Smithsonian Institution

Office of Planning, Design & Construction

SPECIFICATIONS

PROJECT NO.: 2466904

PROJECT TITLE: Renovate 4E NMAL Office Suite

FACILITY: Capital Gallery

DATE: April 18, 2025

This project is approved as being in conformance with applicable provisions of the Smithsonian Directive (SD) 410.

Andrew Scott 5/9/2025

Michael J. Carrancho, P.E., Deputy Director Date

600 Maryland Avenue, S.W.
Suite 5001
Washington, D.C. 20024
Voice: 202.633.6230 Fax: 202.633.6233

USPS Mail: OPDC Capital Gallery
MRC 511
P.O. Box 37012
Washington, D.C. 20013-7012

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PROJECT SUMMARY AND INFORMATION

1 PROJECT INFORMATION

1.1. Project No: 2466904
Project: Renovate 4E NMAL Office Suite
East Tower Fourth Floor
Capital Gallery
600 Maryland Avenue SW
Washington, DC

1.2. Smithsonian Institution Contacts:
Tom Dempsey, Contracting Officer
Smithsonian Institution
Office of Contracting
600 Maryland Ave, SW Suite 500E
Washington, DC 20024-2520

Rex Little, Contracting Officer's Technical Representative (COTR)
Smithsonian Institution
Office Engineering Design & Construction
600 Maryland Ave., SW Suite 5001
Washington, DC 20024

2 SUMMARY OF WORK

2.1. The Contractor shall furnish all supervision, labor, materials, and equipment needed to complete interior improvements at the Smithsonian Institution's Capital Gallery Administrative Headquarters located on the 4th Floor of the East Tower at 600 Maryland Avenue SW, Washington DC as set forth on the Drawings for Project No: 2466904, sheets 1 through 75 and in these specifications, both dated 04/18/2025. Supplemental Information includes Product Data and Basis of Design dated 04/18/2025.

2.2. The Work includes, but is not limited to:

- The Tenant Fit Up of approximately 13,500 square feet of existing 4th floor Office Suite with limited demolition; partition modifications; new ceiling tile, wall, and floor finishes; miscellaneous cabinetry.
- Demolition of plumbing fixtures and piping in existing pantries and addition of new plumbing fixtures and piping in new pantry and lactation room.
- New Communication and Security equipment including runs to existing LAN room.
- Limited HVAC alterations
- Modification to HVAC controls for central AHU’s and floor-mounted perimeter units.
- Limited Electrical alterations and additions of power, mechanical equipment, and lighting branch circuits;
- new lighting fixtures and lighting control system and devices; replacement and consolidation of existing panelboards;
- Fire Alarm – Modify existing fire alarm system to meet new tenant fit-out and NFPA 72 codes and SI OSHEM requirements. Installation of smoke detection throughout.
- Sprinkler – Providing all new quick response heads throughout and modifying existing

sprinkler system to meet new tenant fit-out.
- New Security System and Panel new devices, cameras, etc. tied into existing SI Security System.
- Communication/Data infrastructure and pathways from Office Suite to LAN Room; fiber and cabling by others.

2.3. Critical Elements of the Work: The successful Contractor shall be fully qualified to install critical elements of the Work. Upon request of the Contracting Officer, shall submit a statement of qualifications to address the following critical elements of the Work:

- Interior demolition
- Interior finishes
- Interior Mechanical & HVAC
- Interior Electrical
- Interior Plumbing
- Security Infrastructure & Devices
- IT & A/V Infrastructure

3 CONTRACT TIME FOR COMPLETION

3.1. Work under this contract shall begin by the Contractor within ten (10) calendar days after the Notice to Proceed and shall be completed within the total contract time of **One Hundred Sixty days (160) calendar days.** All work, including project closeout activities, shall be completed in every respect within the contract time.

3.2. The start date and completion date shall be as stated in the Notice to Proceed issued by the Contracting Officer.

4 SCHEDULE OF OPTIONS/ALTERNATES FOR BID

4.1. The following is a brief Statement of the Work identified for bid/proposal options/alternates. The complete description of the Work is identified elsewhere in the drawings and specifications.

BASE BID/PROPOSAL:
Provide all work shown on project drawings and specifications.

OPTION/ALTERNATE 1: DEDUCT
Delete material and labor related to glazing at office sidelites, conference room 4040E, conference room 4002E. Provide gyp board wall similar to adjacent construction.

5 SCHEDULE OF UNIT PRICES (Not Used)

6 OFFEROR EXAMINATION OF SITE

6.1. Every effort has been made to indicate all work necessary to complete the project as identified. All Offerors shall carefully examine the premises during the Bid period and satisfy themselves as to the extent, nature and location of the work, general and local conditions, particularly those bearing on transportation, disposal, handling and storage of materials, availability of labor, water, electric power, access routes, uncertainties of the weather, type of equipment and facilities needed for the successful execution of the Work.

6.2. Before the Bid opening date, Offerors may view the project site on an appointment basis. Any comments, information or discussion during the site visit shall not modify the contract documents. Offerors shall make an appointment to view the site by contacting:

Rex Little, Construction Manager
Telephone No. (202) 359-6332
Smithsonian Institution
Office Planning Design and Construction
600 Maryland Ave. SW, Suite 5001
Washington, DC 20024

6.3. Pre-Bid Conference and Site Visit: Before the Bid opening date, a scheduled pre- Bid conference and site visit will be announced by the Contracting Officer. The purpose of the scheduled meeting is to provide an opportunity for all Offerors to review the project site. Any comments, information or discussion during the site visit shall not modify the contract documents.

6.4. This project requires special arrangements for access to a non-public area. Access to the site may be restricted at times other than during the scheduled visit.

7 AVAILABILITY OF DOCUMENTS (Not Used)

SPECIAL PROJECT REQUIREMENTS

8 UNITS OF MEASURE

8.1. All fabrication and installation shall be performed in accordance with the units of measure given in the Contract Documents.

9 NON-PUBLIC, TENANT AND SECURED SPACES

9.1. Certain tenant spaces, non-public spaces, utility and equipment rooms and other areas related to or used for purposes of storage, research, or for scientific research may have restricted access.

9.2. The Contractor shall identify to the COTR as soon as possible, but no less than two (2) working days in advance, any occupied areas that the Contractor must access that are located outside the limits of the project site. The Contractor shall identify in writing:

9.2.1. Restricted areas to be accessed.

9.2.2. Specific reason for needing access.

9.2.3. Nature of the work to be performed.

9.2.4. Date(s) and hours needed to complete construction work activity.

10 SCIENTIFIC RESEARCH MATERIALS (Not Used)

11 PROTECTION OF HISTORIC PROPERTIES (Not Used)

12 COMMITMENT TO SUSTAINABILITY

12.1. The Smithsonian Institution is a trust instrumentality of the United States (recognized as a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code) and although not an Executive Branch of the U.S. Government, is committed to planning, designing, constructing, maintaining and operating its owned and leased buildings and facilities consistent with Federal environmental and energy management requirements, as listed in the Smithsonian Facilities Codes, Standards and Guidelines document, dated February 15, 2015, to the maximum extent practical.

13 COMMISSIONING

13.1 Provide industry standard start-up and testing. Coordinate with SI-COTR.

CONTRACTOR USE OF PREMISES

14 HOURS OF WORK, WORKDAYS AND GOVERNMENT HOLIDAYS

14.1. Work shall be performed under this contract during the normal workdays of Monday through Friday, except Smithsonian holidays as specified herein and the normal work hours of 6:00 AM to 3:30 PM

14.2. The premises will be continually occupied, requiring the work under this contract, which is potentially disruptive to the tenants, to be performed during periods other than the normal building operation hours. The Capital Gallery Building Operation Hours are Monday through Friday between 7:00 AM - 7:30 PM and Saturdays 9:00am – 2:00pm. Therefore, the Contractor shall schedule and coordinate actual work hours with and through CM-COTR, who will coordinate with Boston Properties (BxP). The intent is to minimize disruption to the building tenants and their operations.

14.3. For each occasion the Contractor intends to work on Saturdays, Sundays, or Smithsonian holidays or during hours other than those indicated above, the Contractor shall obtain written permission from the COTR, at least three (3) working days in advance.

14.4. The Contractor shall reimburse the Smithsonian Institution for security and inspection services provided by the Smithsonian when the Contractor chooses to work outside the normal workdays and hours, as identified herein. However, the Contractor will not be charged for SI overtime security and inspection services, if, in the opinion of the COTR, the work cannot be done during the normal workdays and hours due to requirements of the Smithsonian or BxP.

14.5. Smithsonian Holidays: For holidays that fall on Saturday, the Smithsonian holiday is observed on the previous Friday. For holidays that fall on Sunday, the Smithsonian holiday is observed on the following Monday. The Smithsonian holidays are listed below.

New Year's Day	January 1
Martin Luther King Jr.'s Birthday	January, third Monday
George Washington's Birthday	February, third Monday
Memorial Day	May, last Monday
Juneteenth	June 19
Independence Day	July 4
Labor Day	September, first Monday
Columbus Day	October, second Monday
Veterans' Day	November 11
Thanksgiving Day	November, fourth Thursday
Christmas Day	December 25

15 CONDITIONS AFFECTING CONTRACTOR'S WORK

15.1 Existing Occupied Spaces: The premises will be occupied during the performance of the Work. All requests for on-site storage shall be coordinated with CM-COTR. The Contractor shall schedule work activities to minimize interruption of occupants and occupied spaces.

15.2 Space for Contractor Use: The space available for Contractor's use is limited to areas indicated on the Contract Drawings as the project site. Space allocation and availability are subject to change, at the discretion of the Smithsonian, to meet the needs of all parties requiring access and space within the building and the surrounding areas.

15.3 Other conditions:

- Ability to manage resources and schedule to deliver the project on time;
- Observance and Compliance with the Boston Properties (BxP) Construction Rules Rider (attachment B) coordinated through the COTR and SI Construction Manager Representative.
- All Design Documents are to be considered 'Approved by Boston Properties' and ready for Construction.
- Building Permit and Certificate of Occupancy to be received from SI at no cost to the Contractor.
- SI Office of Design and Construction, Permitting in SI Spaces
- SI-OSHEM, Authority Having Jurisdiction within SI Spaces

16 CONTRACTOR DELIVERIES, HAULING AND ACCESS

16.1 The Contractor's materials and equipment shall be delivered, received and handled by the Contractor's personnel.

16.2 Access to the building for on- and off-loading of all material, structures and equipment shall be the Capital Gallery loading dock.

16.3 The transportation of hazardous materials or hazardous waste into or out of the building shall be coordinated with the COTR. All hazardous materials shall be transported through the building in secondary containment and properly secured to transport carts to prevent breakage or spills.

17 DRESS AND DEPORTMENT

17.1. Contractors' personnel shall be fully and appropriately clothed at all times and shall conduct themselves in a manner appropriate to a public place. The COTR may require removal of any individual from the premises and project for unacceptable dress, demeanor or disruptive conduct, if the Contractor superintendent fails to correct conditions in violation of this paragraph.

18 CONTRACTOR PARKING

18.1 Contractor shall be responsible for making their own parking arrangements.

19 EATING, DRINKING, SMOKING, AND ILLEGAL SUBSTANCE ABUSE

19.1 Eating and drinking in Smithsonian buildings will not be allowed. Offenders may be subject to removal from the premises and project should the Contractor's Superintendent fail to correct conditions which, in the opinion of the COTR, violate this clause.

19.2 The consumption of alcoholic beverages by the Contractor's personnel is prohibited in all Smithsonian buildings or leased space.

19.3 Smoking or carrying lighted tobacco products is prohibited in all Smithsonian buildings or leased space, in exhibition and public spaces, in areas where hazardous materials are stored or handled, and in areas undergoing construction, renovation, or repair.

19.4 The possession, sale and/or use of narcotic or other illegal substances or firearms by Contractor employees is strictly prohibited in all Smithsonian facilities and leased space. Working on the project under the influence of alcohol or illegal substances is strictly prohibited.

PROJECT COORDINATION

20 COORDINATION OF TRADES

20.1. The Contractor shall coordinate work of different trades so that interference between mechanical, electrical, architectural, and structural work, including existing services, shall be avoided.

20.2 Where work by separate entities requires off-site fabrication of products and accurate interfacing of materials to produce the required results, the Contractor shall prepare coordination drawings to indicate how work shown on separate shop drawings will be interfaced, intermeshed, and sequenced for installation. Coordination drawings shall be submitted in accordance with the requirements of the "Submissions" section.

20.2.1. Work installed prior to approval of coordination drawings shall be at the Contractor's risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Smithsonian. If an interference develops, the COTR will decide which work shall be relocated, regardless of which was installed first.

20.3. Installation of equipment and systems shall allow the maximum practical space for operation, repair, removal, and testing, within the limits indicated on the Contract Documents. Pipes, conduit, ducts, and other system components shall be installed as close as possible to ceiling slabs, walls, and columns to minimize space used while accommodating function and maintenance.

21 QUALITY ASSURANCE

21.1. The Contractor shall provide for quality control, inspections, testing and re-testing as necessary for all work, including that of subcontractors, to assure compliance with the contract documents.

22 PERMITS, LICENSES & FEES

22.1. The Contractor shall obtain and pay for all applicable permits and licenses required by regulating agencies, including, but not limited to: permits for pedestrian and road markings, construction fences, sidewalk cuts, utility company connections, elevator certificates, waste containers, etc.

16.2 A DC Building Permit is NOT REQUIRED for work within Smithsonian-owned Space. An SI Building Permit will be provided at NO COST to the Contractor.

23 UTILITY SERVICE INTERRUPTIONS AND NEW CONNECTIONS

23.1. Any planned interruption in utility service must be approved by and coordinated through the COTR. The Contractor shall submit a written request as far in advance of scheduled interruption as possible, but no less than two (2) full working days in advance. The Contractor shall make the necessary temporary provisions to supply continuous electrical power, HVAC space conditioning and security as required during periods when service is interrupted.

23.2. The Contractor's work efforts to restore service shall be continuous until the interrupted utility is back in service.

23.3. (Not Used)

23.4. A fire watch shall be provided for the time periods when fire suppression and detection systems are out of service. See Section 33 for additional requirements.

23.5 Areas of the facility will remain occupied and in operation beyond the construction zone throughout the construction period. Utility services to occupied areas must remain operable 24 hours a day. All work requiring shut down of equipment serving occupied areas beyond the construction zone will be coordinated with the COTR a minimum of 2 days in advance of scheduled work requiring shut down.

23.6 The Contractor must provide on-going access to SI personnel to all equipment which is to remain operational throughout the construction period.

24 SMITHSONIAN FURNISHED ITEMS INSTALLED BY CONTRACTOR

24.1 Refer to the responsibility’s matrix shown in the drawings.

25 SALVAGE

25.1. The Smithsonian Institution assumes no responsibility for salvage value or any loss or damage to materials or structures on the site for which the Contractor may have reflected a salvage value in their bid.

25.2. Except as specifically stated in the contract documents, construction materials, equipment or other items that are to be removed and neither re-used under this contract nor reserved as property of the Smithsonian Institution shall become the property of the Contractor and shall be removed from the premises by the Contractor.

26 CUTTING, PATCHING AND MATCHING EXISTING WORK

26.1. Existing work shall be cut, drilled, altered, removed, or temporarily removed and replaced as necessary for performance of work under the contract. Work that is replaced shall match similar existing work. Structural members shall not be cut or altered, except where noted on drawings, without authorization of the COTR. Work to remain in place, which is damaged or defaced during this contract shall be restored to match the conditions existing at the time of award of the contract, at no additional cost to the Smithsonian.

26.2. Conditions exposed by removal of existing work that do not match new finishes or align with new work shall be called to the COTR's immediate attention. Necessary corrective work directed by the COTR will be subject to adjustment provisions as stated in the General Conditions

of the contract.

PROTECTION OF THE SITE

27 PROTECTION OF THE SITE

27.1. The Contractor shall provide adequate protection for all parts of the building, including interior and exterior surfaces, its occupants and contents and grounds wherever work under this contract is performed.

27.2 Plan for Protection of the Site: The Contractor shall submit a plan for protection of the site to the COTR for approval. As a minimum, the Plan shall describe:

15.2.1 Proposed method, location, and construction of temporary barricades, signage.

15.2.2 Methods of protection of existing surfaces and occupants.

28 PROTECTION OF FLORA AND FAUNA (Not Used)

29 DEBRIS CONTROL AND DAILY CLEANUP

29.1. The Contractor shall regularly clean up the work areas and shall, at all times, maintain the project in as neat and orderly a manner as is consistent with normal operations. Debris resulting from construction operations shall be removed daily from the site by the Contractor. The Contractor shall keep all access, haul routes and site areas free of dirt, debris and other materials resulting from construction activities.

Coordinate with SI-COTR and BxP.

30 DUST AND AIR QUALITY CONTROL

30.1 The Contractor will execute the Work by methods that minimize dust raised by construction operations. The Contractor will provide positive means to prevent objectionable odors and air-borne dust from dispersing into the atmosphere and from being drawn into existing air-intake louvers and ductwork.

30.2 Dust barriers shall be erected where necessary to protect adjacent areas from dust infiltration as required by the COTR. Dust barriers shall be rigid and visually opaque and shall seal the work area by affixing to the structure on all sides (i.e. ceiling, walls, and floor).

30.3 Means of connection of dust barriers to existing structures shall not damage the building fabric. Details of barriers shall be submitted for approval to the COTR.

31 NOISE CONTROL

31.1 The Contractor shall comply with the regulations of OSHA Standard 1926.52 and 1910.95 and all other regulations relative to safety noise control.

31.2 Activities that generate excessive noise or vibration and interrupt the facilities functions or create public disturbances may be required to be performed during off-hours at the discretion of the COTR.

31.3 The Contractor shall provide sound attenuation to maintain acoustic level below 75 dBA at a distance of 15 m.

32 VERMIN, PEST, AND RODENT CONTROL (Not Used)

33 DRILLING, WELDING, AND CUTTING

33.1 Daily Permit: When welding, torch cutting, or other heating operations are to occur, the Contractor shall obtain a daily welding permit from the COTR at least two working days in advance. The permit must be posted at the job site prior to beginning the scheduled work.

33.2 Fire Watch: No welding or torch cutting shall be performed unless adequate fire protection is provided. The Contractor shall maintain a fire watch for the duration of welding, cutting, and heating operations and for at least 30 minutes after the 'hot' work has stopped. The Contractor shall provide adequate ventilation to prevent air contamination or the accumulation of toxic materials. A fire extinguisher (minimum 10 pounds, dry-chemical type, typical) shall be on hand when drilling, welding, or cutting.

33.3 Use of Impact Hammers: The use of impact hammers or other equipment causing vibration, noise, and dust may be harmful the facilities equipment, telescopes and/or building occupants. The Contractor shall request approval from the COTR at least five working days before beginning this type of work.

TEMPORARY CONSTRUCTION FACILITIES

34 CONTRACTOR FIELD OFFICES

34.1. The Contractor shall establish a temporary office at the project site. The Contractor shall provide information about proposed locations of any temporary office, staging and storage areas and designation of size, color, and materials to the COTR for approval at least five (5) working days prior to mobilization.

34.2. The Contractor may provide his own locking device on the door to the temporary office, trailer or shed. The Contractor shall be solely responsible for the safekeeping and security of the construction facilities, materials, and equipment.

34.3. Upon completion of the Work, the temporary offices be removed, and the area returned to its original pre-contract condition.

35 STAGING, STORAGE AND WORK AREAS

35.1. Before any work is started, the Contractor shall coordinate with the COTR regarding the use of area for staging and storage of materials and equipment.

36 SANITARY FACILITIES

36.1 The Contractor's personnel may use the public restrooms as long as the privilege is not abused, and the facility is kept clean. If in the opinion of the COTR the facility is not being properly used, it will be placed off limits and the Contractor will be required to make other arrangements.

37 TEMPORARY UTILITY CONNECTIONS AND EXTENSIONS

37.1. The Contractor shall provide and maintain all temporary lighting and power required, including interior lighting and security lighting, in all areas where permanent lighting or power has been disconnected or removed. Contractor shall continue to provide such temporary power of lighting until permanent lighting and power has been installed or restored or until otherwise directed by the COTR. Contractor shall maintain all permanent lighting and power in areas inside the construction zone even if such power or lighting is not part of the Work.

37.1.1. When the use of such temporary lighting and power is no longer required, all temporary wiring, and equipment including hangers and supports shall be completely removed by the Contractor.

37.1.2. Temporary Lighting shall meet minimum OSHA standards.

37.1.3. The required temporary lighting shall remain on twenty-four (24) hours a day and seven (7) days a week at all stairs and egress paths. In other areas temporary lighting may be shut off during non-working hours.

37.1.4. All temporary wiring and equipment shall be in conformity with the National Electric Code. Three-phase temporary power circuits shall be installed as required to operate construction equipment of the various trades and to install and test equipment such as pumps and fans. The Contractor shall install and maintain temporary or permanent service for the permanently installed building equipment such as sump pumps, air handlers, chillers, cooling towers, automatic temperature controls, boilers, boiler controls, fans, pumps, etc. so that such equipment may be operated when required and so ordered by the COTR. Wiring for temporary lighting and receptacles, within the existing building shall be type MC cable as defined in NFPA 70 and shall contain an insulated ground wire. Minimum conductor shall be No. 12 AWG solid copper with type THHN/THWN insulation.

37.1.5. Receptacles for temporary power during construction shall be provided in work areas, with maximum spacing of 25 feet. A maximum of three duplex receptacles shall be connected to 20A, 120V circuit GFCI protection must be provided at all temporary power receptacles.

38 SCAFFOLDING AND PLATFORMS

38.1. The Contractor shall erect temporary scaffolding in accordance with OSHA 29 CFR 1926.451 and ANSI A10.8. The Contractor shall provide landing platforms with stairways or ladders for proper access and egress to all work areas.

38.2. For all frame scaffolding greater than 4 m in height, the Contractor shall submit working drawings to the COTR a minimum of ten (10) working days in advance of scaffolding erection. Working drawings submitted by the Contractor shall be certified by a registered Professional Engineer.

38.3. During non-working hours, the Contractor shall close and lock the scaffolding with a physical barrier to prevent access by unauthorized persons.

39 PROJECT SIGNS (Not Used)

MEETINGS

40 PRECONSTRUCTION MEETING

40.1. A Preconstruction Meeting will be scheduled with the Contractor before any work is started at the site. As soon as possible after the Date of Award, the COTR will contact the Contractor to arrange a time, date, and place for the conference. Items to be discussed at the Preconstruction Meeting include, but are not limited to:

40.1.1. Contract Time: Notice to Proceed date and Completion date;
40.1.2. Scheduling and Submittals;
40.1.3. Project Communications;
40.1.4. Mobilization and Staging;
40.1.5. Access to the Premises, Haul Routes, Loading Dock;
40.1.6. Security Requirements/List of Contractor's Personnel;
40.1.7. Emergency Procedures and Phone Numbers;
40.1.8. Protection of Site;
40.1.9. Fire Protection and Safety Requirements;
40.1.10. Utility Interruptions, Rough-in Inspections, Testing;
40.1.11. Applications for Payment;
40.1.12. Pre-Condition Survey of the Site;
40.1.13. Accessibility Requirements;
40.1.14. Sustainability Requirements;
40.1.15. Building Systems Commissioning;
40.1.16. Quality Assurance;
40.1.17. (Not Used)

40.2. The Contractor's key staff and representatives of all Subcontractors or Suppliers shall attend the Preconstruction Meeting.

40.3. Coordination Plan: The Contractor shall use the Preconstruction Meeting to develop a Coordination Plan for interaction with other parties working in or using the facility. The plan shall be submitted no less than five (5) working days after the Preconstruction Meeting and shall address interactions with other contractors, tenants, the public and any others making use of the site and surrounding areas. As a minimum it shall include:

40.3.1. Locations of overlap in use of the site by the Contractor and others, including work areas, delivery points, access/egress areas.

40.3.2. Specific items of work by others required to support critical milestones in the Contractor's schedule.

40.3.3. Coordination with the work of the designated Commissioning Provider.

40.3.4. Completion or delivery of work by others that may impact the Contractor's schedule.

40.3.5. Portions of the work that create special hazards or disturbances.

40.3.6. Portions of the work that affect utilities, fire-protection or detection systems or security systems.

40.3.7. Events requiring access to areas outside of the project site or secured spaces.

40.3.8. Protection to be provided by the Contractor for work completed by others

either before or during this project.

41 PRE-CONDITION SURVEY OF THE SITE

41.1. After the Preconstruction Meeting and before the start of work on the site, the project site (i.e. building, its contents, grounds, and equipment) shall be inspected by the Contractor, major Subcontractors, COTR and other Smithsonian Institution personnel as may be required for the purpose of verification of the existing conditions. Any damages or defective equipment will be noted at this time and this survey will serve as the basis for the establishment of the pre-contract conditions. The identification of pre-contract conditions will be jointly established by the Contractor and Smithsonian Institution.

41.2. Written and photographic documentation: The Contractor shall prepare a typewritten and photographic report in PDF format to identify damages or defects of materials, equipment, and the site. The Contractor shall submit report electronically to the Contracting Officer and the COTR.

41.3. Video documentation: The Contractor shall video and document the observations made during the survey of the existing conditions for buildings, improvements, finishes, utilities, interior surfaces, construction and other systems, components, or materials, which might be affected by the Work, including sidewalks, streets, and adjacent facilities. The Contractor shall submit the report electronically to the COTR. The typewritten and photographic report and video reports shall be complimentary in content and shall be submitted together.

42 PROJECT MEETINGS

42.1. Progress Meetings: The COTR will lead regular progress meetings with an interdisciplinary integrated management team consisting of representatives of the Contractor, Smithsonian, Architect/Engineer Commissioning Provider, major Subcontractors and other critical Subcontractors and suppliers. The purposes of these meetings are to expedite the work, coordinate and schedule the Work and coordinate the work with Smithsonian activities. Progress meetings shall be held weekly unless otherwise directed by the COTR. The time and place of the meetings will be established at the Preconstruction Meeting. The Contractor shall ensure that all required Subcontractors and suppliers attend the Progress Meetings and the COTR will ensure that all necessary SI personnel attend.

42.2. Special-Topic Meetings: At the discretion of the COTR, additional meetings may be scheduled to address issues of quality control, sustainability requirements, coordination between contractors on the premises, coordination with other agencies, scheduling of the work, application for payments, etc. The Contractor's staff and Subcontractors or Suppliers shall attend.

42.3. Meeting Minutes: The Contractor shall promptly prepare Meeting Minutes, see Appendix A, of each meeting and transmit to the COTR, within three (3) working days.

SUBMISSIONS

43 SUBMITTAL DEFINITIONS

43.1. Submittals are defined to include shop drawings, product data, samples and additional data required for submission to the COTR for review and approval prior to incorporation into the work.

43.1.1. Shop Drawings: Detailed drawings, schedules, diagrams, and illustrations prepared specifically for this project by the Contractor or any subcontractor, manufacturer, supplier, or distributor to illustrate fabrication and/or installation of a portion of the Work.

43.1.2. Schedule: A detailed tabulation of components, items, or parts to be furnished for use on this project.

43.1.3. Statement: An affirmation prepared by the Contractor, the installer or manufacturer of a material, product, or system, to satisfy a requirement defined in a technical section.

43.1.4. Factory Test Report: A written report of the findings of a test performed by the Contractor on an actual portion of the Work or prototype prepared for this project before it is shipped to the site.

43.1.5. Field Test Report: A written report of the findings of a test performed by the Contractor on a portion of the Work during or after installation.

43.1.6. Certificate of Compliance: A written statement, signed by an authorized official of the manufacturer of a product or system or supplier of a material attesting that the product, system, or material meets the requirements of the contract documents. The certificate of compliance must be dated after the award of this Contract and must name the project and cite the specification section, paragraph, and requirements, which it is intended to address.

43.1.7. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature and catalog information illustrating a material, product or system to be installed on this project, including all data related to LEED requirements, such as recycled and regional content information, Volatile Organic Compound (VOC) product schedules, Forest Stewardship Council (FSC) chain-of-custody documentation and other documentation as requested by the COTR.

43.1.8. Color Charts: Pre-printed brochures showing the color range of a material.

43.1.9. Test Reports: Reports verifying that a material, assembly, system, process, or laboratory meets requirements established in the Contract Documents. Reports shall indicate compliance by naming and describing the test method and test results. Testing must have occurred within three (3) years of the date of award of this contract.

43.1.10. Samples: Physical examples of materials, equipment, assemblies, or workmanship establishing standards for evaluating finished Work.

43.1.11. Color/Texture Selection Sample: Samples of an available range of textures and/or colors of a material formed of the actual finish material over a substrate identical to that which will be used in the field.

43.1.12. Mock-up: An assembly or sample panel constructed in accordance with specifications to show construction details, finished appearance and/or performance.

43.1.13. Safety Data Sheets: Instructions, warnings and recommended and required handling and use procedures for individual hazardous materials published by the product manufacturer.

44 SUBMITTALS AND REVIEWS

44.1. Contractor Responsibility for Submittals: The Contractor shall provide all required submittals, by technical specification section, in accordance with the contract documents. All submittals, with exception of mockups or samples, are to be submitted electronically by email in PDF format. The Contractor shall clearly indicate on the submittal that it has been reviewed by the Contractor and found to meet the project requirements. Any items submitted as substitutions shall be clearly identified as such on the submittal and the transmittal document. If shop drawings show variations from the contract documents because of standard shop practices or for other reasons, the Contractor shall provide a separate, written description of variations along with the submittal. The Contractor shall:

44.1.1. Review each submittal for conformance with requirements of the contract documents and coordination with related work.

44.1.2. Determine and verify all field measurements, required material quantities, method of assembly or erection, installation requirements and proper connection to adjoining materials installed by others.

44.1.3. Assure that all submittals use the appropriate units of measure. All drawings and technical data shall be in SI (metric) units for projects designed in SI units. Preprinted literature in other units shall be accompanied by documentation to show conformance to project requirements.

44.1.4. Transmit all required submittals for a technical specification section at the same time unless prior written waiver of this requirement has been provided by the COTR.

44.1.5. Transmit submittals to the COTR in a logical and orderly sequence in accordance with the Submittal Schedule to prevent project delays or adversely impact work by the Smithsonian Institution or other contractors.

44.1.6. Correct and resubmit submittals according to response from the Smithsonian Office of Planning Design and Construction (OPDC).

44.1.7. Commence work on items requiring submittals only after all related submittals are reviewed and approved by the Smithsonian. All Work shall conform to approved submittals.

44.1.8. Submittal Procedures: All submittals shall be submitted to and coordinated through the COTR. The Contractor shall establish and maintain a secure FTP/Web site for the duration of the project. The FTP/Web site will be used for the purpose of posting, exchanging, and sharing project information and documents, including but not limited to submittals, shop drawings, meeting minutes, reports, and test data. The FTP/Web site will be made available to the COTR, the project Architect/Engineer and their consultants and other project team members as approved by the COTR.

Submittals which cannot be posted electronically, such as samples, shall be delivered to the office of the COTR, properly labeled and with transmittals.

44.2. Submittal Schedule and Control Log: The Contractor shall submit, to the COTR, a schedule of work-related submittals using the Smithsonian Facilities Submittal Log form, see Appendix A, within fourteen (14) calendar days after the effective date of the Notice to Proceed.

Submittals shall be listed in the order they are scheduled to be submitted and the following information shall be given:

44.2.1. Project Name, Project Number, Contractor Name, Contract Number;

44.2.2. Technical Specification Section for each submittal;

44.2.3. Unique Submittal Number;

44.2.4. Description of item to be submitted, as listed in the specifications;

44.2.5. Date item must be submitted to the Smithsonian to support the project schedule;

44.2.6. Subcontractor providing submittal (in "Comments" column).

44.3. Quantities for Submittals: Unless otherwise noted in the technical specification, the Contractor shall deliver to the COTR:

44.3.1. Shop Drawings: Submit electronic copy of shop drawings in PDF format. Submittal will be forwarded electronically to the AE for review. After submittal review, submittal will be returned to the Contractor electronically, in PDF format. Submit in DWG format, if requested.

44.3.2. Product Data, Test Reports, Color Charts, etc: The Contractor shall make submittals in electronic format, preferably PDF.

44.3.3. Color/Texture Samples: Submit two (2) samples, minimum size 600 mm by 600 mm, unless otherwise specified. After submittal review, one (1) sample may be retained by the Smithsonian.

44.3.4. Mock-up and Sample Installations: Unless otherwise specified, minimum size shall be as noted to complete a panel section or normal break in the work.

44.3.5. Written Text Documents, Plans and Reports: Submit electronic copy of written text documents, plans and reports in PDF format. Submittal will be forwarded electronically to the AE for review. After submittal review, submittal shall be returned to the Contractor electronically, in PDF format.

44.4. Submittal Reviews by the Smithsonian: Reviewed submittals shall be marked "Approved," "Approved as Noted," "Revise/Resubmit," "No Action Taken." Submittal approval by the Smithsonian shall not relieve the Contractor of responsibility for submittal errors, omissions, or deviations from the contract documents. Approval of submissions does not constitute acceptance of substitutions except as covered under sub-paragraph entitled "Contract Requests for Substitutions."

44.5. Submittal Review Period: The Contractor shall transmit, to the COTR, all submittals sufficiently in advance of the time necessary for fabrication and installation to allow for review by the Smithsonian and return to the Contractor, including any time needed for correction and resubmission by the Contractor. The expected time required by the Smithsonian for review of initial submission is **21** calendar days. No extension of the Contract Time will be granted for the Contractor's failure to allow sufficient time for review and processing, including resubmission of items, which initially rejected due to improper submission or non-compliance with the Contract Documents.

44.6. Contractor Requests for Substitutions: Contractor requests for items identified by

manufacturer, brand name, make, catalog number, etc. in the contract documents shall be submitted to the Contracting Officer for approval prior to contract award, in accordance with the General Conditions. After award of the contract, contractor requests for substitutions may be considered and accepted by the Smithsonian at the discretion of the Contracting Officer.

44.7 Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

44.7.1. Note date and content of previous submittal.

44.7.2. Note date and content of revision in label or title block and clearly indicate extent of revision.

44.7.3. Cloud, bubble, or otherwise highlight and identify all revisions on the drawings. Submittals which do not identify changes and revisions will be returned as “Not Reviewed”. Do not renumber submittal documents which have been previously submitted for review except to modify the revision number. Drawings that have been renumbered will be rejected and returned. Resubmit submittals until they are marked with approval notation from COTR.

45 CRITERIA FOR PRODUCT SELECTION

45.1. To the greatest extent possible, subject to the restrictions of the Buy American Act, provide products, materials, or equipment of a singular generic kind from a single source. Where more than one choice of a product or material is available for Contractor's selection, select an option, which is compatible with other products and materials already selected.

45.2. Provide products complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation for intended use and effect.

45.3. Products, which, by nature of their application, are likely to be needed at a later date for maintenance and repair or replacement work, shall be current models for which replacement parts are available.

45.4. Product selection shall be done in accordance with the following requirements:

45.4.1. Standards, Codes and Regulations: Select from among products that are in compliance with the project requirements, as well as with construction standards, all applicable codes and regulations and LEED requirements.

45.4.2. Performance Requirements: Provide products that comply with specific performances indicated and are recommended by the manufacturer (in published product literature or by individual certification) for the application indicated.

45.4.3. Prescriptive Requirements: Provide products that have been produced in accordance with prescriptive requirements, using specified ingredients and components and complying with specified requirements for mixing, fabricating, curing, finishing, testing and other operations in the manufacturing process.

45.4.4. Visual Matching: Where matching with an established sample for color, pattern and/or texture, the COTR shall determine whether a proposed product matches the sample.

45.4.5. Avoidance of banned materials: The Contractor will commit to not using the following toxic and hazardous materials:

45.4.5.1. Products containing asbestos, urea formaldehyde, polychlorinated biphenyls (PCBs) and/or chlorinated fluorocarbons;

45.4.5.2. Products containing lead content, including older or flux containing more than 0.2 percent lead; domestic water pipe or pipe fittings containing more than 8 percent lead; and paint containing more than 0.06 percent lead.

46 PROGRESS PHOTOGRAPHS

46.1. The Contractor shall provide digital photographs of the project site and construction activities throughout the progress of the Work. The COTR shall determine the vantage points from which photographs will be taken.

46.2. At least 24 color progress digital photographs shall be taken monthly. The actual number and location of views shall be directed by the COTR. Photographs shall be taken at the start and finish of various elements of construction designated by the COTR.

46.3. Within Seven (7) working days of taking digital photographs, the Contractor shall submit to the COTR, via email or other electronic means, JPEG files for all photographs taken.

46.4. On the front of each print provide, by photographic means, an information box (40 mm by 90 mm) in the lower right-hand corner. The box shall be typewritten and arranged as follows:

Smithsonian Institution
Title: _____
SI Project No.: _____Contract No.: _____
Contractor: _____
Photo No.: _____Date:_____Time: _____
Description/View: _____

46.5. Submit all original images, select labeled images and typed index to COTR on electronic media and posted to FTP/Web site.

46.6. All photographs and digital files, including the copyright thereto, are the sole property of the Smithsonian Institution. The Contractor shall not use Smithsonian property except as authorized in writing by the Contracting Officer.

47 CONTRACTOR CORESPONDANCE AND DAILY REPORTS

47.1. The Contractor shall correspond with the COTR for all matters related to this construction project, unless otherwise directed. All correspondence shall be signed and dated by the Contractor and shall reference the project, project number and contract number.

47.2. The Contractor shall maintain daily reports using the Smithsonian Institution Contractor's Daily Report form, see Appendix A. Reports shall be numbered consecutively, and all sections shall be completed or noted as "not applicable." Reports shall contain detailed remarks each day, including but not limited to progress on the job, problems discovered and discussions with Smithsonian staff. Reports shall be submitted to the COTR each day for the previous workday.

47.3. The Contractor shall request information using the Smithsonian Institution Request for Information (RFI) form. RFIs shall be numbered consecutively and shall address a single topic,

include the specification section or drawing detail number, and clarification requested. The COTR will evaluate properly submitted RFIs in consultation with the project team and issue a response within 14 calendar days.

47.3.1 RFIs shall be submitted on the Smithsonian's standard form (available upon request).

47.3.2 RFIs shall be numbered consecutively.

47.3.3 Each RFI shall address a single topic, include the specification section or drawing detail number, and clarification requested.

47.3.4 The COTR will evaluate properly submitted RFIs in consultation with the project team and issue a response within **7** calendar days.

47.3.5 Requests for Information will be answered as prioritized by the COTR.

SAFETY, HEALTH AND FIRE PROTECTION

48 JOB SITE SAFETY

48.1. Safety Coordinator: The Contractor shall designate a person responsible for safety at the project site for the duration of the project.

48.2. Jobsite Safety Plan: The Contractor shall submit a Jobsite Safety Plan within fourteen (14) calendar days of the Contract Award and at least ten (10) calendar days prior to mobilization to the site for approval by the COTR. See Site Specific Safety Plan (SSSP) Format template for requirements and shall detail the procedures, designated persons, instructions, and reports to be used to assure jobsite safety for all contractors, subcontractors, Smithsonian personnel, the public and others on the site.

48.3. Occupational Safety and Health: This contract is subject to Title 29 of the Code of Federal Regulations, Part 1910 "Occupational Safety and Health Standards" and Part 1926 "Safety and Health Regulations for Construction" pursuant to the Occupational Safety and Health Act (OSHA) of 1970 administered by the US Department of Labor, Occupational Safety and Health Administration.

48.4. Emergency Assistance: The Contractor shall post, at the site, telephone numbers for reporting emergencies, including the Smithsonian Office of Protection Services (OPS), ambulance, police, fire department, gas utility, electric utility, water/sewer utility, poison prevention aid and hazardous-waste handling. This information shall be posted in a conspicuous location within the project area prior to the start of any work at the site.

48.5. Safety Signs: The Contractor shall post legible accident prevention signs in construction areas in accordance with OSHA standards. Safety signs shall conform to ANSI 235.1 and 235.2 Vehicular traffic control devices, barricades and signals shall conform to ANSI D6.1.

48.6. Report of Accident or Illness: In the event of any accident or illness for which medical assistance is required, any criminal action or any fire, the Contractor shall notify the appropriate authority (Ambulance, Police, Fire Dept.), Smithsonian Security and the COTR.

48.7. Emergency Evacuation: The Contractor shall post evacuation routes and facility emergency/self-protection plans at the site, train all employees in emergency procedures, and

document such training. In the event of a fire, the Contractor shall immediately activate the alarm at the nearest fire alarm pull station and notify building security. Upon the activation of the audible alarm, the building will be evacuated. No personnel shall reenter the facility until security personnel signal that the building is safe.

48.8. Contractor Personnel to be Contacted: The Contractor shall submit a written list of emergency telephone numbers and names of persons to contact for the General Contractor superintendent and for each major sub-contractor working on the project site. The initial list shall be submitted to the COTR at the Preconstruction Meeting. The list shall be updated and resubmitted to the COTR as needed.

49 TOXIC AND HAZARDOUS SUBSTANCES

49.1. The Contractor shall submit to the COTR, at least ten (10) working days prior to their intended use, a written list of toxic and hazardous substances that will be used on the project. The Contractor shall submit a "Safety Data Sheet" similar to OSHA Form No. 20 for these substances to identify the following information:

49.1.1. Product Identification
49.1.2. Hazardous Ingredients
49.1.3. Physical Data
49.1.4. Fire and Explosion Hazard Data
49.1.5. Health Hazard Data
49.1.6. Emergency and First Aid Procedures
49.1.7. Reactivity Data
49.1.8. Spill or Leak Procedures
49.1.9. Special Protection Information
49.1.10. Special Precautions

49.2. The Contractor will commit to not using the following toxic and hazardous materials:

49.2.1. Products containing asbestos, urea formaldehyde, polychlorinated biphenyls (PCBs) and/or chlorinated fluorocarbons.

49.2.2. Products containing lead content, including solder or flux containing more than 0.2% lead; domestic water pipe or pipe fittings containing more than 8% lead; and paint containing more than 0.06% lead.

49.2.3. Chlorofluorocarbon (CFC)-based refrigerants in new base building heating, ventilating, air conditioning and refrigeration (HVAC&R) systems and comprehensive CFC phase-outs when reusing existing base building HVAC equipment.

49.3.4. The Contractor hereby understands that historic properties may contain pre-existing harmful materials and coatings including, but not limited to, arsenic, lead, dioxide, polyvinylchloride (PVC) and asbestos. Upon discovery of hazardous or toxic materials, the Contractor shall alert the COTR immediately.

50 PERSONAL PROTECTIVE EQUIPMENT

50.1. Personal protective equipment for eyes, face, ears, nose, head, extremities and/or full body shall be provided, used, and properly maintained by the Contractor whenever necessitated by reasons of hazards encountered in a manner capable of causing illness, injury, or impairment in the function of any part of the body.

50.2. Persons required to use personal protective equipment shall be thoroughly trained. Training programs shall, as a minimum, meet OSHA and EPA requirements where applicable. The Contractor shall submit proof and criteria for employee training as requested.

51 BARRIERS, BARRICADES AND WALKWAYS

51.1. The Contractor shall provide safety barricades in accordance with the COTR, BxP and applicable OSHA regulations. The Contractor shall also provide barricades, subject to approval by the COTR, to deter passage of persons and/or vehicles into construction areas as specified or necessary.

51.2. The Contractor shall install temporary barriers, in a manner satisfactory to the COTR, to contain and secure the site from unauthorized entry and to minimize the adverse effects of noise, dust and vapors generated by construction activities on surrounding areas. Barriers shall be constructed of pressure-impregnated fire-retardant treated wood, with fire-retardant 6-mil polyethylene as necessary. Submit all product data to the COTR for review and approval.

51.3. If the work interferes with public or employee access to the facility or parts of the facility, as determined by the COTR, the Contractor shall provide personnel barriers and signage to create easily identifiable, accessible (to people with handicaps) walkways around the work. Signs shall be posted at decision points to prevent unnecessary travel along changed routes and to dead ends. The barriers shall be erected and dismantled in phases so that a clear route is always available. The COTR and Contractor personnel shall have access through the barriers to the work areas. The Contractor may use hardware on the barrier doors to prevent entry by unauthorized persons.

51.3.1. Interior barriers shall be of standard drywall partition construction, painted and terminated at the underside the existing ceilings. All requirements for fire protection shall be maintained.

51.3.2. Exterior barriers shall be of dimensional lumber and plywood, painted on both sides and supported to prevent overturning. Barriers shall be repainted and maintained as necessary to remain in good condition as long as they are required.

51.4. Unless specifically indicated otherwise, barricades, barriers and associated signs shall be removed upon completion of the Work. The Contractor shall coordinate the dismantling and removal with the COTR.

52 EXISTING FIRE PROTECTION SYSTEMS

52.1. During the course of the Work, all existing smoke and heat detectors and sprinkler heads must remain operable. Coverings may be applied to protect them from spray coatings or other hazardous conditions only during the actual operations. Coverings must be removed immediately after the operations have concluded. Damaged detectors and sprinkler heads shall be replaced immediately by the Contractor at no additional cost to the Smithsonian Institution. The Contractor shall test replaced detectors and sprinklers after installation to the satisfaction of the COTR.

SECURITY REQUIREMENTS

53 GENERAL SECURITY REQUIREMENTS

53.1. The Contractor and his employees must comply with security requirements imposed by the Smithsonian Institution, including any necessary security clearances. Failure to inspect the site or obtain knowledge of security regulations shall not relieve the Contractor from security requirements or from performance of any part of the work.

54 IDENTIFICATION BADGES (Not Used)

55 ACCESS AND PROPERTY CONTROL AT MSC (Not Used)

56 SECURITY OF TEMPORARY OPENINGS

56.1 Any temporary opening in the building perimeter or between non-public and public interior spaces must be closed and secured with means acceptable to the COTR at the end of each workday. A clear and safe path shall be maintained at all times to allow staff and visitors entrance into the facility. The Contractor shall secure his facilities and equipment during non-working times at his own expense. Authorized Smithsonian personnel shall have access to the work site.

57 EXISTING BUILDING ALARM SYSTEMS

57.1. The Contractor shall notify the COTR prior to disturbing any alarm wiring, device, system, etc. The Contractor shall coordinate planned disturbances at least two (2) working days in advance of the scheduled work. Any alarm wiring, devices, or system that is broken or disturbed for any reason must be reported to the COTR within three (3) minutes of the occurrence.

57.2. If any system or component is damaged by Contractor employees, the COTR determine the procedures for repairing the damage to existing building alarm systems, and who will perform the repair work. The cost to repair the system and any related overtime costs for Smithsonian personnel shall be borne by the Contractor.

58 SECURITY GUARD DUTY CHARGES (Not Used)

SCHEDULING AND PAYMENTS

59 SCHEDULE OF VALUES

59.1. The Contractor shall submit, to the COTR, a schedule of estimated values of all parts of the work. The breakdown of costs on the Schedule of Values shall follow the divisions used in the project specifications and shall reflect major items and groups of items shown on the Contractor's project schedule. All values shall be in US dollars.

59.2. Wages: The contractor shall verify wages and comply with regulated wage scales, i.e. Davis-Bacon, Service Contract Act, etc.

60 SCHEDULING & PAYMENTS / BAR CHART

60.1. Project Schedule: The Contractor shall submit to the COTR for approval, a Gantt bar chart project schedule within fourteen (14) calendar days after the date of contract award. Submit in PDF format. No work shall start at the site until the project schedule has been approved by the COTR. The approved bar chart will represent a baseline schedule on which the monthly construction progress will be indicated and submitted to the COTR. The baseline project schedule

shall comply with the following:

60.1.1. Weekly breakdown of work activities shall be provided, including interaction between building trades, subdivided by items of work and areas of the project. Items of work shall be grouped and subdivided according to the divisions of the Construction Specifications Institute (CSI) format.

60.1.2. The start date and completion date shall be consistent with the Contract Time established by the Contracting Officer. Any intermediate deadline dates needed to meet specific requirements for Smithsonian use of portions of the work shall be shown.

60.1.3. Project condition survey activities shall be scheduled not later than the 14th calendar day of the contract time and prior to the start of any site work.

60.1.4. Project closeout activities shall be scheduled for completion in accordance with the requirements for the Contract Time for Completion.

60.1.5. Order dates and projected delivery dates shall be shown for equipment, special devices, hardware, products, or other items requiring long lead time.

60.1.6. Required delivery dates for items to be furnished by Smithsonian and installed by the Contractor shall be shown, as well as items to be furnished and installed by Smithsonian, which will affect the Contractor's work.

60.1.7. Review periods for all submittals and time required for all necessary inspection and/or testing shall be shown.

60.1.8. Dates shall be given for ordering, delivery, installation and testing of major equipment and special materials and equipment.

60.1.9. The Contractor shall specifically identify work activities and dates associated with construction bid alternates.

60.2. Revisions to Baseline Schedules: The Contractor shall submit to the COTR for approval, all revisions to the approved baseline project schedule. The Contractor shall submit a proposed revision to the schedule, as necessary, along with proposals for construction changes, clearly indicating modifications to the schedule based on the proposal. The Contractor shall also submit, for review and approval, any proposed changes to the schedule due to inability to accomplish the work as planned for any reason. Approved changes to the schedule shall be incorporated into the Project Schedule and it shall be resubmitted as necessary or as requested by the COTR.

60.3. Progress Behind Schedule: If it becomes apparent to the COTR that the overall progress of the project is behind the approved project schedule, then the COTR will notify the Contractor in writing. The Contractor shall submit to the COTR for approval, a Recovery Schedule and Plan to describe how the Work will be accelerated to meet the Contract Time requirements in accordance with the General Conditions contract clause entitled "Commencement, Prosecution and Completion of the Work." The Recovery Schedule shall be superimposed on the approved baseline project schedule to demonstrate that proposed recovery activities will accomplish completion of the work by the approved completion date.

60.4. Reporting Progress and Applying for Payment: Each month, the Contractor shall apply for payment and submit a report of the actual construction progress as follows:

60.4.1. By the 25th of each month, the Contractor and the COTR shall have inspected the work to determine percentages complete for each item, projected through the end of the month. The parties shall attempt to reach agreement on each item, but if they cannot reach an agreement the COTR will determine percent complete.

1. The Contractor shall submit to the COTR a complete and up-to-date set of record prints for review prior to Application for Payment and certify that the project record documents are current at the time of application. The Contractor shall require such drawings to be current as a condition of approving any payment to the trade Contractor and Subcontractor.

60.4.2. By the last day of the month, the Contractor shall submit an Application for Payment based on the determined percentages complete for each item. The application shall be submitted on the Smithsonian standard Application for Payment form. Each copy of the Application for Payment shall be accompanied by the following:

1. A Progress Schedule identifying the cumulative progress superimposed on the latest revision of the approved Project Schedule. The net progress for the month and applicable dates shall be clearly indicated.

2. A complete set of copies of certified weekly-payroll data for the period.

60.5. Response to Application:

23.5.1. Payment shall be made only for progress agreed upon by the COTR, performed on original Contract Work or approved modifications, in accordance with the current, approved Project Schedule. Failure to submit the Application in accordance with the specifications will prevent the processing of payments.

23.5.2. Payments shall be mailed to the Contractor's address as identified in the contract documents on record with the Contracting Officer. Any changes of address or requests for wire transfer of progress payments must be made in writing, signed by the Contractor's authorized person and submitted to the Contracting Officer.

61 SCHEDULING & PAYMENTS / CRITICAL PATH METHOD (Not Used)

62 ASSIGNMENT OF CLAIMS

62.1. Assignment of Claims are subject to the approval of the Contracting Officer. Any Assignment of Claim or subsequent re-assignment shall meet the requirements of the General Conditions contract clause entitled "FAR 52.232-23 Assignment of Claims."

PROJECT CLOSEOUT REQUIREMENTS

63 PROJECT CLOSEOUT

63.1. Definition: Project closeout is a scheduled process for fulfillment of remaining contract requirements at the end of the project in preparation for final acceptance, final payment, normal termination of contract, beneficial occupancy, and establishment of the warranty period(s).

64 SUBSTANTIAL COMPLETION

64.1. Definition: The date of Substantial Completion of a project or specified part of a project is the date, as confirmed by inspection by the COTR, when the construction is at least 95% complete and ready for beneficial occupancy, so that the Smithsonian can take possession of that area or part of the work. Portions of the work that are specified to be phased for completion, areas required for Smithsonian's use prior to completion of the total project or items of work identified by the COTR as necessary for partial beneficial occupancy may be inspected for substantial completion separately from the rest of the Work.

64.1.1. The Smithsonian Institution reserves the right to occupy or install equipment in completed areas of the building prior to substantial completion provided that such occupancy does not interfere with the completion of the work. Such partial occupancy shall not constitute acceptance of any part of the work.

64.2. Request for Substantial Completion Inspection: The Contractor shall submit a written request to the COTR for an inspection to establish Substantial Completion status. This request shall specify areas or parts of the work to be considered and shall include a listing of all exceptions to the request, that is, items not considered to be substantially complete.

64.3. Submission of Operation and Maintenance Manuals: Prior to requesting Substantial Completion Inspection, the Contractor shall submit, to the COTR, three (3) sets of manuals for all systems and equipment, as specified in the technical sections of this specification. The manuals shall be bound in letter-sized, three-ring, loose-leaf binders with durable plastic covers. They shall be organized into suitable volumes of manageable size using the divisions of the Specifications as a guide. Each manual shall have a table of contents and shall be assembled to conform to the table of contents with tab sheets locating each subject. The instructions shall be legible and easy to read. Where oversize drawings are necessary, they shall be folded to be not greater than letter-size. The words "Operation and Maintenance Manual," the name and location of the project, project number, contract number, date, and the name of the general contractor, shall appear on the cover. Data shall be specific to the equipment that is installed and reflect all approved changes and substitutions. Data shall also reflect any required or recommended seasonal adjustments or inspections. Include electronic copy of manual, in PDF format, on CD/DVD. Manuals shall include, as a minimum, the following data:

64.3.1. Detailed description of each system and each of its components, including layout showing piping, valves, controls, and other components and including diagrams and illustrations where applicable.

64.3.2. Wiring and control diagrams with data to explain detailed operation and control of each component.

64.3.3. Control sequence describing start-up, operation, and shutdown.

64.3.4. Procedures for starting, operating and shutdown.

64.3.5. Installation instructions.

64.3.6. Maintenance and overhaul instructions.

64.3.7. Lubricating schedule, including type, grade, temperature range and frequency.

64.3.8. Emergency instructions and safety precautions.

64.3.9. On-site acceptance test results for equipment installed under this contract.

64.3.10. Approved product data, shop drawings and system as-builts.

64.3.11. Copies of approved certifications and laboratory test reports (where applicable).

64.3.12. Notarized copies of warranties (originals to be provided as required by "Warranties and Guarantees").

64.3.13. Written instructions for test procedures.

64.3.14. Performance curves and rating data.

64.3.15. Parts list, including source of supply, recommended spare parts and service organization convenient to Smithsonian.

64.3.16. Name, address, and telephone number of each subcontractor who installed equipment and systems, local representative for each type of equipment and each system.

64.3.17. Other pertinent data applicable to the operation and maintenance of particular systems or equipment and/or other data as specified Divisions 2 through 33 of the Specifications.

64.4. Other Prerequisites for Substantial Completion Inspection: The Contractor shall also complete the following prior to requesting inspection for certification of substantial completion:

64.4.1. Testing and start-up of systems.

64.4.2. Installation of all signage, including accessibility related signs, equipment instructions, identification labels and permanent directional signs.

64.4.3. Submission of spare parts, tools and surplus materials as required in technical specifications. Submit to the COTR an MSDS for each surplus material that contains toxic or hazardous substances. Surplus materials that the SI determines not to retain shall be removed and properly disposed of by the Contractor according to all applicable regulations.

64.4.4. Scheduling of training sessions for Smithsonian personnel.

64.4.5. Removal of all waste, rubbish and temporary facilities and services. Means of access to all areas of the work to be inspected by the COTR shall be maintained.

64.4.6. Disposition of samples and mock-ups not incorporated into the work.

64.4.7. Arrangement for permanent utility connections and billing responsibility transfer to Smithsonian's Office of Facilities Operations (OFO).

64.4.8. Arrangement for transfer of security responsibility for the project site and changeover of locks by Smithsonian's Office of Protection Services (OPS).

64.4.9. Hazardous Waste Disposal: Submit copies to the COTR of the following hazardous waste records for hazardous waste generated on SI property and disposed of by contract personnel.

1. Hazardous Waste Manifests
2. Notification and Certification Forms
3. Material Profile Sheet or characterization
4. Container Content Sheets
5. Certificates of Disposal

64.5. Scheduling of the Substantial Completion Inspection: Within seven (7) calendar days after receipt of the Contractor's written request, the COTR will either schedule an inspection or advise the Contractor of work that must be completed or prerequisites that must be met prior to scheduling the Substantial Completion Inspection. In that case, another written request for Substantial Completion Inspection must be submitted when all requirements have been met.

64.6. The Substantial Completion Inspection: The Substantial Completion Inspection will be performed by representatives of the Smithsonian Institution led by the COTR. During the inspection, the COTR will prepare a punch list of deficiencies in the work. If the punch list becomes too extensive the COTR may cancel the inspection and require additional work to be performed for a repeat inspection.

64.6.1. For satisfactory inspection results, the COTR will issue the written punch list to the Contractor as soon as possible after the inspection. Items on the punch list must be completed prior to final acceptance of the total project work.

64.6.2. For unsatisfactory inspection results, the COTR will, within three (3) calendar days, give written notice to the Contractor that the Work or portion of the Work is not substantially complete in accordance with the contract documents and therefore does not meet Substantial Completion status. Requests for re-inspection shall meet all requirements for the original request for Substantial Completion inspection.

64.7. Punch List: Incomplete contract requirements identified during the Substantial Completion Inspection will form an initial basis for a punch list for final acceptance. All punch list items must be completed by the Contractor within the Contract Time. If additional days are needed to complete the punch list items beyond the Contract Time, then the Contractor shall submit, prior to the end of the Contract Time, a written request to the Contracting Officer stating:

64.7.1. Items requiring additional time;

64.7.2. Amount of time needed to complete each item;

64.7.3. Reasons why the items cannot be completed by the contract completion date.

65 FINAL COMPETION AND ACCEPTANCE

65.1. Definition: The date of final completion of a project is the date, as confirmed by inspection by the COTR, when the Work is satisfactorily completed and accepted in accordance with the contract documents, as amended and/or modified.

65.2. Request for Final Completion Inspection: When all items on the punch list have been corrected to the satisfaction of the COTR and additional requirements as described below have been satisfied, the Contractor shall submit a written request for Final Completion Inspection.

65.3. Prerequisites for Final Completion: Prior to requesting the inspection for certification of Final Completion, the Contractor shall complete the following:

65.3.1. Submission of a copy of a prior punch-list stating that each item has been completed or otherwise resolved for acceptance.

65.3.2. Provision of Instructions to Smithsonian Personnel -where instructions to Smithsonian personnel are specified in other sections, furnish, without additional expense to the Smithsonian, the services of competent instructors, who will give full instruction in the care, adjustment and operation of the systems and equipment to designated Smithsonian employees.

1. Each instructor shall be familiar with all parts of the system on which he or she is to give instruction and shall be knowledgeable about the systems' operation and required maintenance. Factory trained instructors shall be employed wherever practical and available.

2. Unless otherwise required or approved, the instruction shall be given during the regular workweek after the equipment has been accepted and turned over to the Smithsonian for regular operation. Where significant changes or modifications in equipment are made under the terms of the contract, additional instruction shall be provided as may be necessary to acquaint the operating personnel of the changes or modifications. Unless otherwise stated, at least half of the time allocated for instruction shall be "hands-on," using the actual system installed.

3. Upon completion the Contractor shall obtain written acknowledgment from the COTR that the required instruction was completed.

65.3.3. Posting of operating instructions approved by the COTR for each system and each principal piece of equipment. Include wiring and control diagrams showing the complete layout of the entire system including equipment, piping, valves, and control sequence framed under clear laminated plastic and posted where directed by the COTR. Printed or engraved operating instructions for each principal piece of equipment including start-up, proper adjustment, operating lubrication, shut-down safety precautions, procedure in the event of equipment failure and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment. Operating instructions exposed to the weather or wet or humid conditions shall be made of weather-resisting materials or shall be suitably framed and enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling. The Contractor shall coordinate the location of posted instructions with the COTR.

65.3.4. Provision of equipment demonstrations for each equipment item. The Contractor shall coordinate scheduling of all demonstrations through the COTR.

65.3.5. Submission of original warranties for all products, equipment, and systems.

1. The Contractor shall assemble original warranty certificates or notarized copies of warranty certificates executed by the Contractor, Subcontractors, suppliers, and manufacturers in a tab-indexed, three-ring loose-leaf binder with a durable plastic cover. Provide electronic copy, in PDF format, on CD/DVD. The table of contents shall identify the item covered, the location of the item, the date of Substantial Completion, expiration date of the warranty and the

supplier, vendor and installing contractor. Duplicate notarized copies of warranties shall be provided as required by "Manuals for Operation, Maintenance and As-Built Product Data."

2. Each warranty certificate or bond shall identify the date(s) for:

(1) Substantial Completion status in accordance with project closeout requirements.

(2) Beginning and ending of the warranty period.

(3) The Contractor shall provide any coincidental product warranty, which is available on a product incorporated in the Work, but for which the warranty is not specifically required by the contract documents.

3. Warranty of Construction: The Contractor shall warrant that the work performed under this contract conforms to the contract requirements and is free of any defect in equipment, materials, design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. Unless otherwise stated in the technical sections of the Specifications, the warranty of the Work shall continue for a period of one (1) year from the date of Final Completion status. If the Smithsonian takes partial occupancy before Final Completion, then the warranty for that portion shall be in effect for a period of one (1) year beginning on the date of Substantial Completion for that portion of the Work.

65.3.6. Submission of construction progress photographs and digital files, property survey and similar final record information.

65.3.7. Arrangement for changeover locks through the COTR and Smithsonian Office of Protection Services as required for security for Smithsonian occupancy.

65.3.8. (Not Used)

65.3.9. Submission of evidence that all regulatory agency permit and code requirements have been completed and recorded, as necessary.

65.3.10. Submission of a signed, written statement that no damage has occurred to the site as documented by the pre-condition survey report.

65.3.11. Final clean up, including:

1. Sweep and dust all surfaces and wash all finished surfaces to appear new and free of all stains, soil marks, dirt, and other forms of defacement.

2. Remove labels that are not required as permanent labels.

3. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances that are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

4. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust stains, films, and similar noticeable substances. Except

as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

5. Wipe surfaces of equipment clean. Remove excess lubrication and other substances.

6. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

7. Wet-mop concrete and clean other hard-surface floors according to manufacturers' recommendations.

8. Vacuum clean carpeted surfaces and similar soft surfaces.

9. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

10. Clean project site (yard and grounds) of litter and foreign substances. Sweep exterior paved areas to a broom-clean condition; remove stains, petro-chemical spills, and other foreign deposits. Rake grounds, which are neither planted nor paved, to a smooth, even textured surface.

65.4. Inspection of the Work for Final Completion: Upon receipt of the Contractor's written notice that the work has been completed, the COTR will inspect the work to confirm Final Completion status and acceptance of the work. As soon as possible after inspection, the COTR will either provide written acknowledgment of final acceptance or advise the Contractor of work not completed or obligations not fulfilled as required for final completion and acceptance.

65.5. Application for Final Payment:

65.5.1. Application for Final Payment shall be submitted only after Final Acceptance has been certified in writing to the Contractor by the COTR. Application shall include final labor data and progress schedule update.

65.5.2. Final Payment will be approved when Final Acceptance has been certified and the following conditions have been met:

a. Certification signed and submitted by the Contractor that all contract requirements, including contract modifications, have been met.

b. Final Release of Claims submitted.

c. Release of assignment of claims or consent of surety submitted, as necessary.

d. (Not Used).

e. As-Built Record Drawings Submitted: During the progress of the work the Contractor shall maintain a complete and up-to-date set of record prints, open to inspection by the COTR at any time. These prints shall provide a complete and accurate as-built record of all changes to the Contract Drawings, including rerouting of runs, relocation of items or control points and all other modifications. The exact location of pipes, conduit, or other features concealed

underground, under concrete, in chases or above ceilings shall be shown by perpendicular dimensions from at least two available landmarks. As-built drawings shall be neatly marked with colored pencils or ink, marked "As-Built" and signed and dated by the Contractor. Upon completion of the Work and before final payment, the Contractor shall submit the following to the COTR: photographically produced as-built record drawings on 4-mil, double matte, mylar sheets, sized the same as the contract drawings; electronic copies of as-built record drawings in PDF and DWG formats.

f. As-Built Record Survey of Underground Utilities Submitted: If outside or underground utilities are part of the work, the Contractor shall furnish, to the COTR for approval, an acceptable and accurately dimensioned survey showing location and elevation of underground storage tanks, all utility lines for water, gas, electrical, sewer, steam, etc., including valves, connections and changes in direction, as installed under the contract, within the property lines and outside the building walls. Points where utility lines emerge from the building shall be located from lot monuments. The survey shall be made to scale and must be marked "As-Built" and signed and dated by the Contractor. The Contractor shall furnish a scanned, digital copy to the COTR as well as a copy on a 3-mil, double matte, mylar sheet or sheets the same size as the contract drawings.

g. As-Built Record Specifications Submitted: The Contractor shall submit one (1) hard copy and one digital (scanned) set of project specifications with annotations to identify any changes made during construction, referencing modification numbers, dates and originators of authorizing letters or memos and other sources of changes. The cover shall be marked "As-Built" and signed and dated by the Contractor.

h. Close-out Conditions Text and Photographic Documentation Submitted: The Contractor shall prepare a typewritten text and photographic report of observations made during the inspections for project closeout regarding conditions of new work and adjacent items that were examined for the pre-condition survey report. Any defects shall be identified and the Contractor's operations on the defect shall be described. Within ten (10) calendar days after the Final Inspection, the Contractor shall submit the text and photographic report in PDF format to the Contracting Officer and the COTR and retain a copy of each for the Contractor’s files.

i. Final Video Documentation Submitted: The Contractor shall prepare a video with audio narrative of the observations made during the inspections for project closeout. The video shall include work completed under the project and items examined for the pre-condition survey report. Within ten (10) calendar days after the Final Inspection, the Contractor shall submit the Final report electronically to the Contracting Officer and the COTR.

END OF SUPPLEMENTARY CONDITIONS FOR CONSTRUCTION

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner’s property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.

B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference via teleconference. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.

5. Revenue from recycled materials.
6. Savings in transportation and tipping fees by donating materials.
7. Savings in transportation and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work in four or more waste streams. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials including, but not limited to:

1. Demolition Waste:
   a. Wood studs.
   b. Plywood and oriented strand board.
   c. Wood paneling.
   d. Wood trim.
   e. Structural and miscellaneous steel.
   f. Rough hardware.
   g. Insulation.
   h. Doors and frames.
   i. Door hardware.
   j. Glazing.
   k. Metal studs.
   l. Gypsum board.
   m. Acoustical tile and panels.
   n. Carpet.
   o. Carpet pad.
   p. Demountable partitions.
   q. Equipment.
   r. Cabinets.
   s. Plumbing fixtures.
   t. Piping.
   u. Supports and hangers.
   v. Valves.
   w. Sprinklers.
   x. Mechanical equipment.
   y. Refrigerants.
   z. Electrical conduit.
   aa. Copper wiring.
   bb. Lighting fixtures.
   cc. Lamps.
   dd. Ballasts.
   ee. Electrical devices.
   ff. Switchgear and panelboards.
   gg. Transformers.

2. Construction Waste:
   a. Lumber.
   b. Wood sheet materials.
   c. Wood trim.
   d. Metals.
   e. Insulation.
   f. Carpet and pad.
   g. Gypsum board.
   h. Piping.
   i. Electrical conduit.
   j. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

      1) Paper.
      2) Cardboard.
      3) Boxes.
      4) Plastic sheet and film.
      5) Polystyrene packaging.
      6) Wood crates.
      7) Wood pallets.
      8) Plastic pails.

   k. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:

      1) Paper.
      2) Aluminum cans.
      3) Glass containers.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

   1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

   1. Distribute waste management plan to everyone concerned within three days of submittal return.

2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.4 RECYCLING DEMOLITION WASTE

A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

B. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

D. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

E. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.

F. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

G. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

H. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.

I. Conduit: Reduce conduit to straight lengths and store by material and size.

J. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

D. Paint: Seal containers and store by type.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.

C. Burning: Do not burn waste materials.

END OF SECTION 017419

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ASBESTOS ABATEMENT

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ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 Introduction

1.1.1 Perform all planning, administration, execution, and cleaning necessary to safely remove asbestos-containing or contaminated materials.

1.1.2 Approval of or acceptance by the Contracting Officer's Technical Representative (COTR) of various construction activities or methods proposed by Contractor does not constitute an assumption of liability either by the COTR or Smithsonian Institution (SI) for adequacy or adverse consequences of said activities or methods.

1.2 Description of the Abatement Work

1.2.1 The asbestos abatement shall also include, but not be limited to the following:

(a) Notification to regulatory agencies

(b) Regulatory permits, licenses and approvals

(c) Worker health and safety program

(d) Air monitoring

(e) Construction of temporary containment barrier/decontamination enclosures

(f) Preparation for abatement operations

(g) Removal of existing asbestos-containing material

(h) Transport and disposal of asbestos-containing material

(i) Decontamination and cleaning

(j) Application of lockdown encapsulant**s**

(k) Removal of temporary containment barrier/decontamination enclosures

(l) Final job close-out

1.2.2 Summary Listing of Work Locations and Approximate Quantity: The Contractor shall review all contract documents and make a site visit to make his/her own

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determination about quantity values prior to applying for the required federal, state, or local permits from agencies having authority or jurisdiction.

1.2.3 Drawings and Other Information: Drawings of the project area(s) and the reference location(s) within the building may be provided upon request to assist in the Contractor's planning of the abatement work effort for protection of occupants and contents.

1.2.4 Other Work Not Included: Concurrently with this contract, the SI reserves the right to collect and analyze samples or retain an independent testing laboratory to provide supplemental sampling services. These services will in no way relieve the Contractor from compliance liability or from providing the testing required by these specifications or any other requirements of other agencies with jurisdiction authority.

NOTE: The SI has contracted independent air monitoring and testing services. The Contractor shall use a different firm for air monitoring and testing on this project.

1.3 Definitions

1.3.1 Abatement: Procedures to control or eliminate fiber release from asbestos-containing building materials, to include encapsulation, enclosure and removal.

1.3.2 Abatement Work Area (regulated area): An area established by the employer to demarcate areas where Class I, II, III and IV asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

1.3.3 Airlock: A system of enclosures within the containment area consisting of two (2) doorways, curtained with polyethylene sheeting, at least 1 meter apart.

1.3.4 Air Filtration Units: A local exhaust unit, utilizing high-efficiency particulate air (HEPA) filtration and capable of maintaining a minimum negative pressure differential of 0.05 mm of water within the containment barrier with respect to that of the environment surrounding the containment barrier. The unit also cleans recirculated air or generates a constant air flow from adjacent areas into the abatement work area through the decontamination enclosure.

1.3.5 Air Monitoring**:** The process of measuring the fiber content of a specific volume of air during a stated period of time.

1.3.6 Air Pressure Monitoring: The process of measuring the air pressure differential between the containment barrier and the surrounding area using a micromanometer unit.

1.3.7 Amended Water: Water to which a surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate asbestos containing materials (ACM).

1.3.8 ANSI**:** American National Standards Institute.

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1.3.9 ASTM**:** American Society for Testing and Materials.

1.3.10 Asbestos: Asbestiform varieties of chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

1.3.11 Asbestos-Containing Material (ACM): Any material containing more than 1% asbestos by volume of any type or mixture of types.

1.3.12 Authorized Person: Any person authorized by the SI and required by work duties to be present in a regulated area.

1.3.13 Caulking: High-grade rubber base caulk for masonry and/or for other materials to be used or existing, as appropriate.

1.3.14. Class I Asbestos Work: Activities involving the removal of thermal systems insulation (TSI) and surfacing ACM and presumed asbestos containing materials (PACM).

1.3.15. Class II Asbestos Work: Activities involving the removal of ACM which is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

1.3.16. Class III Asbestos Work: Repair and maintenance operations, where ACM, including TSI and surfacing ACM and PACM, is likely to be disturbed.

1.3.17. Class IV Asbestos Work: Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II and III activities.

1.3.18 Clean Room: An uncontaminated area or room which is part of the abatement worker/equipment decontamination enclosure, with provisions for storage of workers' or visitors' street clothing, protective equipment and uncontaminated materials and equipment. It may be used for changing clothes.

1.3.19 Competent Person: In addition to the definition in 29 CFR 1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f)**.** In addition, the competent person shall have successfully completed training for Class I, Class II, Class III, and Class IV projects meeting the criteria set forth in the EPA Model Accreditation Plan (40 CFR 763) for project designer or supervisor, and operations and maintenance training.

1.3.20 Containment Barrier: A temporary enclosure constructed with fire-retardant plastic sheeting, suitable framing, tape (as defined in 1.3.52) and other adhesives within the abatement work area. This barrier serves to confine the asbestos abatement and decontamination work, and to contain the release of asbestos containing dust and debris through the action of pressure differential ventilation and air filtration systems. The only entrance is via the abatement worker/equipment decontamination enclosure.

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1.3.21 COTR (Contracting Officer's Technical Representative)**:** An individual representing the SI as the technical advisor to the SI's Contracting Officer. This individual may be an employee of the SI or consultant.

1.3.22 Critical Barrier: Those portions of the containment barrier which represent the minimum structural components necessary to maintain the asbestos removal area in airtight isolation from the surrounding areas. Critical barriers shall be placed at floors, windows, ventilation louvers and other openings as necessary to achieve abatement work area isolation before putting up the double-layer plastic sheeting containment enclosure within which abatement work is performed. If a temporary plastic sheeting/stud wall must be erected, it shall be treated as a critical barrier. The double-layer plastic sheeting containment enclosure shall then be erected on that wall. Wrappings on lights, control boxes, etc., do not constitute part of the critical barrier.

1.3.23 Curtained Doorway: A minimum 2-flap passageway to allow access or egress from one room to another while permitting minimal air movement between the rooms of the decontamination enclosure system. It is constructed by placing 2-3 overlapping sheets of plastic sheeting at least three feet wide over an existing or temporarily framed doorway. The sheets shall be weighted at the bottom so that they close quickly after being released.

1.3.24 Decontamination Enclosure: A series of connected rooms with curtained doorways between each room, for the decontamination of the abatement workers and equipment/materials. A decontamination enclosure contains a minimum of three (3) separate rooms (typically with airlocks located between the rooms) consisting of an equipment room, shower room, and clean room. The system is constructed of an air-tight, impermeable, temporary barrier. Framing for enclosure shall be metal or fire retardant pressure impregnated wood.

1.3.25 Disposal Bag: A properly labeled minimum 0.15 mm thick, leak-tight plastic bag used for transporting asbestos waste from the abatement work area to an EPA-approved disposal site for ACM waste.

1.3.26 Disturbance: Contact which releases fibers from ACM or presumed asbestos-containing material (PACM) or debris containing ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM or PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag (as defined in 1.3.29) or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 1.52 m in length and width.

1.3.27 Encapsulant: A material applied after the removal of ACM or to the ACM-edges of partially abated substrates which surrounds or embeds residual asbestos fibers in an adhesive matrix to prevent their release into the atmosphere. Encapsulation for purpose of final lockdown is not to be accomplished until after the project has passed final air clearance tests and the COTR has authorized removal of the containment.

1.3.28 Enclosure**:** Procedures necessary to completely enclose material containing asbestos behind airtight, impermeable, permanent barriers.

1.3.29 Equipment Room: A contaminated area or room which is part of the decontamination enclosure, with provisions for storage of contaminated clothing and equipment and cleaning supplies for decontamination of equipment. Airlocks are required at all entrances to the equipment room.

1.3.30 EPA: United States Environmental Protection Agency.

1.3.31 Excursion Limit: Airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1 f/cc), as averaged over a sampling period of thirty minutes.

1.3.32 Fiber: A particulate form of asbestos, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.

1.3.33 Fixed Object: A unit of equipment or furniture in the abatement work area which cannot be removed from the abatement work area.

1.3.34 Glove Bag: A pouch, typically constructed of a minimum 0.15 mm thick, 1.5 m x 1.5 m (maximum), transparent polyethylene or polyvinylchloride plastic, with inward projecting sleeve gloves to abate ACM in a sealed micro-environment with designated inlets for amended water and sealant application, and a HEPA filtered vacuum unit attachment. The pouch has capacity for tool storage and to hold removed ACM.

1.3.35 GFCI (Ground Fault Circuit Interrupter): A type of ground fault protection in areas where personnel are at high risk of receiving electrical shocks (for example, in damp locations); makes use of a device designed to trip at a ground current in the milliampere range, i.e., very much below currents that are normally harmful.

1.3.36 HEPA Filter: A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97% of all mono-dispersed particles 0.3 micrometer in diameter or larger.

1.3.37 HEPA-Filtered Vacuum Cleaner: HEPA-filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers.

1.3.38 Holding Area: A chamber between the washroom and uncontaminated area in the equipment decontamination enclosure system.

1.3.39 Impermeable Waste-Disposal Containers: Suitable to receive and retain any asbestos-containing or contaminated material until disposal at an approved site. The containers shall be labeled in accordance with OSHA Regulation 29 CFR 1910.1001 and 29 CFR 1926.1101. Containers must be both water-tight and air-tight.

1.3.40 Lockdown: The process of applying encapsulant as a finishing coat to abated surfaces after project has successfully passed final air clearance tests and the COTR has authorized removal of containment.

1.3.41 Movable Object: A unit of equipment or furniture in the abatement work area which can be removed from the abatement work area.

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1.3.42 MSHA: Mine Safety and Health Administration:

1.3.43 Negative Exposure Assessment (NEA): A demonstration by the contractor, which complies with the criteria in OSHA 29 CFR 1926.1101(f)(2)(iii), that employee exposures during an operation are expected to be consistently below the permissible exposure limits (PELs). Such assessment is to be used to justify level of respiratory protection to be used on the job.

1.3.44 NESHAPS: National Emissions Standard for Hazardous Air Pollutants.

1.3.45 N.E.C.: National Electrical Code.

1.3.46 NIOSH: National Institute for Occupational Safety and Health.

1.3.47 OSHA: Occupational Safety and Health Administration.

1.3.48 PACM: Presumed Asbestos-Containing Material, meaning thermal system insulation and surfacing material found in buildings constructed no later than 1980.

1.3.49 PEL: Permissible Exposure Limit. An occupational limit of exposure to a chemical substance or physical agent.

1.3.50 Personal Monitoring: Sampling of asbestos fiber concentrations within the breathing zone of an employee. Breathing zone is defined as a radius of 150 mm to 250 mm around the employee's head.

1.3.51 Personal Protective Equipment: Equipment which may consist of coveralls, shoes, gloves, helmet, goggles, and respirator used for protection against asbestos exposure.

1.3.52 Plastic Sheeting: Fire retardant Polyethylene sheet material of specified thickness used for protection of walls, floors, etc., and critical barriers in the abatement work area.

1.3.53 Protection Factor: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

1.3.54 Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres and approved by NIOSH or MSHA for a specific category of use.

1.3.55 SI IH - Smithsonian Institution's Industrial Hygienist: An individual serving as the Smithsonian's industrial hygienist. This individual may be an employee or consultant.

1.3.56 Surfactant: A chemical wetting agent added to water to decrease surface tension and improve material penetration.

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1.3.57 Tape: Glass fiber or other tape capable of sealing joints of adjacent sheets of plastic (0.15 mm polyethylene) and for attachment of plastic sheets to finished or unfinished surfaces of dissimilar materials under both dry and wet conditions, including use of amended water. Minimum tape width shall be 51 mm.

1.3.58 Warning Labels and Signs: As required by OSHA regulations 29 CFR 1910.1001 and 1926.58.

1.3.59 Waste Water Filters: Discharged liquids shall pass through a primary filter and the output shall be particles 20 microns or smaller. The secondary filter shall have output particles 5 microns or smaller.

1.3.60 Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water.

1.4 Regulations and References

1.4.1 Regulations: Contractor shall comply with the most current edition of all federal, state, county, and city codes and ordinances as they apply to the location(s) in which the work is performed. Make available for review at the site one copy of all applicable federal, state, county and city regulations governing the abatement work, including but not limited to:

1.4.1.1 Occupational Safety and Health Administration (OSHA), U.S. Department of Labor

(a) 29 CFR 1910 (General Industry) and 29 CFR 1926 (Construction) Occupational Safety and Health Standards

(b) 29 CFR 1910.1001 and 29 CFR 1926.1101 Asbestos

(c) 29 CFR 1910.134 Respiratory Protection

(d) 29 CFR 1910.1200 Hazard Communication

1.4.1.2 U. S. Department of Transportation

(a) 49 CFR 171 Subchapter C, Hazardous Materials Regulations

(b) 49 CFR 172 Subchapter C, Shipping Container Specifications

1.4.1.3 U.S. Environmental Protection Agency

(a) 40 CFR 763, Toxic Substances Control Act; particularly Subpart E, Asbestos Containing Materials in Schools

(b) 40 CFR 61, Sub-parts A and M, National Emission Standard for Hazardous Air Pollutants (NESHAPS)

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1.4.1.4 District of Columbia Law Title 20 DCMR Section 800. District of Columbia Department of Health.

1.4.1.5 New York City Department of Environmental Protection.

1.4.1.6 New York State Department of Health; New York State Department of Environmental Conservation; New York State Department of Labor.

1.4.1.7 Virginia Department of Labor and Industry; Virginia Department of Professional and Occupational Regulation; Virginia Department of Environmental Quality.

1.4.1.8 Maryland Department of the Environment; Maryland Occupational Safety and Health.

1.4.1.9 Arizona Department of Environmental Quality.

1.4.1.10 Hawaii Department of Health.

1.4.1.11 Florida Department of Environmental Protection.

1.4.1.12 Massachusetts Department of Environmental Protection.

1.4.1.13 American National Standards Institute (ANSI), 1430 Broadway, New York, New York 10018. Telephone (212)354-3300

(a) ANSI Publication Z88.2 Practices for Respiratory Protection

1.4.1.14 American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103. Telephone (215) 299-5400

(a) ASTM Standard P-189 Specification for Encapsulants for Friable Asbestos Containing Building Materials Proposal

1.4.1.15 Compressed Gas Association, Inc. New York. Pamphlet G-7 "Compressed Air for Human Respiration", Specification G-7.1 Commodity Specification for Air"

1.4.1.16 Canadian Standard Association (CSA), Rexdal, Ontario, Standard Z180.1, "Compressed Breathing Air".

1.5 Submittals

1.5.1 Reference Division 1, Section 01000 Supplementary Conditions for Construction, for additional requirements.

1.5.2 Contractor's Work Plan: The Contractor shall submit a Contractor's Work Plan for asbestos abatement work within 15 calendar days after contract award to the COTR for approval. Approval of the Plan is required prior to beginning abatement work. The Plan shall be on 220 mm x 280 mm paper in a binder indexed by the subjects listed

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below. Detail the procedures, instructions, and reports used to assure compliance with the contract documents.

1.5.2.1 Barchart Schedule: Provide barchart scheduling of the abatement work by daily and/or weekly increments for each abatement work area and individual decontamination enclosure system. The time line is to include all work, both on and off the job site, for the entire contract period.

1.5.2.2 Notices: The contractor shall notify federal, state, and local regulatory agencies in writing immediately upon contract award and a minimum of 10 days in advance of any asbestos related work. Notifications shall be made by the Contractor as required by USEPA National Emission Standards for Hazardous Air Pollutants (NESHAPS) Asbestos Regulations (40 CFR 61, Subpart M)). Submit copies of notifications and documentation to the COTR. If a project consists of multi-phases, with distinct start and stop dates, these shall be declared on the EPA Notice or individual notices shall be filed for each phase.

1.5.2.3 Permits and Licenses: Maintain current licenses and obtain applicable permits as required by federal and applicable state or local jurisdictions for the removal, transporting, disposal or other regulated activity relative to the abatement work of this contract. Submit copies of all state and local licenses and permits necessary to carry out the abatement work of this contract.

(a) All asbestos containing waste is to be transported by an entity maintaining a current "Industrial waste hauler permit" specifically for asbestos-containing materials, as required for transporting of waste asbestos-containing materials to a disposal site.

(b) Notices of Violations: Submit copies of all Notices of Violations issued to the contractor and its sub-contractors within the last three (3) years by federal, state, and local regulatory agencies.

1.5.2.4 Sequence of Work: Narrative description of the proposed sequencing of asbestos work and breakdown of abatement work areas requiring separate or individual decontamination enclosures. Include how enclosure systems will be erected and dismantled. Include how re-useable equipment will be cleaned for re-use before relocation or removal from the site. Include how waste disposal containers will be cleaned and removed from the abatement work area.

1.5.2.5 Abatement Work Area Layout Sketch: Layout sketch of decontamination enclosure systems and abatement work area. Describe assembly of construction, materials to be used and location of notices to be posted on the job site. Indicate which areas will be sealed off (and by what means). Show locations of facilities and equipment such as showers, lockers, storage, etc. Show locations of all filtration devices to be used, their exhaust, and calculations to determine the number of these devices needed to provide the minimum 4 air changes per hour in the abatement work area. These requirements shall be coordinated with the COTR and facility representative

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1.5.2.6 Isolation of Abatement Work Areas: Methods to isolate/restrict access to abatement work areas. Include how access will be controlled, how building HVAC ventilation systems will be isolated from abatement area. Include how security and fire systems will be maintained within the containment. Include plans for electrical lock-out and dedicated electrical systems. These requirements shall be coordinated with the COTR and facility representatives.

1.5.2.7 Transportation and Disposal: Details of hauling equipment, materials and contaminated debris from inside the building. Submit written identification of licensed hauler and landfill location.

1.5.2.8 Personnel Organization and Responsibilities: The Contractor shall provide a list of all project personnel, both on-site and in the offices, and a statement of their responsibilities and authority for work on this project.

1.5.2.9 Personal Protective Equipment: Details of personal protective equipment and use, storage and maintenance at job site.

1.5.2.10 Posted Notices and Warning Signs: Submit copies of notices to be posted at the job site, as required by EPA and OSHA regulation for asbestos abatement activities.

1.5.2.11 Materials and Equipment Product Data: Submit manufacturer's literature and written information for all materials and equipment, including NFPA test report of flame resistant materials, and material safety data sheets for all chemical-content supplies. Contractor shall not change materials or equipment without approval of a new submittal to the COTR.

1.5.2.12 Contractor Monitoring Services: Before start of asbestos work, submit to the COTR the name of the contractor's industrial hygiene consultant and analytical laboratory for air monitoring.

1.5.2.13 Superintendent/Competent Person: Before start of asbestos work, submit to the COTR the name of job site supervisor who must meet the following requirements as a minimum. Furnish documentation that the General Superintendent:

(a) has a minimum of five (5) years on-the-job experience as a supervisor of asbestos abatement projects

(b) is a competent per Section 1.3.15 of this document.

(c) is certified as an Asbestos Abatement Supervisor in accordance with 40 CFR Part 763.

(d) is fluent in the English language and all other primary languages spoken by the abatement work crew.

1.5.2.14 Workers' Specialized Training: Submit training course descriptions, locations, and dates. Submit to the COTR a written affidavit before start of asbestos removal as proof that all employees have had instruction on the

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hazards of asbestos exposure; and on all aspects of work procedures and personal protection and area protective measures as required and/or recommended by OSHA and EPA and other applicable guide documents. The affidavit shall include course name, designation, installation, place, date taken, and student names.

(a) Training shall be in accordance with 29 CFR 1926.1101.

(b) Course certification shall be in accordance with EPA as required by 40 CFR 763.

(c) Workers should have a minimum of one (1) year experience as an asbestos worker.

1.5.2.15 Respiratory Program: Submit a written respiratory program as defined in OSHA 1926.1101 and in these specifications. Submit type of NIOSH/MSHA certified respiratory equipment intended for each operation required by this project. Selection criteria must meet 29 CFR 1926.1101 (h) (2). When a Type "C" supplied positive pressure air respiratory system is required by the abatement work, submit drawing showing assembly of components into a complete supplied air respiratory system. Include diagram showing location of compressor, filter banks, backup air supply tanks, hose line connections in abatement work area(s), routing of air lines to abatement work area(s) from compressor.

1.5.2.16 Negative exposure assessment data submitted to justify respiratory selection must be less than 12 months old and closely resemble the current project following criteria set forth in 29 CFR 1926.1101 (f) (2) (iii).

1.5.2.17 Emergency Preparedness: Submit an emergency plan to COTR for approval by SI Office of Safety, Health and Environmental Management (OSHEM). The emergency plan shall address responses to fire, accident, power failure, pressure differential system failure, supplied air system failure, or any other event that may requiremodification or abridgement of decontamination or abatement work area isolation procedures. Show exit routes from the building, locations of the nearest manual pull stations, telephone number of Smithsonian security office, name of the designated employee responsible for fire protection, fire hazards inherent to the project and measures taken for prevention. All employees shall be familiar with the emergency plan and have initialed the plan after reading it, know how to activate the fire alarm, and trained in the use of portable fire extinguishers. One on-site employee shall be designated as responsible for fire protection. The plan shall be available at the job site in all primary languages of the abatement work crew. In addition, the following emergency information shall be posted at all entrances to the abatement work area:

(a) Exit route map
(b) Phone number of SI security office

1.6 Daily Reports

1.6.1 The Contractor shall correspond with the COTR for all matters related to this construction project, unless otherwise directed.

1.6.2 All correspondence with the SI shall be in the English language, signed and dated by the Contractor.

1.6.3 Reference General Conditions (Construction Contract Clauses) and Specifications Division 1 for Supplementary Conditions for Construction.

1.6.4 The Contractor shall maintain daily logs and reports of job-site activities and personnel exposure monitoring at the site and shall provide copies to the COTR for inspection upon request.

1.6.5 The Contractor shall maintain daily reports using the SI Contractor's Daily Report form. Reports shall be numbered consecutively and all sections shall be completed or noted as 'not applicable.' Each day's report shall contain detailed remarks including but not limited to progress on the job, problems discovered, and discussions with Smithsonian staff. Reports shall be submitted to the COTR each day for the previous work day.. Copies shall be maintained at the jobsite and made available to the COTR upon request.

1.6.6 Reporting Unusual Events: When an event of unusual and significant nature occurs at site (examples: failure of pressure differential system, rupture of temporary enclosures, equipment or power failure, high airborne fiber reading), prepare and submit a special report listing chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information.

1.6.7 Accident Reporting: Report all accidents to Smithsonian Security Office first, then to the COTR. Prepare reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions; comply with industry standards. For this purpose, a significant accident is defined to include events where personal injury is sustained, property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury. Report shall be submitted to the COTR, who will forward copies to OSHEM and the facility Safety Coordinator.

1.6.8 Waste Manifest-Asbestos: At completion of hauling and disposal of each load, submit a copy of waste manifest, chain of custody form, and landfill receipt to the COTR. Waste manifest to be submitted shall be signed by the contractor, waste transporter, and the disposal facility. A copy of all manifests will be included in the post-job submittal.

1.6.9 Waste Manifest-Hazardous Waste: Any hazardous waste generated as a result of asbestos abatement activities will be disposed of by a Certified Hazardous Waste Disposal Contractor. A copy of the Hazardous Waste Manifest generated by this disposal is to be submitted to the COTR, who will forward a copy to the facility's SI

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Hazardous Waste Coordinator. A copy of all manifests will be included in the post-job submittal.

1.7 Product Handling

1.7.1 Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

1.7.2 Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

1.7.3 Remove from the premises all damaged or deteriorated materials. Dispose of materials that become contaminated with asbestos in accordance with applicable regulatory standards and these specifications.

PART 2 - PRODUCTS

2.1 Materials

2.1.1 Caulking: High-grade rubber base caulk for masonry and/or for other materials.

2.1.2 Encapsulant: Product shall be rated as acceptable for use intended when field tested in accordance with ASTM Proposed Specification P-189 “Specification for Encapsulants for Friable Asbestos Containing Building Materials". Use only materials that have a flame spread index of 25 or less when dry, when tested in accordance with ASTM E-84.

2.1.3 Glove-Bag: 0.15 mm thick, 1500 mm x 1500 mm, transparent polyethylene or polyvinylchloride plastic with long sleeve gloves, designated inlets for HEPA vacuum attachment, and storage pouch.

2.1.4 Impermeable Waste-Disposal Containers: Suitable to receive and retain any asbestos-containing or contaminated material until disposal at an approved site. The containers shall be labeled in accordance with OSHA Regulation 29 CFR 1910.1001 and 29 CFR 1926.1101. Containers must be both water-tight and air-tight.

2.1.5 Plastic Sheeting: Product Standard PS 17-69 and OSHA Regulation 29 CFR 1926.1101; Polyethylene plastic sheeting material 0.15 mm thickness for covering floors and walls, providing air locks, and sealing doors and windows; supply in appropriate widths to minimize seams. Must be flame-resistant material and must meet test criteria in NFPA 701. Reinforced sheeting is required for applications subject to wear and tear.

2.1.6 Surfactant (Wetting Agent): 50% polyoxyethylene ester and 50% polyoxyethylene ether, or approved equal, shall be mixed with water to provide a concentration of 2 ml surfactant to 1 liters of water, or manufacturer's recommended concentration.

2.1.7 Tape: Glass fiber or other tape capable of sealing joints of adjacent sheets of plastic sheeting and for attachment of plastic sheets to finished or unfinished surfaces

of dissimilar materials under both dry and wet conditions, including use of amended water. Minimum tape width shall be 50 mm.

2.1.8 Warning Labels and Signs: As required by OSHA regulations 29 CFR 1910.1001 and 1926.58.

2.1.9 Waste Water Filters: Discharged liquids shall pass through a primary filter and the output shall be particles 20 microns or smaller. The secondary filter shall have output particles 5 microns or smaller.

2.2 Equipment

2.2.1 Air Filtration Units: Shall be factory-sealed and equipped with HEPA filters(final), pre-filters, instrumentation to monitor pressure differential, and safety and warning devices.

2.2.1.1 Provide units with electrical components approved by the National Electrical Manufacturers Association (NEMA) and Underwriter's Laboratories (UL).

2.2.1.2 Access to the units for replacement of all air filters shall be from intake end. Provide units with pre-filters and intermediate filters installed either on or in the intake grid of the unit and held in place with special housings or clamps. The filter media shall be completely sealed on all edges with a structurally rigid frame with a continuous rubber gasket.

2.2.1.3 HEPA Filters: Provide units equipped with HEPA filters. Filters shall be individually tested and certified by the manufacturer.

2.2.1.4 Pre-filters: Provide a two-stage pre-filtration to extend the life of the primary HEPA filter. The first-stage pre-filter is a low-efficiency type effective for particles 100 micrometers and larger. The second-stage (or intermediate) filter has a medium efficiency effective for particles down to 5 micrometers.

2.2.1.5 Instrumentation: Provide units equipped with a magnehelic gauge or manometer to measure the pressure drop across filters and to indicate when filters have become loaded and need to be changed. A table indicating the usable air-handling capacity for various static pressure readings on the magnehelic gauge affixed near the gauge for reference, or the magnehelic reading indicating at what point the filters should be changed, noting cubic feet per minute (CFM) air delivery at that point. Provide an elapsed time meter to show the total accumulated hours of operation.

2.2.1.6 Safety and Warning Devices: Provide units with the following safety and warning devices:

(a) Warning lights to indicate normal operation, too high a pressure drop across the filters (i.e., filter overloading), and too low of a pressure drop (i.e., rupture in HEPA filter or obstructed discharge)

(b) GFCIs.

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(c) Audible alarm if unit shuts down due to operation of safety systems.

(d) Electrical overload protection sized for the equipment. The motor, fan, fan housing, and cabinet are to be grounded.

2.2.2 Respirators and Respirator Systems

2.2.2.1 Product Data: Must possess NIOSH and MSHA approval for each component in an assembly and/or for entire assembly.

PART 3 - EXECUTION

3.1 Controlled Access to Site

3.1.1 Access to the abatement work area shall be restricted to contractor's workers and authorized visitors as defined in these specifications.

3.1.2 Authorized visitors shall have access to the work site at all times following notification to COTR. Contractor shall supply protective clothing and equipment for visitors as necessary, except for respirators which are to be provided by the visitor in accordance with Section 3.4 of this document.

3.1.3 Contractor shall prominently post signs at all potential entry points to the abatement work area which clearly state: "Restricted Area Under Construction-Admittance by Special Permission Only - Protective Clothing Required Beyond This Point". Immediately inside entry point and outside critical barriers post a warning sign meeting specifications of OSHA 29 CFR 1910 and 1926. Suggested format is a sign of minimum size 508 mm by 356 mm displaying the following legend:

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DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE CLOTHING ARE
REQUIRED IN THIS AREA

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3.1.4 All workers and authorized visitors shall enter the abatement work area only through the abatement worker/equipment decontamination enclosure, in accordance with Section 3.3 of this document.

3.1.5 All workers and authorized visitors, before entering the abatement work area, shall read and be familiar with all posted regulations, personal protection requirements, and emergency procedures and exit routes.

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3.1.6 Contractor shall maintain a daily job site personnel log listing names and social security numbers of individuals who entered the abatement work area, and the times of entering and leaving the area.

3.2 Worker and Visitor Protection

3.2.1 No eating, drinking, smoking, or chewing gum is permitted within the abatement work area. The COTR shall designate a "break area" where these activities, except for smoking, are permitted. Smoking is prohibited in SI facilities.

3.2.2 Workers and Visitors shall be fully protected with respirators and protective clothing during any work which may disturb asbestos-containing materials and result in fiber release. Full protection is not required during pre-abatement inspections of the containment, while work is not being conducted.

3.2.3 Protective Clothing and Equipment: Provide workers and visitors with sufficient sets of protective full body clothing, to include full body coveralls with hood, boots (for workers) and footwear coverings (for workers and visitors), and gloves. Provide eye protection and hard hats as required by applicable safety regulations. Contaminated non-disposal clothing and footwear shall be left in the equipment room until the end of the asbestos abatement work, at which time such items shall be disposed of as asbestos waste, or shall be thoroughly cleaned of all asbestos or asbestos-containing material. Contractor shall have at least six (6) sets of disposable protective full body clothing for COTR and authorized visitors for each work day. Provide storage facilities for visitors and workers for removed street clothing in the clean room.

3.2.3.1 Boots: Provide workers non-skid type work boots with protective shields as required by OSHA. Paint uppers of boots with red waterproof enamel paint as a permanent marking that the boots have been exposed to ACM abatement work areas. These boots are to be handled as asbestos-contaminated materials.

3.2.3.2 Hard Hats: Provide hard hats that meet ANSI Z89.1 for use where work is overhead, scaffolding is being used, or as otherwise required by OSHA. Label hats with same warning labels as required for ACM disposal bags.

3.2.3.3 Goggles: Provide goggles that meet ANSI Z87.1 as required by OSHA.

3.2.3.4 Gloves: Provide disposable work gloves for use in the abatement work area.

3.2.3.5 Coveralls with Hood: Provide disposable coveralls with hoods for use in the abatement work area.

3.2.3.6 Respirators: Provide workers with personally issued and marked respirator equipment approved by NIOSH/MSHA and, in accordance with these specifications, suitable for the asbestos exposure level in the abatement work area. Where respirators with disposable filters are employed, provide sufficient filters for replacement as necessary by the abatement worker, or as required by the applicable regulation. Authorized visitors must provide their own

respirators, with fresh filters or cartridges as necessary, to enter the abatement work area. These are minimum requirements. Section 3.4 of this document is to be consulted for more detail.

3.3 Abatement Work Area Entry and Exit Procedures

3.3.1. Each time the abatement work area is entered remove all street clothes in the Clean Room of the Decontamination Enclosure and put on new disposable coveralls, new head cover, and a clean respirator. Proceed through shower room to equipment room and put on work boots.

3.3.2 Each time the abatement work area is exited, the following procedures shall be followed:

3.3.2.1 Before leaving the regulated area, employees and authorized visitors shall remove all gross contamination and debris from their protective clothing.

3.3.2.2. Personnel exiting the regulated area shall remove their protective clothing and equipment (except respirators) in the equipment room and deposit the clothing in labeled impermeable bags or containers.

3.3.2.3 Personnel shall remove their respirators in the shower room, washing and rinsing them.

3.3.2.4 Personnel shall shower thoroughly before entering the clean room.

3.3.2.5 After showering, employees shall enter the clean room before changing into street clothes.

3.4 Respiratory Protection

3.4.1 Contractor is hereby advised that asbestos has been determined by the U.S. Government to be a CANCER-CAUSING AGENT. Provide workers with respirators [which, as a minimum, meet the requirements of OSHA 29 CFR 1926.1101] and protective clothing during all phases of the abatement work and until final air tests are accepted by COTR.

3.4.2 The Contractor shall select respirators from among those jointly approved as being acceptable for protection by the MSHA and the NIOSH under the provisions of 30 CFR Part 11.

3.4.3 The Contractor shall select and provide respirators, at no cost to the employee and shall ensure that the employee uses the respirator provided.

3.4.4 Instruct and train each worker involved in asbestos abatement or maintenance and repair of asbestos-containing materials in proper respiratory use and require that each worker always wear in the abatement work area a respirator, properly fitted on the face. The respirator shall be worn from the start of any operation which may cause airborne asbestos fibers until the abatement work area is completely decontaminated.

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3.4.5 Allow an individual to use only those respirators for which training and fit-testing have been provided. Require that each time an air-purifying respirator is put on it be checked for fit with a positive and negative pressure fit test in accordance with the manufacturer's instructions or ANSI Z88.2.

3.4.6 For all jobs that involve the removal of thermal system insulation (TSI) or surfacing materials (OSHA definition of Class I work) the employer shall provide respirator protection in accordance with 29 CFR 1926.1101 (h) Table 1 - Respiratory Protection for Asbestos Fibers. This level of respiratory protection shall be maintained until the employer can produce a negative exposure assessment.

3.4.7 For all other abatement work, use respiratory protection appropriate for the fiber level encountered in the abatement work area or as required for other toxic or oxygen-deficient situations encountered. The level of respiratory protection which supplies an airborne fiber level inside the respirator, at the breathing zone of the wearer, at or below the permissible exposure limit (PEL) is the minimum level of protection allowed. (Table
1, Respiratory Protection for Asbestos Fibers, 29 CFR 1926.1101*)* Do not use single-use, disposable, or quarter-face respirators.

3.4.8 Authorized visitors are responsible for providing their own respirator and replacement filters and cartridges, with the exception of Type C which shall be provided by Contractor, and for having been previously and properly trained fit-tested, for the respirator used.

3.4.9 For use with air-purifying respirators, provide, at a minimum, HEPA type filters certified by NIOSH and MSHA for protection against asbestos fibers. In addition, a chemical cartridge may be added, if required for protection against chemicals used on this job.

3.4.10 For use with powered air purifying respirators, supply a sufficient quantity of HEPA filters approved for asbestos, so workers can change filters at any time that flow through the face piece decreases to the level at which the manufacturer recommends filter replacement.

3.4.11 For supplied-air respirator systems, provide equipment capable of producing air used for breathing in Type "C" supplied air respiratory systems that meets or exceeds standards set for C.G.A. Type 1, Gaseous Air, Grade D. (See 1.5.2.15) System must be certified by NIOSH/MSHA as an approved Type "C" respirator assembly operating in pressure demand mode with a positive pressure face-piece including as a minimum the following:

- Auxiliary backup system
- Escape air supply
- Backup air supply
- Warning Alarm Device
- Compressor Shut Down
- Compressor Motor (electric)
- Compressor Location (outside building)
- Air Intake

- After-Cooler

3.5 Air Monitoring; Stop Action and Clearance Levels

3.5.1 This section describes work being performed by the SI. The SI will not be performing air monitoring to meet Contractor's OSHA requirements for personal sampling or any other purpose.. The Contractor is to conduct air monitoring required by OSHA for Contractor personnel.

3.5.2 Analytical Methods: The following methods will be used by the SI in analyzing filters used to collect air samples. Minimum sample volumes will be 1200 liters for clearance samples.

3.5.2.1 Phase Contrast Microscopy (PCM) - will be performed using the OSHA Reference Method, Appendix A to 29 CFR 1926.1101, or NIOSH Method 7400.

3.5.2.2 Transmission Electron Microscopy (TEM) - will be performed using the analysis method set forth in the AHERA regulation 40 CFR Part 763 Appendix A, or NIOSH Method 7402, whichever is deemed more appropriate by SI in each case.

3.5.3 Before Start of Work: The SI will secure abatement work area air samples to establish a base line fiber level in each homogeneous abatement work area before start of work. All samples will be taken at the same time to ensure identical environmental conditions.

3.5.4 Daily: From start of abatement work through project decontamination, the SI may be taking samples on a daily basis inside and outside each abatement work area.

3.5.5 All Clearance Air Samples will be taken using aggressive sampling techniques.

3.5.6 Stop Action: If any air sample taken outside of the abatement work area exceeds 0.01 f/cc by PCM, or 70 structures per mm^2 by TEM, depending on sampling method used, immediately and automatically stop all work except corrective action. PCM air samples will be re-analyzed by TEM to determine whether the high outside-of-work-area results were due to asbestos or non-asbestos fibers. The SI and the abatement contractor will determine the source of the high reading. The contractor will correct the condition, as appropriate.

3.5.7 Abatement Work Area Final Clearance Levels:

3.5.7.1 The SI standard for abatement work area final clearance in all occupied areas for removing the containment and re-occupancy is 70 structures per mm^2 by TEM using the analysis method set forth in the AHERA regulation 40 CFR Part 763 Appendix A.

3.5.7.2 The SI standard for abatement work area final clearance in un-occupied areas, or at the case-by-case discretion of the SI, is less than 0.01 fibers per cubic centimeter of air using PCM methods specified in NIOSH 7400.

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3.5.7.3 Final air clearance requirements of specific state and local regulations that exceed the requirements of 3.5.7.1 and 3.5.7.2 will be utilized (e.g., in the District of Columbia, at least two PCM samples per 2,500 square feet of floor are required).

3.6 Initial Isolation of Abatement Work Area

3.6.1 Contractor shall completely separate the abatement work area from other portions of the building, and the outside, by sealing all openings (windows, doorways, elevator openings, corridor entrances, drains, ducts, grill, diffusers, skylights, etc.) with barriers of 0.15 mm polyethylene sheeting and tape, or by sealing cracks leading out of the abatement work area. Contractor shall caulk the joints and seal holes in that portion of the walls, ceiling, and floor inside the abatement work area that could allow airborne asbestos fibers to be carried into adjoining spaces, or the exterior. Note in particular where pipes, conduit, and ductwork penetrate walls, ceilings and floor. Doorways and corridors which will not be used for passage during work must be sealed with 9.5 mm plywood, wood framing and plastic sheeting with tape.

3.6.2 All heating, ventilating, and air conditioning (HVAC) components that are in, supply or pass through the abatement work area shall be shut down. During asbestos removal and until job completion, elevators, exhaust fans, and HVAC vents and intakes will be key locked to not operate in the abatement work area.

Coordinate with the COTR and Building Representative which areas are to be shut down and for what duration. Seal all intake and exhaust vents, and seams in system components, with a double layer of 0.15 mm polyethylene sheeting.

3.6.3 If it becomes necessary to shut down electric power to the enclosed abatement work area, then the contractor shall provide temporary power and lighting and ensure safe installation of temporary power sources and equipment in accordance with NFPA 70 electric code requirements.

3.6.4 Arrange for the abatement work area to be locked during non-work hours. Install temporary doors with entrance type locksets that are key lockable from the outside and always unlocked and operable from the inside. Remove deadbolts and padlocks. Provide one key (to be held by SI security office on site) to the COTR.

3.7 Preparation of Abatement Work Area and Temporary Enclosures

3.7.1 No exhibit collection object shall be handled by the contractor without the approval of the COTR. Methods for surface decontamination and/or disposal of unsalvageable objects shall be determined with the input from the COTR, the object owner, the contractor and the SI IH.

3.7.2 Clean all contaminated furniture, equipment, and supplies with a HEPA-filtered vacuum cleaner or by wet wiping, as directed by the COTR, prior to being moved or covered.

3.7.3 Before removal, clean by HEPA-filtered cleaner and/or by wet wiping, all electrical and mechanical items, (such as lighting fixtures, clocks, diffusers, registers, etc.) and general construction items (such as cabinets casework, door and window trim,

moldings, etc.) which cover the surface of the abatement work as required to prevent interference with the abatement work. Reinstall all such materials upon completion of the removal work with materials, finishes, and workmanship to match existing installations before start of work.

3.7.4 Remove all removable furniture, equipment, and supplies that have been deemed by the COTR to be uncontaminated, or completely cover with 2 layers of polyethylene sheeting, at least 0.15 mm in thickness, securely taped in place with duct tape. Such furniture, equipment, and supplies shall be considered outside the abatement work area unless covering plastic or seal is breached.

3.7.5 Clean all surfaces in abatement work area with a HEPA-filtered vacuum cleaner or by wet methods prior to installation of primary barrier.

3.7.6 All critical barriers, including ventilation openings (supply and exhaust), lighting fixtures, clocks, doorways, windows, speakers, and other openings into the abatement work area shall be individually sealed with 0.15 mm plastic sheeting and tape. Elevator doors, fire extinguisher cabinets and all other penetration in the floor, walls, or ceiling shall be sealed in the abatement work area. If a temporary polyethylene/stud wall must be erected, that wall shall be treated as a critical barrier. The double layer polyethylene containment enclosure shall then be erected on that wall. Critical barriers shall be sealed prior to installation of primary barriers

3.7.7 Take care in sealing of lighting fixtures and control boxes to avoid melting or burning of sheeting. The inside of unsealed lighting fixtures, control boxes, and buss lines are to be cleaned by asbestos workers specially certified to work on high voltage lines.

3.7.8 Cover floor of abatement work area with 2 layers of clear polyethylene, at least 0.15 mm in thickness, turned up at the walls at least 600 mm. Both spray-glue and duct tape all seams in floor covering. Size to minimize seams. Locate seams in top layer 2.0 meters from, or at right angles to, seams in bottom layer. Install sheeting so that top layer can be removed independently of bottom layer. Do not locate seams at wall/floor interface.

3.7.9 If carpeting is to remain, cover carpeting with three layers of polyethylene sheeting at least 0.15 mm in thickness. Place one layer of corrugated cardboard sheets between the top and middle layers of polyethylene.

3.7.10 Cover plastic sheeting in areas where scaffolding is to be used with a single layer of 12.7 mm fire retardant plywood. Wrap edges and corners of each sheet with duct tape.

3.7.11 Cover all walls in abatement work area including critical barrier sheet plastic with primary barrier of 2 layers of 0.15 mm polyethylene sheeting, mechanically supported and sealed with duct tape or spray-glue in the same manner as critical barrier sheet plastic. Size to minimize seams. Seams shall be staggered and separated by at least 600 mm. Wall sheeting shall overlap floor sheeting by at least 406 mm beyond wall/floor joint. Tape all joints including the joining with the floor covering with duct tape or as otherwise indicated by the COTR.

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3.7.12 Cover interior surfaces of any existing elevator with 2 layers of 0.15 mm plastic sheeting. Arrange entry to abatement work area so that elevator door is in a positively pressurized space outside the clean room of the decon unit.

3.7.13 When installing the critical and primary barriers, automatic sprinkler heads and fire detectors shall not be covered or altered to prevent or delay operation. Smoke detectors should be protected (but not completely masked) to avoid nuisance alarms during paint or demolition operations. The covers on the smoke detectors shall be removed directly after such operations and at the end of the abatement workday.

3.7.14 A secondary barrier of plastic as a drop cloth shall be used to protect the primary layer from debris and shall be rolled and disposed as contaminated waste at the end of each workday.

3.7.15 Provide emergency exiting from the enclosure as required by NFPA 101, Life Safety Code. Arrange exit door(s) so that it is secure from outside the abatement work area but permits exiting from the abatement work area. Mark outline of door on barriers with luminescent paint at least 250 mm wide. Hang a razor knife on a string beside outline. Post a sign identifying "EMERGENCY EXIT", using letters at least 150 mm high, inside outline with luminescent paint. Arrows shall be taped on the polyethylene wall covering at eye level and at floor level to indicate location of exits. At entrance to decontamination chamber, post building floor plan and escape routes, plus locations of nearest exist and phone numbers of SI security. Emergency lighting shall be required, in accordance with the Life Safety Code.

3.7.16 A 4.5 kg ABC type portable fire extinguisher shall be located by each exit and clean room.

3.7.17 Install inspection windows in the containment barrier enclosure system walls. Each window shall have a minimum 600 mm x 600 mm viewing area fabricated from 6.0 mm acrylic or polycarbonate sheeting. Install window with top at 2.0 m above floor height in a manner that provides unobstructed vision from outside to inside of the abatement work area. A sufficient number of windows are to be installed to provide observation of all portions of the abatement work area that can be made visible from adjacent areas. Provide also for viewing to be blocked from the inside with opaque plastic flap.

3.7.18 Where the abatement work area is immediately adjacent to or within view of occupied areas, provide a visual barrier of opaque polyethylene sheeting at least 0.15 mm in thickness so that the abatement work procedures are not visible to building occupants. Where this visual barrier would block natural light, substitute frosted or woven rip-stop sheet plastic in locations approved by the COTR.

3.7.19 Provide GFCI protection for all electrical equipment.

3.7.20 Provide temporary lighting inside the decontamination enclosure facility.

3.8 Construction of Worker/Equipment Decontamination and Waste Load-Out Enclosures

3.8.1 Worker/equipment decontamination enclosures shall be provided at each location where workers shall enter or exit the abatement work area.

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3.8.2 The Contractor shall construct a worker/equipment decontamination enclosure consisting of at least a clean room, a shower room, and an equipment room, each separated by 900 mm air locks. Narrower air locks may be built if approved by the COTR.

3.8.2.1 All rooms shall be constructed of or fully lined with 0.15 mm thick polyethylene sheeting and suitable framing to make them as air-tight as possible. Where joining separate sheets of polyethylene is necessary, the two sheets of polyethylene shall be over-lapped at least 150 mm and adhered with an unbroken line of tape in such a manner to prohibit air movement. Stagger joints. Tape shall then be used to further seal the joint on the other side of the containment barrier so that both loose edges of the overlap are completely sealed.

3.8.2.2 Doorways will consist of three 3 sheets of 0.15 mm polyethylene from ceiling to floor. The width of these polyethylene sheets shall be sufficient to prevent air movement through the doorways when closed.

These doorways shall be the only source of make-up air for the HEPA negative air filtration unit under normal circumstances, unless other sources are specifically approved by the COTR.

3.8.2.3 Provide GFCI protection for all electrical equipment.

3.8.2.4 Provide temporary lighting inside the decontamination enclosure facility.

3.8.3 The Clean Room shall have a curtained doorway leading to the outside of the abatement work area, and an airlock leading to the Shower Room. The clean room shall be of sufficient size to accommodate at least one worker, and a supply of clean disposable coveralls and storage facilities for street clothing, and uncontaminated equipment.

3.8.4 The Shower Room shall have two airlocks, one adjacent to the clean room and one adjacent to the equipment room. The Shower room shall provide hot and cold running water and soap and towels. It should have adequate space for a shower stall. Waste water from the shower shall be discharged through a water filtration unit efficient to 5 microns, then to a sanitary sewer. Shower room shall have opaque walls.

3.8.4.1 Shower Stall: Provide leak tight shower enclosure unit with integrated drain pan fabricated from fiberglass or other durable waterproof material. Equip with hose bibs for hot and cold water. Arrange water shut off and drain pump operation controls so that a single individual can shower without assistance from either inside or outside of the abatement work area. Provide splash proof entrances. Provide back flow prevention device and vacuum breaker, where required. Connect drain to a reservoir, pump water from reservoir through filters to a drain. Mount filters inside shower stall in manner that allows for access for filters to be changed from inside the shower. Change filters daily or more often if necessary. Locate filters inside shower unit so that water lost during filter changes is caught by shower pan. Provide

temporary extensions of existing (if available and authorized for Contractor use by COTR) hot and cold water and drainage, as necessary for a complete and operable shower.

3.8.4.2 Filtered Waste Water Drainage: Provide cascaded disposable HEPA filter units on drain lines from showers or any other fluid source carrying ACM. Connect so that discharged water passes primary filter and output of primary (particles 20 microns and smaller) filter passes through secondary (particles 5 microns and smaller) filter.

3.8.4.3 Sump Pump: Provide totally submersible waterproof sump pump with integral float switch. Provide unit sized to pump 2 times the flow capacity of all showers or hoses supplying water to the sump, through the filters specified herein when they are loaded to the extent that replacement is required. Provide unit capable of pumping debris, sand, plaster or other materials washed off during decontamination procedures without damage to mechanism of pump. Adjust float switch so that a minimum of 75 mm remains between top of liquid and top of sump pan.

3.8.5 The Equipment Room shall have two airlocks, one adjacent to the abatement work area and one adjacent to the shower room. The room shall be of sufficient size so as to accommodate at least one worker to change clothes, and temporarily house any equipment which the contractor wishes to store when not in use. The area shall have facilities for decontaminating material and equipment, and a container lined with 0.15 mm polyethylene bag for collection of disposable coveralls and foot coverings.

3.8.6 Waste Load-Out Enclosure: Asbestos-contaminated waste that has been containerized shall be transported out of the abatement work area either through the personnel/equipment decontamination enclosure or through a separate waste load-out enclosure. If a separate enclosure is used, it shall be built with two airlocks, with curtained doorways: one to the abatement work area and one to an uncontaminated area outside the abatement work area.

3.9 Air Circulation Inside Containment Barrier

3.9.1 Formula for Quantity of Air-Filtration Units: The number of air filtration units needed to achieve the required air circulation rate shall be determined by the following formula:

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CALCULATE	Volume of abatement work area (CF)
MULTIPLY BY	Number of air changes per hour, four to ten.
MULTIPLY BY	1/60 (hr/minutes)
DIVIDE BY	Capacity of air filtration unit fully loaded with all filters (pressure differential activates warning light for loaded filters)

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DIVIDE BY	80% expected efficiency
ADD	one additional unit as backup for machine failure or shutdown
EQUALS	minimum number of units required

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3.9.2 Supplemental Makeup Air Inlets: As necessary to achieve air flow throughout the abatement work area, locate auxiliary makeup air inlets as far away as possible from the air filtration units, preferably near the ceiling and away from barriers that separate the containment barriers and enclosures from surrounding areas. Cover inlet with plastic sheeting flaps to reseal automatically if the pressure differential system should shut down for any reason. Provide rigid framing around the opening. Spray the flap and around opening with spray adhesive so that if flap closes, the meeting surfaces are both covered with adhesive. Use adhesive that forms contact bond when dry. If used during clearance monitoring, tape or seal HEPA filters over inlets.

3.9.3 Penetrations through masonry and/or fire walls, required for improving air circulation, shall be protected with a fire damper.

3.9.4 Accomplish the pressure differential by exhausting a sufficient volume of HEPA filtered air from the abatement work area. Efforts to achieve pressure isolation shall first address:

3.9.4.1 Establishing required air circulation

3.9.4.2 Verifying seals are complete as practical

3.9.4.3 Establishing increased pressure in adjacent areas, if available

3.9.4.4 Exhausting sufficient volume of HEPA filtered air with additional air filtration units.

3.9.4.5 Decreasing the size of abatement work area to affect a smaller volume required for filtration

3.10 Placement of Air Filtration System Units

3.10.1 Equipment shall be located so as to optimize air movement throughout the abatement work area by positioning air filtration units as far away as practical from the access opening or other supplemental make-up air inlets.

3.10.2 The auxiliary air-filtration unit shall be located on site and available and ready to run at any time.

3.10.3 Air movement shall be established in such a way that air borne fibers will be carried away from workers' breathing zones.

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3.10.4 Dead air pockets shall be minimized by proper ducting of make-up air if necessary, and by optimum location of the negative air filtration units.

3.10.5 The Contractor shall use smoke tubes to determine if dead air spots are present, and shall take corrective action as outlined above when they are found. Report such actions to the COTR immediately.

3.10.6 The air filtration units shall be placed so that access for changing the filters is inside the containment barrier. The unit is to run continuously during filter changing. A supply of filters shall be kept on site outside of containment area. If a unit must be turned off for servicing, an auxiliary unit must be in place and turned on.

3.10.7 Vent to the outside of the building, whenever practical, as determined by the COTR. Units may be vented inside the building only if outside venting is impractical. Units venting inside a building must be vented through an expansion chamber or diffuser system (self-contained water baffle) to reduce exhaust air velocity. A secondary HEPA unit may also be used after the expansion chamber/diffuser. Terminal exhaust ductwork must be placed as far away as possible from occupied areas. Special provisions for air monitoring shall be implemented by the SI air monitoring firm.

3.10.8 Mount units to exhaust directly or through disposable ductwork. Use ductwork and fittings of same diameter or larger than discharge connection on fan unit. Use spiral wire-reinforced flex duct in lengths not greater than 15 meters. If direction of discharge from fan unit is not aligned with duct use sheet metal elbow to change direction. Use six feet of spiral wire reinforced flex duct after direction change.

3.10.9 All HEPA units shall be tested in-place before removal begins. Test will be the responsibility of the contractor.

3.11 Pressure Differential Isolation

3.11.1 The abatement work area and the decontamination enclosure system shall be maintained at a negative pressure relative to adjacent areas. The relative pressure differential when measured across any physical or critical barrier must continuously equal or exceed a static pressure of 0.5 mm of water. Measurement shall be by manometer or magnahelic gage.

3.11.2 Minimum 4 air changes per hour. Continuous HEPA filtered exhaust unit is to be in operation until job is completed.

3.11.3 Make-up air shall be obtained only through the decontamination enclosure facilities, or as provided in Section 3.9.2 of these specifications.

3.11.4 Where asbestos-containing material covers an opening or joint, provide negative air pressure sufficient to draw air from the adjoining space into the containment barrier when the opening or joint is exposed after asbestos removal. Seal newly exposed openings and joints immediately to prevent contamination of adjoining spaces.

3.11.5 Supply sufficient pre-filters to allow frequent changes.

3.11.6 During and after the pre-abatement test, run the air filtration units continuously to maintain a constant pressure differential and air circulation until decontamination, cleaning, and encapsulation of the abatement work area is complete.

3.11.7 The HEPA-filtered units shall be left on continuously until after final clearance air measurement of 0.01 f/cc or the pre-removal background level, whichever is lower is achieved, and the COTR authorizes the shut-down of the units. Where feasible, the units shall be left on until the enclosure is completely removed.

3.11.8 HEPA units must be set up to cause an alarm-bell or buzzer to sound should the HEPA filter become clogged or the exhaust unit fails in operation after working hours. The alarm must be loud enough to alert a SI Security Officer of the equipment failure. The guard will phone a previously designated contractor employee whose 24-hour number shall have been recorded at the beginning of the project. The notified contractor will immediately dispatch a repair crew to the job site. A spare HEPA unit shall always be available to immediately restore negative air pressure.

3.11.9 If the pressure differential between inside and outside the containment barrier drops to 0.4 mm of water, the Contractor will immediately inspect the containment for sources of pressure leaks and report actions taken to the SI IH and COTR. The system warning alarm shall sound if pressure drops below 0.03 mm of water, and work shall stop.

3.12 Pre-Abatement Inspection, Testing, and Approval

3.12.1 Pre-Abatement Testing Requirements: Contractor must demonstrate with continuous data log that abatement work area can hold negative pressure of 0.5 mm of water for a minimum of 2 hours, prior to commencement of actual asbestos removal, unless the system is exhausted through an isolated ventilation system. In this case, the test period shall be long enough to ensure that the lock-out ventilation controls are not over ridden and the HVAC system does not reactivate. As a minimum, the Contractor shall make all arrangements and demonstrate satisfactory equipment operation and set-up for compliance with these specifications.

3.12.1.1 Show proper condition of equipment seals including results of in-place HEPA-filter testing.

3.12.1.2 Show proper operation of safety and warning devices.

3.12.1.3 Show proper operation and calibration of instrumentation.

3.12.1.4 Show identification of equipment unit and fan capacity.

3.12.1.5 Use smoke tubes to demonstrate adequate air circulation, elimination of dead air pockets, and positive air motion through the decontamination enclosure system into the abatement work area.

3.12.1.6 Show the installation method for pre-filters and the HEPA primary filter in the air filtration unit. Show supply of filters available on site.

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3.12.1.7 Demonstrate and record that a minimum 0.50 mm of water pressure differential has been achieved and can be maintained.

3.12.1.8 Demonstrate procedures for how workers will enter and exit the decontamination enclosure system.

3.12.1.9 Demonstrate procedures for handling emergencies and for the prevention of contamination of surrounding areas.

3.12.1.10 With COTR and Building Representative, identify disabled building ventilation systems and the positive means that will prevents accidental or premature restarting. Confirms means to have unit restarted at the conclusion of the abatement work. With COTR and Building Representative, verify that all equipment affected is secured at the main breaker.

3.12.1.11 Demonstrate how contaminated shower water is filtered and drained.

3.12.1.12 Use a pressure differential meter or manometer to demonstrate the required pressure differential at every barrier separating the abatement work area from the balance of the building, equipment, ductwork or outside.

3.12.1.13 Demonstrate that each air filtration unit is serviced by a dedicated minimum 115V-20A circuit with GFCI protection.

3.12.1.14 Demonstrate how asbestos will be removed and bagged for transport. Identify procedures for hauling through the building to the loading dock.

3.13 Maintenance of Containment Barrier and Enclosures

3.13.1 Ensure that the containment barrier, decontamination enclosure rooms, and other sealed doors, vents, etc., and plastic linings are effectively sealed and taped for the duration of the abatement work.

3.13.2 Repair damaged barriers and remedy defects immediately upon discovery. Visually inspect enclosure at the beginning of each work period.

3.13.3 Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes exposed to and contaminated with asbestos shall be decontaminated or disposed of in accordance with the applicable regulations and special requirements.

3.13.4 Clean debris and residue from inside of the decontamination enclosure system on a daily basis. Damp wipe or hose down all surfaces after each shift change. Clean debris from shower pans on a daily basis.

3.13.5 Maintain floors in the clean room and airlocks as dry as possible to minimize slips and trips. Damp wipe all surfaces twice after each shift change with a disinfectant solution.

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3.14 Removal of Asbestos-Containing Materials (ACM) - General

3.14.1 Prohibited Work Practices. The following methods shall not be used for work related to or disturbing asbestos, regardless of exposure level:

3.14.1.1 High-speed abrasive disc saws that are not equipped with point of cut ventilation or enclosures with HEPA-filtered exhaust air.

3.14.1.2 Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

3.14.1.3 Dry sweeping, shoveling or other dry cleanup of dust and debris containing ACM and PACM.

3.14.1.4 Employee rotation as a means of reducing employee exposure to asbestos.

3.14.2 Methods of Compliance. The following engineering controls and work practices shall be used, at a minimum, for all asbestos tasks:

3.14.2.1 HEPA-filtered vacuum cleaners.

3.14.2.2 Wet methods.

3.14.1.3 Prompt cleanup and disposal.

3.14.3 The following work shall be done only after the decontamination facilities have been constructed, the area has been isolated and can be maintained under negative air pressure as specified in the previous section, pre-abatement background sampling has been conducted, and arrangements have been made for disposing waste at an acceptable site.

3.14.4 Start abatement work at a location farthest from the fan units and proceed toward them. If an electric power failure occurs, immediately stop all abatement work and do not resume until power is restored and negative air filtration units are operating again. Immediately notify COTR of occurrence. Any torn or unsealed plastic sheeting shall be immediately repaired. Floor sheeting shall be replaced if damaged.

3.14.5 Wet Removal: Prior to stripping and/or tooling, the asbestos material shall be sprayed using an airless pump and wetting agents (amended water or removal encapsulant) to enhance penetration and reduce fiber dispersal into the air.

3.14.5.1 A fine spray of amended water shall be applied to reduce fiber release preceding the removal of the asbestos material. The material shall be sufficiently saturated to prevent emission of excessive airborne fibers.

3.14.5.2 Spray material repeatedly during the abatement work process to maintain a continuously wet condition. If a removal encapsulant is used, apply in strict accordance with manufacturer's instructions. Perforate outer covering

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of any insulation which has been painted and/or jacketed in order to allow penetration of water, amended water or removal encapsulant. Where necessary, carefully strip away while simultaneously wetting the insulation to minimize dispersal of asbestos fibers into the air.

3.14.5.3 Remove materials in manageable quantities and control the descent to the staging or floor below. If over 6 meters, use drop chutes to contain material during descent.

3.14.6 Gross removal of dust and debris from contaminated material, material containers, and equipment shall be accomplished in the containment barrier before removal to the equipment decontamination room for wet sponging before leaving the abatement work site.

3.15 Requirements for Specific ACM and Methods - Fireproofing/Soundproofing on Scratch Coat or Wire Lath

3.15.1 Spray asbestos-containing fireproofing or architectural acoustic finish with a fine mist of amended water. Allow time for amended water to saturate materials to substrate.

3.15.2 Spray the asbestos-containing material repeatedly during the abatement work to maintain wet condition but do not use excessive amounts of water that results in ponding or entry into other areas of the building.

3.15.3 Do not over-saturate to cause excess dripping. Scrape materials from substrate. Remove residue remaining on scratch coat after scraping using stiff nylon bristled hand brush. Use high pressure washer only with written authorization from the COTR.

3.15.4 Remove the saturated asbestos-containing material in small sections. Do not allow material to dry out. As it is removed, place the material in sealable plastic bags of 0.15 mm minimum thickness.

3.15.5 Carefully lower removed and bagged asbestos-containing material to the floor without dropping or throwing, or transport to the floor via dust-tight chutes or containers, in accordance with the procedures set forth in 40 CFR 61.147.

3.15.6 Cut wire lath into 50 mm x 150 mm sections and cut hanger wires. Roll or fold up complete with asbestos-containing material and hand place in container. Do not drop on floor. After removal of lath and asbestos-containing material remove any overspray on decking and structure above using stiff nylon bristled brush. Use one of the following methods for containing waste.

(a) Wrap material in felt and place in fiberboard drum lined with two disposal bags. Use caution to insure that all edges of wire lath that could cut plastic are covered with felt.

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(b) Place material directly in a steel drum. Use waste containers which are impervious to puncture, leakage, tearing, or ripping from wire lathe.

3.16 Requirements for Specific ACM and Methods - Vinyl Asbestos Tile (VAT) and Mastic

3.16.1 Full containment barriers, with pressure differential ventilation units, shall be used. Dispose as ACM.

3.16.2 Removal of asbestos-containing floor tile and mastic shall be performed in accordance with the procedure outlined below.

(a) Prepare abatement work area as previously specified for the abatement work.

(b) Spray areas of asbestos-containing material with amended water using spray equipment capable of providing a "mist" application to reduce the release of fibers. Wet the material sufficiently to maintain dust control. Spray the asbestos-containing material repeatedly during work process to maintain wet condition but do not use excessive amounts of water.

(c) Do not break the individual tiles to remove them. Gently pry up a corner of the tile with a broad blade putty knife and slip the knife between the tile and the substrate while cutting the mastic bond.

(d) If the mastic is especially tenacious, use a heat gun to loosen the bond between the tile and the substrate and to make the tile more pliable.

(e) Non-toxic organic solvents may be used to remove mastic.

(f) Continuously use a HEPA vacuum around the individual tiles that are being removed. Do not allow any dust or debris to accumulate on the floor or other surfaces of the abatement work area.

(g) Do not allow dislodged tiles to dry out. As it is removed, place the material in sealable plastic bags of 0.15 mm minimum thickness. Place sealed asbestos debris in second 0.15 mm plastic bag, appropriately labeled, and remove from abatement work area.

(h) After removal of asbestos-containing material, wet-clean all surfaces in the abatement work area to remove residual accumulated material. Continue wet-cleaning until surfaces are visibly free of material.

*****OR USE THE FOLLOWING STANDARD FOR FLOOR TILE*****

3.16.3 Removal of asbestos-containing floor tile and mastic, baseboard and mastic shall be performed in accordance with the procedure outlined below.

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(a) All critical barriers, including ventilation openings (supply and exhaust), lighting fixtures, clocks, doorways, windows, speakers, and other openings into the work area shall be individually sealed with 0.15 mm plastic sheeting and tape. Elevator doors, fire extinguisher cabinets and all other penetration in the floor, walls, or ceiling shall be sealed in the abatement work area.

(b) Prepare a worker and/or equipment decontamination and waste load-out enclosure as previously specified.

(c) Cover all walls in the abatement work area with two layers of 0.15 mm polyethylene sheeting and seal with duct tape or spray-glue. The sheeting shall be applied to a height of 1.5 m above the floor. The seams shall be staggered and separated by at least 150 mm.

(d) Wet asbestos-containing materials with amended water to minimize fiber release during removal. Use amended water sparingly to eliminate standing water and to prevent water from traveling on the floor.

(e) Remove tiles individually and minimize breakage. Heat guns may be used to heat tile and soften the adhesive. Immediately place tiles in disposal bags.

(f) Non-toxic organic solvents may be used to remove mastic.

(g) Wet clean all surfaces to remove residual material. Continue cleaning until abatement work area is free of visible material.

(h) Proceed to clearance testing following approval from COTR that abatement work area is visually free of asbestos-containing materials.

3.17 Requirements for Specific ACM and Methods - Roofing

Use the wet removal method for ACM to eliminate visible emissions in accordance with NESHAP regulations. Controls shall be used to prevent re-entrainment into building HVAC system. Dispose as ACM.

(a) Spray large areas of asbestos-containing roofing material thoroughly with amended water using spray equipment recommended by surfactant manufacturer capable of providing a "mist" application to reduce the release of fibers. Spray the asbestos material repeatedly during the abatement work process to maintain wet conditions, but do not use excessive amounts of water that result in ponding or entry into building.

(b) Remove the asbestos-containing material in small sections. Do not allow material to dry out. As it is removed, place the material in sealable plastic bags of 0.15 mm

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minimum thickness. Place sealed asbestos debris in second 0.15 mm plastic bag, appropriately labeled, and remove from abatement work area.

(c) Carefully lower removed and bagged asbestos-containing material to the ground without dropping or throwing, or transport to the ground via dust-tight chutes or containers, in accordance with the procedures set forth in EPA 40 CFR 61.147 Code of Federal Regulations.

(d) Clean area of all debris and notify COTR for visual inspection.

3.18 Requirements for Specific ACM and Methods – Exterior and Interior Window Caulk

(a) Exterior: Work will be done from the exterior of the building. If lifts are needed, lift platforms should be covered with canvass drop cloths.

(b) Interior: If lifts are needed, lift platforms should be covered with canvass drop cloths.

(c) Cover the ground or floor area below the abatement work area with 2 layers of 0.15 mm polyethylene sheeting.

(d) Wet the asbestos-containing materials with amended water to minimize fiber and dust release during removal. Use amended water sparingly to eliminate standing water and to prevent water from traveling on the ground sheeting.

(e) Remove the window caulk in small sections using manual methods, not power tools. Keep the material wet with amended water and do not allow the material to dry out. As it is removed, place the material in sealable plastic bags of 0.15 mm minimum thickness, and completely seal the bag. Place sealed debris bag into a second 0.15 mm plastic bag, and completely seal the bag.

(f) Carefully lower the sealed material debris bag to the polyethylene sheeting on the ground without dropping or throwing.

(g) After removal of the sealed material debris bags from the work area, HEPA vaccum and wet-clean all surfaces and equipment in the abatement work area to remove residual accumulated material. Continue cleaning until the surfaces are visibly free of material.

(h) Place dropcloths and other abatement related disposable materials into sealable plastic bags of 0.15 mm minimum thickness, and completely seal the bag. Place sealed debris bag into a second 0.15 mm plastic bag, and completely seal the bag. Remove from the work site and dispose as asbestos waste per these specifications.

(i) Notify COTR for visual inspection.

3.19 Requirements for Specific ACM and Methods - Gypsum Wallboard Joint Compound

(a) All critical barriers, including ventilation openings supply and exhaust), lighting fixtures, clocks, doorways, windows, speaker, and other openings into the abatement

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work area shall be individually sealed with 0.15 mm plastic sheeting and tape. Elevator doors, fire extinguisher cabinets and all other penetrations in the floor wall, or ceiling shall be sealed in the abatement work area.

(b) Prepare worker/equipment decontamination and waste load-out enclosure as previously specified.

(c) Isolate the abatement work area by constructing a temporary double layered 0.15 mm polyethylene/stud wall.

(d) Cover the floor of the abatement work area with 2 layers of 0.15 mm polyethylene sheeting turned up at walls at least 600 mm.

(e) Wet the asbestos-containing materials with amended water to minimize fiber and dust release during removal. Use amended water sparingly to eliminate standing water and to prevent water from traveling on the floor.

(f) Remove the gypsum wallboard and joint compound in small sections. Do not allow the material to dry out. As it is removed, place the material in sealable plastic bags of 0.15 mm minimum thickness. Place sealed debris in a second 0.15 mm plastic bag, and remove from the work area.

(g) Carefully lower the material to the floor without dropping or throwing.

(h) After removal of the material, HEPA vacuum and wet-clean all surfaces in the abatement work area to remove residual accumulated material. Continue cleaning until the surfaces are visibly free of material.

3.20 Requirements for Specific ACM and Methods - Duct Insulation Mastic

(a) All critical barriers, including ventilation openings (supply and exhaust), lighting fixtures, clocks, doorways, windows, speaker, and other openings into the abatement work area shall be individually sealed with 0.15 mm plastic sheeting and tape. Elevator doors, fire extinguisher cabinets and all other penetrations in the floor wall, or ceiling shall be sealed in the abatement work area.

(b) Prepare worker/equipment decontamination and waste load-out enclosure as previously specified.

(c) Isolate the abatement work area by constructing a temporary double layered 0.15 mm polyethylene/stud wall.

(d) Cover the floor of the abatement work area with 2 layers of 0.15 mm polyethylene sheeting turned up at walls at least 600 mm.

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(e) Wet the asbestos-containing materials with amended water to minimize fiber and dust release during removal. Use amended water sparingly to eliminate standing water and to prevent water from traveling on the floor.

(f) Removed the duct wrap and insulation and the duct mastic in small sections. Do not allow the material to dry out. As it is removed, place the material in sealable plastic bags of 0.15 mm minimum thickness. Place sealed debris in a second 0.15 mm plastic bag, and remove from the work area.

(g) Carefully lower the material to the floor without dropping or throwing.

(h) After removal of the material, HEPA vacuum and wet-clean all surfaces in the abatement work area to remove residual accumulated material. Continue cleaning until the surfaces are visibly free of material.

3.21 Requirements for Specific ACM and Methods - Contaminated Soils

Saturate dry soil with amended water or a removal encapsulant for a depth of 75 mm. Remove the top 25mm of soil. Start removal at the point of work farthest from the entrance to the soil floor area and proceed toward the entrance. Do not permit traffic into the fresh soil surface. After the entire first layer of soil is removed, completely change coveralls and at the entrance to the soil removal area don clean boot covers. Use amended water to keep the surface of the soil continuously wet throughout removal and decontamination. Remove the second 25 mm of soil in the same manner as the first. Remove the third 25 mm of soil in the same manner as the previous 50 mm.

3.22 Requirements for Specific ACM and Methods - Contaminated Carpeting

Deface carpeting with a light coat of contrasting spray paint before the abatement work. Coat lightly enough that wetting will not be retarded. Prior to cutting, thoroughly wet the asbestos-contaminated carpeting to be removed to reduce fiber dispersal into the air. Accomplish the wetting by using a fine spray (mist) of amended water or encapsulant. Saturate material completely without causing excess dripping. Allow time for water or encapsulant to penetrate material thoroughly. Roll up carpeting and dispose of as ACM.

3.23 Requirements for Specific ACM and Methods -Removal of Asbestos-Containing Transite Panels.

(a) Develop a daily removal plan indicating the square footage of panel material that will be removed during the abatement working day.

(b) Establish a regulated area by posting necessary barricades and warning signs to isolate the abatement work area.

(c) Prior to commencing work, establish a regulated area by covering the surface with plastic sheeting a minimum of 4.5 m from the panels being removed.

(d) At all times, keep the panels misted with water.

(e) Remove the panels individually and minimize breakage.

(f) Gently place the panels in bags or wrap the panels in two layers of 0.15 mm plastic sheeting.

(g) Collect and dispose of any debris that falls on the plastic sheeting as asbestos-containing material.

(h) Wet-clean all surfaces of the structure which secured the panels to remove residual ACM.

(i) Encapsulate the structure surfaces wet-cleaned in (h) above.

(j) Wet wipe the plastic sheeting prior to disestablishing the regulated area and dispose of the sheeting as contaminated waste.

3.24 Requirements for Specific ACM and Methods - Glove-Bag Removal Method

(a) Preparation: Before any work commences, a layer of polyethylene sheeting shall be placed on the floor, as a drop cloth, beneath the glove bag abatement work area. A temporary enclosure shall be constructed around the general removal area to separate it from occupied areas of the building and to serve as a physical barrier should accidental fiber release occur. Appropriate warning signs shall be posted outside this barrier in areas of high visibility. A HEPA filtered air filtration unit shall be on-site to be used to contain an emergency fiber release.

(b) Remove asbestos-containing material inside a glove bag according to manufacturer's guidelines. Thoroughly wet material to be removed with amended water or removal encapsulant and allow to soak through to substrate.

(c) Each glovebag shall be installed so that it completely covers the circumference of pipe or other structure where the work is to be done.

(d) Glovebags shall be smoke-tested for leaks and any leaks sealed prior to use.

(e) Glovebags may be used only once and may not be moved.

(f) Glovebags shall not be used on surfaces whose temperature exceeds 65° C.

(g) Before beginning the operation, loose and friable material adjacent to the glovebag/box operation shall be wrapped and sealed in two layers of 0.15 mm plastic sheeting or otherwise rendered intact.

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(h) Use two people for glove-bag operation. One shall remove insulation, the other shall operate water sprayer and repair any leaks in bag.

(i) Using a small HEPA vacuum, create a negative pressure inside the glove-bag before starting any asbestos removal and maintain throughout the use of the bag.

(j) Gently remove insulation from pipe and place it in bottom of bag.

(k) After removal of insulation, brush and wet-clean pipe to remove residual material. Continue wet cleaning until surfaces are free of visible material. Clean area of all debris and notify COTR for visual inspection.

(l) Spray all tools with water inside bag and place back in pouch.

(m) Where system uses attached waste bag, such bag shall be connected to collection bag using hose or other material which shall withstand pressure of ACM waste and water without losing its integrity.

(n) Sliding valve or other device shall separate waste bag from hose to ensure no exposure when waste bag is disconnected.

(o) Wet and seal visible ends of remaining pipe insulation.

(p) Spray the inside of the bag with amended water and remove the watering wand, taping the water sleeve closed.

(q) Tape the make-up air opening closed.

(r) Using the HEPA-vacuum, collapse bag and seal off lower portion containing asbestos-containing material and gloves of the bag.

(s) Remove bag from pipe and tools from pouch.

(t) Glove-bag shall be considered the first container for material. Dispose of properly.

(u) Encapsulate abated section of pipe and any adjacent pipe as required.

(v) Accidental Fiber Release During Glove Bag Removal: If the glove bag is accidentally cut open, duct tape from inside the bag shall be used to seal the opening. If the glove bag should rupture during abatement, the drop cloth sheeting beneath the bag shall be used to contain the bag by bringing the edges together, twisting, taping and folding over in gooseneck fashion and taping again. The area around and under this cloth shall be cleaned with a HEPA vacuum.

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3.25 Requirements for Specific ACM Methods: Negative Pressure Glove Box Systems

Negative pressure glove box systems shall be used to remove ACM or PACM from pipe runs with the following specifications and work practices:

(a) Glove boxes shall be constructed with rigid sides and made from metal or other material which can withstand the weight of the ACM and PACM and water used during removal.

(b) A negative pressure generator shall be used to create negative pressure in system.

(c) An air filtration unit shall be attached to the box.

(d) The box shall be fitted with gloved apertures.

(e) An aperture at the base of the box shall serve as a bagging outlet for waste ACM and water.

(f) A back-up generator shall be present on site.

(g) Waste bags shall consist of 0.15 mm thick plastic, double-bagged before they are filled, or plastic thicker than 0.15.mm.

Work Practices:

(a) At least two persons shall perform the removal.

(b) The box shall be smoke tested prior to each use.

(c) Loose or damaged ACM adjacent to the box shall be wrapped and sealed in two layers of 0.15 mm plastic prior to the job, or otherwise made intact prior to the job.

(d) A HEPA filtration system shall be used to maintain pressure barrier in box.

3.26 Requirement for Specific ACM Methods: Water Spray Process System

A water spray process system may be used for removal of ACM and PACM from cold line piping if, employees carrying out such process have completed a 40-hour separate training course in its use, in addition to training required for employees performing Class I work. The system shall meet the following specifications and shall be performed by employees using the following work practices.

Specifications:

(a) Piping shall be surrounded on three sides by rigid framing.

(b) A 360 degree water spray, delivered through nozzles supplied by a high pressure separate waterline, shall be formed around the piping.

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(c) The spray shall collide to form a fine aerosol which provides a liquid barrier between workers and the ACM and PACM.

Work Practices:

(a) The system shall be run for at least ten minutes before removal begins.

(b) All removal shall take place within the water barrier.

(c) The system shall be operated by at least three persons, one of whom shall not perform removal, but shall check equipment, and ensure proper operation of the system.

(d) After removal, the ACM and PACM shall be bagged while still inside the water barrier.

3.27 Requirement for Specific ACM Methods: Mini Enclosure

A small walk-in enclosure which accommodates no more than two persons may be used if the disturbance or removal can be completely contained by the enclosure with the following specification and work practices.

Specifications:

(a) The fabricated or job-made enclosure shall be constructed of 0.15 mm plastic or equivalent.

(b) The enclosure shall be placed under negative pressure by means of a HEPA filtered vacuum or similar ventilation unit.

Work Practices:

(a) Before use, the mini-enclosure shall be inspected for leaks and smoke tested to detect breaches, and breaches sealed.

(b) Before reuse, the interior shall be completely washed with amended water and HEPA-vacuumed.

(c) During use air movement shall be directed away from the employee's breathing zone within the mini-enclosure.

3.28 Requirements for Specific ACM and Methods - Dry-Removal of Electrical Equipment

Do not begin dry removal work until authorized in writing by the EPA NESHAP coordinator and the COTR. A State regulatory authority waiver may be required and if so shall be obtained by the contractor. Use where wetting may create a hazard for workers or damage equipment or finishes, such as electrical closets, transformer vaults, high pressure steam lines, etc. Work on active electrical equipment is to be performed by qualified trades person with prior experience in the installation or repair of the involved equipment. Restrict access to electrical equipment.

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3.29 Post Removal: Cleaning and Clearance

3.29.1 Provide general clean-up of abatement work area concurrent with the removal of all asbestos-containing materials. Do not permit accumulation of debris on workspace floor.

3.29.2 Do not perform dry dusting or dry sweeping.

3.29.3 Maintain the minimum required pressure differential of 0.50 mm of water inside the abatement work area enclosure at all times, and until the COTR authorizes the Contractor to remove the enclosure.

3.29.4 During decontamination of automatic sprinkler and smoke detectors, the Smithsonian security office must be contacted for possible nuisance alarms. Care must be taken in the wiping down of the sprinkler heads and smoke detectors so as not to damage them. Smoke detectors must be vacuumed clean as directed by the Fire Alarm Shop, Office of Physical Plant.

3.29.5 Initial Phase Cleanup Sequence

(a) Remove all visible accumulations of asbestos-containing material and debris.

(b) Wet clean and HEPA-vacuum all surfaces in the abatement work area.

(c) Clean all equipment (excluding that which will be needed for further cleaning phases) used in the abatement work area and remove from abatement work area via the Equipment Decontamination Enclosure.

(d) Remove the top layer (secondary barrier) of plastic sheeting, change all air filtration system pre-filters, and proceed with the second cleaning.

(e) Replace all HEPA-filters and pre-filters in air filtration air machines with clean filters. Clean all air filtration machines.

(f) Notify SI IH for observation of cleaning to determine completeness. Plastic sheeting surfaces will be considered clean when free from dust, dirt, residue, film, or discoloration resultant from abatement operations or other activities subordinate to these operations.

(g) Perform no activity in abatement work area for at least 12 hours in order to allow settlement of airborne fibers. No reduction in this settling period will be allowed.

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3.29.6 Secondary Phase Cleanup Sequence

(a) Wet clean and HEPA-vacuum all surfaces in abatement work area at least one more time.

(b) Notify SI IH for observation to determine completeness of cleaning.

(c) SI IH will perform a visual observation of the abatement work area in general accordance with ASTM 1368, *Standard Practice for Visual Inspection of Asbestos Abatement Projects.*

(d) If visual clearance is not attained, then subsequent re-cleaning will be required. This sequence will continue until visual clearance is attained.

(e) When visual clearance has been obtained, the plastic barriers down to the critical barriers may be removed.

3.29.7 Final Air Clearance Testing.

(a) SI IH will test for the final air clearance levels, in accordance with 3.5.7 of this specification, when areas have passed the visual clearance phase. Final air testing shall be performed using aggressive air sampling techniques.

(b) Re-clean and continue to clean at Contractor's expense, areas which do not comply with the specified final clearance level.

3.29.8 Consider abatement work areas and all other decontaminated and cleaned areas clean when:

(a) All phases of clean up have been completed and level of cleanliness is approved by COTR.

(b) All asbestos final clearance testing results will be as specified in 3.5.7 of this specification.

3.29.9. After area passes final air clearance dismantle Decontamination Enclosure Systems and thoroughly HEPA-vacuum and wet clean immediate areas.

3.29.10 Dispose of debris from removal operation, used cleaning materials, unsalvageable materials used for sturdy barriers, and any other remaining materials. Consider the materials to be contaminated, and dispose of accordingly.

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3.29.11 The "COTR's Certification of Visual Inspection and Final Air Sampling for Asbestos Abatement" form (see page 45) or equivalent shall be completed, signed by the Contractor, SI IH, COTR and included with the COTR project records. The COTR shall provide written results of all visual inspections and final clearance testing to the facility safety coordinator.

3.30 Post Clearance: Application of Lockdown Encapsulant To Base Material

3.30.1 Pre-Lockdown Encapsulant Mock-up Test: Prior to beginning lockdown encapsulant work, provide a sample area for approval by the COTR. Notify the COTR a minimum of 72 hours in advance to schedule the test. Lockdown encapsulant shall be applied using methods set forth in ASTM Proposed Specification P-189 "Specification for Encapsulants for Friable Asbestos Containing Building Materials". The test must be witnessed by the COTR or as otherwise designated by the COTR. The approved procedures and materials shall serve as a standard for the balance of the lockdown encapsulant work.

3.30.2 Apply encapsulant only when environmental conditions in the abatement work area are as required by the manufacturer's instructions and the COTR. Prior to applying any encapsulant, ensure that its application will not cause the base material to fail and allow the encapsulated material to fall of its own weight or separate from the substrate.

3.30.3 Apply encapsulant with an airless spray gun with air pressure and nozzle orifice or as otherwise recommended by the encapsulant manufacturer.

3.30.4 Encapsulant Application to Plaster Scratch Coat: Apply two coats of encapsulant to the scratch coat plaster after all ACM has been removed. Apply in strict accordance with the manufacturer's printed instructions. Any deviations from such printed instructions must be approved by the COTR in writing prior to commencing work.

3.30.4.1 Apply the first coat of encapsulant while the plaster scratch coat is still damp from the asbestos removal procedures. If the surface has been permitted to dry, vacuum surface with a HEPA vacuum prior to applying the encapsulant.

3.30.4.2 Apply second coat over first coat in strict conformance with manufacturer's instructions.

3.30.4.3 Color the encapsulant with contrasting colors in alternate coats so that visual confirmation of complete and uniform coverage of each coat is possible. Adhere to manufacturer's instructions for coloring. At the completion of work, the encapsulated surface must be a uniform third color produced by the mixture.

3.30.4.4 Sealing Exposed ACM edges: Prior to encapsulation, permit the exposed edges to dry completely to permit penetration of the encapsulant. Seal edges of ACM with two coats of encapsulant. Label the joint for the portions which are asbestos and non-asbestos.

3.31 Containment Barrier Removal

GENERIC SPEC

3.31.1 Following area final clearance and lockdown encapsulation, leave pressure differential units running as long as feasible during containment barrier removal.

3.31.2 Equipment, machinery, scaffolding, tools, etc., within the abatement work area shall not be removed without first being thoroughly cleaned with amended water or in the case of delicate items susceptible to rust, an acceptable substitute.

3.31.3 After the abatement work area is found to be in compliance, the remaining sealed areas and exits are unsealed and the plastic sheeting, tape, and any other trash and debris are disposed of in sealable plastic bags and treated as asbestos waste. The SI IH will conduct a final walkthrough and document results for the COTR.

3.31.4 Before removal from the abatement work area, remove and properly dispose of pre-filter, decontaminate exterior of machine and seal intake to the machine with 0.15 mm polyethylene to prevent environmental contamination from the filters.

3.31.5 The contractor shall patch and paint and repair all damaged areas and restore them to their original, pre-contract condition.

3.32 Waste Disposal

3.32.1 The COTR reserves the right to restrict when containerized ACM will be moved outside of the abatement work area and pass through the building. Times chosen to move containerized ACM in the building shall be during non-public hours and when limited staff is in attendance or under other appropriate conditions as determined by the COTR.

3.32.2 Asbestos-contaminated waste that has been containerized shall be transported out of the abatement work area either through the personnel/equipment decontamination enclosure or through a separate waste load-out enclosure. Waste load-out procedures shall be performed by two teams. The team inside the abatement work area shall clean the outside of properly labeled asbestos waste containers using HEPA vacuums and/or wet wiping, and place them into the waste load-out enclosure. No personnel from the inside team shall exit any further from the abatement work area. The team inside the waste load-out area (wearing protective clothing and respirators) shall retrieve the waste containers from the load-out enclosure, double-bag the waste and pass them to an uncontaminated area outside the enclosure. No unprotected personnel from the outside team shall enter this enclosure. As applicable, routes to the elevator, the elevator itself, and route to covered carts shall be lined with polyethylene sheeting.

3.32.3 For Amosite Fibers: If the material contains amosite fibers, evacuate air from disposal bags with a HEPA vacuum before sealing.

3.32.4 Water not disposed of with the asbestos-containing materials shall be filtered to remove asbestos fibers and debris before disposal into sanitary sewer.

3.32.5 Do not store containerized materials outside of the abatement work area. Take containers from the abatement work area directly to a sealed truck or dumpster.

3.32.6 Bulk and containerized asbestos waste shall be packed, labeled, and transported according to DOT Regulations 49 CFR 173.216 and 49 CFR 173.240. All removed ACM, plastic sheeting, tape, cleaning material, clothing, and all other disposable material or items used in the abatement work area shall be packed into double bagged sealable 0.15 mm plastic bags or double containerized with one bag and one drum. The bags shall be marked with the labels required by OSHA 29 CFR 1910.1001 and/or 1910.1200, and 1926.1101.

3.32.6.1 If the asbestos waste can reasonably be expected to damage double bagged 0.15 mm plastic bags, the following barrel decontamination procedures shall be followed.

(a) Line barrels with a 0.15 mm plastic liner to prevent leaking of contaminated material from the containers.

(b) As bags are moved out through the decontamination system, wet wipe bags to remove all contamination from them before they are moved into an uncontaminated space.

(c) Place bagged waste into appropriately labeled barrels for transport to landfill.

(d) After bagged contaminated waste is placed in barrels, seal lids on barrels.

3.32.6.2 Minimum labeling required:

First Label:

==========
DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
==========

Second Label:

==========
PROVIDE IN ACCORDANCE WITH U.S. DEPARTMENT OF TRANSPORTATION REGULATION ON HAZARDOUS WASTE MARKING. 49 CFR PART 172, SUBPART D: "RQ ASBESTOS NA 2212". PROVIDE A "CLASS 9" LABEL, PER 49 CFR PART 172, SUBPART E.
==========

3.32.6.3 Notify COTR prior to removing each trailer or other waste transport from the jobsite.

GENERIC SPEC

3.32.6.4 Notify COTR not less than 48 hours prior to the proposed time of delivery of contaminated waste to the landfill. Owner may elect to observe this operation.

3.32.6.5 The Contractor shall transport the approved sealed drums to an approved waste disposal site.

3.32.6.6 Allow only sealed plastic bags or impermeable containers to be deposited in landfill. Leave damaged, broken, or leaking plastic bags in the impermeable container and deposit entire barrel in landfill.

3.32.6.7 Ensure that there are no visible emissions to the outside air from site where materials and waste are deposited.

3.32.7 Contractor shall submit a disposal certificate from the EPA approved landfill confirming final disposal in accordance with EPA standards and regulations before final payment. Retain receipts from landfill or processor for materials disposed off. At completion of hauling and disposal of each load, submit copy of waste manifest, chain of custody form, and landfill receipt to the COTR.

3.32.8 The COTR shall provide copies of all hazardous waste disposal manifests to the facility hazardous waste coordinator.

3.33 Job Close-Out

3.33.1 The Contractor shall submit to the COTR, Post Abatement Drawings to indicate location of the asbestos material removed. If required, the Contractor may edit the Project Drawing to show the actual or additional abatement work completed.

3.33.2 The Contractor shall remove from the site all other debris and rubbish resulting from removal and disposal operations and the temporary construction of containment barriers and enclosures.

3.33.3 The Contractor shall use positive means to demonstrate to the COTR that any building utilities that were temporarily disabled are now in full service. Notify the COTR when disabled building ventilation, systems, electrical power, smoke detectors, building access/egress passages may safely be re-started or used.

**** END OF SECTION 028200 ****

GENERIC SPEC

SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “All-Glass Entrances”.
2. Division 08 Section “Door Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service

representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 08 41 26 – All Glass Entrances.
2. Section 08 71 00 – Door Hardware.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. GS - ASSA ABLOY Glass Solutions
3. RO - Rockwood
4. YA - Yale
5. SA - SARGENT
6. MC - Medeco
7. HS - HES
8. RF - Rixson
9. NO - Norton
10. PE - Pemko

Hardware Sets

Set: 1.0
Doors: ST-4A

1 Door Cord	TSB-C	US15	SU	087100	⚡
1 Electrified Exit Device (Fail-Safe)	6100FED B MO690F	630	YA	087100	⚡
1 Rim Cylinder	1109	626	YA	087100	
1 ElectroLynx Harness	QC-C x LENGTH REQ'D		MK	087100	⚡
1 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 Card Reader	BY SECURITY CONTRACTOR				
1 Door Contact	BY SECURITY CONTRACTOR				
1 Wiring Diagrams	ELEVATION & POINT-TO-POINT				

Set: 2.0
Doors: 4001

1 Door Bottom Rail	DRT-4AC-B	US32D	GS	084126	
1 Door Top Rail	DRT-4AC-T	US32D	GS	084126	
1 Header	HD Series	US32D	GS	084126	
1 Bottom Pivot	PV-ENDLOAD	AL	GS	084126	
1 Exit Device	PDU8000-3 x CODE 04	US32D	GS	084126	
1 Mortise Cylinder	100200J	19	MC	087100	
1 Electric Strike	ESK-SGL-24D	US32D	GS	084126	⚡
1 Concealed Closer	OHC-304-90NHO		GS	084126	
1 Card Reader	BY SECURITY CONTRACTOR				
1 Motion Sensor/REX	BY SECURITY CONTRACTOR			087100	⚡
1 Door Contact	BY SECURITY CONTRACTOR				
1 Wiring Diagrams	ELEVATION & POINT-TO-POINT				

Operational Description: Door is normally closed and locked. Presenting a valid card to the card reader will momentarily release keeper of electric strike, allowing entry. Entry also by key in cylinder. Egress at all times by pressing rail of exit device and exiting. Entering read range of REX will momentarily shunt monitor in strike for authorized egress. Door contacts monitor the position of the doors and report this status to the security system.

Set: 3.0
Doors: 4014A

4 Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK	087100
1 Storeroom Lock	MO 5405LN	619	YA	087100
1 Closer	R9500	689	NO	087100
1 Gasketing	S88BL		PE	087100

Set: 4.0
Doors: 4018AE

4 Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK	087100
1 Storeroom Lock	MO 5405LN	619	YA	087100
1 Kick Plate	K1050 – 8" x 2" LDW BEV CSK	US32D	RO	087100

Set: 5.0
Doors: 4014B

8 Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK	087100
1 Flush Bolt Set	2945	US26D	RO	087100
1 Dust Proof Strike	570	US15	RO	087100
1 Storeroom Lock	MO 5405LN	619	YA	087100
1 Coordinator	2600 SERIES	US28	RO	087100
2 Mounting Bracket	2601AB/C	US28	RO	087100
2 Closer	R9500	689	NO	087100
2 Kick Plate	K1050 - 8" x 1" LDW BEV CSK	US32D	RO	087100
2 Wall Stop	RM860	US32D	RO	087100

1 Gasketing	S88BL		PE	087100
1 Mtg Edge Gasketing	S772BL		PE	087100

Set: 6.0
Doors: 4002, 4040A, 4040B

4 Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK	087100
1 Passage Set	MO 5401LN	619	YA	087100
1 Closer	R9500	689	NO	087100
1 Overhead Stop	1-SERIES	619	RF	087100

Set: 7.0
Doors: 4000B, 4060, 4062, 4064

4 Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK	087100
1 Passage Set	MO 5401LN	619	YA	087100
1 Wall Stop	RM860	US32D	RO	087100

Set: 8.0
Doors: 4016

1 Passage Set	MO 5401LN	619	YA	087100

NOTE: DOOR, FRAME AND BALANCE OF EXISTING HARDWARE TO REMAIN

Set: 9.0
Doors: 4031, 4033

4 Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK	087100
1 Office Lock	MO 5407LN	619	YA	087100
1 Wall Stop	RM860	US32D	RO	087100
1 Gasketing	S773BL		PE	087100
1 Coat Hook	RM802	US32D	RO	087100

Set: 10.0
Doors: 4003, 4004, 4005, 4006, 4007, 4008, 4009, 4011, 4013, 4015, 4017, 4037, 4039, 4041, 4043, 4044, 4045, 4046, 4047, 4048, 4050, 4057, 4059, 4061, 4063, 4065, 4067, 4069, 4071

1 Office Lock	MO 5407LN	619	YA	087100
1 Wall Stop	RM860	US32D	RO	087100
1 Coat Hook	RM802	US32D	RO	087100

NOTE: DOOR, FRAME AND BALANCE OF EXISTING HARDWARE (HINGES) TO REMAIN

Set: 11.0

Not Used

Set: 12.0
Doors: 4001A

3	Hinge	TA2714 4-1/2" x 4-1/2"	US15	MK 087100	
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US15	MK 087100	⚡
1	Electrified Lock (FSEC)	LC RX 8271-24V LNB	US15	SA 087100	⚡
1	Mortise Cylinder	2153	19	YA 087100	
1	Closer	PR9500	689	NO 087100	
1	Kick Plate	K1050 - 8" x 2" LDW BEV CSK	US32D	RO 087100	
1	Wall Stop	RM860	US32D	RO 087100	
1	Gasketing	S88BL		PE 087100	
1	ElectroLynx Harness	QC-C x LENGTH REQ'D		MK 087100	⚡
1	ElectroLynx Harness	QC-C1500P		MK 087100	⚡
1	Card Reader	BY SECURITY CONTRACTOR			
1	Door Contact	BY SECURITY CONTRACTOR			
1	Wiring Diagrams	ELEVATION & POINT-TO-POINT			

Operational Description: Door is normally closed and locked. Presenting a valid card to the card reader will momentarily unlock outside lever allowing entry. Entry also by key in cylinder. Egress at all times by operating inside lever and exiting. Operating inside lever will shunt door contacts for authorized egress. Door contact monitors the position of the door and reports this status to the security system.

Set: 13.0
Doors: 4016AE

1	Bifold Track	HF4/100A		PE 087100	
2	Wire Pull	856	US32D	RO 087100	

END OF SECTION 080671

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" .
4. Division 08 Section "Door Hardware".

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for te
CG RENOVATE 4E NMAL OFFICE SUITE 3000738.00
WASHINGTON, DC
2. Temperature-Rise openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by

referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company (CU) - CM Series.
    b. Curries Company (CU) - M Series.

C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated

or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
2. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
5. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
6. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".

    a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
    b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
    c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
    d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
10. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 084126 - ALL-GLASS ENTRANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Refer to Division 01 Section "Project Requirements".

1.3 SUBMITTALS

A. Product Data: For each type of all-glass entrance component specified. Details of construction relative to materials, dimensions of individual components, profiles, and finishes, including:

1. Glass panels.
2. Rail and Patch fittings.
3. Closer and pivots.
4. Door hardware and accessories.

B. Shop Drawings: Show details of fabrication and installation, including the following:

1. Plans, elevations, and sections.
2. Details of fittings.
3. Hardware quantities, locations, and installation requirements.
4. Anchorages and reinforcement.
5. Glazing details.
6. Door hardware locations, mounting heights, and installation requirements.

C. Samples for Verification: For each type of exposed finish indicated, prepared on Samples of size indicated below as required by Architect.

1. Metal Finishes: 6-inch (150-mm) long sections of rail fittings.
2. Glass: 12-inch (300 mm) square, showing exposed-edge finish and tint.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, sidelites, transoms, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify opening dimensions of all-glass entrances by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of all-glass entrances that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
3. Failure of operating components to function normally.

C. General Warranty Period: Two years from date of Substantial Completion.

1. Concealed Floor Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design all-glass entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of all-glass entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings
3. Deflection Limits: In accordance with GANA “Fully Tempered Heavy Glass Door and Entrance Systems Design Guide.”

D. Seismic Performance: All-glass entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. Coordinate requirements with structural engineer.

E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. Accessibility Standards: Comply with applicable provisions in Accessibility Guidelines for Buildings and Facilities ICC (ANSI) A117.1 and requirements of authorities having jurisdiction.

2.2 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide the named product, or the comparable product by one of the alternate specified manufacturers. Comparable products are subject to review and approval through the submittal process specified.

B. Manufacturers (All Glass Doors): Subject to compliance with requirements, provide products by one of the following:

1. ASSA ABLOY Glass Solutions (All Glass Door components).

2.3 ENTRANCE DOOR MATERIALS

A. Type II: Laminated Safety Glass:

1. Color: Clear.
2. Thickness: 9/16 inch (15 mm)
3. Interlayer: SGP (SentryGlas Plus).
4. Exposed Edges: Flat polished.
5. Butt Edges: Flat polished.
6. Corner Edges: Mitered.

2.4 ENTRANCE DOOR COMPONENTS

A. Rails: Manufacturer's standard continuous horizontal fittings and as follows:

1. Rail Locations: As follows:

a. Door tops and bottoms.

2. Top Rail Height: 4 inch tapered (102 mm).
3. Top Rail Profile: Tapered no less than 60 degrees from horizontal.
4. Bottom Rail Height: 4 inch tapered (102 mm).
5. Bottom Rail Profile: Tapered no less than 60 degrees from horizontal.
6. One piece dry glazed compression system that accommodates 3/8” to 9/16” thick glass.
7. End Caps: One-piece solid stainless steel, beveled.
8. Material: Satin stainless-steel-cladding.
9. Basis of Design: ASSA ABLOY Glass Solutions #DRT/DRS x Height.

2.5 ENTRANCE DOOR HARDWARE

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch fittings and rail fittings.

B. Refer to section 080671 “Door Hardware Schedule” for specific hardware sets.

C. Pivots: ANSI/BHMA A156.4, Grade 1.

1. Center and Offset Hung Top Pivots:

a. Walking beam type (overhead).
b. Surface mounted offset type (top rails).

2. Bottom Pivots:

a. End load type (bottom rails).
b. Adjustable bottom types compatible with bottom patches.

3. Manufacturers:

a. ASSA ABLOY Glass Solutions (GS) - PV and PF Series.

D. Cylinders and Keying: Refer to Section 087100 Door Hardware.

E. Mortised Exit Device Electric Strikes: Exit device electric strikes to be mortise mounted type conforming to ANSI A156.31, Grade 1, and UL1034 listed. Strikes available as 12 or 24 VDC supplied standard as fail-secure unless otherwise specified.

1. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2. Manufacturers:

a. ASSA ABLOY Glass Solutions (GS) – ESK Series.
b. No Substitution.

F. Panic Devices: Certified panic devices conforming to ANSI/BHMA A156.3, Grade 1 Certified complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Device to be ADA compliant requiring less than 5 lbs. of force to activate and meet California Building Code (2013) Sec 11B.309.4.Post mounting with optional mechanical dogging. Provide proper fasteners as required by manufacturer to meet application requirements. Provide exit devices on both leaves of pairs of doors.

1. Style: Exposed vertical rod. 1-1/4” grip diameter with interior operating panic handle in combination with exterior fixed pull handle. Panic mechanism shall be concealed within brass or stainless steel tubing. Optional entrance from exterior by a keyed cylinder.
2. Configurations (provide as specified):

a. Full Height L-Shape Pull.

b. Half Height L-Shape Pull.
c. Full Height Straight Pull.
d. Half Height Straight Pull.
e. Half Height Centered Straight Pull.
f. Horizontal Straight Pull.
g. Exit Only (No Exterior Pull).

3. Push/pull operation when dogged from the inside.
4. Latching: Top latching. Reversed, flat, Pullman style. Roller-type latching not acceptable.
5. Options for engraved "PUSH" signage infill and boundary grooves.

6. Manufacturers:

a. ASSA ABLOY Glass Solutions (GS) - PDU8000 Series.
b. No Substitution.

G. Overhead Concealed Closers (Heavy Duty): Center hung, BHMA A156.4, Grade 2 units including arms, pivots, cover plates, mounting clips, and accessories required for complete installation. Provide separate closing and latching valves for closing speed, latch speed, backcheck, and optional hold open.

1. Compact cast iron closers capable of being fully concealed in the frame head for center hung applications.
2. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, interior or exterior application, and exposure to weather, and anticipated frequency of use.
3. Closer Accessories: Provide door closer accessories including custom spindles and templates as required for proper installation.
4. Double acting, non-handed with spring power size 4.

5. Manufacturers:

a. ASSA ABLOY Glass Solutions (GS) - OHC 304 Series.
b. No Substitution.

2.6 FABRICATION

A. General: Fabricate all-glass entrance components in sizes, profiles, and configurations indicated on Drawings.

B. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

C. Factory assemble components and factory install hardware and fittings to greatest extent possible.

2.7 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

2.8 STAINLESS-STEEL FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Mirror-like Reflective, Non-directional Polish: No. 8 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clear.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DOOR INSTALLATION

A. General: Comply with all-glass entrance manufacturer's written installation instructions and approved shop drawings.

B. Install all-glass door assemblies after other finishing operations have been completed. Coordinate installation of recesses housings with installation of adjacent finishes.

C. Set units level, plumb, and true to line, with uniform joints.

D. Maintain uniform clearances between adjacent components.

E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

F. Install butt-joint sealants according to manufacturer's instructions to produce weathertight installation.

3.3 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure all-glass entrances are without damage or deterioration at the time of Substantial Completion.

3.5 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Refer to Section 080671, Door Hardware Schedule, for hardware sets.

END OF SECTION 084126

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “All-Glass Entrances”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Twenty five years for manual overhead door closer bodies.
4. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. Bommer Industries (BO).
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
c. Stanley Hardware (ST).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
b. No Substitution.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.
b. No Substitution.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
b. No Substitution.

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
   1. Manufacturers:

      a. Match Existing Medeco, Field Verify.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

   1. Threaded mortise cylinders with rings and cams to suit hardware application.
   2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
   4. Tubular deadlocks and other auxiliary locks.
   5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
   6. Keyway: Manufacturer’s Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

   1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

   1. Change Keys per Cylinder: Two (2)

E. Key Registration List (Bitting List):

   1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
   2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

   1. Manufacturers:

      a. Sargent Manufacturing (SA) - 8200 Series.
      b. No Substitution.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.

1. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).

2. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

3. Locks are to be non-handed and fully field reversible.

4. Manufacturers:

a. Yale Commercial(YA) 5400LN Series.
b. No Substitution.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes tested to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1006 Series.
b. No Substitution.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Manufacturers:

a. LCN Closers (LC) - 4040XP Series.
b. Norton Door Controls (NO) - 9500 Series.

C. Door Closers, Overhead Concealed (Narrow Profile): ANSI/BHMA 156.4 Grade 1 Certified Products Directory (CPD) listed door closers designed for narrow profile frames and doors. Closers to have fully concealed body in the frame head for offset hung applications, with separate and independent valves for closing speed and backcheck adjustments and a decorative cover plate.

1. Manufacturers:

    a. LCN Closers (LC) - 2030 Series.
    b. Rixson Door Controls (RF) - 91DCP Series.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

2.11 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Rixson Door Controls (RF).

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
2. Reese Enterprises, Inc. (RE).
3. Zero (ZE).

2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.15 EXISTING HARDWARE PREPS

A. The general contractor shall verify that all new hardware specified for existing doors and frames will be compatible with the existing hardware preparations. Lack of verification prior to bid, that requires additional work to the existing doors and frames or additional material, will be the responsibility of the general contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
2. Submit documentation of incomplete items in the following formats:

a. PDF electronic file.

b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

Additional Sprinkler Information

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The following sections apply to the work of this section:

1. Division 1 : General and Special Conditions

2. Division 1 : Submittals

3. Division 28 : Addressable Fire Alarm System

1.2 SUMMARY

A. Scope: Provide a complete, code compliant modifications to the existing sprinkler system to accommodate the new renovation at Capital Gallery, including wet pipe sprinkler system modifications and associated equipment, ready for operation.

B. The work includes designing and installing automatic wet-pipe fire extinguishing sprinkler systems for Light Hazard including uniform distribution of water by hydraulic design to afford complete fire protection coverage throughout the contract area.

C. Existing Sprinkler Equipment: Existing sprinkler equipment shall be maintained fully operational until the new equipment has been tested and accepted by the COTR and OSHEM fire protection engineer. After acceptance of the new equipment, all existing equipment so indicated shall be removed.

D. Authority Having Jurisdiction: Any reference in the specifications or applicable codes to the "authority having jurisdiction" shall be interpreted to mean the OSHEM Fire Protection Engineer.

E. Comply with NFPA 13, all contract documents, and the Smithsonian Fire Protection and Life Safety Design Manual.

1.3 DEFINITIONS

A. COTR: Contracting Officer Technical Representative

B. FM: FM Global (Factory Mutual)

C. FPE: Fire Protection Engineer

D. Furnish: To supply the stated equipment or materials

E. Install: To set in position and connect or adjust for use

F. NFPA: National Fire Protection Association

G. NICET: National Institute for Certification in Engineering Technologies

H. OSHEM: Office of Safety Health and Environmental Management

I. Provide: To furnish and install the stated equipment or materials

J. UL: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION:

A. The design shall conform to NFPA 13 and the requirements specified herein. Design of the automatic wet pipe sprinkler system shall be for Light Hazard as shown on the drawings and by hydraulic calculations. The design, equipment, materials, installation, workmanship, examination, inspection and testing shall be in strict accordance with NFPA 13, except as modified herein.

B. The system shall include all materials, accessories, and equipment to provide a system complete and ready for use.

C. Design and provide each system giving full consideration to obstructions, blind spaces, piping, electrical equipment, duct work and other construction and equipment in accordance with detailed drawings to be submitted for approval.

D. Equipment for fire protection service shall be UL listed or FM approved for use in wet pipe sprinkler systems.

E. In the NFPA publications referred to herein, the advisory provisions shall be considered mandatory, as though the word "shall" had been substituted for "should," wherever it appears.

1.5 PERFORMANCE REQUIREMENTS

A. Water Distribution: Distribution shall be uniform throughout the area which it is assumed the sprinkler heads will open. Variation in discharge from individual heads in the hydraulically most remote area shall be between 100 and 120 percent of the specified density.

B. Piping Restrictions: Piping is prohibited in the following areas, except when solely supplying sprinklers in such areas:

1. Transformer, switchgear, electrical or similar rooms

2. Elevator machine rooms and elevator shafts

3. Collections storage rooms

C. Clearance From Electrical Equipment: Piping and automatic sprinklers are prohibited directly over:

1. Transformers

2. Substations

3. Switchboards

4. Motor control centers

5. Emergency generators

6. Bus ducts

7. Electrical panels

D. If installing pipe over electrical equipment is unavoidable, provide drip pans under piping to protect electrical equipment.

E. Sprinkler systems shall be designed for earthquake protection in accordance with the requirements and recommendations of NFPA 13.

F. Location of Sprinkler Heads: Heads in relation to the ceiling and the spacing of sprinkler heads shall not exceed their listed area of coverage for Light Hazard . Uniformly space sprinklers on the branch piping. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply air diffusers.

G. Sprinkler Discharge Area: The sprinkler discharge area shall be the hydraulically most remote areas as defined in NFPA 13. Remote area reductions permitted per NFPA 13 shall not apply.

H. Hose Allowances: System design shall include an allowance of 100 gpm (6.31 l/s) for inside hose stream, and 250 gpm (15.77 l/s) for total combined inside and outside hose streams.

I. Hydraulic Calculations: Hydraulic calculations shall be in conformance with NFPA 13 and the following requirements:

1. Water Supply: Base hydraulic calculations the current year's NMAH annual fire pump test. Contractor shall provide a copy of the most recent fire pump test with the hydraulic calculations. The fire pump test may be no more than 10 months old when used for hydraulic calculations.

2. Margin of Safety: The sprinkler system shall be hydraulically designed so that the total waterflow and pressure demand is at least 20% less than the available water flow and pressure at the site, based on the fire pump discharge pressure.

3. Friction Losses: Calculate losses in piping in accordance with the Hazen-Williams formula with "C" value of 100 for unlined ductile iron piping, 120 for steel piping, 140 for cement-lined ductile-iron piping, 150 for copper tubing and plastic piping.

4. Flow Velocity: Piping shall be sized so that the water flow velocity does not exceed 20 ft/sec (6.1 m/s) at any point in the system during maximum water flow (including inside hose demand). Flow velocity in each pipe segment is to be provided in the calculations.

5. Test Point: Calculations shall be brought back to the fire pump discharge test point.

6. Area of Coverage and Density: The area of coverage and density for each sprinkler shall be provided in the calculations.

7. Equivalent Lengths: The equivalent lengths for all types of fittings and valves used shall be provided.

8. Supply and Demand Graph(s): A graph comparing the water supply and the sprinkler and hose stream demand for each remote area shall be provided. Pressure and flow values for the supply and demand curves are to be provided on $N^{1.85}$ graph paper.

1.6 SUBMITTALS

A. Partial submittals will not be acceptable. Any installation work performed prior to the approval of the submittal shall be at the Contractor’s own risk.

B. Before any work is commenced, submit manufacturer's data (with listing or approval), system calculations, water supply data, and complete sets of working drawings.

C. The OSHEM Fire Protection Engineer shall review and approve submittals.

D. Manufacturers' Data: Annotate descriptive data to show the specific model, type and size of each item the Contractor proposes to furnish. Include data for proper installation of each system including:

1. Pipe and fittings
2. Sprinkler heads
3. Pressure and waterflow switches
4. Pipe Hangers and Supports
5. Tamper switches
6. Inspector's test station
7. Lubricating compound/PTFE tape.
8. Signs
9. Caps, chains
10. Drip pans

E. Shop Drawings: Prepare working drawings on sheets not smaller than 24 in by 36 in (610 mm by 914 mm), in accordance with the requirements for "Working Plans" as specified in NFPA 13. A scaled site plan, with the location and elevation of the water flow test, shall be provided on the drawings. Drawings are to also include isometric diagram of sprinkler risers and feed mains, including all control valves.

F. As-Built (Record) Working Drawings: On a weekly basis, the Contractor Superintendent, in conjunction with the COTR, shall review and record as-built conditions on a set of drawings maintained at the job site. After completion, but before final acceptance of the work, furnish a complete set of as-built drawings for review and approval by OSHEM. Make all necessary corrections to the drawings and furnish four sets of as-built drawings for record purposes. All deviations from the approved shop drawings shall be highlighted on the as-built drawings; if required by OSHEM the Contractor shall also provide hydraulic calculations justifying deviations. The drawings shall not be smaller than 24 in by 36 in (610 mm by 914 mm) on reproducible sepia with title block similar to full size contract documents. Provide 1 compact disc containing CAD based drawings in DXF and PDF based format of all as-built drawings and schematics.

G. Operation and Maintenance Manuals: Furnish four (4) instruction manuals containing complete operation and maintenance instructions for the specific make and model of all check valves, detector check valves, alarm valves, waterflow and tamper switches, backflow preventers, and other trim furnished, including 21 1316 valves and assemblies.

Serial numbers and ordering information shall be provided. Place one copy of each instruction manual in a flexible, oil-resistant protective binder and mount in an accessible location.

1.7 QUALITY ASSURANCE

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. All publications listed below refer to the most current edition.

B. Manufacturers Qualifications

1. American Society for Testing and Materials (ASTM) Publications:

a. A53 Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless

b. A135 Welded and Seamless Steel Pipe

2. Factory Mutual System (FM) Publications

a. Approval Guide

3. National Fire Protection Association (NFPA) Publications

a. 13 Standard for the Installation of Sprinkler Systems

c. 70 National Electrical Code

d. 72 National Fire Alarm and Signaling Code

e. 101 Life Safety Code

f. 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants

g. 1963 Standard for Fire Hose Connections

4. International Code Council (ICC)

a. International Building Code

5. Underwriters Laboratories, Inc. (UL) Publications:

a. Fire Protection Equipment Directory

b. 262 Gate Valves for Fire Protection Service

c. 789 Indicator Posts for Fire Protection Service

6. American Society of Mechanical Engineers (ASME)

a. A17.1 Safety Code for Elevators and Escalators

C. Qualifications Of Installer:

1. Design (including hydraulic calculations) shall be by a NICET Level III or IV Technician (in automatic sprinkler system design) or a Professional Engineer (P.E.), licensed in Fire Protection Engineering. Qualifications of the designer must be submitted to OSHEM for approval. The designer's NICET or P.E. stamp shall be present on each sheet of the working drawings.

2. Prior to installation, submit data for approval by OSHEM, showing that the Contractor has successfully installed automatic wet pipe fire extinguishing sprinkler systems of at least 200 sprinkler heads each, or there is a firm contractual agreement with a subcontractor having such required experience. These systems shall be the same type which have been retrofitted into existing museums and historical buildings as specified herein. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months.

D. Service Organization: The Contractor shall furnish, to the COTR, evidence that there is an experienced and effective service organization which carries a stock of repair parts for the system in order to readily conduct repairs throughout the warranty period. Should the Contractor fail to comply with the service requirements of this section, the Government will then have the option to make the necessary repairs and back charge the Contractor without any loss of warranty or guarantee as provided by the contract documents.

1.8 DELIVERY STORAGE AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, above ground, kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

C. Automatic sprinklers must be kept in original packaging until they are installed. Loose carrying or storage is not permitted. Loose sprinklers shall be discarded immediately and replaced at Contractor's expense.

1.9 COORDINATION

A. Coordinate sprinkler head layout with reflected ceiling plan and all ceiling mounted equipment, including diffusers, lights, security cameras, fire alarm devices, exit signs, and other devices, existing and new.

B. Coordinate major equipment and piping layouts with other trades to avoid obstructions and excessive changes in direction for piping.

1.10 WARRANTY

A. The Contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the date of final acceptance of this work by the Government.

B. Final acceptance includes, but is not limited to, the receipt and OSHEM approval of, as-built drawings and operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All products are subject to the following listed acceptable manufacturers. If the product is not addressed herein the product shall be from a US based manufacturer and listed for fire protection use.

B. All products shall be UL Listed/FM approved.

C. Fire Protection Valves and Drain Assemblies

1. Tyco Fire & Building Products
2. Victaulic
3. Stockham
4. Kennedy
5. Jenkins
6. Reliable Automatic Sprinkler Co.
7. Viking Corporation

E. Sprinklers

1. Tyco Fire & Building Products
2. Reliable Automatic Sprinkler Co.
3. Viking Corporation
4. Victaulic Corporation

F. Valve Supervisory Switches

1. Potter Electric Signal
2. System Sensor
3. McWane, In. Kennedy Valve Div.

2.2 ABOVEGROUND PIPING SYSTEMS

A. Provide fittings for changes in direction of piping and for all connections. Arrange piping so that it can be drained at the main riser. Make changes in piping sizes through standard tapered, reducing pipe fittings; the use of bushings is not permitted. Perform welding in the shop; field welding is not permitted.

B. Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape only, applied on the male threads**.**

C. Use of pipe dope is not permitted.

D. Use of mechanical branch outlet type fittings is not permitted.

E. Lubricant used on gaskets for mechanical fittings must be non-petroleum based and approved by OSHEM.

F. Run piping concealed in areas with suspended ceilings, except as noted on the drawings.

G. Sprinkler Pipe and Fittings: Provide in accordance with NFPA 13, except as modified herein. Steel piping shall be Schedule 40 per ASTM A53 for sizes less than 4 inches (101.6 mm) and Schedule 10 or 40 per ASTM A53 for sizes 4 inches (101.6 mm) and larger. ASTM A135, Schedule 40 piping may be used for pipe sizes less than 2 ½ inches (63.5 mm).

1. Standard Installation:

a. Nominal pipe sizes 4 inches (DN 40) or larger: Schedule 10 or 40 Pipe meeting ASTM A-53, A- 135 or A-795 with factory- or field-formed, roll-grooved for Schedule 10 or 40 ends, or cut-grooved for Schedule 40 ends.

b. Nominal pipe sizes smaller than 4-inches (DN 40): Schedule 40 Pipe meeting ASTM A-53, A-135, and A-795 with factory- or field-formed threaded ends.

c. For connections between 4 inch (DN 40) and larger pipes on risers, feed mains, cross-mains and drain lines, the requirements are as follows: .

1) Grooved pipe couplings and fittings for grooved pipe.

2) Outlet coupling with screwed connection for grooved pipe.

d. For connections from risers, feed mains, cross-mains, or drains to branch lines, the requirements are as follows:

1) Welded outlet with screwed connection or threaded coupling or fittings.

e. For connections to and between branch line pipes less than 4 inches the requirement is as follows:

1) Threaded pipe couplings and fittings only.

f. For connections between drain pipes requirement is as follows:

1) Galvanized threaded or cut-grooved pipe couplings and fittings.

2. Pressure ratings: All fittings and gaskets shall meet or exceed maximum working pressures present within the system.

3. Corrosion protection: All piping and hangers where exposed to the weather or installed in a corrosive atmosphere shall be protected against corrosion.

4. Pipe and Hanger Supports: Provide pipe supports, hangers, and clamps conforming to NFPA 13 and listed by UL or approved by FM. Provide galvanized supports, hangers, and clamps for all galvanized piping.

5. Joint Construction

a. Procedures for welding outlets shall be in strict conformance with the welding requirements of NFPA 13, including submission of welding certifications. Welding shall not be performed on-site.

b. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe with wall thickness less than Schedule 40.

c. Grooved Joints and Fittings: Assemble joints and fittings with listed coupling and gasket, lubricant, and bolts from the same manufacturer. Fittings and attached couplings shall be from the same manufacturer.

d. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

e. If the galvanized coating on piping is found to be chipped or cracked upon grooving of joint, two coats of liquid galvanizing material shall be applied to groove. The first coat shall be thoroughly dry prior to applying the second coat.

f. Use of plain end fittings with mechanical couplings, hole-cut mechanical threaded outlet fittings, hole-cut mechanical grooved outlet fittings, and hole-cut saddle clamp outlet fittings are not permitted.

H. Use of restriction orifices, reducing flanges, unions, and plain-end fittings is not permitted.

I. Flanged fittings shall be used in lieu of unions with the exception of drain lines.

J. The corrosion resistance ratio of pipe and fitting method shall not be less than 0.95.

K. Pipe Hangers and Supports: Provide in accordance with NFPA 13, including hanger requirements for pressures in excess of 100 psi (690 kPa).

L. Identification Signs: Attach properly lettered approved metal or polycarbonate signs conforming to NFPA 13 to each valve and alarm device. Polycarbonate signs shall be red with engraved white letters. Signs at valves shall describe the sprinkler zone it controls and state that the valve is to remain open. Permanently affix design data nameplate to the riser of each system.

M. Inspector's Test Connection: Provide test connections no higher than 6 ft (1.83 m) above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the control valve/drain assembly. Provide combination drain valve and test connection. Discharge shall be readily visible from the inspector's test connection, either by direct observation of the discharge or through a sight glass. Discharge shall be piped to either an open building drain or to the outside. Drainage and test valves shall be bronze globe, angle, or gate valves.

N. Drains: Provide drain piping to discharge at safe points outside the building or to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. All drain piping and fittings are to be galvanized. Provide auxiliary drains as required by NFPA 13. Splash guards are to be provided where necessary at discharge outlets.

O. Pipe Sleeves and Seals. Provide where conduit or piping passes through walls, floors, roofs and partitions. Provide clearance between exterior of piping and interior of sleeve in accordance with NFPA 13. See Section 078413 Penetration Firestopping, for sleeves and seals through fire-rated assemblies. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through the entire thickness of walls, floors, roofs, and partitions. Sleeves in Masonry and Concrete Walls,

Floors, and Roofs: Provide ASTM A53, Schedule 40, zinc-coated steel pipe sleeves. Sleeves in floors shall project 4 inches (101.6 mm) above finished floors to prevent seepage. Sleeves in Partitions and Other than Masonry and Concrete Walls, Floors and Roofs: Sleeves shall be constructed from either zinc-coated schedule 40 steel pipe or zinc-coated 26 gauge steel sheet.

P. Escutcheon Plates: Provide one piece or split-hinge-type metal plates for piping passing through floors, walls, and ceilings in exposed and concealed areas. Provide chromium-plated or color- coordinated metal plates where pipe passes through finished ceilings. Securely anchor plates in proper position. Provide sprinkler escutcheon plates to match sprinkler head finish.

2.3 SPRINKLER HEADS

A. Provide quick response sprinklers throughout the renovation area where their use is listed or approved. Heads located within the air streams of unit heaters or other heat-emitting equipment or skylights shall be selected for proper temperature rating.

B. Heads shall have a nominal ½ inch (12.7 mm) orifice, 5.6 k-factor for quick response sprinklers. Corrosion-resistant sprinkler heads shall be installed where they are exposed to the weather, moisture or corrosive vapors. Heads installed where they might receive mechanical injury or are less than 7 feet (2.13 m) above the floor level, shall be protected with approved guards in accordance with NFPA 13. Provide finish as indicated.

2.4 VALVES:

A. Provide valves as required by NFPA 13. Valves shall be UL listed and FM approved for fire protection service.

B. Gate Valves: Gate valves shall be the outside stem & yoke (OS&Y) type, and open by counterclockwise rotation. Gate valves installed higher than 7 feet (2.13 m) above the floor shall be provided with a chain drive or permanently mounted ladder. Provide a gate valve beneath each alarm valve in each riser when more than one alarm valve is supplied from the same water supply pipe. For post indicator valves, provide operating nut located about 3 feet above finish grade. Gate valves for use with indicator posts shall conform to UL 262. Indicator posts shall conform to UL 789. Provide each indicator post with one coat of primer and two coats of red enamel paint.

C. Check Valves: Check valves shall be clear-opening, swing-check type, with a bronze or stainless steel seat ring and an EPDM rubber clapper facing. Flanged check valves of sizes 4 inch (101.6 mm) and larger shall have flanged inspection and access cover plates.

D. Butterfly Valves: Butterfly valves are permitted only for pipe sizes of 4 inches (100 mm) and smaller.

2.5 ALARMS

A. Paddle-Type Water Flow Switches: Provide paddle-type water flow switches as indicated on the drawings. Switches shall have sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head. Water flow switch mechanisms shall incorporate an instantly recycling, pneumatic, adjustable retard element and shall be set with a 20-second delay. Assembly shall be rated at 175 psi (1206.6 kPa) cold water pressure. Switches shall be compatible with the fire alarm system and shall be connected per Section 28 3111.

B. Valve Supervisory Switch: Valve supervisory switches shall be installed on all sprinkler control valves. The switches shall be mounted so as not to interfere with the normal operation of the valve and shall be adjusted to operate within two revolutions of the valve control or when the stem has moved no more than 1/5 of the distance from its normal open position. The mechanism shall be contained in a weather-proof, die-cast, aluminum housing that shall be provided with a ½ inch (12.7 mm) tapped conduit and incorporate the necessary facilities for attachment to the valve. Switch housing shall be finished in red baked enamel. The entire installed assembly shall be tamper- proof and arranged to cause a switch operation if the housing cover is removed or if the unit is removed from its mounting. Devices shall be compatible with and connected to the fire alarm system per Section 28 3111.

2.6 CABINET

A. Furnish and install a metal cabinet containing a stock of spare sprinkler heads of all types and ratings installed. The cabinet shall be located in Fire Pump Mechanical Room and where the temperature will not exceed 100ºF (37.8ºC). The number of spare sprinkler heads shall be as required by NFPA 13.

B. Provide a sprinkler head wrench in the cabinet for each type of sprinkler installed on the system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment, materials, installation, workmanship, examination, inspection and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Install piping as close to the ceiling as possible, without interfering with other equipment and construction. Nipples shall be perpendicular to ceilings.

B. Accurately align sprinkler heads in suspended ceilings symmetrically with diffusers, lights, and ceiling tiles. Install sprinkler heads in the center of the ceiling tiles unless directed otherwise. Concealed head covers shall not be installed until ceiling construction is complete and an inspection to determine height compliance has been conducted by OSHEM.

C. Keep the interior and ends of all piping affected by Contractor's operations thoroughly clean of water and foreign matter by means of plugs or other approved methods. Inspect piping before placing into position. All pipe, fittings, and gaskets are to be cleaned of oil prior to installation.

3.2 FIELD CHANGES

A. Do not make field changes in the piping layout, pipe sizes, or type of equipment, without the prior approval of the COTR.

3.3 CONNECTIONS TO EXISTING SYSTEM

A. A schedule of any interruption of service shall be provided to the COTR and approval received before any service is interrupted. In no case shall the existing standpipe/sprinkler systems be shut off during periods other than normal Contractor construction hours.

3.4 FIELD PAINTING

A. Painting shall be per Section 099000, Painting, except as modified herein. The above-ground steel piping systems including valves, piping, pipe sleeves and hangers shall be cleaned, pre-treated, primed and painted. Coatings shall be applied only to clean, dry surfaces using clean brushes. Surfaces shall be cleaned to remove all dust, dirt, rust and loose mill scale.

B. Immediately after cleaning, provide the metal surfaces with one coat of primer, applied to a minimum dry film thickness of 1.0 to 1.5 mil. Due care shall be exercised to avoid the painting of sprinkler heads or protective devices or allowing paint to drip or splatter on any equipment, artifacts, building structures, and floors. Materials which are used to protect sprinkler heads while painting is in progress shall be removed upon completion of painting.

C. The Contractor shall remove all sprinkler heads which are painted and provide new, clean sprinkler heads of the proper type at his own expense. In addition to the primer, surfaces shall receive the following:

1. Above-Ground Piping Systems in Unfinished Areas (all areas with exposed construction): Unfinished areas are defined as attic spaces, mechanical equipment spaces, spaces above suspended ceilings, crawl spaces, pipe chases, and spaces where walls or ceilings are not painted or not constructed of a pre-finished material. Provide 2 inch (50.8 mm) wide red enamel or self-adhering plastic bands on sprinkler piping, spaced at a maximum of 10 ft (3.05 m) intervals.

2. Above-Ground Piping Systems in Other Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except valves and operating accessories shall receive one coat of red enamel. Provide piping with 2 inch (50.8 mm) wide red enamel bands or self-adhering red plastic bands spaced at a maximum of 10 ft (3.05 m) intervals. In finished areas such as offices, the red bands may be omitted.

3. All other coatings (e.g., zinc for galvanized pipe) shall be in compliance with NFPA 13.

3.5 FIELD TESTING AND FLUSHING

A. All testing shall be scheduled with the COTR.

B. At the discretion of the OSHEM Fire Protection Engineer, an air pressure test may be required prior to filling the system with water. The test shall be conducted by raising the air pressure in the system to 40 psi (275.8 kPa) and allowing it to stand for 24 hours. There shall be no loss of air pressure greater than 1.5 psi (10.34 kPa) over the 24 hour period. Air pressure during this test shall be tracked via a graph over the 24 hour period by a pressure monitoring device or pressure monitoring gauge.

C. Hydrostatic tests shall be conducted at the greater of 200 psi (1379 kPa) or the normal system pressure plus 50 psi (345 kPa) for a 2 hour period with no leakage or reduction in gage pressure. Hydrostatic test pressures shall not be maintained on the system overnight. Flush piping with potable water in accordance with NFPA 13.

D. Preliminary Tests and Procedures: Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. Prior to the hydrostatic test, perform an air test on the system. In areas where piping will be concealed by ceilings, walls, or other construction before the system is complete and ready for final testing, the preliminary hydrostatic test shall be conducted prior to piping being concealed. This test shall be witnessed by the COTR, and the OSHEM Fire Protection Engineer. When all tests and procedures are completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for formal inspections and tests.

E. Formal Inspection and Tests: At this time, all piping, sprinklers, and other system components shall be in-place and all adjustments to the system completed. The OSHEM Fire Protection Engineer shall be notified by the COTR, shall witness all tests, and shall approve all systems before they are accepted. Submit a request for a formal inspection at least five working days prior to the date the inspection is to take place. A competent representative of the sprinkler installer shall be present during testing and inspection. As-built drawings shall be on-site for the inspection. At this inspection, the system shall be hydrostatically tested. Any or all of the required tests shall be conducted by the Contractor at his own expense and additional tests made until it has been demonstrated that the systems comply with all contract requirements. The Contractor shall furnish all appliances, equipment, instruments, connecting devices and personnel for the tests. Any costs incurred by the SI for repeat tests, due to the failure of the Contractor to adequately demonstrate that the system complies with the contract requirements, shall be borne by the Contractor.

F. CONNECTIONS TO EXISTING PIPING: During air and hydrostatic testing, the Contractor shall test new piping prior to connecting to the existing system. If the Contractor chooses to test the new piping while it is connected to existing piping or valves, the Contractor shall assume responsibility for all piping and equipment which is pressurized, as well as any damage caused by the failure of existing or new sprinkler systems. The SI accepts no responsibility for existing valves' performance to withstand hydrostatic pressure testing.

END OF SECTION

Additional Fire Alarm Information

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provision of Contract, including General and Special Conditions and Division 1 Specification Section, apply to work of this Section.

B. Related Sections:

1. Division 1 : General and Special conditions

2. Division 1: Submittals

3. Division 8: Door Release and unlocking

4. Division 21: Sprinkler System

1.2 SUMMARY

A. Scope: The contract drawings are conceptual. This work includes designing and modifying the existing addressable fire alarm system as described herein and on the contract drawings for the National Museum of the American Latino office space. The existing system is a Siemens XLS. The system shall include all wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, dual channel, alarm and supervisory signals, initiating devices, alarm notification appliances, interfaced equipment, and all other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described.

B. Existing Equipment: Existing or temporary fire alarm equipment shall be maintained operational until the new equipment has been tested and accepted by the Smithsonian Institution Authority Having Jurisdiction. As new equipment is installed, it shall be labeled "NOT IN SERVICE" until the new equipment is accepted. Once the new system is accepted by the Smithsonian, the labels on the new equipment shall be removed and the existing equipment shall be labeled "NOT IN SERVICE" until removed from the building. Just prior to demolition and construction activities (dust producing activities), dust covers shall be installed over smoke detectors and the duct detector(s) for the air handling unit serving the area on a daily/per shift basis. Duct detector sampling tubes and interior housing shall be cleaned prior to removal of detector dust cover. The dust covers are to be removed at the end of every workday/shift. An in-line filter shall be installed for each air-sampling unit to prevent dust infiltration if it is not possible to shut down the unit in

question during construction. This filter shall be maintained and replaced by the Contractor for the duration of construction. Air sampling piping shall be cleaned at the end of the construction contract.

C. Equipment Removal: After acceptance of the new system by the Smithsonian, all existing equipment not connected to the new system shall be removed and all damaged surfaces shall be restored to finishes similar to surrounding walls/ceiling/floor. Detectors shall remain covered during removal and while in storage. Operational equipment which was removed shall be carefully packaged, labeled, and turned over to the SI at the discretion of the COTR.

1. Other equipment, such as conduit and electrical boxes, shall be removed from the site and disposed of by the Contractor.

D. Repair/Service Replacement Parts: Repair services and replacement parts for the system shall be furnished under this contract after the date of final acceptance of work by the Smithsonian Institution. On-site service during the warranty period shall be provided within 24 hours after notification. All repairs shall be completed within 48 hours after notification.

1.3 RELATED SECTIONS

A. General and Special conditions

B. Division 01 Section SUBMITTALS

C. Division 21 Sections SPRINKLER SYSTEMS

1.4 DEFINITIONS

A. COTR: Contracting Officer Technical Representative

B. Designer: Person or persons responsible for the development of fire alarm or signaling system plans and specifications.

C. EoR: Engineer of Record

D. FACU: Fire Alarm Control Unit

E. Fire Alarm Contractor: Any company with the qualified experience and personnel as laid out in Section 1.9 to complete fire alarm system installation work.

F. FM: FM Global (Factory Mutual)

G. FPE: Fire Protection Engineer

H. Furnish: To supply the stated equipment or materials

I. Install: To set in position and connect or adjust for use

J. Installer: The person or persons working on the wiring, conduit, devices, and panels associated with the fire alarm system.

K. NAC: Notification Appliance Circuit

L. NFPA: National Fire Protection Association

M. NICET: National Institute for Certification in Engineering Technologies

N. OSHEM: Office of Safety Health and Environmental Management

O. Provide: To furnish and install the stated equipment or materials

P. Quality Control Personnel: The person or persons responsible inspection for and quality control activities associated with the wiring, conduit, devices, and panels of the fire alarm system.

Q. SLC: Signaling Line Circuit

R. Technician: The qualified person in charge of fire alarm system programming.

S. UL: Underwriters Laboratories

1.5 SYSTEM DESCRIPTION

A. The System shall be a complete, supervised, noncoded, addressable multiplex fire alarm system with voice/strobe evacuation, dual channel intelligent analog alarm initiation, and complying with all aspects of the applicable documents listed herein.

1.6 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72, all contract documents, and the requirements of the Smithsonian Design Standards.

B. The system shall be classified as a proprietary protective signaling system.

C. Control features:

1. Priority of Signals: Priority levels of pre-recorded automated voice messages including the Fire message, Emergency Communications messages, and test/drill messages are defined in paragraph 1.18. Alarm events are queued in the order received and do not affect existing alarm conditions. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

2. Any intelligent analog smoke detector or conventional smoke detector zone shall include a selectable alarm confirmation capability. Alarm conditions on these devices are processed through a confirmation period of 45 seconds. Over the next 300 seconds, a signal justification period is initiated where any subsequent alarms are reported immediately.

3. A subprogram shall be provided to allow environmental compensating for smoke detector sensitivity. Each smoke detector shall be programmed with this capability.

4. The system shall provide a field-test function where one person can test the complete system or a specified area at the fire alarm control unit while maintaining full operational function of other areas not under test. Alarms, troubles, device types, and the initiation device addresses shall be logged to historical memory.

5. History Logging - recirculating last 500 events, minimum. History shall be downloadable by classification for selective event reports.

D. Supervision

1. Class B signaling line circuits for each floor.

2. Class X signaling line circuits for panel-to-panel communication and audio network(s).

3. Class B notification appliance circuits.

4. Provide electrical supervision of the primary power (AC) supply, emergency power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control unit.

5. Provide electrical supervision of the circuits leading to interfacing modules for the monitoring of contact type initiation devices, the control of electrical devices, fire pump controllers, load control relays (controlling elevators and HVAC equipment), and each independent smoke detection, kitchen, and gaseous fire suppression systems.

E. Spare capacity:

1. All installed signaling line circuits and notification appliance circuits shall have 20 percent spare capacity.

2. All amplifiers shall have 20 percent spare capacity.

3. Battery size shall be a minimum of 125 percent of the calculated requirement.

F. Alarm Functions: Fire alarm system functions and operations shall be as indicated below. A fire alarm sequence of operation shall be provided in the shop drawings. Operation of an alarm initiating device shall cause the functions indicated on the matrix to occur as described below:

1. Sound General Evacuation Alarm: This function shall cause all strobe lights to activate and speakers in the building to sound a temporal three tone for three cycles followed by the voice message:

"May I have your attention please! May I have your attention please! A fire has been reported in the building. Please walk to the nearest exit and leave the building. Do not use the elevators."

2. This is repeated until the control unit is reset. After the digital message has ended, or if the digitally prerecorded message shall fail for any reason, the alarm signal shall revert to a temporal three tone, which will continue until manually silenced.

3. It shall also be possible to preempt the temporal three signal or prerecorded voice evacuation message and sound a live message from the microphone at the Fire alarm Master CPU location on a floor-by-floor basis. All floors not selected for a manual message shall continue to receive the pre-recorded message or temporal three signal. Paging selector switches shall be provided for this purpose.

4. Unlock Time Delay Hardware on Exit Doors: This function shall cause a signal to be sent to all exit doors provided with electrically operated locks to become unlocked and free for egress.

5. Shutdown Supply Fan Served: This function shall cause the air handling system supply fan on the affected system to shut down.

6. Close Smoke Damper: This function shall cause smoke dampers installed in HVAC systems to shut down.

7. Initiate Elevator Recall: This function shall cause a signal to be sent to the elevator controller recalling the elevator to the preselected floor, or if the activated initiation device is on the preselected floor, the elevator will be recalled to the preselected secondary floor. Recall shall be initiated for all elevators served by a common shaft, elevator machine room, or elevator lobby.

8. Shutdown Power to Elevator Equipment: This function shall cause a signal to be sent to a shunt trip switch in the power circuit serving the elevator to cause elevator shutdown. This shall be typical for all elevators served by a common shaft, elevator machine room or elevator lobby.

9. Activate Fire Suppression System Served: This function shall cause a signal to be sent to an interface device to operate a solenoid and activate a fire suppression system.

10. Shutdown Exhibit Hall Audio/Visual Equipment: This function shall cause a signal to be sent to a circuit shunt trip causing audio/visual equipment to shut down.

11. Illuminate LED on Device in Alarm: This function shall cause an LED, integral to a device, to illuminate, flash, or change color when in alarm condition, indicating that the device is in alarm. For contact devices, such as sprinkler valve tamper switches, the LED shall be built into the intelligent system interface module monitoring the device.

12. Activate audio/visual signals and display address on the FACU: This function shall illuminate an alarm indicating LED, sound an audible alarm, and display a device address at the FACU when the system is in an alarm condition.

13. Signal Confirmation: This function shall cause the fire alarm control unit to reset the activated device and wait for a second alarm activation. Alarm conditions are processed through a confirmation period of 45 seconds. Over the next 300 seconds, a signal justification period is initiated where any subsequent alarms are reported immediately.

G. Trouble Functions: Provide the following actions and indications at the FACU upon a single break, open condition, or ground fault on all supervised circuits which may prevent the required operation of the system:

1. Annunciate at the FACU: A yellow visual signal, audible alarm, and alphanumeric LCD display of type of trouble, and device, module, or circuit address.

2. Send a signal to the existing remote monitoring point. This message shall include the building of origin as well as all information indicated to be displayed on the FACU.

3. Send a signal to the remote panel shown on the drawings. This message shall include the building of origin as well as all information indicated to be displayed on the FACU. The message sent shall be the same message displayed on the FACU LCD display board.

H. Each independent fire detection, kitchen, and fire suppression system shall be monitored for supervisory conditions. Each monitored condition shall be provided with a separate address.

I. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual pull station

2. Heat detector

3. Smoke detector

4. Automatic sprinkler system water flow switch or pressure switch.

J. Supervisory signal initiation shall be by one or more of the following devices or actions:

1. Operation of a fire-protection system valve tamper switch.

2. Duct smoke detector associated with air handling unit or smoke damper.

3. Operation of any non-fire system as designated on the Matrix.

4. Generator running

5. Generator fault

6. Bypass Functions

7. Emergency voice notification message

8. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.

9. Abnormal position of any switch at the FACU or annunciator.

K. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Loss of primary power at the FACU or remote panel(s).

2. Ground or a single break in FACU internal circuits.

3. Abnormal A/C voltage at the FACU.

4. A break in standby battery circuitry.

5. Open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

6. Failure of battery charging.

7. Amplifier failure

1.7 SUBMITTALS

A. General: Refer to Division 01 Section "SUBMITTALS" for basic information relating to submittal requirements. Partial submittals will not be acceptable and will be returned without review. Complete submittals shall include drawings, product data, calculations, and qualifications. Before any work is commenced, the submittal shall be approved by the Office of Safety, Health and Environmental Management (OSHEM). Any work performed by the contractor prior to their approval will be at the contractor's own risk. If such work is contrary to applicable codes and contract documents, the contractor shall bear all costs including, but not limited to, demolition, reconstruction, and all costs and expenses associated with revising the fire alarm system to meet all applicable codes and contract document requirements. All working drawings shall be a minimum 24 in by 36 in. Electronic submittals in PDF based format are also acceptable.

B. System Description: Submit a detailed description of the control unit as it shall operate for this specific installation. General system descriptions from the catalog cuts and copies of the Systems Design Operation portion of this specification will not be acceptable. All equipment shall be compatible and listed/approved for operation with one another. Any accessory panel shall be compatible with the fire alarm unit(s).

C. Comply and provide documents associated with the recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.

D. Equipment: Include annotated catalog data showing manufacturer's name, model, voltage, and catalog numbers for all equipment and components of the following:

1. Strobe power extender panels

2. Storage batteries

3. Battery charger

4. Cabinet

5. Manual pull station

6. Addressable interface devices

7. Terminal cabinets/assemblies

8. Addressable relays and interface modules

9. Annunciation devices (e.g., speakers, strobes, bells)

10. Fire detector (e.g., smoke, heat, flame, video)

11. Strobe, speaker, and speaker/strobe notification appliances

12. Waterflow switch

13. Tamper switch

14. Fire alarm cabling

15. Boxes

16. Terminal strips

17. Wire nuts

18. Relays

19. Transient voltage surge suppressors

20. Conduit

21. Support

E. Shop Drawings: Provide three sets of working drawings not smaller than 24 inches by 36 inches (609 mm by 914 mm) and an electronic file. Shop drawings shall be prepared on a Computer Aided Drafting (CAD) System. As a minimum, the shop drawing submittal shall include all items required by NFPA 72 Section 7.4, and the following:

1. Point to point wiring diagrams on floor plans at a scale of not less than 1/8" = 1'-0" (1:100), showing all field devices (indicating and initiating devices, relays, switches, etc.), field interconnections, the routing of conduit and circuits between devices, electrical boxes, terminal cabinets, risers, and the FACU. All device circuit numbers and addresses shall be indicated. The device circuit number and addresses on the point-to-point wiring diagram shall be in logical/sequential order (e.g., L1D1, L1D2).

2. Field wiring color code scheme: The following wire jackets shall be used for fire alarm cabling.

    a. XNET/Class X Network Circuit: White

    b. DACNET/Audio Risers: Blue

c. Phone Riser/Circuit: Yellow

d. Master Sync: Red with White Stripe

e. 24VDC Power, Door Holds, etc.: White with Red Stripe

f. Strobe: Red with Blue Stripe

g. Speaker: Blue with Red Stripe

h. SLC: Red

i. IDC: Green

j. Control Circuit: Orange

3. Wire nut color code scheme shall be provided in the wiring schedule for each wire size/type.

4. Locations for all ceiling mounted equipment shall be coordinated with lighting fixtures, air outlets, ductwork, and other fixtures. Shop drawings shall include reflective ceiling plans that show at a minimum lights and HVAC diffusers. All detectors shall be centered and aligned with ceiling tiles and/or other ceiling mounted devices.

5. Complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment. Provide a color code schedule for the wiring.

6. Detailed drawings of the remote graphic annunciator.

7. Wiring diagrams of all load control relays. Each device shall be provided with a diagram demonstrating writing terminations of that device, specific to the project. Installation responsibilities of specific parts of the detail (if applicable), shall be shown.

8. Detailed sequence of operations and matrix.

9. Utilize NFPA 170 standard symbols.

F. As-Built (Record) Working Drawings: On a daily basis the contractor's superintendent shall record as-built conditions on a set of Shop Drawings maintained at the job site. Two sets of Shop Drawings reflecting as-built conditions shall be available prior to and for use during the final acceptance test. Two weeks after the acceptance test and before final acceptance of the work, furnish four complete sets of as-built drawings. The drawings shall be prepared on uniform sized sheets not less than 24 inches by 36 inches (609 mm by 914 mm). The drawings shall include:

1. As-built locations of all devices and equipment. Point to point wiring diagrams on floor plans at a scale of not less than 1/8” = 1’-0” (1:100), showing all field devices (indicating and initiating devices, relays, switches, etc.), field interconnections, the routing of conduit and circuits between devices, electrical boxes, terminal cabinets, risers, and the FACU. All device circuit numbers and addresses shall be indicated. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points. Device addresses shall be listed next to each device.

2. Conduit pathways shall be shown. T-taps and other circuit deviations shall be shown.

3. Riser diagram

4. All deviations from the project drawings and approved shop drawings. Deviations shall be noted by clouds or other means.

5. Record Drawing Software: Provide three (3) USB drives containing CAD based drawings in DWG and PDF format of all as-built drawings and schematics. All as-built submittals shall also be digitally transmitted to the COTR.

6. Record Programming: Provide one (1) USB drive containing the final programming for the FACU.

7. Device Addresses: Prior to fire system installation, provide for approval a complete list of device addresses with corresponding commands, controls, and sequence of operation.

8. LCD Display Messages: The fire alarm control unit shall display messages in the following format: Device type, Floor, Room/Location. All messages for tamper and waterflow switches shall also display the zone and valve location. System programming and device descriptions shall be provided to OSHEM with as-built drawings prior to final acceptance. Any changes required to the programming/descriptions shall be completed before final acceptance.

9. LCD messaging shall be standardized using the following rules and abbreviations:

    a. Abbreviations:

        1) AMPS-24 – Power Supply

        2) DD – Duct Detector

        3) FS – Flow Switch

        4) FSD – Fire/Smoke Damper (usually followed by a number)

        5) HD – Heat Detector

        6) MON – Monitor Module

        7) MS – Manual Station

        8) NAP – Notification Appliance Power Supply

        9) RLY – Relay Module

        10) SD – Smoke Detector

        11) TS – Tamper Switch

    b. Examples:

1) Standard Device: (Device Type) (Floor Level) (Location Description including room number)

Example: SD L1 GALLERY 203 BY STAIR 2

2) Air Handler: (Device Type) (Floor Level) (Air Handler Number) (Room Number where AHU is present)

Example: DD LL AHU10 SUPPLY PM10

3) Fire/Smoke Dampers: (Device Type) (Floor Level) (Location) (Damper Number) (Air Handler number, if possible) (Room Number where AHU is present)

Example: DD LL 3103 FSD-OA-1-8 AHU10 PM10

4) Fire Sprinkler Valve: (Device Type) (Floor Level) (System Number) (Location/Area covered by sprinkler system) (Location of valve if possible)

Example: FS L2 2-1 G203 VLV IN STAIR 1

5) Relays and Monitors: (Device Type) (Floor Level) (Location Description) (Function of Relay/Monitor)

Example: RLY L1 EL10 EMR 110A SHUNT TRIP

G. Qualification Data: For Designer, Installer, and Technician as outlined in Section 1.6.

H. Strobe and Voice Evacuation Circuit Labels: Prior to fire system installation, provide for approval a complete list of area descriptions for strobe and voice evacuation circuits to be labeled on the fire alarm control unit(s).

I. Descriptions on Graphic Annunciators: Prior to fire system installation, provide descriptive labels for graphic annunciator labeling which will include sprinkler zones, sprinkler valve locations, fire walls, stairwells, and elevators.

J. Service Manuals and Equipment Descriptions: Thirty days prior to the final acceptance test and after the preliminary testing has been completed submit the following:

1. Furnish four (4) bound copies of complete service manuals to include: device and board specifications, operation, installation, and maintenance manual; manufacturers installation instructions for all aspects of the installation; Test Mode Operating Instructions; manufacturer’s wiring specifications for the system; training manual.

2. Maintenance checklists for equipment.

3. As-built circuit diagrams, complete with color-code scheme, and device descriptions.

4. Complete parts list by make model number and manufacturer.

5. List of smoke detector addresses and corresponding sensitivity readings.

6. Copies of approved submittal materials.

7. Operating instructions shall be framed and mounted at the FACU.

K. Calculations:

1. Battery capacity calculations: The battery calculations shall be detailed to show device quantity, standby current, alarm current and total current to justify proposed battery size. Ampere-hour requirements for each system component and each panel component shall be submitted with the calculations.

2. Supervisory power requirements for all equipment.

3. Alarm power requirements for all equipment.

4. Power supply rating justification showing power requirements for each of the system power supplies.

5. Justification showing power requirements of the system amplifiers. Amplifiers shall be sized for a minimum of 1 watt per connected speaker in common areas and 0.5 watt per speaker in all other locations.

6. Voltage-drop calculations for NAC wiring runs demonstrating worst-case condition. Show capability of 25 or 70.7 vrms circuits for wire runs.

7. Provide complete battery calculations for both the alarm and supervisory power requirements. Ampere-hour requirements for each system component shall be submitted with the calculations.

8. Updated battery calculations shall be provided prior to Acceptance Testing to account for as-built conditions.

L. Terminal Cabinet Wire Chart: Prepare a wire chart of the wires in each terminal cabinet. Chart every wire showing the wire number, color, size, type of circuit, designation, origination point and termination point. The chart shall be typewritten with minimum 12-point lettering. The format of the wire chart shall be as shown on the contract drawings. The chart shall be protected with a clear laminate and mounted in each cabinet so that it does not interfere with the wiring or terminals.

M. Certificate of Compliance: Within two weeks after passing the acceptance test, submit a certificate of code and contract compliance to the COTR in accordance with NFPA 72.

1.8 QUALITY ASSURANCE

A. General Qualifications:

1. A submittal shall be provided, prior to installation taking place, specifying personnel for each of the roles outlined below.

B. Manufacturer Qualifications

1. Testing Services or Laboratories: Construct all fire alarm and fire detection equipment in accordance with the latest edition of the following publications from Underwriters Laboratories (UL) and Factory Mutual Engineering Corporation (FM):

    a. UL Fire Protection Equipment Directory

    b. UL Electrical Construction Materials Directory

    c. UL 38 – Standard for Manual Signaling Boxes for Fire Alarm Systems

    d. UL 268 - Smoke Detectors for Fire Alarm Systems

    e. UL 268A - Smoke Detectors for Duct Application

    f. UL 464 - Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories

    g. UL 497A – Standard for Secondary Protectors for Communications Circuit

    h. UL 521 - Heat Detectors for Fire Protective Signaling Systems

    i. UL 864 - Standard for Control Units and Accessories for Fire Alarm Systems

    j. UL 1283 – Standard for Electromagnetic Interference Filters

    k. UL 1449 - Standard for Surge Protective Devices

    l. UL 1480 - Speakers for Fire Alarm and Signaling Systems, Including Accessories

    m. UL 1971 – Standard for Signaling Devices for the Hearing Impaired

    n. FM Approval Guide

    o. Codes and Standards, Latest Edition

    p. International Building Code

    q. NFPA 70, National Electrical Code

    r. NFPA 72, National Fire Alarm and Signaling Code

    s. NFPA 101, Life Safety Code

    t. Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).

C. Qualifications of Installer:

1. Installation shall be accomplished by a fire alarm contractor with a minimum of five years' experience in the installation of fire alarm system of comparable size and capacity.

2. Contractor shall have an office, which has been in existence for at least 3 years, within a 121-kilometer (75 mile) radius of the project site.

3. The Installer foremen or team leaders shall be at minimum NICET Level II in fire alarm systems and shall be onsite when any work on the fire alarm system is performed. Work shall not be performed on the fire alarm system if one of these individuals is not present and overseeing work. Key personnel shall be present on the Contractor's daily log

4. Quality Control Personnel shall be at minimum NICET Level III in fire alarm systems and shall visit the site weekly to inspect the work installed, including conduit, wiring, devices, and panels. This person or persons shall not be the Installer or the Technician.

5. The Technician shall be at minimum NICET Level III in fire alarm systems and shall supervise installation, adjustments, and tests of the system. If a Technician is on site daily whenever work is performed, they can qualify as the Installer as well. The Technician shall be an employee of the fire alarm contractor.

6. The certifications of the Installer, Technician, and Quality Control Personnel shall be part of the submittals and shall be approved by OSHEM prior to the start of their work. If the Installer or Technician is changed at any point during the project, the credentials of the replacement shall be submitted and approved prior to the start of their work. Certifications for corporate personnel or personnel who will not be on-site for installation of the project will not be accepted.

D. Qualifications of Distributor/ Service Organization/ Designer:

1. Design Personnel certified by NICET as Fire Alarm Level III or IV or a registered fire protection engineer. The manufacturer's equipment distributor shall show evidence of certification by the manufacturer in the technical support of the system installed under this contract.

2. The distributor shall show evidence of certification of at least one employee by the NICET at Level III or IV in the Fire Alarm Systems subfield of Fire Protection Engineering Technology. If such a certified individual is not employed, adequate documentation shall be provided to show comparable training and experience of an existing employee. At a minimum, comparable training and experience shall consist of ten years of progressive experience in the installation and design of fire alarm systems of comparable size and complexity to that specified herein.

3. In lieu of an employee with NICET Level III or IV certification, the distributor shall show evidence of at least one employee with a minimum of ten years of progressive experience in the design of fire alarm systems. In addition, the distributor shall show evidence of technical support in the design, installation, and testing of the systems from a manufacturer-affiliated company, which shall show evidence of certification of at least one employee by the NICET at level III or IV in the Fire Alarm Systems subfield of Fire Protection Engineering Technology.

4. The contractor shall furnish evidence that the fire alarm equipment supplier has an experienced and effective service organization, which carries a stock of repair parts for the system being furnished. Should the Contractor fail to comply with the service requirements of this section, the Smithsonian will then have the option to make the necessary repairs and

back-charge contractor without any loss of warranty as provided by the contract documents.

5. The control equipment manufacturer shall provide an employee certified in the inspection, testing and maintenance of the panel and/or equipment being installed, to assist in the final connections to the panel. This individual shall also assist with pre-testing and acceptance testing.

E. Qualifications of Instructor:

1. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the Smithsonian employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm system. Qualifications shall be provided to OSHEM for review prior to any training taking place.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.9 DELIVERY STORAGE AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.10 PROJECT CONDITIONS

A. Interruption of Existing Fire Alarm Service: Do not interrupt fire alarm service to facilities occupied by The Smithsonian Institution or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify COTR no fewer than 48 hours in advance of proposed interruption of fire alarm service.

2. Do not proceed with interruption of fire alarm service without The Smithsonian Institution's written permission.

3. No system shall be out of service during non-business hours unless a fire watch is established.

4. At no time shall the work area not be protected by either the temporary fire alarm system or the building fire alarm system.

5. When working on the fire alarm system, the Contractor shall be present in the control room or at the main fire alarm control unit for the duration of the work and be aware of any abnormal conditions resulting from their work. If their work causes any abnormal conditions (alarm, supervisory, or trouble signals), the Contractor shall be present to acknowledge them and clear them by the end of the work shift. Issues that would incapacitate the majority or all of the system shall be brought to the attention of the COTR and OSHEM and rectified immediately. If other abnormal conditions are received (not the result of the Contractor's work), the Contractor will discontinue work as needed by SI/OPS to resolve the condition.

6. COTR shall be notified in advance if disruption is required in areas open to the public. The affected area shall be closed to the public during service disruption. Work shall be done during closed-hours, or Smithsonian Institution shall give permission to close the public areas during open hours.

7. All contractor(s) working on the fire alarm system (or subsystem) shall check the system(s) status before and after each shift to ensure no faults are present in the area of work. Any existing alarm, trouble, or supervisory signals shall be recorded at the beginning and end of each shift. Photographs of the panel troubles shall be provided to the COTR and OSHEM before and after each shift. Any troubles in either the area of work or the remainder of the facility determined to be at the fault of the Contractor shall be rectified at no additional cost to the SI within 24 hours of the issue being discovered. Issues determined to be critical by the COTR or OSHEM shall be rectified immediately.

8. If a temporary fire alarm panel is present, photographs of the panel troubles shall be provided to the COTR and OSHEM daily. Any troubles shall be rectified within 24 hours of the issue being discovered.

1.11 COORDINATION

A. Coordinate device layout with reflected ceiling plan and all ceiling–mounted equipment, including diffusers, lights, security cameras, fire alarm devices, exit signs, and other devices.

B. Coordinate major equipment and aspiration smoke detection piping layouts with other trades to avoid obstructions and excessive changes in direction for piping.

1.12 WARRANTY

A. The contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the final acceptance of this work by the Smithsonian and after the receipt of as-built drawings and schematics of all equipment.

B. A full system warranty fire alarm test shall be provided by the installer one month prior to warranty expiration. All interfaced systems (e.g., smoke management systems, lighting systems), shall be tested. All deficiencies found shall be corrected for the warranty to be considered complete. If the warranty is phased, then the testing shall also be phased. The warranty period shall not start when the panel is powered on but rather when the project or phase has been completed.

1.13 EXTRA MATERIALS

A. Spare parts shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, stamping, or tagging.

B. Furnish the following spare parts. Quantity shall be two percent of the installed number of devices, but not less than the quantities listed:

1. Smoke Detectors of each type installed: 5

2. Heat detectors: 2

3. Audio/visual devices of each type installed: 5

4. Keys for all fire alarm cabinets: 5

5. Wrenches or special tools required to gain access to all lockable equipment: 5 of each type required

PART 2 - PRODUCTS

2.1 GENERAL

A. All components provided shall be listed for use with the selected system.

B. With the exception of the air aspirating smoke detection control panels, all fire alarm equipment (including releasing panels) shall be from a single manufacturer.

C. Only appliances that comply with the manufacturer's installation instructions shall be permitted.

2.2 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements and compatibility to Smithsonian monitoring system, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. FACU, cabinets, and peripheral devices:

a. Notifier

b. FireLite

c. Siemens

d. Approved equal. (Shall be approved by OSHEM prior to submitting shop drawings)

2. Wire and Cable:

a. As per Division 26 this specification.

3. Conduit:

   a. As per Division 26 this specification

4. Boxes, supports, terminal blocks, and appurtenances:

   a. As per Division 26 this specification.

2.3 FIRE DETECTORS

A. Photoelectric light scattering type smoke detectors shall be provided as follows:

1. The detector shall be suitable for two-wire 24VDC operation and two-way communications on the intelligent analog signaling circuit. Smoke detectors shall be UL listed for use with the FACU and environmental conditions.

2. Detectors shall be self-compensating for ambient temperature and humidity.

3. Detector bases shall be installed on an industry standard, 4 inch (101 mm) square or octagonal electrical outlet box. Bases shall be universal for ionization, heat, and photoelectric (light scattering type) detectors.

4. Detectors shall be twist-lock type on to the base with self-wiping contacts.

5. Screw clamp terminals shall be provided for all conductor terminations.

6. The detector shall be addressed, tested, and programmed prior to installation. The detector readout shall yield a discreet electrical value for status tracking and logging for determining maintenance and cleaning requirements. The control unit shall provide a sensitivity readout from the detector without removal from the base.

7. Provide self-restoring type detectors that do not require any readjustment after actuation to restore them to normal operation.

8. All components shall be rust and corrosion resistant. Vibration shall have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or air born materials. The screen shall not inhibit the movement of smoke particles into the chamber.

9. The detector shall display a differentiating indicating LED when in the alarm state when the system is operating from normal or standby power.

B. Duct Detectors:

1. Duct smoke detectors shall meet the requirements for photoelectric light scattering type detectors. With the addition that duct detectors are UL 268A listed for installation in air duct sampling housings for the detection of smoke in HVAC system ducts.

2. Provide remote indication where the detector is obstructed or not visible from the floor level. Location of remote indicators shall be approved by OSHEM.

3. Provide a remote test station where the detector is more than six feet above floor level. An operating key switch shall initiate an alarm test. Location of key switches shall be approved by OSHEM and shall be accessible from the floor level. Key switches shall be provided no more than 8 feet above finished floor.

4. Weatherproof Enclosure: NEMA 250, Type 4X; NRTL Listed for use with the supplied detector for smoke detection in HVAC system ducts.

5. Sampling Tubes: Design and dimensions as recommend by the manufacturer for the specific duct size, air velocity, and installation conditions where installed.

6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

C. Heat Detectors:

1. Detectors shall be Listed or Approved for use with the FACU and environment conditions.

2. Detectors shall be addressed, tested and programmed prior to installation.

3. Detectors shall display a steady LED when in the alarm state when the system is operating from normal or standby power.

4. Detectors shall be equipped with screw terminals for each conductor.

5. Detectors shall be hermetically sealed and of the automatically resetting type which will operate when ambient air temperature reaches detector setting regardless of rate of temperature rise.

6. Detector operation shall not be subject to thermal lag.

7. Heat detectors in hoistways and elevator machine rooms shall be intelligent, low temperature (135ºF-140ºF), rate-compensating detectors.

2.4 MANUAL PULL STATIONS

A. Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

B. Provide double action addressable manual stations where shown on the drawings, to be flush or surface mounted as required. Manual stations shall be addressable.

C. Stations shall be equipped with terminal strip and pressure-style screw terminals for the connection of field wiring. Stations that require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station.

2.5 NOTIFICATION APPLIANCES

A. Speakers and strobes shall be 24VDC (strobes) or 70 VAC (speakers) and shall be equipped with terminal strip and pressure-style screw terminals for the connection of field wiring. Devices shall be mounted to 4 inch (101 mm) square outlet boxes.

B. Speakers: Provide fire alarm speakers conforming to UL 464.

1. Speakers shall be provided with at least the following four tap settings: 2-watt, 1-watt, 1/2-watt, and 1/4-watt.

2. The audible signal shall have two alternate and distinct audible patterns; horn tone and recorded voice message; each field switchable for peak output levels of 100db or 106db measured at 3048mm (10 feet). When multiple tones are activated simultaneously, the tones shall be prioritized to avoid interference.

3. System shall meet intelligibility requirements of NFPA 72.

4. Where the design has determined that high-challenge acoustic areas are present, high-fidelity speakers are to be provided to achieve audibility and intelligibility in the subject areas.

C. Strobe lights

1. Provide with white finish plate and with the word “ALERT” horizontally printed for ceiling mounting.

2. Xenon strobe with a minimum repetition rate of 1 Hz, not exceeding 3 Hz and a maximum duty cycle of 40% with pulse duration of 0.2 seconds.

3. Visual alarm signals shall be furnished with minimum light intensity of 75 candelas and meet the requirements of ADA and UL 1971. In large rooms with ceilings over 10 feet, 110 candela models shall be provided. Any device up to 110 cd shall have adjustable candela ratings.

4. Provide strobe light visual alarm signals that operate on 24 VDC.

5. Synchronization shall be provided as required in NFPA 72. All strobe lights within view of one another shall be synchronized.

D. Audio-Visual Combination Assemblies shall be provided where strobes and speakers are identified at the same locations.

E. Relays for the control of air handler contactors and elevator recall circuits shall be rated for use with circuits up to 240VAC at 7A inductive. Relays shall be of the sealed pluggable type, and terminations shall be made to pressure-type screw terminals.

F. Wiring powering equipment load relays shall be supervised.

2.6 INTERFACE/CONTROL MODULES

A. Furnish intelligent analog signaling circuit interface modules for the monitoring of contact type initiation devices, the control of electrical devices, fire pump controllers, load control relays (controlling elevators and HVAC equipment), and each independent smoke detection, kitchen, and gaseous fire suppression systems. The modules shall be capable of monitoring three separate functions: alarm, trouble, and supervisory conditions.

B. The module shall be addressed, tested, and programmed prior to installation using a UL listed programmer/tester.

C. The module shall display a steady or contrasting intermittent LED for each circuit, in both normal and standby power conditions, when in the alarm state or during control circuit is activation. The LED shall flash during system address polling.

2.7 CABLE FASTENERS

A. Wire nuts shall be rated to the same temperature as the cabling in question.

B. Wire nuts shall be provided at the size appropriate for the cabling in question.

C. Terminal blocks shall be provided at the size appropriate for the cabling in question.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment, materials, installation, workmanship, examination, inspection, and testing shall be in accordance with Division 26 of the project specifications and NFPA 72, except as modified herein.

3.2 PRIMARY POWER

A. Make the service connection for the FACU at the emergency distribution panel where shown. Provide a separate NEMA 4X "General Purpose Enclosure" for the circuit breaker. The circuit breaker enclosure shall be painted red, marked "FACU", and provided with a lockable handle or cover.

3.3 SYSTEM FIELD WIRING AND CONDUIT

A. Wiring within Cabinets and Junction Boxes: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box or cabinet.

B. Conductor Type and Size: Wire size shall be sufficient to prevent dropping voltage below specified minimum levels. Wire type and sizing of conductors shall also be in accordance with the manufacturer’s wiring specifications. Conflicts with the manufacturer’s requirements shall be

brought to the attention of OSHEM during the shop drawing phase, prior to product approval. Minimum wire size and type shall be as follows, unless manufacturer's requirements conflict. Conflicts shall be brought to the attention of the COTR and OSHEM:

1. Signaling Line Circuits: 16AWG, Type FPLR/FPLP, solid copper

2. Notification Appliance Circuits: 14AWG, Type FPLR/FPLP, solid copper, twisted pair

3. Interfaced Circuits: 16AWG, Type FPLR/FPLP, solid copper

4. Speaker Circuits: 16 AWG, Type FPLR/FPLP, solid copper, twisted pair

5. Battery Cable: 14AWG, solid copper

C. Connectors:

1. Twist-type wire nuts are permitted at junction boxes 4" square or smaller. No more than two wires are permitted to be connected in this manner.

2. Stab-lock or similar connectors are not permitted.

3. Terminal blocks shall be utilized at terminal cabinets.

D. Terminal Cabinets: Provide a terminal cabinet at the base of any circuit riser, on each floor at each riser, and where indicated on the drawings. Cabinet size shall be appropriate for the size of the wiring to be connected. All terminals shall be permanently labeled with circuit type, circuit number, and area served. Terminal strips shall be appropriately sized to accommodate the cables being connected.

E. Conductor Numbering: All conductors installed in the system shall be numbered at every junction point and device. Use a numbered shrink-wrap label designed specifically for this purpose. Wire numbers shall be the same as those designated on the as-built drawings. Mark each terminal in accordance with the wiring chart and diagrams of the system.

F. Conductor Color Coding: Color coded conductors shall be consistent for each type of circuit. When renovating or adding to an existing system, color-coding shall match the existing system. Wire color coding schedule shall follow the requirements specified in Section 1.9 of this specification.

G. Junction Boxes: Any junction/gang box used in a circuit shall sole be dedicated to that circuit. A common junction/gang box is not permitted for routing multiple circuits. 6 inches of slack cable shall be provided in all pull-through boxes without devices.

H. Signaling Line and Notification Appliance Circuits

1. Signaling Line, notification appliance, and power circuits shall each be in separate conduit. Circuits accessory to (e.g. controls wiring), or not associated with the fire alarm system shall be run in separate conduit until the point of termination to the fire alarm system.

2. Strobes are to be connected to circuits separate from speakers. This includes strobes and speakers that are mounted as a unit.

3. Provisions for tying in signaling line and notification appliance circuits directly to the FACU mother board (board containing CPU) shall not be used. Initiation and indicating circuits shall be tied to a separate electronic board before connection to the motherboard.

I. Circuit Loading:

1. Spare capacity shall be in accordance with Section 1.07 of this specification.

2. Circuits operating at 24 VDC shall not operate at less than 21.6volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10% of nominal voltage.

J. Spare Circuits: Provide one spare signaling line and notification appliance circuit for each terminal box placed at each floor on each riser. Spare capacity shall also be provided in the FACU for these circuits. FACU control boards shall be provided to permit two spare initiation circuits and two spare indicating circuits. Spare circuits are not to include those provided on the motherboard.

K. Conduit:

1. All conductors shall be in grounded metal conduit. Conduit shall be Rigid metal or EMT. Flexible metal conduit not exceeding six-foot lengths shall be permitted from junction box to initiating device. On flexible metal conduit, use only insulated throat connectors.

2. Run conduit or tubing concealed unless specifically shown otherwise on the drawings.

3. Minimum conduit size shall be 3/4-inch.

4. Steel compression-type fittings shall be used. Set-screw type fittings are not permitted.

5. All sharp edges, including excess all-thread rod, shall be removed from the interior of junction boxes before wire is pulled.

6. Provide insulated throat connectors or plastic bushings on all conduit.

L. Labeling: Label all addressable input/output fire alarm cover plates and appliances (including smoke detectors, manual pull stations, addressable modules, and notification appliances) with their address utilizing a label machine. Addresses on SLC or NAC devices/appliances shall include panel number, circuit number, and appliance number. Associated end of line shall also be identified as such. Each SLC field device address shall match the fire alarm display address.

M. Circuits to Interfaced Equipment:

1. Circuits to smoke management systems, fan shutdown systems, door locking systems, A/V shutdown, fire door release, firefighter telephones in elevator cabs, etc. shall terminate in terminal cabinets within 914mm (3 feet) of the controllers for those systems. The completion of those circuits from the terminal cabinets to the appropriate system shall be provided under the appropriate division specification.

2. Devices shall have a separate raceway up until the point of termination at the fire alarm system. Wiring other than fire alarm cabling shall not be permitted in any fire alarm conduit.

N. Load Control Relays:

1. Where required by NFPA 101, relays shall be located within three feet of the device controlled.

2. Wiring between the fire alarm addressable module and the equipment load relay shall be supervised.

3.4 ACCESS PANELS

A. All devices shall be easily accessible for testing, repairs, and maintenance. Provide access panel of sufficient size where devices and junction boxes are concealed to allow access. The Contractor shall provide documentation showing accessibility.

B. The minimum access size shall be 12” x 12”. Larger panels may be required at the discretion of the OSHEM FPE if access is deemed insufficient for maintenance staff.

3.5 FIRESTOPPING

A. Seal all holes caused by penetrating conduit, piping, or other penetrations that pass through floors, walls, or ceilings. Firestop penetrations through floor slabs, fire-rated walls, shafts, or any fire-rated assembly in accordance with Division 07 Section Penetration Firestopping.

3.6 MARKING

A. All metal surfaces shall be painted. Metal conduit in finished areas shall be painted the color to match adjacent surfaces. Junction boxes in unfinished areas shall be painted full gloss enamel red. Painting shall be in accordance with Section 09 Painting.

B. 2-inch wide red bands shall be applied every 10 feet when not using red-colored conduit. Tape shall not be used for banding purposes.

C. Prior to acceptance testing, label all addressable input/output fire alarm cover plates and appliances (including detectors, manual pull stations, addressable modules, and notification appliances) with their address utilizing a labeling machine. Handwritten labels are not acceptable. Addresses on SLC or NAC appliances shall include panel number, circuit number, and appliance number. Associated end of line appliances shall also be identified as such. Each SLC field appliance address shall match the fire alarm display address. Relays and monitors shall be labeled with their associated function or the equipment they control.

D. All circuits entering and leaving a terminal cabinet or panel shall be marked with their designations. Where the circuits then travel to another panel or terminal cabinet, those locations and designations shall also be marked in the terminal cabinet.

E. All duct smoke detectors shall be labeled with the designation of the air handling unit it serves and that unit’s location.

F. Monitor modules associated with sprinkler equipment shall be labeled with the corresponding system number or valve designation.

G. Laminated device coverage maps shall be provided adjacent to each aspirating smoke detection unit. Maps shall mark the coverage area of each pipe on the detection unit. Maps shall be sized at 11”x17” minimum.

3.7 DEVICE INSTALLATION

3.8 Manual Pull Stations: Mount the manual pull stations so that their operating handles are 4 feet (1219 mm) above the finished floor.

A. Strobes: Wall mount strobes shall be a minimum of 80 inches (2032 mm) above the finished floor or 6 inches (152 mm) below the ceiling, whichever is lower. The bottom of the strobe lens shall be above the 80-inch level.

B. Speakers: Speakers shall be tapped in accordance with the Contract Documents.

C. Smoke Detectors:

1. In raised floor spaces and high-velocity plenum areas, the smoke detectors shall be installed to protect 225 sq. ft per detector.

2. Detectors shall be installed in elevator machine rooms and elevator hoistways.

3. Install smoke detectors a minimum of 3 feet (914 mm) away from supply air vents.

4. New smoke detectors shall be installed with dust covers. The dust covers shall be removed just prior to acceptance testing.

5. The indicating LED on the smoke detector shall be visible from the floor. Where ceiling conditions prevent viewing of the LED from the floor, a remote indicating lamp shall be installed. Lamp shall be installed not more than 6 feet above finished floor.

D. Duct Detectors:

1. Installation of duct detector sampling tubes shall be verified by OSHEM prior to final acceptance.

2. Sampling holes shall be oriented facing into the airflow, or as manufacturer’s requirements specify.

3. Duct detector sampling tubes shall be verified by OSHEM for proper orientation and airflow. Airflow shall be tested per manufacturer’s instructions and shall be confirmed with a magnehelic/manometer (airflow/pressure) meter to ensure air is passing over/through the detector chamber. Testing shall be completed while the air handling units are active at their normal settings.

4. Duct detector sampling tube length and installation shall be in accordance with manufacturer’s requirements.

a. Where possible and where access would be available to the endcap, sampling tubes shall be installed extending out the opposite side of the duct.

3.9 INSPECTION & TESTING

A. Test Equipment: The Contractor shall supply personnel, communication devices, and all equipment necessary for performance of the final test.

B. Provide no less than 48-hours notice for the inspections and testing below. Notice for final acceptance shall be in accordance with the Final Acceptance section.

C. Conduit Rough-In Inspections:

1. Prior to installation of any wire on a circuit, and/or prior to ceiling close-in, Contractor shall provide conduit plans for review. OSHEM shall inspect and approve conduit layout and installation.

2. Installation shall be in accordance with NFPA 70, NFPA 72, Division 26 of this specification, and Section 283111.

3. If deviations from the approved shop drawings are present, red-line plans shall be available for review at the time of inspection.

4. Contractor shall correct all deficiencies before wire installation commences. OSHEM shall verify all deficiencies.

D. Wiring Tests:

1. Test equipment used for the test shall have been calibrated within one year of the test date.

2. Continuity Tests: Continuity of both wires on a circuit as well as the shield (if present) shall be demonstrated.

3. Megger Tests: After all wiring has been installed, and prior to making any connections to panels or devices, all wiring shall be megger tested for insulation resistance, grounds, and/or shorts. Conductors shall be tested to a minimum of 550 Mega-Ohms. The tests shall be witnessed by OSHEM, SI Life Safety Group, and the Contracting Officer. Test results recorded for use at the final acceptance test. Results recorded shall be values between positive/negative, positive/ground, negative/ground, positive/shield, negative/shield, and shield/ground.

4. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Contracting Officer, OSHEM and the SI Life Safety Group. Test results shall be recorded for use at the final acceptance test.

5. Verify the absence of unwanted voltages between circuit conductors and ground.

6. If partial circuit testing conducted, Contractor shall keep a written record of testing make it available to OSHEM for tracking purposes.

7. Contractor shall correct all deficiencies before device installation commences. OSHEM shall verify all deficiencies.

E. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter to the COTR certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly, including proper device message descriptions and proper placement of graphic icons in fire alarm systems with graphic notification equipment. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

F. Final Acceptance Test: Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until megger test results, the loop resistance test results, preliminary testing letter, and the submittals required in Part 1 are provided to the Contracting Officer. Test the system in accordance with the procedures outlined in the NFPA 72 and as follows:

1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.

2. Complete operational tests under emergency generator power.

3. Complete operational tests under battery power and as described above under battery power. Test the battery charger.

4. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.

5. Test the airflow through all duct detectors to ensure flow is within the Manufacturer's requirements.

6. Commission all Air Aspirating Smoke Detectors in accordance with Manufacturer's requirements.

7. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturers operating and maintenance manual.

8. Verify the audibility and intelligibility results that were recorded on the as-built drawings as part of the preliminary testing above.

9. Visually inspect all wiring at all panels and terminal cabinets. Up to 5% of all devices shall be disconnected and wiring visually inspected during the acceptance test. More devices may be inspected at the discretion of the OSHEM FPE if deficiencies are observed. A minimum of 2 devices per circuit shall be inspected.

10. Verify that all software control and data files have been entered or programmed in the FACU.

11. Verify that shop drawings reflecting as-built conditions are accurate.

12. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits. Current should not exceed 80% of the capacity of the circuit.

13. Measure voltage readings for circuits to assure that voltage drop does not exceed manufacturer's requirements. Voltage drop shall not exceed manufacturer's requirements for the devices in question.

14. Measure the voltage drop at the most remote appliance on each notification appliance circuit. Voltage drop shall not exceed manufacturer's requirements for the devices in question.

15. All faults and trouble signals associated with the completed work shall be cleared from the panel.

16. All deficiencies shall be corrected by the Contractor.

3.10 TRAINING

A. Training sessions shall cover all aspects of system performance, including system architecture, signaling line circuit configurations, sensor and other initiating device types, locations, and addresses, fire alarm control unit function key operation, and other functions as designated by the COTR.

B. Required Instruction Time: Provide 24 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the Contracting Officer. The instruction may be divided into two or more periods at the discretion of the Contracting Officer to account for the nature of shift work of SI employees. One training session shall be videotaped by the contractor. Video shall be delivered to the COTR.

C. Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACU. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The instructions shall be approved by OSHEM.

D. All training sessions shall be conducted following final system certification and acceptance. Three additional training sessions shall be provided for all security personnel on all shifts six months after final system certification.

E. All training sessions shall be conducted by an authorized fire alarm system distributor representative, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. Manufacturer Factory Certifications for training personnel shall be provided to OSHEM for review prior to scheduling of training.

3.11 KEYS

A. Keys and locks for all equipment shall be identical. All panels and terminal cabinets provided shall be keyed the same. Air aspirating smoke detection control panels shall be keyed the same. Provide not less than five keys of each type required. Identify keys by an appropriate number stamped on each key or on a metal tag attached thereto. Provide a key numbering chart in each operation and maintenance manual furnished.

3.12 ON-SITE DOCUMENTATION

A. Provide a document box in the same room as the main FACU. The box shall be red in color and shall be capable of holding a full set of as-built plans. Both electronic and hard-copy plans shall be provided.

END OF SECTION 283111

APPENDIX A:

SI Documents Examples:

- SI Site Specific Safety Plan (SSSP) Format
- Access Plan

SI Site Specific Safety Plan (SSSP) Format (Rev 5a)

A Site Specific Safety Plan (SSSP) is a safety and health policy and program document that outlines how the contractor will safely conduct their work. The following areas are typically addressed in an SSSP, but this plan shall be job-specific and shall also address any unusual or unique aspects of the project or activity for which it is written.

The SSSP shall interface with the employer's overall safety and health program, and a copy shall be available on the work site. Any portions of the employer's overall safety and health program that is referenced in the SSSP shall be included as appropriate.

> For LIMITED-SCOPE SERVICE, SUPPLY AND R&D CONTRACTS, for example, mowing (only), surveying, industrial cleaning, inspecting, the Contracting Officer and Facility Safety Coordinator may allow the use of an ABBREVIATED SSSP (customized SSSP requirements and waive the more stringent elements of this section*). > See section 11.*

Section 1 **SIGNATURE SHEET.** Title, signature, and phone number of the following:

a. Plan preparer (Qualified Person, Competent Person, such as corporate safety staff person, QC);
b. Plan must be approved, by company/corporate officers authorized to obligate the company;
c. Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC). Provide concurrence of other applicable corporate and project personnel (Contractor).

Section 2 **BACKGROUND INFORMATION.** List the following:

a. Contractor;
b. Contract number;
c. Project name;
d. Brief project description, description of work to be performed, and location; phases of work anticipated these will require a Job Hazard Analysis (JHA's). **OSHA 3071**

Section 3 **STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.

Section 4 **RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:

a. A statement of the employer's ultimate responsibility for the implementation of Safety and Health on the job site;
b. Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes. Qualifications shall include the OSHA 30-hour course or equivalent course areas as listed here:
    (1) OSH Act/General Duty Clause;
    (2) 29 CFR 1904, Recordkeeping;

(3) Subpart C: General Safety and Health Provisions, Competent Person;

(4) Subpart D: Occupational Health and Environmental Controls, Citations and Safety Programs;

(5) Subpart E: PPE, types and requirements for use;

(6) Subpart F: understanding fire protection in the workplace;

(7) Subpart K: Electrical;

(8) Subpart M: Fall Protection;

(9) Rigging, welding and cutting, scaffolding, excavations, concrete and masonry, demolition; health hazards in construction, materials handling, storage and disposal, hand and power tools, motor vehicles, mechanized equipment, marine operations, steel erection, stairways and ladders, confined spaces or any others that are applicable to the work being performed.

c. The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached. Requirements that no work shall be performed unless a designated competent person is present on the job site;

e. Requirements for pre-task safety and health analysis;

f. Lines of authority;

g. Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;

h. Provide written company procedures for holding managers and supervisors accountable for safety.

Section 5 SUBCONTRACTORS AND SUPPLIERS. If applicable, provide procedures for coordinating **Safety and Health** activities with other employers on the job site:

a. Identify key personnel of subcontractors and suppliers (if known);

b. Establish how safety responsibilities of subcontractors and suppliers will be communicated and managed.

Section 6 TRAINING.

a. Requirements for new hire Safety and Health orientation training at the time of initial hire or transfer of each new employee to the job site.

b. Requirements for all employees to be briefed and familiar with the contents of the SSSP prior to beginning their assigned work.

c. Requirements for mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, confined space entry, respiratory protection, crane operator, fall protection, vehicle/equipment operators, HAZWOPER training and certification, PPE etc.) and any requirements for periodic retraining/recertification.

d. Procedures for periodic safety and health training for supervisors and employees to include "Tool Box" safety meetings.

Section 7 SAFETY AND HEALTH INSPECTIONS.

a. Specific assignment of responsibilities for a minimum daily/weekly job site safety and health inspection during periods of work activity: Who will conduct (e.g., Site

Superintendent, Safety Professional, Project Manager, QC, supervisors, employees – depends on level of technical proficiency needed to perform said inspections), proof of inspector's training/ qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures;

Section 8 ACCIDENT REPORTING The Contractor shall identify person(s) responsible to provide the following:

a. Exposure data (man-hours worked);

b. Accident investigations, reports, and logs: Report all accidents as soon as possible but not more than 24 hours afterwards to the Contracting Officer/ Representative (COTR). The contractor shall thoroughly investigate the accident and submit the findings of the investigation along with root causes and appropriate corrective actions to the COTR as soon as possible but no later than five (5) working days following the accident. Implement corrective actions as soon as reasonably possible;

c. The following require **immediate** accident notification:

(1) A fatal injury;

(2) The hospitalization of one or more people resulting from a single occurrence;

(3) Injuries to employees, SI staff, visitors, or members of the public requiring emergency response and/or transport to the hospital;

(4) Any damage to SI property.

Section 9. PLANS (PROGRAMS, PROCEDURES) REQUIRED BY THE SAFETY MANUAL. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks and compliance plans. Using the 29 CFR 1926 and/or current and accepted procedures in the EM 385-1-1 as a guide, plans must include but not be limited to:

a. Layout plans/Temporary Facilities (04.A.01)

Plans for the layout of temporary construction buildings, facilities, lay down area, fencing, and access routes and anchoring systems for temporary structures shall be submitted.

b. Emergency response plans:

(1) Procedures and tests (01.E.01); 1926.35

(2) Spill plans (01.E.01, 06.A.02);

(3) Firefighting plan (01.E.01, Section 19); 1926.24

(4) Posting of emergency telephone numbers (01.E.05); 1926.50

(5) Medical Support. Outline on-site medical support and off-site medical arrangements including rescue and medical duties for those employees who are to perform them, and the name(s) of on-site Contractor personnel trained in first aid and CPR. A minimum of one employee shall be certified in CPR and first-aid per shift/site (Section 03.A.02; 03.D); 1926.50(c)

c. Plan for prevention of alcohol and drug abuse (01.C.02); Drug-Free Workplace Act 1988

d. Site sanitation plan, housekeeping (Section 02); 1926.25, 1926.51

e. Access and haul road plan (4.B); Access/haul roads shall be designed in accordance with current engineering criteria.
f. Respiratory protection plan (05.G); 1910.134
g. Health hazard control program (06.A); 1926.53
h. Hazard communication program (06.B.01); 1910.1200(e)
i. Process Safety Management Plan (06.B.04); 1926.64 and 1910.119
j. Lead abatement plan (06.B.05 & specifications); 1910.1025 and 1926.62
k. Asbestos abatement plan (06.B.05 & specifications); 1910.1001, 1926.1101 and 40 CFR 61, Subpart M
l. Radiation Safety Program (Ionizing & Non-Ionizing) (06.E.03.a); 1926.53, 1926.54
m. Abrasive blasting (06.H.01); 1926.57
n. Inclement Weather/Heat/Cold Stress Plan (06.I.02) Plan shall developed to outline actions when there are warnings or indications of impending severe weather (heavy rains, thunderstorms, damaging winds, tornados, hurricanes, floods, lightning, etc.). Weather conditions shall be monitored using appropriate weather station or similar notification system. Appropriate precautions shall be outlined and taken to protect personnel and property from the effects of the severe weather. Employers shall also develop a comprehensive written activity/site -specific heat/cold stress monitoring plan.
o. Crystalline Silica Monitoring Plan (Assessment) (06.M); 1926.55 and 1910.1000
p. Night operations lighting plan (07.A.08); 1926.56
q. Fire Prevention Plan (09.A); 1926.24,1926.151,
r. Hot Work Plan; The plan shall include the name of the person in charge of hot work safety for the contractor and will designate who maintains the hot work plan and ensures that hot work safety guidelines are implemented for all hot work activities. The plan will also include written verification of employees who are trained and authorized to conduct hot work operations and the names of those who are designated and trained as fire watch. The plan will contain a description of anticipated site specific hot work activities and outline the process for obtaining SI hot work permits and ensuring conditions are in accordance with SI hot work permit requirements before hot work begins. SI Safety Manual Chapter 14, NFPA 51B;
s. Hazardous energy control plan (12.A.01); 1910.147
t. Crane and Hoisting Safety Plan (16.H); 1926.1400 Subpart CC
u. Site-Specific Fall Protection & Prevention Plan (21.C); The plan shall describe in detail, the specific practices, equipment, and methods used to protect workers from falling to the next lower level. Fall protection competent person(s) will be identified, worker training verified, description of fall hazard tasks, anchorage and fall arrest systems, and rescue procedures will be outlined as a minimum. 1926.501, Subpart M
v. Demolition plan (to include engineering survey) (23.A.01); 1926.850
w. Excavation/trenching plan (25.A.01); 1926.652
x. Concrete Formwork and shoring erection and removal plans (27.C); 1926.703, Subpart Q
y. Precast Concrete Plan (27.D);1926.704
z. Lift slab plans (27.E); 1926.705
aa. Steel erection plan (27.F.01); 1926.752
bb. Confined space Program (34.A); 1910.146
cc. Protection of the staff, visitors, and public; A detailed plan shall describe procedures taken to protect staff, visitors, and members of the public from construction activities including but not limited to signs, barricades, engineering controls; pedestrian and traffic control; lighting requirements; falling object protection; protection from heavy equipment operation; protection from noise, vibration, dust, etc.

Additional plans listed in EM 385-1-1 that although not normally part of SI Construction projects, should be reviewed for applicability:

- **Man overboard/abandon ship (Section19.A.04);**
- **Wild Land Fire Management Plan (09.K);**
- **Float Plan (19.F.04);**
- **Compressed air plan (26.I.01); 1926.803**
- **Emergency rescue (tunneling) (26.A.);**
- **Underground construction fire prevention and protection plan**
- **(26.D.01); 1926.800**
- **Site Safety and Health Plan for HAZ Waste Site Cleanup work**
- **(28.B); 1926.65(b)**
- **Blasting Safety Plan (29.A.01); 1926 Subpart U**
- **Diving plan (30.A.13); 1910 Subpart T**

Section 10 RISK MANAGEMENT PROCESSES Detailed project-specific hazards and controls shall be provided by a Job Hazard Analysis for each major phase/activity of work, including but not limited to work involving confined space, fall protection, trenching/excavation, crane/rigging, steel erection, hot work, protection of the public, scaffolding, and other activities that involve high risk potential. 01.A.13; **OSHA 3071**

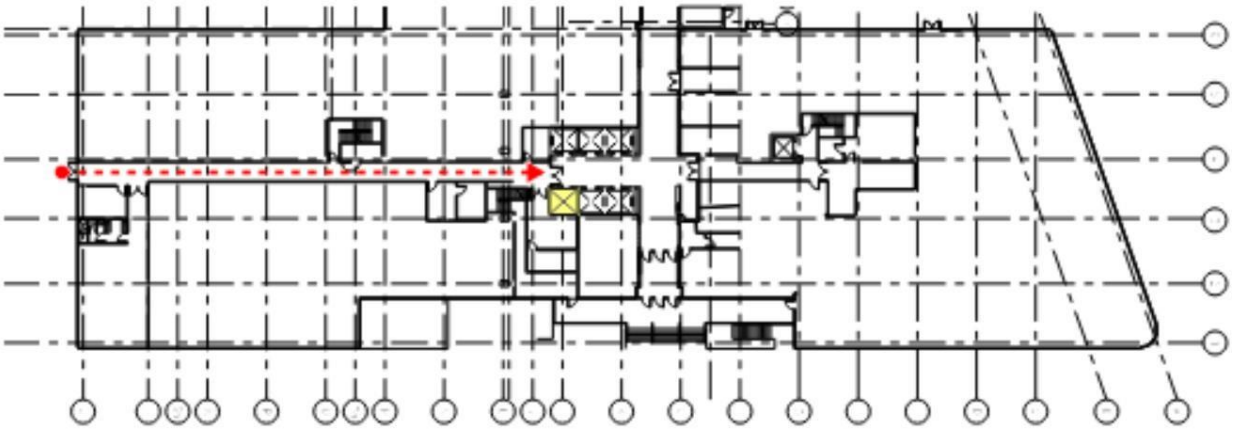
Section 11 ABBREVIATED SITE SPECIFIC SAFETY PLAN (SSSP) for LIMITED-SCOPE SERVICE, SUPPLY AND Research & Development (R&D) CONTRACTS.

If service, supply and R&D contracts with limited scopes are awarded, the contractor may submit an abbreviated Site Specific Safety Plan. This SSSP shall address the following areas **at a minimum**. If other areas of OSHA 1910 and 1926 are pertinent to the contract, the contractor must assure these areas are addressed as well.

a. Title, signature, and phone number of the plan preparer.
b. Background Information to include: Contractor; Contract number; Project name; Brief project description, description of work to be performed, and location (map); The project description shall provide a means to evaluate the work being done (see **JHA requirements in OSHA 3071**) and associated hazards involved. Contractor's SSSP shall address the identified hazards involved and the control measures to be taken.
c. Statement of Safety and Health Policy detailing their commitment to providing a safe and healthful workplace for all employees.
d. Responsibilities and Lines of Authorities – to include a statement of the employer's ultimate responsibility for the implementation of his Safety and Health Program; Identification and accountability of personnel responsible for safety at all levels to include designated Site Safety and Health officer (SSHO) and associated qualifications.
e. Training - new hire Safety and Health orientation training at the time of initial hire of each new employee and any periodic retraining/recertification requirements.
f. Procedures for job site inspections - assignment of responsibilities and frequency.
g. Procedures for reporting man-hours worked and reporting and investigating any accidents as soon as possible but not more than 24 hours afterwards to the Contracting Officer/Representative (COTR). An accident that results in a fatal injury, permanent partial or permanent total disability shall be immediately reported to the (COTR).
h. Emergency Planning. Employees working alone shall be provided an effective means of emergency communication. This may be cellular phone, two-way radio or other acceptable means. The selected means of communication must be readily available and must be in working condition.

i. Drinking Water provisions, toilet and washing facilities.
j. First Aid and CPR training (at least one employee on each shift shall be qualified/certified to administer first aid and CPR) and provision of first aid kit (types/size).
k. Personal Protective Equipment.
    (1) WORK CLOTHING - Minimum Requirements. Employees shall wear clothing suitable for the weather however minimum requirements for work shall be short-sleeve shirt, long pants (excessively long or baggy pants are prohibited) and leather work shoes. If Job Hazard Analysis (JHA) determines that safety-toed (or other protective) footwear is necessary (i.e., mowing, weed eating, chain saw use, etc), they shall be worn.
    (2) Eye and Face Protection. Eye and face protection shall be worn as determined by an JHA of the operations being performed HOWEVER, all involved in chain saw use, chipping, stump grinding, pruning operations, grass mowing, weed eating and blowing operations shall be provided safety eyewear (Z87.1) as a minimum.
    (3) Hearing Protection. Hearing protection must be worn by all those exposed to high noise activities (to include grass mowing and trimming, chainsaw operations, tree chipping, stump grinding and pruning).
    (4) Head Protection. Hard hats shall comply with ANSI Z89.1 and shall be worn by all workers when a head hazard exists. At a minimum, hard hats shall be worn as determined by JHA.
    (5) High Visibility Apparel shall comply with ANSI/ISEA 107, Class 2 requirements at a minimum and shall be worn by all workers exposed to vehicular or equipment traffic.
    (6) Protective Leg chaps shall be worn by all chainsaw operators.
    (7) Gloves of the proper type shall be worn by persons involved in activities that expose the hands to cuts, abrasions, punctures, burns and chemical irritants.
    (8) If work is being performed around water and drowning is a hazard, PFDs must be provided and worn as appropriate.
l. Machine Guards and safety devices. Lawn maintenance equipment must have appropriate guards and safety devices in place and operational.
m. Hazardous Substances. When any hazardous substances are procured, used, stored or disposed, a hazard communication program must be in effect and MSDSs shall be available at the worksite. Employees shall have received training in hazardous substances being used. When the eyes or body of any person may be exposed to corrosives, irritants or toxic chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within 10 seconds of the worksite.
n. Traffic control shall be accomplished in accordance with DOT's Manual on Uniform Traffic Control Devices (MUTCD).
o. Control of Hazardous Energy (Lockout/Tagout). Before an employee performs any servicing or maintenance on any equipment where the unexpected energizing or startup of the equipment could occur, procedures must be in place to ensure adequate control of this energy.
p. Driving, working on (i.e., working with equipment/mowers) while on slopes, working from/in boats/skiffs, etc shall also be considered and dealt with accordingly.

Access Plan



SI CAP GALLERY EAST BUILDING - PLAZA LEVEL
1" = 50'-0"

- CONSTRUCTION TRAVEL PATH FROM EAST LOADING DOCK TO FREIGHT ELEVATOR HIGLIGHTED IN YELLOW.
- MOVING PROTECTION WILL NEED TO BE PLACED BY THE VENDOR TO PREVENT DAMAGES ALONG THE WAY.

APPENDIX B:

Other Supporting Documents

- Boston Properties Rules for Construction Projects in Operating Buildings (rev. 05.13.2024)
- Boston Properties Rules for Contractors Working in Occupied Building – Building Specific Rider Capital Gallery (rev. 01.13.2025)

Form Version: 5/13/24

RULES FOR CONSTRUCTION PROJECTS IN OPERATING BUILDINGS

The following requirements have been developed to ensure that modifications or improvements to the building and/or building systems and equipment are completed to BXP's building standards. BXP may, at its discretion, elect to impose additional regulations in order to maintain a level of safety, code compliance and consistency within industry standards.

The review of plans and/or specifications by BXP and its insurers, consultants and/or other representatives, does not imply that reviewed materials comply with applicable laws, ordinances, codes, standards or regulations. Additionally, BXP's review and/or approval does not imply that any work is to be performed at BXP's expense.

BXP has the explicit right to remove from the project any person who does not comply with these rules after 24-hour notice.

I. GENERAL

A. No work will be performed until BXP has received two (2) hard copy sets of drawings and specifications and has given written approval. BXP to receive one (1) hard copy final "for construction" set of documents including all BXP and permit comments, which must be clearly identified, dated and clouded. A complete set shall also be kept on site.

B. When constructing new demising walls, Architectural and Engineering firm must clearly depict future adjacent spaces as code compliant in plans. General Contractor may not build or demolish conditions that would otherwise leave adjacent tenant spaces non-code compliant.

C. Upon completion of the work, the General Contractor shall furnish to BXP one hard copy and one electronic copy of all "As-Built Drawings." As-Built Drawings shall reflect all modifications made to the Construction Documents and shall be comprised of all applicable drawings. For tenant managed projects, it is the responsibility of the tenant to track all close out document requirements listed in such tenant's lease and ensure that such tenant's consultants and contractors submit them to BXP at completion of work.

Architect and Engineer of record shall provide an electronic copy of the most current drawings on a USB flash drive and via email to BXP's designated construction manager and to DC-Drawings@bxp.com. "Electronic copy" is defined as a full set of both PDF and AutoCAD (.dwg) drawings, saved down to AutoCAD Version 2011 (or such other more current version as designated by BXP), all X-Reference files bound, and raster images included. The USB flash drive and email subject line should clearly reference the project name and address.

Files should be named using the **United States National CAD Standard** followed by a short description and the date on the final drawings (https://www.archtoolbox.com/construction-document-sheet-numbers/).

D. All modifications to the building or to the building systems and equipment must comply with federal, state, and local codes and ordinances.

E. All modifications, relocations or additions to the fire life safety within the building, in relation to a construction project, will require the tenant to obtain a building permit, pass final inspections, and obtain a certificate of occupancy from the jurisdiction having governing authority, prior to any occupancy of the space.

F. For phased construction projects where the demolition occurs as the initial phase and prior to the commencement of the main construction portion, the tenant is required to ensure that all fire life safety systems are in full code compliance, as dictated by the jurisdiction having governing authority. This includes but is not limited to the sprinkler heads being turned upright until the main construction commences. BXP, at its discretion, has the right to review and direct fire life safety protocol prior to implementation.

G. The General Contractor and its subcontractors shall comply with all applicable federal, state or local laws, regulations, ordinances, rules or codes relating to employment or conditions of employment of its employees, including, without limitation, laws or regulations concerning workers' compensation, social security, unemployment insurance, classification of employees, hours of labor, wages, working conditions, safety regulations and work practices. The General Contractor and its subcontractors confirm that their employees are licensed and qualified under all applicable federal, state and local requirements.

H. The General Contractor shall comply with all applicable provisions of the Occupational Safety and Health Act, 29 U.S.C. Section 651 et seq., as amended, all applicable standards and regulations promulgated thereunder, and applicable responsibilities under OSHA's Multi-Employer Citation Policy (CPL 02-00-124).

I. Prior to the work commencing, a building permit must be obtained and displayed on site and an electronic copy must be provided to BXP.

J. Prior to the work commencing, a construction kick-off meeting must be held with BXP, the Project Manager, the Superintendent, the Tenant Representative and the General Contractor. BXP must be notified and invited to all weekly construction progress meetings, which must include the entire Project Team. Prior to commencing any work, the General Contractor must provide BXP with a list of all General Contractor personnel and subcontractors working in the building, which list must include emergency contact information, including telephone numbers.

RULES FOR CONSTRUCTION PROJECTS IN OPERATING BUILDINGS

K. The General Contractor must provide an on-site project superintendent at all times during ongoing construction when subcontractors are working on site. This superintendent must be knowledgeable of the project's scope of work and have on-site reference materials including "for construction" plans, specifications and MSDS information on all materials used in the performance of the work. If more than one contractor is working in the building at the same time, then it is the responsibility of the contractors to coordinate schedules and building shared uses accordingly.

L. Prior to the work commencing, all blinds must be raised and bagged. All windowsills and other base building components must be adequately protected throughout construction. Workers must not stand on windowsills or other building components. Prior to mobilization, General Contractor shall survey work area(s) and public areas, including all existing blinds, and identify deficient items on a floor plan or on a list provided to Property Management.

M. The General Contractor shall repair all existing public area finishes disturbed by the work or damaged by the General Contractor's or subcontractor's personnel.

N. Any work that requires access to adjacent tenant spaces must first be coordinated through BXP. Any additional costs of security or building engineering services required due to General Contractor's work or during the performance of the General Contractor's work shall be charged to the Tenant.

O. All workers must be dressed appropriately when working in an occupied building and in compliance with OSHA standards, which includes appropriate PPE. No shorts are permitted.

P. BXP must approve manufacturer of lockset and key cores for compatibility with building master keying system.

Q. All carts must be furnished with pneumatic tires and rubber bumpers.

R. Smoking is not allowed in and around any occupied building.

S. Radios/speakers/music are prohibited on site.

T. Dumping of construction debris into building drains, mop sinks, trash dumpsters, etc. is strictly prohibited. If this occurs, the General Contractor shall be charged 200% of the cost of clearing any drain, plus administrative time, where evidence of this is found.

U. Base building restrooms within the construction area will not be available for use by the General Contractor unless BXP indicates otherwise. Alternative restroom options may be determined by BXP personnel. If General Contractor is permitted to use the restrooms, General Contractor shall be responsible for any damage, cleaning and

stocking during construction. All other base building restrooms are for tenant use only and are not to be used by construction personnel.

V. Use of the building stairwells for moving construction materials and construction personnel shall be limited to the stairwell designated by BXP.

W. There is to be no communication between the building tenants, their guests and the General Contractor's/subcontractor's personnel.

X. No work will be performed during building operating hours that will disturb or inconvenience any existing tenants in the building. Examples of noisy work include, but are not limited to:

1. Core drilling and anything that causes building vibration (e.g., dropping heavy materials, chipping concrete, etc.)
2. Shooting track
3. Noxious odors
4. Threading pipe
5. Hammer drilling or impact gun usage
6. Cutting metal ductwork
7. Pulling BX or rigid conduit through metal.

BXP must pre-approve any work that could be deemed to disturb or inconvenience any existing tenants in the building.

Y. The General Contractor shall immediately report any and all accidents to BXP in writing after first notifying BXP's Construction Manager and Property Management by telephone.

Z. Any roof related work must be performed by a roofing contractor authorized to do so by the roof manufacturer or by BXP (see attached building specific rider for details).

AA. All requests requiring assistance by building personnel, including, but not limited to, freight and loading dock reservations, access to other tenant spaces, drain down of sprinkler, call out of fire alarm, hot work permits and inspections must be scheduled a minimum of 48 hours in advance. Depending on current staffing and ability to meet off hours requests this advance notice is subject to change at the discretion of BXP's specific property team. A separate process is in place for power shut down requests (de-energizing of floors/building) and the specific building will set the notice guidelines

due to current tenant requirements and needs. If a project requires a shut down, then the tenant A/E team must note such requirement on the plans when they are submitted for review. All contractors are encouraged to discuss shut down requirements for projects at the initial kick off meeting to ensure they receive the required notification timelines from the building personnel. It is the responsibility of the General Contractor to incorporate these scheduling activities into their schedule and the management of their project.

II. STRUCTURAL

A. GENERAL

Design load on office floor levels is 100 psf, including 20 psf for partitions. Any uniform live load exceeding the design load shall be reviewed and approved by the base building structural engineer.

B. CORE DRILLING

1. Prior to core drilling or cutting, all slabs with any power-driven penetrations greater than ½" depth must be x-rayed.

2. A plan of all core drills identified and numbered with photos of the scans, dimensions of scans from building columns and/or perimeter wall, must be provided to BXP and BXP's base building structural engineer. BXP's base building structural engineer must review and approve x-rays, scans and associated plan(s) in writing. Prior to commencing the work, such approval shall be provided to BXP's Construction Manager. Structural engineer review costs must be borne by Tenant as a project cost.

3. If obstructions are detected, the core drill locations must be moved as required by the base building structural engineer. Ultrasound and ground penetrating radar are acceptable substitutes for x-ray only upon approval by the base building structural engineer.

C. POST-TENSION REQUIREMENTS

1. For buildings that are post-tensioned concrete construction, all slabs must be x-rayed. Scheduling of all x-ray scans must be coordinated with BXP's building team a minimum of 72 hours in advance. Provide x-ray technician's horizontal and vertical spread to BXP when making schedule requests. All scans must be performed after hours, as directed by BXP.

2. Concentration of punching shear stresses, reinforcement and post-tensioned cables are heavier around columns. All coring shall be kept away from the column as much as possible. Coring is not permitted in the beams or column drop pads. Locations of all coring shall be approved and backed per tests as indicated. Any coring shall clear

post-tensioned cables as directed by the base building structural engineer.

3. Duct supports, conduit attachments, ceiling hangers, etc. should all be supported by power-actuated fasteners with maximum slab penetration of 5/8". Hilti HDI-P drop-in anchors with ¾". These hanger locations should also be coordinated with the formwork paint marking to avoid the indicated location of the tendons on the underside of the slab.

4. When ceiling, deck or slab is to be painted/sprayed, all post-tensioned markings are to be taped; taping to be inspected and approved by the property management team prior to commencement of slab painting.

III. LIFE SAFETY

A. GENERAL

General Contractor shall perform the work in full compliance with NFPA 241, which prescribes the minimum safeguards for construction, alteration and demolition operations necessary to provide reasonable safety to life and property from fire.

B. SPRINKLER

1. General Contractor shall furnish BXP with sprinkler submittal inclusive of shop drawings, product data and calculations (if applicable) prepared by subcontractor and ready for submittal to the fire marshal. Based on project size, the General Contractor must adhere to the following:

    a. Spaces **under** 5,000 SF: Once approved by the fire marshal, the General Contractor shall (i) furnish BXP with one set of the approved sprinkler shop drawings and (ii) provide BXP with electronic copies of the sprinkler submittal inclusive of shop drawings and product data, for BXP's review and approval prior to scheduling any sprinkler work (e.g., drain downs, relocation of head, etc.).

    b. For first generation spaces or renovation of spaces **larger** than 5,000 SF, General Contractor must provide BXP with two (2) hard copies of the following:

        i. Full-size sprinkler plans
        ii. Sprinkler calculations
        iii. Cut sheets highlighting the selected sprinkler heads, pipe, hangers, fasteners and all fittings.
        iv. All components of the sprinkler system to be UL listed and FM approved.

BXP's Risk Management shall review and approve the aforementioned items prior to scheduling any sprinkler work (e.g. drain downs, relocation of head, etc.). BXP's risk management review may take up to ten (10) business days. General Contractor should incorporate review time in its construction schedule.

2. The entire sprinkler system should be designed and installed in accordance with NFPA Pamphlet No. 13, 231 and 231C latest issues. If demolition is not immediately followed by a build out, General Contractor must turn up sprinkler heads as directed by BXP and in accordance with all applicable jurisdictional regulations and code requirements.

3. General Contractor must adhere to the following when designing the sprinkler system:

   Note #1: If concealed type sprinkler heads are to be utilized in office areas, the system must be designed as an Ordinary Hazard Group 1 System. If hybrid pendant installation exists (i.e., concealed, recessed, semi-recessed, etc. in one design), then Ordinary Hazard Group 1 System design always governs.

   Note #2: If determined by the definitions of NFPA Pamphlet No. 13 that the system is a light hazard designed system, the hydraulically most remote design area shall not be allowed a 40% reduction. The minimum design area shall be 1,500 square feet.

   Note #3: Partial renovation of space where majority of heads are not relocated:

   a. Since there is not a quick pendant sprinkler head with FM Approvals, BXP will allow use of a UL Listed quick response head when it also carries an FM Approval standard response (i.e., V3802 sprinkler head).

   b. General Contractor must provide BXP written confirmation that the existing heads within the same physical space are also existing quick response heads and the sprinkler system can support an ordinary hazard group 1 design. If the existing heads are standard response, then the heads must be designated as UL Listed and FM Approved.

   Note #4: Complete renovation of space where majority of heads are affected or relocated:

   a. Standard response head that is UL Listed and FM Approved is required.

   Note #5: Sprinkler work will not commence until BXP has received a copy of the sprinkler permit and BXP has approved the sprinkler shop drawings and product data (as well as calculations when necessary) as indicated above.

4. All buildings must be fully protected by automatic sprinkler systems in accordance with BXP's standards and specifications.

5. All sprinkler systems and equipment must be designed and installed in accordance with the current standards of the National Fire Protection Association.

6. All equipment, devices, materials, hangers, etc., used in the life safety system installation must be UL Listed and FM Approved.

7. Connections to the base building sprinkler system/standpipe riser shall be provided with a control valve and water flow alarm device. Sprinkler system control valves shall be UL Listed and FM Approved, clockwise closing, indicating valves with supervisory switches.

8. Enclosed, as Attachment A, is a copy of the "Guidelines for Managing Construction Project Fire Protection Impairments."

C. FIRE ALARM

1. General Contractor will not disconnect, tamper with, delete, obstruct, relocate, or expand any life safety equipment, except as indicated on drawings approved by BXP. General Contractor shall not interfere with or delay any other contractors' (or BXP's) inspections that are scheduled prior to the General Contractor's inspections or testing.

2. The General Contractor must take necessary precautions to prevent accidental fire alarms. General Contractor will be charged for all emergency response costs and penalty fees imposed by any authority having jurisdiction over the building for any accidental fire alarms caused by their activities. In the event of an increased likelihood of an accidental fire alarm by the General Contractor's activities, such as demolition, sprinkler work or hot work, the General Contractor must take steps needed to prevent accidental alarms, including but not limited to, monitoring the fire alarm panel for accidental alarms.

3. Any unit or device temporarily incapacitated must be red tagged "Out of Service" and BXP must be alerted prior to the temporary outage. Please refer to the procedures outlined in Attachment A for additional information.

4. The base building fire alarm system shall monitor all Tenant installed special fire extinguisher/alarm detection systems. The connections to the base building fire alarm system will be at the Tenant's expense.

5. All Tenant installed fire alarm initiation and notification devices that connect with the base building fire alarm system must match the base building system and must be approved by BXP.

6. All connections to the building's existing fire alarm system are to be made only by the subcontractor specified by BXP.

7. General Contractor shall perform a ring-down of the affected area, as well as a pre check of the functionality of all fire alarm devices. A report outlining any deficiencies must be submitted to BXP prior to commencement of work. Absent such report, any deficiencies found after commencement of work will be the responsibility of the Tenant and General Contractor to correct.

8. All fire alarm testing will be scheduled at least 72 hours in advance with BXP and must occur after normal business hours if the building is occupied.

9. Combustible and hazardous materials are not allowed to be stored in the building without prior written approval of BXP. Material safety data sheets on all materials to be stored in the building must be kept on site and a copy submitted to BXP.

10. Dust protection of smoke detectors must be installed and removed each day (if operational). Dust protection is required during construction to avoid false fire alarms and damaging of detector system. Filter media must be installed over all return air paths to any equipment rooms prior to demolition. The media must be maintained during construction and removed at substantial completion.

11. All corrective work to the fire alarm system due to the General Contractor's work shall be charged to the General Contractor.

12. Final tie-in of fire alarm work into the base building fire alarm system is to be made by the base building fire alarm contractor.

IV. MECHANICAL, ELECTRICAL, PLUMBING AND VOICE/DATA/LOW VOLTAGE CABLING

A. GENERAL

1. Before any new electrical or mechanical equipment is installed in the building, the General Contractor must submit a copy of the manufacturer's data sheets along with complete shop drawings and submittal to BXP for approval.

2. Any installation or modification to building HVAC or electrical systems must be first submitted to BXP for review. This includes base building systems as well as supplemental units and/or exhaust systems. The mechanical and electrical plans must be prepared by a licensed engineer and must show size and location of all supply and return grilles. BXP may require that its MEP engineer review the MEP drawings. In such an event, the Tenant will pay for the cost of the review and BXP will notify the Tenant prior to engaging BXP's engineer.

3. As required by code and BXP regulations, all telecommunications, data, access control, security, fire alarm, HVAC control, electrical lighting, electrical power, cable and other systems' wiring and piping which is not to be reused by Tenant and is not a part of other tenants' or base building systems, including but not limited to:

conduit, BX/MC cable, “plenum cable” (low voltage electric, telephone, data wiring), plumbing and/or mechanical piping shall be removed from the risers (including ceiling plenums, telephone, mechanical, utility and electrical closets and risers) and shall be removed back to the originating terminal block, panel board, wet stack or source as determined by BXP.

The installation of Tenant equipment (except emergency lighting per code) on the base building emergency power supply systems is not permitted.

4. BXP’s building engineering team shall complete a baseline multi-point inspection of the mechanical equipment within the Tenant space prior to (or immediately following) ceiling demolition by the General Contractor. It is the responsibility of the General Contractor to provide 48-hour written notice to BXP identifying when the ceiling demolition will be complete. Prior to commencement of construction, it is the responsibility of the General Contractor to document any mechanical equipment deficiencies and provide an associated report for BXP’s review. Failure to provide such report prior to the commencement of construction will require any corrections be the responsibility of the General Contractor, in order for BXP to be able to approve the final design and performance of system.

B. MECHANICAL

1. General Contractors modifying or relocating ductwork, air grilles, VAV boxes, etc. must balance the air and water systems as necessary. All air balancing must be done in the presence of BXP. Two (2) copies of all balance shall be submitted to BXP for review and approval.

2. All Test Adjust Balance contractors must be either NEBB or AABC. The following standard NEBB and AABC terminal unit data must be accounted for within the report:

    a. Manufacturer
    b. Terminal Type
    c. Terminal Model Number
    d. Terminal Size
    e. Identification/Designation
    f. Location (Typically an acceptable mechanical print mark up)
    g. DDC Address
    h. Fan Design CFM
    i. Fan Actual CFM
    j. Maximum Primary Air Design CFM

k. Maximum Primary Air Actual CFM

l. Minimum Primary Air Design CFM

m. Minimum Primary Air Actual CFM

n. DDC Maximum/Minimum CFM

o. Fan Speed (High, medium, low, variable, etc.)*

p. DDC Flow Correction/Calibration Factors**

q. For terminals with electric heat, the following shall also be provided:

   i. Provide design and actual KW
   ii. Voltage
   iii. Amperage
   iv. Entering and leaving temperature readings from terminal

* Note: Item o. Fan Speed – Log fan control voltage (from speed controller) for PSC motors, log control DCV to ECM motors.

** Note: Item p. DDC Flow Correction/Calibration Factors – Verify factor via manufacturer's published inlet velocity ring DP vs. CFM graphs. Provide reference graph with report.

To reduce the possibility that a balance report is rejected, we suggest the Test Adjust Balance Contractor submit a sample report in advance of its work for BXP's approval.

3. Exhaust fans discharging air directly into the ceiling plenum are for room-generated heat transfer applications only. Air cooled condensers and fans used for toilet, smoking, or chemical fumes' exhaust shall not be permitted to be discharged into the ceiling plenum.

4. Tenant-installed supplemental HVAC units and certain utility intensive equipment are required to have an electric and/or water submeter. Absent such submeter, Tenant may incur a flat rate electricity and/or water charge which is to be paid by the Tenant based on anticipated consumption.

   Meter Specifications:

   - Electrical Submeter – EMON Class 3400 with expanded feature package and type 3 communications BACnet MS/TP.

   - Water Meter – Badger Recordall Disc Meter with remote reader and pulse output.

   Units: DC – cubic feet (cf); MD – gallons (gal); VA – gallons (gal).

Note: General Contractor to be responsible for the full installation including low voltage connections from submeter to building metering network.

5. All base building mechanical equipment shall be properly protected with pre-filters, dust covers etc. prior to start of work. Protection shall be removed and equipment wiped down at completion.

6. Energy management and building control work is to be performed by the base building controls contractor (see attached building specific rider for details).

7. Tenant installed equipment that supplements existing base building equipment such as VAV boxes, fire alarm devices, control work, etc. shall be identical to the existing base building equipment to facilitate warranty and maintenance operations.

8. All concealed equipment shall be located with necessary accessibility for maintenance and repair.

9. Tenant shall engage MEP engineer to perform inspection of above ceiling conditions, prior to the General Contractor's scheduled ceiling close-in inspection. MEP engineer to provide field report of such inspection findings to BXP, prior to ceiling close-in completion.

10. General Contractor shall contact BXP 48 hours in advance for BXP wall and ceiling close-in inspections. All items noted in BXP and MEP engineer ceiling inspection reports must be corrected by General Contractor prior to ceiling close-in completion.

C. ELECTRICAL

1. Receptacles shall not be installed with building envelope.

2. All circuit breaker panels must be clearly and accurately identified with typed labels and directories.

3. All wiring run outside of Tenant-demised area and in core rooms (i.e. below slab, electrical room, mechanical room or where exposed) shall be in rigid conduit.

D. PLUMBING

1. Any domestic or condenser water connections made to the building's piping system must include a high-quality isolation valve (e.g., brass bodied gate or ball-type) and adequate system drain valves. If the system piping is of a different material a dielectric union must be installed. All valves and equipment must be easily accessible; access doors are required in drywall or other fixed construction.

2. Compression (aka ferrule), ProPress, shark bite (aka push to connect) fittings are not permitted at any plumbing connection. Viega ProPress System Fittings: Only in very limited and justified circumstances will ProPress fittings be permitted for use (e.g., fire hazard, leaking supply lines, etc.). A specific written request with justification for the circumstances must be submitted to BXP for review and approval prior to use in any circumstances.

3. All new piping points of connection to existing domestic or condenser water must match the base building system connection methods, fitting types, and pressures. Saddle taps are not permitted. Refer to Hot Work Permit Section from Property Management Team prior to commencement of work.

4. General Contractor shall provide leak detection system and automatic shut off system to stop flow of domestic cold and hot water to associated plumbing equipment (e.g. sinks, water heater, ice maker, dishwasher, shower, etc.). Request specifications from BXP for building-specific leak detection requirements and sequence of operation.

5. Sanitary Sewer Clean Outs: In-floor cleanouts are required for use with sanitary piping laterals serving kitchens, bathrooms, cafeterias, fitness centers and other high volume plumbing areas. Clean out provisions in ceiling of the space below (below slab) are not acceptable.

E. VOICE/DATA/LOW VOLTAGE CABLING

All wiring/cabling run outside of Tenant-demised area and in core rooms (i.e. below slab, electrical room, mechanical room or where exposed) shall be in rigid conduit.

V. PARKING – LOADING DOCK

A. Contractors, subcontractors and their personnel will not use the loading dock area for daytime parking. BXP may permit at its discretion parking at the loading dock. Unauthorized vehicles will be ticketed and towed.

B. Use of the loading dock for deliveries/trash removal must be scheduled through BXP a minimum of 48 hours in advance.

C. Material that does not fit into the service elevator must be delivered through a window opening. The contractor will be required to properly remove and replace the glass and adequately protect the window framing. General Contractor must use the base building glass contractor and request prior approval and scheduling from BXP.

VI. UTILITIES

A. All inside utilities (i.e. electric, natural gas, water, sewer, telephone, cable, condenser water) must not be disconnected or interrupted without first notifying BXP (except in

emergencies). A minimum of 48-hour notice and written permission from BXP must be provided and attained, respectively.

B. In unoccupied Tenant space under construction or control by the General Contractor, the General Contractor shall turn off all lights, except emergency lighting, at the end of each workday. In the event the General Contractor fails to turn off the non-emergency lighting at the end of each workday, the General Contractor will be invoiced for the excess electric consumption at the rate of $0.01 per square foot, per day.

VII. SECURITY

A. The General Contractor will be responsible for controlling any keys or access cards furnished by BXP and will return them to BXP at the completion of construction. There will be a charge to the General Contractor for lost or unreturned access fobs/key cards.

B. At the completion of the workday, the General Contractor will be responsible for locking all base building areas that were made available by BXP.

C. ID Badges: If requested, contractors may be required to wear identification badges.

VIII. ELEVATORS

A. PASSENGER ELEVATOR

1. Passenger elevators will not be used to move construction material or construction personnel. During full floor construction, General Contractor must protect all passenger elevator openings, jambs, call lanterns, call buttons, sills, etc. Lack of protection of the elevator may result in back charges (e.g. service calls, shaft or machine room cleaning, etc.). General Contractor must coordinate with BXP for locking off of passenger elevator access to the floor for the duration of construction.

2. All work on any component of the elevators, inside or outside the cab must be performed by BXP's base building elevator contractor. This includes moving, removing/installing, relocating and/or shifting call buttons and/or indicator lights to install new wall finish. If it is determined by BXP that elevator work as noted above was performed by anyone other than BXP's base building elevator contractor, the General Contractor will be responsible for all repairs, inspections and testing, etc. as determined by BXP's base building elevator contractor to ensure the equipment is functioning normally. All costs associated with the repair, replacement and inspections, etc. will be the responsibility of the General Contractor and/or Tenant.

B. SERVICE ELEVATOR

The service elevator can be used to move construction personnel at any time during the day, provided the elevator doors are not held open. The service elevator cannot be used

to move construction materials, furniture, furnishing or equipment into the building during building operating hours unless approved in writing by BXP. All other usage must be scheduled with BXP with at least 48 hours advance notice. General Contractor shall protect the service elevator's walls with homasote and plywood. In some instances, corex and masonite may be permitted at BXP's discretion. Any costs to repair damage to the elevators including dust or dirt in machine rooms or shaft or costs for service calls resulting from the General Contractor's operations will be charged to the General Contractor.

IX. CLEANING

A. The General Contractor will remove all trash and debris daily or as often as necessary to maintain cleanliness in the building(s). The building trash compactors or containers may not be used for construction debris.

B. Walk-off mats or other protection must be provided at door entrances where work is being performed.

C. Carpeting must be protected by masonite or corex as necessary to maintain cleanliness and to protect carpets from damage.

D. Tile, terrazzo, stone and wood floors must be protected from damage.

E. General Contractor will furnish a vacuum(s) with a supply of clean bags and an operator to facilitate ongoing clean- up.

F. Trash removal will be scheduled and coordinated with BXP.

G. Contractors must remove all food cartons and related debris from the work area on a daily basis.

H. Driveway and street cleaning by General Contractor will be required when General Contractor's work has created mud or debris.

ATTACHMENT A

GUIDELINES FOR MANAGING CONSTRUCTION PROJECT FIRE PROTECTION IMPAIRMENTS

I. IMPAIRMENTS

Impairments to the building sprinkler and fire alarm systems are typically required when renovations involve changes to these systems. The following impairment procedures must be adhered to whenever impairments to the sprinkler or fire alarm systems are required or encountered.

General Contractors requiring an impairment shall follow these steps:

1. Request a Red Impairment Tag from BXP's Impairment Coordinator and be prepared to fulfill the responsibilities assigned to the General Contractor.

2. Assist the Impairment Coordinator in completing the Pre-Impairment Checklist part of the Red Impairment Tag (Part A).

3. The "hard copy" of the Red Impairment Tag is placed on the impaired equipment.

4. Upon completion of work and/or to release the impairment the General Contractor shall return the Red Impairment Tag "hard copy" to the Impairment Coordinator.

5. The General Contractor and Impairment Coordinator place both parts of the tag together and complete the system restoration checklist (Part B) including signing off that the restoration is complete.

Enclosed as Attachment A-1 is a copy of the Impairment Tag. Important points are as follows:

- A Red Tag Permit is required for any impairment of the sprinkler / fire alarm systems.

- Each permit will be valid for one shift.

- Plan all work to minimize the duration of the system(s) impairment.

- The actual impairment of the system(s) should not take place until all personnel, material and equipment are at the work location.

- If possible, isolate only the work zone for impairment. System(s) must be restored at the end of the work shift.

- Impairments to large areas or that would affect primary life safety system(s) should be scheduled for times when the building or area is unoccupied. Fire watch tours of the impaired area shall be established and if applicable, personnel should be provided at closed valves or fire pumps to quickly restore the system if a fire occurs.

- Hot work or other hazardous-type operations shall not be conducted in an area where the fire protection or life safety system(s) are impaired.

- If any hot work or hazardous operations are necessary as part of the impairment, fire watches must be established.

II. HOT WORK

Hot Work Permit is required for any temporary operation producing open flame or sparks. This includes brazing, cutting, grinding, soldering, pipe thawing, torch applied roofing and welding.

General Contractors requiring a hot work permit shall follow these steps:

1. Request a Yellow Hot Work Permit from BXP's Impairment Coordinator and be prepared to fulfill the responsibilities assigned to the General Contractor, adhering to Attachment A-3, BXP Operational Guidelines.

2. Assist the Impairment Coordinator in completing Part A of the Yellow Hot Work Permit.

3. The "hard copy" of the Yellow Hot Work Permit is placed at the work location.

4. Upon completion of the hot work, the General Contractor shall complete Part B of the Yellow Hot Work Permit and return the "hard copy" to the Impairment Coordinator.

5. The General Contractor and Impairment Coordinator place both parts of the tag together and sign off/close the Yellow Hot Work Permit.

Enclosed as Attachment A–2 is a copy of the Hot Work Permit. Important points are as follows:

- If there is a practical and safer way to do the job without hot work and that is approved in advance by BXP, that method should be used.

- No hot work is permitted without authorization from BXP's representative serving as the fire safety supervisor / impairment coordinator, in the form of a signed hot work permit. This permit will be valid for a maximum of one eight-hour shift. After this time, another permit must be obtained from and signed by the fire safety supervisor / impairment coordinator, before any additional hot work can continue.

- Specific firefighting equipment and protection material will be required at the hot work site before work starts. General Contractor shall provide all equipment and protection required to ensure fire safe operations or otherwise specified by BXP.

- No hot work is permitted without a designated fire watch present. The General Contractor is responsible to provide necessary personnel to conduct a fire watch for

four (4) hours after the hot work has been completed. The subcontractor completing the work will monitor the work the 1st hour with the General Contractor monitoring the last 3 hours. The four (4) hour fire watch overrides the timeframe indicated on the sample hot work permit. The General Contractor will notify BXP upon completion of the hot work and that the four (4) hour fire watch has commenced. If unsafe conditions are observed, the hot work operation will be stopped until the hazard is neutralized or eliminated. Additionally, the fire safety supervisor/impairment coordinator must be notified immediately of all unsafe or hazardous conditions.

- The General Contractor will verify that all equipment associated with the hot work is in proper working order. An inspection of the equipment may be conducted by the fire safety supervisor/impairment coordinator before the hot work permit is issued. Any unsafe equipment must be removed from the property and replaced prior to starting hot work.

- All contractor-owned equipment or materials stored in the facility overnight must be properly secured in an area designated by the fire safety supervisor/impairment coordinator.

- A sprinkler impairment and hot work in the same zone at the same time will not be allowed.

ATTACHMENT A-1

IMPAIRMENT TAG

Revision 01/02

bxp Boston Properties

Impairment Tag

CONTROL NUMBER 283351

Property: _____ Area: _____

System(s): _____ Equip. I.D. #: _____ Date: _____

All items in Part A should be completed prior to any fire protection or life safety system impairment with the exception of impairments conducted as part of a documented routine test procedure where the systems(s) can be immediately restored by standby personnel. Part B should be completed as part of the restoration procedure.

PART A: PRE-IMPAIRMENT

	Yes	No	N/A
1. Boston Properties□ Impairment Guidelines have been reviewed?			
2. Was this impairment planned?			
3. Scope of impairment has been reviewed with property management?			
4. Work will be performed continuously until protection is restored?			
5. The following notifications have been made: Impairment Database Fire Department Fire Alarm Monitoring Company Security Tenants			
6. Hazardous operations have been terminated (Hot Work)?			
7. Additional fire extinguishers/charged hose lines have been located in impairment work area?			
8. Security rounds have been modified to include impairment area/increased rounds?			
9. Impairment tags have been completed and placed on impaired systems?			

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____
Impairment Coordinator

PART B: SYSTEM RESTORATION

	Yes	No	N/A
1. All systems have been restored?			
2. Work area has been inspected and found to be satisfactory?			
3. Operational test of system has been completed with satisfactory results?			
4. All parties notified in Part A, Section 5, have been notified that system(s) are restored?			
5. Tags and status boards have been cleared?			
6. Any fire equipment displaced has been returned to original location?			

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____
Impairment Coordinator

RETAINED BY IMPAIRMENT COORDINATOR

(second page of tag is identical and is placed on impaired equipment)

ATTACHMENT A-2

HOT WORK PERMIT

bxp **Hot Work Permit**

CONTROL NUMBER 298701

All items in Part A should be completed prior to the start of any hot work operations. Part B should be completed as part of the restoration procedure at completion of the hot work operation.

Building: _____ **Date:** _____

Location: _____

Description of Work: _____

Work Approved to be Done from: **to:**

PART A

	Yes	No	N/A
1. Boston Properties Hot Work Guidelines have been reviewed?			
2. Has smoke detection system in area been arranged to prevent unnecessary alarms as a result of hot work?			
3. Scope of work has been reviewed with Property Manager, Hot Work Coordinator, Impairment Coordinator and Chief Engineer?			
4. Sprinkler systems in service?			
5. Equipment to be used in hot work is in good condition?			
6. Flammable/combustible liquids and explosive atmospheres removed/eliminated?			
7. Combustibles finishes/furnishings removed or covered with fire resistant material?			
8. Combustibles on opposite side of wall moved away?			
9. Wall and floor openings covered, protective curtains in place?			
10. Air transfer equipment arranged to prevent products of combustion from getting into occupied areas?			
11. Ventilation acceptable for hot work area?			
12. Fire watch in place with portable communications device and portable fire extinguishes.			
13. Emergency reporting instructions have been provided to fire watch?			
14. Hot Work Coordinator has reviewed and approved start of work?			

Fire Watch: _____ Date: _____

Hot Work Coordinator: _____ Date: _____

PART B

	Yes	No	N/A
1. Area has been inspected by fire watch at completion of work? Record time of inspection: _____			
2. Continuous fire watch of area has been maintained for 60 minutes after work was completed? Record time: _____			
3. Periodic inspection of area has been conducted for four hours after work was completed? Record final time: _____			
4. All fire protection and building systems restored to normal operations?			
5. Property Manager, Hot Work Coordinator, Impairment Coordinator and Chief Building Engineer notified of completion?			

Fire Watch: _____ **Date:** _____

Hot Work Coordinator: _____ **Date:** _____

RETAINED BY HOT WORK COORDINATOR Page 1 of 2 Rev/ 3/02

(second page of tag is identical and placed at site of hot work)

ATTACHMENT A-3

OPERATIONAL GUIDELINES

I. Hot Work Project Planning

Hot work may be conducted as a repair measure or on a larger scale during construction or tenant buildouts. Historically, hot work operations have contributed significantly in large loss fires. In order to prevent losses, the following guidelines are provided for your consideration in managing hot work projects:

1. If possible, hot work should be scheduled for periods when the building is unoccupied.

2. Plan all work to minimize the exposure to fire. If possible, remove and relocate system/equipment component(s) to be worked on to an exterior area or an area designated for hot work.

3. Hot work should not take place until all personnel, material and equipment are at the work location and all approvals have been provided.

4. Do not conduct hot work in an area where the sprinkler system is impaired. If the hot work must be conducted in an area of sprinkler impairment or if sprinklers are not installed, hose lines and/or other special arrangements should be made in addition to these operational guidelines.

5. Smoke detection devices should be reviewed in area of hot work. Steps to prevent activation of the fire alarm system due to hot work should be taken. Smoke detection devices sharing sprinkler waterflow alarm zones should not be zoned out.

6. Special attention to the transfer of flying sparks to adjacent areas should be evaluated and controlled. Consideration should be given to floor and wall openings and air transfer systems.

7. Building furnishings and interior finishes may have inflammatory characteristics that are unknown and should be covered with resistant materials.

8. The products of combustion from hot work may become a problem if large concentrations are accumulated in an area without proper ventilation.

9. The products of combustion from hot work may become a problem if they are transferred into occupied tenant areas by the air handling equipment or other building ventilation systems. All systems should be arranged to prevent transfer of products of combustion.

10. Hot work in or near air handling units should be conducted when building is not occupied and the unit should be shut off.

11. Spare fire extinguishers should be used to support fire watch operations. Relocation of existing building fire extinguishers may cause delay in others trying to retrieve extra units from known locations. The proper class of fire extinguisher should be selected based on combustibles in area and building construction.

12. Communication systems for reporting fire emergencies should be available to the fire watch and tested prior to the start of the job.

ATTACHMENT A-3

OPERATIONAL GUIDELINES

Step	Responsibility	Action
1.	**Hot Work Coordinator (HWC)**	• Manages all hot work projects as follows: ➢ coordinates hot work with property management. ➢ reviews scope of work. ➢ reviews hot work permit. ➢ reviews contractor's hot work program and monitors activities related to meeting Boston Properties' requirements. ➢ secures/reviews permits required by local authority having jurisdiction. • Directs staff in monitoring of project. • Completes all items on yellow Hot Work Permit tag (Part A) - [contact risk management for additional tags] • Inspects area where hot work will be performed prior to the start of the work. • Inspects condition of equipment to be used to perform hot work to determine that it is in good condition. • Verifies that fire watch personnel are trained in: ➢ preparing the area for hot work. ➢ following emergency guidelines for Fire/Explosion. ➢ operating portable fire extinguishers. ➢ implementing fire watch responsibilities. • Verifies that the sprinkler system in the area is not impaired and that additional portable fire extinguishers are brought to the area for use by the fire watch. • Posts yellow Hot Work Permit work tag(s) in area. • Implements Impairment Guidelines as required.
2.	**Property Manager**	• Coordinates with the HWC, engineering staff, contractors and tenants as necessary. • Notifies tenants of the project if it will affect their operations. • Terminates or suspends any operations that threatens the safety of the occupants of the building or could cause damage to the property.
3.	**Chief Building Engineer**	• Reviews scope of work and supports project as required.

II. Fire Watch

Note: If contractor fire watches are being provided, they must meet the minimum standards as outlined below.

Step	Responsibility	Action
1.	**Fire Watch**	• Verifies that the HWC has inspected area and that yellow Hot Work Permit tag (Part A) has been completed and signed. • Maintains area free of combustible material as indicated on yellow Hot Work Permit tag (Part A) • Verifies that all floor openings and communicative openings to adjacent areas are covered/closed. • Maintains portable fire extinguisher ready for use and has, at a minimum, one back-up extinguisher. • Maintains a two-way radio, telephone or other means of quickly reporting a fire emergency. Emergency telephone numbers should be in possession of fire watch. • Conducts visual surveillance of the hot work area for possible sparks or fires during work. • Conducts inspections of the work area at the completion of work.
2.	**HWC**	• Inspects work area at least once during the workday. • Implements corrective actions as necessary. • Suspends work if sprinkler system in area becomes impaired.

III. Post-Job Inspection and Review

Step	Responsibility	Action
1.	**Fire Watch**	• Verifies that all equipment used to perform hot work has been properly secured and/or removed from area. • Conducts inspection of work area and adjacent areas at conclusion of hot work to look for sparks or smoldering fires. • Restores all fire protection and building systems to normal operation and notifies Impairment Coordinator of system(s) status. • Conducts follow-up inspection of area for four hours after the completion of work. • Removes yellow Hot Work Permit tag at conclusion of final inspection (four hours). • Completes yellow Hot Work Permit tag (Part B). • Notifies the HWC.
2.	**HWC**	• Inspects area. • Reviews completed yellow Hot Work Permit tag (Part B). • Completes Impairment Guidelines as necessary. • Notifies Property Manager and Chief Engineer of job completion. • Maintains completed yellow Hot Work Permit tag(s) in file.

BXP
Capital Gallery

RULES FOR CONTRACTORS WORKING IN OCCUPIED BUILDINGS – BUILDING SPECIFIC RIDER

Building Address: 600 Maryland Avenue SW, Washington DC 20024

Hours of Operation:

Monday – Friday:	7:00 AM to 7:30 PM
Saturday:	9:00 AM to 2:00 PM

Required Contractors and Vendors

Access Control:	Datawatch Systems, Inc. Stephanie Doggett Phone: (301) 280-4333 Cell: (301) 370-5798 sdoggett@datawatchsystems.com
Base Building Structural Engineer:	KCE Structural Engineers, P.C. Phone: (202) 833-8622
Elevator Service:	Otis Elevator Phone: (301) 324-4140
Exterior Glazing:	Dominion Glass Phone: (703) 378-8329
Fire Alarm Tie-Ins:	Freestate Electric Phone: (301) 230-3868
HVAC Controls:	Siemens (West Building) Justin Hare Phone: (301) 837-2598 Email: justin.hare@siemens.com EMS (East Building) Phone: (301) 858-0220
Locksmith	Lock Technology Phone: (301) 345-8300
Roofing Installer:	Prospect Roofing

	Phone: (703) 450-2355
Roofing Manufacturer:	_____
Base Building Structural Engineer:	Mark J. Tamaro, P.E., LEED AP Thornton Tomasetti Phone: 202-580-6300 Direct: 202-580-6348 Fax: 202-580-6301 Cell: 202-997-1625 MTamaro@ThorntonTomasetti.com

Recommended TAB Contractors:

1. Comfort Control – (301) 931-9300 – contact: Darren Aley
2. Metro T&B – (301) 808-3660 – contact: James M. Noto
3. Seneca Balance, Inc. – (410) 665-1281 – contact: Eric Fleischer

Special Conditions:

1. No parking at loading dock (at any time) without Property Management approval.
2. Large deliveries must be performed after-hours and scheduled in advance with the Property Management office.
3. After hours work may require a Boston Properties or security escort. Tenant responsible for costs associated with after hours services.
4. After hours work requiring Boston Properties engineering staff assistance must be scheduled at least 48 hours in advance with Property Management.

APPENDIX C:

Product Data

Single zone

Single Zone

☐ Show simple view

System Name and Number	Condition Analyzed (impacts Ez)	Occupancy Category	Zone Floor Area *Az* (sq ft)	Are you using default value for zone population?	Zone Population *Pz* people	People Outdoor Air Rate *Rp* (cfm per person)	Area Outdoor Air Rate *Ra* (cfm per sq ft)	Breathing Zone Outdoor Airflow *Vbz* (cfm)	Zone Air Distribution Effectiveness *Ez*	Zone Outdoor Airflow *Voz* (cfm)	Outdoor air intake flow provided (measured or design) (cfm)
								(Rp Pz + Ra Az)		Vbz / Ez	
East Tower 4th Floor North (partial)	Cooling	Office space	13,399	No	145.00	5.00	0.06	1528.94	0.80	1,911	1,950

80% population diversity

amount of ventilation air available for the project area's percentage of the total area served by the central AHUs

Summary

Note: All information on this tab is READ-ONLY. To edit, see the previous tab(s).

☑ Show simple view

System Name and Number	System Type	All zones included in the VRP calculation?	Condition Analyzed	System Floor Area *As* (sq ft)	System Population *Ps* (people)	Outdoor Air Intake Flow (required by 62.1) *Vot* (cfm)	Outdoor Air Intake Flow Provided (measured or design) (cfm)	Outdoor air intake flow provided meets or exceeds Vot?	Zone outdoor airflow provided meets or exceeds Voz for all zones?
Single Zone Systems									
East Tower 4th Floor North (partial)	Single zone	n/a	Cooling	13,399	145.00	1,911	1,950	Yes	n/a
Multiple Zone Systems									
100% Outdoor Air Systems									
Totals				13,399	145.00	1,911	1,950		

Level	Space Description	Interior (Note 1)	Area (sq. ft.)	Greater of VMC 2015 or Trace People/ 1000 SF	TRACE Building Loads (Btu)	WSHP Capacity (Btu)	TRACE Building Loads (cfm)	Selected CFM (Note 2)	cfm/ sqft	Outdoor Air Calculation for Zones - From VMC 2015 Chapter 4							
										VMC Space Type	CFM/ Pers.	CFM/ sq.ft.	E_z Effectiveness	$P_z \times R_p$	$A_z \times R_a$	OA V_{oz}	AHU Fraction OA/SA Z_p
4	4000E - RECEPTION	X	535	30	8,674	0	224	680	1.27	Reception areas	5	0.06	0.80	85	32	146	0.22
4	4071E - 2P OFFICE		198	11	3,129	6,200	0	100	0.51	Office spaces	5	0.06	0.80	10	12	27	0.27
4	4068E - FOCUS	X	111	25	889	0	23	100	0.90	Break rooms	5	0.06	0.80	15	7	27	0.27
4	4069E - 2P OFFICE		195	11	3,101	6,200	0	200	1.03	Office spaces	5	0.06	0.80	10	12	27	0.14
4	4066E - COPY/PRINT/MAIL	X	157	4	3,709	0	96	200	1.27	Copy, Printing Rooms	5	0.06	0.80	5	9	18	0.09
4	4067E - 3P OFFICE		198	16	3,134	6,200	0	200	1.01	Office spaces	5	0.06	0.80	15	12	34	0.17
4	4064E - FOCUS	X	101	40	919	0	24	200	1.98	Break rooms	5	0.06	0.80	20	6	33	0.16
4	4065E - 1P OFFICE		146	7	2,373	6,200	0	100	0.68	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4062E - FOCUS	X	58	25	544	0	14	100	1.74	Break rooms	5	0.06	0.80	10	3	17	0.17
4	4063E - 1P OFFICE		145	7	2,350	6,200	0	100	0.69	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4060E - FOCUS	X	83	49	748	0	19	185	2.23	Break rooms	5	0.06	0.80	20	5	31	0.17
4	4061E - 1P OFFICE		144	7	2,327	6,200	0	100	0.69	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4CR04E - CORRIDOR	X	1115	0	8,490	0	220	500	0.45	Corridors	0	0.06	0.80	0	67	84	0.17
4	4059E - 1P OFFICE		146	7	2,352	6,200	0	100	0.68	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4057E - 1P OFFICE		144	7	2,325	6,200	0	100	0.69	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4048E - 1P OFFICE	X	123	9	1,049	0	27	100	0.81	Office spaces	5	0.06	0.80	5	7	15	0.15
4	4053E - 1P OFFICE		137	8	2,256	6,200	0	100	0.73	Office spaces	5	0.06	0.80	5	8	17	0.17
4	4046E - 1P OFFICE	X	139	8	1,176	0	30	100	0.72	Office spaces	5	0.06	0.80	5	8	17	0.17
4	4051E - 3P OFFICE		208	15	3,361	6,200	0	200	0.96	Office spaces	5	0.06	0.80	15	12	34	0.17
4	4044E - 1P OFFICE	X	154	7	1,419	0	37	100	0.65	Office spaces	5	0.06	0.80	5	9	18	0.18
4	4049E - 3P OFFICE		257	12	8,121	6,200	50	200	0.78	Office spaces	5	0.06	0.80	15	15	38	0.19
4	4047E - 2P OFFICE		134	15	4,532	6,200	0	100	0.75	Office spaces	5	0.06	0.80	10	8	23	0.23
4	4040E - CONFERENCE	X	654	50	16,946	0	438	800	1.22	Conference Rooms	5	0.06	0.80	165	39	255	0.32
4	4045E - 2P OFFICE		137	15	4,571	6,200	0	100	0.73	Office spaces	5	0.06	0.80	10	8	23	0.23
4	4050E - 1P OFFICE	X	129	8	1,174	0	30	100	0.78	Office spaces	5	0.06	0.80	5	8	16	0.16
4	4043E - 2P OFFICE		144	14	4,792	6,200	0	100	0.69	Office spaces	5	0.06	0.80	10	9	23	0.23
4	4041E - 2P OFFICE		144	14	4,822	6,200	0	100	0.69	Office spaces	5	0.06	0.80	10	9	23	0.23
4	4016E - FLEX	X	300	25	2,889	0	75	170	0.57	Break rooms	5	0.06	0.80	40	18	73	0.43
4	4039E - 3P OFFICE		219	14	7,013	6,200	21	200	0.91	Office spaces	5	0.06	0.80	15	13	35	0.18
4	4014E - STORAGE	X	492	5	2,558	0	66	165	0.34	Office spaces	5	0.06	0.80	15	30	56	0.34
4	4037E - 1P OFFICE		157	7	5,304	6,200	0	100	0.64	Office spaces	5	0.06	0.80	5	9	18	0.18
4	4035E - WAITING AREA		151	30	5,211	6,200	0	200	1.32	Reception areas	5	0.06	0.80	25	9	43	0.21
4	4008E - 2P OFFICE	X	112	18	952	0	25	100	0.89	Office spaces	5	0.06	0.80	10	7	21	0.21
4	4033E - DIRECTOR'S OFFICE		351	6	9,180	6,200	77	200	0.57	Office spaces	5	0.06	0.80	10	21	39	0.19
4	4006E - 2P OFFICE	X	112	18	951	0	25	100	0.89	Office spaces	5	0.06	0.80	10	7	21	0.21
4	4031E - 1P OFFICE		143	7	5,374	6,200	0	100	0.70	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4004E - 2P OFFICE	X	112	18	952	0	25	100	0.89	Office spaces	5	0.06	0.80	10	7	21	0.21
4	4020E - OPEN OFFICE		2255	8	31,737	6,200	660	1,400	0.62	Office spaces	5	0.06	0.80	80	135	269	0.19
4	4002E - CONFERENCE	X	280	50	7,164	0	185	800	2.86	Conference Rooms	5	0.06	0.80	70	17	109	0.14
4	4CR01E - CORRIDOR	X	992	0	7,979	0	206	500	0.50	Corridors	0	0.06	0.80	0	60	74	0.15
4	4018E - PANTRY	X	665	2	16,197	0	419	400	0.63	Kitchenette	7.5	0.18	0.80	8	120	159	0.40
4	4017E - 1P OFFICE		148	7	5,626	6,200	0	100	0.68	Office spaces	5	0.06	0.80	5	9	17	0.17
4	4015E - 1P OFFICE		142	15	5415	6,200	0	100	0.70	Office spaces	5	0.06	0.80	10	9	23	0.23
4	4013E - 3P OFFICE		219	14	7,868	6,200	43	200	0.91	Office spaces	5	0.06	0.80	15	13	35	0.18
4	4011E - 2P OFFICE		186	11	6,838	6,200	17	100	0.54	Office spaces	5	0.06	0.80	10	11	26	0.26
4	4009E - 2P OFFICE		178	12	6,389	6,200	5	100	0.56	Office spaces	5	0.06	0.80	10	11	26	0.26
4	4007E - 2P OFFICE	X	116	18	1,053	0	27	100	0.86	Office spaces	5	0.06	0.80	10	7	21	0.21
4	4005E - 2P OFFICE	X	116	18	1,055	0	27	100	0.86	Office spaces	5	0.06	0.80	10	7	21	0.21
4	4003E - 2P OFFICE	X	117	18	1,054	0	27	100	0.85	Office spaces	5	0.06	0.80	10	7	21	0.21
4			**13399**	**13**				**10,500**	**0.78**				**0.80**	**858**	**884**	**2,177**	**1.04**
	Filter Totals:		**13,399**				**1,581**		**0.78**		Total Uncorrected Outside Air Flow:			**858**	**884**	**2,177**	**CFM**
	Totals:		**13,399**				**1,581**		**1**		80% Diversity Corrected Outside Air Flow:			**686**	**884**	**1,962**	**CFM**

VRP Calculation Notes:

General:
Ventilation calculations are based on the larger airflow rate of either ASHRAE 62.1-2013 Table 6.2.2.1 or VMC 2015 section 403.3.

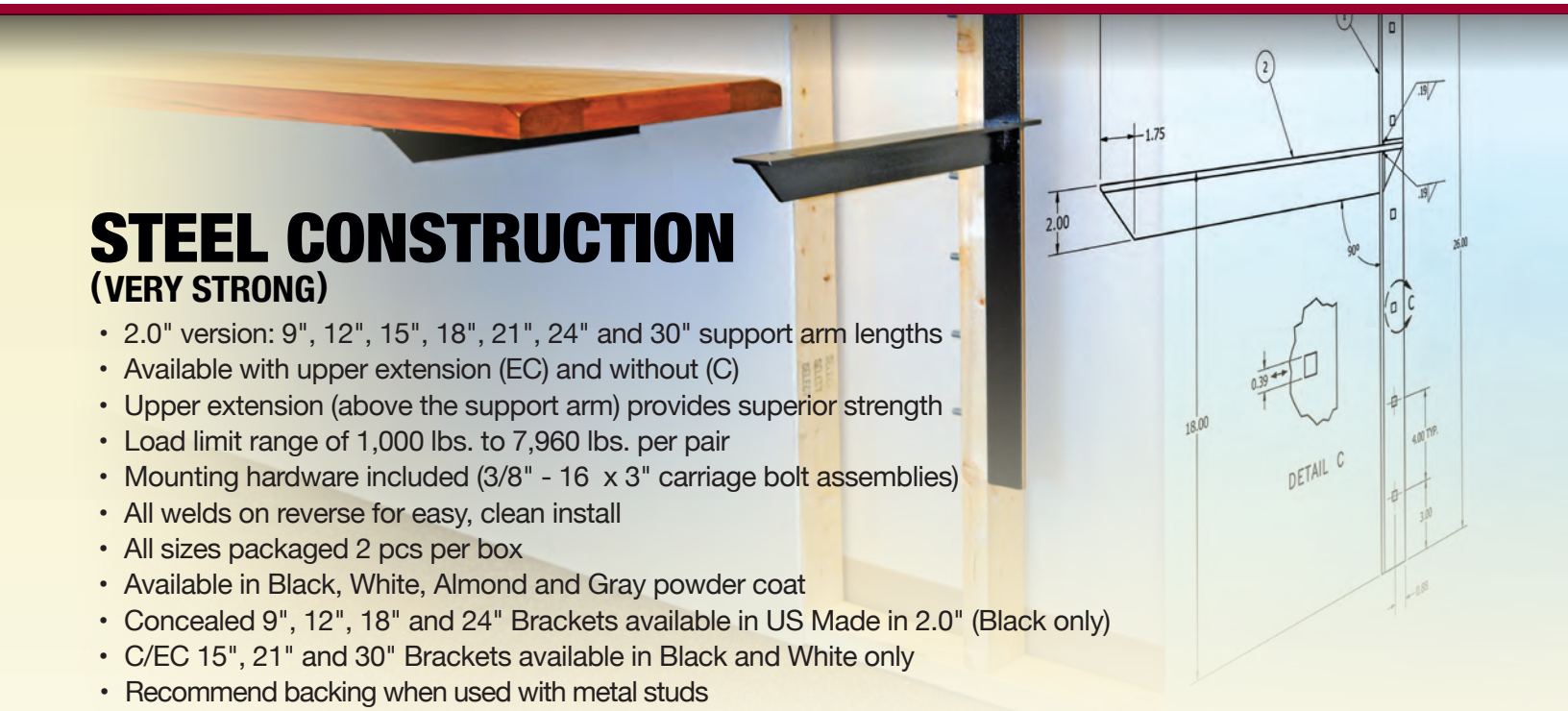
1. Interior spaces have a factor of 1.54 applied to their zone airflow because of the desire to reset the supply air temperature from 55°F to 62°F.
2. Selected airflow is the max of calculated airflow or overridden airflow.
3. Overridden airflow is a minimum of 0.25 cfs/sf of air for corridors.
4. VAV controller minimum is the minimum airflow a standard VAV controller can see with stable accuracy.
5. Minimum 20% airflow is allowed per ASHRAE 90.1-2013 paragraph 6.5.2 exception 2. Other minimum airflows have been calculated per exception 2, and the calc demonstrates that these higher minimums reduce overall system annual energy usage by reducing outdoor air intake.
6. Spaces with less than 40 sf/person are considered high occupancy and require CO2 sensors for LEED.
7. This is the zone primary airflow Zpz, which is the lowest airflow value expected at the design condition analyzed (heating).

Bookmark Summary

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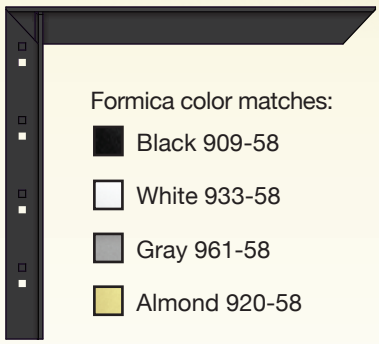
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2.0" CONCEALED BRACKETS



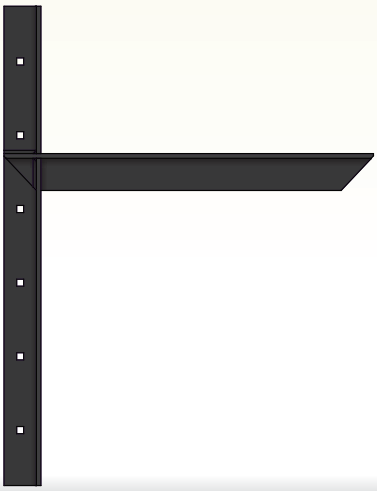
STEEL CONSTRUCTION
(VERY STRONG)

- 2.0" version: 9", 12", 15", 18", 21", 24" and 30" support arm lengths
- Available with upper extension (EC) and without (C)
- Upper extension (above the support arm) provides superior strength
- Load limit range of 1,000 lbs. to 7,960 lbs. per pair
- Mounting hardware included (3/8" - 16 x 3" carriage bolt assemblies)
- All welds on reverse for easy, clean install
- All sizes packaged 2 pcs per box
- Available in Black, White, Almond and Gray powder coat
- Concealed 9", 12", 18" and 24" Brackets available in US Made in 2.0" (Black only)
- C/EC 15", 21" and 30" Brackets available in Black and White only
- Recommend backing when used with metal studs



Formica color matches:

- Black 909-58
- White 933-58
- Gray 961-58
- Almond 920-58



2.0" Concealed Brackets - 9" to 30" Support Arm
Mounting Hardware Included - (3/8" - 16 x 3" carriage bolt assemblies)

	2 - 58 Per Bracket		60+ Per Bracket		
Bracket Size	USA	Import	USA	Import	Pcs/Wgt/Box*
C(2.0)9					2 pcs/11 lbs
C(2.0)12					2 pcs/12 lbs
C(2.0)15					2 pcs/13 lbs
C(2.0)18					2 pcs/18 lbs
C(2.0)21					2 pcs/19 lbs
C(2.0)24					2 pcs/22 lbs
C(2.0)30					2 pcs/27 lbs

2.0" Extended Concealed Brackets - 9" to 30" Support Arm
Mounting Hardware Included - (3/8" - 16 x 3" carriage bolt assemblies)

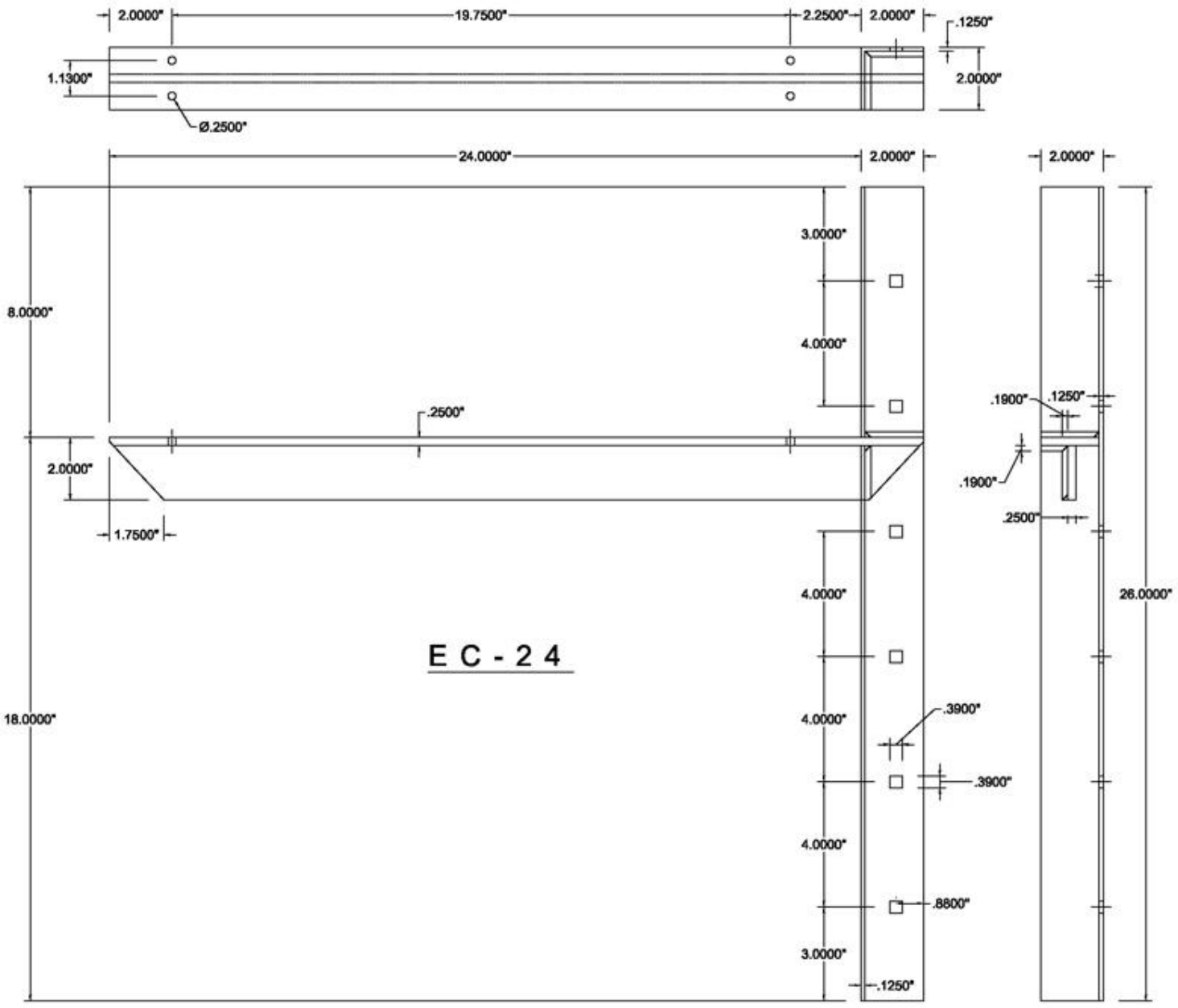
Bracket Size	2 - 58 Per Bracket	60+ Per Bracket	Pcs/Wgt/Box*
EC(2.0)9			2 pcs/14 lbs
EC(2.0)12			2 pcs/16 lbs
EC(2.0)15			2 pcs/16 lbs
EC(2.0)18			2 pcs/22 lbs
EC(2.0)21			2 pcs/22 lbs
EC(2.0)24			2 pcs/24 lbs
EC(2.0)30			2 pcs/31 lbs

A&M HARDWARE, INC.

Call To Order (888) 647-0200

1165 Strickler Road, Mount Joy, PA 17552 | Fax: (717) 653-5874

www.AandMhardware.com


2.0000"
19.7500"
2.2500"
2.0000"
.1250"
1.1300"
2.0000"
Ø.2500"
24.0000"
2.0000"
2.0000"
3.0000"
8.0000"
4.0000"
.1900"
.1250"
.2500"
.1900"
2.0000"
.2500"
1.7500"
4.0000"
26.0000"
E C - 2 4
18.0000"
4.0000"
.3900"
.3900"
4.0000"
.8600"
3.0000"
.1250"



ADA Solutions for Cabinetry

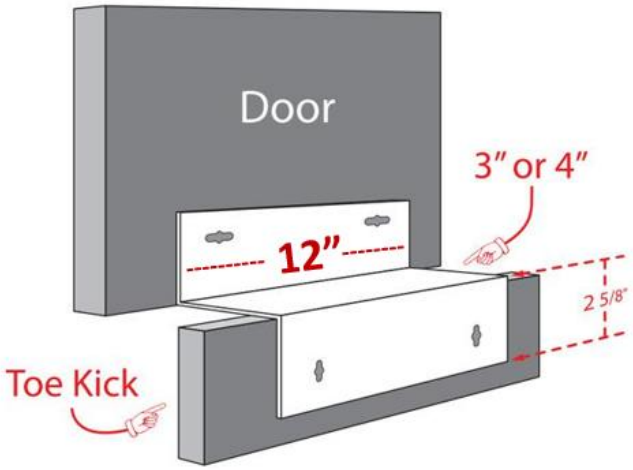
We can supply you with the perfect solution to complying with the requirements of the Americans with Disabilities Act to provide wheelchair access to sinks or other counter areas.

PATENT PENDING

VETERAN OWNED AND OPERATED

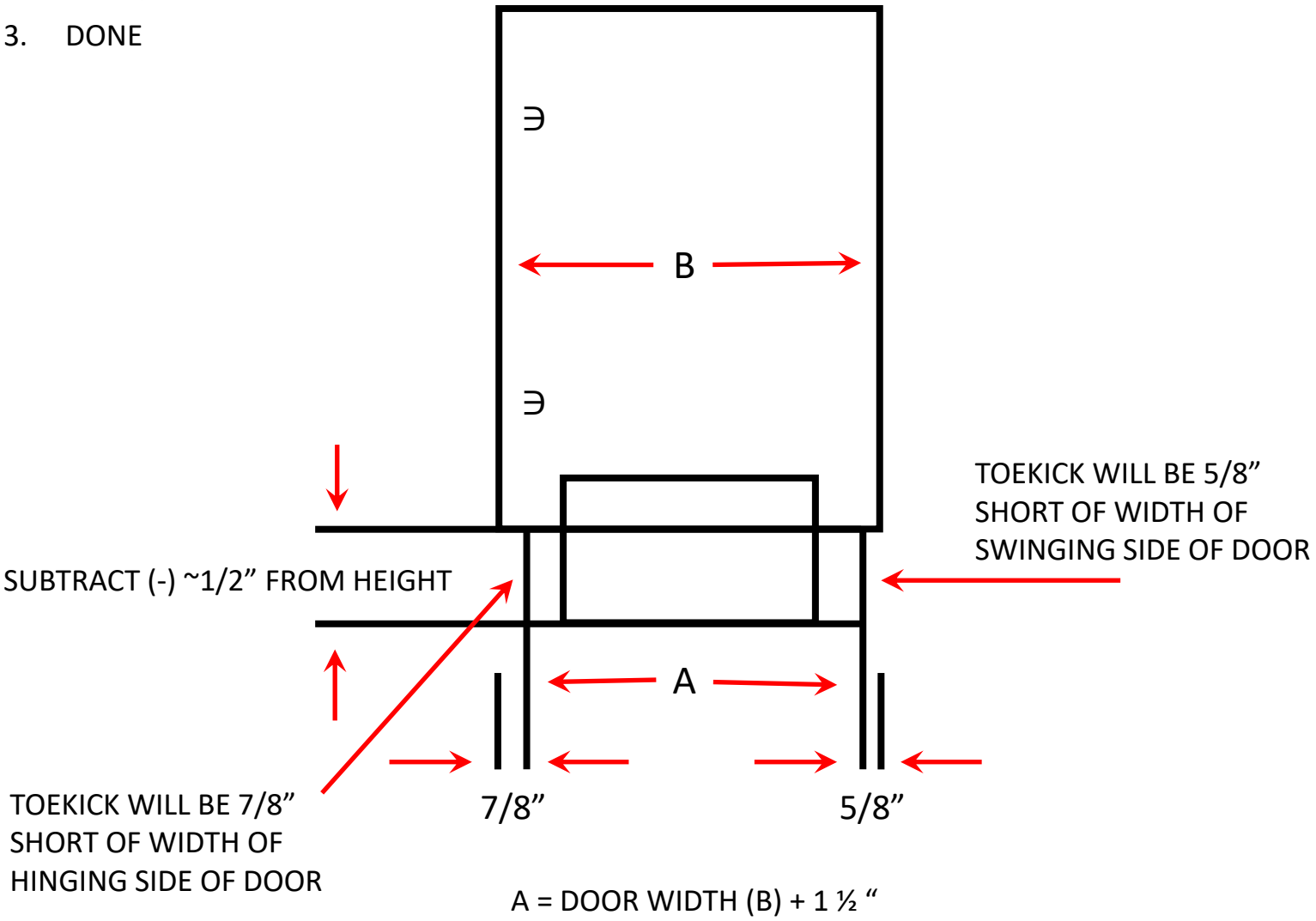
http://www.adatoekick.com or call 805-748-1652

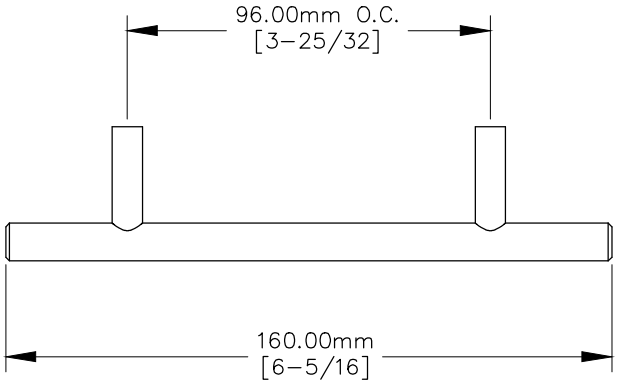
Our 18 gauge steel powder coated bracket allows the toe kick to swing out with the cabinet door allowing unimpeded access for wheel chairs to sink, counter, desk, or other work areas.



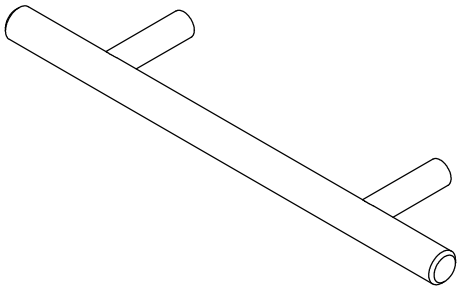
INSTRUCTIONS

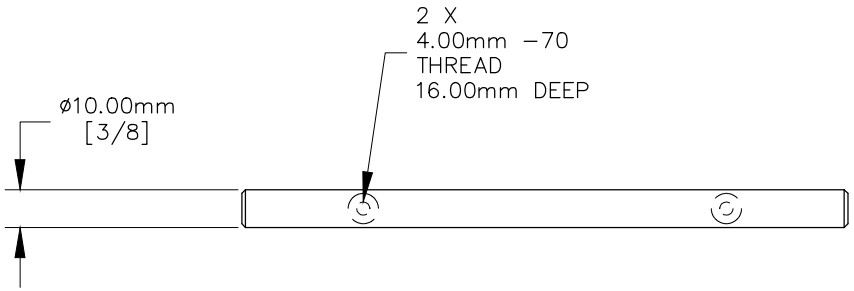
1. Just screw the plate to the door using the enclosed screws, the plate has tabs to align it with the bottom of the door.
2. Attach the toe kick material to the plate and adjust fit, plate is adjustable in both left/right and up/down directions.
3. DONE



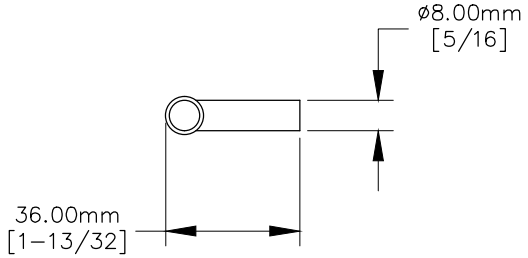


TOP VIEW





FRONT VIEW



SIDE VIEW

MOCKETT
DOUG MOCKETT & COMPANY, INC
P.O. BOX 3333
MANHATTAN BEACH, CA 90266 USA
PHONE: 310.318.2491 FAX: 310.376.7650
email: info@mockett.com www.mockett.com

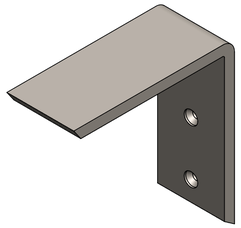
PROPRIETARY AND CONFIDENTIAL.
ALL DIMENSIONS HAVE A +/- 1/32" TOLERANCE UNLESS OTHERWISE SPECIFIED. WE DO NOT RECOMMEND DRILLING OR CUTTING ANY HOLES BEFORE RECEIVING A PRODUCT OR A PRODUCT SAMPLE.
ALL MEASUREMENTS ARE IN INCHES.

PART NAME:		DRAWN BY:	LAST EDITED:	REQUESTED BY:	SHEET:
DP55A		TWR	-	BP	1 OF 1
SCALE:	TOLERANCE:	DATE:	DATE:	APPROVED BY:	
N.T.S.	± 1 / 16 "	2018.11.14	0000.00.00 12:00am	-	

NOTES: UNLESS OTHERWISE SPECIFIED

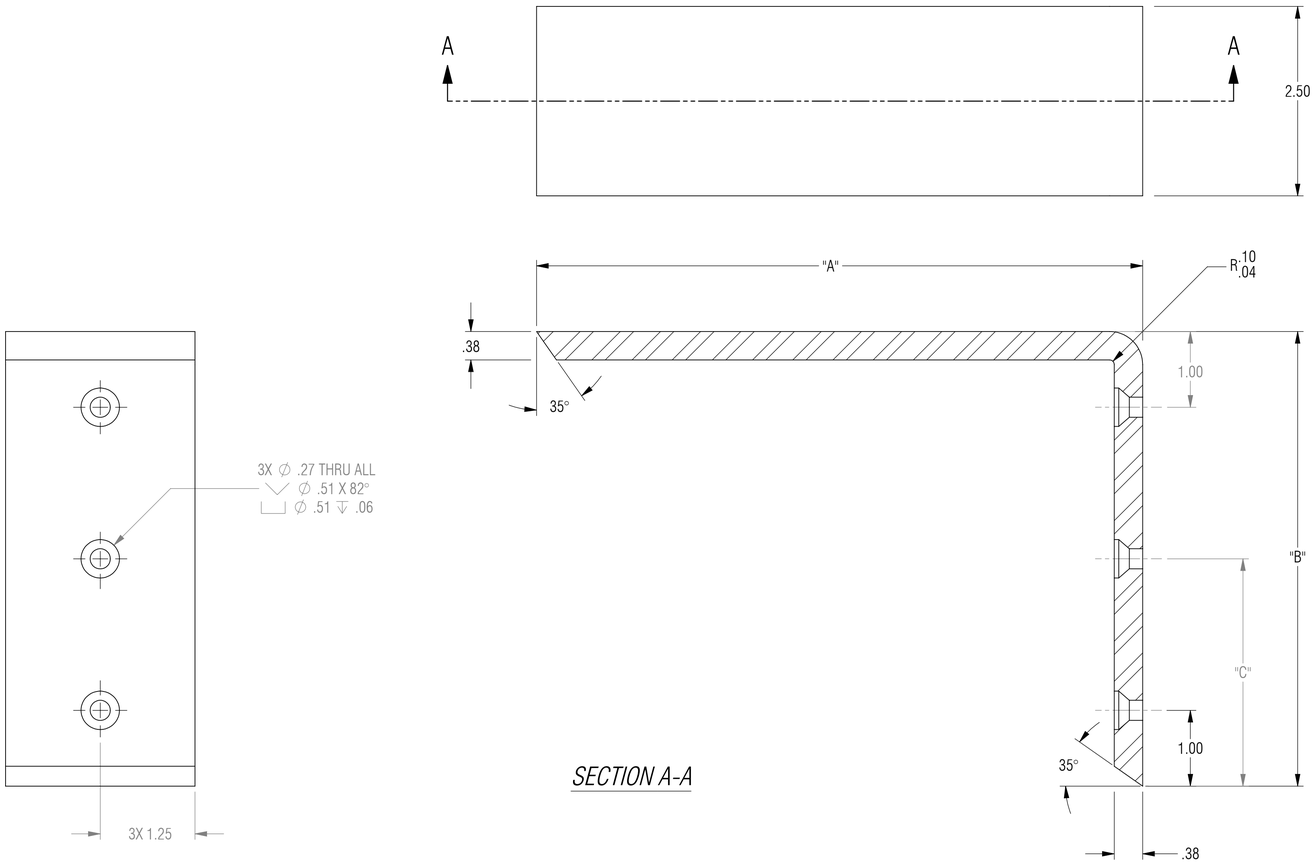
1. MATERIAL: ASTM A36, HOT ROLLED STEEL, OR CENTERLINE STEEL, LLC APPROVED EQUIVALENT.
2. ALL DIMENSIONS ARE TO THEORETICAL SHARP.
3. REMOVE BURRS AND BREAK ALL SHARP EDGES .03 MAX.
4. ALL DIMENSIONS ARE IN INCHES UNLESS STATED OTHERWISE.
5. PARTS SHALL BE FREE OF GREASE AND CUTTING FLUID.
6. POWDER COAT PER MIL-PRF-24712A (TYPE 3, CLASS 3)

FLOATING SHELF BRACKET



1 6 **ISOMETRIC VIEW**
FOR REFERENCE ONLY

REVISION STATUS - ALL SHEETS ARE THE SAME REVISION				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	X1	DEVELOPMENT	07/13/2013	KRH
	X2	MODIFIED CONFIGURATION TABLE ADDED DIMENSION "B" ADDED DIMESION "C" MODIFIED SHEET THICKNESS TOLERANCE (NOW) .38 (WAS) .375	07/15/2013	KRH



SECTION A-A

CONFIGURATION TABLE			
	"A"	"B"	"C"
CSP-0013-6	6.00	6.00	3.00
CSP-0013-8	8.00	6.00	3.00
CSP-0013-10	10.00	8.00	4.00
CSP-0013-12	12.00	10.00	5.00
CSP-0013-14	14.00	10.00	5.00

RELEASED

USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES

TOLERANCES ARE:

.XX ± .01
.XXX ± .005

ANGLES
XX° ± 1°

INTERPRET DRAWINGS IN ACCORDANCE WITH:

ASME Y14.100	ENGINEERING DRAWING PRACTICES
ASME Y14.38	ABBREVIATIONS
ASME Y14.5	DIMENSIONING AND TOLERANCING
ASME Y14.6	SCREW THREAD REPRESENTATION
ASME Y14.8	CASTINGS, FORGINGS & MOLDED PARTS
AWS A2.4	WELDING SYMBOLS
IEEE STD 315	SYMBOLS FOR ELECTRICAL AND ELECTRONIC DIAGRAMS

ENGINEER		
ENGINEER		
ENGINEER		
CHECKED	CAS	07/15/2013
DRAWN	KRH	07/13/2013

MANAGER APPROVAL

THE INFORMATION ON THIS DRAWING IS PROPRIETARY AND SHALL NOT BE DISCLOSED, USED, OR DUPLICATED FOR PROCUREMENT OR MANUFACTURING PURPOSES WITHOUT THE EXPRESS WRITTEN CONSENT OF CENTERLINE STEEL, LLC

THIRD ANGLE PROJECTION

CenterlineBrackets
A CENTERLINE STEEL, LLC DIVISION

DRAWING TITLE

FORMED BRACKET, 90 DEGREES, VARIABLE LENGTH A X VARIABLE LENGTH B X .38 IN

SIZE	CAGE CODE	DRAWING NO	REV
D		CSP-0013	X2
SCALE 1:1		SHEET 1 OF 1	

HÄFELE

View on hafele.com



Wire Waste Bin System, Double Bin

Soft close ball bearing slides

Item no. 503.88.971

Item details

This sturdy, wire system holds waste bins in place and allows for easy removal and replacement

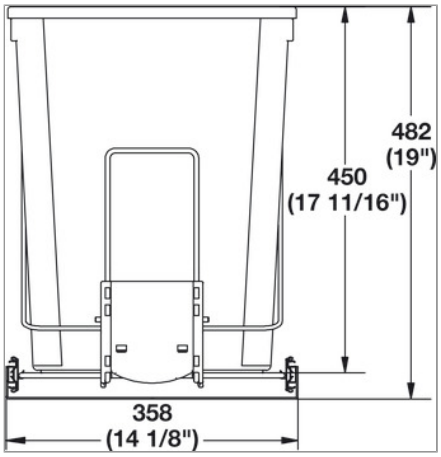
- Easy to install with 4 screws in the floor of the cabinet
  Front bracket slides up against the back side of the face frame for easy mounting

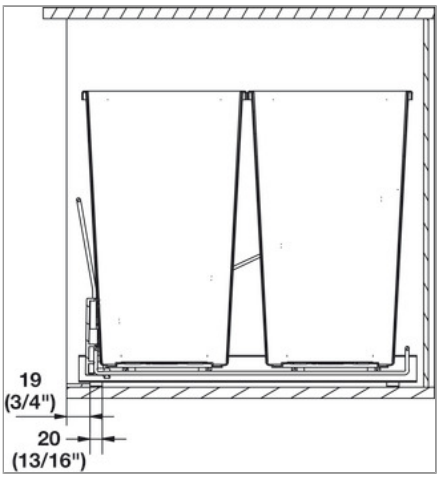
Version	Bottom mount with soft close ball bearing slides
Width	358.00 mm
Depth	552.00 mm
Depth (inch)	21 3/4"
Height	482.00 mm
Height (inch)	19"
Bin	34 l / 34 l
Material/finish	Holder: SteelBin: Plastic, Holder: ChromeBin: Gray
Mounting location	Installation behind hinged doors
Area of application	For use behind a hinged door
Load bearing capacity	88 lbs
Capacity	68.00 l
Capacity	2 x 36 qt.

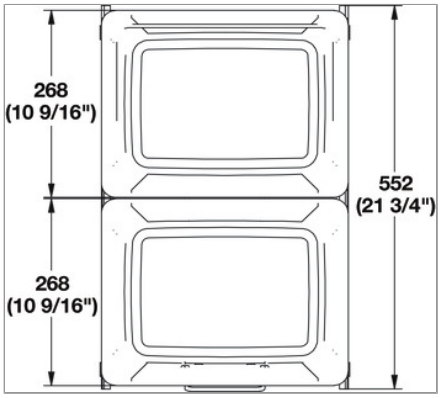
Supplied with

Frame
Bins
Mounting screws

Line drawings





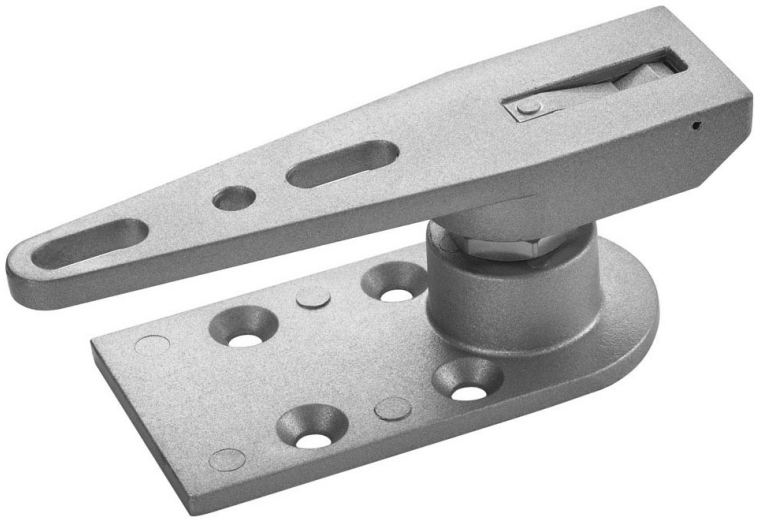


Glass Solutions

ASSA ABLOY

The global leader in door opening solutions

PV-ENDLOAD Adjustable End Load Bottom Pivot

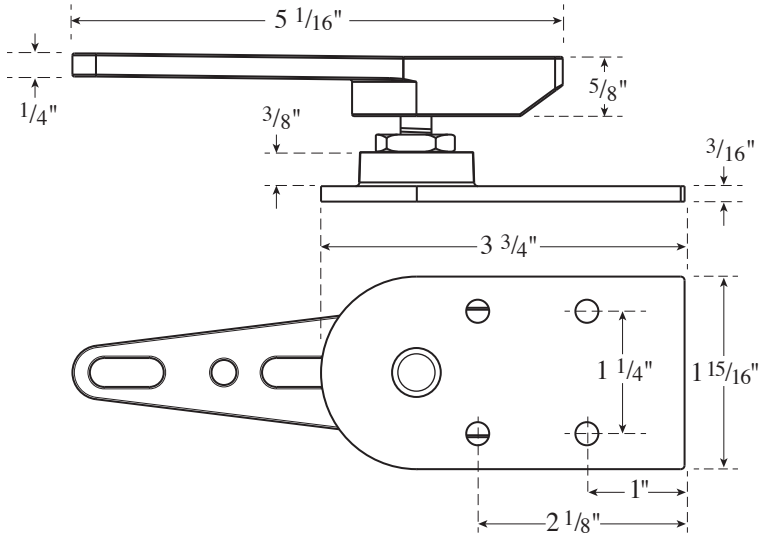


Available Finishes:

- US27/627

CLEARANCE
Min. 3/8"
Max. 3/4"

WEIGHT LIMIT
200 lbs.



Specifications:

MATERIAL:
Aluminum

WHERE USED:
Floor or Threshold

COMPATIBLE PARTS:
Bottom Door Rails

300 Main Street
Rockwood, Pennyslvania 15557
P: 855.594.6989 • F: 844.851.8665
www.assaabloyglass.us
Orders.GlassSolutions@assaabloy.com • TechSupport.GlassSolutions@assaabloy.com

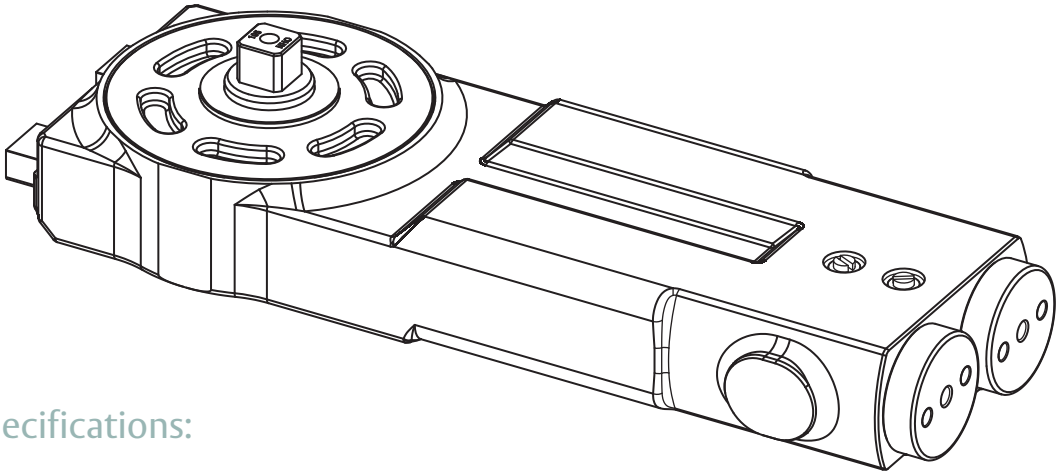
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OHC-304 Heavy Duty Overhead Concealed Door Closer



Key Dimensions:

MAXIMUM
DOOR WEIGHT:
Interior: 300 lbs.
Exterior: 250 lbs.

MAXIMUM
DOOR WIDTH:
Interior: 48"
Exterior: 42"

APPROVALS
AND LISTINGS:
- UL228

Specifications:

MATERIAL:
Cast Iron Closer Body
Radial Ball Bearing Bottom Pivot

SYSTEM INCLUDES:
- 5mm Extended Spindle
- Spring Size 4

HOLD OPEN OPTIONS:
- 90° Back Stop, Non-Hold Open (OHC-304-90NHO)
- 90° Back Stop, Hold Open (OHC-304-90HO)
- 105° Back Stop, Non-Hold Open (OHC-304-105NHO)
- 105° Back Stop, Hold Open (OHC-304-105HO)

**Use an auxiliary stop with OHC-304.*

ACCESSORY OPTIONS:
- Door Rail End Load Bottom Pivot (PV-FM-300END)
- Patch Fitting Floor Mounted Pivot (PF-FM-PIVOT)
- Patch Fitting Adjustable Pivot (PF-ADJ-PIVOT)
- Mounting Clips (OHC-609-MC)
- Center Hung End Load Closer Arm (OHC-609-ARM)

ASSA ABLOY Opening Solutions
Glass Solutions
Rockwood, PA
P: 855.594.6989 • F: 844.851.8665
www.assaabloyglass.us
Orders.GlassSolutions@assaabloy.com • TechSupport.GlassSolutions@assaabloy.com

ASSA ABLOY Door Security Solutions
Vaughan, ON L4K 4T9
P: 800.461.3007
www.assaabloydss.ca

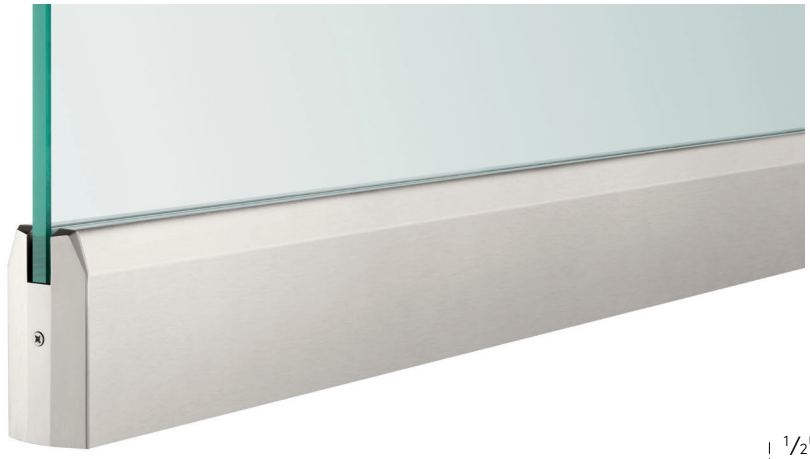
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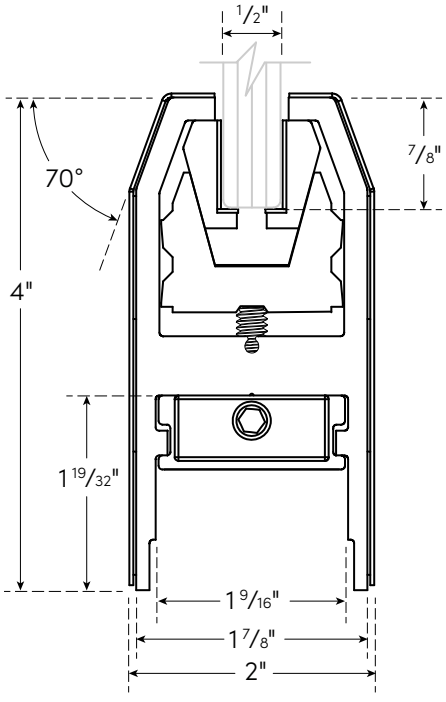
Glass Solutions

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Opening Solutions

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ROCKWOOD DRT-4 Tapered Door Rail





Specifications:

MATERIAL:
Aluminum Body, Bright or Satin Stainless Steel Cladding

FEATURES:
Lateral Adjustable Blocking. Wedge clamping system for easy installation.

OPTIONS:
- Fabricated and supplied with standard closer or pivot components.
- Custom fabrication for competitor's hardware available upon request (consult factory for compatibility).
- Bottom rail available with deadbolt lock and indicator.

Available Finishes:

- US32D/630
- US32/629
- US28/628
- 314
- 314E
- 4E (Translucent Brass PC Equivalent)
- BSP (Black Suede Powder Coat)
- WSP (White Suede Powder Coat)

GLASS THICKNESS
3/8", 1/2", 9/16", 5/8", 11/16", 3/4"

HEIGHT
4"

ASSA ABLOY Opening Solutions
Glass Solutions
Rockwood, PA
P: 855.594.6989 • F: 844.851.8665
www.assaabloyglass.us
Orders.GlassSolutions@assaabloy.com • TechSupport.GlassSolutions@assaabloy.com

Canada:
ASSA ABLOY Door Security Solutions
160 Four Valley Drive
Vaughan, ON L4K 4T9
P: 800.461.3007
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Glass Solutions

ASSA ABLOY
Opening Solutions

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ESK-SGL



Available Finishes:

- US32D/630
- US32/629
- 314E
- 10BE/Stock Powder Coats
- BSP (Black Suede Powder Coat)
- WSP (White Suede Powder Coat)

Specifications:

FEATURES:

The HES Folger Adam 310-1 ($^3/_4$) is an industrial grade electric strike designed specifically for use in glass door applications with addition of a strike plate. The stainless steel construction makes it ideal for strength and corrosion resistance.

OPTIONS:

Latchbolt Monitoring (LCBMA): Sends signal to access control system when latchbolt is disengaged.

ASSA ABLOY Opening Solutions
Glass Solutions
Rockwood, PA
Phone: 855.594.6989 • Fax: 844.851.8665
www.assaabloyglass.us

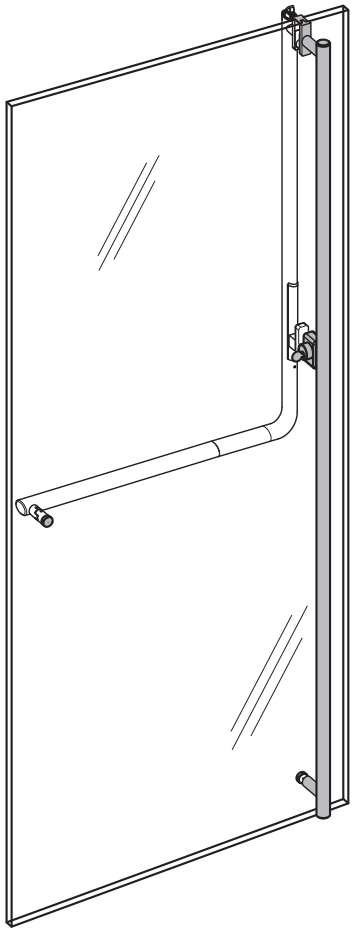
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Glass Solutions

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Opening Solutions

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Rockwood Panic Device PDU8000-3 (Full-Height Straight Pull)



Specifications:

MATERIAL:
Stainless Steel

FUNCTIONS:
- Keyed
- Passage - dogging standard or security

GLASS THICKNESS:
- 1/2" to 3/4" thick standard.
- Non-standard thickness, specify.

APPLICATIONS:
- Glass mounted
- Rail mounted

HANDING:
- Right-hand reverse (swing 3)
- Left-hand reverse (swing 4)

Certifications:
ANSI/BHMA A156.3-2020 (32 and 32D finishes only)
UL305 (2017)
CAN/ULC-S132 (2016)
California Building Code (2019) Sec. 11B-309.4
ADA Compliant
A156.41 (2020)
IBC Sec. 1010.1.9.6 (2021)
A156.3-2020 1000lb Security Test
ANSI/BHMA A156.44-2021

Available Finishes:

- US32/629
- US32D/630
- US32316
- US32D316
- US32DMS
- US32MS
- US32D (device)/ US32 (push area)
- 314E
- 10BE/Stock Powder Coats

Engraved PUSH Area Finish Options:
- Black
- White
- Less Paint
- Custom Color

DIMENSIONS:
Grip: Ø 1 1/4"

Vertical (crash bar to top of tube): 28 1/2" min; Max per GANA guidelines

Horizontal: 15 3/4" min; 48" max

Projection: 2 5/8" Panic side; 3 1/4" Mating pull side

Sold Through:

Authorized Channel Partner
ASSA ABLOY

ASSA ABLOY Opening Solutions
Glass Solutions
Rockwood, PA
P: 855.594.6989 • F: 844.851.8665
www.assaabloyglass.us
Orders.GlassSolutions@assaabloy.com • TechSupport.GlassSolutions@assaabloy.com

ASSA ABLOY Door Security Solutions
Vaughan, ON L4K 4T9
P: 800.461.3007
www.assaabloydss.ca

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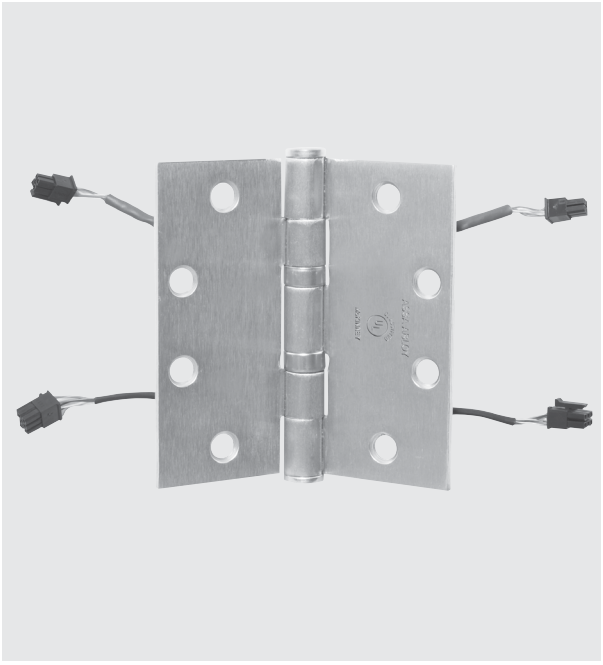
Architectural Door Accessories

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Options

Round Corner Option

Furnished as 1/4" radius unless specified otherwise. 5/32" or 5/8" may be specified on full mortise hinges. Specify option "RC".

RCT2714



Applications

This section will seek to address different variations of door, frame and wall conditions which you might encounter in hanging the door and the product solutions offered in the McKinney line.

Included are some of the more common conditions and some of the not-so-common conditions. The focus here will be on the type of hinge to use within a given door/frame/wall condition. The following examples are not intended to cover every possible situation in which a particular type hinge might be used, but only a representative sampling. Consult the factory for any unusual installation requirements not shown here.

Common Applications

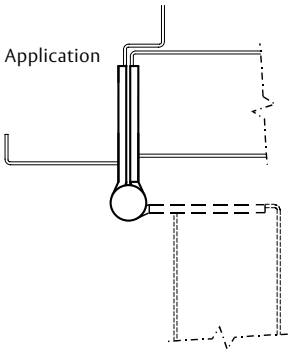
Full Mortise Hinge

The most common application is a flush door/frame/wall condition using a hollow metal frame with a standard hollow metal or wood door which is flush or 1/16" inset from the face of the frame, with a wall which is either flush (or inset from the face of the frame. Recommended to hang door for 180° swing: Full Mortise Hinge. The same hinge could be used with a wood or aluminum frame provided the door/frame/wall conditions are flush.

Note: A fire labeled wood door requires sufficient hinge reinforcement to use this type hinge.

TA2714





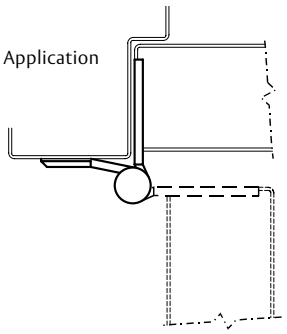
Less Common flush door/frame/wall application

Half Mortise Hinge

A hollow metal or wood door with channel iron frame. Recommended to hang door for 180° swing: Half Mortise Hinge.

TA2774





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Quick Reference Chart

Door, Frame Wall Conditions	Frame Type	Door Type	Hinge Type	Variation of Basic Hinge Type Shown Below (See Note 2)	McKinney Brand Example (See Note 3)
Flush*	Wood or Metal	Wood or Metal	Full Mortise	(not applicable)	TA2714
Flush*	Channel Iron	Wood or Metal	Half Mortise	(not applicable)	TA2774
Flush*	Channel Iron	Kalamein or Fire Labeled Wood Door (See Note 1)	Full Surface	(not applicable)	TA2771
Flush*	Metal	Kalamein or Fire Labeled Wood Door (See Note 1)	Half Surface	(not applicable)	TA2772
Flush*	Metal	Heavy and/or High Frequency Wood or Metal	Anchor	Full Mortise	TA792
Flush*	Wood or Metal	Wood or Metal Requiring Alternative Closing Device	Spring	Full Mortise Half Surface	1502, 1572
Flush*	Wood or Metal	Wood or Metal Required to Clear Opening at 90˚ of Swing	Swing Clear	Full Mortise	TA2895
Deep Frame Reveal	Wood or Metal	Wood or Metal with Maximum Swing of 90˚ to 110˚	Raised Barrel	Full Mortise	RBTA2714
Deep Frame Reveal with or without Trim on the Face of the Frame or a Projecting Wall	Wood or Metal	Wood or Metal with swing to 180˚	Wide Throw	Full Mortise	TA2798
Wall Pocket at 90˚ of swing	Metal	Wood or Metal	Pocket Hinge	(not applicable)	PH-4

* Includes door and frame conditions of up to 1/8" inset

Notes:

1. Fire labeled wood door without sufficient hinge reinforcement. Door leaf is hung using back plate with grommet nuts and bolts.
2. The four basic hinge types are full mortise, half mortise, full surface and half surface. Variations (i.e. anchor, swing clear, raised barrel, wide throw) are available in the basic types shown above but may not be available in all basic hinge types. Consult individual catalog pages for availability.
3. Consult individual catalog pages for available sizes, weights, materials, versions, bearings and finishes. Hinges for doors beveled (1/8" in 2") on hinge side use 5000 series for 3K hinges (e.g. TA5792); use 4000 series for 5K hinges (e.g., TA4895).

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Five Knuckle Standard Weight Series

Recommended for standard weight, medium frequency doors, or doors with closing devices.

- Use for common flush door/frame/wall applications
- For Beveled Edge, where doors are beveled on hinge side, specify TA4314 or TA4714
- For available finishes see page 28

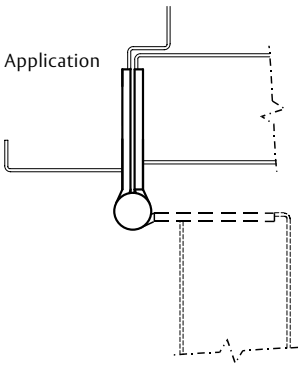
TA2314
TA2714



No.	ANSI Cross Reference	Base Material	Weight
TA2314	A5112	Stainless	STD
TA2314	A2112	Brass	STD
TA2714	A8112	Steel	STD

Specifications

Inches	mm	Gauge	No. of Holes	Fasteners	
				Machine	Wood
3 1/2" x 3 1/2"*	88.9 x 88.9	.123	6	1/2 x 10-24	1 x 10
4" x 4"*	101.6 x 101.6	.130	8	1/2 x 12-24	1 1/4 x 12
4 1/2" x 4"	114.3 x 101.6	.134	8	1/2 x 12-24	1 1/4 x 12
4 1/2" x 4 1/2"	114.3 x 114.3	.134	8	1/2 x 12-24	1 1/4 x 12
5" x 4 1/2"*	127 x 114.3	.146	8	1/2 x 12-24	1 1/4 x 12
5" x 5"*	127 x 127	.146	8	1/2 x 12-24	1 1/4 x 12
6" x 6"*	152.4 x 152.4	.160	10	1/2 x 1/4-20	1 1/2 x 14



* Not available in Brass base material.

Options:

Code	Description
NRP	Non-Removable Pin
TB	Ball Bearing
TCA	Concealed Bearing
RC	Round Corner – 1/4" radius furnished unless specified otherwise
HT	Hospital Tip
BT	Ball Tip
FT	Flat Tip*

Code	Description
GT	Grooved Tip*
LT	Lined Tip*
RT	Round Tip*
ST	Steeple Tip
SSF	Safety Stud Feature
CC	Concealed Circuit – 4, 8, or 12 wire available

Code	Description
CC-18	Concealed Circuit – 2, 4, 6, 8 or 10 wire available (2-18AWG wires and the remainder 28AWG wires)
MM	Magnetic Monitoring
QC	ElectroLynx® Hinge – 4, 8 or 12 wire available

*Not available on 3-1/2" and 6" sizes

McKinney Hinge Pin Door Stop

- Recommended for high-use or high impact doors with McKinney T2714 or TA2714 hinges
- Protects against damage to doors and walls
- Runs the full length of the hinge



Part number	Description	Finish
76305	Hinge Pin Stop for MacPro MP79 & MPB79	26D
76306	Hinge Pin Stop for McKinney T2714 & TA2714	26D

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Multi-sized cast iron closer
for high use applications

9500 SERIES

DOOR CLOSER

CATALOG

Norton®

ASSA ABLOY

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INTRODUCTION

Ideal for high use openings, the Norton 9500 Series Cast Iron door closer offers the durability, flexibility and strength required to meet the needs of your facility. For interior or exterior doors, this ANSI/BHMA Grade 1 closer features a clean, modern cover aesthetic and durable cast iron body that can be used in a variety of institutional environments requiring ADA compliance.



FEATURES

- Cast iron closer body
- Non-handed
- Rack-and-pinion design
- Standard, separate and independent, latch, sweep and backcheck intensity valves
- Pressure relief valves for both opening and closing cycles protect the door and frame from damage and reduces maintenance costs
- Staked valves
- 2-1/4" (57mm) projection
- 1-1/2" (38mm) diameter piston
- 5/8" (16mm) diameter pinion journals
- Closer mounting plate for easy installation
- Tri-style® packaging: packed for regular, top jamb or parallel arm mounting
- Adjustable spring sizes 1-6
- Molded ABS plastic cover
- All standard arm applications allow doors to swing 180°, conditions permitting
- Heavy-duty arms: Regular Rigid, Parallel Rigid, CloserPlus®, Parallel Rigid Offset and Unitrol®
- Slide Tracks: push or pull side mounting
- 30-year limited warranty
- Exceeds 25 million cycles

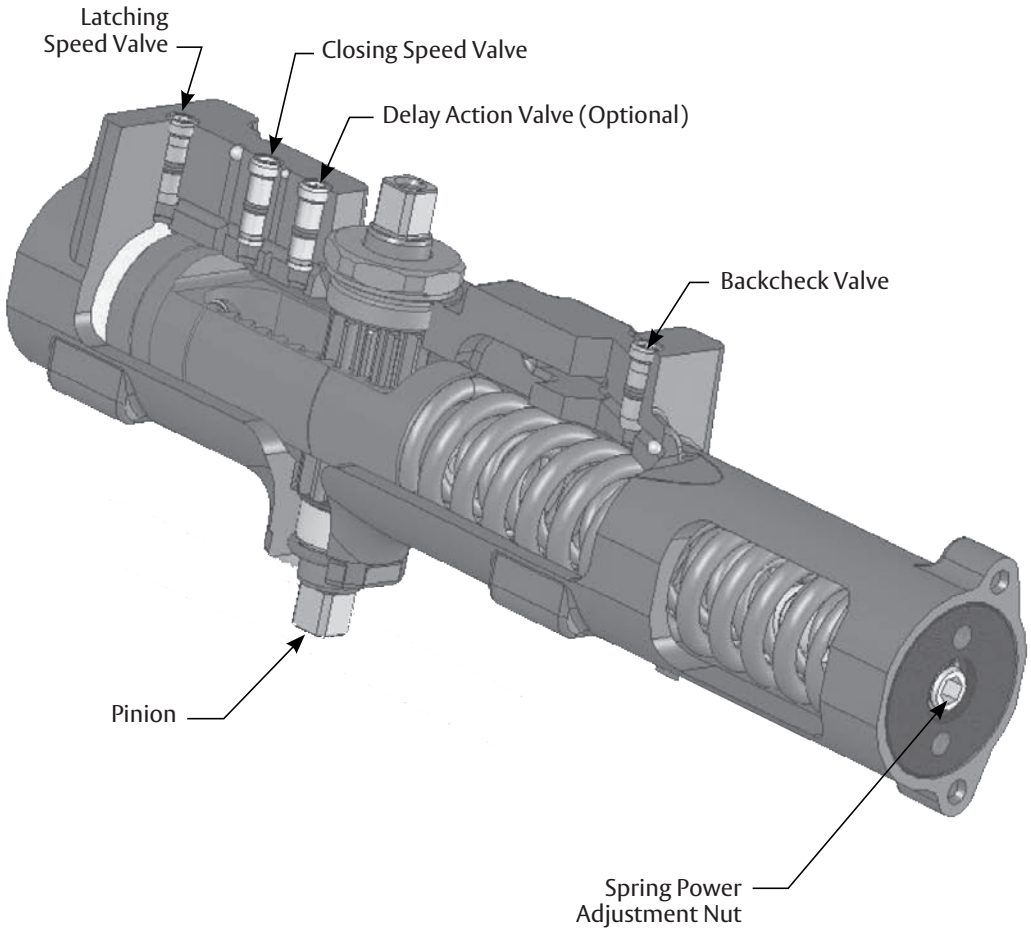
OPTIONAL FEATURES

- Metal cover
- Delayed action

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OVERVIEW



CERTIFICATIONS

- ANSI/BHMA A156.4, Grade 1 certified
- UL / cUL listed for use on fire rated doors
- UL10C listed for positive pressure fire test
- Comply with requirements for the Americans with Disabilities Act (A.D.A) and ANSI standard A117.1
- This product is manufactured in an ISO 9001, ISO 14001 facility
- UL certified environmental produced declaration
- GreenCircle certified environmental facts

CAUTION: Door Closers for Low Opening Force Applications:
Door closers installed in openings required to meet the requirements of the Americans With Disabilities Act or ANSI/BHMA Standard A117.1, when adjusted to meet those requirements, may not provide adequate closing power to dependably close and latch the door based on opening or site conditions.

SPECIFICATIONS

Door closers shall be of full rack and pinion construction with a cold headed heat-treated steel spindle and a forged steel piston precision machined and heat treated. The case shall be of cast iron. All closers for both interior and exterior doors shall be the product of one manufacturer.

Surface closers shall be adjustable to provide sizes 1 though 6 and comply with ADA. All sizes shall be accommodated in one closer body.

Closing shall be controlled by two valves — one to control closing speed and one to control latching speed. Valves shall be concealed against unauthorized adjustment and be non-critical with “O” ring seals. Delayed action shall be available and shall be accomplished with a separate valve.

All arms shall be finely finished with heavy duty forged steel main arm. All closers shall be suitable for regular arm, top jamb, and parallel arm mounting and track type applications when provided with proper brackets and arms. Hold open and heavy duty arms are available. Closers mounted regular arm, top jamb and parallel arm shall allow for full 180° door opening, trim permitting.

Closers shall be available with an adjustable backcheck intensity valve with a safety feature that automatically relieves internal pressure when backcheck has reached the desired adjustment level. V alves shall be accessible without removing the closer from the door.

Closers shall be available with a backcheck intensity valve. Backcheck begins at approximately 70° of door opening for all applications. This valve shall be operative on regular, top jamb, parallel arm, and track type mountings.

Closer covers shall be non-handed to meet a variety of door conditions and design requirements. Closer covers shall be of high impact plastic material of flame retardant grade, secured by machine screws. Projection of the closer body from the door shall not exceed 2-1/4". Closers shall be capable of mounting on 1-3/4" top rail or inverted mounting on 1-3/4" top jamb. Metal covers shall be available. All closers with metal covers shall be available in architectural finishes to match corresponding door hardware.

Closers without hold open shall be regularly furnished with power adjustment arm bracket capable of providing a 15% power adjustment.

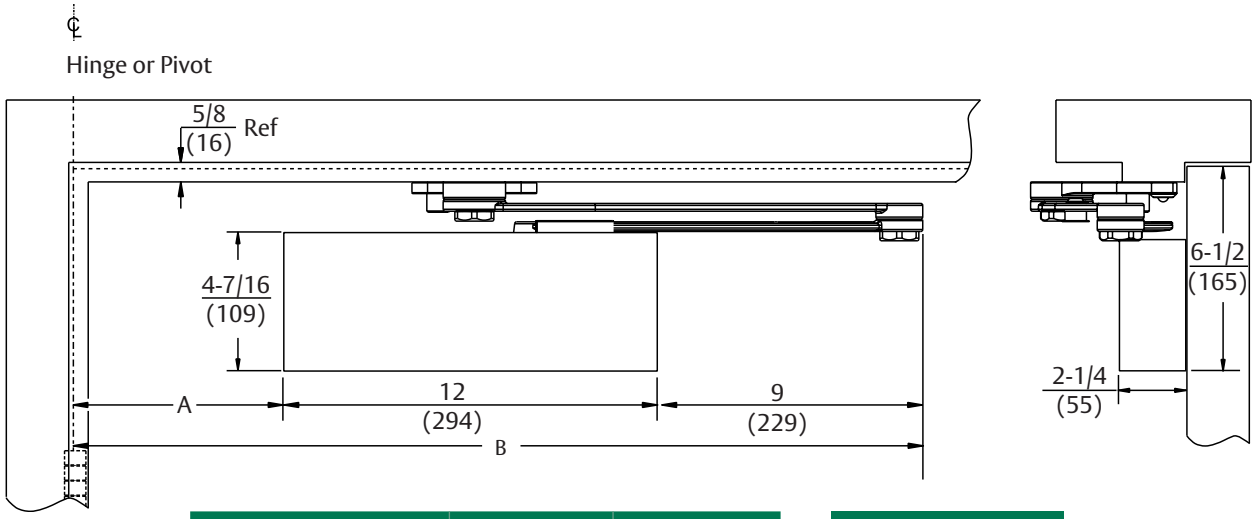
A mounting bracket to attach the closer shall be regularly furnished.

Hydraulic fluid shall be of a type requiring no seasonal valve readjustment due to extreme temperature variations.

Closer shall have a 30-year limited warranty.

Closers with non-hold open arms shall be listed by Underwriters Laboratories.

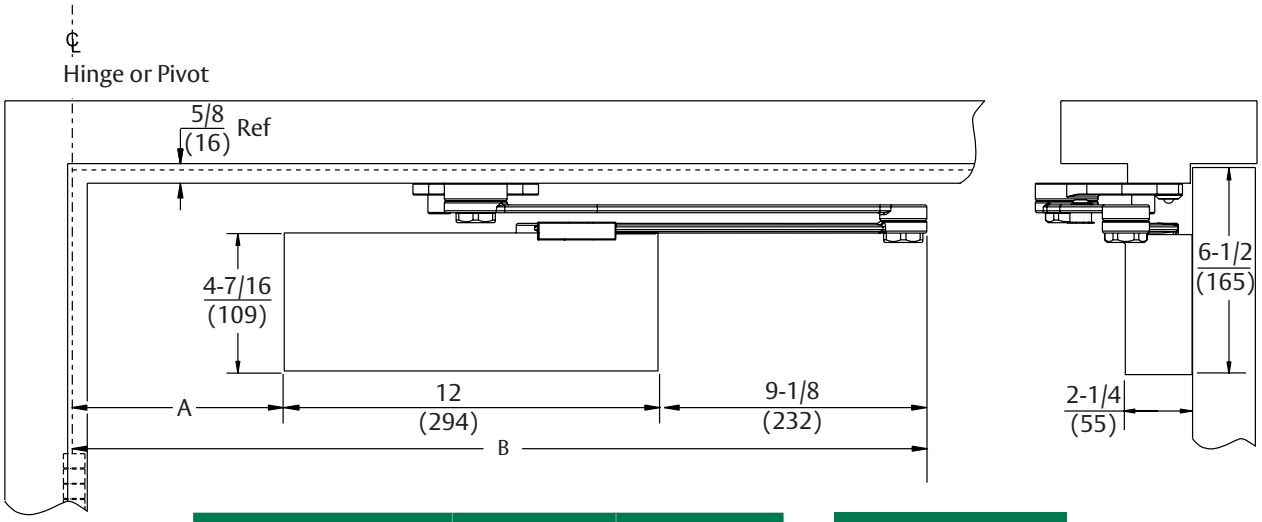
TECHNICAL DETAILS – PARALLEL RIGID ARM



Maximum Opening	A	B
90°	6-7/8" (175)	27-7/8" (708)
180°	2-7/8" (73)	23-7/8" (606)

Minimum Top Rail
5" (127)

TECHNICAL DETAILS – PARALLEL RIGID, FRICTION HOLD OPEN ARM



Maximum Opening	A	B
90°	6-1/2" (165)	27-5/8" (702)
180°	2-1/2" (64)	23-5/8" (600)

Minimum Top Rail
5" (127)

NOTE:

» Mounting holes for mounting bracket are spaced 1" (25mm) x 10" (254mm).

ARM OPTIONS

Parallel Rigid Arm

PR9501-5
(Non-Hold Open)



- Recommended for high-use, high-abuse environments
- Tamper-resistant, solid forged steel riveted arm
- Mounted on push side
- Not available in plated finishes

Parallel Rigid - Friction Hold Open Arm*



- Recommended for high-use, high-abuse environment
- Requires auxiliary stop
- Allows door to swing 180°, conditions permitting
- Handed
- Mounted on push side
- Not available in plated finishes

Arm Assemblies	Handing
PR9501-8R	Right Hand
PR9501-8L	Left Hand

CloserPlus® Arm

9770-5
(Non-Hold Open)



9870T-8
(Hold Open)*

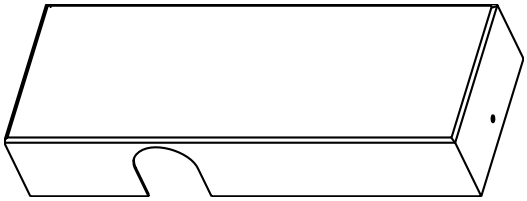


- Recommended for high-use, high-abuse environments
- Tamper-resistant, solid forged steel riveted arm (mounted on push side)
- Field-reversible steel lug restricts degree of opening to protect door, wall and hardware
- Requires both backcheck valves on closer
- Shipped standard as left hand. Handing can be reversed in the field
- Not available in plated finishes

Specify finish when ordering arms.
*Not allowed by code on fire doors.

COVERS AND PLATES

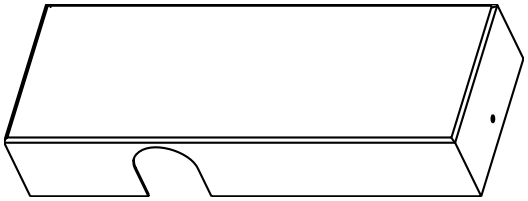
Full Plastic Cover



9500P

- Completely covers closer body
- Non-handed
- Dimensions: 12" (294) x 4-7/16" (109) x 2-1/4" (55)
- Available in painted finishes only

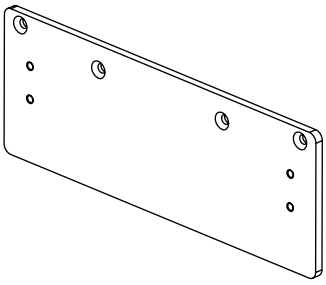
Full Metal Cover



- For use in high-abuse applications
- Specify hand; not field reversible
- Dimensions: 12" (294) x 4-7/16" (109) x 2-1/4" (55)
- Available in painted and plated finishes

Part Numbers	Handing
9500M-R	Right Hand
9500M-L	Left Hand

Drop Plate



- Permits parallel arm or top jamb mounting on door when top rail is too narrow to install closer in the regular manner
- Minimum 2" (51mm) top rail required
- To order separately, specify Part No. x Finish

Drop Plate	Used with:
9586	Regular Arm or Pull Side Track
9587	Top Jamb
9588	Parallel Arm or Push Side Track

PARTS LIST

DOOR CLOSER BODY ASSEMBLIES

Part Number	Description
9500LAP	Multi-Size Closer Body

SCREW PACKS

SP9500	Standard screw package
SP9500SN	Standard screw pack (includes sex nuts)
SP9500SNB	Sex Nuts and Bolts (SNB) for 1-3/4" door
95ASW	Main arm screw & washer
SP9500COV	Cover screw pack

FASTENERS

Self drilling screws (for properly reinforced wood and metal doors) are supplied standard.

Sleeve nuts and bolts (SNB) are supplied standard with Parallel Rigid, CloserPlus® and Unitrol® arms and Slide Track (push and pull) closers. SNB's are optional for Tri-Style® packed closers (Regular, Top Jamb and Parallel arms). Torx® machine screws are optional for all 9500 series.

TORX® SCREW PACKS

Arm Type	Part Number
Regular, Top Jamb & Parallel	TX95
Parallel Rigid, CloserPlus®	PRTX95
Regular Rigid Heavy-Duty	RTX95
Unitrol® Arm	UNITX95
Slide Track	TXTK95
70TK	Torx® tool kit

FINISHES

Norton offers waterborne acrylic, polyster powder coat and plated finishes. Custom finishes are available on special order. A sample and approval is required.

Waterborne acrylic and polyester powder coat will withstand 100 hours of salt spray (ANSI requires 25 hours).

ANSI/BHMA	Description
600*	**Prime Coat**
605^	**Bright Brass**
606^	**Satin Brass**
611^	**Bright Bronze**
612^	**Satin Bronze**
613E	**Dark Oxidized Satin Bronze – Equivalent**
619^	**Satin Nickel**
625^	**Bright Chrome**
626^	**Satin Chrome**
689	**Aluminum**
690	**Statuary Bronze**
691	**Dull Bronze**
693	**Black**
694	**Medium Amber**
696	**Gold**
BSP	**Black Suede Powder**
WSP	**White Suede Powder**

^Plated finishes are available on metal covers and standard arms; heavy duty arms are not available plated

HOW TO ORDER

NOTE: For optimum protection of door and frame assemblies, always use auxiliary wall, floor, or overhead door stop.

PR
PREFIXES

9500
Defines closer series

H
SUFFIXES

9500 = Multi-sized closer w/ adjustable spring power range 1-6

No Prefix } 9500 series designates Tri-Style® packaging (regular arm, top jamb and parallel arm)

PR – Parallel rigid arm (parallel arm only); specify hand for hold open functions.

PRO – Parallel rigid arm with offset soffit plate (parallel arm only); specify hand for hold open applications.

PS – 9500ST for push side mounting only.

R – Rigid heavy-duty regular arm. (Torx® screws not included).

CLP – CloserPlus® arm (parallel arm only).

UNI – Unitrol® arm (parallel arm only - specify **door width**). Frame reveals 1-7/8" to 4-5/8" (48-117mm) standard.

None – Non-hold open arm function.

H – Hold open arm function (specify hand when "PR" prefix is ordered).

M – Metal cover.

DA – Optional delayed action feature.

ST – Slide track - single lever arm (auxiliary stop recommended). For push side - prefix PS.

T – Thumbturn hold open on CloserPlus® (CLP).

NOTE:

- Door closer warranty becomes void if the closer is installed on the exterior side of a door in the exterior wall of a building.
- It is strongly recommended, and may be required on fire door assemblies, that doors having a door closer be hung on ball-bearing or anti-friction hinges or pivots. Consult local authority having jurisdiction.
- Failure to use fasteners supplied with closer may void factory warranty.
- Fasteners for fire/smoke door assemblies must conform to NFPA 80. In some applications additional fasteners may be mandated by NFPA 80 that are not shipped with standard Norton product, such as sleeve-nuts/sex-nuts or thru bolts and grommet nuts.
- Information provided is based on 1-3/4" (44mm) x 7' (2.13m) standard weight doors swinging to 110°. Other conditions (such as door height or weight; or wind/draft conditions) may require adjustment of spring setting, selection of a larger size closer or different closer.

The ASSA ABLOY Group is the global leader in access solutions. Every day, we help billions of people experience a more open world.

ASSA ABLOY Opening Solutions leads the development within door openings and products for access solutions in homes, businesses and institutions. Our offering includes doors, frames, door and window hardware, locks, perimeter fencing, access control and service.

Since 1880, Norton door controls have been an integral part of schools, hospitals and businesses around the globe. When you need products and people that perform at the highest level, rely on Norton – From Open to Close.

Norton Door Controls | www.nortondoorcontrols.com
3000 Highway 74 East | Monroe, NC 28112 | 1.877.974.2255

ASSA ABLOY Opening Solutions
Door Security Solutions Canada | www.assaabloy.ca
160 Four Valley Drive | Vaughan, ON L4K 4T9 | 800.461.3007

43258-K 05/21

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CHECKMATE®
STOPS & HOLDERS

Absolute Door Control and Entire
Opening Protection

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INTRODUCTION



Checkmate® overhead stops and holders are used to extend the life of the door, frame and any door closing devices. They are ideal for installations prone to strong winds, high traffic or abuse, and when used with a floor closer, they provide absolute control at the top and bottom of the door.

Offered in a variety of architectural finishes for surface and concealed mounting, models are available to fit many different door widths.

Model	Concealed	Surface	Low Profile	Adjustable
1 Heavy-Duty Concealed	•			
1ADJ Heavy-Duty Concealed Adjustable	•			•
2 Standard-Duty Concealed Adjustable	•			•
5 Standard-Duty Concealed	•			
6 Low Profile Concealed	•		•	
6ADJ Low Profile Concealed Adjustable	•		•	•
7 Surface Cantilever Holder		•		
8HD Extra Heavy-Duty Double Lever		•		
9 Heavy-Duty Surface		•		
9ADJ Heavy-Duty Surface Adjustable		•		•
10 Standard-Duty Surface Adjustable		•		•
55 Standard-Duty Surface		•		

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1ADJ Heavy-Duty Concealed Adjustable....7
2 Standard-Duty Concealed Adjustable....8
5 Standard-Duty Concealed....9
6 Low Profile Concealed....10
6ADJ Low Profile Concealed Adjustable....11
7 Surface Cantilever Holder....12
8HD Extra Heavy-Duty Double Lever....13
9 Heavy-Duty Surface....14
9ADJ Heavy-Duty Surface Adjustable....15
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55 Standard-Duty Surface....17
Parts Drawings....18
How to Order....19

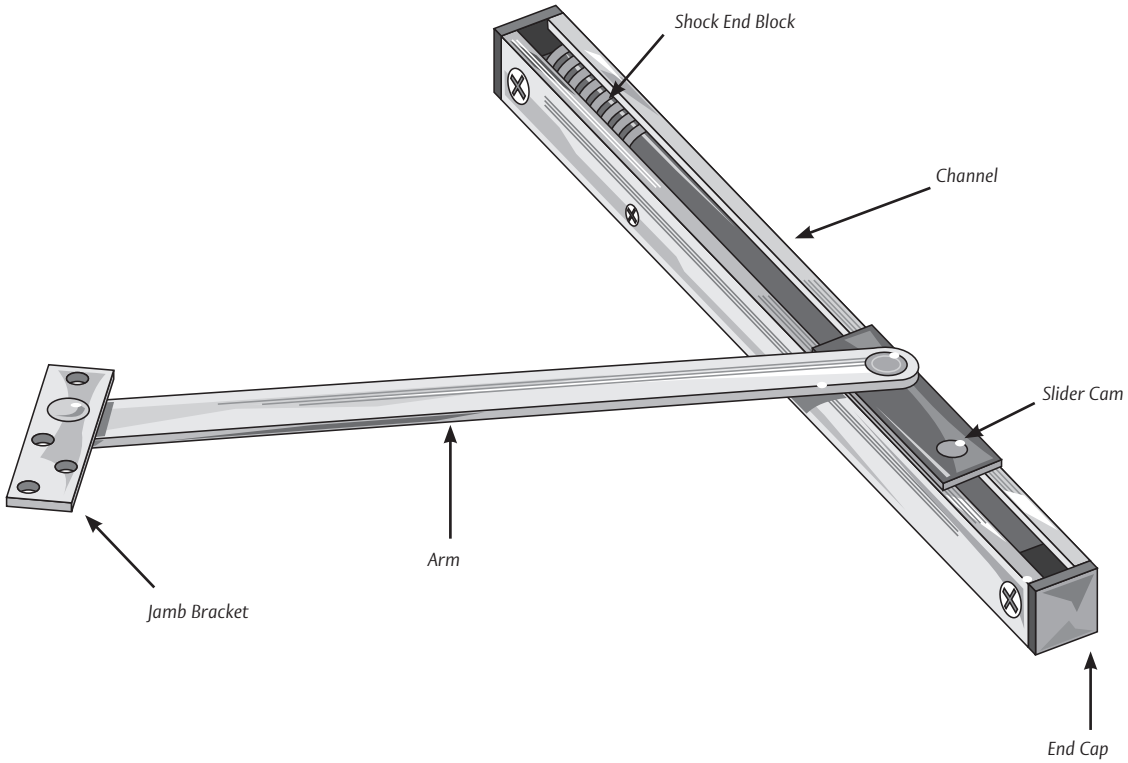
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Checkmate® overhead stops and holders are used to extend the life of the door, frame and any door closing devices. They may be necessary if there are strong winds, high traffic or abuse.

- When used in conjunction with a floor closer, you have absolute door control, top and bottom
- Provides positive deadstop at selected degree
- There are three functions, four ways to order:
  - Friction Stay – used on doors without closers to keep doors open
  - Hold Open – door remains held open near deadstop location
  - Stops – door deadstops at a particular degree of opening
  - Multi Function – adaptable as hold open and/or stops
- Available for surface or concealed mounting
- Standard mount on push side of door (see model descriptions for pull side installations)
- Thru bolts are furnished with all surface models and must be used for installation



SPECIFICATIONS

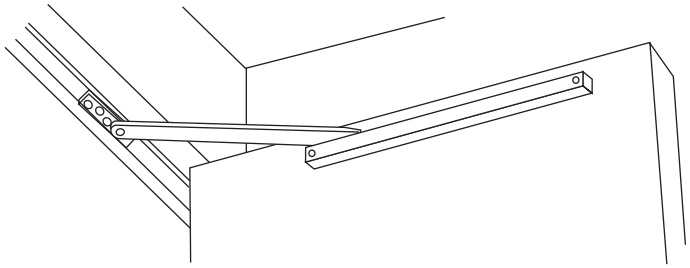
- All overhead stops and holders shall be from a single manufacturer.
- Standard-duty models used for interior or low to moderate traffic doors.
- Heavy-duty models used for exterior or high traffic doors or doors subject to abuse.
- For extremely abusive areas or high winds use double lever arm type.
- Coordinate deadstop and/or hold open location with concealed floor closers.
- Checkmate products provide hold open and/or deadstop.

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9 Series





Application

- Interior or exterior doors
- Doors are single acting
- Non-handed
- Recommended for high traffic, heavy abuse installations

Features

- Heavy-duty
- Slide track design
- Heavy shock absorber spring provides 5-7° compression before deadstop
- LS option omits spring for special application
- On/off knob on hold open models
- Stop, friction stay or hold open function
- Complete screw packet with thru-bolts for door, wood and machine screws for frame
- Torx® screws optional for security applications
- Standard architectural finishes
- Durable slider cam and shock block
- 110° maximum opening
- 1-3/4" minimum door thickness
- 1-3/16" square channel
- For pull side mounting or flush mounting on push side or for rabbeted push side use angle jamb bracket adapter 5458-LH or 5459-RH
- Hanging means other than standard butts or offset pivots require special templating

Compliance

- ANSI/BHMA A156.8, Grade 1 Certified (Hold Open, Stop Models)
- Stop function UL listed for fire door assemblies

Door Opening Chart (in inches)

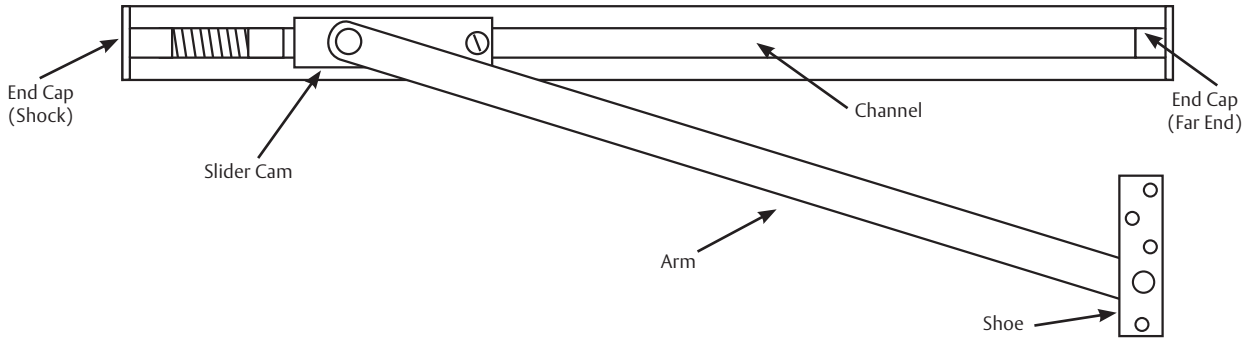
Butts Offset Pivots	Center Hung Pivots	Model Number		
		Friction	H.O.	Stop
*24 - 28	25-1/2 - 30	9-116	9-126	9-136
28-1/16 - 33	30-1/16 - 36	9-216	9-226	9-236
33-1/16 - 38	36-1/16 - 41	9-316	9-326	9-336
38-1/16 - 43	41-1/16 - 46	9-416	9-426	9-436
43-1/16 - 48	46-1/16 - 50	9-516	9-526	9-536

**Butt hung only on this size door. No swing clear hinges.*

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End Caps #1, 2, 9 & 10 only		
1 & 9	Shock End Block	6003
	Far End Block	6004
2 & 5	Far End Block	5059 (2 req.)
10	Far End Block	5011 (2 req.)
Screw Kits		
1	Stop	6487-*
	Hold Open	6998N*
1ADJ	Stop and Holder	6487-*
2	Friction or Stop	5999-*
6	Stop	6487-*
7	Friction or Stop	3880-*XXXA
8	Friction or Stop	5897-*
9	Friction or Stop	6468-*
	Hold Open	6997N*
9ADJ	Stop and Holder	6468-*
10 & 55	Friction or Stop	5998-*

ARM ASSEMBLIES (includes arm, shoe and slider cam)

Examples for ordering arm assemblies

Series	Dash	Size	Function	Letter for Arm Assembly	Finish		Part Number
1ADJ	–	3	36	R	630	=	1ADJ-236R 630
2	–	1	16	R	613	=	2-116R 613
6	–	4	36	R	630	=	6-436R 630
7	–	4	26	R	689	=	7-426R 689

Components for arm assemblies may not be ordered separately.

ADAPTER KITS

2	Hold Open, Friction Adapter	5012-PKG
10	Hold Open, Friction Adapter	5012-PKG

**specify finish*

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HOW TO ORDER

1 Series	—	3 Door Size	36 Function/Base Metal	X Suffix/Options	630 Finish

1	-	Hvy Dty Conc
1ADJ	-	Hvy Dty Conc Adj
2	-	Std Dty Conc Adj
5	-	Std Dty Conc Non-Adj
6	-	Low Profile Conc
6ADJ	-	Low Profile Conc Adj
7	-	Surf Cantilever Hldr
8HD	-	Extra Hvy Dty Dbl Lever
9	-	Hvy Dty Surf
9ADJ	-	Hvy Dty Surf Adj
10	-	Std Dty Surf Adj
55	-	Std Dty Surf

1
2
3
4
5

16	-	Friction
26	-	Holder
36	-	Stop
46	-	Mult-func

LS	Less Spring (models 1 & 9 only)
5258	Standard Duty Bracket
5458	LH Heavy Duty Bracket
5459	RH Heavy Duty Bracket
Torx	Security Screws
R	Arm Only

689	Sprayed Alum
690	Sprayed Dk Brz
691	Sprayed Lt Brz
696	Sprayed Brass
605	Bright Brass
606	Satin Brass
611	Bright Bronze
612	Satin Bronze
613	Dark Bronze
618	Bright Nickel
619	Satin Nickel
622	Flat Black
629	Bright Stainless
630	Stainless Steel
652	Satin Chrome
BSP	Black Suede Powder
WSP	White Suede Powder

SHIPPING WEIGHTS

Models	Shipping Weights
1, 1ADJ, 6, 6ADJ, 8HD, 9, 9ADJ	4.5 lbs.
2, 5, 10, 55	3.5 lbs.
7	7 lbs.

Less Spring – Suffix LS

Heavy-duty slide track type stops have a spring in the end of the channel that keeps the slider from deadstopping. If these units are being used with electromechanical closer, where the door, must deadstop, the LS option is needed. Available only with models 1 and 9

Angle Jamb Bracket Adapter

Standard-duty models suffix 5258 (non-handed)

Heavy-duty models suffix 5458 (LH) or 5459 (RH)

When surface mounted units are mounted on a rabbeted door on the push side, flush door and transom on the push side, or in a reverse installation on the pull side of the door, a special bracket is needed. Note: not all models can be mounted on the pull side of the door (see specific model numbers in catalog.)

Security Screws – Suffix Torx®

Security screws can be supplied for exposed fasteners



5258



5458/5459

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PRODUCT COMPARISON CHART

	1 Series	1ADJ Series	2 Series	5 Series	6 Series	6ADJ Series	7 Series	8HD Series	9 Series	9ADJ Series	10 Series	55 Series
Application	High Traffic, Heavy Abuse Installations	High Traffic, Heavy Abuse Installations	Moderate Traffic, Medium Weight Doors	Moderate Traffic, Medium Weight Doors	Moderate Traffic, Medium Weight Aluminum Storefront Doors	Moderate Traffic, Medium Weight Aluminum Storefront Doors	Industrial Applications	High Traffic, Heavy Abuse Installations	High Traffic, Heavy Abuse Installations	High Traffic, Heavy Abuse Installations	Moderate Traffic, Medium Weight Doors	Moderate Traffic, Medium Weight Doors
Heavy-Duty	•	•						•	•	•		
Standard Duty			•	•							•	•
Concealed	•	•	•	•	•	•						
Low Profile					•	•						
Surface							•	•	•	•	•	•
Type of arm	Slide track	Slide track	Slide track	Slide track	Slide track	Slide track	Double spring	Double lever	Slide track	Slide track	Slide track	Slide track
Adjustable		•	•			•				•	•	
Exterior Door	•	•			•	•	•	•	•	•		
Interior Door	•	•	•	•	•	•	•	•	•	•	•	•
Single or Double Acting Doors	Single or Double	Single or Double	Single or Double	Single or Double	Single or Double	Single or Double	Single only	Single only (push side mount)	Single only	Single only	Single only	Single only
Maximum opening[1]	110°	110°	110°	110°	110°	110°	110°	110°	110°	110°	110°	110°
Standard Door Thickness[2]	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"
Friction	•		•						•		•	
Hold Open	•	•	•	•			•	•	•	•	•	•
Stop	•	•	•	•	•	•		•	•	•	•	•
Multi-Function			•								•	
LS option[3]	•								•			
Grade 1 Certified[4]	•	•	•	•	•	•			•	•	•	•
Stop function UL listed for fire door assemblies	•	•	•	•	•	•		•	•	•	•	•

1 Maximum opening for ADJ series center hung 30-36" is 105°
2 For thicker doors, consult factory
3 LS = Less Spring
4 Refer to product pages for specify models that meet certification.

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CONTACT US AT:

Rixson®
3000 Highway 74 East
Monroe, NC 28112
Tel: 800-457-5670
Fax: 800-221-0489

ASSA ABLOY Door Security Solutions Canada
160 Four Valley Drive
Vaughan, Ontario, L4K 4T9 Canada
Tel: 800-461-3007
Fax: 800-461-8989

For a complete listing of products and applications please visit our web site.
www.rixson.com
www.assaabloydss.ca

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44042-11/20

Architectural Door Accessories

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Rockwood RM860 - Wall Mounted Door Stop



Available Finishes:

- US3/605
- US4/606
- US10/612
- US10B/613
- US10BE/613E
- US26/625
- US26D/626
- US32D/630

MATERIAL SIZE:
Base: 1 5/8"
Projection: 1 3/32"

BUMPER:
Convex

Specifications:

MATERIAL:
Brass, Stainless Steel, Rubber Bumper

ASSA ABLOY Opening Solutions
Architectural Accessories Group
Rockwood, PA
Phone: (800) 458-2424 • Fax: (800) 922-9212
www.assaabloydooraccessories.us

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Architectural Door Accessories

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Rockwood K1050 - Metal Kick Plate - .050" Thick



Specifications:

MATERIAL:
.050" Aluminum, Brass, Bronze, Stainless Steel

FASTENERS:
#6 x 5/8" Oval Head Sheet Metal Screws

FEATURES:
- Push Side Plate Width - 2" less than door width
- Pull Side Plate Width - 1 1/2" less than door width

ORDERING:
Specify height x width x finish code. Add any options

OPTIONS:
- SA - self-adhesive mounting
- TEK - self-drilling screws
- All sides are beveled
- Heavy bevel available, specify HVBEV
- CSK - countersunk holes
- Cutouts for locks, louvers, or windows
- TORX - security torx screws

Available Finishes:

- US3/605
- US4/606
- US9/611
- US10/612
- US10B/613
- US10BE/613E
- US26/625
- US26D/626
- US28/628
- US32/629
- US32316
- US32D/630
- US32D316
- US32DMS
- Powder Coat

WEIGHT:
8" x 34" = 4.0 lbs.

ANSI:
J101 - metal armor plate
J102 - metal kick plate
J103 - metal stretcher & mop plate

NFPA 80 STANDARDS - 2-4.5 Protection Plates: Factory-installed protection plates shall be installed in accordance with the listing of the door. Field-installed protection plates shall be labeled and installed in accordance with their listing.
Exception: Labeling is not required where the top of the protection plate is not more than 16 in. (406 mm) above the bottom of the door.

NOTE: Finishes US26/625 and US26D/626 are only available up to 24"H.

ASSA ABLOY Opening Solutions
Architectural Accessories Group
Rockwood, PA
Phone: (800) 458-2424 • Fax: (800) 922-9212
www.assaabloydooraccessories.us

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VT INDUSTRIES **Architectural Wood Doors**

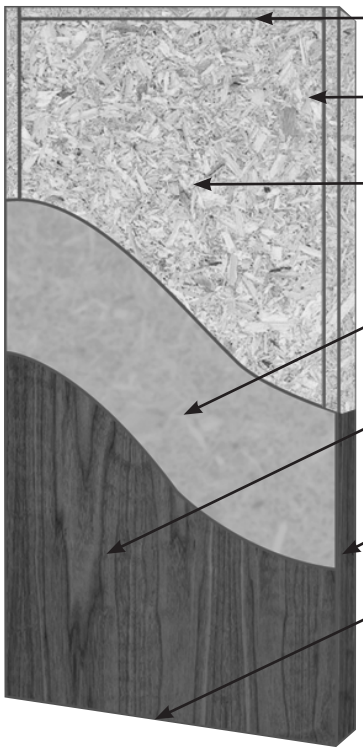
WOOD VENEER, MILL OPTION, OR HPDL
BONDED AGRIFIBER
3-PLY OR 5-PLY CONSTRUCTION CORE
NON-RATED OR 20-45-MIN. POSITIVE PRESSURE

HERITAGE
VT Door Type

WSPC
5509H • 5P09H • 9P09H • 909H

(Interior use only)

THIS INFORMATION IS FOR HOLSTEIN & EGGERS NEENAH PRODUCTION FACILITIES.



TOP RAIL:
SCL or Fire Composite for 45-min

VERTICAL STILES:
SCL with matching laminate or wood edge or Fire Composite for 45-min

CORE:
Agrifiber Board, ANSI A208.1, grade LD-2; 70% of door construction weight, composed of pre-consumer rapidly renewable material

CROSSBANDS:
HDF, 20% of door construction weight, composed of pre-consumer recycled material

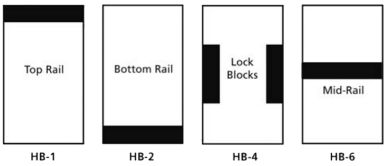
LAMINATE FACES:
Wood Veneer "A" grade, unless otherwise specified, Mill Option Paintable Surface or HPDL - HGS

FINISHED THICKNESS:
1-3/4" (± 1/16")

BOTTOM RAIL:
SCL

All dimensions shown are nominal before sanding, trimming and prefitting within industry standards. Specifications may be changed at manufacturer's option. Prefit and stock sizes available.

Blocking Reinforcement Options*: available at additional cost for undercutting and specialized hardware. Blocking recommended for Extra Heavy Duty Doors using surface mounted hardware.



LEED V4 Credit Assistance Available	
MR - Building Life Cycle Impact Reduction - Option 4	X
MR - Extraction / Manufacture Valuation Factor	X
MR - BPDO Environmental Product Declarations - Option 1	X
MR - BPDO Sourcing of Raw Materials - Option 2	X
MR - BPDO - Material Ingredients - Option 1	X
EQ - Low-Emitting Materials	X

Consult VT for project specific LEED compliance documentation. FSC available by request.

AWS/WDMA CUSTOM/PREMIUM GRADE HEAVY DUTY DOOR*

DOOR FEATURES:

Standard Finish Type: WDMA TR-8/AWS System 9 (UV Cured Acrylated Polyurethane). Primed factory finish or opaque finish available (Veneer). Woodgrains, Solid Colors, & patterns available (laminate).

Veneer / Laminate Match: Book match standard. Slip or random available (Veneer) or Standard Horizontal Grade (HGS)

Veneer Face Assembly: Running match standard. Center or balanced available.

Pairs and Sets: Pair match standard, set match available.

Doors/Transoms: Continuous match standard. End or no match available.

Vertical Edges: (Visible surface) Matching wood edge finished to match the face.

Cutouts: 5" minimum distance from door edge and the minimum distance between lite and lock cut out is 3-5/16 for 20-minute.

Standard Bevel: 1/8" in 2" or 3 degrees.

Clearances: 1/8" top, 1/8" lock and hinge stiles. See NFPA-80 6.3.1.7.1, 2013 Edition. Bottom clearance 3/4" max. (bottom of the door to top finish floor) See NFPA-80 4.8.4.1, 2013 edition.

Security Rating: Class 40 (highest rating possible)

STC Rating: See STC chart for requirements.

Screw Holding: Refer to Customer Service Update #CS119F (www.vtindustries.com/doors/csupdates).

DOOR STANDARDS:

- WDMA I.S. 1-A-2013 and AWS, Edition 2, Section 9 Quality Standards (Bonded Core).
- Top and bottom rails of door shall be factory sealed.
- Doors shall be clad in AWS/WDMA custom wood veneer "A" grade with minimum thickness 1/42" before sanding, with Type 1 adhesive containing no added urea-formaldehyde. Both domestic and exotic hardwood species available for transparent finish. Premium "AA" grade wood veneer available by request. Mill option paintable surface for opaque finish door construction will be 3-ply. HDF faces adhered to core material OR horizontal grade standard high pressure decorative laminate, meeting or exceeding NEMA Standard LD3, Type HGS, with Type 1 adhesive containing no added urea-formaldehyde. Standard colors and patterns may be selected, or custom colors and patterns can be specified at additional cost.
- Positive pressure 20-minute Intertek/Warnock Hersey fire labels shall be available within size and usage limitations. Fire-rated doors must use approved lite frames. UL 10C
- Cutouts for vision panels shall be made at the factory and shall be of sizes and locations as indicated on the drawings. Factory finished wood glazing stops or beige powder coated metal lite frames shall be furnished for lite openings unless otherwise specified. Metal lite frames may be veneer-wrapped at additional cost. Louvers are prohibited in 20-minute fire doors.
- Cutouts for vision panels shall be made at the factory and shall be of sizes and locations as indicated on drawings. See STC chart for lite sizes and glass requirements by STC rating.
- Hardware preparation: All cutouts for mortise hardware shall be made at the factory from hardware manufacturer's templates and approved shop drawings.
- Doors shall be individually poly-bagged for protection in transit and storage periods, and shall be marked as per tag openings on shop drawings.
- Door bottoms, sweeps, thresholds, gasketing, lite kits and glass may be supplied by others or VT.

CALLA® High CAC

Square Lay-in & Tegular
smooth texture

TOTAL ACOUSTICS®
Sound Absorption (NRC)
+ Sound Blocking (CAC)

SUSTAIN®
High Performance
Sustainable
Ceiling Systems

24/7 DEFEND™
Solutions for Healthier,
Safer Spaces

CONTAIN CLEAN PROTECT

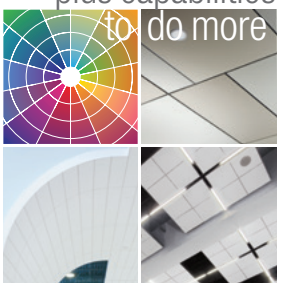


▲ Calla® High CAC Square Tegular panels with Suprafine® 9/16" suspension system

CAD/Revit® drawings at:
armstrongceilings.com/cadrevit

DESIGNFlex®
A New World of Choice
for Ceiling Systems

plus capabilities to do more



armstrongceilings.com/capabilities
See more photos at:
armstrongceilings.com/photogallery

Smooth, drywall-like finish with the highest levels of sound blocking available to address speech privacy. Offers both Sustain® and Total Acoustics® panel performance for flexible spaces.

KEY SELECTION ATTRIBUTES

- DESIGNFlex® options include made-to-order sizes and colors available to ship in 3 weeks
- Get total noise control and floor plan versatility with Total Acoustics® ceiling panels: NRC + CAC = Total Acoustics Performance
- Calla® High CAC panels are part of the Sustain® portfolio and meet the most stringent sustainability compliance standards today
- Excellent combination of acoustical performance with exceptional sound blocking; NRC 0.80, CAC 40, and AC 170
- CleanAssure™ family of products – includes disinfectable panels, suspension systems, and trim
- Mold- and mildew-resistant surface
- Washable, Impact-resistant, Scratch-resistant, Soil-resistant
- USDA-Certified Biobased Product – 91%
- Compatible with the TechZone® Ceiling Systems
- Product can be recycled through the Armstrong Ceilings Recycling Program
- 30-Year Limited System Warranty against visible sag, mold, and mildew

TYPICAL APPLICATIONS

- Offices – closed spaces for privacy and confidentiality; open spaces for focus, collaboration, and teaming
- Healthcare – assists in addressing HIPAA, HCAHPS, and FGI acoustical requirements
- Classrooms
- Corridors
- Lobbies/reception areas

COLORS

Due to printing limitations, shade may vary from actual product.



White (WH) | Black (BK) | Available in any color!

These colors are pre-qualified to meet Sustain® portfolio requirements.



White (WH) | Shell (SH) | Pale Lemon (LM) | Pecan (PC) | Sky (SK) | Moss (MS) | Stone (SE)

Reef (RE) | Lagoon (LA) | Plum (PM) | Cranberry (CN) | Kiwi (KW) | Tangerine (TG) | Black (BK)

Other made-to-order colors must be evaluated if sustainability criteria is required. Lead time will increase.

DETAILS



1. Calla® High CAC Square Tegular
2. Calla High CAC Square Lay-in
3. Calla High CAC Square Tegular with Suprafine® 9/16" suspension system

TechLine 877 276-7876
armstrongceilings.com/calla

Armstrong® CEILING & WALL SOLUTIONS

CALLA® High CAC

Square Lay-in & Tegular
smooth texture

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 91%

SUSTAIN® High Performance Sustainable Ceiling Systems

Declare.

GREENGUARD Gold Certified (details below)

LEED® | WELL™ | LBC

76% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management; construction waste mgmt; regional materials; design for flexibility; EPD; recyclable/ extended producer resp.; biobased materials; recycled content; sourcing of raw materials; material ingredient reporting; low emitting/ materials; lighting quality; acoustics

LOCATION DEPENDENT

VISUAL SELECTION

PERFORMANCE SELECTION

Dots represent high level of performance.

$$$$

armstrongceilings.com/catdwgs	Susp. Dwg.	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC	+ CAC	= NRC+CAC	Total Acoustics[1]	PrivAssure[2]	Articulation Class AC	Fire Performance	Light Reflect*	Bio-Block Anti-Mold/ Mildew	Humi-Guard+ Sag Resistant	Certified Low VOC Emissions	CleanAssure™ Disinfectable Panels Fog	DURABILITY Wash*	Impact	Scratch*	Soil	Recycle Program	30-Yr Warranty
CALLA® High CAC 15/16" Square Lay-in	1	8805	24 x 24 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8808	24 x 48 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8811	24 x 60 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8814	24 x 72 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8817	30 x 30 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
15/16" Square Tegular	8	8806	24 x 24 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8809	24 x 48 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8812	24 x 60 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8815	24 x 72 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8818	30 x 30 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
9/16" Square Tegular	26,43, 47, 51, 55	8807	24 x 24 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8810	24 x 48 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8813	24 x 60 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8816	24 x 72 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		8819	30 x 30 x 1"	0.80 •	40 •	BEST	N/A	170 •	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
1" Thick – 15/16" Square Lay-in & Square Tegular																					
Made-to-Order Sizes		Width	Length	N/A	N/A	N/A	N/A	–	Class A	0.85 •	•	•	•	•	•	•	•	•	•	•	•
		4" – 11-1/2"	12" – 72"																		
		12" – 35-1/2"	4" – 72"																		
		36" – 48"	4" – 30"																		

1 Ctn Min FASTSIZE 3 WEEKS order to ship

Visit the product page online and see "Configure an Item" to verify capabilities.
Questions? email Techline@armstrongceilings.com

[1] Total Acoustics® ceiling panels have an ideal combination of sound absorption and sound blocking in one product.
GOOD (NRC 0.60-0.65; CAC 35+)
BETTER (NRC 0.70-0.75; CAC 35+)
BEST (NRC 0.80+; CAC 35+)

* Advertised values for light reflectance, wash and scratch resistance are applicable to white tiles only

SUSPENSION SYSTEMS

15/16" Prelude® XL®

9/16" Silhouette® XL® 1/4" Reveal; Silhouette XL 1/8" Reveal; Suprafine®; Interlude® XL® HRC

PHYSICAL DATA

Material
Wet-formed mineral fiber with acoustically transparent membrane

Surface Finish
Acoustically transparent membrane with factory-applied latex paint

Fire Performance
Class A: ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index of 25 or less. Smoke Developed Index of 50 or less (UL labeled).

Design Considerations
Combining materials with different run dates may result in shade variations. Order attic stock for any anticipated future needs.

ASTM E1264 Classification
Type IV, Form 2, Pattern E; Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Anti-Mold/Mildew
Ceiling tiles with BioBlock® performance resist the growth of mold and mildew on the tile surface.

VOC Emissions
GREENGUARD Gold Certified
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017. This standard is the guideline for low emissions in LEED®, WELL Building Standard™, Living Building Challenge® (LBC), CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS UL.COM/GG UL 2818

GREENGUARD GOLD

High Recycled Content
Classified as containing greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Insulation Value
R Factor – 2.9 (BTU units); R Factor – 0.445 (Watts units)

Cleaning and Disinfecting
Cleaning and CDC recommended disinfecting options available on armstrongceilings.com/cleaning

30-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com/warranty

Weight; Square Feet/Carton
8805, 8806, 8807 – 1.0 lbs/SF; 40 SF/ctn
8808, 8809, 8810 – 1.0 lbs/SF; 48 SF/ctn
8817, 8818, 8819 – 1.0 lbs/SF; 50 SF/ctn
8814, 8815, 8816 – 1.0 lbs/SF; 72 SF/ctn
8811, 8812, 8813 – 1.0 lbs/SF; 80 SF/ctn

Minimum Order Quantity
1 carton

TechLine / 1 877 276-7876
armstrongceilings.com/calla

BPCS-5936-121

LEED® is a registered trademark of the U.S. Green Building Council; Declare® and Living Building Challenge® (LBC) are trademarks of the International Living Future Institute®; WELL™ and Well Building Standard are trademarks of the International WELL Building Institute; UL and UL Certified are registered trademarks of UL LLC; all other trademarks used herein are the property of AWI Licensing LLC and/or its affiliates © 2021 AWI Licensing LLC

Armstrong® CEILING & WALL SOLUTIONS

MINERAL FIBER – Standard

CALLA® Shapes for DesignFlex®

Tegular
smooth texture

TOTAL ACOUSTICS®
Sound Absorption (NRC) + Sound Blocking (CAC)

SUSTAIN®
High Performance Sustainable Ceiling Systems

24/7 DEFEND™
Solutions for Healthier, Safer Spaces

CONTAIN CLEAN PROTECT

SHAPES SIZES COLOR

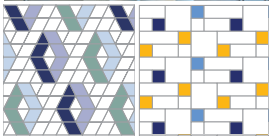
DESIGNFLEX®
CEILING SYSTEMS

PERSONALIZE YOUR DESIGN!

Mix and match different sizes, shapes, colors, and materials to reinvent your ceiling. More at:
armstrongceilings.com/designflex







▲ Calla® Shapes panels with Suprafine® XM 9/16" suspension system

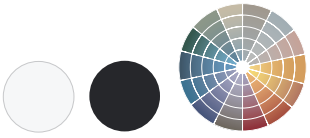
Smoothest ceiling panels available in shapes, made-to-order sizes, and colors with Total Acoustics® and Sustain® performance. Available to ship in 3 weeks.

KEY SELECTION ATTRIBUTES

- DesignFlex® options include shapes, made-to-order sizes, and colors available to ship in 3 weeks
- Mix and match – Shapes also available with Lyra®, Ultima®, Optima®, MetalWorks™, and WoodWorks® panels
- Get total sound absorption and floor plan versatility with Total Acoustics® ceiling panel options: NRC + CAC = Total Acoustics Performance
- Calla® panels are part of the Sustain® portfolio and meet the most stringent industry sustainability compliance standards today
- new CleanAssure™ family of products – includes disinfectable panels, suspension systems, and trim
- Light reflectance – 0.85 (white only)
- Mold- and mildew-resistant surface
- Shaped lights and diffusers are available from our DesignFlex partners. Our lighting partners for TechZone® and MEP partners also provide products that are compatible with the DesignFlex® system; other standard modular and pendant fixtures can also be used with this ceiling system
- USDA-Certified Biobased Product – 91%
- Washable, Scratch-resistant, Soil-resistant
- Product can be recycled through the Armstrong Ceilings Recycling Program
- 10-Year Limited System Warranty against visible sag, mold, and mildew

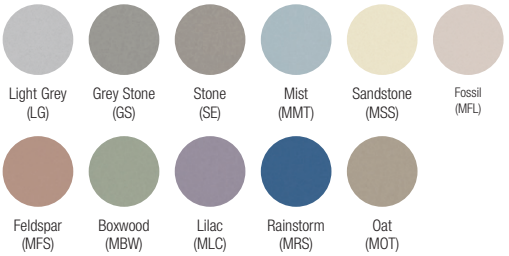
COLORS

Due to printing limitations, shade may vary from actual product.



White (WH) | Black (BK) | Available in any color!

These colors are pre-qualified to meet Sustain® portfolio requirements.



Light Grey (LG) | Grey Stone (GS) | Stone (SE) | Mist (MMT) | Sandstone (MSS) | Fossil (MFL)

Feldspar (MFS) | Boxwood (MBW) | Lilac (MLC) | Rainstorm (MRS) | Oat (MOT)

Other made-to-order colors must be evaluated if sustainability criteria is required. Lead time will increase.

DETAILS



1. Calla® Shapes Square Tegular
2. Calla® Shapes Square Tegular with Suprafine® XM 9/16" suspension system

TechLine 877 276-7876
armstrongceilings.com/callashapes

Armstrong® CEILING & WALL SOLUTIONS

CALLA® Shapes for DesignFlex®

Tegular
smooth texture

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 91%

SUSTAIN® High Performance Sustainable Ceiling Systems

Declare.

GREENGUARD Gold Certified (details below)

LEED® | WELL™ | LBC

UP TO 85% RECYCLED CONTENT

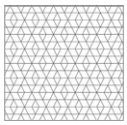
Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management · construction waste mgmt · regional materials · design for flexibility · EPD · recyclable/ extended producer resp. · biobased materials · recycled content · sourcing of raw materials · material ingredient reporting · low emitting/ materials · lighting quality · acoustics

▲ LOCATION DEPENDENT

Start your design process with a visit to our online pattern gallery at: armstrongceilings.com/patterngallery

See dozens of pre-designed patterns and colors online in our pattern gallery. We've provided all of the details – from takeoffs showing 2' or 4' on-center spacing to panels, suspension, trims, and accessories. Installation instructions answer questions typically associated with unique ceiling installations. Lighting and air diffusers can also be easily integrated. If you can't find the ceiling pattern you envision for your next space online, call us and we'll help you create a design to personalize your space – 1 877 276-7876.

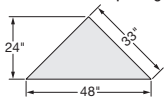
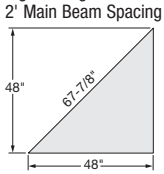




These 9 Calla® Shapes with Square Tegular edges are available with Suprafine® XM 9/16" suspension:

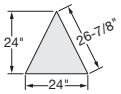
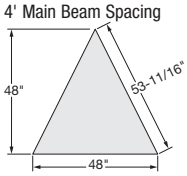
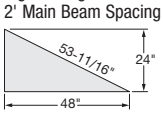
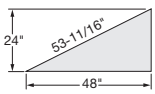
45° SHAPES

Triangles

	Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC+CAC
2' Main Beam Spacing 	100100	Triangle 24 x 48 x 1"	0.80 •	35 •	BEST
Right Triangle – 2' Main Beam Spacing 	100107	Right Triangle – 24 x 24 x 1"	0.80 •	N/A	–
Right Triangle – 2' Main Beam Spacing 	100108	Right Triangle – 48 x 48 x 1"	0.80 •	35 •	BEST

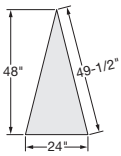
60° SHAPES

Triangles

	Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC+CAC
2' Main Beam Spacing 	100101	Triangle 24 x 24 x 1"	0.80 •	N/A	–
4' Main Beam Spacing 	100102	Triangle 48 x 48 x 1"	0.80 •	35 •	BEST
Right Triangle – 2' Main Beam Spacing 	100105	Right Triangle – Left 24 x 48 x 1"	0.80 •	N/A	–
	100106	Right Triangle – Right 24 x 48 x 1"	0.80 •	N/A	–

75° SHAPES

Triangles

	Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC+CAC
2' Main Beam Spacing 	100103	Triangle 24 x 12 x 1"	0.80 •	N/A	–
4' Main Beam Spacing 	100104	Triangle 48 x 24 x 1"	0.80 •	N/A	–

MORE ITEMS ▶

[1] Total Acoustics® ceiling panels have an ideal combination of sound absorption and sound blocking in one product.
GOOD (NRC 0.60-0.65; CAC 35+) **BETTER** (NRC 0.70-0.75; CAC 35+) **BEST** (NRC 0.80+; CAC 35+)

PHYSICAL DATA

Material
Wet-formed mineral fiber with acoustically transparent membrane

Surface Finish
Acoustically transparent membrane with factory-applied latex paint

Fire Performance
Class A: ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type IV, Form 2, Pattern E; Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Anti-Mold/Mildew
Ceiling tiles with BioBlock® performance resist the growth of mold and mildew on the tile surface.

VOC Emissions
GREENGUARD Gold Certified
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017. This standard is the guideline for low emissions in LEED®, WELL Building Standard™, Living Building Challenge® (LBC), CalGreen Title 24, ANSI/ ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol

PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS UL.COM/GG UL 2818

GREENGUARD GOLD

High Recycled Content
Classified as containing greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Seismic Restraint
Suprafine® XM for Shapes suspension systems have been engineered, tested, and approved for use with DesignFlex® Shapes panels for application in all seismic areas when installed per Armstrong® Ceilings installation instructions. For more details, visit armstrongceilings.com/shapesinstallation

Insulation Value
R Factor – 2.9 (BTU units); R Factor – 0.445 (Watts units)

Design Consideration
Physical product samples for standard and custom colors are available upon request. Please refer to the physical product sample prior to making a final selection. While we strive to ensure exact color matches, various factors such as differences in materials, texture, substrate porosity, painting processes, lighting, and observer subjectivity can all affect how paint colors appear on ceiling and wall panels, suspension systems, and trim products.

Due to these and other differences, ceiling and wall panels, trim products, and suspension systems with the same color name will coordinate but may not be an exact color match. Product is dye-lotted. Order sufficient initial quantities and attic stock to minimize possible color variation.

Cleaning and Disinfecting
Cleaning and CDC recommended disinfecting options available on armstrongceilings.com/cleaning

10-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com/warranty

Weight; Pieces/Carton
100103 – 1.1 lbs/pc; 24 pcs/ctn
100101 – 2.2 lbs/pc; 12 pcs/ctn
100107 – 2.2 lbs/pc; 24 pcs/ctn
100102, 100108 – 8.8 lbs/pc; 6 pcs/ctn
100100, 100104, 100105, 100106 – 8.8 lbs/pc; 12 pcs/ctn

Minimum Order Quantity
1 carton

TechLine 877 276-7876
armstrongceilings.com/callashapes

Armstrong® CEILING & WALL SOLUTIONS

DESIGNFLEX® SHAPES

CALLA® Shapes for DesignFlex®

Tegular
smooth texture

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 91%+

SUSTAIN® High Performance Sustainable Ceiling Systems

Declare.

GREENGUARD Gold Certified (details below)

LEED® WELL™ LBC

76% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management ✓ | construction waste mgmt ✓ | regional materials ✓ | design for flexibility ✓ | EPD ✓ | recyclable/ extended producer resp. ✓ | biobased materials ✓ | recycled content ✓ | sourcing of raw materials ✓ | material ingredient reporting ✓ | low emitting/ materials ✓ | lighting quality ✓ | acoustics ✓

▲ LOCATION DEPENDENT

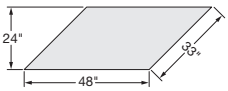
PANEL OPTIONS (shown in finish view from below ceiling)

These 8 Calla® Shapes with Square Tegular edges are available with Suprafine® XM 9/16" suspension:

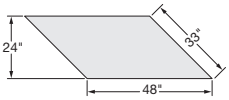
45° SHAPES

Parallelograms

2' Main Beam Spacing



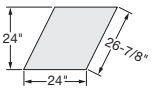
Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC + CAC
100112	Right Parallelogram 24 x 48 x 1"	0.80 •	35 •	BEST
100113	Left Parallelogram 24 x 48 x 1"	0.80 •	35 •	BEST



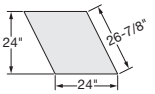
60° SHAPES

Parallelograms

2' Main Beam Spacing



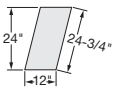
Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC + CAC
100114	Right Parallelogram 24 x 24 x 1"	0.80 •	35 •	BEST
100115	Left Parallelogram 24 x 24 x 1"	0.80 •	35 •	BEST



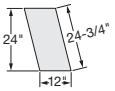
75° SHAPES

Parallelograms

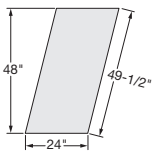
2' Main Beam Spacing



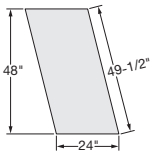
Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC + CAC
100116	Right Parallelogram 24 x 12 x 1"	0.80 •	N/A	–
100117	Left Parallelogram 24 x 12 x 1"	0.80 •	N/A	–



4' Main Beam Spacing



Item No.	Description/ Dimensions (Inches)	Total Acoustics[1] NRC	CAC	NRC + CAC
100118	Right Parallelogram 48 x 24 x 1"	0.80 •	35 •	BEST
100119	Left Parallelogram 48 x 24 x 1"	0.80 •	35 •	BEST



[1] Total Acoustics® ceiling panels have an ideal combination of sound absorption and sound blocking in one product.
GOOD (NRC 0.60-0.65; CAC 35+) **BETTER** (NRC 0.70-0.75; CAC 35+) **BEST** (NRC 0.80+; CAC 35+)

PHYSICAL DATA

Material
Wet-formed mineral fiber with acoustically transparent membrane

Surface Finish
Acoustically transparent membrane with factory-applied latex paint

Fire Performance
Class A: ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type IV, Form 2, Pattern E
Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Anti-Mold/Mildew
Ceiling tiles with BioBlock® performance resist the growth of mold and mildew on the tile surface.

VOC Emissions
GREENGUARD Gold Certified
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017. This standard is the guideline for low emissions in LEED®, WELL Building Standard™, Living Building Challenge® (LBC), CalGreen Title 24, ANSI/ ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol

PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS UL.COM/GG UL 2818

GREENGUARD GOLD

High Recycled Content
Classified as containing greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Seismic Restraint
Suprafine® XM for Shapes suspension systems have been engineered, tested, and approved for use with DesignFlex® Shapes panels for application in all seismic areas when installed per Armstrong® Ceilings installation instructions. For more details, visit armstrongceilings.com/shapesinstallation

Insulation Value
R Factor – 2.9 (BTU units)
R Factor – 0.445 (Watts units)

Design Consideration
Physical product samples for standard and custom colors are available upon request. Please refer to the physical product sample prior to making a final selection. While we strive to ensure exact color matches, various factors such as differences in materials, texture, substrate porosity, painting processes, lighting, and observer subjectivity can all affect how paint colors appear on ceiling and wall panels, suspension systems, and trim products.

Due to these and other differences, ceiling and wall panels, trim products, and suspension systems with the same color name will coordinate but may not be an exact color match. Product is dye-lotted. Order sufficient initial quantities and attic stock to minimize possible color variation.

Cleaning and Disinfecting
Cleaning and CDC recommended disinfecting options available on armstrongceilings.com/cleaning

10-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com/warranty

Weight; Pieces/Carton
100116, 100117 – 2.2 lbs/pc; 24 pcs/ctn
100114, 100115 – 4.4 lbs/pc; 12 pcs/ctn
100112, 100113, 100118, 100119 – 8.8 lbs/pc; 6 pcs/ctn

Minimum Order Quantity
1 carton

DESIGNFLEX® SHAPES

TechLine 877 276-7876
armstrongceilings.com/callashapes

Armstrong® CEILING & WALL SOLUTIONS

CALLA® Shapes for DesignFlex®

Tegular
smooth texture

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 91%

SUSTAIN® High Performance Sustainable Ceiling Systems

Declare.

GREENGUARD Gold Certified (details below)

LEED® | WELL™ | LBC

UP TO 85% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management · construction waste mgmt · regional materials ▲ · design for flexibility · EPD · recyclable/ extended producer resp. · biobased materials · recycled content · sourcing of raw materials · material ingredient reporting · low emitting/ materials · lighting quality · acoustics

▲ LOCATION DEPENDENT

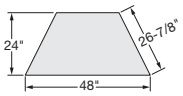
PANEL OPTIONS (shown in finish view from below ceiling)

These 3 Calla® Shapes with Square Tegular edges are available with Suprafine® XM 9/16" suspension:

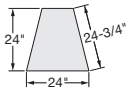
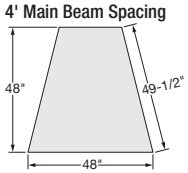
45° SHAPES

Trapezoids	Item No.	Description/ Dimensions (Inches)
No Trapezoids available in 45° shapes		

60° SHAPES

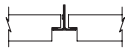
Trapezoids	Item No.	Description/ Dimensions (Inches)
2' Main Beam Spacing 	**100109**	Trapezoid 24 x 48 x 1"
	Total Acoustics[1]	NRC + CAC = NRC CAC
	0.80 •	35 • BEST

75° SHAPES

Trapezoids	Item No.	Description/ Dimensions (Inches)
2' Main Beam Spacing 	**100110**	Right Parallelogram 24 x 24 x 1"
	Total Acoustics[1]	NRC + CAC = NRC CAC
	0.80 •	35 • BEST
4' Main Beam Spacing 	**100111**	Trapezoid 48 x 48 x 1"
	Total Acoustics[1]	NRC + CAC = NRC CAC
	0.80 •	35 • BEST

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GOOD (NRC 0.60-0.65; CAC 35+) **BETTER** (NRC 0.70-0.75; CAC 35+) **BEST** (NRC 0.80+; CAC 35+)

SUSPENSION SYSTEMS

9/16" 

Suprafine® XM for Shapes

PARTNER COMPANIES

For more information on our partner companies, please visit armstrongceilings.com/partners

Compatible with: Axis Geometrix™ Lighting, JLC-Tech T-BAR FLEX LED Lights and Price diffusers.

axis · JLC • tech · price

Shaped infill panels are available for applicable lighting fixtures. Add L I N F to the end of any Shape panel item number to order. Metal diffuser infills are available from the diffuser manufacturer.

PHYSICAL DATA

Material
Wet-formed mineral fiber with acoustically transparent membrane

Surface Finish
Acoustically transparent membrane with factory-applied latex paint

Fire Performance
Class A: ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type IV, Form 2, Pattern E
Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Anti-Mold/Mildew
Ceiling tiles with BioBlock® performance resist the growth of mold and mildew on the tile surface.

VOC Emissions
GREENGUARD Gold Certified
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017. This standard is the guideline for low emissions in LEED®, WELL Building Standard™, Living Building Challenge® (LBC), CalGreen Title 24, ANSI/ ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol

PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS UL.COM/GG UL 2818

GREENGUARD GOLD

High Recycled Content
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Seismic Restraint
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Insulation Value
R Factor – 2.9 (BTU units)
R Factor – 0.445 (Watts units)

Design Consideration
Physical product samples for standard and custom colors are available upon request. Please refer to the physical product sample prior to making a final selection. While we strive to ensure exact color matches, various factors such as differences in materials, texture, substrate porosity, painting processes, lighting, and observer subjectivity can all affect how paint colors appear on ceiling and wall panels, suspension systems, and trim products.

Due to these and other differences, ceiling and wall panels, trim products, and suspension systems with the same color name will coordinate but may not be an exact color match. Product is dye-lotted. Order sufficient initial quantities and attic stock to minimize possible color variation.

Cleaning and Disinfecting
Cleaning and CDC recommended disinfecting options available on armstrongceilings.com/cleaning

10-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com/warranty

Weight; Pieces/Carton
100110 – 3.3 lbs/pc; 12 pcs/ctn
100109 – 6.6 lbs/pc; 8 pcs/ctn
100111 – 13.2 lbs/pc; 4 pcs/ctn

Minimum Order Quantity
1 carton

TechLine / 1 877 276-7876
armstrongceilings.com/callashapes

BPCS-5805-1121

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Armstrong® CEILING & WALL SOLUTIONS

DESIGNFLEX® SHAPES

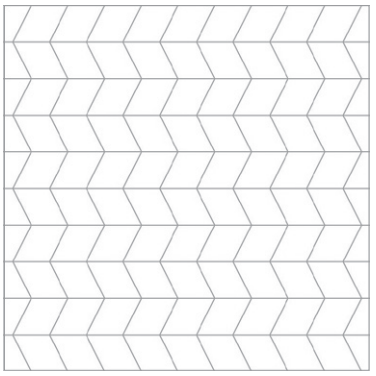
CALLA® Shapes for DesignFlex®

Tegular
smooth texture



Online pattern gallery at armstrongceilings.com/patterngallery





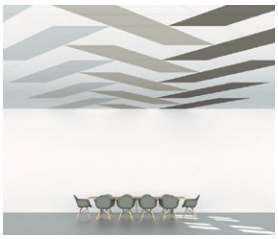
DesignFlex Shapes Pattern – SH2



DesignFlex Shapes – Pattern SH 1



DesignFlex Shapes – Pattern SH 2



DesignFlex Shapes – Pattern SH 3



DesignFlex Shapes – Pattern SH 4



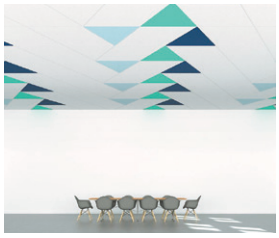
DesignFlex Shapes – Pattern SH 5



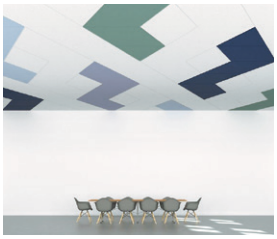
DesignFlex for FORMATIONS
Shapes – Pattern FCSH 5



DesignFlex Shapes – Pattern SH 6



DesignFlex Shapes – Pattern SH 7



DesignFlex Shapes – Pattern SH 8

TechLine 877 276-7876
armstrongceilings.com/callashapes

Armstrong® CEILING & WALL SOLUTIONS

DesignFlex®
Suspension Systems & Accessories

CALLA® Shapes panels

Declare.

SUSPENSION SYSTEMS COMPONENTS & ACCESSORIES System utilizes Suprafine® XL® main beams

45° SHAPES

Item No.		Description
75AB45L		Suprafine® 45° Left Angle Bracket
75AB45R		Suprafine® 45° Right Angle Bracket
75AB45D		Suprafine® 45° Double Angle Bracket
75CB45		Suprafine® 45° Corner Bracket
XM754524		Suprafine® 45° Base Cross Tee – 24" Main Beam Spacing
XM754548		Suprafine® 45° Base Cross Tee – 48" Main Beam Spacing
XM7524		Suprafine® Perimeter Cross Tee – 24" Main Beam Spacing
XM7548		Suprafine® Perimeter Cross Tee – 48" Main Beam Spacing
PCC		Axiom® Perimeter Corner Clip
PAC		Perimeter Angle Clip

60° SHAPES

Item No.		Description
75AB60L		Suprafine® 60° Left Angle Bracket
75AB60R		Suprafine® 60° Right Angle Bracket
75AB60D		Suprafine® 60° Double Angle Bracket
75CB60L		Suprafine® 60° Corner Bracket – Left
75CB60R		Suprafine® 60° Corner Bracket – Right
XM756024		Suprafine® 60° Base Cross Tee – 24" Main Beam Spacing
XM756048		Suprafine® 60° Base Cross Tee – 48" Main Beam Spacing
XM7524		Suprafine® Perimeter Cross Tee – 24" Main Beam Spacing
XM7548		Suprafine® Perimeter Cross Tee – 48" Main Beam Spacing
PCC		Axiom® Perimeter Corner Clip
PAC		Perimeter Angle Clip

75° SHAPES

Item No.		Description
75AB75L		Suprafine® 75° Left Angle Bracket
75AB75R		Suprafine® 75° Right Angle Bracket
75AB75D		Suprafine® 75° Double Angle Bracket
XM757524		Suprafine® 75° Base Cross Tee – 24" Main Beam Spacing
XM757548		Suprafine® 75° Base Cross Tee – 48" Main Beam Spacing
XM7524		Suprafine® Perimeter Cross Tee – 24" Main Beam Spacing
XM7548		Suprafine® Perimeter Cross Tee – 48" Main Beam Spacing
PCC		Axiom® Perimeter Corner Clip
PAC		Perimeter Angle Clip

For additional suspension components, trims, and clips, please consult the full installation instructions at www.armstrongceilings.com/shapesinstallation

ProjectWorks™

NOTE - THIS SET OF DRAWINGS IS MEANT TO SUPPLEMENT STANDARD INSTALLATION INSTRUCTIONS. THIS SET IS NOT INTENDED TO REPLACE STANDARD INSTALLATION INSTRUCTIONS, BE REVISED OR RESUBMITTED. THE INSTALLING CONTRACTOR IS RESPONSIBLE FOR DETERMINING ORDER QTY'S, SCOPE, AND ADHERING TO LOCAL BUILDING CODES.

THIS MATERIAL ESTIMATE DOESN'T INCLUDE AN ALLOWANCE FOR WASTE. IT IS BASED ON ARMSTRONG'S RECOMMENDED INSTALLATION PRACTICES. OTHER METHODS OF INSTALLATION MAY USE MORE OR LESS MATERIAL. PLEASE REFER TO THE ARMSTRONG INSTALLATION INSTRUCTIONS FOR MORE DETAILS.

DIMENSIONS: DRAWINGS, INSTALLATION DETAILS, AND BILL OF MATERIALS ARE BASED ON DIMENSIONS FROM THE RCP SUPPLIED BY THE ARCHITECT. DIMENSIONS SUPPLIED BY THE ARCHITECT MIGHT NOT MATCH FIELD VERIFIED DIMENSIONS.

SMITHSONIAN SI CAP GALLERY
CEILING + AXIOM - DRAWING SUBMITTAL (03-02-22)

DRAWING LIST

C1 - COVER SHEET
T1 - DRAWING TAGS, LABELS, AND MATERIAL QUANTITIES
R1 - ENLARGED REFLECTED CEILING PLAN (CEILING DIMENSIONS AND LAYOUT)
R2 - ENLARGED REFLECTED CEILING PLAN (PANEL LAYOUT)
S1 - SUGGESTED SUSPENSION LAYOUT
S2 - SUSPENSION HUB LAYOUT
D1 - GENERIC CEILING DETAILS
T2 - DRAWING TAGS, LABELS, AND MATERIAL QUANTITIES
X1 - ENLARGED REFLECTED CEILING PLAN (AXIOM PERIMETER LAYOUT)
D2 - TYPICAL AXIOM DETAILS

DESIGN SERVICES DRAWING PACKAGE
AN ORDER FOR MATERIAL SHOULD NOT BE PLACED UNTIL THIS DRAWING PACKAGE IS APPROVED FOR PRE-CONSTRUCTION.

CUSTOMER APPROVAL: _____
PLEASE PRINT AND SIGN HERE FOR ORDER TO BE PROCESSED.

1) GENERAL NOTES:

1.1) AN ELECTRONIC COPY OF THE ARCHITECTURAL DRAWINGS FOR THIS PROJECT WAS PROVIDED. THIS DRAWING IS BASED ON OUR BEST INTERPRETATION OF THE INFORMATION SUPPLIED. DRAWING MUST BE CHECKED AND APPROVED FOR ACCURACY.

1.2) CONTRACTOR RESPONSIBLE FOR MEETING ALL LOCAL CODES FOR INSTALLATION.

1.3) REFER TO ARMSTRONG (SYSTEM TYPE) INSTALLATION INSTRUCTIONS FOR ADDITIONAL INFORMATION.

1.4) FIELD CUT PANELS AS REQ'D - (BY CONTRACTOR).

1.5) ALL CEILING PANEL PENETRATIONS TO BE FIELD CUT - (BY CONTRACTOR).

1.6) ARMSTRONG DOES NOT SUPPORT WALL-TO-WALL INSTALLATIONS OF FULL SIZED PANELS AT PERIMETER MOLDING DUE TO THE INCONSISTENCY OF WALLS DURING CONSTRUCTION.

1.7) HANGER WIRE / THREADED ROD / AIRCRAFT CABLE LOCATIONS AND ASSOCIATED HANGING HARDWARE ARE NOT DETAILED OR INCLUDED IN THE BILL OF MATERIALS SUPPLIED WITH OR REPRESENTED IN THIS DRAWING. HANGING HARDWARE QUANTITIES AND LOCATIONS ARE SITE SPECIFIC AND MUST BE CALCULATED BY INSTALLING CONTRACTOR.

2) SEISMIC:

2.1) DRAWINGS & BILL OF MATERIALS DO NOT INCLUDE ALL SEISMIC CONSIDERATIONS OR ACCESSORIES.

2.2) ANY ADDITIONAL, REQUIRED SEISMIC ACCESSORIES AND HARDWARE MUST BE ORDERED SEPARATELY.

2.3) PLEASE REFER TO ARMSTRONG'S PRODUCT-SPECIFIC INSTALLATION INSTRUCTIONS AND THE SEISMIC INSTALLATION BROCHURE (DOC: BPCS-4141-921) FOR GUIDANCE.

3) TYPICAL DRAWING DETAILS:

3.1) TYPICAL DRAWING DETAILS SHOWN AT THE END OF THIS DOCUMENT SHOULD BE USED FOR REFERENCE TO TYPICAL INSTALLATION METHODS. TYPICAL DETAILS SHOWN DO NOT NECESSARILY PERTAIN TO THE EXACT SITE SPECIFIC CONDITIONS DEPICTED IN THE DRAWING PACKAGES SUPPLIED BY ARMSTRONG OR PROVIDED BY THE ARCHITECT.

4) SLOPES:

4.1) PROJECTWORKS DOES NOT CURRENTLY ACCOUNT FOR OR DETAIL SLOPED CEILINGS IN 3 DIMENSIONS. ALL RCP LAYOUT VIEWS SHOWN IN THIS DRAWING PACKAGE ASSUME A FLAT (0% GRADE) INSTALLATION . ANY RCP LAYOUTS OF A SLOPED CEILING INCLUDED IN THIS DRAWING PACKAGE ARE 2D DEPICTIONS OF THAT 3D SLOPE. AS A RESULT, PANEL, SUSPENSION, AND HARDWARE QUANTITIES IN THESE AREAS ARE ESTIMATED BASED ON WHAT IS SHOWN IN 2D.

4.2) ACTUAL QUANTITIES AND INSTALLATION POSITIONING OF THE CEILING IN THESE AREAS SHOULD BE EVALUATED BY A LOCAL ENGINEER WITH REFERENCE TO THE ARMSTRONG SLOPED CEILING GUIDE - DOC: BPCS-5618-417.

4.3) ADDITIONAL QUANTITIES OF MATERIAL TO SUPPORT THE SLOPED CEILING INSTALLATION WILL NEED TO BE CONSIDERED SEPARATELY AND AT TIME OF ORDER.

5) AXIOM:

5.1) ALL PERIMETER TRIM SHOWN HAS BEEN ADJUSTED FOR TANGENCY.

5.2) ALL CEILING TO AXIOM CONNECTIONS ASSUMED AS **LAY-IN** UNLESS OTHERWISE REQUESTED.

5.3) ALL DIMENSIONS DERIVED FROM AUTOCAD FILE PROVIDED. CUSTOMER ASSUMES ALL RESPONSIBILITY.

5.4) TOLERANCES ARE ± 1/16"

5.5) BEFORE SIGNING OFF ON DRAWING, CONFIRM IN ALL CEILINGS THAT THE SIZE, TYPE, AND FINISH IS CORRECT.

5.6) BEFORE SIGNING OFF ON DRAWING, CONFIRM THE DIRECTION OF THE AXIOM PROFILE IS CORRECT. REFERENCE "D" SHEETS FOR ISO VIEW EXAMPLES OF AXIOM DIRECTIONALITY.

5.7) DETAILS SHOWN ON "D" SHEETS ARE TYPICAL AND MAY NOT INCLUDE ALL HARDWARE OR FASTENERS REQUIRED. TYPICAL DETAILS ARE TO BE USED AS A REFERENCE.

5.8) INSTALLATION NOTE: IT IS SUGGESTED TO ALIGN MATERIAL ON THE FLOOR PRIOR TO INSTALLATION TO FAMILIARIZE YOURSELF WITH THE PRODUCT LAYOUT.

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks™

These drawings show generic conditions which the Armstrong products depicted are installed. They are not a substitute for an architect's or engineer's plan and do not reflect the unique requirements of local building codes, laws, statutes, ordinances, rules and regulations (Legal Requirements) that may be applicable for a particular installation. Armstrong does not warrant, and assumes no liability for the accuracy or completeness of the drawings for a particular installation or their fitness for a particular purpose. The user is advised to consult with a duly licensed architect or engineer in the particular locale of the installation to assure compliance with all legal requirements. Armstrong is not licensed to provide professional architecture or engineering design services.

SMITHSONIAN SI CAP GALLERY
PROJECTWORKS DRAWING SUBMITTAL

CASE NUMBER: 02209605

DATE FIRST ISSUED: (03-02-22)

CAD TECH: JDL

CHECKED BY: XXX

DESCRIPTION: PROJECTWORKS DRAWING SUBMITTAL

REVISIONS

REV: 1	DATE:XX-XX-XX
REV: 2	DATE:XX-XX-XX
REV: 3	DATE:XX-XX-XX
REV: 4	DATE:XX-XX-XX

DRAWING NO.

C1

CEILING - PANEL SCHEDULE

Armstrong World Industries Panel Schedule					
Tag	Category	Description	Color	Item Number	Quantity
P1	Panel	Calla 9/16" Sq Teg 60° Rtri 48" Base	White	100106	64.0 PCS

CEILING - SUSPENSION / GRID / TRIM SCHEDULE

Armstrong World Industries Optimized Grid Schedule					
Tag	Category	Description	Color	Item Number	Quantity
-	Axiom	Axiom Drywall Bottom Trim (straight)	White	AXBTSTR	8.0 PCS
-	Axiom	Axiom Transitions 4" (straight)	White	AXTR4STR	8.0 PCS
-	Bracket	Suprafine 60° Right Corner Bracket	White	75CB60R	42.0 PCS
MB1	Grid	Suprafine 9/16" - 12' ID Main Beam, Routs 6" OC	White	7500	112.6 LFT
PT1	Grid	Suprafine 48" Base Perimeter Cross Tee	White	XM7548	20.0 PCS
XT1	Grid	Suprafine 9/16" - 2' Cross Tee	White	XL7520	24.0 PCS
XT2	Grid	Suprafine 60° 48" Base Cross Tee	White	XM756048	12.0 PCS

CEILING - HARDWARE SCHEDULE

Armstrong World Industries Hardware Schedule				
Tag	Description	Color	Item Number	Quantity
-	Axiom Splice Plate	-	AXSPLICE2 (included)	20.0 PCS
-	Axiom T-Bar Connector Clip	-	AXTBC (included)	18.0 PCS
-	Perimeter Angle Clip	-	PAC	40.0 PCS
-	Perimeter Corner Clip	-	PCC	4.0 PCS

HUB SCHEDULE

Hub Schedule				
Tag	Part Description	Color	Quantity	Item Number
A	Axiom Splice Plate		2	AXSPLICE2 (included)
	Perimeter Corner Clip		1	PCC
B	Axiom Splice Plate		2	AXSPLICE2 (included)
C	Axiom Splice Plate		2	AXSPLICE2 (included)
	Perimeter Angle Clip		2	PAC
	Perimeter Corner Clip		1	PCC
D	Axiom Splice Plate		2	AXSPLICE2 (included)
G	Axiom T-Bar Connector Clip		1	AXTBC (included)
	Perimeter Angle Clip		2	PAC
H	Axiom T-Bar Connector Clip		1	AXTBC (included)
	Perimeter Angle Clip		2	PAC
I	Suprafine 60° Right Corner Bracket	White	2	75CB60R

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks

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SMITHSONIAN SI CAP GALLERY
PROJECTWORKS DRAWING SUBMITTAL

CASE NUMBER:
02209605

DATE FIRST ISSUED:
(03-02-22)

CAD TECH:
JDL

CHECKED BY:
XXX

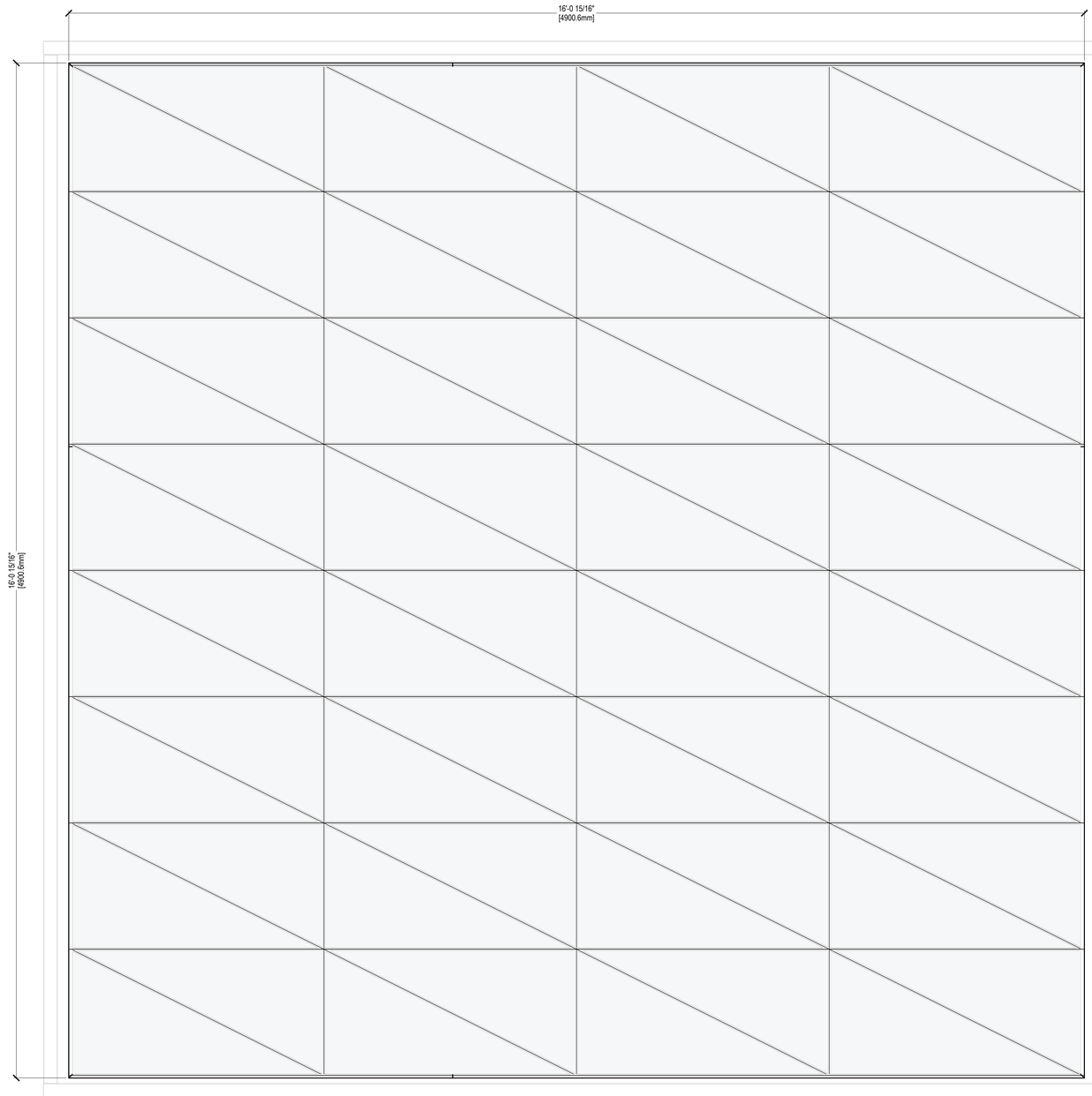
DESCRIPTION:
PROJECTWORKS
DRAWING SUBMITTAL

REVISIONS

REV: 1	DATE:XX-XX-XX
REV: 2	DATE:XX-XX-XX
REV: 3	DATE:XX-XX-XX
REV: 4	DATE:XX-XX-XX

DRAWING NO.

T1



1 ENLARGED REFLECTED CEILING PLAN
SCALE: 1" = 1'-0"

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks

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SMITHSONIAN SI CAP GALLERY
PROJECTWORKS DRAWING SUBMITTAL

CASE NUMBER:
02209605

DATE FIRST ISSUED:
(03-02-22)

CAD TECH:
JDL

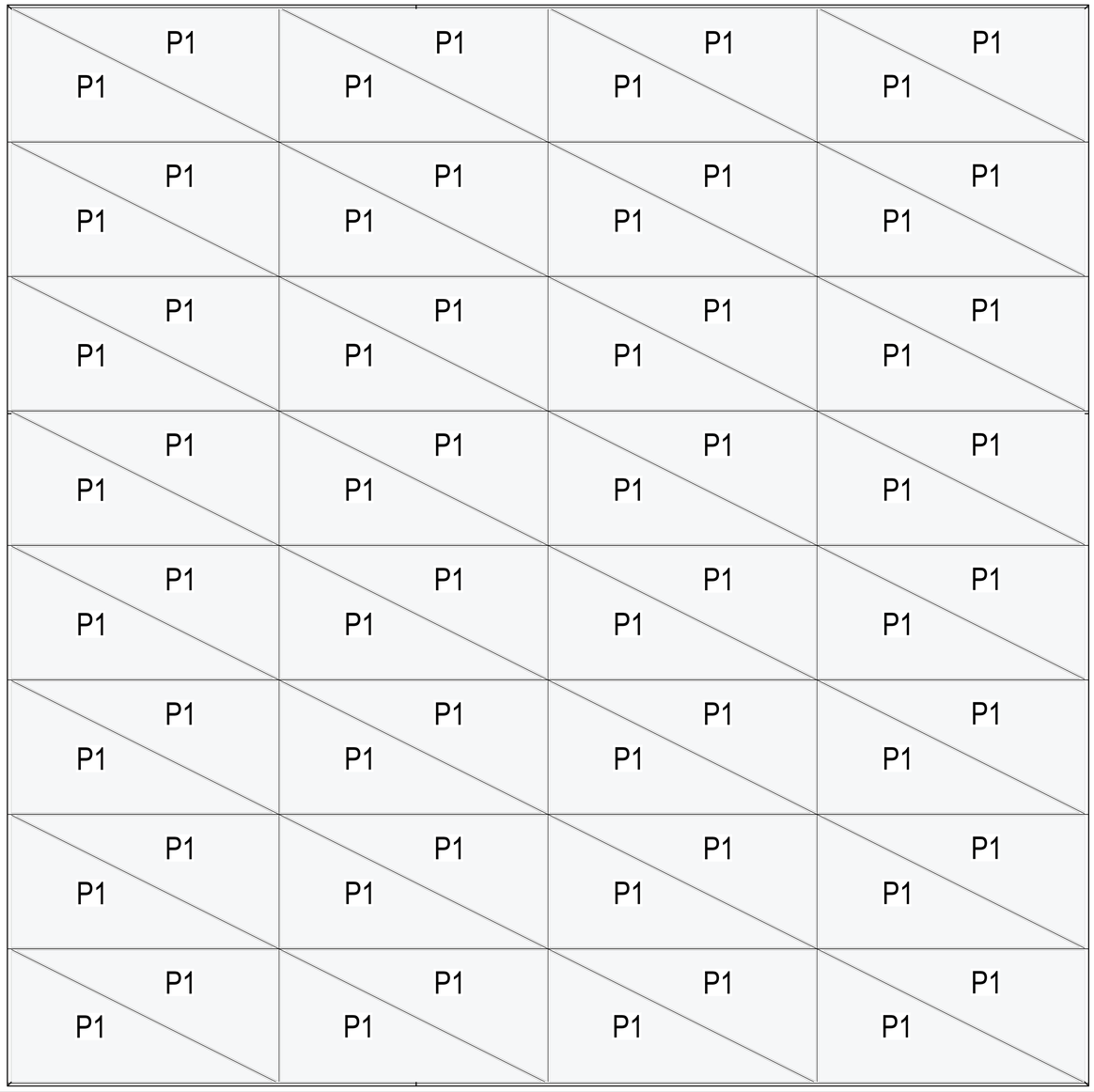
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REV: 2	DATE:XX-XX-XX
REV: 3	DATE:XX-XX-XX
REV: 4	DATE:XX-XX-XX

DRAWING NO.

R1



1 ENLARGED REFLECTED CEILING PLAN (PANEL LAYOUT)
SCALE: 1" = 1'-0"

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks

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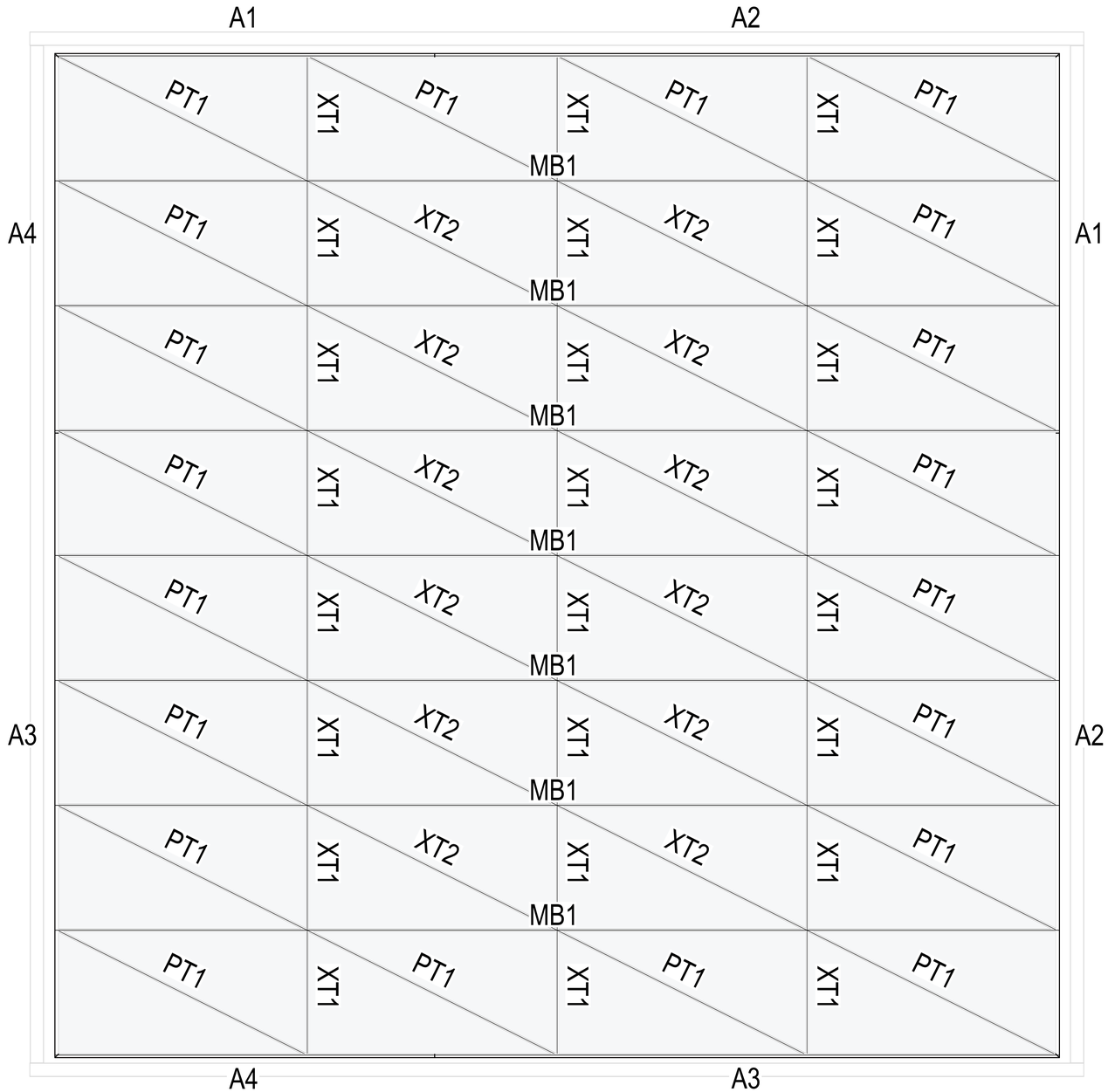
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DESCRIPTION:
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DRAWING SUBMITTAL

REVISIONS	
REV: 1	DATE:XX-XX-XX
REV: 2	DATE:XX-XX-XX
REV: 3	DATE:XX-XX-XX
REV: 4	DATE:XX-XX-XX

DRAWING NO.

R2



1 SUGGESTED SUSPENSION LAYOUT
SCALE: 1" = 1'-0"

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks™

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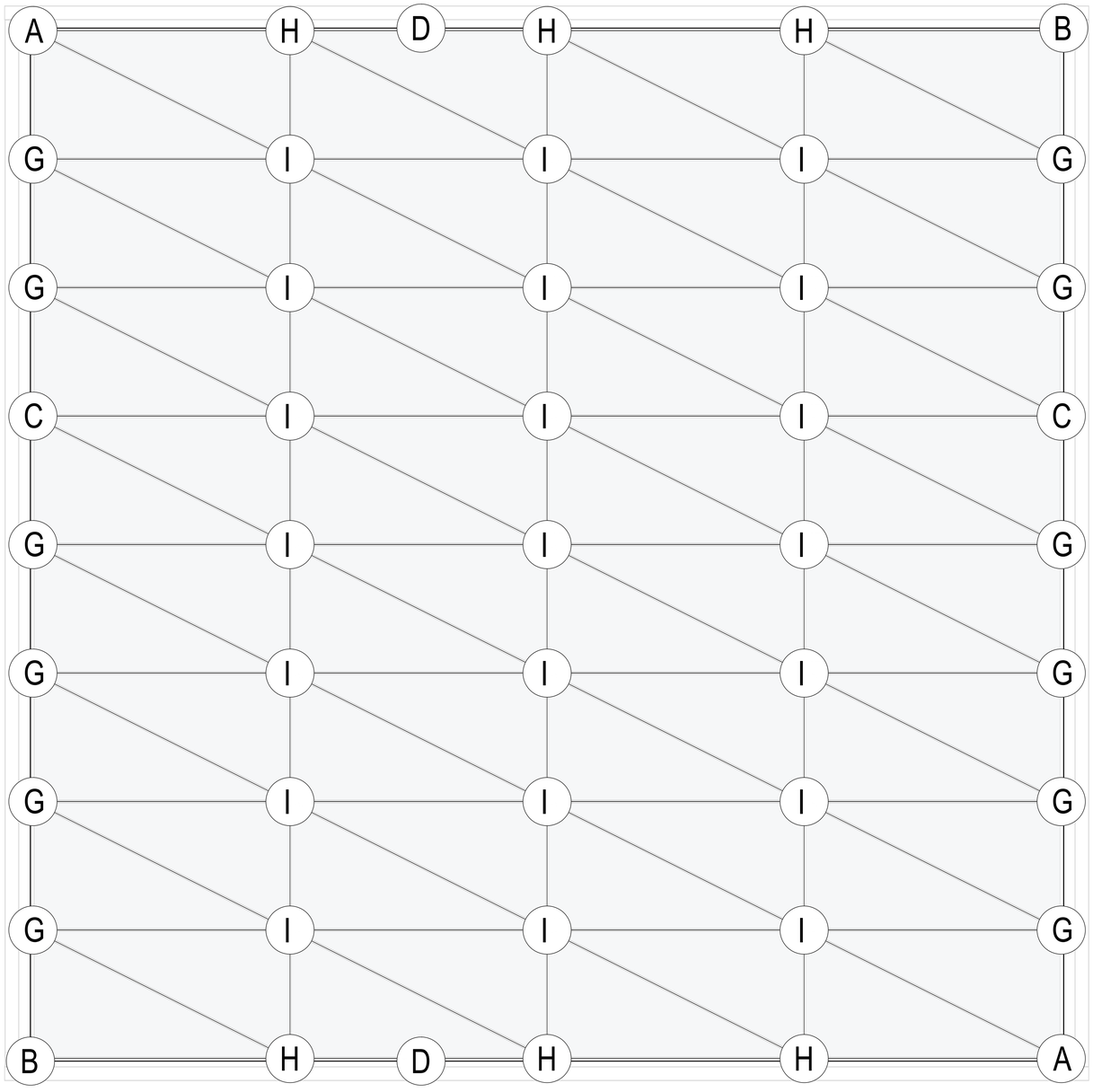
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REV: 3	DATE:XX-XX-XX
REV: 4	DATE:XX-XX-XX

DRAWING NO.

S1



1 SUSPENSION HUB LAYOUT
SCALE: 1" = 1'-0"

* SUSPENSION HUB NOTES:
- QUANTITIES LISTED IN HUB SCHEDULE REFLECT QUANTITIES OF COMPONENTS NEEDED FOR EACH HUB LOCATION.

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks

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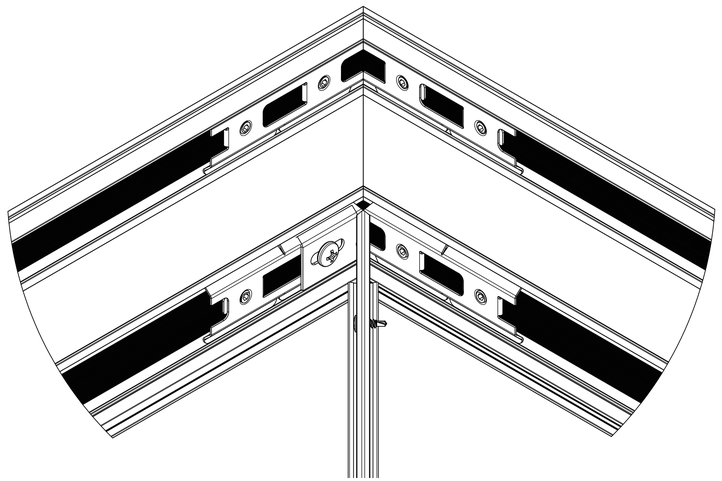
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PROJECTWORKS
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REVISIONS

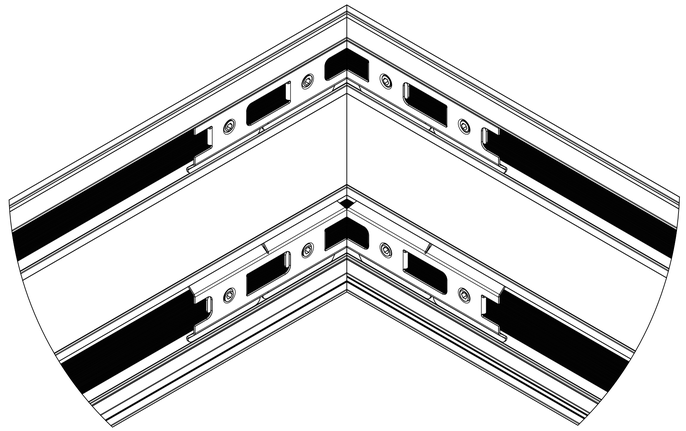
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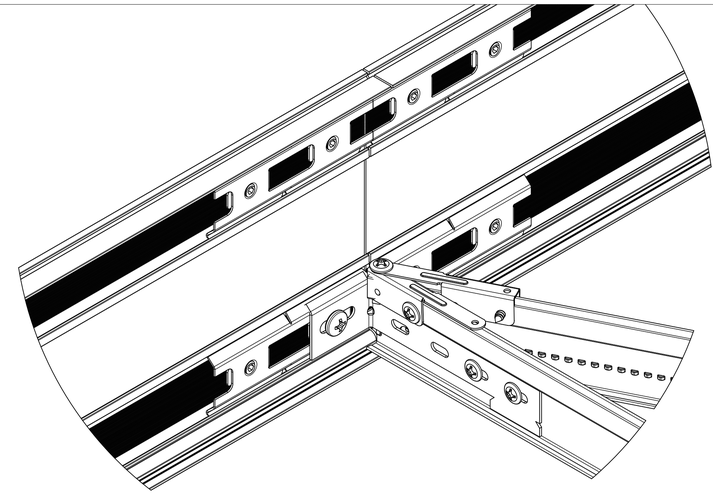
S2



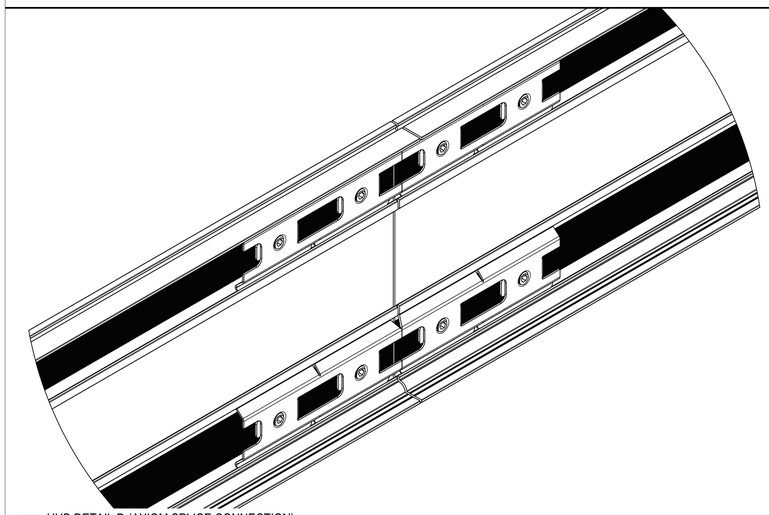
A HUB DETAIL A (PCC TO ANGLE TEE AT AXIOM MITERED OUTSIDE CORNER)
Scale: 3/4" = 1'-0"



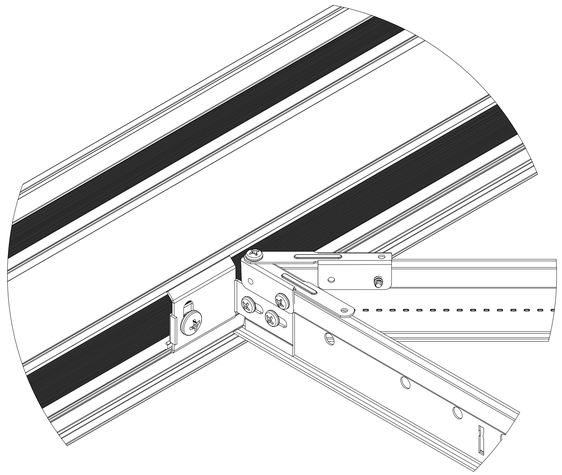
B HUB DETAIL B (AXIOM MITERED OUTSIDE CORNER)
Scale: 3/4" = 1'-0"



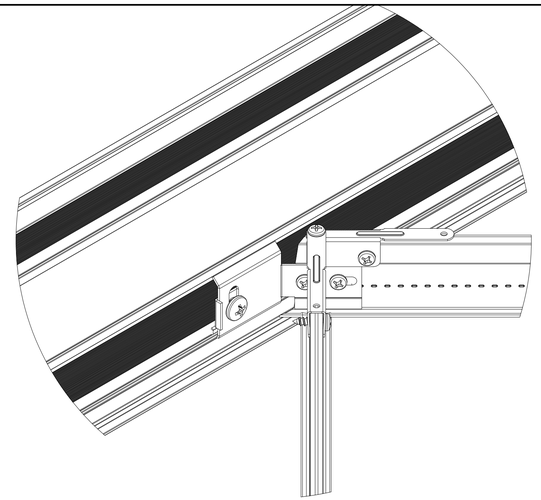
C HUB DETAIL C (PCC & PAC TO MAIN BEAM & ANGLE TEE AT AXIOM SPLICE CONNECTION)
Scale: 3/4" = 1'-0"



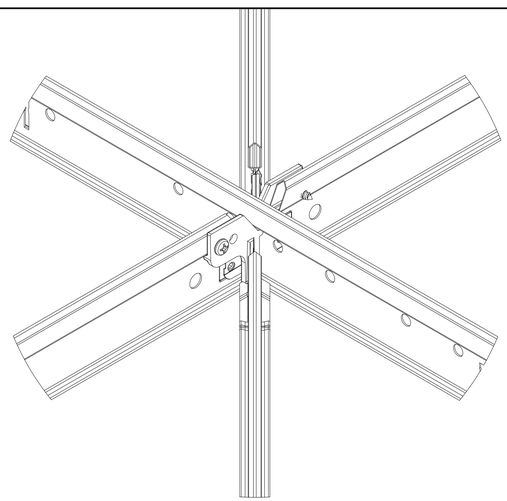
D HUB DETAIL D (AXIOM SPLICE CONNECTION)
Scale: 3/4" = 1'-0"



G HUB DETAIL G (AXTBC & PAC TO MAIN BEAM & ANGLE TEE)
Scale: 3/4" = 1'-0"



H HUB DETAIL H (AXTBC & PAC TO TWO ANGLE TEES)
Scale: 3/4" = 1'-0"



I HUB DETAIL I (RIGHT CORNER BRACKET TO RIGHT CORNER BRACKET)
Scale: 3/4" = 1'-0"

CONTRACTOR RESPONSIBLE FOR MEETING ALL LOCAL CODES FOR INSTALLATION

REFER TO ARMSTRONG (SYSTEM TYPE) INSTALLATION INSTRUCTIONS FOR ADDITIONAL INFORMATION

* SEISMIC NOTE:
- DRAWINGS & BILL OF MATERIALS DO NOT INCLUDE ANY SEISMIC NOTES OR ACCESSORIES. PLEASE REFER TO ARMSTRONG'S INSTALLATION INSTRUCTIONS FOR GUIDANCE. PLEASE ORDER ANY NECESSARY ACCESSORIES SEPARATELY.

Armstrong CEILING & WALL SOLUTIONS

ProjectWorks™

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SMITHSONIAN SI CAP GALLERY
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REV: 4	DATE:XX-XX-XX

DRAWING NO.

D1

AXIOM SPECIFIC DRAWING DETAILS

AXIOM - TRIM SHOP DRAWINGS

Armstrong World Industries Trim Schedule												
Tag	Qty	Item #	Color	Description	Cut Type	Start Angle	End Angle	Curve	Radius	Length	Unit Qty	Total Qty
A1	2	AXTR4STR	White	Axiom Transition 4" (straight)	BEV-OS	135.0	90.0			6' - 0 15/16"	1.0 PCS	2.0 PCS
A2	2	AXTR4STR	White	Axiom Transition 4" (straight)	BEV-OS	90.0	135.0			10'	1.0 PCS	2.0 PCS
A3	2	AXTR4STR	White	Axiom Transition 4" (straight)	BEV-OS	135.0	90.0			10'	1.0 PCS	2.0 PCS
A4	2	AXTR4STR	White	Axiom Transition 4" (straight)	BEV-OS	90.0	135.0			6' - 0 15/16"	1.0 PCS	2.0 PCS
Aa1	2	AXBTSTR	White	Axiom Drywall Bottom Trim (straight)	BEV-OS	135.0	90.0			6' - 0 15/16"	1.0 PCS	2.0 PCS
Aa2	2	AXBTSTR	White	Axiom Drywall Bottom Trim (straight)	BEV-OS	90.0	135.0			10'	1.0 PCS	2.0 PCS
Aa3	2	AXBTSTR	White	Axiom Drywall Bottom Trim (straight)	BEV-OS	135.0	90.0			10'	1.0 PCS	2.0 PCS
Aa4	2	AXBTSTR	White	Axiom Drywall Bottom Trim (straight)	BEV-OS	90.0	135.0			6' - 0 15/16"	1.0 PCS	2.0 PCS

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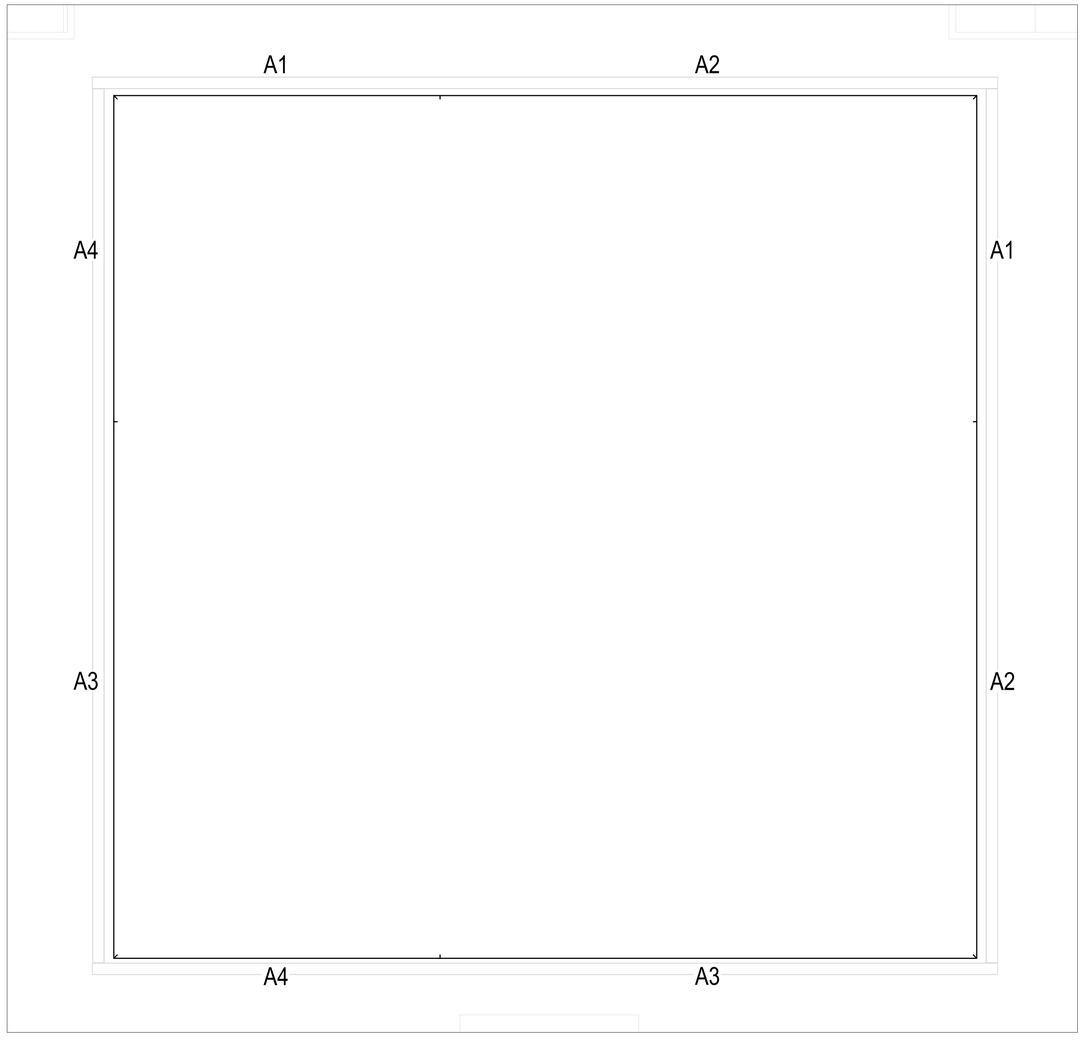
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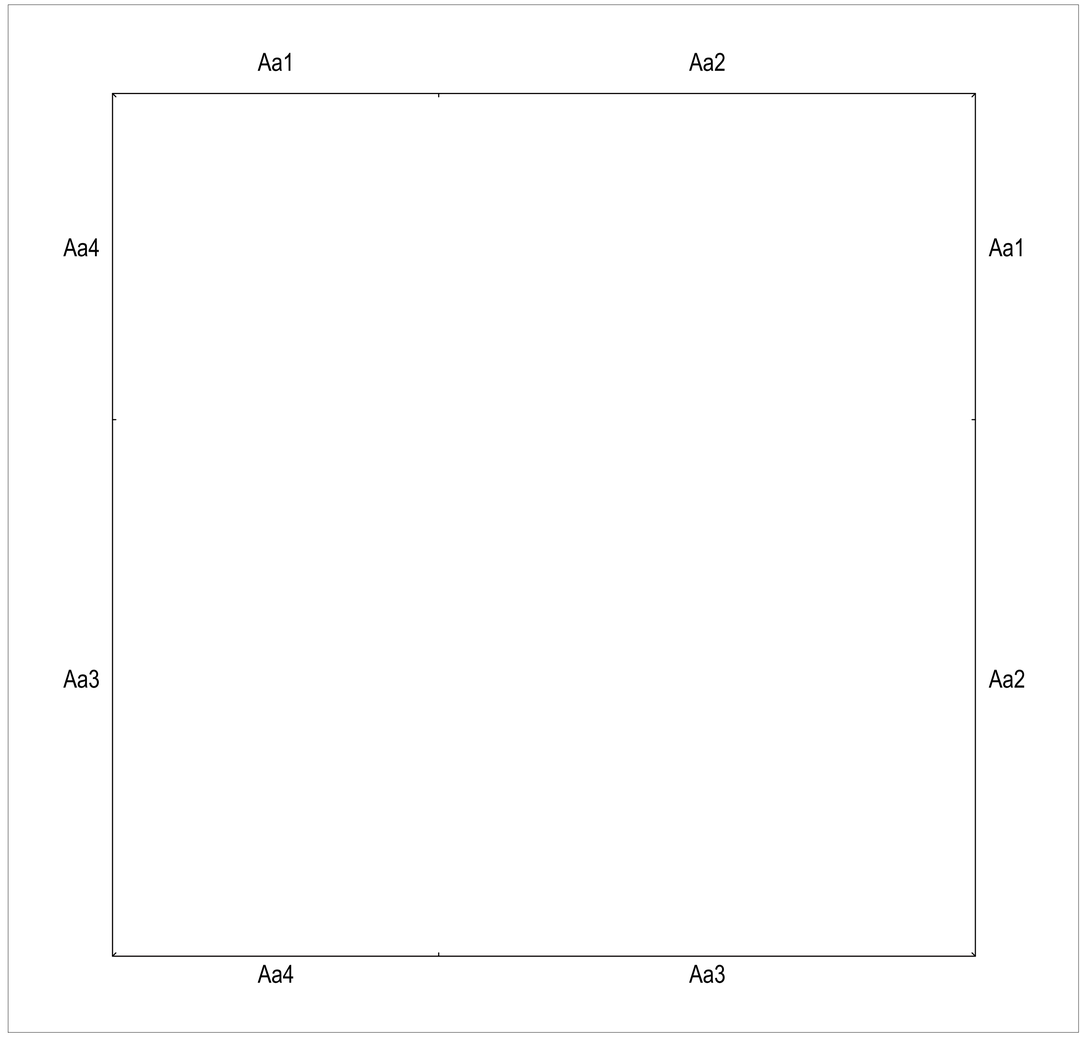
REVISIONS

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REV: 3	DATE:XX-XX-XX
REV: 4	DATE:XX-XX-XX

DRAWING NO.

T2





1 ENLARGED REFLECTED CEILING PLAN (AXIOM PERIMETER LAYOUT)
SCALE: 3/4" = 1'-0"

Armstrong CEILING & WALL SOLUTIONS

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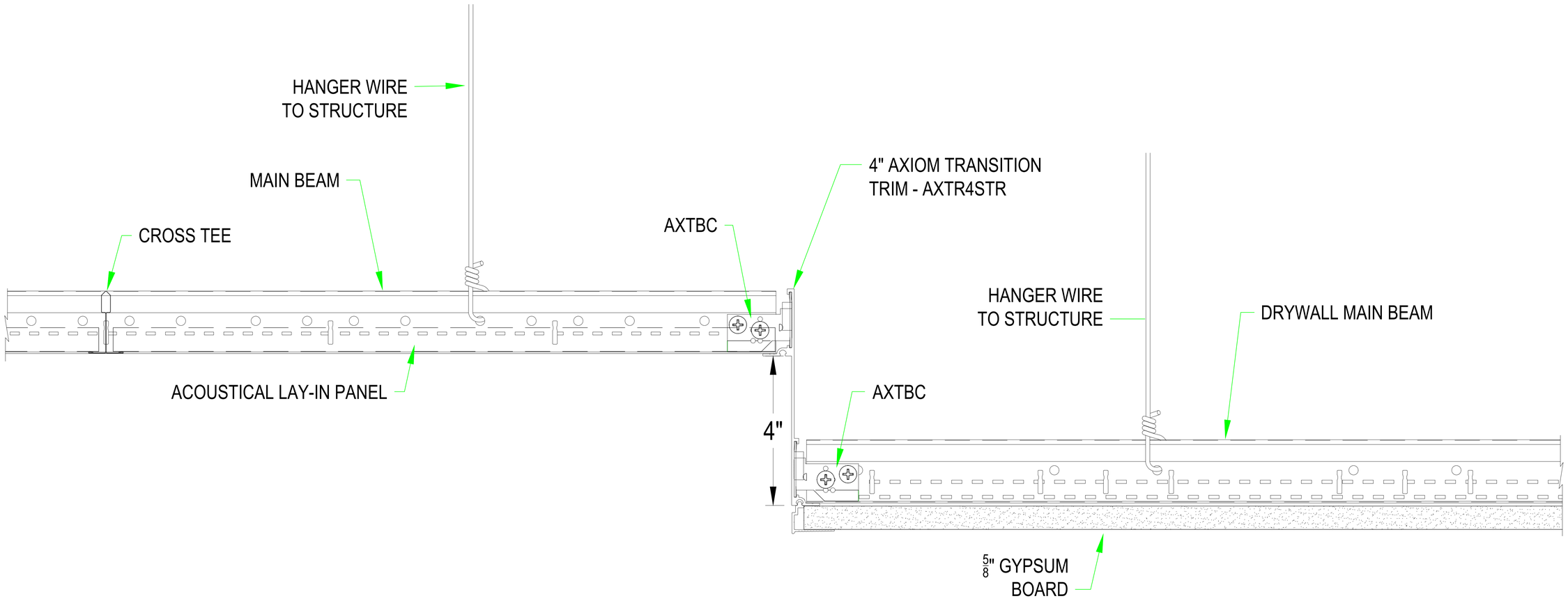
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DRAWING NO.

X1



1 GENERIC AXIOM TRANSITION DETAIL
NTS

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DRAWING NO.

D2

TRANSITION MOLDINGS

Acoustical-to-Drywall Transition Molding



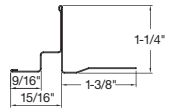
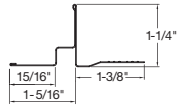
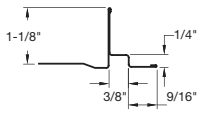
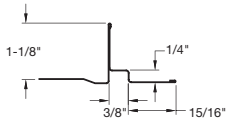
▲ Acoustical-to-Drywall Transition Molding

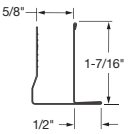
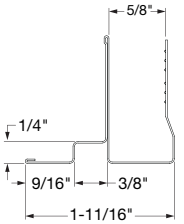
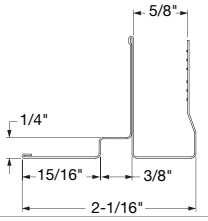
Transition moldings save time and money and are easier to install.

KEY SELECTION ATTRIBUTES

- Fewer parts and pieces; combines acoustical molding with drywall taping flange
- Pre-punched vertical web to improve screw attachment
- Knurled and slotted integral taping flange on items 7901, 7902, 7904, 7905, 7906, 7907, 7908 accommodates taping and finishing
- Protective film on the face of the wall molding flange of 7904PF and 7905PF facilitates faster, easier mudding, sanding, and taping
- Compatible with all types of framing including Armstrong® Drywall Grid and ShortSpan®

VISUAL SELECTION

	Item No.	Flange	Length	Reveal	Pcs/ Ctn	Lin. Ft./ Ctn.	
Shadow Reveal Transition Molding	**7901**	9/16"	120"	3/8"	12	120	
	7902	15/16"	120"	3/8"	12	120	
	7911	9/16"	120"	3/8 x 1/4"	12	120	
	7912	15/16"	120"	3/8 x 1/4"	12	120	

	Item No.	Flange	Length	Pcs/ Ctn	Lin. Ft./ Ctn.	
F Vertical Transition Molding	**7906**	1/2"	120"	12	120	
	7913	9/16"	120"	12	120	
	7914	15/16"	120"	12	120	

SUSPENSION SYSTEMS – Standard Moldings

TRANSITION MOLDINGS

Acoustical-to-Drywall Transition Molding

LEED® | WELL™ | LBC

UP TO 61% RECYCLED CONTENT

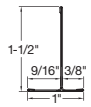
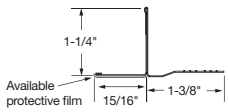
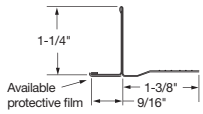
Calculate sustainability with GreenGenie™
armstrongceilings.com/greengenie

energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
		✓	✓				✓	✓				

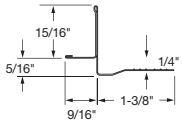
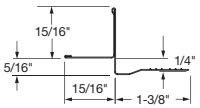
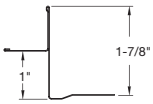
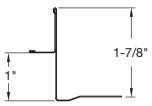
▲ LOCATION DEPENDENT

Well Building Standard™ (WELL)
Living Building Challenge® (LBC)

VISUAL SELECTION

	Item No.	Flange	Length	Transition Height	Pcs/ Ctn	Lin. Ft./ Ctn.	
Flush Transition Molding	**7903**	9/16"	120"	1"	12	120	
	7904 **7904PF***	15/16"	120"	N/A	12	120	
	7905 **7905PF***	9/16"	120"	N/A	12	120	

* Protective film applied to face of wall molding flange for easier finishing.

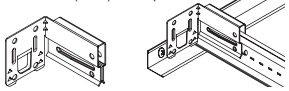
	Item No.	Flange	Length	Reveal	Pcs/ Ctn	Lin. Ft./ Ctn.	
Tegular Transition Molding	**7907**	9/16"	120"	15/16"	12	120	
	7908	15/16"	120"	15/16"	12	120	
Step Transition Molding	**7909**	15/16"	120"	1"	12	120	
	7910	9/16"	120"	1"	12	120	

ACCESSORIES

2" Beam End Retaining Clip – Joins main beam or cross tee to wall molding and web of suspension system with no visible pop rivets.

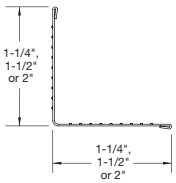
ALBERC2 (aluminum) – 200 pcs
FZALBERC2 (aluminum) – 50 pcs

BERC2 (steel) – 200 pcs
FZBERC2 (steel) – 50 pcs



Knurled Angle Molding – Hemmed with prefinished exposed flanges.

KAM10 – 10 pcs
KAM12 – 10 pcs



SUSPENSION SYSTEMS – Standard Moldings

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TRANSITION MOLDINGS

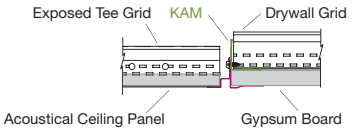
Acoustical-to-Drywall Transition Molding

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UP TO 61% RECYCLED CONTENT
Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie
energy management; construction waste mgmt; regional materials ✓; design for flexibility ✓; EPD; recyclable/ extended producer resp.; biobased materials; recycled content ✓; sourcing of raw materials ✓; material ingredient reporting; low emitting/ materials; lighting quality; acoustics
▲ LOCATION DEPENDENT
Well Building Standard™ (WELL)
Living Building Challenge® (LBC)

INSTALLATION DETAILS

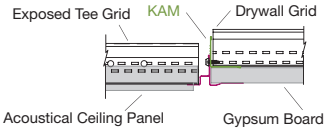
Drywall to Acoustical (Acoustical Flange with 3/8" reveal) 7901 – 9/16" and 7902 – 15/16"

Flush



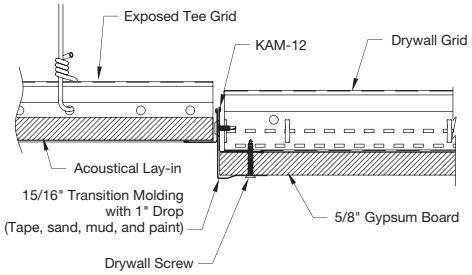
7901 or 7902

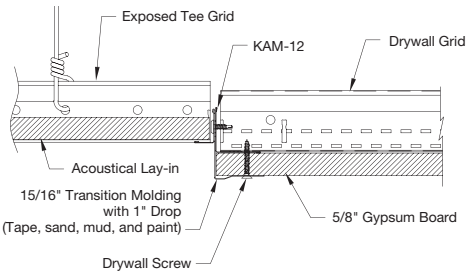
Tegular



7901 or 7902

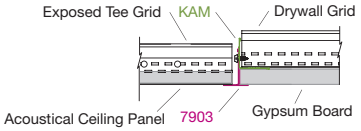
Drywall to Acoustical 1" Step 7910 – 9/16"and 7909 – 15/16"



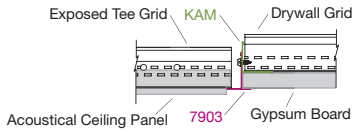


Drywall to Acoustical (1" Inverted T) 7903

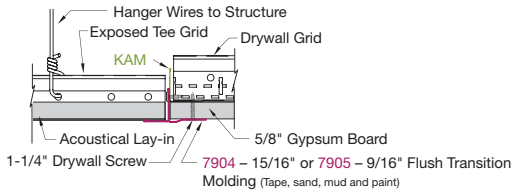
Flush

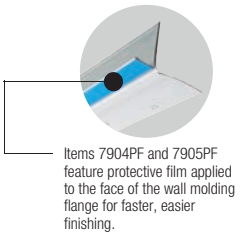


Tegular



Drywall to Acoustical Flush Transition 7904/7904PF – 15/16" and 7905/7905PF – 9/16"





Items 7904PF and 7905PF feature protective film applied to the face of the wall molding flange for faster, easier finishing.

TRANSITION MOLDINGS

Acoustical-to-Drywall Transition Molding

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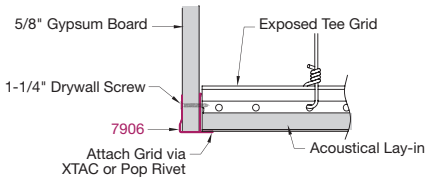
energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
		✓	✓				✓	✓				

▲ LOCATION DEPENDENT

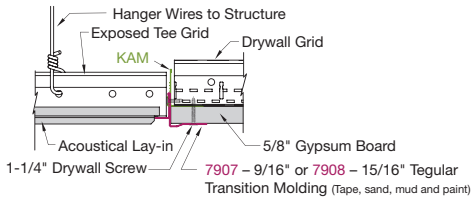
Well Building Standard™ (WELL)
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INSTALLATION DETAILS

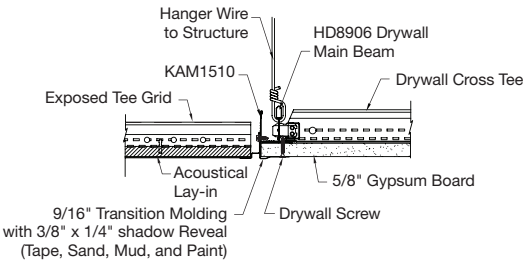
F Vertical Transition Molding Flush 7906

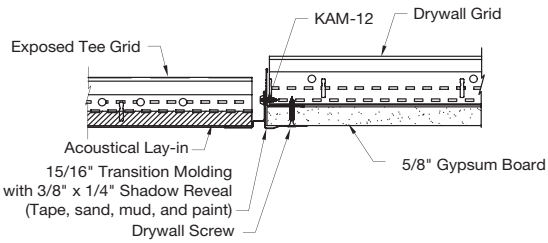


Drywall-to-Acoustical Tegular 7907 – 9/16" and 7908 – 15/16"

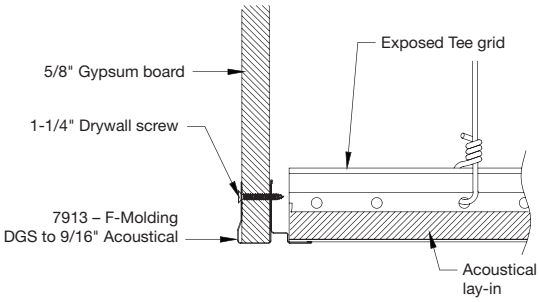


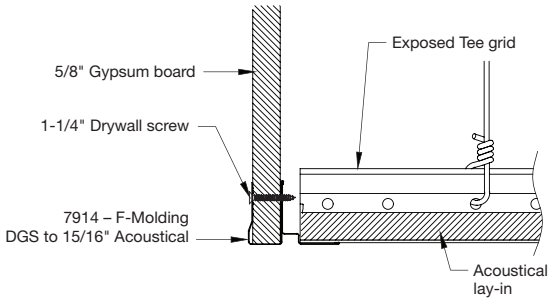
Drywall to Acoustical (Acoustical Flange with 3/8" x 1/4" reveal) 7911 – 9/16" and 7912 – 15/16"





Stepped 7913 – 9/16" and 7914 – 15/16"





SUSPENSION SYSTEMS – Standard Moldings

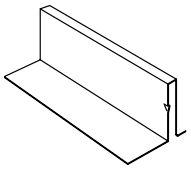
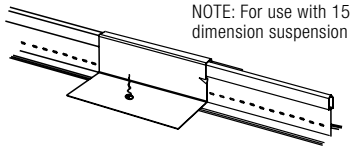
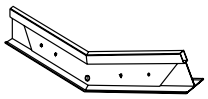
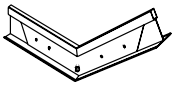
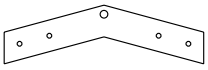
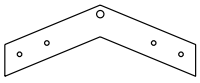
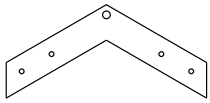
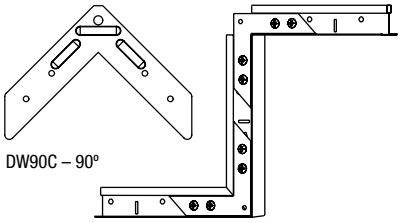
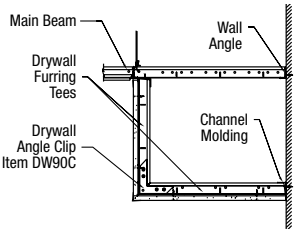
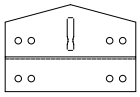
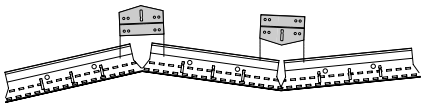
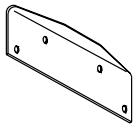
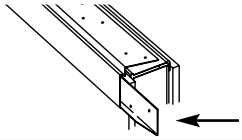
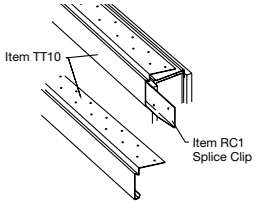
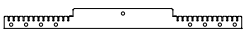
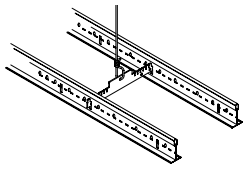
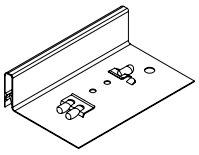
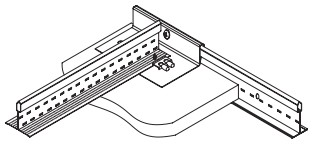
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DRYWALL Grid Systems

Clips and Accessories

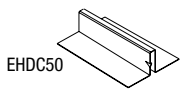
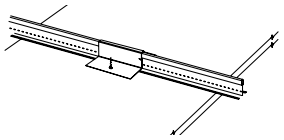
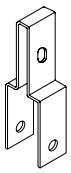
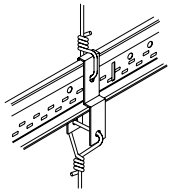
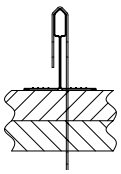
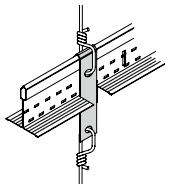
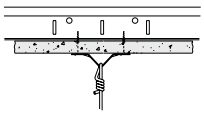
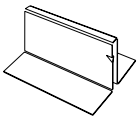
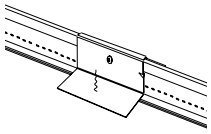
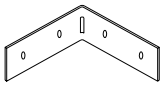
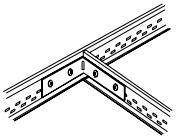
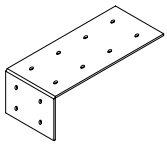
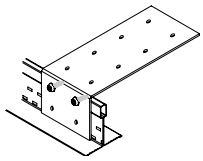
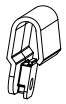
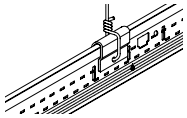
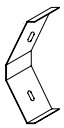
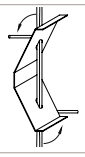
VISUAL SELECTION

Item Number	Description	
☐ **DWACS** 100 pcs/bucket ☐ **FZDWACS** 50 pcs/bucket	DWACS – Drywall Attachment Clip – Facilitates transition from drywall to acoustical ceiling; locks under bulb of grid section to prevent upward movement and provide secure attachment surface on one side of exposed grid	  NOTE: For use with 15/16" face dimension suspension system.
☐ **DW30CAG** – 30º ☐ **DW45CAG** – 45º ☐ **DW60CAG** – 60º ☐ **DW90CAG** – 90º 250 pcs/bucket ☐ **FZDW30CAG** – 30º ☐ **FZDW45CAG** – 45º ☐ **FZDW60CAG** – 60º ☐ **FZDW90CAG** – 90º 50 pcs/bucket	Drywall Angle Clip – Used to create positive and secure angles for drywall and ceiling installations on either main beams or cross tees; attachment to be made with 7/16" pan head screw	   DW30C – 30º  DW45C – 45º  DW60C – 60º  DW90C – 90º  Main Beam Wall Angle Drywall Furring Tees Channel Molding Drywall Angle Clip Item DW90C
☐ **RC2AG** 250 pcs/bucket ☐ **FZRC2AG** 50 pcs/bucket	RC2 – Radius Clip is used for drywall applications which form curved installations; attaches to the cavity side of web of the main beam with four 7/16" pan head screws. Install at all knockout locations.	 
☐ **RC1** 200 pcs/bucket ☐ **FZRC1** 50 pcs/bucket	RC1 – Splice Clip is used as a main beam splice or partition top trim splice	 
☐ **TT10** 30 pcs/bucket	TT10 – 10' Partition Top Trim – Used to finish off the top of a drywall partition for a continuous drywall/acoustic ceiling interface	  Item TT10 Item RC1 Splice Clip
☐ **GSC9** (1" to 4") ☐ **GSC12** (4" to 8") ☐ **GSC16** (8" to 14") 100 pcs/bucket ☐ **FZGSC9** (1" to 4") ☐ **FZGSC12** (4" to 8") ☐ **FZGSC16** (8" to 14") 50 pcs/bucket	Adjustable Grid Spacer Clip – Used to space two parallel main beams for light fixtures, air diffusers, etc.; allows for 1/4" adjustments with three different clips	 
Locking ☐ **DW58LTAG** – 5/8" Gypsum ☐ **DW50LT** – 1/2" Gypsum 125 pcs/bucket ☐ **FZDW58LTAG** – 5/8" Gypsum ☐ **FZDW50LT** – 1/2" Gypsum 50 pcs/bucket	Drywall Transition Clip with Locking Tabs – Facilitates transition from drywall to acoustical ceiling; one-sided hold down clip; eliminates need for drywall bead. Locking tabs provide secure location for DGS cross tees.	 

DRYWALL Grid Systems

Clips and Accessories

VISUAL SELECTION

Item Number	Description		
☐ **EHDC50** (for 1/2" ceiling panels and drywall) ☐ **EHDC58** (for 5/8" ceiling panels and drywall) ☐ **EHDC75** (for 3/4" ceiling panels and drywall) 125 pcs/bucket ☐ **FZEHDC50** (for 1/2" ceiling panels and drywall) ☐ **FZEHDC58** (for 5/8" ceiling panels and drywall) ☐ **FZEHDC75** (for 3/4" ceiling panels and drywall) 50 pcs/bucket	External Hold Down Clip – Locks under bulb of grid section to prevent upward movement and provide secure attachment surface. Keeps acoustical and drywall ceiling components in place during wind uplift and in high security areas.		
☐ **DLCCAG** 250 pcs/bucket ☐ **FZDLCCAG** 50 pcs/bucket	DLCC – Direct Load Ceiling Clip is used to hang suspension system below existing 15/16" grid face, transferring weight directly to hanger wire; may be used to preserve the fire rating of an existing ceiling and to support heavy accessories		
☐ **DDC** 250 pcs/bucket ☐ **FZDDC** 50 pcs/bucket	DDC – Double Drywall Clip is used to hang suspension system below existing 1-1/2" grid face, transferring weight directly to hanger wire; may be used to preserve the fire rating of an existing ceiling and to support heavy accessories; allows for double layer of 5/8" gypsum board		
☐ **DWC** 250 pcs/bucket	DWC – Drywall Clip allows for a "second" ceiling to be installed below a drywall ceiling; attaches through installed drywall to supporting structure		
☐ **MBACAG** 70 pcs/bucket ☐ **FZMBAC** 50 pcs/bucket	MBAC – Main Beam Adapter Clip attaches to web of suspension system section; provides larger surface for screw attachments; used as a hold down clip for thin material (metal or plastic lay-in panels); fastens drywall track to underside of exposed suspension system with lay-in panels, leaving suspension system face free of screw holes		
☐ **XTAC** 100 pcs/bucket ☐ **FZXTAC** 50 pcs/bucket	XTAC – Cross Tee Adapter Clip is used to attach field cut cross tees to main beams		
☐ **QSUTC** 150 pcs/bucket ☐ **FZQSUTC** 50 pcs/bucket	QSUTC – QuikStix™ Uptight Clip saves time in tight plenum areas and is adjustable to uneven surfaces		
☐ **IIC** ☐ **IIC2** 36 pcs/bucket	Impact Isolation Clips for use with HD8906IIC drywall grid main beam. Provides up to 8 points of IIC improvement to ensure your project meets IBC requirements. IIC and IIC2 Clips must be used with HD8906IIC Drywall Grid Main Beam		
☐ **WS12** 1000 pcs/bucket ☐ **FZWS12** 50 pcs/bucket	Hanger Wire Splice – Splices two pieces of 12 gauge wire for extra long wire drops or renovation work		

The FastShip™ Clips and Accessories Program offers over 90 clip and accessory items that are available for overnight or ground delivery direct to the jobsite in full-size or 50 piece cartons.

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Armstrong® CEILING SOLUTIONS

DRYWALL/STUCCO/PLASTER – Flat Ceilings

Suspension Systems

SUSTAIN™ High Performance Sustainable Ceiling Systems

Declare.

LEED® | WELL™ | LBC

UP TO 61% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
	✓	✓	✓				✓	✓				

▲ LOCATION DEPENDENT

Well Building Standard™ (WELL)
Living Building Challenge® (LBC)

Armstrong® Drywall Grid is 3x faster than traditional track and channel framing – saving you time and labor.

KEY SELECTION ATTRIBUTES

- Some components available in High Recycled Content (HRC): Total Recycled Content 61%, Post-consumer 53%, Pre-consumer 8%
- Non-HRC items have 30% recycled content
- PeakForm® patented profile increases strength and stability for improved performance during installation
- SuperLock™ main beam clip is engineered for a strong, secure connection and fast, accurate alignment confirmed with an audible click; easy to remove and relocate
- HD8906IIC main beam accepts integral Impact Isolation Clips (IIC) to provide up to eight points of IIC improvement.
- ScrewStop™ reverse hem prevents screw spin off on 1-1/2" wide face
- Rotary-stitched during manufacture by a patented method for additional torsional strength and extra stability during installation
- HD8906 (HRC) main beams and cross tees with extra routings for Type F light fixtures
- Minimum G40 hot dipped galvanized coating, per ASTM C645; provides superior corrosion resistance
- Wind uplift construction available
- XL® (staked-on end detail) cross tees provide secure locked connection; fast and easy to install
- All drywall components minimum .018" steel thickness; complies with ASTM C645
- Accommodates stud, track, hat channel, wood, or other supplemental framing
- Fire Guard™ components meet broad range of UL® design assemblies (XL7936G90 is not fire rated)
- 10-Year Limited System Warranty, 30-Year Limited Ceiling Systems Warranty
- G90 hot dipped galvanized coating is available for exterior applications (HD8906G90, XL8945PG90, XL8947PG90, XL8965G90, XL8925G90, XL7936G90)
- SimpleCurve® bend to create curves as tight as 52"

TYPICAL APPLICATIONS

- Indoor/outdoor applications
- Soffits/special transitions
- High visibility areas
- Combination drywall and acoustical panel or tile ceilings
- Barrel vaults and domes
- Wet installations (stucco/plaster)

FIRE RESISTANCE RATING

Meets a broad range of UL design assemblies: D501, D502, G523, G524, G526, G527, G528, G529, J502, K504, L502, L508, L513, L515, L525, L526, L529, L564, P501, P506, P507, P508, P509, P510, P513, P514, P516 (XL7936G90 and SP135 are not fire rated).

NOTE: See UL Directory for details on specific designs.

MATERIALS

ASTM C635 Heavy-duty main beam classification, ASTM A653 zinc-coated hot dipped galvanized steel. Exposed surfaces chemically cleansed, zinc-coated, and prefinished. Materials conform to the performance standard ASTM C645 (Standard Specification for Rigid Furring Channels for Screw Applications of Gypsum Board).

VISUAL SELECTION

	Item No.		Description	Dimensions	Rout Spacing	HANGER SPACING (LBS./LIN. FT.) L/240 2 Ft.	L/240 3 Ft.	L/240 4 Ft.	L/360 2 Ft.	L/360 3 Ft.	L/360 4 Ft.
Drywall Main Beams – Imperial (Red Numbers are Fire Guard Items)**	HD8906 HD8906HRC HD8906G90 HD8906IIC	1-1/2"	12' HD Drywall Main Beam (For Type F Light Fixtures)	144 x 1-1/2 x 1-11/16"	54 routs – starting 2-1/4" from each end†	143.0	57.3	28.14	95.5	43.19	18.66
	HD890610	1-1/2"	10' HD Drywall Main Beam (For Type F Light Fixtures)	120 x 1-1/2 x 1-11/16"	45 routs – starting 2-1/4" from each end†	143.0	57.3	28.14	95.5	43.19	18.66
	SP135	1-1/2"	135" HD Stucco Main Beam G90	135 x 1-1/2 x 1-11/16"	13.5" O.C.	139.85	52.59	28.71	–	43.19	18.66
Drywall Main Beams – Metric	HD7940	43mm	3600mm HD Drywall Main Beam	3600 x 38 x 42.8mm	200mm O.C.	150.0	68.3	29.34	100.0	45.35	19.56
	7940G	43mm	3600mm HD Drywall Main Beam	3600 x 38 x 35mm	150mm O.C. – starting 75mm from each end†	114.0	51.92	22.40	76.39	34.61	14.93

	Item No.		Description	Dimensions	Rout Spacing	LOAD TOTAL DATA (LBS./LIN. FT.) L/240	L/360	LOAD TOTAL DATA (KG./LIN. M.) L/240	L/360
Drywall Cross Tees – Imperial (Red Numbers are Fire Guard Items)**	XL8965 XL8965HRC	1-1/2"	6' Drywall Cross Tee	72 x 1-1/2 x 1-1/2"	6 routs – starting 24" from each end†	6.87 @ 6'	4.58 @ 6'		
	XL8947P XL8947PG90	1-1/2"	50" Drywall Cross Tee	50 x 1-1/2 x 1-1/2"	8 routs – starting 10" from each end†	19.5 @ 50"	12.79 @ 50"		
	XL8945P XL8945PHRC XL8945PG90	1-1/2"	4' Drywall Cross Tee	48 x 1-1/2 x 1-1/2"	9 routs – center rout and starting 10" from each end†	22.5 @ 4'	14.27 @ 4'		
	XL8940	1-1/2"	40" Drywall Cross Tee	40 x 1-1/2 x 1-1/2"	1 rout – center of tee	36.22 @ 40"	24.15 @ 40"		
	XL7936G90	1-1/2"	3' Drywall Cross Tee	36 x 1-1/2 x 1-1/2"	none	50.0 @ 3'	31.33 @ 3'		
	XL8926	1-1/2"	2' Drywall Cross Tee	24 x 1-1/2 x 1-1/2"	3 routs – center rout and 10" from each end†	158.0 @ 2'	90.25 @ 2'		
Drywall Cross Tees – Metric	XL7961	38mm	1600mm Drywall Cross Tee (6')	1600 x 38 x 36mm	800mm center of tee	10.25 @ 6'	6.84 @ 6'	15.15 @ 1600mm	10.18 @ 1600mm
	XL7930	38mm	1200mm Drywall Cross Tee (4')	1200 x 38 x 38mm	450mm, 600mm, 750mm	22.4 @ 4'	14.93 @ 4'	33.33 @ 1200mm	22.22 @ 1200mm
	XL7925	38mm	900mm Drywall Cross Tee (3')	900 x 38 x 38mm	none	51.92 @ 3'	34.61 @ 3'	77.26 @ 900mm	51.51 @ 900mm
	XL7920	38mm	600mm Drywall Cross Tee (2')	600 x 38 x 38mm	none	114.59 @ 2'	76.39 @ 2'	170.52 @ 600mm	113.68 @ 600mm

* NOTE: All load test data based on flat installation per ASTM C635.
** For fire-rated assemblies, use Type C gypsum board as noted in the UL® fire-rated assembly designs.
† Type F fixture compatible

ASTM Class
HD - Heavy-duty
ID - Intermediate-duty
LD - Light-duty

DRYWALL/STUCCO/PLASTER – Flat Ceilings

Suspension Systems

SUSTAIN™ High Performance Sustainable Ceiling Systems

Declare.

LEED® | WELL™ | LBC

UP TO 61% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
	✓	✓	✓				✓	✓				

▲ LOCATION DEPENDENT

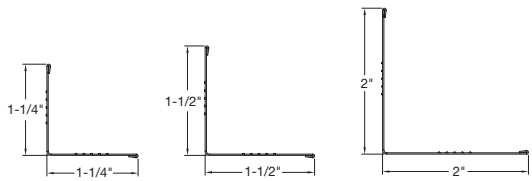
Well Building Standard™ (WELL) Living Building Challenge® (LBC)

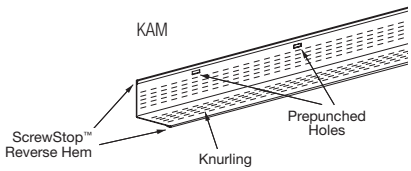
VISUAL SELECTION

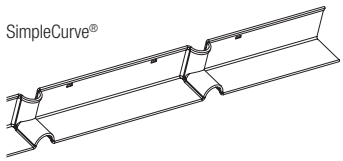
PACKAGING

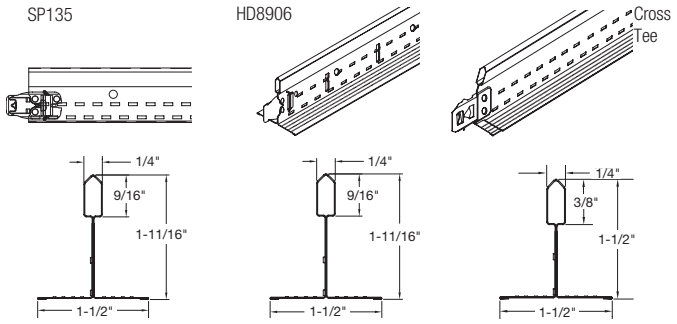
	Item No.	Face Flange	Description	Dimensions	Packaging Pcs.	Lin. Ft.
Moldings	**7858**	15/16"	12' Reverse angle molding	144 x 1-9/16 x 15/16"	20	240
	LAM12	1-1/4"	12' Nominal locking angle molding, locking tabs 8" O.C, starting 4" from each end	144 x 1-1/4 x 1-1/4"	10	240
	LAM12HRC	1-1/4"	12' Nominal locking angle molding, locking tabs 8" O.C, starting 4" from each end	144 x 1-1/4 x 1-1/4"	10	240
new	**LAM151220E**	1-1/2"	12' Locking Angle Molding, locking tabs 8" O.C. 22 Gauge (.028" metal thickness)	144 x 1-1/2 x 1-1/2"	10	120
	KAM10	1-1/4"	10' Knurled Angle Molding – (.018 metal thickness)	120 x 1-1/4 x 1-1/4"	10	100
	KAM12	1-1/4"	12' Knurled Angle Molding – (.018 metal thickness)	144 x 1-1/4 x 1-1/4"	10	120
	KAM12G90	1-1/4"	12' Knurled Angle Molding – G90 galvanized steel coating (.018 metal thickness)	144 x 1-1/4 x 1-1/4"	10	120
	KAM12HRC	1-1/4"	12' Knurled Angle Molding – High Recycled Content (.018 metal thickness)	144 x 1-1/4 x 1-1/4"	10	120
	KAM1510	1-1/2"	10' Knurled Angle Molding – (.018 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM1512	1-1/2"	12' Knurled Angle Molding – (.018 metal thickness)	144 x 1-1/2 x 1-1/2"	10	120
	KAM151020E	1-1/2"	10' Knurled Angle Molding – (.028 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM151220E	1-1/2"	12' Knurled Angle Molding – (.028 metal thickness)	144 x 1-1/2 x 1-1/2"	10	120
	KAM151020	1-1/2"	10' Knurled Angle Molding – (.033 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM151020G90	1-1/2"	10' Knurled Angle Molding – G90 galvanized steel coating (.033 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM21025	2"	10' Knurled Angle Molding – (.018 metal thickness)	120 x 2 x 2"	10	100
	KAM21020EQ	2"	10' Knurled Angle Molding – (.028 metal thickness)	120 x 2 x 2"	10	100
	KAM21020	2"	10' Knurled Angle Molding – (.033 metal thickness)	120 x 2 x 2"	10	100
new	**SC151220EQ**	1-1/2"	12' x 1.5" SimpleCurve® Knurled Angle Molding – (.028" metal thickness)	148 x 1-1/2 x 1-1/2"	10	124
new	**SC151225**	1-1/2"	12' x 1.5" SimpleCurve® Knurled Angle Molding – (.018" metal thickness)	148 x 1-1/2 x 1-1/2"	10	124
new	**SC21220EQ**	2"	12' x 2" SimpleCurve® Knurled Angle Molding – (.028" metal thickness)	148 x 2 x 2"	10	124
new	**SC21225**	2"	12' x 2" SimpleCurve® Knurled Angle Molding – (.018" metal thickness)	148 x 2 x 2"	10	124

NOTE: .018" metal thickness meets ASTM C645 for framing





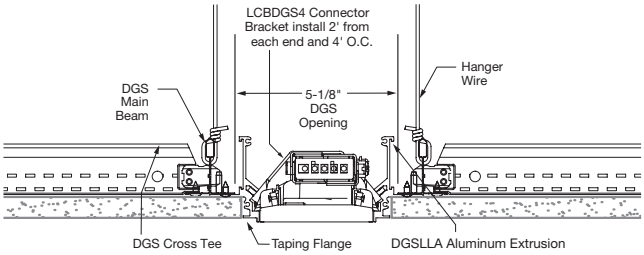




DRYWALL LINEAR LIGHTING

Item No.	Description	Fixture Length
DGSLLTK24	2' Linear Light Trim Kit	24" x 4"
DGSLLTK30	2' – 6" Linear Light Trim Kit	30" x 4"
DGSLLTK48	4' Linear Light Trim Kit	48" x 4"
DGSLLTK60	5' Linear Light Trim Kit	60" x 4"
DGSLLTK72	6' Linear Light Trim Kit	72" x 4"
DGSLLTK90	7' – 6" Linear Light Trim Kit	90" x 4"
DGSLLTK96	8' Linear Light Trim Kit	96" x 4"
DGSLLTK120	10' Linear Light Trim Kit	120" x 4"
DGSLLTKCON	10' Continuous Linear Light Trim Kit	10'

NOTE: Linear Light Trim Kits designed to work with 5/8" drywall



SEISMIC PERFORMANCE

Main Beams	Minimum Lbs. To Pull Out Compression/Tension
HD8906/HD890610 / HD8906HRC	332.3
HD8906IIC	332.3
XL7918, XL8926, XL8925, XL7936G90, XL8945PHRC, XL8945P, XL8947P, XL8965HRC	380.1

ICC REPORTS

For areas under ICC jurisdiction, see ICC evaluation report number ESR-1289 for allowable values and/or conditions of use concerning the suspension system components listed on this page. The report is subject to reexamination, revisions, and possible cancellation.

For fixture weight and UL listings, see Drywall Grid Systems for Flat Applications Technical Guide BPCS-3539.

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Armstrong® CEILING & WALL SOLUTIONS

SILHOUETTE® XL® 1/8" Reveal

9/16" Slotted Tee System

SUSTAIN™ High Performance Sustainable Ceiling Systems

24/7 DEFEND™ Solutions for Healthier, Safer Spaces

Declare.

CONTAIN CLEAN PROTECT

UP TO 30% RECYCLED CONTENT

Calculate LEED contribution at armstrongceilings.com/greengenie

LEED®: energy management; construction waste mgmt ✓; regional materials ✓; design for flexibility ✓; EPD ✓; recyclable/ extended producer resp.; biobased materials; recycled content ✓; sourcing of raw materials; material ingredient reporting; low emitting/ materials; lighting quality; acoustics

▲ LOCATION DEPENDENT



KEY SELECTION ATTRIBUTES

- Seismic Rx® Suspension System saves time and money; offer an ICC-ES approach to installations (ESR-1308)
- Silhouette is part of the Sustain™ portfolio and meets the most stringent sustainability compliance standards today
- Hot dipped galvanized coating inhibits red rusting better than electrogalvanized or painted systems
- Some items available in metric sizes
- Rotary-stitched during manufacture for additional torsional strength and extra stability during installation; maintains size and shape of reveal when cutting perimeter cross tees

new

- CleanAssure™ family of products – includes disinfectable panels, suspension systems, and trim (Fog, Spray, and Wipe)
- XL² staked-on end detail provides secure locked connection
- 10-Year Limited System Warranty; 30-Year Limited Ceiling Systems Warranty when used with HumiGuard® Plus products

10-YEAR Availability

- Made-to-Order main beams and cross tees can be ordered for your project needs in one carton minimums

Blizzard White and Charcoal Black powder-coated finish coordinates with Calla®, Optima®, Ultima® and Lyra® ceiling panels for a clean, seamless, monolithic installed visual.

Linear lighting integration is easy with made-to-order main beam-to-cross tee adapters, rout spacing, miter spacing, and short cross tees (3" to 6" lengths).

VISUAL SELECTION

PERFORMANCE

PACKAGING

Item No.	Face Profile	Description	Rout Spacing	Notching	Dimensions (Inches)	Hanger Spacing* Lbs./Lin. Ft. 4 Ft.	5 Ft.	Fire Guard™	Seismic Category DEF	Pcs./ Ctn.	Lin.Ft./ Ctn.
Silhouette XL – 1/8" Reveal								Dots represent high level of performance.			
☐ **76018**_ _❖	9/16"	12' HD Main Beam – Notched 24" O.C.	24" O.C.		144 x 9/16 x 1-3/4"	16.35	7.80	–	•	20	240
☐ **76128**_ _❖	9/16"	12' HD Main Beam – Unnotched	–		144 x 9/16 x 1-3/4"	16.35	7.80	–	•	20	240
☐ **76008**_ _❖	9/16"	12' ID Main Beam – Notched 24" O.C.	24" O.C.		144 x 9/16 x 1-3/4"	13.10	6.61	–	–	20	240
☐ **76028**_ _❖	9/16"	10' ID Main Beam – Notched 24" O.C.	24" O.C.		120 x 9/16 x 1-3/4"	13.10	6.61	–	–	20	200
☐ **76038**_ _❖	9/16"	12' ID Main Beam – Notched 48" O.C.	48" O.C.		144 x 9/16 x 1-3/4"	13.10	6.61	–	–	20	240
☐ **76068**_ _❖	9/16"	10' ID Main Beam – Notched 30" O.C.	30" O.C.		120 x 9/16 x 1-3/4"	13.10	6.61	–	–	20	200
☐ **XL76808**_ _❖	9/16"	8' Cross Tee – Unnotched	–		96 x 9/16 x 1-3/4"	12.59**	–	–	•	20	160
☐ **XL76908**_ _❖	9/16"	6' Cross Tee – Unnotched	–		72 x 9/16 x 1-3/4"	12.59**	–	–	•	20	120
☐ **XL76508**_ _❖	9/16"	5' Cross Tee – Unnotched	–		60 x 9/16 x 1-3/4"	–	6.09	–	•	30	150
☐ **XL76558**_ _❖	9/16"	5' Cross Tee – Center-notched, both sides	–		60 x 9/16 x 1-3/4"	–	5.71	–	•	30	150
☐ **XL76408**_ _❖	9/16"	4' Cross Tee – Unnotched	–		48 x 9/16 x 1-3/4"	14.11	–	–	•	60	240
☐ **XL76458**_ _❖	9/16"	4' Cross Tee – Center-notched, both sides	–		48 x 9/16 x 1-3/4"	12.60	–	–	•	60	240
☐ **XL76468**_ _❖	9/16"	4' Cross Tee – Center-notched, one side	–		48 x 9/16 x 1-3/4"	13.01	–	–	•	60	240
☐ **XL76708**_ _❖	9/16"	30" Cross Tee – Unnotched	–		30 x 9/16 x 1-3/4"	47.76	–	–	•	60	150
☐ **XL76208**_ _❖	9/16"	2' Cross Tee – Unnotched	–		24 x 9/16 x 1-3/4"	69.69	–	–	•	60	120
☐ **XL76108**_ _❖	9/16"	1' Cross Tee – Unnotched	–		12 x 9/16 x 1-3/4"	69.69	–	–	•	120	120
☐ **XL76048**_ _❖	9/16"	4" Cross Tee – Unnotched	–		4 x 9/16 x 1-3/4"	–	–	–	•	60	20

Size Capabilities		Main Beams Length	Cross Tees Length	Varies	Varies
9/16"	1 CTN MIN Made-to-Order Sizes or Colors (2 Wks)	36" – 144" Rout spacing 3" from ends, 6" thereafter **NOTE: Up to 6 Weeks for Color & Size Combinations**	6" – 144"		

ASTM Class
HD - Heavy-duty
ID - Intermediate-duty
LD - Light-duty

Made-to-Order main beams and cross tees can be ordered with special sizes, rout spacing, and colors for your project needs in one carton minimums.

SILHOUETTE® XL®
1/8" Reveal
9/16" Slotted Tee System

SILHOUETTE XL – 1/8" REVEAL PAINTED GRID TO MATCH AXIOM® TRIM

VISUAL SELECTION | **PERFORMANCE** | **PACKAGING**

Item No.	Face Profile	Description	Rout Spacing	Notching	Dimensions (Inches)	Hanger Spacing* Lbs./Lin. Ft. 4 Ft.	5 Ft.	Seismic Category Fire Guard™ DEF (Dots represent high level of performance.)		Pcs./ Ctn.	Lin.Ft./ Ctn.
360° Painted – Powder Coated Paint – (made to order)											
☐ **AX76003XX**	9/16"	12' HD Main Beam – Notched 24" O.C.	12" O.C.		144 x 9/16 x 1-3/4 x 1/4"	13.10	6.61	–	–	20	240
☐ **AX76013XX**	9/16"	12' HD Main Beam – Notched 24" O.C.	12" O.C.		144 x 9/16 x 1-3/4 x 1/4"	16.35	7.80	–	–	20	240
☐ **AX76103XX**	9/16"	1' Cross Tee – Unnotched	–		12 x 9/16 x 1-3/4 x 1/4"	69.69	71.66	–	–	120	120
☐ **AX76203XX**	9/16"	2' Cross Tee – Unnotched	–		24 x 9/16 x 1-3/4 x 1/4"	69.69	71.66 @ 2'	–	–	60	120
☐ **AX76703XX**	9/16"	30" Cross Tee – Unnotched	–		30 x 9/16 x 1-3/4 x 1/4"	39.86 @ 2.5'	–	–	–	60	150
☐ **AX76453XX**	9/16"	4' Cross Tee – Center Notched Both Sides	–		48 x 9/16 x 1-3/4 x 1/4"	12.85	–	–	–	60	240
☐ **AX76503XX**	9/16"	5' Cross Tee – Unnotched	–		60 x 9/16 x 1-3/4 x 1/4"	–	6.09	–	–	30	150

VISUAL SELECTION | **PERFORMANCE** | **PACKAGING**

Item No.	Description	Length	(A) Flange	(B) Flange	(C) Flange	Pcs./ Ctn.	Lin. Ft./ Ctn.
Suggested Wall Moldings and Shadow Moldings Additional molding options available. See armstrongceilings.com/suspensionsystems (search: accessories and moldings)							
☐ **7804_ _** ❖	12' Hemmed Angle Molding	144"	9/16"	7/8"	–	30	360
☐ **7873_ _** ❖	10' Shadow Molding	120"	9/16"	15/16"	3/8"	30	300
☐ **7878_ _** ❖***	10' Seismic Shadow Molding	120"	15/16"	15/16"	3/8"	30	300

* Simple Span
** Wire at 4'
*** Suitable for Category D, E, F Seismic Installation with BERC2 clip
❖ Items available in Blizzard White powder-coated finish
When specifying or ordering items with a color or finish, add the two-letter suffix to the end of the item number (e.g.,. 7804ZW – Blizzard White)

MAXIMUM FIXTURE WEIGHT

Configuration A	Configuration B	Item No.	Fixture A	Fixture B	Planning Module A	Planning Module B	Hanger Spacing A	Hanger Spacing B	Maximum Weight A	Maximum Weight B
Main Beam to Main Beam – Drawing Key: Main beam (↑) Cross tee (┄) Hanger wire (✦)										
		**76008**	24" x 48"	24" x 48"	48" x 48"	48" x 48"	48"	48"	73.0 lbs.	73.0 lbs.
		76018	24" x 48"	24" x 48"	48" x 48"	48" x 48"	48"	48"	76.0 lbs.	76.0 lbs.
			12" x 48"	12" x 48"	48" x 48"	48" x 48"	48"	48"	73.0 lbs.	58.0 lbs.
			12" x 48"	12" x 48"	48" x 48"	48" x 48"	48"	48"	76.0 lbs.	76.0 lbs.

Main beams tested as follows: 76008/814042 tested at 13.1 lbs./lin. ft. to 1/360 of 4' span; 76018 tested at 16.35 lbs./lin. ft. to 1/360 of 4' span.

Cross Tee to Cross Tee – Drawing Key: Main beam (↑) Cross tee (┄) Hanger wire (✦)

		**XL76458**	24" x 48"	24" x 24"	48" x 48"	48" x 48"	48"	48"	59.0 lbs.	41.0 lbs.
		XL76468	12" x 48"	24" x 24"	48" x 48"	48" x 48"	48"	48"	59.0 lbs.	41.0 lbs.

Cross tees tested as follows: XL76458/813042 at 12.0 lbs./lin. ft. to 1/360 of 4' span.

Fixtures weighing more than 56 lbs. should be independently supported. Fixture weight is based on single fixture only. For end-to-end fixtures or other configurations not shown, consult your Armstrong representative.
NOTE: The above data is based on 48" hanger wire spacing, board weight of 1 lb./SF, maximum deflection of tees not to exceed 1/360 of the span, and suspension system installed in accordance with ASTM C636.

SILHOUETTE® XL®
1/8" Reveal
9/16" Slotted Tee System

COLOR AND FINISH SELECTION

Standard

White (WH)

Powder-coated Finish❖

NEW!

Charcoal Black (ZB)

Blizzard White (ZW)

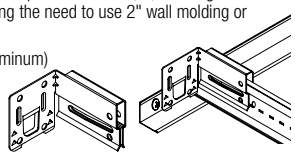
Available in any color!

❖ Items available in powder-coated finish

ACCESSORIES

BERC2 – 2" Beam End Retaining Clip – Allows you to create a code compliant Seismic D, E, F ceiling installation while eliminating the need to use 2" wall molding or spreader bars.

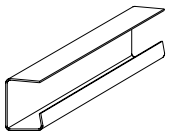
ALBERC2 (aluminum)



☐ **BERC2** (Steel) – 200 pcs
☐ **FZBERC2** (Steel) – 50 pcs

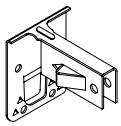
☐ **ALBERC2** (Aluminum) – 200 pcs
☐ **FZALBERC2** (Aluminum) – 50 pcs

MCC8 – Silhouette 1/8" Reveal Miter Closure Clip – Eliminates main beam and cross tee miters.



☐ **MCC8** – 200 pcs
☐ **FZMCC8** – 50 pcs

GCWA – Grip Clip Wall Attachment – Joins main beam or cross tee to wall molding via locking barbs without pop rivets or screws.



☐ **GCWA** – 250 pcs
☐ **FZGCWA** – 50 pcs

DETAILS

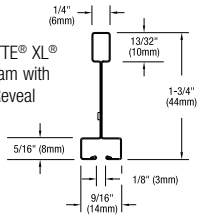


SILHOUETTE XL Main Beam

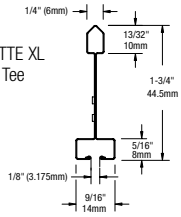


SILHOUETTE XL Cross Tee

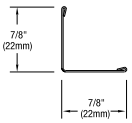
SILHOUETTE® XL® Main Beam with 1/8" Reveal



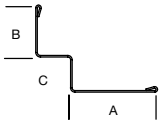
SILHOUETTE XL Cross Tee



7/8" Hemmed Angle Molding



Shadow Molding



SEISMIC PERFORMANCE

Main Beams
76018, 76128

Minimum Lbs. To Pull Out Compression/Tension
392.9, 340.0

Cross Tees
XL76808, XL76908, XL76508, XL76558, XL76408, XL76458, XL76468, XL76708, XL76208, XL76108

Minimum Lbs. To Pull Out Compression/Tension
299.5

ICC Reports
For areas under ICC jurisdiction, see ICC evaluation report number ESR-1308 for allowable values and/or conditions of use concerning the suspension system components listed on this page. The report is subject to reexamination, revisions, and possible cancellation.

To derive maximum lbs/sf, divide the on-center spacing of the component into the lbs/lf given in the load test data table.

PHYSICAL DATA

Material
Hot dipped galvanized steel

Surface Finish
Baked polyester paint or powder-coated paint

Manufactured and tested in accordance with ASTM C635

Face Dimension
9/16"

Profile
Bolt-slot

Cross Tee/Main Beam Interface
Mitered

End Detail
Main Beam: Coupling

Cross Tee: Staked-on clip

Duty Classification
Intermediate or Heavy-duty

Cleaning & Disinfecting
Cleaning and CDC approved disinfecting options available on armstrongceilings.com/cleaning)

TechLine / 1 877 276-7876
armstrongceilings.com/suspensionsystems
(search: silhouette)
BPCS-3078-321

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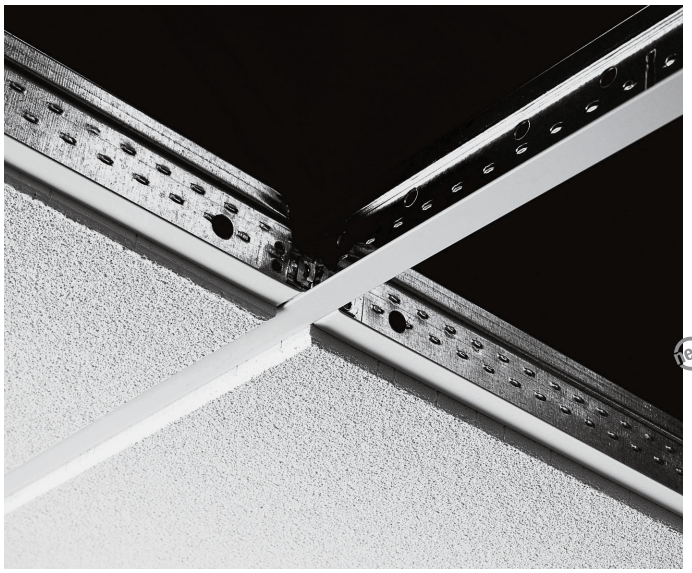
Armstrong® CEILING SOLUTIONS

SUPRAFINE® XL® & ML
SUPRAFINE XL High Recycled Content (HRC)
Exposed Tee Suspension System

SUSTAIN™ High Performance Sustainable Ceiling Systems

24/7 DEFEND™ Solutions for Healthier, Safer Spaces

CONTAIN CLEAN PROTECT



Suprafine XL suspension system

This versatile 9/16" suspension system combines durability and stability with a refined appearance.

KEY SELECTION ATTRIBUTES

- Suprafine® XL® & ML and Suprafine XL HRC are part of the Sustain™ portfolio and meet the most stringent industry sustainability compliance standards today
- Seismic Rx® Suspension System saves time and money; Armstrong offers an ICC-ES approach to installations (ESR-1308)
- PeakForm® profile increases strength and stability for improved performance during installation
- CleanAssure™ family of products – includes disinfectable panels, suspension systems, and trim (Cleaning and CDC-approved disinfecting options available on armstrongceilings.com/cleaning)
- SuperLock™ main beam clip is engineered for a strong, secure connection and fast, accurate alignment confirmed with an audible click; easy to remove/relocate
- Hot-dipped galvanized coating inhibits red rusting better than electrogalvanized or painted systems
- Some items available in metric sizes
- 1-11/16" web height keeps components vertical and stable at light fixture interface
- 10-Year Limited Warranty; 30-Year Limited Ceiling Systems Warranty when used with HumiGuard® Plus products
- Made-to-Order main beams and cross tees can be ordered for your project needs in one carton minimums
- Fire Guard™ options offer UL® design fire-rated performance
- Linear lighting integration is easy with made-to-order main-beam-to-cross-tee adapters, rout spacing, miter spacing, and short cross tees (3" to 6" lengths)
- Blizzard White and Charcoal Black powder-coated finish coordinates with Calla®, Optima®, Ultima®, and Lyra® ceiling panels for a clean, seamless, monolithic installed visual

COLORS AND FINISHES

Due to printing limitations, shade may vary from actual product.

Standard

White (WH), Black (BL), Silver Grey (SG), Gun Metal Grey (MY), Silver Satin (SA), Ivory (IV), Medium Taupe (MT), Light Grey (LG), Grey Stone (GS), Custom Colors Available*

Stone (SE), Mist (SMT), Sandstone (SSS), Fossil (SFL), Feldspar (SFS), Boxwood (SBW), Lilac (SLC), Rainstorm (SRS), Oat (SOT)

Premium

Camel (CM), Bronze (BZ)

Powder-Coated Finishes

Blizzard White (ZW), Charcoal Black (ZB)

NOTE: Powder-coated finishes are also available on select Axiom® Classic, Knife Edge®, and Vector® trim profiles

* Colors that are pre-qualified to meet Sustain™ portfolio requirements are available upon request. Other made-to-order colors must be evaluated if sustainability criteria is required. Lead time will increase.
NOTE: 360º paint finishes and custom colors available as special order.

VISUAL SELECTION

PERFORMANCE

PACKAGING

	Item No.◆	Description	Rout Spacing	Dimensions (Inches)	HANGER SPACING* LBS./LFT 4 Ft.	HANGER SPACING* LBS./LFT 5 Ft.	Fire Guard™	Seismic Category	CleanAssure™ Disinfectable Grid: Fog	CleanAssure™ Disinfectable Grid: Spray	CleanAssure™ Disinfectable Grid: Wipe	Pieces/ Carton	LFT/ Carton
SUPRAFINE® XL® & SUPRAFINE XL High Recycled Content 9/16" (Red Numbers are Fire Guard™ items)	7501_ _ _	12' HD Main Beam	6" O.C.	144 x 9/16 x 1-11/16"	16.86	10.62	N/A	•	•	•	•	20	240
	7501HRC						N/A	•	•	•	•	20	240
	8501						•	•	•	•	•	20	240
	7536		4" O.C.				N/A	•	•	•	•	20	240
	7500_ _❖	12' ID Main Beam	6" O.C.	144 x 9/16 x 1-11/16"	12.75	5.74	N/A	N/A	•	•	•	20	240
	8500						•	N/A	•	•	•	20	240
	7502_ _❖	10' ID Main Beam	6" O.C.	120 x 9/16 x 1-11/16"	12.75	5.74	N/A	N/A	•	•	•	20	200
	XL7580_ _❖	8' Cross Tee	12" O.C.	96 x 9/16 x 1-11/16"	12.73**	N/A	N/A	•	•	•	•	20	160
	XL7590_ _❖	6' Cross Tee	12" O.C.	72 x 9/16 x 1-11/16"	12.73**	N/A	N/A	•	•	•	•	20	120
	XL7558_ _❖	5' Cross Tee	6", 20", 30" O.C.	60 x 9/16 x 1-11/16"	N/A	5.80	N/A	•	•	•	•	60	300

** Wire at 4'
◆ When specifying or ordering items with a color or finish, add the two- or three-letter suffix to the end of the item number (e.g. 7501 L G _ – Light Grey)
❖ Available in White (WH), and Blizzard White and Charcoal Black powder-coated finishes only
NOTE: Additional Suprafine XL items for TechZone® Integrated Ceiling Systems are listed in the TechZone Technical Guide (BPCS-4486). Available online at armstrongceilings.com/techzone

Dots represent high level of performance.

ASTM Class
HD - Heavy-duty
ID - Intermediate-duty
LD - Light-duty

SUPRAFINE® XL® & ML
SUPRAFINE XL High Recycled Content
Exposed Tee Suspension System

SUSTAIN™ High Performance Sustainable Ceiling Systems

Declare.

LEED® | WELL™ | LBC

UP TO 63% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management; construction waste mgmt ✓; regional materials ✓ (▲ LOCATION DEPENDENT); design for flexibility; EPD; recyclable/ extended producer resp.; biobased materials; recycled content ✓; sourcing of raw materials; material ingredient reporting; low emitting/ materials; lighting quality; acoustics

VISUAL SELECTION

PERFORMANCE

PACKAGING

	Item No.◆	Description	Rout Spacing	Dimensions (Inches)	HANGER SPACING* LBS./LFT 4 Ft.	HANGER SPACING* LBS./LFT 5 Ft.	Fire Guard™	Seismic Category	CleanAssure™ Disinfectable Grid: Fog	Spray	Wipe	Pieces/ Carton	LFT/ Carton
SUPRAFINE® XL® & SUPRAFINE XL High Recycled Content 9/16" (Red Numbers are Fire Guard™ items)	**XL7541HRC**	4' Cross Tee	12" O.C.	48 x 9/16 x 1-11/16"	12.73	N/A	N/A	•	•	•	•	60	240
	XL7540_ _ _	4' Cross Tee	12" O.C.	48 x 9/16 x 1-11/16"	10.34	N/A	N/A	•	•	•	•	60	240
	XL8540						•	•	•	•	•	60	240
	XL7549_ _❖	4' Cross Tee	12" O.C.	48 x 9/16 x 1-11/16"	16.42	N/A	N/A	•	•	•	•	60	240
	XL7530_ _❖	3' Cross Tee	N/A	36 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	60	180
	XL7570_ _❖	30" Cross Tee	N/A	30 x 9/16 x 1-11/16"	28.67	N/A	N/A	•	•	•	•	60	150
	XL7520_ _ _	2' Cross Tee	N/A	24 x 9/16 x 1-11/16"	51.83	N/A	N/A	•	•	•	•	60	120
	XL7520HRC						N/A	•	•	•	•	60	120
	XL8520						•	•	•	•	•	60	120
	XL7510_ _❖	1' Cross Tee	N/A	12 x 9/16 x 1-11/16"	51.83	N/A	N/A	•	•	•	•	120	120
Size Capabilities NOTE: Up to 6 weeks for color and size combinations.	1 Ctn Min FASTSIZE 2 WEEKS order to ship	9/16" Suprafine XL & Suprafine XL High Recycled Content Main Beams Length: 36" – 144" Cross Tees Length: 6" – 144" Rout spacing 3" from ends, 6" thereafter		N/A	N/A	N/A	N/A	•	•	•	•	Varies	Varies
SUPRAFINE® XL® items for TechZone® Ceiling Systems 9/16" Additional items available in TechZone Technical Guide – BPCS-4486 or armstrongceilings.com/techzone	**7504**_ _❖	120" HD Main Beam	15", 42", 48", 75", 102", 108" O.C.	120 x 9/16 x 1-11/16"	12.75	10.62	N/A	•	•	•	•	20	200
	7505_ _❖	100" HD Main Beam	2", 26", 50", 74", 98" O.C.	100 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	20	166
	7507_ _❖	144" HD Main Beam	15", 36", 42", 63", 84", 90", 11",132", 138" O.C.	144 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	20	240
	7508_ _❖	132" HD Main Beam	10", 30", 50", 56", 76", 96", 116", 122" O.C.	132 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	20	220
	TZXL7556_ _†	56" Cross Tee	N/A	56 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	60	280
	XL7562_ _❖	42" Cross Tee	N/A	42 x 9/16 x 1-11/16"	12.34	N/A	N/A	•	•	•	•	60	210
	XL7528_ _❖	28" Cross Tee	N/A	28 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	60	140
	XL7561_ _❖	21" Cross Tee	N/A	21 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	60	105
	XL7506_ _❖	6" Cross Tee	N/A	6 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	60	30
	XL7504_ _❖	4" Cross Tee	N/A	4 x 9/16 x 1-11/16"	N/A	N/A	N/A	•	•	•	•	60	20
SUPRAFINE ML 9/16"	**ML7540**_ _❖	4' Cross Tee	N/A	48 x 9/16 x 1-11/16"	10.34	N/A	N/A	N/A	•	•	•	60	240
	ML7520_ _❖	2' Cross Tee	N/A	24 x 9/16 x 1-11/16"	51.80	N/A	N/A	N/A	•	•	•	60	120

* Simple Span
** Wire at 4'
◆ When specifying or ordering items with a color or finish, add the two- or three-letter suffix to the end of the item number (e.g. XL7540 L G _ – Light Grey)
❖ Available in White (WH), and Blizzard White (ZW) and Charcoal Black (ZB) powder-coated finishes only
† Available in Black (BL), Silver Grey (SG), and Gun Metal Grey (MY) only
NOTE: Additional Suprafine XL items for TechZone Integrated Ceiling Systems are listed in the TechZone Technical Guide (BPCS-4486). Available online at armstrongceilings.com/techzone

Dots represent high level of performance.

ASTM Class
HD - Heavy-duty
ID - Intermediate-duty
LD - Light-duty

SUSPENSION SYSTEMS — Standard

SUPRAFINE® XL® & ML
SUPRAFINE XL High Recycled Content

Exposed Tee Suspension System

SUSTAIN™ High Performance Sustainable Ceiling Systems

Declare.

LEED® | WELL™ | LBC

UP TO 63% RECYCLED CONTENT

Calculate sustainability with GreenGenie™ armstrongceilings.com/greengenie

energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
	✔	✔					✔					

▲ LOCATION DEPENDENT

VISUAL SELECTION

PERFORMANCE

PACKAGING

	Item No.◆	Description	Rout Spacing	Dimensions (Inches)	HANGER SPACING* LBS./LFT 4 Ft.	5 Ft.	Fire Guard™	Seismic Category	CleanAssure™ Disinfectable Grid: Fog	Spray	Wipe	Pieces/ Carton	LFT/ Carton
SUPRAFINE XL 360° Painted Grid to match Axiom® Trim 9/16"	**AX75003**_ _ _	12' ID Main Beam, Routs 6" O.C.	N/A	144 x 9/16 x 1-11/16"	12.75	5.74	N/A	N/A	•	•	•	20	240
	AX75013_ _ _	12' ID Main Beam, Routs 6" O.C.	N/A	144 x 9/16 x 1-11/16"	16.86	10.62	N/A	N/A	•	•	•	20	240
	AX75103_ _ _	1' Cross Tee	N/A	12 x 9/16 x 1-11/16"	51.83	N/A	N/A	N/A	•	•	•	120	120
	AX75203_ _ _	2' Cross Tee	N/A	24 x 9/16 x 1-11/16"	51.83	N/A	N/A	N/A	•	•	•	60	120
	AX75703_ _ _	30" Cross Tee	N/A	30 x 9/16 x 1-11/16"	28.67	N/A	N/A	N/A	•	•	•	60	150
	AX75403_ _ _	4' Cross Tee	N/A	48 x 9/16 x 1-11/16"	10.34	N/A	N/A	N/A	•	•	•	60	240
	AX75583_ _ _	5' Cross Tee	6", 20", and 30" from ends	60 x 9/16 x 1-11/16"	N/A	5.80	N/A	N/A	•	•	•	60	300

* Simple Span

◆ When specifying or ordering items with a color or finish, add the two- or three-letter suffix to the end of the item number (e.g. AX75003 L G _ – Light Grey)

Dots represent high level of performance.

ASTM Class
HD - Heavy-duty
ID - Intermediate-duty
LD - Light-duty

VISUAL SELECTION

PACKAGING

	Item No.◆	Description	Length	(A) Flange	(B) Flange	(C) Reveal	(D) Reveal	Pieces/ Carton	LFT/ Carton
Suggested Wall Moldings and Shadow Moldings (Additional molding options available)	**7808**_ _††	10' Hemmed Angle Molding	120"	2"	2"	N/A	N/A	10	100
	7804_ _ _ **7804HRC**	12' Hemmed Angle Molding	144"	9/16"	7/8"	N/A	N/A	30	360
	7800_ _ _† **7800HRC**	12' Hemmed Angle Molding	144"	7/8"	7/8"	N/A	N/A	30	360
	7835	10' Channel Molding	120"	7/8"	1-3/4"	3/8"	N/A	20	200
	7873_ _❖	10' Shadow Molding	120"	9/16"	15/16"	3/8"	N/A	30	300
	7874_ _❖	10' Shadow Molding	120"	9/16"	15/16"	1/4"	N/A	30	300
	7878_ _ _**†	10' Seismic Shadow Molding	120"	15/16"	15/16"	3/8"	N/A	30	300
	7889_ _❖	10' Shadow Molding	120"	9/16"	15/16"	3/8"	1/4"	30	300
	7850_ _❖	10' Hemmed Angle Molding	120"	1-1/8"	7/8"	N/A	N/A	30	300
	7851_ _❖	12' Hemmed Angle Molding	144"	1-1/8"	7/8"	N/A	N/A	30	360

** Suitable for IBC Category D,E,F installations using Armstrong® Seismic Rx® suspension system and BERC2 Clip

◆ When specifying or ordering items with a color or finish, add the two- or three-letter suffix to the end of the item number (e.g., 7808 L G _ – Light Grey)

❖ Available in White (WH), and Blizzard White (ZW) and Charcoal Black (ZB) powder-coated finishes only

† Not available in Silver Grey (SG), Gun Metal Grey (MY), or Silver Satin (SA).

†† Available in White (WH), Silver Grey (SG), Silver Satin (SA), and Blizzard White (ZW) and Charcoal Black (ZB) powder-coated finishes only

MAXIMUM FIXTURE WEIGHT

Drawing Key: Main beam (|) Cross tee (┄) Hanger wire (✦)

	Configuration A	Configuration B	Item No.	Fixture A	Fixture B	Planning Module A	Planning Module B	Hanger Spacing A	Hanger Spacing B	Maximum Weight A	Maximum Weight B
Main Beam to Main Beam			**8500/7500/7502**	24" x 48"	24" x 48"	48" x 48"	48" x 48"	48"	48"	73.36 lbs.	57.07 lbs.
			7501	24" x 48"	24" x 48"	48" x 48"	48" x 48"	48"	48"	100 lbs.	70.8 lbs.
			**7500/7502**	12" x 48"	12" x 48"	48" x 48"	48" x 48"	48"	48"	68 lbs.	44 lbs.
			7501	12" x 48"	12" x 48"	48" x 48"	48" x 48"	48"	48"	85 lbs.	61 lbs.
Cross Tee to Cross Tee			**XL7540**	24" x 48"	24" x 24"	48" x 48"	48" x 48"	48"	48"	55 lbs.	67 lbs.
			XL7541	24" x 48"	24" x 24"	48" x 48"	48" x 48"	48"	48"	73 lbs.	84 lbs.
			ML7540	24" x 48"	24" x 24"	48" x 48"	48" x 48"			65.71 lbs.	76 lbs.
			**ML7540**	24" x 48"	12" x 48"	48" x 48"	48" x 48"	48"	48"	46 lbs.	–
			XL7541	24" x 48"	12" x 48"	48" x 48"	48" x 48"	48"	48"	52 lbs.	–

Main beams tested as follows: 7500 tested at 12.7 lbs./lin. ft. to 1/360 of 4' span; 7501 tested at 16.86 lbs./lin. ft. to 1/360 of 4' span; 8500 tested at 13.3 lbs./lin. ft. to 1/360 of 4' span. 48" cross tee tested at 10.34 lbs./lin. ft. to 1/360 of 4' span.

Cross tees tested as follows: 48" cross tee tested at 10.34 lbs./lin. ft. to 1/360 of 4' span.

Fixtures weighing more than 56 lbs. should be independently supported. Light fixture clips are required at all fixture locations.

Fixture weight is based on single fixture only. For end-to-end fixtures or other configurations not shown, consult your Armstrong representative.

NOTE: The above data is based on 48" hanger wire spacing, board weight of 1 lb./sq. ft., maximum deflection of tees not to exceed 1/360 of the span, and suspension system installed in accordance with ASTM C636. To derive maximum lbs/sf, divide the O.C. spacing of the component into the lbs/lf given in the load test data table.

TechLine 877 276-7876
armstrongceilings.com/suprafine

Armstrong® CEILING & WALL SOLUTIONS

SUPRAFINE® XL® & ML
SUPRAFINE XL High Recycled Content

Exposed Tee Suspension System

SUSTAIN™
High Performance
Sustainable Ceiling Systems

Declare.

LEED® | WELL™ | LBC

UP TO 61% RECYCLED CONTENT

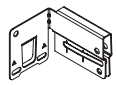
Calculate sustainability with GreenGenie™
armstrongceilings.com/greengenie

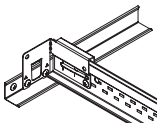
energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
	✓	✓	✓	✓			✓	✓				

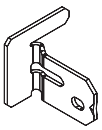
▲ LOCATION DEPENDENT

ACCESSORIES

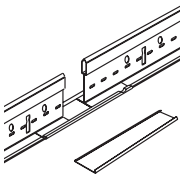
Item No.	Description	Pieces/ Carton
BERC2	**2" Beam End Retaining Clip** Allows you to create a code compliant Seismic D, E, F ceiling installation while eliminating the need to use 2" wall molding or spreader bars.	
BERC2	Steel	200
FZBERC2	Steel	50
ALBERC2	Aluminum	200
FZALBERC2	Aluminum	50
STAC	**Single Tee Adapter Clip** Used to create code compliant non-seismic and seismic C and D, E, F off-module main beam to cross tee connections.	
STAC		100
FZSTAC		50

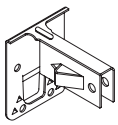






Item No.	Description	Pieces/ Carton
ES49	**Expansion Sleeves** For 9/16" Suprafine	
ES49		200
FZES49		50
GCWA	**Grip Clip Wall Attachment** Joins main beam or cross tee to wall molding via locking barbs without pop rivets or screws.	
GCWA		200
FZGCWA		50





DETAILS

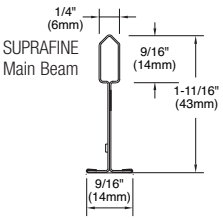


SUPRAFINE® XL®
Cross Tee

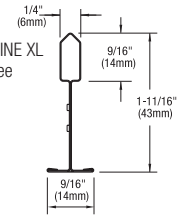


SUPRAFINE ML
Cross Tee

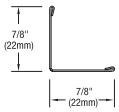
SUPRAFINE
Main Beam



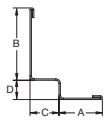
SUPRAFINE XL
Cross Tee



7/8" Hemmed
Angle Molding



Shadow Molding



SEISMIC PERFORMANCE

Main Beams
7501, 7501HRC, 7504, 7505, 7507, 7536, 8501
Minimum Lbs. To Pull Out Compression/Tension
335.0

Cross Tees
XL7558, XL7540, XL7549, XL7520, XL7510, XL8520, XL7570, XL7590, XL7580, XL8540, XL7541,753032, 752032, ML7540, ML7520

Minimum Lbs. To Pull Out Compression/Tension
352.0, 130.0

ICC Reports
For areas under ICC jurisdiction, see ICC evaluation report number ESR-1308 for allowable values and/or conditions of use concerning the suspension system components listed on this page. The report is subject to reexamination, revisions, and possible cancellation.

PHYSICAL DATA

Material
Hot dipped galvanized steel

Surface Finish
Baked polyester paint or powder coated

Manufactured and tested in accordance with ASTM C635

Face Dimension
9/16"

Profile
Exposed tee

Design Considerations
Physical product samples for standard and custom colors are available upon request. Please refer to the physical product sample prior to making a final selection. While we strive to ensure exact color matches, various factors such as differences in materials, texture, substrate porosity, painting processes, lighting, and observer subjectivity can all affect how paint colors appear on ceiling and wall panels, suspension systems, and trim products. Due to these and other differences, ceiling and wall panels, trim products, and suspension systems with the same color name will coordinate but may not be an exact color match. Product is dye-lotted. Order sufficient initial quantities and attic stock to minimize possible color variation.

Cross Tee/Main Beam Interface
XL – Override
ML – Flush fit

End Detail
Main Beam: Staked-on clip
XL Cross Tee: Staked-on clip
ML Cross Tee: Staked-on hook clip

Duty Classification
Intermediate or Heavy-duty

Cleaning & Disinfecting
Cleaning and CDC approved disinfecting options available on armstrongceilings.com/cleaning

SUSPENSION SYSTEMS – Standard

TechLine / 1 877 276-7876
armstrongceilings.com/suprafine

BPCS-3077-122

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Armstrong® CEILING & WALL SOLUTIONS

CPT-1

patcraft®

Scaffold PRODUCT SPECIFICATIONS

COLLECTION	Infrastructure
STYLE NUMBER	I0519
PRODUCT TYPE	Tile
CONSTRUCTION	Multi-Level Pattern Loop
FIBER TYPE	Eco Solution Q® Nylon
DYE METHOD	100% Solution Dyed
PRIMARY BACKING	Non-Woven Synthetic
SECONDARY BACKING	EcoWorx® Tile
PROTECTIVE TREATMENTS	SSP® Shaw Soil Protection
GSA APPROVED PRODUCT	Yes

	US Units	**Metric Units**
PRODUCT SIZE	24 inches x 24 inches	60.96 cm x 60.96 cm
AREA PER BOX	48 ft^2	4.46 m^2
PIECES PER BOX	12	
GAUGE	1/10 inches	39.37 per 10 cm
STITCHES	10 per inches	38.71 per 10 cm
FINISHED PILE THICKNESS	0.071 inches	1.80 mm
AVERAGE DENSITY	8113 oz/yd^3	9.07
TOTAL THICKNESS	0.229 inches	5.82 mm
TUFTED YARN WEIGHT	16 oz/yd^2	542.49 g/m^2

Performance Testing

PILL TEST	Pass
RADIANT PANEL	Class I
NBS SMOKE	Less than 450
ELECTROSTATIC PROPENSITY	Less than 3.5 kv
CRI GREENLABEL PLUS	GLP9968
ADA COMPLIANCE	>0.6, meets the recommended static coefficient of friction for ADA walking surfaces and accessible routes

Test Reports may be included or listed by the manufacturing/inventory style number as opposed to the noted selling style number.

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TRANSFORMSPACE

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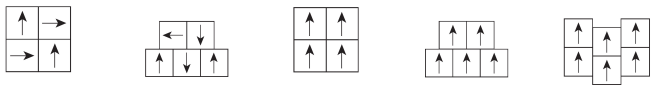
Scaffold

Warranty

Lifetime Commercial Limited

Please visit patcraft.com for the most current warranty information.

Installation Methods



Quarter Turn | Random | Monolithic | Brick | Ashlar

Installation Guidelines

Maintenance Guidelines

Environmental Specifications

RECYCLABILITY	100% recyclable

Materials

Ingredients

DOES NOT CONTAIN	does not contain PVC, phthalates or PBD/PBDE

Recycled Content

TOTAL RECYCLED CONTENT (BY WEIGHT)	45%
PRE-CONSUMER	45%
POST-CONSUMER	0%
BIO-BASED/RAPIDLY RENEWABLE CONTENT (BY WEIGHT)	0%
PACKAGING	100% recyclable
COUNTRY OF ORIGIN (MANUFACTURER)	US

Meets or exceeds all local and national regulations in country of manufacture. Manufactured in an ISO9001 & ISO14001 certified facility or equivalent. Recycled content is calculated using system allocation, mass balance, and direct insertion. The actual recycled content in this product will likely vary. For more information email info@patcraft.com.

Third Party Certifications

MBDC CRADLE TO CRADLE	Silver Certified
NSF 140	Gold Certified
CRI GREEN LABEL PLUS	Certified GLP 9968
USGBC LEED	contributes
BUILDING RESEARCH ESTABLISHMENT	certified
GOOD ENVIRONMENTAL CHOICE AUSTRALIA	certified

Specifications are subject to nominal manufacturing variances. Material supply and/or manufacturing processes may necessitate specification changes without notice. This carpet is an exclusive design and may not be duplicated in any manner. Use of this design in the creation of another carpet design is also strictly prohibited. Visit patcraft.com/testing for more information.

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CPT-2

patcraft®

M | Transverse PRODUCT SPECIFICATIONS



COLLECTION	Infrastructure
STYLE NUMBER	I0520
PRODUCT TYPE	Tile
CONSTRUCTION	Multi-Level Pattern Loop
FIBER TYPE	Eco Solution Q® Nylon
DYE METHOD	100% Solution Dyed
PRIMARY BACKING	Non-Woven Synthetic
SECONDARY BACKING	EcoWorx® Tile
PROTECTIVE TREATMENTS	SSP® Shaw Soil Protection
GSA APPROVED PRODUCT	Yes

	US Units	**Metric Units**
PRODUCT SIZE	24 inches x 24 inches	60.96 cm x 60.96 cm
AREA PER BOX	48 ft^2	4.46 m^2
PIECES PER BOX	12	
GAUGE	1/10 inches	39.37 per 10 cm
STITCHES	10 per inches	38.71 per 10 cm
FINISHED PILE THICKNESS	0.068 inches	1.73 mm
AVERAGE DENSITY	8471 oz/yd^3	9.07
TOTAL THICKNESS	0.216 inches	5.49 mm
TUFTED YARN WEIGHT	16 oz/yd^2	542.49 g/m^2

Performance Testing

PILL TEST	Pass
RADIANT PANEL	Class I
NBS SMOKE	Less than 450
ELECTROSTATIC PROPENSITY	Less than 3.5 kv
CRI GREENLABEL PLUS	GLP9968
ADA COMPLIANCE	>0.6, meets the recommended static coefficient of friction for ADA walking surfaces and accessible routes

Test Reports may be included or listed by the manufacturing/inventory style number as opposed to the noted selling style number.

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TRANSFORMSPACE

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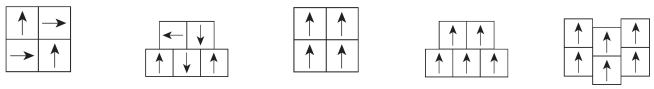
Transverse

Warranty

Lifetime Commercial Limited

Please visit patcraft.com for the most current warranty information.

Installation Methods



Quarter Turn | Random | Monolithic | Brick | Ashlar

Installation Guidelines

Maintenance Guidelines

Environmental Specifications

RECYCLABILITY	100% recyclable

Materials

Ingredients

DOES NOT CONTAIN	does not contain PVC, phthalates or PBD/PBDE

Recycled Content

TOTAL RECYCLED CONTENT (BY WEIGHT)	45%
PRE-CONSUMER	45%
POST-CONSUMER	0%
BIO-BASED/RAPIDLY RENEWABLE CONTENT (BY WEIGHT)	0%
PACKAGING	100% recyclable
COUNTRY OF ORIGIN (MANUFACTURER)	US

Meets or exceeds all local and national regulations in country of manufacture. Manufactured in an ISO9001 & ISO14001 certified facility or equivalent. Recycled content is calculated using system allocation, mass balance, and direct insertion. The actual recycled content in this product will likely vary. For more information email info@patcraft.com.

Third Party Certifications

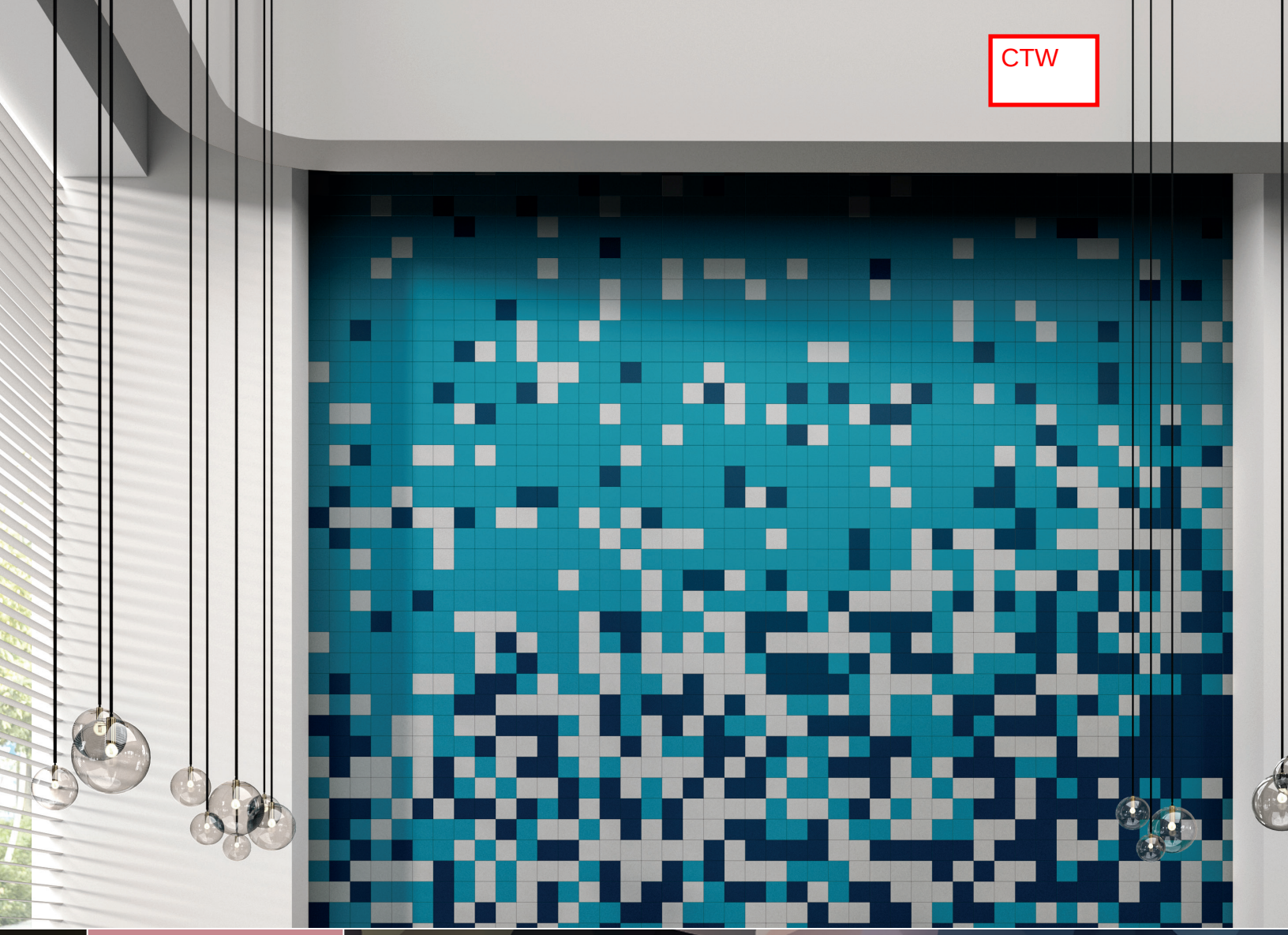
MBDC CRADLE TO CRADLE	Silver Certified
NSF 140	Gold Certified
CRI GREEN LABEL PLUS	Certified GLP 9968
USGBC LEED	contributes
BUILDING RESEARCH ESTABLISHMENT	certified
GOOD ENVIRONMENTAL CHOICE AUSTRALIA	certified

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CTW



WALL

WALL

CLASSIC

COLOR WHEEL™ COLLECTION – GLAZED CERAMIC



daltile®

IMAGINE WHAT'S POSSIBLE™

WALL

CLASSIC

COLOR WHEEL™ COLLECTION – GLAZED CERAMIC

A Spectacular Spectrum

The element of color is visually represented in Color Wheel™. This vibrant collection offers a wide spectrum of colorful selections from bright and pigmented hues to neutral and earthy tones. A favorite of artists and designers, Color Wheel provides the perfect palette to inspire the imagination.

- COLOR SCHEME
  - Eighteen rich semi-gloss colorful accents
  - Plus, twelve coordinating neutral tones in semi-gloss and matte finishes
- ARTISTIC INSPIRATIONS
  - Stylish shapes in classic size options
  - With endless design opportunities, this collection is a perfect fit for residential and commercial applications

WALL

USAGE

- FLOOR
- WALL
- COUNTERTOP
- SHOWER FLOOR
- EXTERIOR FLOOR

SPECIAL FEATURES

- STEPWISE™
- TRU-EDGE™
- MADE IN THE U.S.A.
- LARGE FORMAT
- MOSAIC/ DECO
- ENCAUSTIC
- TERRAZZO
- PAVER
- CUSTOMIZE
- FLEXFIT™

CG GLAZED CERAMIC

LOW HIGH

SEE CHARTS FOR FULL PRODUCT DETAILS

Cover photo features Color Wheel™ Classic Ocean Blue, Galaxy, & Desert Grey 6 x 6 on the wall with Emerson Wood™ Brazilian Walnut 8 x 48 on the floor.
Above photo features Color Wheel™ Classic Artic White & Navy on the walls.

WALL

CLASSIC

COLOR WHEEL™ COLLECTION – GLAZED CERAMIC

SIZES:

- 6 x 6 Wall Tile
- 4 x 4 Wall Tile
- 3 x 6 Wall Tile
- 3 x 6 Bevel Wall Tile

FINISHES: MATTE | SEMI-GLOSS

SEMI-GLOSS

CTW-1

WHITE 0100 (1)	ARCTIC WHITE 0190 (1)	BISCUIT K175 (1)	ALMOND 0135 (1)	URBAN PUTTY 0161 (2)	ARCHITECTURAL GRAY 0109 (2)
ELEMENTAL TAN 0166 (2)	ARTISAN BROWN 0144 (2)	DESERT GRAY X114 (1)	SUEDE GRAY 0182 (2)	CHALKBOARD 0180 (2)	BLACK K111 (2)

MATTE

	MATTE ARCTIC WHITE 0790 (1)	MATTE BISCUIT K775 (1)	MATTE ALMOND X735 (1)	MATTE URBAN PUTTY 0761 (2)	MATTE ARCHITECTURAL GRAY 0709 (2)
MATTE ELEMENTAL TAN 0766 (2)	MATTE ARTISAN BROWN 0744 (2)	MATTE DESERT GRAY X714 (1)	MATTE SUEDE GRAY 0782 (2)	MATTE CHALKBOARD 0780 (2)	MATTE BLACK K711 (2)

ACCENT*

CORNSILK 0160 (3)	MUSTARD 1012 (3)	SUNFLOWER DH50 (3)	ORANGE BURST 1097 (3)	CURRANT SH17 (3)	PLUM CRAZY 1178 (3)
SPA 0148 (3)	GARDEN SPOT 0141 (3)	KEY LIME 1098 (3)	ELECTRIC BLUE 1194 (3)	COBALT DM14 (3)†	WOOD VIOLET 1467 (3)
WATERFALL 0169 (3)	EMERALD 0115 (3)	OCEAN BLUE 1049 (3)	SEA BREEZE 1174 (3)	GALAXY 1469 (3)	NAVY K189 (3)

* Accent available in Semi-Gloss finish only. † Subject to crazing; black grout not recommended
(1), (2) and (3) indicate price groups. (1) being the least expensive.

STAINPROOF

DENTPROOF

SCRATCH-RESISTANT*
*Applicable to products with Matte and Textured Finishes

FIRE-RESISTANT*
*Not Applicable to Mesh-Mounted Mosaics

SIMPLICLEAN™

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CLASSIC

COLOR WHEEL™ COLLECTION – GLAZED CERAMIC

TRIM

			Thickness	Pieces/ Carton
TRIM				
	S1/212J / 1/2 x 12 Jolly	(1/2" x 11-15/16") (1.29 cm x 30.36 cm)	1/4" 7.23 mm	12
	A106 / 1 x 6 Quarter Round	(1" x 6") (2.43 cm x 15.16 cm)	5/16" 7.90 mm	152
	AC106 / 1 x 6 Quarter Round Corner	(1" x 6") (2.43 cm x 15.16 cm)	5/16" 7.90 mm	120
SURFACE BULLNOSE				
	S4269 / 2 x 6 Bullnose	(2" x 6") (5.15 cm x 15.31 cm)	5/16" 7.90 mm	100
	SN4269 / 2 x 2 Bullnose Corner	(2" x 2") (5.15 cm x 5.15 cm)	5/16" 7.90 mm	25
	S4669 / 6 x 6 Bullnose	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	50
	SCRL4669 / 6 x 6 Bullnose Corner	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	50
	S4449 / 4 x 4 Bullnose	(4-1/4" x 4-1/4") (10.90 cm x 10.90 cm)	5/16" 7.90 mm	100
	SCRL4449 / 4 x 4 Bullnose Corner	(4-1/4" x 4-1/4") (10.90 cm x 10.90 cm)	5/16" 7.90 mm	100
	S4369MOD / 3 x 6 Bullnose (on 6" side)	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	100
	S4639MOD / 3 x 6 Bullnose (on 3" side)	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	100
	SCR4369M / 3 x 6 Bullnose Corner Right	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	100
	SCL4369M / 3 x 6 Bullnose Corner Left	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	100
RADIUS BULLNOSE				
	A4200 / 2 x 6 Bullnose	(2" x 6") (5.28 cm x 15.20 cm)	5/16" 7.90 mm	100
	AN4200 / 2 x 2 Bullnose Corner	(2" x 2") (5.28 cm x 5.28 cm)	5/16" 7.90 mm	20
FLAT TOP COVE BASE ▲				
	A3601 / 6 x 6 Cove Base	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	44
	SCR3601 / 6 x 6 Cove Corner Right	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	20
	SCL3601 / 6 x 6 Cove Corner Left	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	20
	A3401 / 4 x 4 Cove Base	(4-1/4" x 4-1/4") (10.90 cm x 10.90 cm)	5/16" 7.90 mm	84
	SCR3401 / 4 x 4 Cove Corner Right	(4-1/4" x 4-1/4") (10.90 cm x 10.90 cm)	5/16" 7.90 mm	30
	SCL3401 / 4 x 4 Cove Corner Left	(4-1/4" x 4-1/4") (10.90 cm x 10.90 cm)	5/16" 7.90 mm	30
	A3361MOD / 3 x 6 Cove Base	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	36
	SCR3361M / 3 x 6 Cove Base Corner Right	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	36
	SCL3361M / 3 x 6 Cove Base Corner Left	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	36
SANITARY COVE BASE ⁺				
	S3619T / 6 x 6 Cove Base	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	40
	SCR3619T / 6 x 6 Cove Base Corner Right	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	20

TRIM (CON'T)

			Thickness	Pieces/ Carton
	SCL3619T / 6 x 6 Cove Base Corner Left	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	20
	S3419T / 4 x 6 Cove Base	(4-1/4" x 6") (10.90 cm x 15.31 cm)	5/16" 7.90 mm	60
	SCR3419T / 4 x 6 Cove Base Corner Right	(4-1/4" x 6") (10.90 cm x 15.29 cm)	5/16" 7.90 mm	20
	SCL3419T / 4 x 6 Cove Base Corner Left	(4-1/4" x 6") (10.90 cm x 15.31 cm)	5/16" 7.90 mm	20
SANITARY COVE BASE - Slim Foot Design ⁺				
	S3619TN / 6 x 6 Cove Base	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	40
	SC3619TN / 1 x 6 Cove Base Corner	(1" x 6") (2.43 cm x 15.16 cm)	5/16" 7.90 mm	60

▲ Available in Group 1 & 2 Colors. Group 3 Colors are Made-to-Order.

⁺ Available in Group 1 Colors. Group 2 & 3 Colors are Made-to-Order.

TRIM USAGE

Wall Tile	6 x 6	4 x 4	3 x 6	3 x 6 Bevel
Jolly	S1/212J	S1/212J	S1/212J	S1/212J
Quarter Round	A106	A106	A106	A106
Quarter Round Corner	AC106	AC106	AC106	AC106
SURFACE BULLNOSE				
Bullnose	S4669	S4449	S4369MOD & S4639MOD	
Corner	SCRL4669	SCRL4449	SCR4369M & SCL4369M	
Bullnose	S4269	S4269	S4269	
Corner	SN4269	SN4269	SN4269	SN4269
RADIUS BULLNOSE				
Bullnose	A4200	A4200	A4200	
Corner	AN4200	AN4200	AN4200	
FLAT TOP COVE BASE				
Cove Base	A3601	A3401	A3361MOD	A3361MOD
Cove Base Corner	SCR3601 & SCL3601	SCR3401 & SCL3401	SCR3361M & SCL3361M	SCR3361M & SCL3361M

Best Match

WALL
CLASSIC
COLOR WHEEL™ COLLECTION – GLAZED CERAMIC

SIZES

			Thickness	Sq. Ft./ Carton	Pieces/ Carton
▢	6 x 6 Wall Tile	(6" x 6") (15.31 cm x 15.31 cm)	5/16" 7.90 mm	12.50	50
▢	4 x 4 Wall Tile	(4-1/4" x 4-1/4") (10.90 cm x 10.90 cm)	5/16" 7.90 mm	12.50	100
▭	3 x 6 Wall Tile	(3" x 6") (7.65 cm x 15.31 cm)	5/16" 7.90 mm	12.50	100
▭	3 x 6 † Bevel Wall Tile	(3" x 6") (7.65 cm x 15.31 cm)	3/8" 9.40 mm	10.40	80

† Bevel is available in Group 1 colors only. Other colors available through the ColorMatch™ Special Order program.

APPLICATIONS

	Target DCOF wet	Suitable
Dry & Level – Interior Floor	N/A	
Wet & Level – Interior Floor	≥ 0.42	
Shower Floors (Residential or Light Commercial)	≥ 0.42	
Exterior Floor Applications (including pool decking & other wet areas with minimal footwear)	≥ 0.60	
Ramps & Inclines	≥ 0.65	
Walls/Backsplashes	N/A	✓
Countertops	N/A	✓*
Pool Linings	N/A	✓

A DCOF value of ≥0.42 is the standard for tiles specified for level interior spaces expected to be walked upon when wet, as stated in ANSI A137.1-A326.3. For more information about DCOF and the DCOF AcuTest™, visit daltile.com/DCOF.

APPLICATION NOTES:

Suitable for exterior applications in non-freezing climates, when proper installation methods are followed.

* Matte finishes only. No Bevel Tile. Darker colors may show scratches.

INSTALLATION

Grout Joint Recommendation	Shade Variation
Wall: 1/16"	Low (V1)

PERFORMANCE CHARACTERISTICS

	ASTM#	Result
Water Absorption	C373	< 20.0%
Breaking Strength	C648	120-230 lbs
Scratch Hardness	MOHS	4.0-6.0
Chemical Resistance	C650	Resistant
Abrasion Resistance	C1027	N/A

For additional information on test results, visit us at: daltile.com/information/TestResults.

NOTES

Since there are variations in all fired ceramic and natural products, tile and trim supplied for your particular installation may not match samples. Final confirmation should be made from actual tiles and trim prior to installation. Manufactured in accordance with ANSI A137.1 standards.

For additional information refer to "Factors to Consider" at: daltile.com/Factors.

LRV & MUNSELL

Color #	LRV Illuminate-OBS: F02-02 (CWF)	Munsell
SEMI-GLOSS		
0100	83.9	2.6Y 9.2/0.5
0190	83.9	7.0Y 9.2/0.2
K175	75.9	5.2Y 8.8/0.9
0135	68.0	2.9Y 8.4/1.2
0161	48.0	1.7Y 7.3/1.5
0166	26.8	1.1Y 5.7/1.6
0144	14.5	5.9YR 4.3/1.3
0109	37.9	6.0Y 6.6/1.0
X114	43.7	1.4GY 7.0/0.3
0182	22.6	1.9B 5.3/0.1
0180	11.4	1.3B 3.9/0.4
K111	5.0	10.0B 2.6/0.1
MATTE		
0790	83.4	4.9Y 9.2/0.2
K775	75.9	5.2Y 8.8/0.9
X735	70.9	3.5Y 8.6/1.2
0761	48.1	2.5Y 7.3/1.5
0766	26.8	0.2Y 5.7/1.7
0744	13.9	7.6YR 4.3/1.3
0709	36.9	5.6Y 6.5/1.0
X714	43.9	3.6GY 7.0/0.4
0782	22.3	9.8G 5.3/0.1
0780	11.1	0.6B 3.9/0.4
K711	5.8	3.3PB 2.8/0.1
ACCENT		
K189	5.9	5.0PB 2.9/1.2
1012	48.1	9.7YR 7.2/6.9
1049	18.0	1.9B 5.0/4.5
1097	26.4	10.1R 5.6/10.2
0115	11.7	3.3G 4.1/4.9
1174	9.1	5.8PB 3.6/5.6
1178	6.8	5.9RP 3.1/2.0
SH17	14.0	5.1R 4.4/11.1
0141	24.7	3.0GY 5.5/2.1
0148	48.3	3.7BG 7.4/1.3
0160	73.3	3.3Y 8.7/3.3
0169	40.4	9.7B 6.9/2.6
1469	9.3	4.5PB 3.6/2.7
DH50	70.6	4.7Y 8.4/8.8
DM14	4.7	9.9PB 2.5/4.4
1098	50.9	2.6GY 7.4/5.2
1194	19.0	0.3PB 5.2/6.7
1467	16.6	7.0P 4.6/2.2

POST-CONSUMER RECYCLED MATERIALS

PRE-CONSUMER RECYCLED MATERIALS

MADE IN THE U.S.A.

All or select items within this series meet the requirements for these qualifications. For more information, visit daltile.com.

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ACCUSNAP™

PRODUCT APPLICATIONS

- Stretched Fabric Walls
- Acoustic Wall Panels
- Sound Proofing
- Commercial Interiors
- Executive office suites
- Performance Centers
- Studios
- Hospitality
- Medical
- Higher Education

PRODUCT DESCRIPTION

ACCUSNAP is a time tested and innovative framing system used to manufacture stretched fabric panel systems. Its endless versatility allows for an abundance of uses in interior spaces. This patented two part system simplifies the installation and removal process. ACCUSNAP utilizes a Mid Wall Fastening Systems which SNAPs the panel into place, securing it to the wall or ceiling. This allows for the panel to be removed without damaging the panel or wall.

PRODUCT CHARACTERISTICS

- Clean, Crisp Edges.
- Perfect Panel Joints.
- Easy Removal For Repairs or Fabric Change.
- Field or Shop Fabrication.
- Can accommodate heavy/thick fabrics.
- Allows for significantly faster fabrication and installation when compared to other typical stretched fabric systems.







TECHNICAL DETAILS

EDGE DETAILS

ACCUSNAP is available with Square or Beveled edges. Radius edge profiles are available on some extrusions with minimum order requirements.

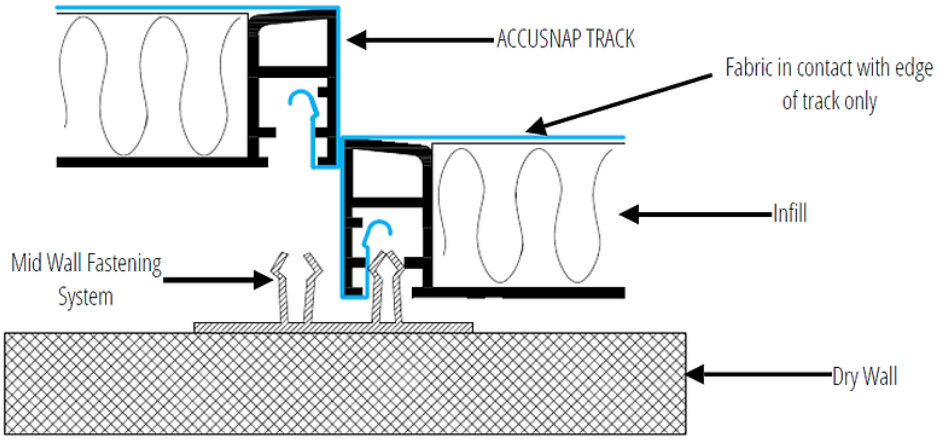
ACOUSTICAL SUBSURFACE

ACCUSNAP will accommodate a multitude of infills, including but not limited to Acoustical Fiberglass & Impact Resistant Composite Fiberglass, Mineral Fiber Board (MiCore), MDF, PET board, and more...

THICKNESS

Available in 1/2", 3/4", 1", 1-1/2", 2" and fully customizable to accommodate any desired thickness.

INSTALLATION METHOD



ACCUSNAP SPECIFICATION GUIDE
ACCUSNAP SPECIFICATION

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ACCUSNAP™

PART 1 - GENERAL

1.1 Scope - Furnish and install ACCUTRACK Stretched-Fabric Wall Systems in accordance with finish schedule and architectural drawings.

1.2 Standards - The components of the systems, both individually and as a finished assembly shall have a Class "A" rating in accordance with ASTM E84.

1.3 Distributed By:

Accutrack Systems, LLC.
6910 Oak Ridge Commerce Way SW
Austell, GA 30168
Office: 770.941.9009
FAX: 770.941.0250
Web: www.accutracksystems.com
Email: Info@accutracksystems.com

1.4 Submittals

A. Submit for approval the following:

1.4.1 Installation drawings showing panel layout, location, typical details and special conditions as required by finish schedule and architectural drawings.

1.4.2 Manufacturer's Specifications

1.4.3 Fire rating certificates for all components.

1.4.4 12"X12" mock up of each fabric specified in the finish schedule.

1.5 Product Handling - All materials shall be protected before, during and after installation from dirt, dust and the work of other trades.

1.6 Preparation

A. Space must be enclosed and weather-tight.

B. All wet work must be completed and dry.

C. Ambient temperature and humidity must be continuously maintained at levels acceptable for final occupancy of the space.

D. Adjacent and related work must be completed including millwork, ceiling grid, base, painting, wall covering, electric work and other miscellaneous finishes.

E. Unsatisfactory conditions will be documented in writing to the general contractor, architect and representatives of the owner. Installation of the System will not proceed until unsatisfactory conditions have been corrected.

PART 2 - PRODUCTS

2.1 ACCUSNAP™ Stretched-Fabric Panel System

A. ACCUTRACK rigid vinyl extrusions, available profiles and thickness.

Specify:

1. **5000B** 1/2" thick with Bevel Edge
2. **5000R** 1/2" thick with Radius Edge
3. **5000S** 1/2" thick with Square Edge
4. **7500B** 3/4" thick with Bevel Edge
5. **7500R** 3/4" thick with Radius Edge
6. **7500S** 3/4" thick with Square Edge
7. **10,000B** 1" thick with Bevel Edge
8. **10,000R** 1" thick with Radius Edge
9. **10,000S** 1" thick with Square Edge
10. **15,000B** 1½" thick with Bevel Edge
11. **15,000R** 1½" thick with Radius Edge
12. **15,0000S** 1½" thick with Square Edge
13. **20,000B** 2" thick with Bevel Edge
14. **20,0000S** 2" thick with Square Edge
15. Custom Thickness greater than 2" available.

B. Standard acoustical infill 6-7 lb. Density compressible, fire retardant fiberglass. Available in 1/2", 3/4", 1" and 2" thickness.

1. 1/2" Thick fiberglass - NRC 0.55
2. 3/4" Thick Fiberglass - NRC 0.65
3. 1" Thick Fiberglass - NRC .080
4. 1½ " Thick Fiberglass - NRC 0.95
5. 2" Thick Fiberglass - NRC 1.05

C. Optional impact resistant, 23lb. density, fire retardant mineral fiber-board.

1. Available in ½" and ¾" thickness
2. Add suffix "T" to indicate tackable infill .
3. May be specified in conjunction with standard acoustical infill.

D. Optional impact resistant, 25 lb. Density, fire retardant, compressed fiberglass overlay - ⅛" thick.

E. Optional "Soft Touch" panel 23 lb. Density, fire retardant, mineral core fiberboard with ½" compressible fire retardant polyester fiberfill overlay.

F. All corners to be reinforced with locking nylon corner keys.

G. Optional plywood infill may be specified in selected areas for signage or heavy artwork.

PART 3 - EXECUTION

3.1 Installation

A. ACCUTRACK will be installed by a factory trained and certified installation company.

B. Field measure and layout each wall to receive panel system as shown on plan, elevation and finish schedule.

C. All installations must be Site Built and Installed.

D. Install ACCUTRACK to create individual panels as required. Panels shall be plumb and straight.

E. Install infill material as required. Infill shall be smooth and free from bumps and protrusions. Infill material shall be flush with face of ACCUTRACK Extrusions.

F. Cut fabric from roll and mark top of panel in numerical sequence.

G. Fabric shall be stretched taught and smoothly over the system and securely fastened in the system. Fabric shall be plumb and fee of flaws and defects.

H. Wall plates and other obstructions shall be shimmed to the same plane as the finished system.

3.2 Cleanup and Protection

A. Vacuum all exposed fabric surfaces.

B. Trim and remove all loose threads.

C. Remove all excess materials, rubbish, and debris from installation and leave in neat, clean and orderly condition.

D. Cover all fabric panels with protective sheeting until space is ready for occupancy.

PART 4 - FABRICS

A. Manufacturers Standard or specified material.

B. All fabrics shall be approved by contractor to insure suitability.

C. All light color and transparent fabrics may require a fabric liner.

D. The following information shall be submitted by the architect for each fabric specified:

1. Fabric Manufacturer
2. Width of Fabric
3. Content
4. Pattern
5. Style
6. Color
7. Source

E. All fabrics should be treated with a stain-resistant finish.

PART 5 - WARRANTY

A. Panel System installation shall be warranted by the Certified Installer for the period defined in contract documents.

B. ACCUTRACK Systems® provides a limited lifetime warranty on extrusions to the certified installer for the "life" of the installation.

DRYWALL/STUCCO/PLASTER – Flat Ceilings

Suspension Systems

SUSTAIN™ High Performance Sustainable Ceiling Systems

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energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
	✓	✓	✓				✓	✓				

▲ LOCATION DEPENDENT

Well Building Standard™ (WELL)
Living Building Challenge® (LBC)

Armstrong® Drywall Grid is 3x faster than traditional track and channel framing – saving you time and labor.

KEY SELECTION ATTRIBUTES

- Some components available in High Recycled Content (HRC): Total Recycled Content 61%, Post-consumer 53%, Pre-consumer 8%
- Non-HRC items have 30% recycled content
- PeakForm® patented profile increases strength and stability for improved performance during installation
- SuperLock™ main beam clip is engineered for a strong, secure connection and fast, accurate alignment confirmed with an audible click; easy to remove and relocate
- HD8906IIC main beam accepts integral Impact Isolation Clips (IIC) to provide up to eight points of IIC improvement.
- ScrewStop™ reverse hem prevents screw spin off on 1-1/2" wide face
- Rotary-stitched during manufacture by a patented method for additional torsional strength and extra stability during installation
- HD8906 (HRC) main beams and cross tees with extra routings for Type F light fixtures
- Minimum G40 hot dipped galvanized coating, per ASTM C645; provides superior corrosion resistance
- Wind uplift construction available
- XL® (staked-on end detail) cross tees provide secure locked connection; fast and easy to install
- All drywall components minimum .018" steel thickness; complies with ASTM C645
- Accommodates stud, track, hat channel, wood, or other supplemental framing
- Fire Guard™ components meet broad range of UL® design assemblies (XL7936G90 is not fire rated)
- 10-Year Limited System Warranty, 30-Year Limited Ceiling Systems Warranty
- G90 hot dipped galvanized coating is available for exterior applications (HD8906G90, XL8945PG90, XL8947PG90, XL8965G90, XL8925G90, XL7936G90)
- SimpleCurve® bend to create curves as tight as 52"

TYPICAL APPLICATIONS

- Indoor/outdoor applications
- Soffits/special transitions
- High visibility areas
- Combination drywall and acoustical panel or tile ceilings
- Barrel vaults and domes
- Wet installations (stucco/plaster)

FIRE RESISTANCE RATING

Meets a broad range of UL design assemblies: D501, D502, G523, G524, G526, G527, G528, G529, J502, K504, L502, L508, L513, L515, L525, L526, L529, L564, P501, P506, P507, P508, P509, P510, P513, P514, P516 (XL7936G90 and SP135 are not fire rated).

NOTE: See UL Directory for details on specific designs.

MATERIALS

ASTM C635 Heavy-duty main beam classification, ASTM A653 zinc-coated hot dipped galvanized steel. Exposed surfaces chemically cleansed, zinc-coated, and prefinished. Materials conform to the performance standard ASTM C645 (Standard Specification for Rigid Furring Channels for Screw Applications of Gypsum Board).

VISUAL SELECTION

	Item No.		Description	Dimensions	Rout Spacing	HANGER SPACING (LBS./LIN. FT.) L/240 2 Ft.	L/240 3 Ft.	L/240 4 Ft.	L/360 2 Ft.	L/360 3 Ft.	L/360 4 Ft.
Drywall Main Beams – Imperial (Red Numbers are Fire Guard Items)**	HD8906 HD8906HRC HD8906G90 HD8906IIC	1-1/2"	12' HD Drywall Main Beam (For Type F Light Fixtures)	144 x 1-1/2 x 1-11/16"	54 routs – starting 2-1/4" from each end†	143.0	57.3	28.14	95.5	43.19	18.66
	HD890610	1-1/2"	10' HD Drywall Main Beam (For Type F Light Fixtures)	120 x 1-1/2 x 1-11/16"	45 routs – starting 2-1/4" from each end†	143.0	57.3	28.14	95.5	43.19	18.66
	SP135	1-1/2"	135" HD Stucco Main Beam G90	135 x 1-1/2 x 1-11/16"	13.5" O.C.	139.85	52.59	28.71	–	43.19	18.66
Drywall Main Beams – Metric	HD7940	43mm	3600mm HD Drywall Main Beam	3600 x 38 x 42.8mm	200mm O.C.	150.0	68.3	29.34	100.0	45.35	19.56
	7940G	43mm	3600mm HD Drywall Main Beam	3600 x 38 x 35mm	150mm O.C. – starting 75mm from each end†	114.0	51.92	22.40	76.39	34.61	14.93

	Item No.		Description	Dimensions	Rout Spacing	LOAD TOTAL DATA (LBS./LIN. FT.) L/240	L/360	LOAD TOTAL DATA (KG./LIN. M.) L/240	L/360
Drywall Cross Tees – Imperial (Red Numbers are Fire Guard Items)**	XL8965 XL8965HRC	1-1/2"	6' Drywall Cross Tee	72 x 1-1/2 x 1-1/2"	6 routs – starting 24" from each end†	6.87 @ 6'	4.58 @ 6'		
	XL8947P XL8947PG90	1-1/2"	50" Drywall Cross Tee	50 x 1-1/2 x 1-1/2"	8 routs – starting 10" from each end†	19.5 @ 50"	12.79 @ 50"		
	XL8945P XL8945PHRC XL8945PG90	1-1/2"	4' Drywall Cross Tee	48 x 1-1/2 x 1-1/2"	9 routs – center rout and starting 10" from each end†	22.5 @ 4'	14.27 @ 4'		
	XL8940	1-1/2"	40" Drywall Cross Tee	40 x 1-1/2 x 1-1/2"	1 rout – center of tee	36.22 @ 40"	24.15 @ 40"		
	XL7936G90	1-1/2"	3' Drywall Cross Tee	36 x 1-1/2 x 1-1/2"	none	50.0 @ 3'	31.33 @ 3'		
	XL8926	1-1/2"	2' Drywall Cross Tee	24 x 1-1/2 x 1-1/2"	3 routs – center rout and 10" from each end†	158.0 @ 2'	90.25 @ 2'		
Drywall Cross Tees – Metric	XL7961	38mm	1600mm Drywall Cross Tee (6')	1600 x 38 x 36mm	800mm center of tee	10.25 @ 6'	6.84 @ 6'	15.15 @ 1600mm	10.18 @ 1600mm
	XL7930	38mm	1200mm Drywall Cross Tee (4')	1200 x 38 x 38mm	450mm, 600mm, 750mm	22.4 @ 4'	14.93 @ 4'	33.33 @ 1200mm	22.22 @ 1200mm
	XL7925	38mm	900mm Drywall Cross Tee (3')	900 x 38 x 38mm	none	51.92 @ 3'	34.61 @ 3'	77.26 @ 900mm	51.51 @ 900mm
	XL7920	38mm	600mm Drywall Cross Tee (2')	600 x 38 x 38mm	none	114.59 @ 2'	76.39 @ 2'	170.52 @ 600mm	113.68 @ 600mm

* NOTE: All load test data based on flat installation per ASTM C635.
** For fire-rated assemblies, use Type C gypsum board as noted in the UL® fire-rated assembly designs.
† Type F fixture compatible

ASTM Class
HD - Heavy-duty
ID - Intermediate-duty
LD - Light-duty

DRYWALL/STUCCO/PLASTER – Flat Ceilings

Suspension Systems

SUSTAIN™ High Performance Sustainable Ceiling Systems

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energy management	construction waste mgmt	regional materials	design for flexibility	EPD	recyclable/ extended producer resp.	biobased materials	recycled content	sourcing of raw materials	material ingredient reporting	low emitting/ materials	lighting quality	acoustics
	✓	✓	✓				✓	✓				

▲ LOCATION DEPENDENT

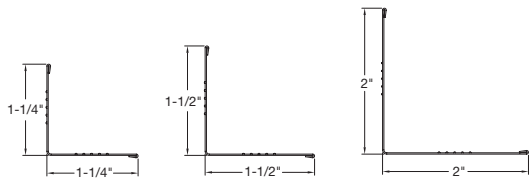
Well Building Standard™ (WELL) Living Building Challenge® (LBC)

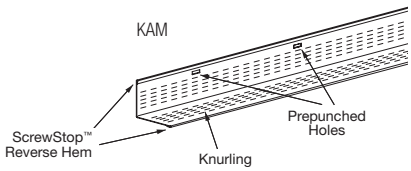
VISUAL SELECTION

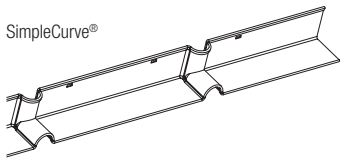
PACKAGING

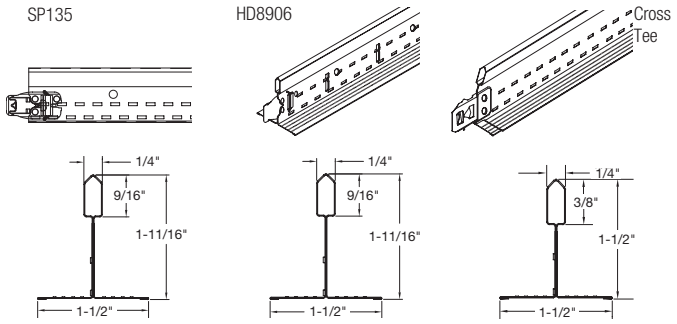
	Item No.	Face Flange	Description	Dimensions	Packaging Pcs.	Lin. Ft.
Moldings	**7858**	15/16"	12' Reverse angle molding	144 x 1-9/16 x 15/16"	20	240
	LAM12	1-1/4"	12' Nominal locking angle molding, locking tabs 8" O.C, starting 4" from each end	144 x 1-1/4 x 1-1/4"	10	240
	LAM12HRC	1-1/4"	12' Nominal locking angle molding, locking tabs 8" O.C, starting 4" from each end	144 x 1-1/4 x 1-1/4"	10	240
new	**LAM151220E**	1-1/2"	12' Locking Angle Molding, locking tabs 8" O.C. 22 Gauge (.028" metal thickness)	144 x 1-1/2 x 1-1/2"	10	120
	KAM10	1-1/4"	10' Knurled Angle Molding – (.018 metal thickness)	120 x 1-1/4 x 1-1/4"	10	100
	KAM12	1-1/4"	12' Knurled Angle Molding – (.018 metal thickness)	144 x 1-1/4 x 1-1/4"	10	120
	KAM12G90	1-1/4"	12' Knurled Angle Molding – G90 galvanized steel coating (.018 metal thickness)	144 x 1-1/4 x 1-1/4"	10	120
	KAM12HRC	1-1/4"	12' Knurled Angle Molding – High Recycled Content (.018 metal thickness)	144 x 1-1/4 x 1-1/4"	10	120
	KAM1510	1-1/2"	10' Knurled Angle Molding – (.018 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM1512	1-1/2"	12' Knurled Angle Molding – (.018 metal thickness)	144 x 1-1/2 x 1-1/2"	10	120
	KAM151020E	1-1/2"	10' Knurled Angle Molding – (.028 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM151220E	1-1/2"	12' Knurled Angle Molding – (.028 metal thickness)	144 x 1-1/2 x 1-1/2"	10	120
	KAM151020	1-1/2"	10' Knurled Angle Molding – (.033 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM151020G90	1-1/2"	10' Knurled Angle Molding – G90 galvanized steel coating (.033 metal thickness)	120 x 1-1/2 x 1-1/2"	10	100
	KAM21025	2"	10' Knurled Angle Molding – (.018 metal thickness)	120 x 2 x 2"	10	100
	KAM21020EQ	2"	10' Knurled Angle Molding – (.028 metal thickness)	120 x 2 x 2"	10	100
	KAM21020	2"	10' Knurled Angle Molding – (.033 metal thickness)	120 x 2 x 2"	10	100
new	**SC151220EQ**	1-1/2"	12' x 1.5" SimpleCurve® Knurled Angle Molding – (.028" metal thickness)	148 x 1-1/2 x 1-1/2"	10	124
new	**SC151225**	1-1/2"	12' x 1.5" SimpleCurve® Knurled Angle Molding – (.018" metal thickness)	148 x 1-1/2 x 1-1/2"	10	124
new	**SC21220EQ**	2"	12' x 2" SimpleCurve® Knurled Angle Molding – (.028" metal thickness)	148 x 2 x 2"	10	124
new	**SC21225**	2"	12' x 2" SimpleCurve® Knurled Angle Molding – (.018" metal thickness)	148 x 2 x 2"	10	124

NOTE: .018" metal thickness meets ASTM C645 for framing





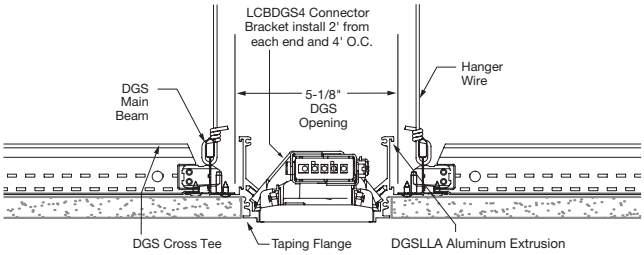




DRYWALL LINEAR LIGHTING

Item No.	Description	Fixture Length
DGSLLTK24	2' Linear Light Trim Kit	24" x 4"
DGSLLTK30	2' – 6" Linear Light Trim Kit	30" x 4"
DGSLLTK48	4' Linear Light Trim Kit	48" x 4"
DGSLLTK60	5' Linear Light Trim Kit	60" x 4"
DGSLLTK72	6' Linear Light Trim Kit	72" x 4"
DGSLLTK90	7' – 6" Linear Light Trim Kit	90" x 4"
DGSLLTK96	8' Linear Light Trim Kit	96" x 4"
DGSLLTK120	10' Linear Light Trim Kit	120" x 4"
DGSLLTKCON	10' Continuous Linear Light Trim Kit	10'

NOTE: Linear Light Trim Kits designed to work with 5/8" drywall



SEISMIC PERFORMANCE

Main Beams	Minimum Lbs. To Pull Out Compression/Tension
HD8906/HD890610 / HD8906HRC	332.3
HD8906IIC	332.3
XL7918, XL8926, XL8925, XL7936G90, XL8945PHRC, XL8945P, XL8947P, XL8965HRC	380.1

ICC REPORTS

For areas under ICC jurisdiction, see ICC evaluation report number ESR-1289 for allowable values and/or conditions of use concerning the suspension system components listed on this page. The report is subject to reexamination, revisions, and possible cancellation.

For fixture weight and UL listings, see Drywall Grid Systems for Flat Applications Technical Guide BPCS-3539.

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Armstrong® CEILING & WALL SOLUTIONS

INTERIOR PAINTING SCHEDULE

A. Gypsum Board:

1. Flat Sheen:

a. Sherwin-Williams Company:

1) Primer (Unpainted Surfaces): ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Flat, B30-2650 Series.

2. Low-Luster, Satin or Eggshell Sheen:

a. Sherwin-Williams Company:

1) Primer (Unfinished Surfaces): ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2650 Series.

3. Semi-Gloss Sheen:

a. Sherwin-Williams Company:

1) Primer (Unfinished Surfaces): ProMar 200 Interior Latex Primer, B28W2600.
2) First and Second Coats: ProMar 200 Zero VOC Interior Latex S/G, B31-2650 Series.

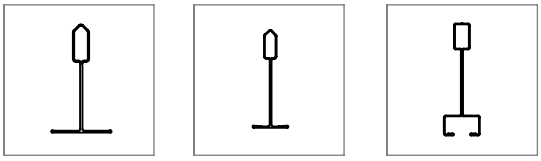
inter•lux *tools for lighting*

Surface Mount 20 Applications Guide

Product Code: WG-20LDL-SM

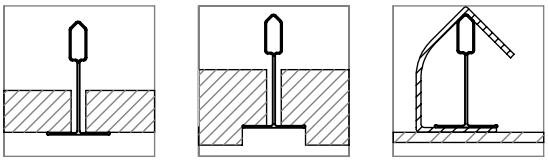
Grid Options

Armstrong™:	Prelude XL 15/16"	Suprafine 9/16"	Silhouette XL 1/2" Reveal
USG Donn™:	DX, DXL, CE, DXLA, ZXLA, AX, DXSS	Centricitee	Fineline 1/2"



Panel Options

Square Lay-In | Tegular | Snap-In Metal Pan

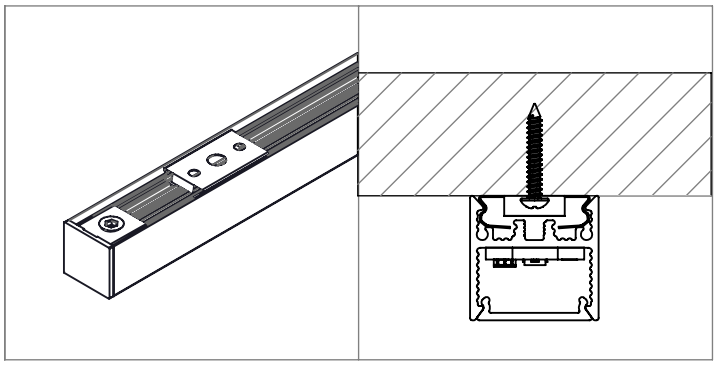


Compatibility Table

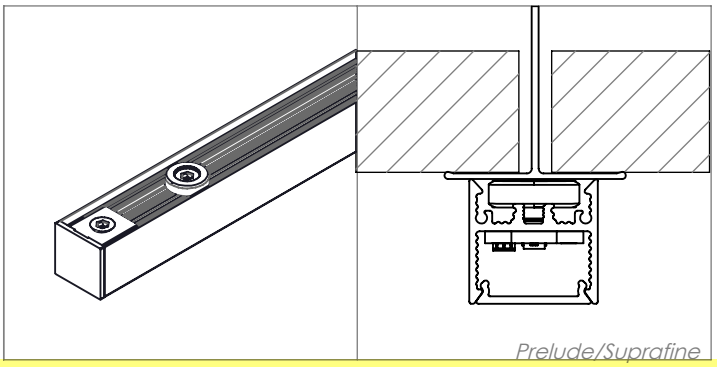
	Screw Clip (SC)	Magnet (MM)	Square Lay-In Grid Clip (GT9/GT15)	Tegular Grid Clip (GT9T)
Hard Ceiling	Yes	No	No	No
Prelude XL 15/16"	Yes	Yes	Yes	No
Suprafine 9/16"	Yes	Yes	Yes	Yes
Silhouette XL 1/2" Reveal	No	Yes	No	No
Snap-In Metal Pan	No	Yes	No	No

Mounting Options

Screw Clip (SC)

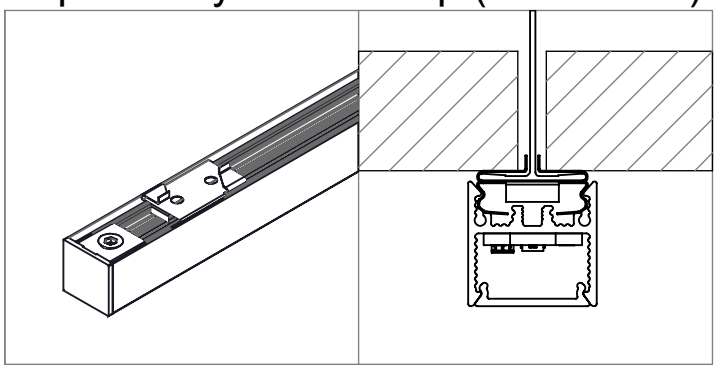


Magnet (MM)

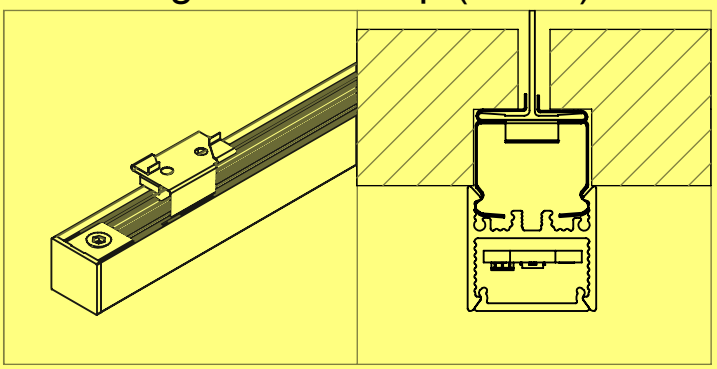


Prelude/Suprafine

Square Lay-In Grid Clip (GT9/GT15)



Tegular Grid Clip (GT9T)



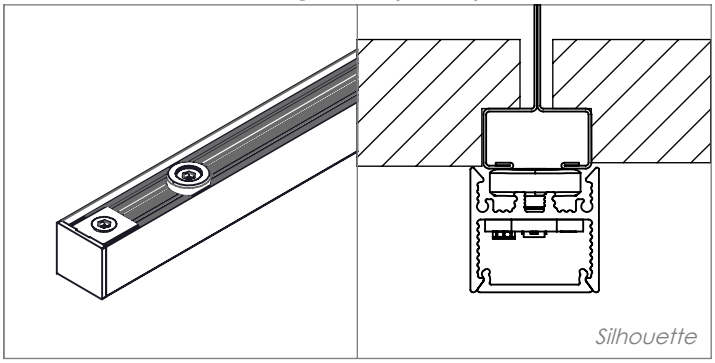
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Surface Mount 20 Applications Guide

Product Code: WG-20LDL-SM

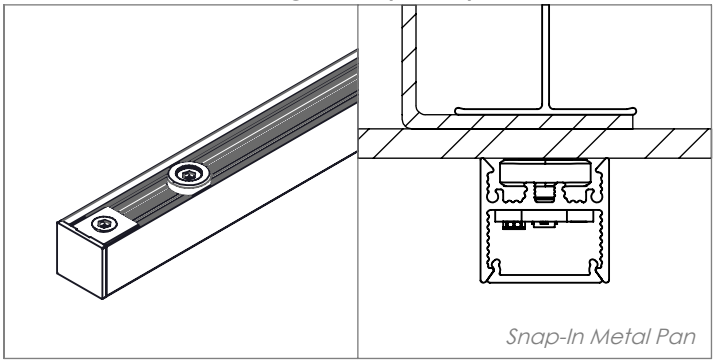
Mounting Options (Continued)

Magnet (MM)



Silhouette

Magnet (MM)



Snap-In Metal Pan

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ShawContract®

LVT-1

Unveil

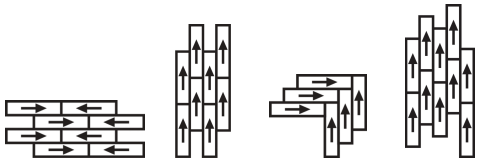
Collection	**Vertical Layers**	
Style Number	**0601V**	
Construction	**Heavy Commercial Luxury Vinyl Tile**	
Class / ASTM F1700	**Class III, Type B**	
Finish	**ExoGuard™**	
	U.S.	Metric
Nominal Dimensions	**9 in w x 36 in l**	**23 cm w x 91 cm l**
Actual Dimensions	**9.00 in w x 36.00 in l**	**22.86 cm w x 91.44 cm l**
Wear Layer Thickness	**30 mil (0.03 in)**	**0.76 mm**
Overall Thickness	**0.118 in**	**3 mm**
Edge Profile	**Squared Edge**	
Installation	**Direct Glue**	
Recommended Adhesive	**LG4100 4G, 4151 or S150-95**	



Packaging

Pieces per Carton	**16 pcs**	
Area per Carton	**36 sq ft**	**3.34 sq m**
Weight per Carton	**35.27 lbs**	**16 kg**

Recommended Installation Method



Brick Ashlar Herringbone Stagger

Coordinating Products

Carpet Tile: Uncover Tile, Expose Tile, Relief Tile, Tinge Tile, Undertone Tile

Performance + Testing

Static Load (ASTM F970)	**Passes (Modified), *2000 lbs**
Residual Indentation (ASTM F1914)	**Passes**
Resistance to Heat (ASTM F1514)	**Passes**
Resistance to Light (ASTM F1515)	**Passes**
Resistance to Chemicals (ASTM F925)	**Passes**
Smoke Density (ASTM E662, Flaming Mode)	**Passes**
Radiant Panel (ASTM E648)	**Passes, Class I**
Coefficient of Friction (ASTM D2047, Slip Resistance)	**>0.6, meets the recommended static coefficient of friction for ADA walking surfaces and accessible routes**
Repetitive Traffic Scratch Test	**Moderate to Severe Change**

*This test is intended to compare relative properties of different styles and constructions. Results are based on a laboratory test and used for comparative purposes - real life load limit may vary.

Test Reports may be included or listed by the manufacturing/inventory style number as opposed to the noted selling style number.

Corporate Headquarters +1 800 257 7429 | +1 706 532 7984 | Atlanta +1 404 853 7429 | Bengaluru +91 80 6773 0202 | Beijing +86 10 6568 588 | Chicago +1 312 467 1331 | Dubai +971 4 584 6956 | Hong Kong +852 2623 0371 | Latin America (Miami) +1 305 827 5912 | London +44 207 961 4120 | Los Angeles +1 800 233 1614 | Melbourne +61 3 9939 8543 | Mexico City +55 5010 7600 | Mumbai +91 22 6284 5050 | Nantong +86 400 800 7429 | New York +1 212 953 7429 | Paris +33 (0) 1 81 22 44 39 | San Francisco +1 415 955 1920 | Santiago +562 2431 5000 x 550 | São Paulo +55 11 3071 1702 | Shanghai +86 21 3338 4000 | Singapore +65 6733 1811 | Sydney +1 800 556 302

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Warranties

15 Year Commercial Limited Warranty

Commercial Limited Underbed Bond Shaw 4100, S150 Or Shaw 4151

Product Transparency

Shaw Contract is dedicated to providing clients with a building chemistry that's safe and dependable. Working together, we will help you meet your goals as they pertain to material health. Luxury Vinyl Tile products are UL Certified with an Industry-Wide EPD and are assessed for impacts on human health and the environment.

Attributes + Certifications

Environmental Product Declaration (EPD)	**3rd Party Certified in Accordance with ISO 14025, EN 15804, & ISO 21930:2017**
FloorScore®	**Certified**
CE Marking (EN 14041)	**3rd Party Certified**
Total Recycled Content	**0% (Pre-Consumer 0% | Post-Consumer 0%)**
Country of Origin	**Korea, Republic of**

LEED Contribution Credit

MR Credit: Building Product Disclosure and Optimization Environmental Product Declarations - Option 1: Environmental Product Declaration	**RFCi Industry Average EPD (50%)**
EQ Credit: Low Emitting Materials Option 1: Product Category Calculations	**FloorScore Certified**

Installation Guidelines

Maintenance Guidelines

Please visit www.shawcontract.com for the most current warranty information. Specifications are subject to nominal manufacturing variance. Material supply and/or manufacturing processes may necessitate changes without notice.

This product is an exclusive design and may not be duplicated in any manner. Use of this design in the creation of another product design is also strictly prohibited.

Visit shawcontract.com/testing for more information.

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Wilsonart®

LAMINATE



CHEMSURF® CHEMICAL-RESISTANT

Specifically designed for environments where chemicals and harsh cleaners are used, Wilsonart® Chemsurf® provides exceptional chemical resistance without sacrificing design or style.

FIRE-RATED

This long-lasting, beautiful laminate meets or exceeds the fire codes across the country and comes in a wide range of patterns and colors.

HIGH WEAR

Low-cost and built to take the extra wear that comes with high traffic commercial projects, Wilsonart® High Wear Laminate boasts more than five times the industry standard for abrasion resistance.

WILSONART X YOU

Customize any surface with Wilsonart X You. Bring us your designs, and we'll create a laminate that is uniquely yours. Visit wilsonart.com/wilsonartxyou.

VIRTUAL DESIGN LIBRARY

Reach beyond the wallboard with Wilsonart's expanded design library. From photorealistic imagery to abstract and artistic graphics, Wilsonart offers a wide range of patterns to fit your needs. Learn more at wilsonart.com/vdl.

RE-COVER™

RE-COVER™ combines vertical grade laminate and adhesive to create an alternative time and money-saving option to standard laminate installation and fabrication.

COMPACT

Available in thicknesses from 1/10" to 1", Wilsonart® Compact Laminate is a durable solution for high-impact surfaces such as lockers and cabinets, elevator cabs, and toilet partitions.

CHALKBOARD

Wilsonart® Chalkboard is the perfect solution for any space or application that demands a durable and affordable writing surface, and unlike other chalkboard surfaces, it requires no special maintenance.

MARKERBOARD

The ideal laminate writing surface for classrooms, business and administrative offices, message centers, athletic facilities, or as a menu board.

COORDINATED SURFACES

The best-matched HPL, TFL Panel, and Edgeband solution in surface design and texture. Visit wilsonart.com/cs.

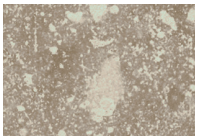
SOLICOR™ & SOLICOR™ COMPACT

Wilsonart® Solicor™ is a specialty laminate created with a solid color core – eliminating the troublesome "brown line" of traditional laminates. A new range of our popular neutral color-through designs are also available in thick Solicor™ Compact laminate.

TRACELESS™

Wilsonart® Traceless™ Laminate is a fingerprint-resistant, repairable surface that refuses smears, smudges, and streaks. Minor scratches can also be easily removed with a white sponge, or melamine foam, also known on the market as a "Magic Eraser." Accompanied by a velvety texture, your senses will swoon over this soft-to-the-touch, super matte finish.

ABSTRACTS



5011K-22 TFL
POTTER'S CLAY
PREMIUM



5005-38 TFL
SIERRA CASCADE



1872K-35
BIANCO ROMANO
HD PREMIUM



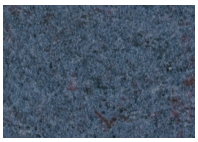
1854K-35
LUNA NIGHT
HD PREMIUM



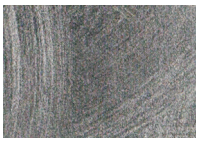
4656-60 TFL
BRONZE LEGACY



4663-60 TFL
TAWNY LEGACY



4651-60 TFL
NAVY LEGACY



4779-60 TFL
PEWTER BRUSH



4745-60 TFL
MAROOCHY BRUSH



4746-60 TFL
WOOLAMAI BRUSH



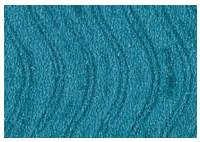
4913-60 TFL
EGGPLANT



4918-60 TFL
SPROUT



4915-60 TFL
TANGERINE



4919-60 TFL
BLUE AGAVE

INNOVATIVE SOLUTIONS

Built directly into the laminate, Antimicrobial Protection defends the surface against damaging microbes such as mold and mildew that cause unpleasant odors. In combination with proper cleaning and disinfection protocols, protected surfaces can stay looking and performing better, longer. Antimicrobial Protection comes standard on all HD® finishes, and is available as an option on all other laminate designs.



1570-60 TFL
WHITE

D354-60 TFL
DESIGNER WHITE

1573-60 TFL
FROSTY WHITE



D427-60 TFL
LINEN

D431-60 TFL
ALABASTER

D388-60 TFL
CRYSTAL

1500-60 TFL
GREY



D92-60 TFL
DOVE GREY



D504-60 TFL
FOSSIL SHALE



D90-60 TFL
NORTH SEA

D381-60 TFL
FASHION GREY

D315-60 TFL
PLATINUM



D503-60 TFL
CEMENT



D73-60 TFL
PEWTER



1595-60 TFL
BLACK

D439-60 TFL
WALLABY



D327-60 TFL
PEPPERDUST



D96-60 TFL
SHADOW

D91-60 TFL
SLATE GREY

D495-60 TFL
COFFEE BEAN

1572-60 TFL
ANTIQUE WHITE

1531-60 TFL
LIGHT BEIGE

D30-60 TFL
NATURAL ALMOND

1530-60 TFL
BEIGE

D50-60 TFL
KHAKI BROWN

D403-60 TFL
WHITE SAND

1503-60 TFL
PUTTY

D502K-18 TFL
OCEAN
PREMIUM

D498K-18 TFL
ISLAND
PREMIUM

D501-60 TFL
ORANGE GROVE

D307-60 TFL
HOLLYBERRY

D12K-18 TFL
REGIMENTAL RED
PREMIUM

D14-60 TFL
PORT

D321-60 TFL
BRITTANY BLUE

D417-60 TFL
LAPIS BLUE

D25-60 TFL
ATLANTIS

D379-60 TFL
INDIGO

D505-60 TFL
MIDNIGHT

Wilsonart's Textured Solids program features a healthy mix of color and pattern combinations perfect for any project. The expanded program allows you to pair any of the solid colors shown on the Wilsonart Commercial Wallboard with multiple finish options, see laminate surface textures page for more information.

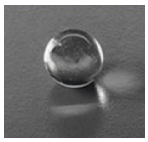


LAMINATE SURFACE TEXTURES



#01 HIGH GLOSS - PREMIUM

AEON™ A mirror sheen finish, which gives a smooth, brilliant appearance. Recommended for horizontal applications such as countertops and light-to medium commercial applications. Excellent for vertical applications.



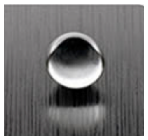
#07 TEXTURED GLOSS - PREMIUM

AEON™ A fine textured surface with a sheen level indicative of a waxed wood, polished stone, or other moderately reflective materials. Recommended for horizontal and vertical applications.



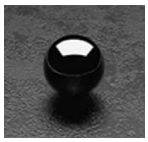
#15 FIELDSTONE - PREMIUM **NEW FINISH**

AEON™ This matte, stone finish has a mixture of low sheen, stone-like textural attributes layered across the surface. And layered on top are fine, irregular veins and features in a higher sheen which create natural contrast and dimensional organic detail.



#18 LINEARITY - PREMIUM

AEON™ A directional texture running the length of the sheet, having a narrow, random, matte-gloss linear quality. It is complementary to linear woodgrains, and linear patterns and provides dimension and visual movement to solid colors. Recommended for horizontal and vertical applications.



#22 ANTIQUE - PREMIUM

AEON™ A mixture of varying low gloss features combined with organic movement, indicative of the surface of an aged stone or an antique metal. Recommended for horizontal and vertical applications.



#35 MIRAGE - HD PREMIUM

AEON™ Subtle variations in matte and gloss finish connect to nature's own finishes: rough and weathered, smooth and polished. Recommended for horizontal and vertical applications.



#52 QUARRY - PREMIUM

AEON™ Premium finish emulating the "pitted" look of polished natural stone. Recommended for horizontal and vertical applications.



#57 ALIGNED OAK* - HD PREMIUM

AEON™ Authentic realism is brought to the surface using synchronized texture as each elegantly aged oak design exhibits the natural dimension and feel of real wood. Recommended for horizontal and vertical applications.



#78 FINEGRAIN - PREMIUM

AEON™ This premium finish features the polish and luxe of a real wood veneer, with a subtle, narrow grain structure that runs the length of the sheet. Recommended for horizontal and vertical applications.



#05 TIMBERGRAIN - PREMIUM

AEON™ A low-sheen wood finish with a dimensional, realistic ticking and natural variation across the surface texture, much like a natural veneer. Recommended for horizontal and vertical applications.



#12 SOFTGRAIN - PREMIUM

AEON™ A dense, woodgrain structure that is low gloss and soft to the touch. Subtle highlights of reflectivity randomly occur within the embossed grains, creating a sophisticated raw wood look. Recommended for horizontal and vertical applications.



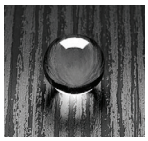
#16 CASUAL RUSTIC - PREMIUM

AEON™ A woodgrain texture with a blend of grain variations ranging from linear to subtle movement with random, irregular features. The overall low gloss surface is accented with higher sheen woodgrain ticking and random highlights. Recommended for horizontal and vertical applications.



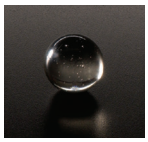
#19 LENO WEAVE* - PREMIUM

AEON™ Random intersecting horizontal and vertical lines create a geometric weave with a matte-gloss mix. Recommended for horizontal and vertical applications.



#28 GLOSS LINE - PREMIUM

AEON™ A linear woodgrain texture with varied widths of narrow grain structures in an alternating mix of matte and gloss surface areas. Recommended for horizontal and vertical applications.



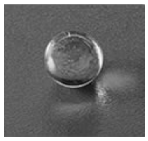
#38 FINE VELVET TEXTURE

A smooth-textured finish with moderate reflective value. Recommended for horizontal and vertical applications.



#55 GLAZE - HD PREMIUM

AEON™ A layering of matte features over a glaze of semi-gloss, creates this timeworn effect. Recommended for horizontal and vertical applications.



#60 MATTE

Textured finish with a moderate reflective quality. Recommended for horizontal and vertical applications.



#79 RIDGEWOOD - PREMIUM

AEON™ An overall matte finish with ridged dimensional features creating a linear woodgrain effect. Recommended for horizontal and vertical applications.

*Not available in Textured Solids

AEON™ Finish features AEON™ Enhanced Performance Technology, providing 3x industry standard wear resistance, improved scratch, scuff and mar performance, versus comparable competitive finishes.

ANTIMICROBIAL PROTECTION is built into HD Premium finishes, to protect the surface against damaging microbes. Antimicrobial agents protect the surface from the growth of mold and mildew that cause odors when used for countertops and work surfaces. Also available on other finishes during the ordering process.

Wilsonart
ENGINEERED SURFACES
2501 Wilsonart Dr
PO Box 6110
Temple, TX 76503-6110

1. Manufacturer

Wilsonart LLC
2501 Wilsonart Drive
P.O. Box 6110
Temple, Texas 76503-6110
Phone: (254) 207-7000; (800) 433-3222
Fax: (254) 207-2384
Web Site: www.wilsonart.com

2. Product Description

Recommended Uses

Wilsonart® Laminate, types 107, 335, and 350, is suitable for use on fine quality residential and commercial furniture, fixtures and casework, and for architectural application on columns, wainscoting, valances, cornices, interior doors and divider systems.

General Purpose (HGS) Type 107 is most frequently used for work surfaces on counters, islands, vanities, desks and tables. Typical vertical uses include surfacing for wall panels, teller cages and the front panels of workstations, such as those in hospitals, airports and restaurants. Type 107 is produced for both horizontal and vertical interior applications where the surface must be functional, durable and decorative.

Vertical Surface (VGP) Type 335 is the usual choice to surface cabinet walls, doors and drawer panels. It often appears on the vertical surfaces of desks, restaurants booths and maître d' stations, and as architectural cladding. Type 335 is intended for vertical applications where a functional, durable, decorative surface must absorb somewhat less impact than a comparable horizontal surface. VGP surfaces may be postformed to achieve radius edges.

Postforming (HGP) Type 350 adds the decorative capability of a soft edge to any typical laminate use. Common applications of postforming laminates are formed edges for counters, desktops, cabinet doors and drawer panels. Type 350 is intended for use on vertical and horizontal interior surfaces where it is necessary or desirable to roll the laminate on a simple radius over the edge of the substrate. This eliminates seams and leaves an attractive surface.

Wilsonart® HD® finishes feature Antimicrobial Protection that helps inhibit the growth of stain and odor causing bacteria, mold, and mildew on your countertop or surface. Wilsonart's Antimicrobial Protection won't wash away or wear off. Premium and Standard finishes are available with Antimicrobial Protection upon request during the ordering process.

Product Composition

Decorative surface papers impregnated with melamine resins are pressed over Kraft paper core sheets impregnated with phenolic resin. These sheets are then bonded at pressures greater than 1000 pounds per square inch at temperatures approaching 300°F (149°C). Finished sheets are trimmed, and the backs are sanded to facilitate bonding.

Basic Limitations

Wilsonart® Laminate is for interior use only and is not recommended for direct application to plaster, concrete walls, or gypsum wallboard. It is not structural material and must be bonded to a suitable substrate.

Do not subject Wilsonart® Laminate to extremes in humidity or temperatures higher than 275°F (135°C) for substantial periods of time, or intense, continuous, direct sunlight.

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Patterns & Colors
Available in a full range of solid colors, stones, marbles, woodgrains, leathers and patterns. See all designs at www.wilsonart.com. Please see actual sample before specifying.

Finishes
Confirm finish availability on individual designs by going to www.wilsonart.com

#01 High Gloss - Premium
A mirror sheen finish, which gives a smooth, brilliant appearance. #01-High Gloss finish also features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Can be used for horizontal applications such as countertops and light-to-medium commercial applications. Excellent for vertical applications. *Nominal Glossometer Reading = 110*

#05 Timbergrain - Premium
An overall finish with dimensional low-sheen, realistic ticking and natural variation across the sheet, looks very much like the surface of natural wood veneer. #05 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 4.5*

#07 Textured Gloss - Premium
A textured finish which reproduces the high sheen of waxed wood furniture. #07 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 42*

#12 SoftGrain - Premium
A dense wood grain structure that is low gloss and soft to the touch. Subtle highlights of reflectivity randomly occur within the embossed grains, creating a sophisticated raw wood look. #12 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 8*

#15 Fieldstone - Premium
A matte, stone finish with a mixture of low sheen, stone-like textural attributes layered across the surface; and layered on top are fine, irregular veins and features in a higher sheen, which create natural contrast and dimensional organic detail. It Includes AEON™ Enhanced Scratch and Scuff Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 3*

#16 Casual Rustic - Premium
A woodgrain texture with a blend of grain variations ranging from linear to subtle movement with random, irregular features. The overall low gloss surface is accented with higher sheen woodgrain ticking and random highlights. #16 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 6*

#18 Linearity - Premium
A directional texture running the length of the sheet, having a narrow, random and matte-gloss linear quality. It is complementary to linear woodgrains, and linear patterns (such as the “Satin” series), and provides dimension and visual movement to solid colors. #18 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 18*

#19 Leno Weave – Premium
Random intersecting horizontal and vertical lines create a geometric weave with a matte-gloss finish. Recommended for horizontal and vertical applications. #19 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading* = 15

#21 Soft Silk – Premium
A smooth, ultra-matte finish with a silky, soft touch. This minimalist finish gives the surface a genuine stone feel. Recommended for horizontal and vertical applications. #21 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 8*

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#22 Antique - Premium
A mixture of varying low gloss features combined with organic movement, indicative of the surface of an aged stone or an antique metal. Antique features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 9*

#28 Gloss Line - Premium
A linear woodgrain texture with varied widths of narrow grain structures in an alternating mix of matte and gloss surfaces areas. Gloss Line features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 5*

#35 Mirage-Wilsonart® HD®
Subtle variations in matte and gloss finish connect to nature's own finishes: rough and weathered, smooth and polished. #35 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Gloss Reading = 50*

#38 Fine Velvet Texture
A smooth textured finish with moderate reflective value. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 14*

#52 Quarry - Premium
Premium finish emulating the "pitted" look of polished natural stone. #52 features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 55*

#55 Glaze-Wilsonart® HD®
A layering of matte features over a semi-gloss glaze, creates this timeworn effect. #55 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical application. *Nominal Gloss Reading = 25*

#57 Aligned Oak – Wilsonart® HD®
Authentic realism is brought to the surfaces using synchronized texture as each elegantly aged oak design exhibits the natural dimension and feel or real world. #57 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 7*

#60 Matte - Standard
Textured finish with a moderate reflective quality. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 10*

#78 FineGrain - Premium
The FineGrain premium finish features the polish and luxe of a real wood veneer, with a subtle, narrow grain structure that runs the length of the sheet. #78 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 38*

#79 Ridgewood – Premium
An overall matte finish with ridged dimensional features creating a linear woodgrain effect. #79 finish features AEON™ Enhanced Scratch & Scuff-Resistant Performance Technology. Recommended for horizontal and vertical applications. *Nominal Glossometer Reading = 4.5*

NOTE: Nominal Glossometer readings are made at a 60° angle of incidence.

Finish Availability: Not all finishes are available in all patterns and colors. Some finish options have limited size availability. Please check with your Wilsonart representative or consult the pattern availability lookup on our website at www.wilsonart.com, to verify size availability by finish type.

Standard Sheet Widths

36"	48"	60"
914mm	1219mm	1524mm

Standard Sheet Lengths

96"	120"	144"
2438mm	3048mm	3658mm

NOTE: Not all sizes are available from stock; contact your Wilsonart representative for details on local availability. Minimums apply to non-standard designs and finishes in sizes other than 48"x96" and 60"x144". Please check with your Wilsonart representative.

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Thickness and Weight

Description	107	335	350
Thickness	0.045" ± 0.005" (1.14mm ± 0.13mm)	0.028" + 0.001 - 0.004" (0.71mm + 0.03 - 0.10mm)	0.036" ± 0.005" (0.91mm ± 0.13mm)
Weight per square foot	0.328#	0.186#	0.260#

3. Technical Data

Physical Properties of General Purpose Laminates

ISO 4586 Test	Typical Wilsonart Type 107	ISO 4586-3 HGS
Thickness	0.045" ± 0.005" (1.14mm ± 0.13mm)	N/A
Appearance	N/A	N/A
Light Resistance	Slight effect	Slight Effect
Cleanability (cycles)	10	10
Stain Resistance **Reagents 1-10** **Reagents 11-15**	 No effect Slight effect	 No effect Moderate effect
Boiling Water Resistance	Slight Effect (Gloss) No Effect (Other Finishes)	Slight Effect (Gloss) No Effect (Other Finishes)
High Temperature Resistance	Slight effect	Slight Effect (Gloss) No Effect (Other Finishes)
Impact Resistance	65" (1651mm)	31.5" (800mm)
Radiant Heat Resistance	210 seconds	≥ 200 sec.
Dimensional Stability **Machine Direction** **Cross Direction**	 0.3% 0.7%	 1.1% (max.) 1.4% (max.)
Surface Wear Resistance (cycles)	Meets or Exceeds 400	350 (min.)
Formability	Not applicable	Not applicable
Blistering	Not applicable	Not applicable

Physical Properties of Vertical Surface Laminates

ISO 4586 Test	Typical Wilsonart Type 335	ISO 4586-3 VGP
Thickness	0.028" + 0.001 - 0.004" (0.71mm + 0.03 - 0.10mm)	N/A
Appearance	N/A	N/A
Light Resistance	Slight effect	Slight effect
Cleanability (cycles)	10	20 (max.)
Stain Resistance **Reagents 1-10** **Reagents 11-15**	 No effect Slight effect	 No effect Moderate effect
Boiling Water Resistance	Slight Effect (Gloss) No Effect (Other Finishes)	Slight Effect (Gloss) No Effect (Other Finishes)

High Temperature Resistance	Slight Effect (Gloss) No Effect (Other Finishes)	Slight Effect (Gloss) No Effect (Other Finishes)
Impact Resistance	40" (1016mm)	23.5" (600mm)
Radiant Heat Resistance	200 seconds	≥ 200 sec.
Dimensional Stability **Machine Direction** **Cross Direction**	 0.5% 0.8%	 1.1% (max.) 1.4% (max.)
Surface Wear Resistance (cycles)	Meets or Exceeds 400	350 (min.)
Formability	5/16" radius (7.93mm)	7/16" radius (11mm) 9/16" radius(14.7mm)
Blistering	45 seconds	≥ 40 seconds

*Radius for face is actually the radius of the form around which the laminate is postformed. The radius for back is actually the radius to which the decorative face is postformed.

Physical Properties of Postforming Laminate

ISO 4586 Test	**Typical Wilsonart Type 350**	**ISO 4586-3 HGP**
Thickness	0.036" ± 0.005" (0.91mm ± 0.13mm)	N/A
Appearance	N/A	N/A
Light Resistance	Slight effect	Slight effect
Cleanability (cycles)	10	20
Stain Resistance **Reagents 1-10** **Reagents 11-15**	 No effect Slight effect	 No effect Moderate effect
Boiling Water Resistance	Slight Effect (Gloss) No Effect (Other Finishes)	Slight Effect (Gloss) No Effect (Other Finishes)
High Temperature Resistance	Slight Effect (Gloss) No Effect (Other Finishes)	Slight Effect (Gloss) No Effect (Other Finishes)
Impact Resistance	55" (1397mm)	31.5" (800mm)
Radiant Heat Resistance	205 seconds	≥ 200 sec.
Dimensional Stability **Machine Direction** **Cross Direction**	 0.5% 0.8%	 1.1% (max.) 1.4% (max.)
Surface Wear Resistance (cycles)	Meets or Exceeds 400	350 (min.)
Formability*	*5/16" face (7.93mm) *3/8" back (9.52mm)	*9/16" face (14.27mm) *3/4" back (19.05mm)
Blistering	65 seconds	≥ 40 seconds

*Radius for face is actually the radius of the form around which the laminate is postformed. The radius for back is actually the radius to which the decorative face is postformed.

Typical Fire Test Data

High-pressure laminates are subject to flame spread and smoke developed standards in structures where codes establish such conditions.

Test data to determine compliance with these codes are obtained by the Steiner Tunnel Test method of the American Society for Testing Materials (ASTM-E-84, Standard Test Method for Surface Burning Characteristics of Building Materials). Tests were conducted in accordance with test method and mounting procedure as described in paragraph X1.7.2 of the test method. This procedure is cataloged by Underwriters Laboratories, Inc. as UL 723. Here is typical data for Wilsonart® Laminates, averaged from two specific tests:

Typical Flame Spread and Smoke Developed Properties

Product Type	Test Condition	Flame Spread	Smoke Developed
General Purpose Type 107	Unbonded	50	45
Vertical Surface Type 335	Unbonded	45	40
Postforming Type 350	Unbonded	60	35
General Purpose Type 107	Bonded with contact adhesive to particleboard substrate; 3/8"	40	100
Vertical Surface Type 335	Bonded with contact adhesive to particleboard substrate; 3/8"	40	155
Postforming Type 350	Bonded with contact adhesive to particleboard substrate; 3/8"	50	140

When you wish to specify decorative laminate for a Class I or A fire rating, please refer to the Fire-Rated Laminate Tech Data.

Model Code Designations used to determine flame spread classification

Flame Spread Classification (Max. Rating)	International (IBC)	Life Safety (NFPA 101)
25	A	A
75	B	B
200	C	C

RE: Architectural Woodwork Quality Standard, 8th Edition, Version 1.0, - 2003

All Model Codes regulate the generation of smoke by interior finish material. In all cases they specify a maximum smoke development rating of 450.

Codes and Certifications

General Standards

Wilsonart® Laminates, types 107, 335 and 350, conform to the voluntary standards of the American National Standards Institute, for thickness, performance properties and appearance. Wilsonart® Laminates 107,335 and 350 meet or exceed the International Standards Organization specifications as found in ISO 4586, titled "High-Pressure Decorative Laminate (HPDL) – Sheets Based on Thermosetting Resins – Part I: specifications."

Specific Product Standards

U.S. Federal Specification L-P 508H, April 9, 1977, "Plastic Sheets, Laminated, Decorative and Non-decorative." Spells out criteria for decorative laminates for federal installations. Wilsonart 107, 335 and 350 laminates comply.

NSF International (NSF) #35 "Laminated Plastic for Surfacing for Food Service Equipment." All solid colors and printed patterns in Basic Types 107, 335 and 350, comply.

U.S. Federal Register, August 9, 1984, Housing and Urban Development Mobile Home Construction and Safety Standard, (24CFR) 3280.203. General Purpose Type 107 and Vertical Surface Type 335 comply.

U.S. Federal Test Method, Federal Aviation Regulation, DOT, Part 25.853, Airworthiness Standards: Transport Category Airplane (Interior Finish). Vertical Surface Type 335 and Postforming Type 350 comply with parts A and C.

U.S. Federal Motor Vehicle Safety Standard (FMVSS) 302, “Flammability of Interior Materials.” Basic Types 107, 335 and 350 comply.

U.S. Military Standard MIL-P-17171E (SHIPS)/Plastic Laminate. General Purpose Type 107 complies.

Branded Cleaner and Sanitizer Resistance for Wilsonart® Laminate per ISO 4586-2 Method 31 (B)

No effect was exhibited except as noted (* or **) on the following:

1. Beckart Environmental (Stabilized Chlorine Dioxide Mixed with Water at 3000ppm)
2. Benefect®
3. Claire® Germicidal Cleaner (Country Fresh Scent)
4. Claire® Disinfectant Spray Q (Country Fresh Scent)
5. Clean Republic – All Purpose Everyday Cleaner (Hypochlorous Acid – 0.003% Solution)
6. Clorox® Anywhere® Hard Surface Sanitizing Spray*
7. Clorox® Clean-Up (Cleaner & Bleach)
8. Clorox® Disinfecting Bleach w/6% Sodium Hypochlorite (24:1/Water:Bleach)
9. Clorox® Disinfecting Spray
10. Clorox® Disinfecting Wipes
11. Clorox Healthcare® Bleach Germicidal Cleaner *
12. Clorox Healthcare® Hydrogen Peroxide Cleaner Disinfectant
13. Clorox Healthcare® Fuzion® Cleaner Disinfectant*
14. Clorox Healthcare® VersaSure® Cleaner Disinfectant Wipes
15. Clorox® Total 360 Disinfectant Cleaner
16. Diversey™ Expose® II 256
17. Diversey™ Oxivir 1
18. Diversey™ Oxivir Tb Wipes
19. Diversey™ Stride® Floral Neutral Cleaner
20. Diversey™ Virex® II 256
21. Fabuloso® Complete (Multi-Purpose Cleaner)
22. Lysol® Professional Disinfectant Spray
23. Microban® 24 Hour (Multi-Purpose Cleaner)
24. PDI Sani-Prime® Germicidal Spray
25. PDI Super Sani-Cloth® Germicidal Disposable Wipes
26. Purell® Advanced Hand Sanitizer Gel
27. Purell® Food Service Surface Sanitizer
28. Purell® Professional Surface Disinfectant
29. Purell® Healthcare Surface Disinfectant
30. Simple Green® Concentrated (All-Purpose Cleaner)
31. Spic and Span® Everyday (Antibacterial Cleaner)

Test procedure: Listed materials were placed in contact with Wilsonart® Laminate surface under 1" (25.4mm) diameter watch cover glass for 16 hours duration prior to evaluation for effect. The branded cleaners and sanitizers listed above were cleaned with water only.

* Causes slight change of gloss or color.

** Causes slight damage, with degree of damage proportionate to length of exposure and concentration.

Branded Cleaner and Sanitizer Resistance for Wilsonart® Laminate per BIFMA HCF 8.1-2014 (Section 6 / Modified)

No effect was exhibited except as noted (* or **) on the following:

1. Beckart Environmental, Inc. (Stabilized Chlorine Dioxide Mixed with Water at 3000ppm)
2. Benefect®
3. Claire® Germicidal Cleaner (Country Fresh Scent)
4. Claire® Disinfectant Spray Q (Country Fresh Scent)
5. Clean Republic – All Purpose Everyday Cleaner (Hypochlorous Acid – 0.003% Solution)
6. Clorox® Anywhere® Hard Surface Sanitizing Spray
7. Clorox® Clean-Up (Cleaner & Bleach)
8. Clorox® Disinfecting Bleach w/6% Sodium Hypochlorite (24:1/Water:Bleach)

9. Clorox® Disinfecting Spray
10. Clorox® Disinfecting Wipes
11. Clorox Healthcare® Bleach Germicidal Cleaner
12. Clorox Healthcare® Hydrogen Peroxide Cleaner Disinfectant
13. Clorox Healthcare® Fuzion® Cleaner Disinfectant
14. Clorox Healthcare® VersaSure® Cleaner Disinfectant Wipes
15. Clorox® Total 360 Disinfectant Cleaner
16. Diversey™ Expose II 256
17. Diversey™ Oxivir 1
18. Diversey™ Stride® Floral Neutral Cleaner
19. Diversey™ Tb Wipes
20. Diversey™ Virex II 256
21. Fabuloso® Complete (Multi-Purpose Cleaner)
22. Lysol® Professional Disinfectant Spray
23. Microban® 24 Hour (Multi-Purpose Cleaner)
24. PDI Sani-Prime® Germicidal Spray
25. PDI Super Sani-Cloth® Germicidal Disposable Wipes
26. Purell® Advanced Hand Sanitizer Gel
27. Purell® Food Service Surface Sanitizer
28. Purell® Professional Surface Disinfectant
29. Purell® Healthcare Surface Disinfectant
30. Simple Green® Concentrated (All-Purpose Cleaner)
31. Spic and Span® Everyday (Antibacterial Cleaner)

Test procedure: Listed reagent materials were placed in contact with Wilsonart® Laminate surface with a one-inch square 100% cotton cloth completely saturated and covered with a 2" (50.8mm) diameter watch cover glass for 15 minute duration. The reagents listed above were removed with clean cloth and the area was then cleaned with clean cloth and distilled water only. The surface area was allowed to dry for 1-hour prior to evaluation for effect.

* Causes slight change of gloss or color.

** Causes slight damage, with degree of damage proportionate to length of exposure and concentration.

Resistance of Furniture to UV Lights for Wilsonart® Laminate per BIFMA HCF 8.1-201X Section 9 (Alternate Method per ASTM G155 using ISO 4586-2.33 conditions).
Wilsonart® Laminates 107,335,350 and 376 conforms to BIFMA – Healthcare Furniture Design Guidelines for Cleanability, Section 9 Resistance to Furniture to UV Lights. Wilsonart® Laminates 107, 335, 350 and 376 meet or exceed the acceptance level for surface evaluation.

4. Installation: Fabrication and Assembly Recommendations

Fabrication should follow approved methods. Assembled pieces should meet the specifications of KCMA (Kitchen Cabinetmakers Manufacturers Association), ANSI A-161.2-1998 (revised), and "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program" guidelines of the Architectural Woodwork Institute where applicable.

Wilsonart® Laminates must be bonded to a substrate of reliable quality, such as particleboard, medium density fiberboard or plywood with one A-face. High-Pressure Laminate, plaster, concrete and gypsum board should not be considered suitable substrates. Basic Types laminate may not be used as structural members.

Bond with adhesives and follow the techniques recommended by the adhesive manufacturer. Recommended adhesives are permanent types, such as urea and polyvinyl acetate (PVA), and contact types. Wilsonart adhesives are recommended for most bonding conditions.

To avoid stress cracking, do not use square-cut inside corners. All inside corners should have a minimum of 1/8" (3.175mm) radius and all edges should be routed smooth.

Drill oversized holes for screws or bolts. Screws or bolts should be slightly countersunk into the face side of a laminate-clad substrate.

Take care to ensure an appropriate acclimation between the laminate and the substrate prior to fabrication. The face and backing laminates and the substrate should be conditioned in the same environment for 48 hours before fabrication. Recommended conditioning temperature is about 75°F (24°C). Laminates should be conditioned at 45% to 55% relative humidity.

With postforming machinery, Wilsonart® Laminate types 335 and 350 will postform at a nominal sheet temperature range of 325°F to 338°F (163°C to 170°C) in 20 ± 5 seconds.

Carbide-tipped saw and router blades should be used for cutting. High tool speed and low feed speed are advisable. Cutting blades should be kept sharp. Use a hold-down to prevent any vibration.

5. Warranty

6. Maintenance

7. Technical Services

For samples, literature, questions or technical assistance, please contact our toll-free Hotline at (800) 433-3222, Monday through Friday, 8 am – 5 pm, CST.

Specification Form:
Surface shall be Wilsonart® Laminate, produced by Wilsonart LLC, Temple, Texas 76503-6110

Type: Specify 107, 335 or 350

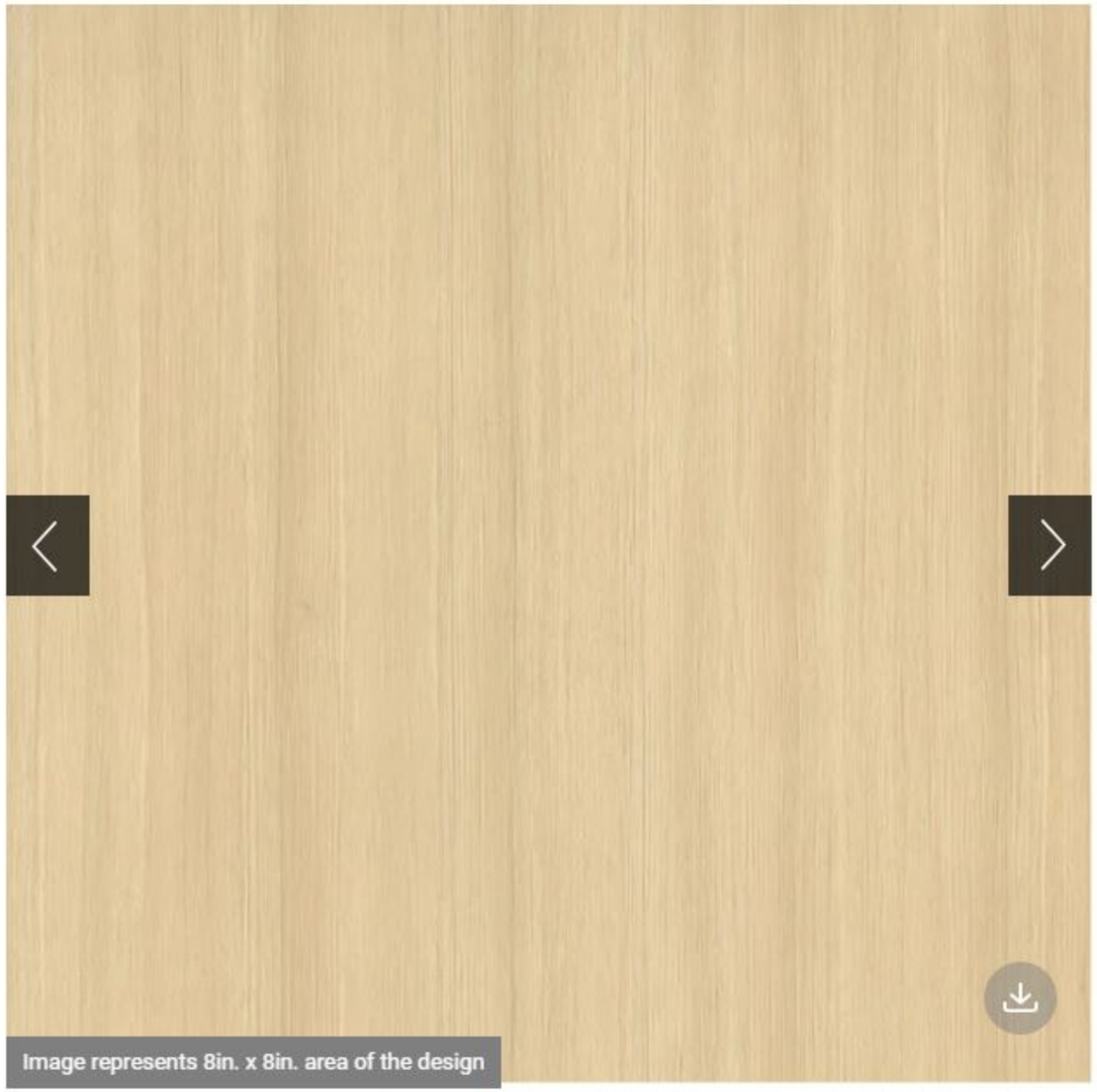
Surface
Color Number: _____ Color Name: _____

Finish
Number: _____ Name: _____

Edge Trim
Color Number: _____ Color Name: _____

Adhesive
Name: _____ Grade/Type: _____
Brand: Wilsonart® Adhesive

Wilsonart® Laminate Technical Data
Basic Types 107, 335, 350
Revised: October 1, 2021
© 1998-2021, Wilsonart LLC





7975

Raw Chestnut

In Stock Design

A straight grained Chestnut laminate design with some light sapping characteristics. The color is a yellow influenced blond woodgrain with highlights and lowlights for definition.

- Approximate Design Repeat Width*: 60"
- Approximate Design Repeat Length*: 36.5"

Finish: **12 SOFTGRAIN**
Finish option availability is dependent on the selected laminate product type

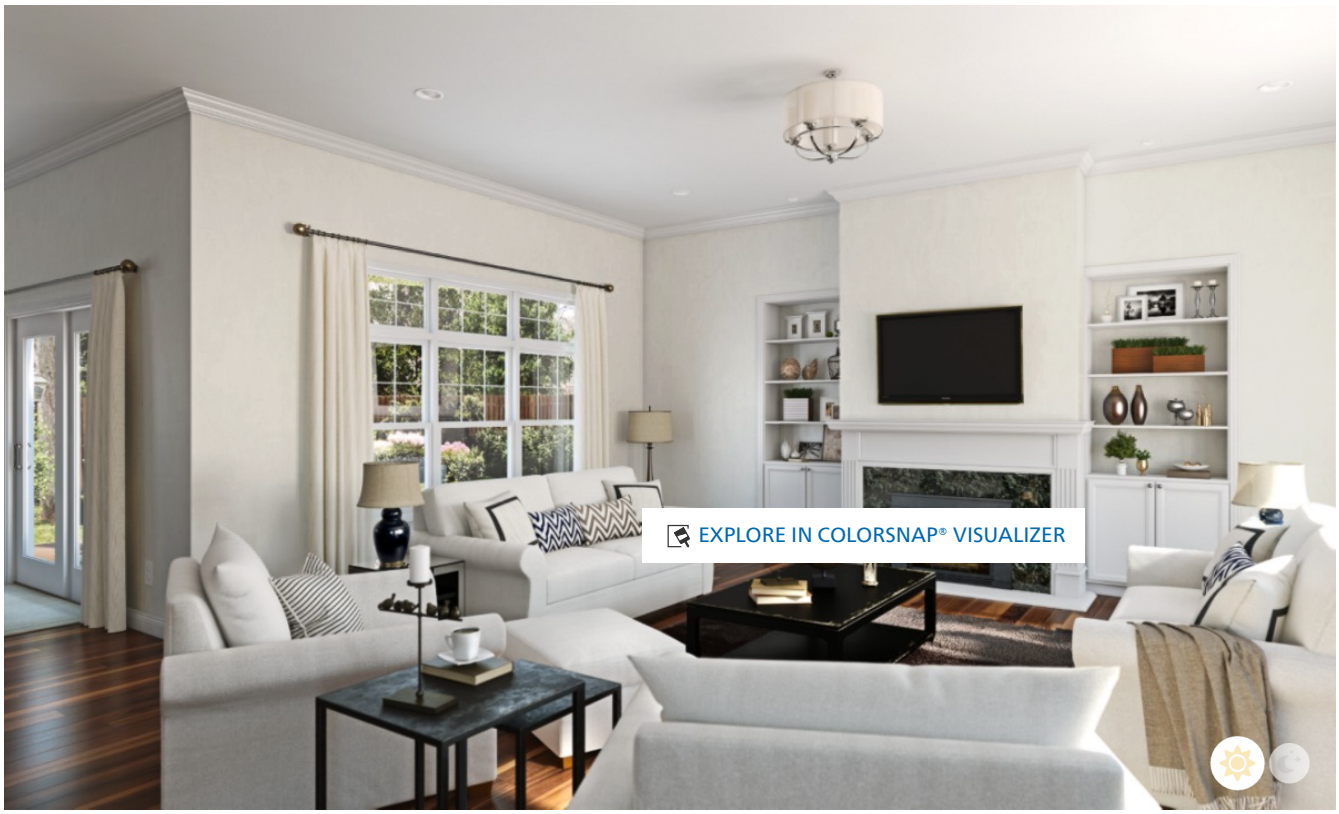
Order a sample

Free Standard Shipping in 7–10 business days. For expedited shipping, please call Customer Support at 1-800-433-3222.

Standard Laminate | 12 SoftGrain

2 in. x 3 in. | 1

ORDER A SAMPLE





SW 7005

Pure White

Interior / Exterior

Location Number: 255-C1

COORDINATING COLORS | SIMILAR COLORS | DETAILS

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OK

Ask SHERWIN-WILLIAMS™

Snow White Corian® Quartz 2cm X 63" X 120" Slab

SKU:

BE THE FIRST TO REVIEW THIS PRODUCT

AVAILABILITY: 2

FREQUENT BUYS **COMPARE**

Details

- Comprised of 93% quartz crystals, offering exceptional toughness and hardness
- Can be cut and fit to meet exact requirements with precision, uniformity, and consistency
- Dense and nonporous, Corian® Quartz requires no sealing
- Features excellent strength and durability, and is heat-, scratch-, and stain-resistant
- GREENGUARD® Indoor Air Quality certified for low VOC emissions
- Easy to maintain with a ten-year manufacturer's warranty against product defects
- To view all available colors, visit www.corianquartz.com.
- Bookmatched pairs are available and work together to extend detailed veining giving the impression of an opened book

More Information

UOM	EA
SIZE	2cm x 63" x 120"
SUPPLIER PART NUMBER	

Reviews

YOU'RE REVIEWING:

CORIAN®QUARTZ PERFORMANCE PROPERTIES

PHYSICAL PROPERTIES

Property	Test	Typical Result
Density	ASTM D792	2.4 g/cm³
Nominal Thickness		2 cm and 3 cm
Approximate weight per square foot (2 cm)		10 lbs.
Approximate weight per square foot (3 cm)		15 lbs.
Thermal Expansion	ASTM D696	1.45 x 10^{-5} m/m°C (8.06 x 10^{-6} in./in.°F)
Hardness	Mohs Hardness Scale	7

MECHANICAL PROPERTIES

Property	Test	Typical Result
Flexural Strength	ASTM D790	>5,300 psi
Flexural Modulus	ASTM D790	5.3 - 5.7 x 10^5 psi
Flexural Elongation	ASTM D790	>0.1%
Compression Strength (Dry)	ASTM C170	27,300 psi
Compression Strength (Wet)	ASTM C170	24,400 psi

FITNESS FOR USE

Property	Test	Typical Result
Gloss	ANSI Z124	45–50
Colorfastness	NEMA LD 3-3.3	No Effect
Ball Impact Resistance: Slabs No fracture - 1/2 lb. ball -28.3 cm	NEMA LD 3-3.8	164 in (No failure at height)
Wear and Cleanability	CSA B45.5-11/IAPMO Z124-2011	Passes
Stain Resistance	CSA B45.5-11/IAPMO Z124-2011	Passes
Fungal Resistance	ASTM G21	ASTM Rating of 0, No observed growth on product at 100x power
Bacterial Resistance	ASTM G22	No observed growth on product at 100x power
Microbial Resistance	UL Environment, UL 2824 (ASTM D6329)	Highly Resistant to Mold Growth
Boiling Water Resistance	NEMA LD 3-3.5	None to slight effect
High Temperature Resistance	NEMA LD 3-3.6	None to slight effect
Freeze-Thaw Cycling	ASTM C1026	Unaffected
Point Impact	ANSI Z124.6.4.2.1	Passes
Static Coefficient of Friction (as received)	ASTM C1028	0.89/0.61 (Dry/Wet)
Abrasion Resistance	ASTM C501	139
Water Absorption	ASTM C373	0.12%
Long and Short term	ASTM D570	<0.04%
Moisture Expansion	ASTM C370	<0.01% average

Typical results for 3 cm product unless gauge is specified. Properties may vary by aesthetic. These values are not intended for engineering calculations, if precise calculations are required contact Corian® Design for additional information. New York City Material Equipment Acceptance (MEA) number is 451-00-M.

CORIAN® QUARTZ PERFORMANCE PROPERTIES

FITNESS FOR USE

Property	Test	Typical Result
Flammability	NFPA 101®, Life Safety Code®	Class A
Flame Spread Index (FSI)	ASTM E84, NFPA 255 & UL 723)	FSI = 0 for 3 cm, FSI = 5 for 2 cm
Smoke Developed Index (SDI)	ASTM E84, NFPA 255 & UL 723)	SDI = 40 for 3 cm, SDI =75 for 2 cm
Flame Spread Value (FSV)	CAN/ULC-S102	FSV=0 for 3 cm, FSV=5 for 2 cm
Smoke Developed Value (SDV)	CAN/ULC-S102	SDV=10 for 3 cm, SDV=40 for 2 cm

PLEASE VISIT: WWW.CORIANQUARTZ.COM, OR CONTACT YOUR LOCAL CORIAN® DESIGN REPRESENTATIVE FOR MORE INFORMATION ABOUT CORIAN® QUARTZ.

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BASEWORKS® THERMOSET RUBBER WALL BASE

A natural fusion of aesthetics, performance and sustainability, BaseWorks® rubber wall base delivers pure, uniform color and an attractive matte finish. Its flexibility makes installation quick, easy and inexpensive. Plus, it won't fade, crack or separate from the wall.

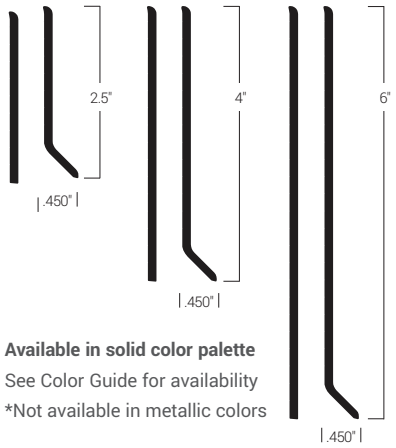


	TV Thermoplastic Vinyl*	TP Thermoplastic Rubber	TS Thermoset Rubber*
Phthalate-Free	✓	✓	✓
Bio-Based Content			✓
100% Recyclable	✓	✓	✓
10%+ Recycled Content	✓	✓	
Material Assessment *Cradle to Cradle Certified*^{CM} V.3 Silver			✓
ColorMatch®	✓	✓	✓
No Dye Lots	✓	✓	✓

*Not available in Metallics

Tarkett Wall Bases. Tie it together.

The connecting space between wall and floor presents an opportunity to add color, pattern, clean lines, lasting protection – or all of the above. With the most comprehensive collection of wall borders in the country, we make it easy to unify your space with the perfect finishing touch.



Available in solid color palette
See Color Guide for availability
*Not available in metallic colors

Thermoset rubber (type TS) 1/8" (3.175 mm)
Standard heights available in toe or toeless
4' sections and coils available
Manufactured inside and outside corners available

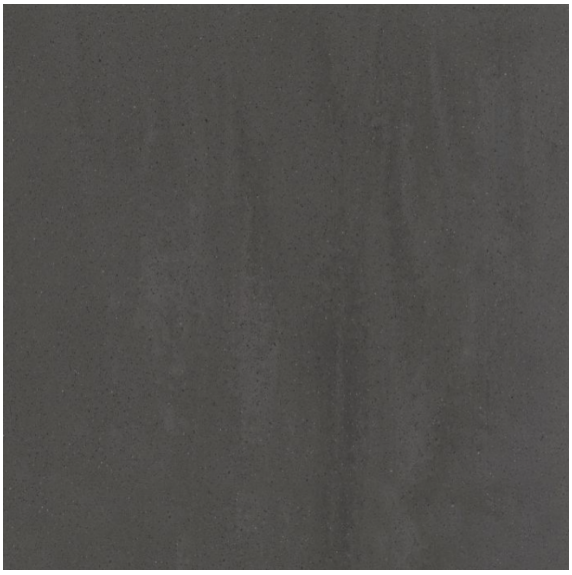
3 Standard Heights:
2.5" (64 mm),
4" (102 mm) or
6"(153 mm)
Recycled Content: Pre-consumer 14%

Carbon Concrete Corian® Solid Surface 1/2" X 30" X 144" Sheet

SKU: DU1230145CX

BE THE FIRST TO REVIEW THIS PRODUCT

AVAILABILITY: 22



FREQUENT BUYS **COMPARE**

Details

- Offers the ultimate in design flexibility for remodeling and new construction projects
- Can be cut or shaped to any size
- Join sheets together with Joint Adhesive for Corian® Solid Surface to create a sheet of any size
- Can be used in vertical applications, including wall cladding and wet walls
- Can be used in horizontal applications, including countertops, vanity tops, desktops, islands, tabletops, laboratory tops, workstations, and window sills
- To view all available colors, visit www.corian.com
- A $20 service fee will apply to requests for matching 1/2” x 30” x 72” sheets
- Corian® Solid Surface, along with its adhesives and sealants, are certified by GREENGUARD® Environmental Institute, providing a complete surfacing system with low-VOC

More Information

UOM	EA
SIZE	1/2" x 30" x 144"
SUPPLIER PART NUMBER	D15522748

Reviews

CORIAN® SOLID SURFACE PRODUCT OVERVIEW

PRODUCT NAME

Corian® Solid Surface

MANUFACTURER

Corian® Design
Experimental Station - Building 356
Wilmington, DE 19803
Toll free 1-800-4-CORIAN (1-800-426-7426)
www.corian.com

PRODUCT DESCRIPTION

Basic use

Corian® Solid Surface is an advanced composite product used as an architectural and design material in a variety of residential and commercial applications. Corian® Solid Surface offers design versatility, functionality and durability. Supplied in sheets and shapes, it can be fabricated with conventional woodworking tools into virtually any design. It is the original Solid Surface material made only by DuPont. It is widely accepted as a material for countertops, vanity tops, tub/shower walls, kitchen sinks, vanity basins and laboratory bench tops in numerous markets including lodging, healthcare, banks, boutiques, restaurants.

Composition

Corian® Solid Surface sheet is a solid, nonporous, homogeneous surfacing material, composed of ≈1/3 acrylic resin (also known as polymethyl methacrylate or PMMA), and ≈2/3 natural minerals. These minerals are composed of aluminum trihydrate (ATH) derived from bauxite, an ore from which aluminum is extracted. Corian® Solid Surface sinks and lavatories utilize a acrylic-modified polyester resin. For more information on the composition of the material, please consult the Corian® Solid Surface Safety Data Sheets (SDS) available via the dupont.com website or via your local supplier.

STANDARD PRODUCTS

Corian® Sheets

Available in various standard thicknesses, easily cut to size by professional fabricators.

All colors in the standard color palette are available in 12 mm (1/2") sheets that are 30" x 144" (760 mm x 3658 mm). Select colors may be available in 19 mm (3/4") sheet with the same length and width or 6 mm (1/4") sheets that are 30" x 98" (2490 mm x 760 mm). 36.6" , 48", 54" and 60" (930 , 1219, 1372, and 1524 mm) wide sheets are available in select 6 and 12 mm colors. Please consult the Corian® Design website, corian.com or *Corian® Solid Surface Sheet Products* (K-24016) and *Corian® Solid Surface Sheet Color Options* (K-26836) for more details.

Corian® Sinks and Lavatories

A wide range of Corian® sinks and lavatories is available in solid colors for custom integration with Corian® sheets to create a continuous surface. This includes vanity basins in solid colors for bathrooms, and single and double sinks for kitchens, bars and small wash-up areas, hospitals and laboratories. Seamed undermounting eliminates rims that trap dirt and water, minimizing cleaning and maintenance and providing improved hygiene.

The Colors of Corian® Solid Surface

A broad palette of colors allows for an almost unlimited working palette. You can choose a single color; a neutral basis for design; or experiment with eye-catching harmonies. Corian® Solid Surface can also be used as inlays, accents, or as a versatile complement to other materials like metal, wood, stone, etc.

For complete information on colors, refer to corian.com. Hues, patterns and textures are related by style and character. Dark, heavily pigmented Corian® colors will show scratches, dust and ordinary wear and tear more readily than lighter, textured colors. As a result, these colors are recommended for applications where surface contact is light or for use as inlays and accent colors. However, the DeepColor™ series incorporates an innovative, proprietary technology that delivers greater depth of color and increased durability compared to other dark Corian® colors.

Custom Sheets

DuPont can manufacture Corian® sheets in custom colors, patterns and dimensions, within manufacturing capability limits and based on a minimum order quantity.

See *Corian® Shapes* (K-29965) for an overview of dimensions available.

Limitations

Although Corian® Solid Surface can withstand high temperatures, it should be protected against direct heat with hot pads or heat shields.

Use of 6 mm (1/4") sheets should be restricted to vertical applications or certain furniture applications only. The choice between 12 mm and 19 mm (1/2" and 3/4") is generally based on performance and cost considerations.

Due to the complex blending of natural minerals and man-made acrylics, slight color variations may be found within a sheet or from sheet to sheet of same color. Therefore, checking for color matching is an essential element of sheet inspection before starting fabrication.

Corian® Solid Surface is nonporous so spills and stains remain on the surface. However, some chemicals can stain, discolor or damage the surface of Corian® Solid Surface. These chemicals include strong acids (like concentrated sulfuric acid), ketones (like acetone), chlorinated solvents (like chloroform) or strong solvent combinations (like paint remover). The extent of the damage will depend on the length of contact. Except for strong solvents such as paint remover, short periods of contact will not usually cause severe damage to Corian® Solid Surface. Acid drain cleaners should not be used as they can damage both Corian® Solid Surface and any plastic plumbing beneath. Corian® Solid Surface is not recommended for use in photographic processing laboratories. More information can be found in *Corian® Chemical Resistance* (K-27406). In some hospitals and laboratories where strong disinfectants come in contact with Corian® applications, the recommendation is to use solid colors and avoid extended contact.

PERFORMANCE PROPERTIES AND CHARACTERISTICS

Since its introduction in 1967, Corian® Solid Surface has proven itself to be remarkably durable, versatile and easy to live with in both the home and commercial environments.

Typical performance properties of Corian® products are shown in *Corian® Performance Properties* (K-26829). The performance of Corian® sheets may vary according to the thickness of the material, its aesthetics and surface finish.

Colors and patterns run through the entire thickness of the material and cannot wear away or delaminate. Joints can be glued inconspicuously, making virtually unlimited surfaces possible.

Corian® Solid Surfaces are restorable, meaning they can be fully restored with ordinary mild abrasive cleansers and a scouring pad. Cigarette burns, for example, can be easily removed in this way. Damage caused by abuse can usually be repaired on site without having to completely replace the material.

Corian® Solid Surface is nonporous with a smooth, seamless appearance. With proper cleaning, the material does not promote the growth of mold, mildew and bacteria.

Corian® Solid Surface is nontoxic and nonallergenic to humans. Corian® Solid Surface meets or exceeds emissions guidelines for volatile organic compounds (VOCs), hazardous air pollutants (HAPs) and has achieved GREENGUARD GOLD Certification.

When burned, it releases mainly carbon oxides and the smoke generated is optically light and does not contain toxic halogenated gases. Because of these properties, Corian® Solid Surface is used in public spaces and delicate applications such as airport check-in counters, wall and work surfaces in hospitals and hotels.

Corian® Solid Surface sheets can be thermoformed in wooden or metal molds at controlled temperatures in order to create various 2D and 3D design objects. Embossing effects can also be created.

The translucency of Corian® sheet is especially striking in the lighter colors as well as in thinner sheets. As a result, many designers are using it to create lamps or lighting effects in various applications.

Inlaying Corian® Solid Surface with different materials or with different colors of Corian® is possible and can enhance the inherent beauty of the material. Inlays and logos can also be created on Corian® Solid Surface using dye sublimation or direct printing techniques.

FABRICATION AND INSTALLATION

Corian® Design trains and certifies fabricators and installers who are provided detailed information regarding proper procedures; the following is a general overview, not a comprehensive guide to proper use.

Seams

To minimize material usage and facilitate installation, a corner block of Corian® Solid Surface should be made square (butt) rather than mitered. The edges to be joined should be straight, smooth and clean. Some seams need to be reinforced (see fabrication manual for details). Joints should only be made with Corian® Joint Adhesive. Cutouts should be made with a router equipped with a sharp carbide bit, with a minimum diameter of $^{3}/_{8}$" (10 mm). All corners of a cutout must be rounded to 5 mm radius and the edges smoothed, both on top and bottom, all around a cutout. "L" and "U" shaped corners need smooth, $^{3}/_{16}$" (5 mm) radius inside corners. For hob cutouts, corners should be reinforced with a Corian® corner block. See fabrication manual for more details.

Some Corian® Solid Surface colors that feature random veins and irregular patterns require special considerations regarding the seams. Please refer to the related technical bulletin for best practices in fabrication of these colors.

Sealants and Adhesives

Corian® Solid Surface is compatible with many commercially available caulks and sealants. 100% silicone products are recommended. Vertical panels of Corian® may be installed over suitable substrates, including water-resistant gypsum board, marine-grade plywood and ceramic tiles. In case a support is needed, apply perimeter frame or full support direct to Corian® using large beads of flexible adhesive leaving a space with a minimum thickness of $^{1}/_{16}$" (1.5 mm).

For making seams in countertops, repairs and custom edges, color-coordinated Corian® Joint Adhesive should be used. When used in accordance with manufacturer's instructions, it provides a smooth and inconspicuous joint. Corian® Joint Adhesive is available from Corian® Design or its distributors.

Clearances

The minimum expansion clearance in inches for Corian® Solid Surface is 2.2×10^{-5} in./in.°F x (length of the piece of Corian® Solid Surface in inches) x (biggest temperature range expected in °F) In mm the minimum expansion clearance is 3.9×10^{-5} mm/mm °C x (length of the piece of Corian® Solid Surface in mm) x (biggest temperature range expected in °C). Joints to be caulked should be a minimum of $^{1}/_{16}$" (1.5 mm) wide to allow satisfactory sealant penetration and expansion.

CORIAN® SOLID SURFACE
PRODUCT OVERVIEW

Precautions
Product dimensions are nominal. If tolerances are critical, review your needs with a Corian® specialist.

AVAILABILITY AND COST
Availability
Corian® Design sheet, shape, and accessory products are readily available through a worldwide network of Distributors and certified Fabricators/Installers.

Cost
Cost varies with color, thickness, and width as well as custom fabrication and installation details.

WARRANTY
DuPont offers limited commercial and residential warranties.

MAINTENANCE
Preventing Damage to Corian® Solid Surface
Avoid prolonged exposure to strong chemicals such as acids, bases, and organic solvents. Spills should be cleaned up promptly. Refer to *Corian® Chemical Resistance* (K-27406) for additional details regarding chemical exposures, and Corian® Solid Surface Care and Maintenance for Facility Managers (K-29810) for clean up, and general maintenance. In case of exposure outside the specifications listed in the Class 1 Reagents section, the 10-year limited product warranty will be void and handled as a case of abuse. While unaffected by minor impacts, Corian® Solid Surface can be damaged by heavy impacts, especially from pointed objects. It can also be damaged by excessive heat. A local Corian® Design specialist can help you include appropriate heat management into your designs.

Repairing Corian® Solid Surface
Corian® Solid Surface provides superior value by being inconspicuously repairable in most cases. Minor cuts, scratches, and stains can be removed by owners using fine sandpaper and Scotch-Brite™ pads. Deeper cuts or impact damage such as cracks may require an authorized Corian® fabricator/installer to make inconspicuous repairs.

ADDITIONAL INFORMATION
For additional information or support please contact your local distributor, visit corian.com or call 1-800-4-CORIAN (800-426-7426).

REFERENCED DOCUMENTS
Corian® Performance Properties (K-26829)

Corian® Chemical Resistance (K-27406)

Corian® Commercial (Product Only) 10-Year Limited Warranty For North America (K-30071)

Corian® 10-Year Limited Residential Warranty For North America (K-30070)

Corian® Solid Surface Sheet Products (K-24016)

Corian® Solid Surface Sheet Color Options (K-26836)

Corian® Solid Surface Care and Maintenance for Facility Managers (K-29810)

PLEASE VISIT OUR WEB SITE: WWW.CORIAN.COM OR CONTACT YOUR CORIAN® REPRESENTATIVE FOR MORE INFORMATION ABOUT CORIAN® SOLID SURFACE

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Specifications
Tek-Wall Hale
399975

maharam

Application
Upholstered Walls, Walls

Characteristics
Content: 52% Non-Phthalate Vinyl, 48% Polyester
Finish: Stain Repellent
Backing: Acrylic
Width: 54" (137cm)
Bolt Size: 37 yards (34 m)
Weight: 24 oz/ly (744 gr/lm)
Traffic: High-Suitable for all applications including heavy duty.
Country of Origin: Canada
Note on Mold: Intended for use in buildings designed and maintained to avoid moisture on or within walls. Application must conform to current Installation Guidelines included in each shipment or available at maharam.com.

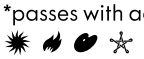
Price
$40.00 / C$53.00 (FOB destination) / C$49.50 (FOB origin)
A $3.00/C$4.00 per yard cutting charge applies to orders under 37 yards.

Maintenance
W/S/B-Clean with water-based cleanser; mild, water-free dry cleaning solvent, or diluted household bleach.



Testing
Acoustics: ASTM C423, 0.75 NRC

Flammability: AS/NZS 3837 Adhered
AS/NZS 3837 Unadhered
ASTM E 84 Adhered
ASTM E 84 Unadhered
BS 476 Adhered*
BS 476 Unadhered*
EN 13501 Adhered*
ISO 5660 Adhered
ISO 5660 Unadhered
*passes with additional treatment



03.22

Specifications
Tek-Wall Hale
399975

maharam

Environmental
Greenguard and Greenguard Gold Certified
Greenscreen Certified
Non-Phthalate Vinyl

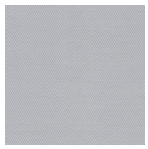
Warranty
3 years: Upholstered Walls.

© 2018 Maharam

Complete product information at maharam.com
800.645.3943

001 Hexose

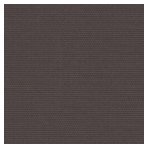
002 Elevate


003 Foundry

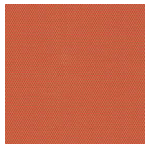

004 Musteline


005 Telescope


006 Sandlot


007 Samisen


008 Machine

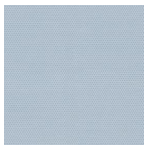

009 Hyper


010 Mantra

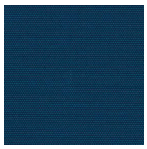

011 Choroid


012 Cove


013 Lake


014 Dewdrop


015 Dragonet


016 Float


017 Kimberlite

03.22

Specifications
Tek-Wall Tint
399682

maharam

Application
Upholstered Walls, Walls

Characteristics
Content: 100% Polyester
Finish: Stain Repellent
Backing: Acrylic
Width: 54" (137cm)
Bolt Size: 56 yards (51 m)
Weight: 14.2 oz/ly (440 gr/lm)
Traffic: High-Suitable for all applications including heavy duty.
Country of Origin: Canada
Note: This textile can also be produced unbacked.
Note on Mold: Intended for use in buildings designed and maintained to avoid moisture on or within walls. Application must conform to current Installation Guidelines included in each shipment or available at maharam.com.

Price
$31.00 / C$42.00 (FOB destination) / C$38.50 (FOB origin)
A $3.00/C$4.00 per yard cutting charge applies to orders under 56 yards.

Maintenance
W/S/B-Clean with water-based cleanser; mild, water-free dry cleaning solvent, or diluted household bleach.

Testing
Acoustics: ASTM C423, 0.85 NRC

Flammability: AS/NZS 3837 Adhered
ASTM E 84 Adhered
ASTM E 84 Unadhered
BS 476 Adhered*
EN 13501 Adhered*
EN 13501 Unadhered*
GB 8624 Adhered*
*passes with additional treatment

03.22

Specifications
Tek-Wall Tint
399682

maharam

Environmental
Greenguard and Greenguard Gold Certified
Greenscreen Certified
FR Free

Warranty
10 years: Walls
3 years: Upholstered Walls.

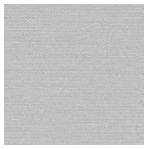
© 2015 Maharam

Complete product information at maharam.com
800.645.3943


001 Path


002 Shimmer

003 Prism


004 Tin


005 Foam


006 Passage


007 Bale


008 Tinge


011 Pasture


012 Air


013 Humid


014 Droplet


015 Submerge


016 Harpoon


017 Depth

03.22

ArmstrongFlooring™

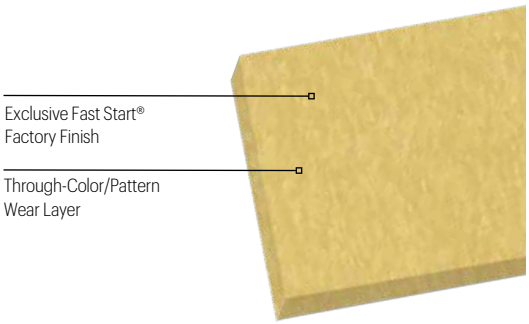
VCT-1

VINYL COMPOSITION TILE (VCT)

Premium Excelon® Crown Texture™ | ChromaSpin™ Raffia® Stream™ | Stonetex®

Product Information

Construction - Vinyl Composition Tile
International Specifications - ASTM F1066 - Class 2 Through Pattern, ISO 10595, Type II
Overall/Wear Layer Thickness - 1/8 in. (3.2 mm)
Factory Finish - Fast Start®
Installation - S-515 High Moisture, S-525, S-700, S-750 or Flip® Spray Adhesive
Maintenance Options - Polish



Packaging

Size	Tile per Carton/Coverage	Shipping Weight per Carton
Crown Texture | ChromaSpin | Stonetex 12 in. x 12 in. (305 mm x 305 mm)	45 - 45 sq. ft. (4.18 m²)	63 lbs./carton (28.6 kg)
Raffia Stream 12 in. x 24 in. (305 mm x 610 mm)	22 - 44 sq. ft. (4.08 m²)	61 lbs./carton (27.7 kg)

Testing

ASTM F1066			
Performance	**Test Method**	**Requirement**	**Performance vs. Requirement**
Thickness	ASTM F386	Nominal ± 0.005 in.	Meets
Size	ASTM F2055	± 0.016 in. per linear foot	Meets
Squareness	ASTM F2055	0.010 in. max	Meets
Indentation – One Minute	ASTM F1914	≥ 0.006 in. to ≤ 0.015 in.	Meets
Indentation @ 115°F	ASTM F1914	< 0.032 in.	Meets
Impact	ASTM F1265	No cracks beyond limit	Meets
Deflection	ASTM F1304	1.0 in. minimum	Meets
Dimensional Stability	ASTM F2199	≤ 0.024 in. per linear foot	Meets
Chemical Resistance	ASTM F925	No more than slight change in surface dulling, attack or staining	Meets
Resistance to Heat	ASTM F1514	ΔE not greater than 8.0	Meets
Additional Testing			
Static Load Resistance	ASTM F970*	≤ 0.005 in.	2000 psi
Fire Test Data – Flame Spread	ASTM E648	0.45 W/cm² or more Class 1	Meets
Fire Test Data – Smoke Evolution	ASTM E662	450 or less	Meets
Fire Test Data – Canada	CAN\ULC S102.2	Use dependent	Flame Spread - 0 Smoke Developed - 30

Maritime Usage

IMO Resolution A653 (16) Surface Flammability Test - IMO Resolution MSC 61(67) Annex 1 Part 5 and Annex 2 Smoke and Toxicity Test - IMO Resolution MSC 61(67) Annex 1 Part 2 and Annex 2	 Passes Passes
Safety Of Life at Sea (SOLAS) 1974 Regulation II-2/3.40.5 II-2/5.3.2.4 II-2/6.2	Compliant
United States Coast Guard	Approved

ArmstrongFlooring™

VINYL COMPOSITION TILE (VCT)

Premium Excelon® Crown Texture™ | ChromaSpin™ Raffia® Stream™ | Stonetex®

Sustainability

WELL v1 Feature		Premium Excelon	Contribution
Air	Feature 04 - VOC Reduction	✓	Tested and third party certified by FloorScore as complying with CDPH v1.2
	Feature 11 - Fundamental Material Safety	✓	Product is free of asbestos and added lead (Part 1)
	Feature 25 - Toxic Material Reduction	✓	Free of flame retardants (Part 2)
Mind	Feature 97 - Material Transparency	✓	Readily available Health Product Declaration (HPD) to 1000 ppm
	Feature 88 (Part 2) Biophilia I - Qualitative	✓	Products available that incorporate nature patterns
	Feature 99 - Beauty and Design II	✓	Patterns and colors to aid in wayfinding and spatial familiarity (Part 3)

WELL v2 Feature		Premium Excelon	Contribution
Air	Feature X12 - Short Term Emission Control	✓	Adhesives associated with product are tested and third party certified by FloorScore as complying with CDPH v1.2
	Feature X11 Long-Term Emission Control	✓	Flooring is tested and third party certified by FloorScore as complying with CDPH v1.2
	Feature X01 Fundamental Material Precautions	✓	Product is free of asbestos
Materials	Feature X10 Volatile Organic Compound	✓	Free of flame retardants (Part 2)
	Feature X14 Material Transparency	✓	Readily available Health Product Declaration (HPD) to 1000 ppm
Mind	Feature M02 Access to Nature	✓	Products available that incorporate nature patterns
Community	Feature C13 (Part 2) Accessibility and Universal Design	✓	Patterns and colors to aid in wayfinding and spatial familiarity

LEED™ v4.1	Premium Excelon
BPDO - EPD	Product Specific certified by ASTM International
BPDO - Material Ingredient	HPD
BPDO - Sourcing	Recycled Content – 40% Total - ChromaSpin™ (10% Post-Consumer and 30% Pre-Consumer) 30% Pre-Consumer - Raffia® Stream™, Stonetex® 25% Total - Crown Texture™ (5% Post-Consumer and 20% Pre-Consumer) Extended Producer Responsibility – On&On™ Recycling Program
Location of Manufacturer	USA
Low Emitting Flooring	Tested and third party certified by FloorScore as complying with CDPH v1.2
Low Emitting Adhesives	Tested and compliant to CDPH v1.2; Methylene Chloride and Perchloroethylene not intentionally added; FloorScore Certified
SCAQMD #1168 Compliant. Adhesives meet >50 g/L requirement	S-515 Exceeds – 0 g/L S-525 Exceeds – 16 g/L S-700 Exceeds – 0 g/L S-750 Exceeds – 5 g/L S-240 Exceeds – 10 g/L Flip® Exceeds – 0 g/L

Limited Warranty

5-year Commercial Warranty when installed in strict accordance with the detailed instructions.

Visit ArmstrongFlooring.com
for complete Product, Technical, Adhesives, Installation & Maintenance recommendations.

FP7440F10012-621
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FloorScore® is a registered trademark of the Resilient Floor Covering Institute. | LEED® is a registered trademark of the United States Green Building Council

*Testing at loads above 125 psi is outside the scope of the test method. Since testing is conducted on uninstalled flooring, results do not consider the performance of the adhesive, underlayment, or subfloor. These test results are not an indicator of the installed flooring system performance.



AMEREX

Fire Extinguisher: Monoammonium Phosphate, ABC, 5 lb Capacity, 2A:10B:C, Dry Chemical

Item #**3YWL7** Mfr. Model #**B424**
UNSPSC #**46191601** Catalog Page #**N/A**

Country of Origin USA. Country of Origin is subject to change.

For class A, B, and C fires (those likely to be caused by dry combustibles, flammable liquids, and live electrical equipment) this

Web Price
$113.52 / each

Qty 1 Add to Cart

Ship Pickup

Expected to arrive **Wed. Sep 07**.

Ship to **21201** | Change

Shipping Weight 10.5 lbs

Ship Availability Terms

Add to List

Technical Specs

Item	Fire Extinguisher
Fire Extinguisher Style	Fire Extinguisher
Extinguisher Type	Dry Chemical
Class	AB
UL Rating	2A:10B:C
Capacity	5 lb
Extinguish Agent Type	Monoammonium Phosphate
Height	15 1/2 in
Diameter	4 1/4 in

Cylinder Material	Steel
Operating Pressure	195 psi
Discharge Time	14 sec
Range Max.	18 ft
Bracket Included	Wall
Valve Material	metal
Rechargeable	Yes
Standards	ANSI/UL, USCG
Fire Extinguisher Class	ABC

Compliance and Restrictions

Hazardous Material - Other Regulated Material

Chat with an Agent



Enhance Collaboration

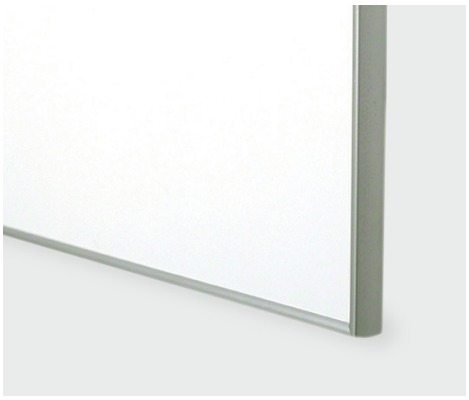
Collaborating means sharing information. It means throwing ideas into the mix, or onto the wall. When people work together, innovation happens.

Steelcase Premium Whiteboards use vertical space to bring people and ideas together, either spontaneously or in planned think sessions.

PRODUCT RANGE

Premium Whiteboards are made of CeramicSteel, delivering extremely high resistance to impact damage, abrasion, scratching, ghosting and color fading.

Parametric sizing is the ability to change dimensions of a product within pre-engineered limits, to 1/16 of an inch, allowing for virtually any size to be ordered. Parametric sizing reduces the need to place orders through specials, leading to a decrease in order processing time, immediate availability of pricing, and an overall cost savings.



Edge Series
With a sleek, slim design and exceptional value, Edge Series is a perfect fit in a range of spaces.



110 Series
Value and durability make the 110 Series perfect for hard-working environments, such as corporate training rooms and classrooms.



555 Series
The 555 Series delivers the same quality and durability of the 110 Series with a boxed end marker tray.

DIGITAL PRINTING

Enhance the design of any space by adding digital print graphics as a standard option on Premium Whiteboards. Choose from a variety of standard graphics or customize your own but know that these products are colorfast, scratch and abrasion resistant, bacteria resistant, fire resistant, 99% recyclable and offer a lifetime warranty on the surface.

STATEMENT OF LINE

Dimensions

Whiteboard
Width: 24.25" to 192.25"
Height: 18.25" to 48.25"

Tackboard
Width: 24.25" to 120.25"
Height: 18.25" to 48.25"

Surface Materials

CeramicSteel
7655 White High Gloss

Trim
8043 Clear Anodized Aluminum

Tackboards
Select Steelcase + Designtex Finishes

SUSTAINABILITY

PEOPLE. PLANET. PROFIT.

By rethinking our business systems and designing our products to avoid negative impacts on humans and the environment, we contribute to a sustainable future for the planet and its people. We commit to advance our practices through continuous learning and building partnerships with our customers, business partners and environmental thought leaders to optimize our performance and contribute to the science and practice of sustainability.

TO FIND OUT MORE VISIT
WWW.STEELCASE.COM/SUSTAINABILITY

SCS Indoor Advantage™ Gold certified for indoor air quality in North America

Level® 2 certified to ANSI/BIFMA e3

Steelcase®

Call 800.333.9939 or visit Steelcase.com

facebook.com/Steelcase **twitter.com/Steelcase** **youtube.com/SteelcaseTV**

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GE Profile™ 18" Built-In Dishwasher

Profile™ Series

Model# PDT145SSLSS



- ADA Compliant with Low-Profile Installation - Great for 34” counter top heights and raised subfloors
- 3-Level Wash - Expect exceptionally clean table-ready dishes with powerful wash arms
- Autosense Cycle - A beam of light measures soil levels and water temperature to adjust to the ideal cycle time
- Piranha™ hard food disposer with removable filter - To ensure consistently clean items, this stainless steel blade rotates at 3,600 RPM to pulverize food particles and helps to prevent large particles from clogging the wash arms
- Sanitize option (NSF Certified) - High-temperature rinse sanitizes and reduces by 99.999% the bacteria found on dishes
- dBA 47 -

FEATURES

Style	Built-In; Spacemaker
Tub and Door Liner	Stainless Steel
Control Type	4 Pushbuttons; Fully Integrated Electronic; Top Controls
Dishwasher Control Features	3 Digit Countdown Display with 1 "Clean" light / 1 "Sanitized" light Cycle Progress Indicators; Audible End-of-Cycle Signal; Cycle Countdown; Last Cycle Memory; Start/Reset Pad
Wash System	3-Level; Standard
Wash System Features	Automatic HotStart; Automatic Temperature Control; Dual Pump; Flood Control System; Piranha™ Hard Food Disposer
Sensor	Clean Sensor
Wash Arms	2 with Upper Nozzle
Water Filtration System	3-Stage Manual Clean Filtration
Dispenser	Rinse Aid with Indicator and Adjustment
Number of Cycles	3
Dishwasher Cycles	Auto Sense; Heavy Wash; Light Wash
Number of Options	5
Dishwasher Options	Child Lock; Delay Start 1-12 Hr.; Sani (NSF Certified); Start/Reset; TempBoost
Rack Features	1 Piece Mid Silverware Basket w/ 1 Cell Cover; 1 Plastic Utility Shelf - Upper; Ball-Tipped Tines; Fold-Down Tines - Lower; Stem Safe
Racking System	Gray
Number of Place Settings	Up to 8
Upper Rack	1 Rack handle; Adjustable; Nylon
Lower Rack	1 Rack handle; Nylon
Dishwasher Drying Features	Condensate Dry
Leveling System	Leveling Legs
Latch	Center Pull
WiFi Connect	Optional (Requires part no. PBX10W00Y0)
Connected Capabilities	Amazon Alexa; IFTTT; The Google Assistant
Exterior Style	18" Wide

Have more questions? Please contact 1-800-626-2005

GE Profile™ 18" Built-In Dishwasher

Profile™ Series

Model# PDT145SSLSS

APPROXIMATE DIMENSIONS (HxDxW)

- **32 1/2 in x 23 1/2 in x 17 3/4 in**

CAPACITY

WARRANTY

- **Parts Warranty - Limited 1-year entire appliance**
- **Labor Warranty - Limited 1-year entire appliance**
- **Warranty Notes - See written warranty for full details**

Have more questions? Please contact 1-800-626-2005

Whirlpool® All Refrigerator

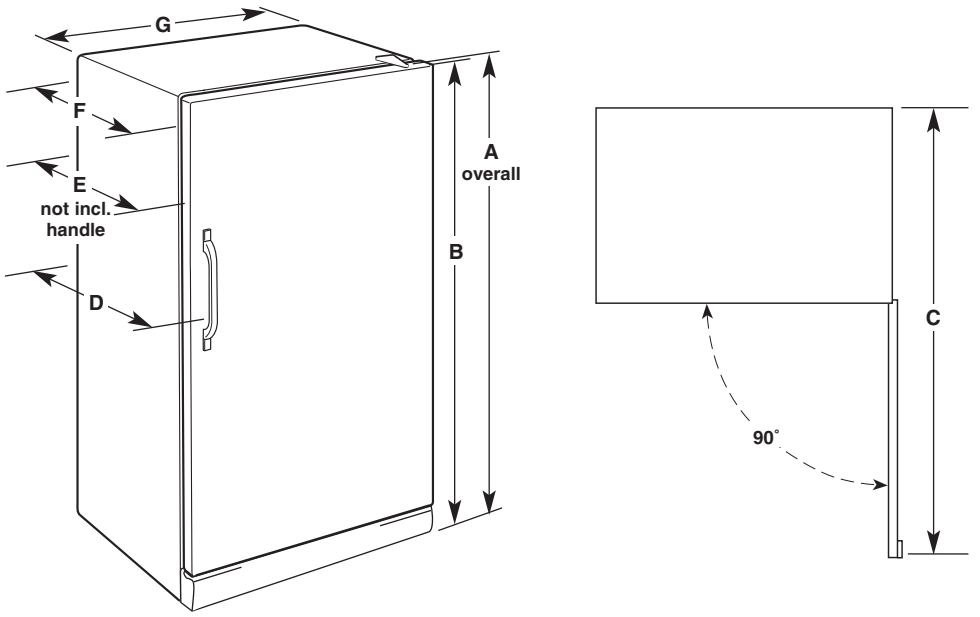
PRODUCT MODEL NUMBERS

WRF57R18D WSR57R18D

Recommended grounding method
A 115 Volt, 60 Hz., AC only, 15- or 20-amp fused, grounded electrical supply is required. It is recommended that a separate circuit serving only your freezer be provided. Use an outlet that cannot be turned off by a switch. Do not use an extension cord.

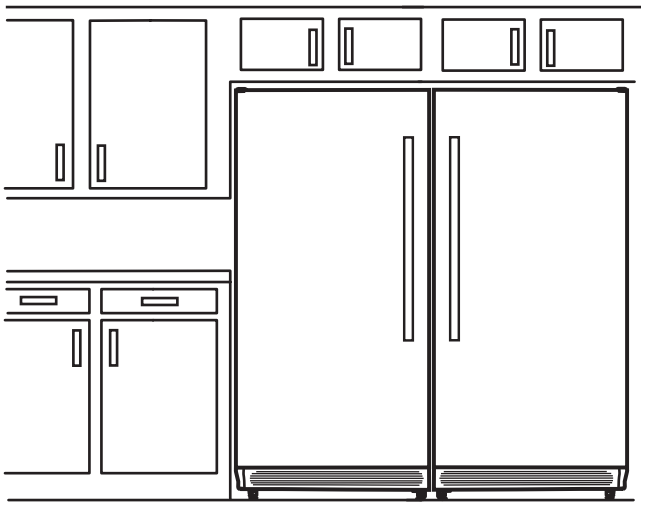
NOTE: Before performing any type of installation, cleaning, or removing a light bulb, turn the control (Thermostat, Refrigerator or Freezer Control depending on the model) to OFF and then disconnect the refrigerator from the electrical source. When you are finished, reconnect the refrigerator to the electrical source and reset the control (Thermostat, Refrigerator or Freezer Control depending on the model) to the desired setting. See “Using the Controls.”

PRODUCT DIMENSIONS



Model Number	Model Size	Door Swing	Height - Overall “A”	Height - Top of Cabinet “B”	Depth - Door Open 90° “C”	Depth - With Handles “D”	Depth - Without Handles “E”	Depth - Cabinet Only “F”	Width - Cabinet “G”
WRF57R18D	17.7 cu. ft.	Right	66¾" (169.5 cm)	66¼" (168.3 cm)	55⅞" (141.9 cm)	30" (76.2 cm)	29⅛" (74 cm)	24⅝" (62.5 cm)	30¼" (76.8 cm)
WSR57R18D	17.7 cu. ft.	Right	66¾" (169.5 cm)	66¼" (168.3 cm)	55¾" (141.6 cm)	31¼" (79.4 cm)	28⅞" (73.3 cm)	24⅝" (62.5 cm)	30¼" (76.8 cm)

LOCATION REQUIREMENTS



Ventilation and Clearance

- This freezer may be installed side by side with another refrigerator or freezer. Allow at least 1" (2.54 cm) between back of cabinet and the wall, and a ¼" (6.4 mm) clearance between the appliances.
- If you are installing your refrigerator next to a fixed wall, leave extra space on the hinge side so the door can open wider.
- Keep flammable materials and vapors, such as gasolline, away from freezer.
- Do not cover the freezer with items such as blankets, sheets, tablecloths, etc. This reduces air circulation.

Temperature

Your freezer operates most efficiently when located in an area where the temperature will not fall below 40°F (5°C). Place your freezer in a location where the temperature will not fall below this recommended temperature.

Because Whirlpool Corporation policy includes a continuous commitment to improve our products, we reserve the right to change materials and specifications without notice.

Dimensions are for planning purposes only. For complete details, see Installation Instructions packed with product. Specifications subject to change without notice.

Ref. W10668406A
11/5/14



ION®

Pure Refreshment

Imagine...

An innovative appliance that replaces all the bottled water you could ever drink.

Introducing the ION, the exciting new alternative to bottled water and soft drinks. Pure water refreshment at the touch of a button.

At the source of every delicious sip is ION's exclusive FiberTek™ filter, reducing a wide range of contaminants, transforming ordinary tap water into a reliable source of endless enjoyment, at your home or office.

Quench your thirst with a variety of healthy beverages—icy cold still water, piping hot water to warm you on cold days, or the bubbly effervescence of Sparkling water.

So leave the heavy bottles and sugary soft drinks behind, and start enjoying the unlimited possibilities of the simple, pure refreshment that is ION.



Good for You, Good for the Planet.

The Technology of Pure Refreshment





1. InstaChill™
Every glass is freshly filtered and instantly chilled in a Sealed Water Pathway where air never contacts the water supply.

2. Cooling Capacity
Dispense an 8-ounce glass of water every 30 seconds, for an hour...and ION makes sure it's 42°F or colder. No other cooler comes close.

3. Rapidhot™
Tea, cocoa, and even instant soups are delicious with piping hot, freshly filtered water. Up to two gallons per hour, convenient and ready whenever you are.

4. Sparkling Water
Make it Sparkle™! Indulge your healthy lifestyle with the healthy alternative to soft drinks. Refreshing with juice, or a twist of lemon or lime.

5. Quick Filter Changes
A simple twist removes the filter, without any tools...even without turning off the water supply.

6. Energy Savings Mode
Why run an appliance when no one is using it? Schedule ION's SleepMode™ to reduce energy consumption.

7. Touchscreen Technology
Easy to use Touchscreen allows users to customize settings, and provides maintenance reminders, such as filter change required.

8. SodaPro™ Regulator
Optional feature for Models 300 & 400 for easy to change CO2 supply.

9. SodaPro™ Tank
Optional CO2 accessory in Models 300 & 400. Carbonates up to 250 8-ounce glasses.

ION Microprocessor Control
Proprietary software and precision sensors deliver exact temperature control and ensure high performance under extreme conditions.

	TS 100	TS 200	TS 300*	TS 400*
Ambient	●	●	●	●
Cold	●	●	●	●
Sparkling			●	●
Hot		●		●
Color Options	Titanium with Charcoal Trim  			Charcoal with Titanium Trim
Cold Capacity**	8GPH			
Hot Capacity***	—	2GPH	—	2GPH
Dimensions (W x D x H)	13.6" x 20.6" x 16.2" / 346mm x 523mm x 412mm			
Shipping Weight	36 lbs.	38 lbs.	43 lbs.	45 lbs.
Electrical Supply	120 VAC and 230 VAC 50/60 hz			

* *Cold Water Capacity based on 70°F inlet water and 41°F outlet, 8-ounce draw/minute.

** *Hot Water Capacity based on 70°F inlet water and 185°F outlet , 6-ounce draw/minute.

Natural Choice Corporation
4601 Interstate Blvd. Loves Park, IL. 61111 USA
(888) 788–8708 • (815) 874–4444
www.naturalchoicewater.com

100% Designed, Engineered, and Assembled in the USA

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KEURIG
COMMERCIAL

K-3500™

Single-Serve Commercial Brewer

DIRECT-WATER-LINE PLUMBED
for unlimited back-to-back brewing

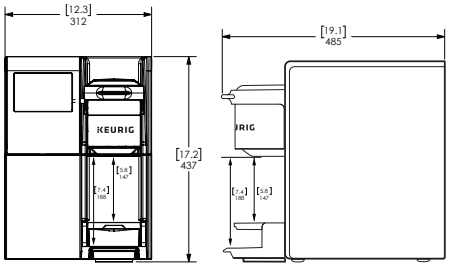
AUTOMATIC K-CUP® POD EJECTION
and built-in disposal bin for used K-Cup® pods

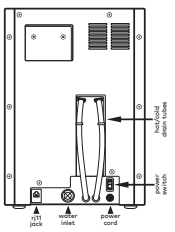
5 CUP SIZES
4, 6, 8, 10, and 12 oz.

STRONG BREW
brew a stronger, more intense cup

For Large-Sized Businesses







Features

Brew Sizes	4 oz. , 6 oz., 8 oz., 10 oz., 12 oz.
Water Source	Plumbed
Drainable Internal Water Tank	Yes- Manual
Interface	Hi-Res Color Touchscreen
- Multiple Languages	English/French/Spanish
- Programmable Sleep Mode	Yes
- Auto-Pod eject	Yes
- Strong Brew Option	Yes
- Dedicated Hot Water Dispense	Yes
- Customizable Brew Size Settings	Yes
- High-altitude Setting	Yes
- Screensaver Mode	Yes

Specifications

Brewer Weight (Empty)	32.3 lbs.
UL Listed	cULus Commercial
NSF	NSF-4 Certified
Electrical	120 VAC, 60 Hz, Single Phase, 15A
Power	1400W
Plug Type	2-Wire Plus Ground
GTIN	10611247379551
UPC Number	611247379554
Case Weight	37.8 lbs.
Case Dimensions	23.7" L x 15.75" W x 22.52" H

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www.Commercial.Keurig.com

KEURIG
COMMERCIAL

K-3500™

Single-Serve Commercial Brewer



1 Lift
handle and insert K-Cup® pod.

2 Place
mug and close the handle.

3 Select
one of FIVE brew sizes (4 oz., 6 oz., 8 oz., 10 oz., or 12 oz.).
For bolder coffee, press the STRONG button before Brew.

© 2019 Keurig Green Mountain
www.Commercial.Keurig.com

24" ADA-HEIGHT COMPLIANT SERIES

Freezer

c UL us

eco friendly
R600a Refrigerant

6 YEAR WARRANTY

JOB	
AREA	
ITEM NO.	
MODEL NO.	



Solid Door Model

MODELS	DESCRIPTION
HA24FB-4-1R/L	Indoor ADA-Height Compliant Freezer Solid Stainless Steel Door
HA24FB-4-2R/L	Indoor ADA-Height Compliant Freezer Solid Panel Ready Door

KEY PRODUCT FEATURES AND BENEFITS

- Superior construction provides ideal combination of energy efficient operation & powerful refrigeration performance ideal for food and beverages
- Industry's largest selection of ADA-height compliant models for accessible and aging in place designs
- 800 BTU/hr capacity delivers commercial grade cooling performance
- Commercial-grade all stainless steel interior provides superior durability and easy cleaning; black vinyl exterior for built in applications
- Full extension shelving provides faster and safer product access with no reaching in the back of the cabinet; shelves fully extend on vibration dampened stainless steel ball-bearing glides

Quick Features:

- Industry's best full 6 year warranty for owner ease of mind
- Available with stainless steel or panel ready door to match your design style
- Audible door alarm warns user if door is held open
- White LED task lighting
- R600a Natural Refrigerant offers maximum energy efficiency with zero ozone depletion potential

Form No. Z2675
Rev 11.07.22

24" ADA-HEIGHT COMPLIANT SERIES

Freezer

MODEL NUMBERS		HA24FB
MODEL DESCRIPTION		24"Indoor Freezer ADA Height Compliant
ATTRIBUTES		
Perlick Anti-Condensation System		NO
OVERALL DIMENSIONS	**Width - in. (mm)**	23-7/8" (606 mm.)
	Depth - in. (mm)	24" (610 mm.)
	Height - in. (mm)	32" (813 mm.)
OPENING DIMENSIONS	**Width - in. (mm)**	24" (610 mm.)
	Depth - in. (mm)	24-7/8" (632 mm.)
	Height - in. (mm)	32-1/4" (819 mm.)
INTERNAL VOLUME Net. Cu. Ft.		4.8 cu. ft total
SHIPPING WEIGHT Lbs. (kg.)		181 lbs (82.27 kg.)
ELECTRICAL SPECIFICATIONS	**Electrical Supply**	115 VAC/60 Hz/1 Ph
	Running Load Amps	2.2 amps
	Electrical Connection	Cord connected
	Cord Plug Type	NEMA 3 Prong 5-15P
	Cord Length	6'
	Defrost Initiation	Hot Gas
	Defrost Type	Off cycle
	Thermostat	Digital
	Lighting Type	LED
REFRIGERATION SPECIFICATIONS	**Refrigerant**	R600a (57g)
	Expansion Device	Capillary Tube
	Temperature Settings F°(C°)	-10° (-23.3°) - 10° (-12.2°) **Factory Set Point** 0° (-17.8°)
	Heat Rejection (at 75°F)	700 BTU/hr
	Pull Down Capacity	800 BTU/hr
	Front Vented	Yes
PLUMBING		None Required

Installation Notes: *To achieve 24" install depth, place electrical connection adjacent to the installation cavity.*

ACCESSORIES

MODEL NOS.	DESCRIPTION
(L)	Factory Installed Lock
67164	6" Toe Kick Kit (includes riser) for HA24 models
66736	Caster Kit for HP24/HC24/HA24 models

Perlick accessories are available for purchase through an authorized Perlick dealer. For a full list of accessories and to find a dealer near you, visit **perlick.com.**

WARNING: California Prop 65 Notice

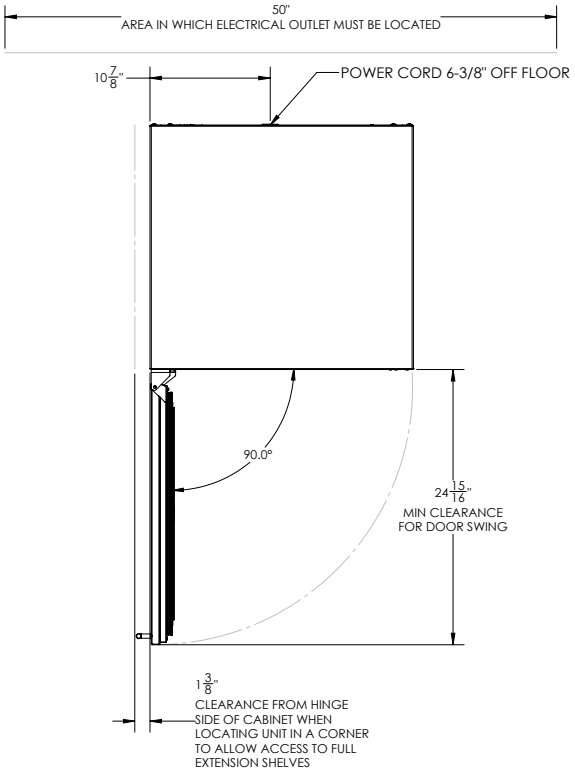
These products may expose you to chemicals including Chromium, which are known to the state of California to cause cancer and birth defects or other reproductive harm. For more information on whether a product in this list contains these chemicals, please refer to the specific product page at perlick.com. Or to find out more about **Prop 65**, go to **P65Warnings.ca.gov**.

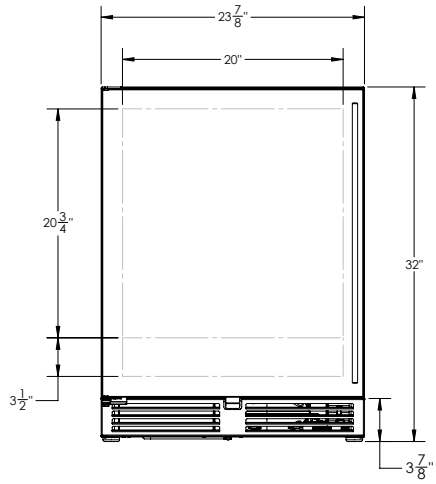
Form No. Z2675
Rev 11.07.22

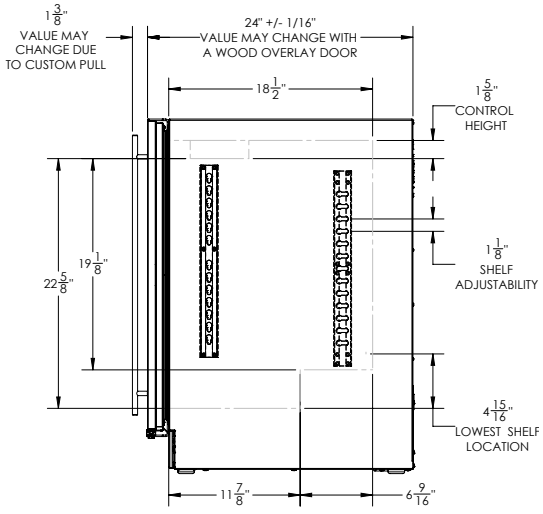
24" ADA-HEIGHT COMPLIANT SERIES

Freezer

CUSTOMER MODEL NUMBER	REGULATORY MODEL NUMBER	Hinge Side	Lock
HA24FB-4-1L	**HA24FB4A-00-SLS0R**	Left	No
HA24FB-4-1R	**HA24FB4A-00-SRS0R**	Right	No
HA24FB-4-2L	**HA24FB4A-00-PL00R**	Left	No
HA24FB-4-2R	**HA24FB4A-00-PR00R**	Right	No
HA24FB-4-1LL	**HA24FB4A-00-SLSLR**	Left	Yes
HA24FB-4-1RL	**HA24FB4A-00-SRSLR**	Right	Yes
HA24FB-4-2LL	**HA24FB4A-00-PL0LR**	Left	Yes
HA24FB-4-2RL	**HA24FB4A-00-PR0LR**	Right	Yes







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Luxury

Perlick®

ADA-Compliant Series

H50IMS-AD - 15″ Clear Ice Maker

- □ H50IMS-ADL
- □ H50IMS-ADR
- □ H50IMW-AD



Clear Ice Maker
H50IMS-ADL

General features

- Undercounter design is less than 32″ tall
- Durable stainless exterior
- Front-vented, forced-air refrigeration system
- Low E, UV coated glass provides industry leading insulation and protection.
- Also available- ADA-Compliant 15″ Clear Ice Maker
- Full one (1) year warranty

Clear Ice Maker Features

- Up to 55 lbs. of ice production per 24 hours
- UL approved for outdoor use
- Power switch accessible without panel removal
- Easily disassembled water circuit for easy cleaning
- Storage capacity of 22 lbs.
- Clear ice production
- Top hat ice shape
- R-134a refrigerant
- Optional drain pump, filter and toe kick available

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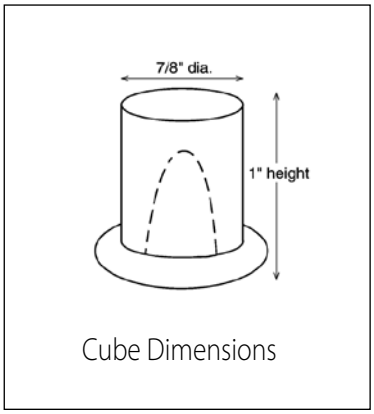
Form No.H50IMS-AD
Rev. 07.09.2012

Product Specifications

Overall Width	14-7/8" (37.78 cm.)
Overall Height	31-1/2" (80.01 cm.)
Overall Depth	22-9/16" (57.31 cm.)
Operating Limits	Ambient Temp Range: 45° - 100°F Water Temp Range: 45° - 95°F Water Pressure: 7 - 113psig Voltage Range: 104-127V
Electrical	115V, 60Hz., 1 Phase, Amperage 3.4
Plumbing	1/2" FTP Water Inlet, 1/2" FTP Drain
Production	Up to 55 lbs. of ice per 24 hours
Shipping Weight	115 lbs (52.16 kg)

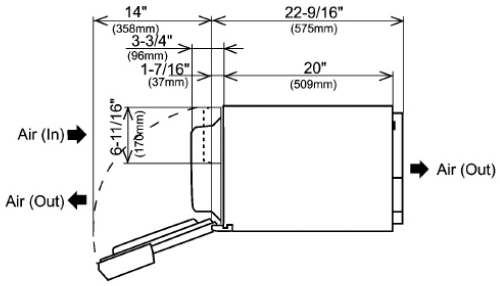
Available Models - ADA-Compliant 15" Clear Ice Maker

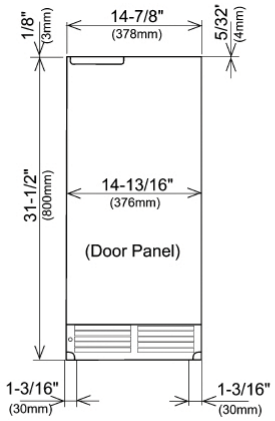
H50IMS-ADL	Solid stainless steel door, hinge left
H50IMS-ADR	Solid stainless steel door, hinge right
H50IMW-AD	Solid wood overlay door, hinge left or right



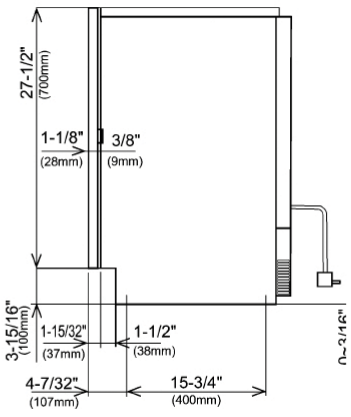
Cube Dimensions

Top Dimensions

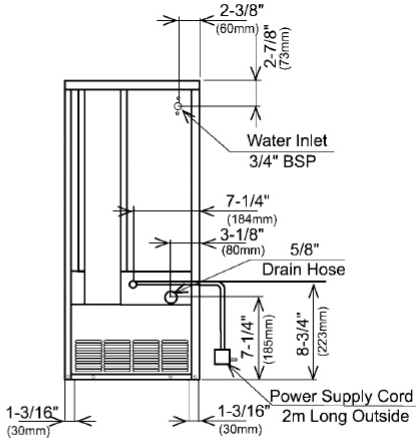




Front Dimensions



Side Dimensions



Back Dimensions

Form No.H50IMS-AD
Rev. 07.09.2012

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Luxury

Perlick®

ADA-Compliant Series

HA24RB - 24" Refrigerator

- ☐ HA24RB-1L*
- ☐ HA24RB-2L*
- ☐ HA24RB-3L*
- ☐ HA24RB-4L*
- ☐ HA24RB-5L
- ☐ HA24RB-6L

*Also available with left hinge



Solid Door Refrigerator
HA24RB-1R



Refrigerator Drawers
HA24RB-5



Glass Door Refrigerator
HA24RB-3R

General ADA-Compliant Series Features

- 32" height with leveling legs
- Zero-clearance hinging allows for abutment with surrounding cabinetry
- Best in Class 700 Btu commercial-grade compressor
- Front-vented, RAPIDcool forced-air refrigeration system
- Commercial-grade stainless steel interior
- ***Industry Exclusive*** convertible door design allows all doors the ability to be converted to wood overlay from stainless steel
- ***Industry Exclusive*** adjustable, full-extension pull-out shelves (drawer models excluded)
- Stainless-steel ball-bearing glides provide smooth movement of shelves
- Low E, UV-coated glass provides industry leading insulation and protection.
- Optional door locks and Industry-Exclusive drawer locks (factory installed)
- Also available - ADA-Compliant Freezer, Beverage Center, Wine Reserve and 15" Clear Ice Maker
- 4.8 cubic feet of capacity
- Industry Best Three-Year Warranty plus additional three years on sealed system

Refrigerator Features

- Available with solid stainless steel door, solid wood overlay door, stainless steel glass door, wood overlay glass door, stainless steel drawers or wood overlay drawers
- Refrigerator rated for both food and beverage storage
- Includes two (2) full-extension pull-out shelves (drawer models excluded)
- Refrigerator temperature 30°- 42°F (factory set at 38°F)

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Form No.HA24RB
Rev. 08.02.2012

Product Specifications

Overall Width	23-7/8″ (60.64 cm.)
Overall Height	32″ (81.28 cm.)
Overall Depth	24″ (60.96 cm.)
Opening Width	24″ (60.96 cm.)
Opening Height	32-1/8″ (81.60 cm.)
Opening Depth	24″ (60.96 cm.)
Refrigerated Volume	4.8 cu. ft.
Door Swing Clearance	25″ minimum
Electrical	115V, 60Hz., 1 Phase, 2.3 amps
Plumbing	None Required
Annual Energy Usage	320 kWh/yr
Shipping Weight	181 lbs (82.27 kg)

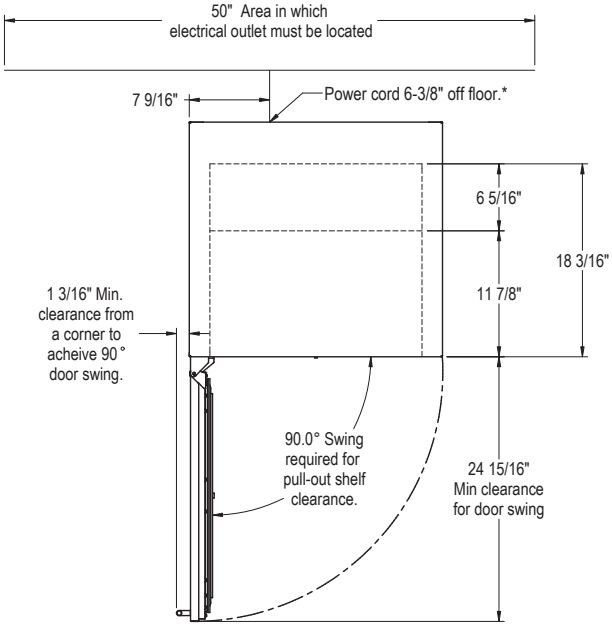
Available Models - ADA-Compliant Refrigerators

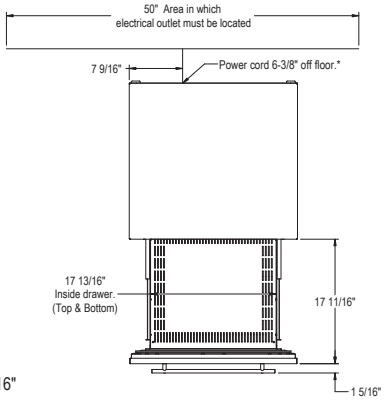
HA24RB-1L*	Solid stainless steel door, hinge left
HA24RB-2L*	Solid wood overlay door, hinge left
HA24RB-3L*	Stainless steel glass door, hinge left
HA24RB-4L*	Wood overlay glass door, hinge left
HA24RB-5	Stainless steel drawers
HA24RB-6	Wood overlay drawers

** Also available hinge right*

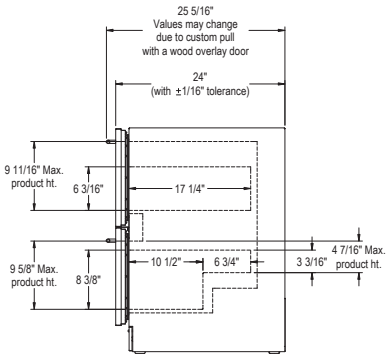
3 YEAR WARRANTY

Intertek

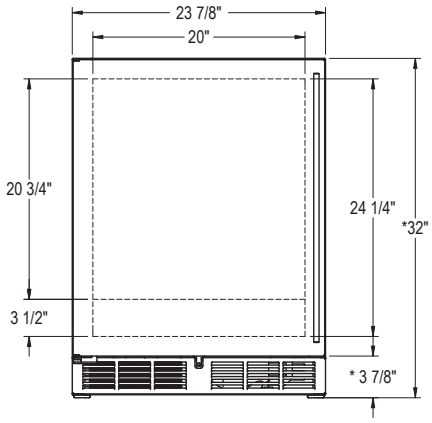


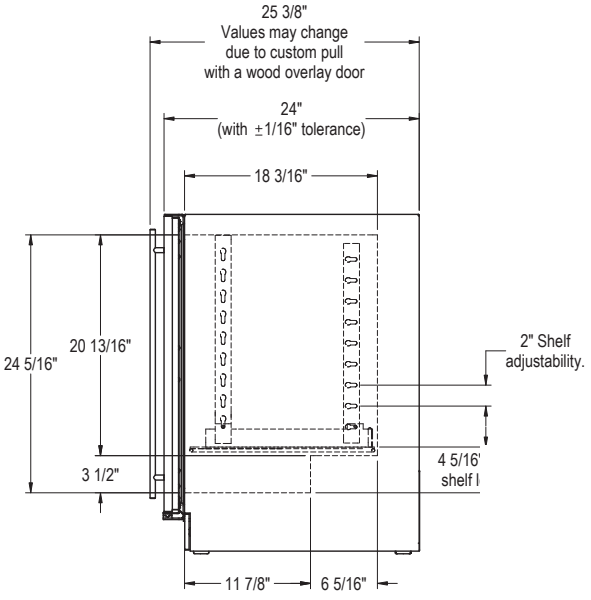


Drawer Models



* - Leg levelers can add 3/4" to these dimensions when fully extended.





Form No.HA24RB
Rev. 08.02.2012

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Bookmark Summary

A1
A2
POKE THRU
RECEPTACLES
D2
S1
X1
L3
L4

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	A1

FEATURES & SPECIFICATIONS

INTENDED USE — The RTL combines digital LED lighting and controls technologies with patented high-performance optical design to offer the most advanced luminaire for general-ambient lighting applications. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality lighting installation that is highly efficient and sustainable.

CONSTRUCTION — Rugged, one-piece cold-rolled steel reflector assembly with embossed facets. Coated polyester powder-paint after fabrication.

Rigid structure with ballast box and end plates. End plates include integral T-bar clips.

Impact-modified acrylic prismatic refractor

Luminaires may be mounted end-to-end and continuously wired.

OPTICS — Volumetric illumination is delivered by creating an optimal mix of light to walls, partitions, vertical and horizontal work surfaces — rendering the interior space, objects and occupants in a more balanced, complementary luminous environment.

Light distribution is carefully controlled at high angles, providing just enough luminous flux to create the volumetric effect.

Linear faceted reflector cavity softens and distributes light into the space while minimizing luminous contrast between the fixture and ceiling.

Sloped end plates provide a smooth, luminous transition between fixture and ceiling while enhancing the perception of fixture depth.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. RTL is rated to deliver L90 performance for 60,000 hours.

Optional integrated nLight®controls make each luminaire addressable - allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Simply connect all the nLight enabled control devices and the RTL luminaires using standard CAT-5 cabling. Unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission.

Lumen Management: Unique lumen management system (option N80) provides onboard intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste created by the traditional practice of over-lighting.

Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance.

eldoLED driver options deliver choice of dimming range, and choice of control, while assuring flicker-free, low current inrush, 89% efficiency and low EMI.

Driver disconnect provided where required to comply with US and Canadian codes.

INSTALLATION — Drivers and internal components accessed via plenum. Driver tray may be removed from fixture during service. Suitable for damp location.

Maintenance: LED boards include plug-in connectors for easy replacement or servicing.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. IC rated.

Tested to LM80 standards. IC rated. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

Protected by one or more of US Patent Nos. 7,229,192; D541,467; D541,468; D544,633; D544,634; D544,992. D544,933 and additional patents pending.

WARRANTY — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/support/customer-support/terms-and-conditions

Note: Actual performance may differ as a result of end-user environment and application.
All values are design or typical values, measured under laboratory conditions at 25 °C.
Specifications subject to change without notice.



RT LED

Volumetric Lighting

2RTL4

2' X 4'
LED

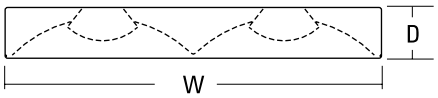
eldoLED

Dimensions

All dimensions are inches (centimeters) unless otherwise specified.

Specifications

Length: 48 (121.9)
Width: 24 (61.0)
Depth: 3-1/8 (7.9)



A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® control networks when ordered with drivers marked by a shaded background*
- This luminaire is part of an A+ Certified solution for nLight control networks, providing advanced control functionality at the luminaire level, when selection includes driver and control options marked by a shaded background*

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

2RTL Volumetric Recessed Lighting 2'x4'

A+ Capable options indicated by this color background.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2RTL4 48L EZ1 LP835 N80

2RTL4							
Series	**Air function**	**Lumens**	**Voltage**	**Driver**	**Color temperature**	**Controls**[5]	**Option**
2RTL4 Recessed 2X4 LED	(blank) No air CAS Center air slots (air removal)	30L 3000[1] 40L 4000[1] 48L 4800[1] 60L 6000[1] 72L 7200[1]	(blank) MVOLT (120 - 277V) 347 347[2]	EZ1 eldoLED dims to 1% (0-10 volt dimming) EZB eldoLED dims to 0.1% (0-10 volt dimming) GZ1 Dims to 1% (0-10V dimming)[3] GZ10 Dims to 10% (0-10V dimming)[3] EDB eldoLED DALI[3] SLD Step-level dimming[3] EXA1 Dims to 1%, XPoint wireless enabled[3,4] EXAB Dims to dark, XPoint wireless enabled[3,4]	LP830 3000 K, 82 CRI LP835 3500 K, 82 CRI LP840 4000 K, 82 CRI LP850 5000 K, 82 CRI	(blank) No controls N80 nLight with 80% lumen management N80EMG nLight with 80% lumen management for use with generator supply EM power[6] N100 nLight without lumen management N100EMG nLight without lumen management for use with generator supply EM power[6]	EL7L 700 nominal lumen battery pack (Noncompliant with CA T20) EL14L 1400 nominal lumen battery pack (Noncompliant with CA T20) E10WLCP EM Self-Diagnostic battery pack, 10W Constant Power, Certified in CA Title 20 MAEDBS CP Chicago plenum

Accessories: *Order as separate catalog number.*

DGA24	Drywall ceiling adaptor , unit installation
2X4SMKSHP PAF	Multi-Use Surface Mount Kit 2X4 Post-Paint

Notes

1 Approximate lumen output.
2 Not available with EL battery packs or SLD driver.
3 Not available with N80, N80EMG, N100, or N100EMG.
4 Gateway not included. Requires on-site commissioning. Visit www.lightingcontrols.com/XPointWireless for more information.
5 nLight access limitations with EZB.
6 nLight EMG option requires a connection to existing nLight network. Power is provided from a separate N80 or N100 enabled fixture.

Performance Data

Lumen Package	Lumens	Input Watts	LPW
30L LP830	3144	24.7	127
30L LP835	3238	24.7	131
30L LP840	3303	24.7	134
30L LP850	3369	24.7	136
40L LP830	4699	39.4	119
40L LP835	4840	39.4	123
40L LP840	4905	39.4	124
40L LP850	5003	39.4	127
48L LP830	5639	47.3	119
48L LP835	5808	47.3	123
48L LP840	5886	47.3	124
48L LP850	6004	47.3	127
60L LP830	6079	49.1	124
60L LP835	6261	49.1	128
60L LP840	6387	49.1	130
60L LP850	6514	49.1	133
72L LP830	7495	59.4	126
72L LP835	7720	59.4	130
72L LP840	7874	59.4	133
72L LP850	8032	59.4	135

How to Estimate Delivered Lumens in Emergency Mode

Use the formula below to estimate the delivered lumens in emergency mode.

Delivered Lumens = 1.25 x P x LPW

P = Ouput power of emergency driver. P = 10W for E10WLCP option.

LPW = Lumen per watt rating of the luminaire. This information is available on the ABL luminaire spec sheet.

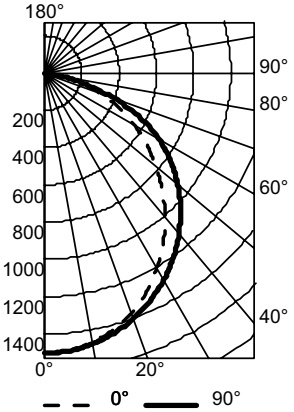
LPW = Lumen per watt rating of the luminaire. LPW information available in Performance Data section.

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2RTL Volumetric Recessed Lighting 2'x4'

PHOTOMETRICS

2RTL4 40L LP835, 4,118 delivered lumens, test no. LTL25588P4, tested in accordance to IESNA LM-79 .



CP Summary

	0°	90
0°	1499	1499
5°	1492	1497
15°	1425	1443
25°	1294	1345
35°	1111	1207
45°	897	1033
55°	669	826
65°	442	570
75°	226	230
85°	44	16
90	0	0

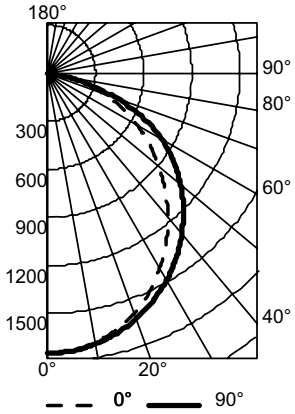
Coefficients of Utilization

RCR	pf	20%								
	pc	80%			70%			50%		
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
0		119	119	119	116	116	116	111	111	111
1		109	104	100	102	98	95	98	95	92
2		99	91	84	89	83	78	86	80	76
3		90	80	72	78	71	65	75	69	64
4		83	71	62	70	61	55	67	60	54
5		76	63	54	62	54	48	60	53	47
6		70	57	48	56	48	42	54	47	41
7		65	52	43	51	43	37	49	42	36
8		61	47	39	46	38	33	45	38	33
9		57	43	35	43	35	29	42	34	29
10		53	40	32	39	32	27	38	31	27

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1152	28.0	28.0
0° - 40°	1875	45.5	45.5
0° - 60°	3294	80.0	80.0
0° - 90°	4118	100.0	100.0
90° - 120°	0	0.0	0.0
90° - 130°	0	0.0	0.0
90° - 150°	0	0.0	0.0
90° - 180°	0	0.0	0.0
0° - 180°	4118	100.0	100.0

2RTL4 48L LP835, 4,786 delivered lumens, test no. LTL25588P8, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	1743	1743
5°	1735	1739
15°	1657	1677
25°	1504	1563
35°	1291	1402
45°	1043	1200
55°	778	960
65°	514	663
75°	262	267
85°	51	19
90	0	0

Coefficients of Utilization

RCR	pf	20%								
	pc	80%			70%			50%		
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
0		119	119	119	116	116	116	111	111	111
1		109	104	100	102	98	95	98	95	92
2		99	91	84	89	83	78	86	80	76
3		90	80	72	78	71	65	75	69	64
4		83	71	62	70	61	55	67	60	54
5		76	63	54	62	54	48	60	53	47
6		70	57	48	56	48	42	54	47	41
7		65	52	43	51	43	37	49	42	36
8		61	47	39	46	38	33	45	38	33
9		57	43	35	43	35	29	42	34	29
10		53	40	32	39	32	27	38	31	27

Zonal Lumen Summary

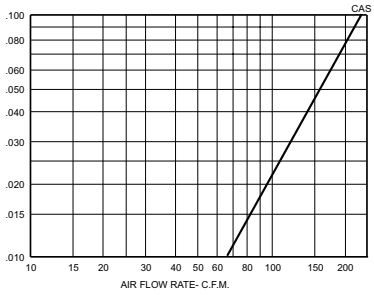
Zone	Lumens	% Lamp	% Fixture
0° - 30°	1339	28.0	28.0
0° - 40°	2179	45.5	45.5
0° - 60°	3828	80.0	80.0
0° - 90°	4786	100.0	100.0
90° - 120°	0	0.0	0.0
90° - 130°	0	0.0	0.0
90° - 150°	0	0.0	0.0
90° - 180°	0	0.0	0.0
0° - 180°	4786	100.0	100.0

nLight® Control Accessories:
Order as separate catalog number. Visit www.sensorswitch.com/nLight for complete listing of nLight controls.

WallPod stations	**Model number**	**Occupancy sensors**	**Model number**
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 / nCM PDT 9
On/Off & Raise/Lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM 10 / nCM PDT 10
Graphic Touchscreen	nPOD GFX	Wall switch with raise/lower	nWSXPDTLVDX
Photocell controls	**Model number**	**Cat-5 cable bundles (plenum rated)**	**Model number**
On/Off & Dimming	nCM ADCX	10', 15 pieces per bundle	CAT5 10FT
		30', 15 pieces per bundle	CAT5 30FT

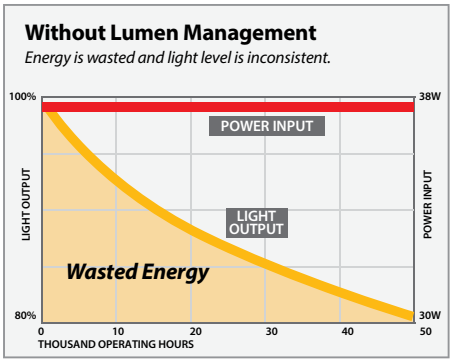
RTL with Air Handling

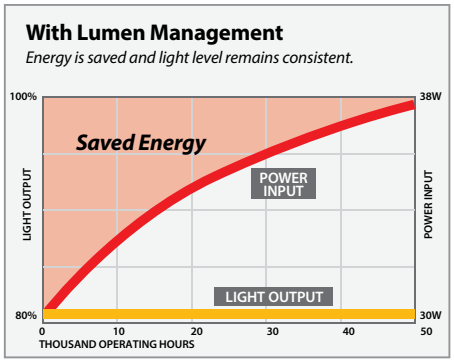




Constant Lumen Management

Enabled by the embedded nLight control, the RTL actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.





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LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	A2

FEATURES & SPECIFICATIONS

INTENDED USE — The RTL combines digital LED lighting and controls technologies with patented high-performance optical design to offer the most advanced luminaire for general-ambient lighting applications. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality lighting installation that is highly efficient and sustainable.

CONSTRUCTION — Rugged, one-piece cold-rolled steel reflector assembly with embossed facets. Coated polyester powder-paint after fabrication.

Rigid structure with ballast box and end plates. End plates include integral T-bar clips.

Impact-modified acrylic prismatic refractor.

Luminaires may be mounted end-to-end and continuously wired.

OPTICS — Volumetric illumination is delivered by creating an optimal mix of light to walls, partitions, vertical and horizontal work surfaces — rendering the interior space, objects and occupants in a more balanced, complementary luminous environment.

Light distribution is carefully controlled at high angles, providing just enough luminous flux to create the volumetric effect.

Linear faceted reflector cavity softens and distributes light into the space while minimizing luminous contrast between the fixture and ceiling.

Sloped end plates provide a smooth, luminous transition between fixture and ceiling while enhancing the perception of fixture depth.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. RTL is rated to deliver L90 performance for 60,000 hours.

Optional integrated nLight®controls make each luminaire addressable - allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Simply connect all the nLight enabled control devices and the RTL luminaires using standard CAT-5 cabling. Unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission.

Lumen Management: Unique lumen management system (option N80) provides onboard intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste created by the traditional practice of over-lighting.

Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance.

eldoLED driver options deliver choice of dimming range, and choice of control, while assuring flicker-free, low current inrush, 89% efficiency and low EMI.

Driver disconnect provided where required to comply with US and Canadian codes.

INSTALLATION — Drivers and internal components accessed via plenum. Driver tray may be removed from fixture during service. Suitable for damp location.

Maintenance: LED boards include plug-in connectors for easy replacement or servicing.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. IC rated.

Tested to LM80 standards. IC rated. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

Protected by one or more of US Patent Nos. 7,229,192; D541,467; D541,468; D544,633; D544,634; D544,992. D544,933 and additional patents pending.

WARRANTY — 5-year limited warranty. Complete warranty terms located at:
www.acuitybrands.com/support/customer-support/terms-and-conditions

Note: Actual performance may differ as a result of end-user environment and application.
All values are design or typical values, measured under laboratory conditions at 25 °C.
Specifications subject to change without notice.



RT LED

Volumetric Lighting

2RTL2

2' X 2'

LED

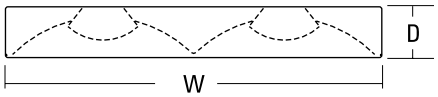
A+ CAPABLE eldoLED DLC QPL LISTED nLIGHT

Dimensions

All dimensions are inches (centimeters) unless otherwise specified.

Specifications

Length: 24 (61.0)
Width: 24 (61.0)
Depth: 3-1/8 (7.9)



A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® control networks when ordered with drivers marked by a shaded background*
- This luminaire is part of an A+ Certified solution for nLight control networks, providing advanced control functionality at the luminaire level, when selection includes driver and control options marked by a shaded background*

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

2RTL Volumetric Recessed Lighting 2'x2'

A+ Capable options indicated by this color background.

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative. **Example:** 2RTL2 33L EZ1 LP835 N80

2RTL2							
Series	**Air function**	**Lumens**[1]	**Voltage**	**Driver**	**Color temperature**	**Controls**	**Options**
2RTL2 Recessed 2X2 LED	(blank) No air CAS Center air slots (air removal)	20L 2000 lumens 33L 3300 lumens 40L 4000 lumens	(blank) MVOLT (120 - 277V) 347 347V[2]	EZ1 eldoLED dims to 1% (0-10 volt dimming) EZB eldoLED dims to 0.1% (0-10 volt dimming) GZ1 Dims to 1% (0-10V dimming)[3] GZ10 Dims to 10% (0-10V dimming)[3] EDB eldoLED DALI EXB eldoLED DMX/RDM SLD Step-level dimming EXA1 Dims to 1%, XPoint wireless enabled EXAB Dims to dark, XPoint wireless enabled	LP830 3000 K, 82CRI LP835 3500 K, 82CRI LP840 4000 K, 82CRI LP850 5000 K, 82CRI	(blank) No controls N80 nLight with 80% lumen management N80EMG nLight with 80% lumen management for use with generator supply EM power N100 nLight without lumen management N100EMG nLight without lumen management for use with generator supply EM power	EL7L 700 nominal lumen battery pack (Noncompliant with CA T20) EL14L 1400 nominal lumen battery pack (Noncompliant with CA T20) E10WLCP EM Self-Diagnostic battery pack, 10W Constant Power, Certified in CA Title 20 MAEDBS CP Chicago plenum

Accessories: *Order as separate catalog number.*

DGA22	Drywall ceiling adaptor , unit installation
2X2SMKSHP PAF	Multi-Use Surface Mount Kit 2X2 Post-Paint

Notes

1 Approximate lumen output.
2 Not available with EL battery packs or SLD driver.
3 GZ1 and GZ10 not available with any Control or Sensor options
4 Not available with N80, N80EMG, N100, or N100EMG.
5 Gateway not included. Requires on-site commissioning. Visit www.lightingcontrols.com/XPointWireless for more information.
6 nLight access limitations with EZB.
7 nLight EMG option requires a connection to existing nLight network. Power is provided from a separate N80 or N100 enabled fixture.

Performance Data

Lumen Package	Lumens	Input Watts	LPW
20L LP830	2299	19.5	118
20L LP835	2368	19.5	121
20L LP840	2415	19.5	124
20L LP850	2464	19.5	126
33L LP830	4138	37.0	112
33L LP835	4262	37.0	115
33L LP840	4347	37.0	117
33L LP850	4478	37.0	121
40L LP830	4699	41.4	114
40L LP835	4840	41.4	117
40L LP840	4937	41.4	119
40L LP850	5036	41.4	122

How to Estimate Delivered Lumens in Emergency Mode
Use the formula below to estimate the delivered lumens in emergency mode.
Delivered Lumens = 1.25 x P x LPW
P = Ouput power of emergency driver. P = 10W for E10WLCP option.
LPW = Lumen per watt rating of the luminaire. This information is available on the ABL luminaire spec sheet.
LPW = Lumen per watt rating of the luminaire. LPW information available in Performance Data section.

nLight® Control Accessories:
Order as separate catalog number. Visit www.sensorswitch.com/nLight for complete listing of nLight controls.

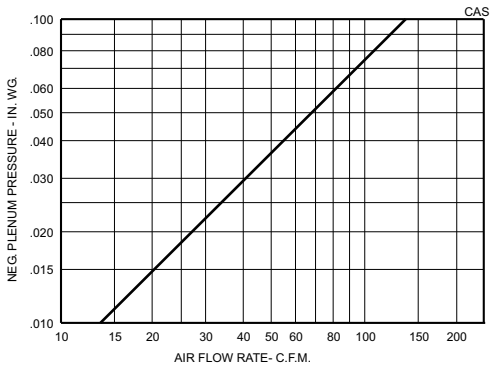
WallPod stations	**Model number**	**Occupancy sensors**	**Model number**
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 / nCM PDT 9
On/Off & Raise/Lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM 10 / nCM PDT 10
Graphic Touchscreen	nPOD GFX	Wall switch with raise/lower	nWSXPDTLVDX
Photocell controls	**Model number**	**Cat-5 cable bundles (plenum rated)**	**Model number**
On/Off & Dimming	nCM ADCX	10', 15 pieces per bundle	CAT5 10FT
		30', 15 pieces per bundle	CAT5 30FT

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2RTL Volumetric Recessed Lighting 2'x2'

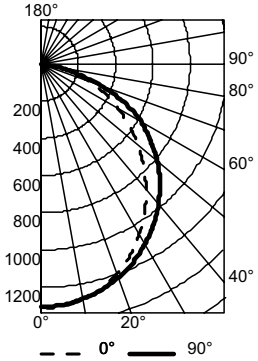
RTL with Air Handling





PHOTOMETRICS

2RTL2 33L LP835, 3,558 delivered lumens, test no. LTL25813P5, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	1302	1302
5°	1306	1299
15°	1250	1256
25°	1133	1173
35°	970	1052
45°	779	903
55°	577	720
65°	378	493
75°	185	194
85°	31	14
90	0	0

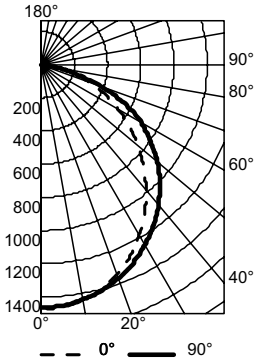
Coefficients of Utilization

RCR	pf 80% pc 70% pw	70% 50%	30%	pf 80% pc 50% pw	50% 30%	10%	pf 20% pc 50% pw	50% 30%	10%
0	119	119	119	116	116	116	111	111	111
1	109	105	100	102	99	95	98	95	92
2	99	91	85	89	83	78	86	81	76
3	91	80	72	79	71	65	76	69	64
4	83	71	62	70	62	55	67	60	55
5	76	64	55	62	54	48	60	53	47
6	70	57	48	56	48	42	54	47	41
7	65	52	43	51	43	37	50	42	37
8	61	47	39	47	39	33	45	38	33
9	57	43	35	43	35	30	42	35	30
10	53	40	32	40	32	27	39	32	27

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1003	28.2	28.2
0° - 40°	1633	45.9	45.9
0° - 60°	2863	80.5	80.5
0° - 90°	3558	100.0	100.0
90° - 120°	0	0.0	0.0
90° - 130°	0	0.0	0.0
90° - 150°	0	0.0	0.0
90° - 180°	0	0.0	0.0
0° - 180°	3558	100.0	100.0

2RTL2 40L LP835, 3,991 delivered lumens, test no. LTL25813P10, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	1461	1461
5°	1465	1457
15°	1403	1409
25°	1271	1316
35°	1088	1181
45°	874	1013
55°	648	807
65°	424	553
75°	208	218
85°	34	16
90	0	0

Coefficients of Utilization

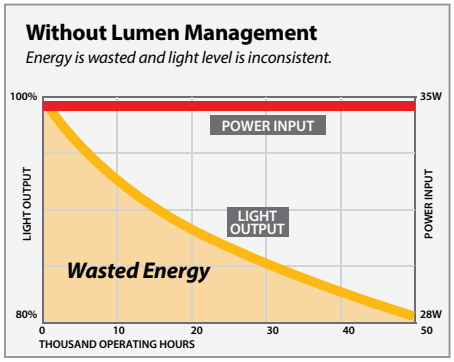
RCR	pf 80% pc 70% pw	70% 50%	30%	pf 80% pc 50% pw	50% 30%	10%	pf 20% pc 50% pw	50% 30%	10%
0	119	119	119	116	116	116	111	111	111
1	109	105	100	102	99	95	98	95	92
2	99	91	85	89	83	78	86	81	76
3	91	80	72	79	71	65	76	69	64
4	83	71	62	70	62	55	67	60	55
5	76	64	55	62	54	48	60	53	47
6	70	57	48	56	48	42	54	47	41
7	65	52	43	51	43	37	50	42	37
8	61	47	39	47	39	33	45	38	33
9	57	43	35	43	35	30	42	35	30
10	53	40	32	40	32	27	39	32	27

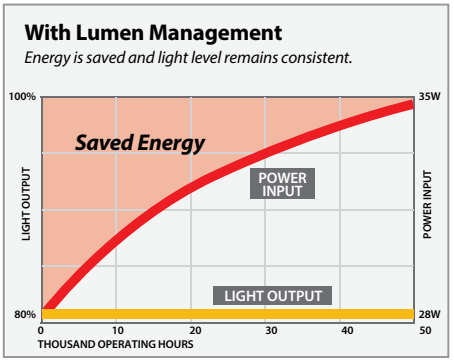
Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1125	28.2	28.2
0° - 40°	1832	45.9	45.9
0° - 60°	3212	80.5	80.5
0° - 90°	3991	100.0	100.0
90° - 120°	0	0.0	0.0
90° - 130°	0	0.0	0.0
90° - 150°	0	0.0	0.0
90° - 180°	0	0.0	0.0
0° - 180°	3991	100.0	100.0

Constant Lumen Management

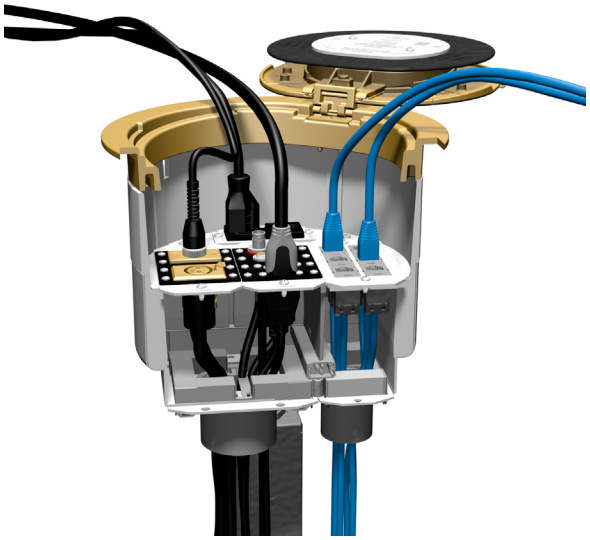
Enabled by the embedded nLight control, the RTL actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.





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WIREMOLD®
Evolution™ Series
8" Poke-Thru Devices



The interior of the Evolution™ Series 8" Poke-Thru Device.

Evolution Series –The most innovative poke-thru devices in the market

Designed for retrofit and new construction, Evolution Series 8" Poke-Thru devices provide convenient access to power, communications, and A/V services recessed below floor level - providing maximum device protection. With five gangs of capacity that allow you to configure services for the needs of your space, services can be placed in any location within the unit.

The low-profile durable metal covers are available in seven finishes, designed to match any space. The cover also features sliding doors that allow cables to neatly egress from the unit, protecting cables while reducing tripping hazards.

Evolution Series 8" Poke-Thru devices are the perfect fit for meeting and training rooms, classrooms, healthcare facilities or commercial buildings with open-space architecture.

Features & Benefits

- **Recessed devices.** Five (5) compartments for power, communications, and/or A/V devices, all recessed 4" (102mm) below the floor level, providing maximum protection and device longevity.
- **Die-cast aluminum cover assemblies.** The Evolution Series poke-thru design includes all metal die-cast aluminum cover assemblies, available in powder coated finishes of black, gray, bronze, and aluminum, as well as a brushed aluminum, satin brass plated and satin nickel plated finishes.
- **A/V compatible design.** The 8AT Series devices are designed to work with with Legrand's AVIP devices. Also compatible with most A/V manufacturers devices including their 1-gang, 2-gang, and 3-gang decorator style designs.
- **Flush tile version cover assemblies.** A flush style cover for tile applications allows the Evolution Series Poke-Thru Devices to be adjusted to the same level as the top surface of the floor covering. The tile cover is designed to be used in higher traffic applications, where a low profile is a must.
- **Auto-close egress doors.** Egress doors lock in position when slid open and automatically close around cables, reducing the egress opening to the smallest size possible.
- **Improved hinge design.** Provides greater durability while creating a more fluid, intuitive, opening and closing motion.
- **"Step-on-it" installation.** Quick and easy installation without the need for additional fasteners or a second installer.
- **Pre-pour sleeve.** Creates a removable cast-in-place core hole that allows the contractor to position poke-thru units before concrete is poured. Eliminates the cost and labor of coring the opening.
- **TopGuard™ Protection.** All Evolution Series Poke-Thru Devices, like every Wiremold Poke-Thru Device, meet and exceed UL scrub water exclusion requirements for tile, carpet, and wood covered floors.
- **Meets ADA Accessibility Guidelines.** Wide trim flange is designed to meet the ADA Accessibility Guidelines as it pertains to ADA Standard 4.5 which addresses changes in floor and ground surface levels. The poke-thru trim flanges are beveled so the slope is no greater than 1:2 ratio.
- **Suitable for use in air handling spaces.** In accordance with Sec 300-22(C) of the National Electrical Code.
- **UL Listed and UL Fire Classified to U.S. and Canadian safety standards.** UL Fire rated for up to 2-hour rated floors maintains the fire classification of the floor.

Vertical Markets

- **Commercial**
- **Education**
- **Healthcare**
- **Hospitality**
- **Entertainment**
- **Retail**

PEP ecoPASSPORT®

Download this product's PEP ecopasport® environmental product declaration at www.legrand.us/resources-and-downloads. This declaration conforms with ISO 14025 and 14040 and is in alignment with EN 15804.

Compliance

cULus Listed, Metallic Outlet Box File Number E2961. Guide QCIT.

cULus Listed Nonmetallic Outlet Boxes & Fittings
Classified for Fire Resistance: File R8209, Guide CEYY.

For more information or to configure your own Evolution™ Series Poke-Thru Device, visit our online configurator at:

www.legrand.us/wiremold/evolution.

Cabling Specifications

Copper Cross Section:
The copper cross-sectional area determines the amount of wire fill capacity in a poke-thru device. Unlike other wire and cable management systems that utilize wire fill capacity, a poke-thru device is UL tested under fire conditions to determine the maximum amount of copper conductors that will pass through a poke-thru device, while maintaining the fire-rating of the floor assembly. All Legrand Poke-Thru Devices are UL Classified to U.S. and Canadian safety standards.



8AT COPPER CROSS-SECTION

	OUTER CHANNELS	CENTER CHANNEL
Max Copper X-Section	0.0154 sq. in. (9.9mm²)	0.0775 sq. in. (16.60mm²)
Max # Conductors	(3) 12 AWG	(24) 14 AWG

NOTE: When using conductor sizes other than listed above, the aggregate cross-sectional area of the copper conductors shall not exceed the cross-sectional area listed.

Copper Cross-Sectional Area of Commonly Used Conductors	
Size	**Solid**
#24	0.00032 sq. in. (.206mm²)
#23	0.00040 sq. in. (.258mm²)
#22	0.00050 sq. in. (.322mm²)
#14	0.00323 sq. in. (2.083mm²)
#12	0.00512 sq. in. (3.303mm²)
#10	0.00815 sq. in. (5.258mm²)
# 8	0.01296 sq. in. (8.361mm²)

NOTE: Use above values for solid or stranded conductors.

Flooring Specifications

8AT CORE HOLE SIZES

FLOOR TYPE	CORE SIZE (Min.)	CORE SIZE (Max.)
Covered Floors (Carpet, Tile or Wood)	8" (203mm)	8 1/8" (206mm)
Bare Concrete or Terrazzo	8" (203mm)	8 1/8" (206mm)

CAUTION: These devices are suitable for 1-, 1 1/2-, and 2-hour rated floor assemblies as described in the UL Fire Resistance directory for each service.

These devices meet all UL scrub water requirements, but are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids, such as commercial kitchens.

Floor Coverings: **The poke-thru device is fire rated for concrete floor coverings. For floor coverings greater than 1" (25mm), consult factory.**

UL Certification: **To view the UL certification, please visit www.UL.com/Database. Enter "Wiremold" as the company name and "CEYY" as the UL Category Code.**

Poke-thru devices and abandonment fittings are for use with 1-, 1 1/2-, or 2-hour rated unprotected reinforced concrete floor and 1-, 1 1/2- or 2-hour rated floors employing unprotected steel floor units and concrete topping (D900-Series Designs), or concrete floors with suspended ceilings. (Fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling area below the poke-thru fittings.)

The assembled Poke-Thru stem and service fitting or the abandonment fittings will not reduce the ratings of the floor assembly when the thickness and type of concrete (required for the specific rating) are within the specified limits and the fittings are installed as specified:

1. **Spacing** – Minimum of 2' (610mm) OC and not more than one unit per 65 square feet (6 square meters) of floor area in each span.
2. **Concrete** – Minimum thickness of structural concrete topping of 2 1/4" (57mm) over metal deck or a minimum 3" thick reinforced concrete slab. Unit weight of concrete to be 110 to 155 pcf.
3. **Installation** – Mounted in a 8" (203mm) diameter core drilled hole in concrete per installation instructions accompanying the fittings or abandonment fittings. For use with power circuits, data and/or telephone cables as tabulated below.

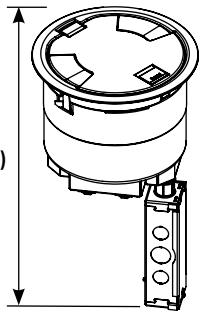
NOTE: The material that is used in Wiremold® poke-thru devices is not listed under the directory for Fire Stopping Material because the poke-thru device is UL Classified as "Outlet Boxes and Fittings Classified For Fire Resistance (CEYY)". The pass/fail criteria comes from UL263. The pass criteria is that the poke-thru unit cannot exceed 325° F. above ambient before the concrete slab (or deck) reaches this same temperature. Some poke-thru devices are tested for 2 hours while others are tested for 4 hours. The intumescent material has never been tested as a fire-stopping material as a stand-alone device. This material is designed to work as a unit with the entire poke-thru device.

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications

Powder Coat Finishes:
8ATC2PBK
8ATC2PBZ
8ATC2PGY

Durable Finishes
8ATC2PAA
8ATC2PSB
8ATC2PSN



NOTE: UL Fire Classified for up to 2-hour rated floors.

NOTE: Receptacles can be wired as a standard or isolated ground device.

Recessed Prewired Surface Style Poke-Thru Assembly –

- Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services.
- Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole.
- The unit comes complete with a surface style cover, two (2) pre-wired, pre-installed duplex receptacles, and three (3) open compartments for additional power, data or AV devices.
- All five compartments are recessed 4" (102mm) below the floor surface level.
- The surface style cover is an aluminum cover that is designed to sit on top of finished floor surfaces, such as: carpet, tile, wood, polished concrete or terrazzo.
- Covers are available in six finishes
  – Three powder coat finishes: black (BK), gray (GY), and bronze (BZ)
  – Three durable finishes: brushed aluminum (AA), satin brass plated (SB), and satin nickel plated (SN)

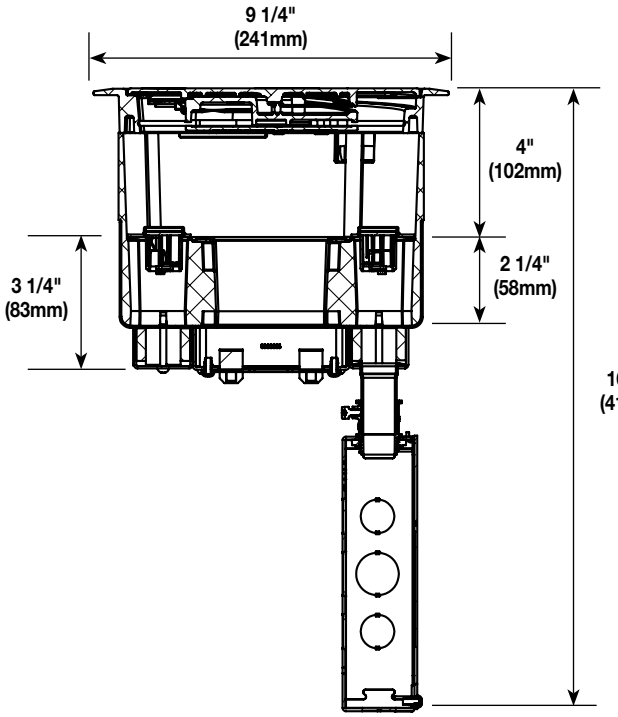
Country of Origin: USA

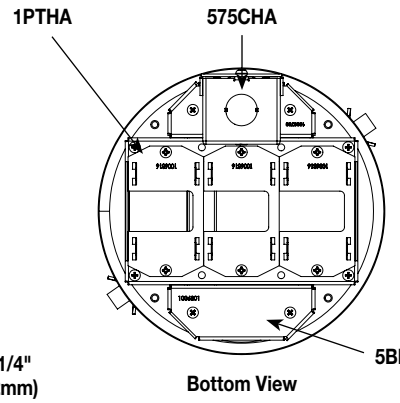
INCLUDED

For Side Compartments:
- Two (2) proprietary Tamper-Resistant 20A Duplex Receptacles installed

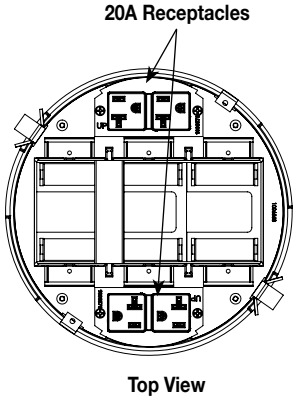
For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5BLH 1/2-Gang Blank Housing*
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider

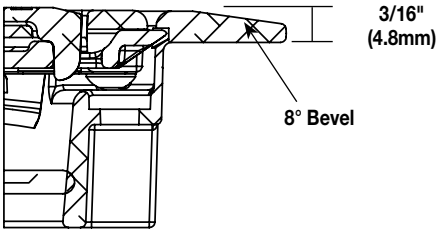




Bottom View



Top View



Surface Style Cover

NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

*** Tunneling extends from the 5BLH to 575CHA so that power cables from the 20A duplex receptacle mounted on the left side of the poke-thru device are run into the junction box attached to the 575CHA.**

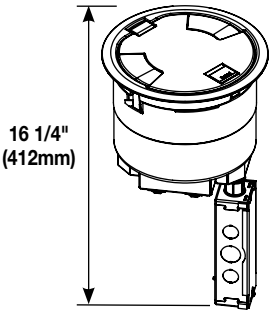
**** Includes junction box attached to the 3/4" trade size conduit.**

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications

Powder Coat Finishes
8ATC2PCRBK
8ATC2PCRBZ
8ATC2PCRGY

Durable Finishes
8ATC2PCRAA
8ATC2PCRSB
8ATC2PCRSN



NOTE: UL Fire Classified for up to 2-hour rated floors.

NOTE: Receptacles can be wired as a standard or isolated ground device.

Recessed Prewired Surface Style Poke-Thru Assembly –

- Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services.
- Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole.
- The unit comes complete with a surface style cover, one (1) pre-wired, pre-installed duplex receptacle, one 20A proprietary duplex receptacle marked with a permanent “Controlled Receptacle” marking, and three (3) open compartments for additional power, data or AV devices.
- All five compartments are recessed 4" (102mm) below the floor surface level.
- The surface style cover is an aluminum cover that is designed to sit on top of finished floor surfaces, such as: carpet, tile, wood, polished concrete or terrazzo.
- Covers are available in six finishes
  – Three powder coat finishes: black (BK), gray (GY), and bronze (BZ)
  – Three durable finishes: brushed aluminum (AA), satin brass plated (SB), and satin nickel plated (SN)

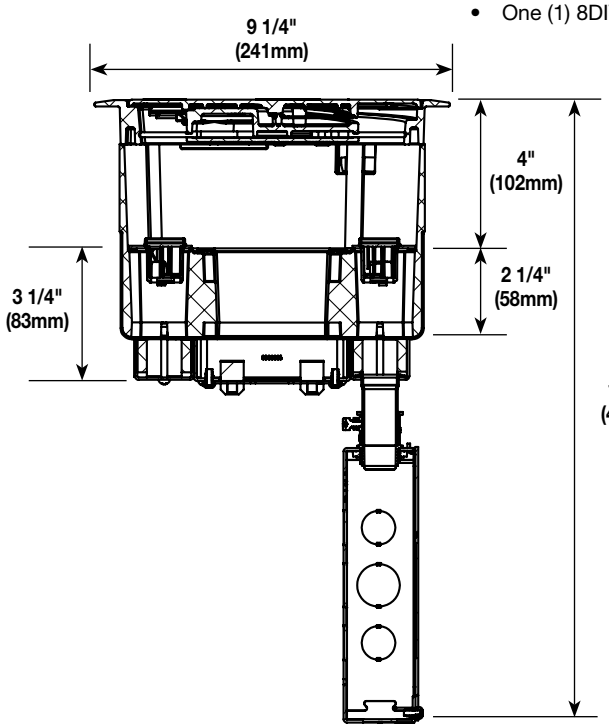
Country of Origin: USA

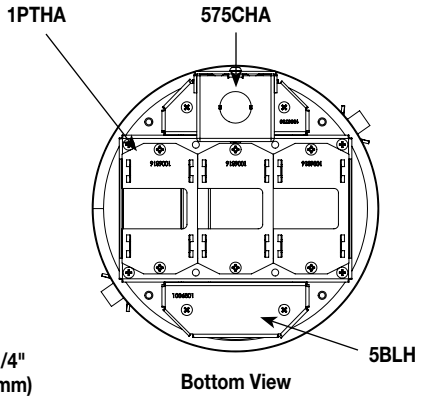
INCLUDED

For Side Compartments:
- One (1) proprietary Tamper-Resistant 20A Duplex Receptacle
- One (1) proprietary Tamper-Resistant 20A Duplex Receptacle marked with a permanent “Controlled Receptacle”

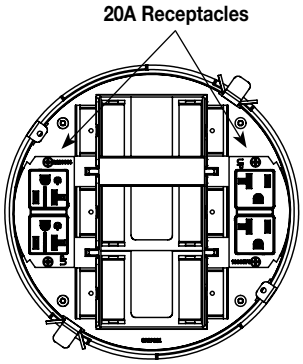
For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5BLH 1/2-Gang Blank Housing*
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider

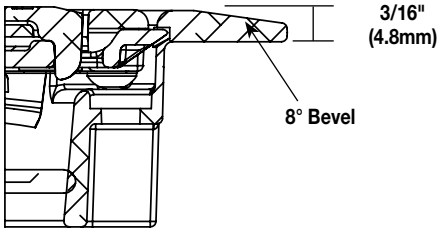




Bottom View



Top View



Surface Style Cover

NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

*** Tunneling extends from the 5BLH to 575CHA so that power cables from the 20A duplex receptacle mounted on the left side of the poke-thru device are run into the junction box attached to the 575CHA.**

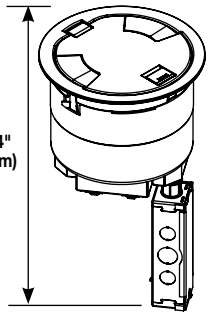
**** Includes junction box attached to the 3/4" trade size conduit.**

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications

Powder Coat Finishes
8AT2PBK
8AT2PBZ
8AT2PGY

Durable Finishes
8AT2PAA
8AT2PSB
8AT2PSN



NOTE: UL Fire Classified for up to 2-hour rated floors.

NOTE: Receptacles can be wired as a standard or isolated ground device.

NOTE: Includes one (1) 6TS Tile Shim.

Recessed Prewired Flush Style Poke-Thru Assembly –

- Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services.
- Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole.
- The unit comes complete with a flush style cover, two (2) pre-wired, pre-installed duplex receptacles, and three (3) open compartments for additional power, data or AV devices.
- All five compartments are recessed 4" (102mm) below the floor surface level.
- The flush style cover is an aluminum cover that is designed to sit flush with finished floor coverings such as: carpet, tile, or wood
- Covers are available in six finishes
  – Three powder coat finishes: black (BK), gray (GY), and bronze (BZ)
  – Three durable finishes: brushed aluminum (AA), satin brass plated (SB), and satin nickel plated (SN)

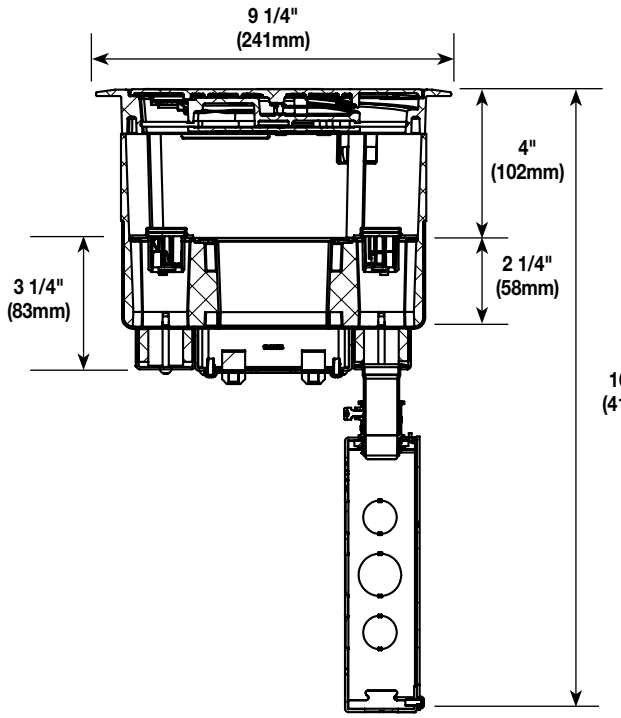
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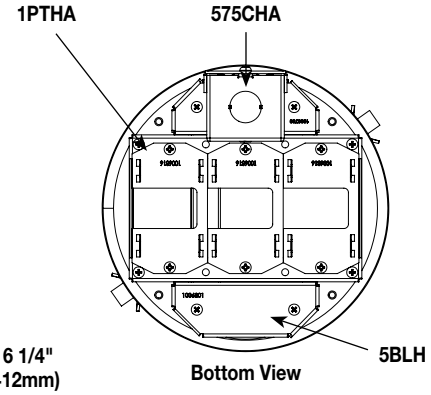
INCLUDED

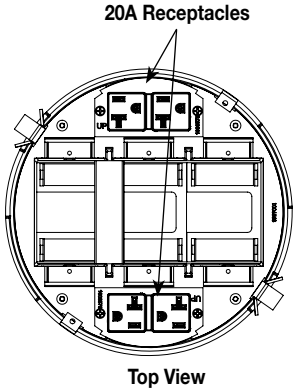
For Side Compartments:
- Two (2) proprietary Tamper-Resistant 20A Duplex Receptacles installed

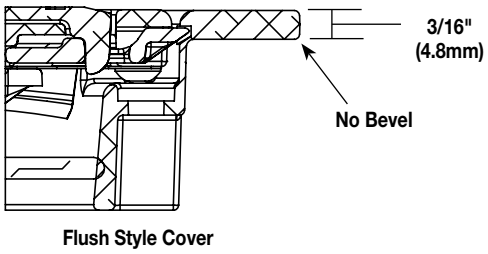
For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5BLH 1/2-Gang Blank Housing*
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider









NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

*** Tunneling extends from the 5BLH to 575CHA so that power cables from the 20A duplex receptacle mounted on the left side of the poke-thru device are run into the junction box attached to the 575CHA.**

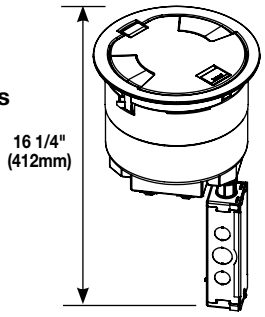
**** Includes junction box attached to the 3/4" trade size conduit.**

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications

Powder Coat Finishes
8AT2PCRBK
8AT2PCRBZ
8AT2PCRGY

Durable Finishes
8AT2PCRAA
8AT2PCRSB
8AT2PCRSN



NOTE: UL Fire Classified for up to 2-hour rated floors.

NOTE: Receptacles can be wired as a standard or isolated ground device.

NOTE: Includes one (1) 6TS Tile Shim.

Recessed Prewired Flush Style Poke-Thru Assembly –

- Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services.
- Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole.
- The unit comes complete with a flush style cover, one (1) pre-wired, pre-installed duplex receptacle, one 20A proprietary duplex receptacle marked with a permanent “Controlled Receptacle” marking, and three (3) open compartments for additional power, data or AV devices.
- All five compartments are recessed 4" (102mm) below the floor surface level.
- The flush style cover is an aluminum cover that is designed to sit flush with finished floor coverings such as: carpet, tile, or wood
- Covers are available in six finishes
  – Three powder coat finishes: black (BK), gray (GY), and bronze (BZ)
  – Three durable finishes: brushed aluminum (AA), satin brass plated (SB), and satin nickel plated (SN)

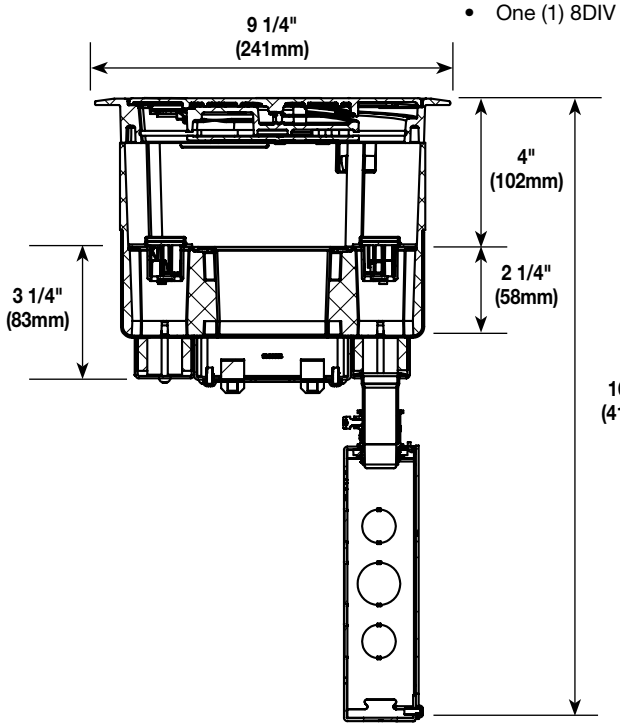
Country of Origin: USA

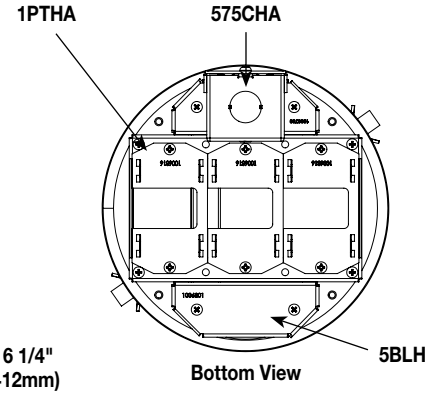
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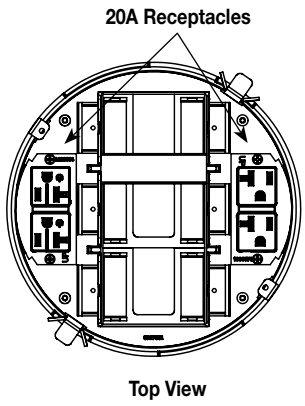
For Side Compartments:
- One (1) proprietary Tamper-Resistant 20A Duplex Receptacle
- One (1) proprietary Tamper-Resistant 20A Duplex Receptacle marked with a permanent “Controlled Receptacle”

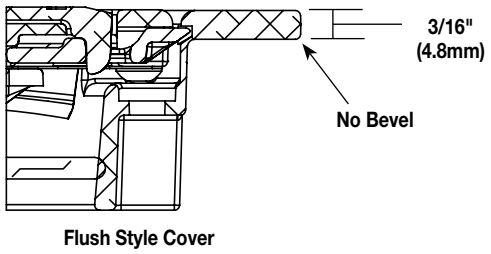
For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5BLH 1/2-Gang Blank Housing*
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider









NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

*** Tunneling extends from the 5BLH to 575CHA so that power cables from the 20A duplex receptacle mounted on the left side of the poke-thru device are run into the junction box attached to the 575CHA.**

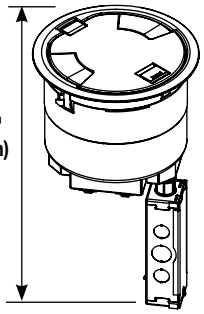
**** Includes junction box attached to the 3/4" trade size conduit.**

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications

Powder Coat Finishes
8ATC2BK
8ATC2BZ
8ATC2GY

Durable Finishes
8ATC2AA
8ATC2SB
8ATC2SN



Recessed Unwired Surface Style Poke-Thru Assembly –

- Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services.
- Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole.
- The unit comes complete with a surface style cover, and five (5) open compartments for additional power, data or AV devices.
- All five compartments are recessed 4" (102mm) below the floor surface level.
- The surface style cover is an aluminum cover that is designed to sit on top of finished floor surfaces such as: carpet, tile, wood, polished concrete or terrazzo.
- Covers are available in six finishes
  – Three powder coat finishes: black (BK), gray (GY), and bronze (BZ)
  – Three durable finishes: brushed aluminum (AA), satin brass plated (SB), and satin nickel plated (SN)

NOTE: UL Fire Classified for up to 2-hour rated floors.

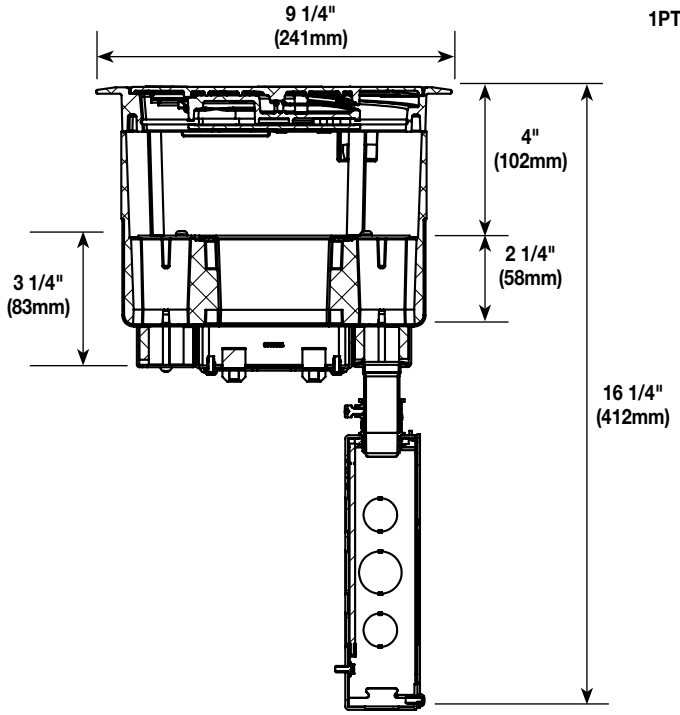
Country of Origin: USA

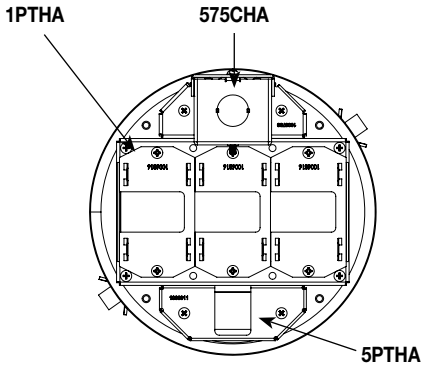
INCLUDED

For Side Compartments:
- No Device Plates are included

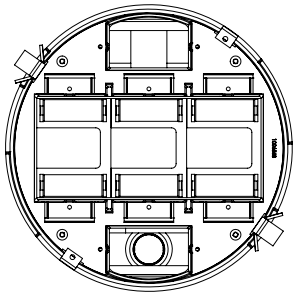
For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5PTHA 1/2-Gang Pass-Through Housing Housing
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider

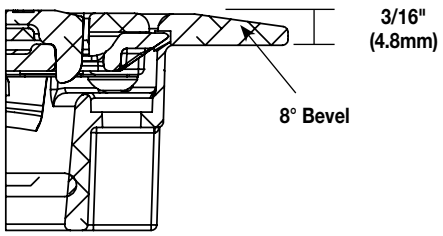




Bottom View



Top View



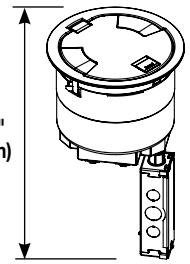
Surface Style Cover

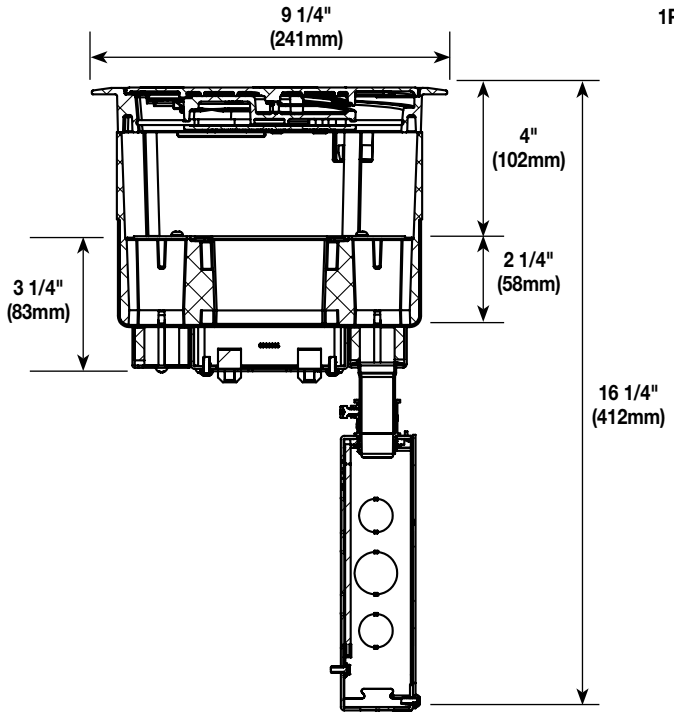
NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

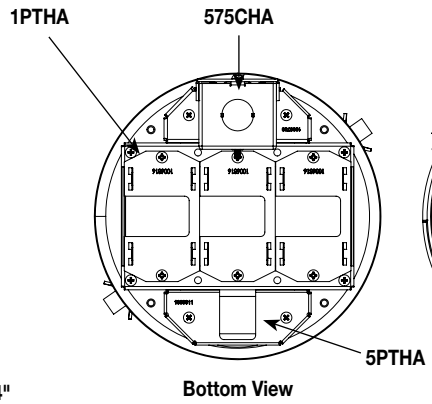
**** Includes junction box attached to the 3/4" trade size conduit.**

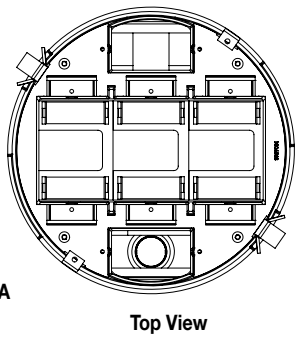
Evolution Series 8" Poke-Thru Devices Ordering Information

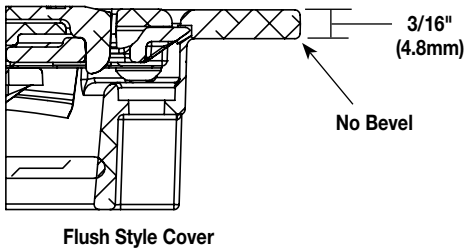
Catalog No./Item	Description/Specifications
Powder Coat Finishes **8AT2BK** **8AT2BZ** **8AT2GY** **Durable Finishes** **8AT2AA** **8AT2SB** **8AT2SN**	**Recessed Unwired Flush Style Poke-Thru Assembly –** • Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services. • Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole. • The unit comes complete with a flush style cover, and five (5) open compartments for additional power, data or AV devices. • All five compartments are recessed 4" (102mm) below the floor surface level. • The flush style cover is an aluminum cover that is designed to sit flush with finished floor coverings such as: carpet, tile, or wood • Covers are available in six finishes – Three powder coat finishes: black (BK), gray (GY), and bronze (BZ) – Three durable finishes: brushed aluminum (AA), satin brass plated (SB), and satin nickel plated (SN)
NOTE: UL Fire Classified for up to 2-hour rated floors.	**Country of Origin: USA**
NOTE: Includes one (1) 6TS Tile Shim.	**INCLUDED** **For Side Compartments:** • No Device Plates are included **For Center Compartment:** • No Device Plates are included **For Bottom Feed Compartment:** • One (1) 5PTHA 1/2-Gang Pass-Through Housing Housing • Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly • One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly** • One (1) 8DIV 8" Divider









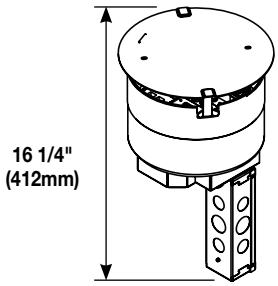


NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

**** Includes junction box attached to the 3/4" trade size conduit.**

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications
8STC	**Recessed Unwired Poke-Thru Stem Assembly –** • Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services. • Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole. • The unit comes complete with a disposable sheet metal cover, five (5) open compartments for additional power, data or AV devices. • All five compartments are recessed 4" (102mm) below the floor surface level. • Designed to work with the 8CTC2 and 8CT2 style covers (sold separately). **Country of Origin: USA**



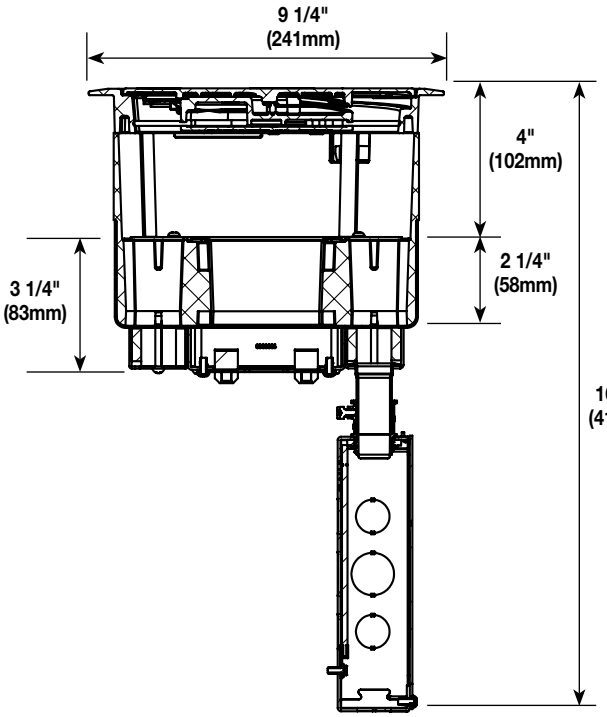
NOTE: UL Fire Classified for up to 2-hour rated floors.

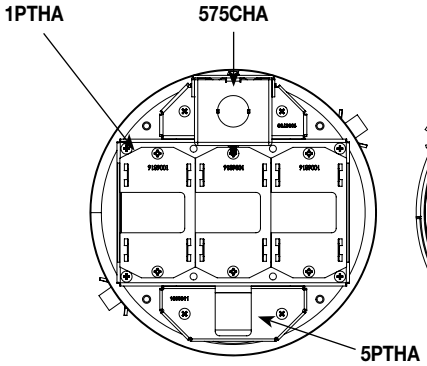
INCLUDED

For Side Compartments:
- No Device Plates are included

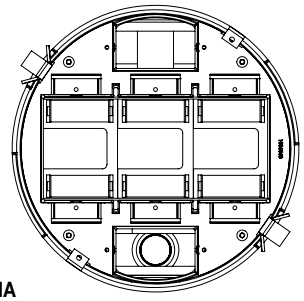
For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5PTHA 1/2-Gang Pass-Through Housing Housing
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider





Bottom View

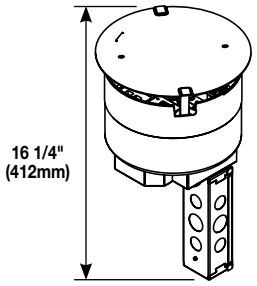


Top View

NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

**** Includes junction box attached to the 3/4" trade size conduit.**

Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications
8STCP 	**Recessed Unwired Poke-Thru Stem Assembly –** • Designed to be installed in a concrete floor which has access in the ceiling of the floor below for running power, data and A/V services. • Poke-thru device installs into an 8" (203mm) to an 8 1/8" (206mm) diameter hole. • The unit comes complete with a disposable sheet metal cover, five (5) open compartments for additional power, data or AV devices. • All five compartments are recessed 4" (102mm) below the floor surface level. • Designed to work with the 8CTC2 and 8CT2 style covers (sold separately). **Country of Origin: USA**

NOTE: UL Fire Classified for up to 2-hour rated floors.

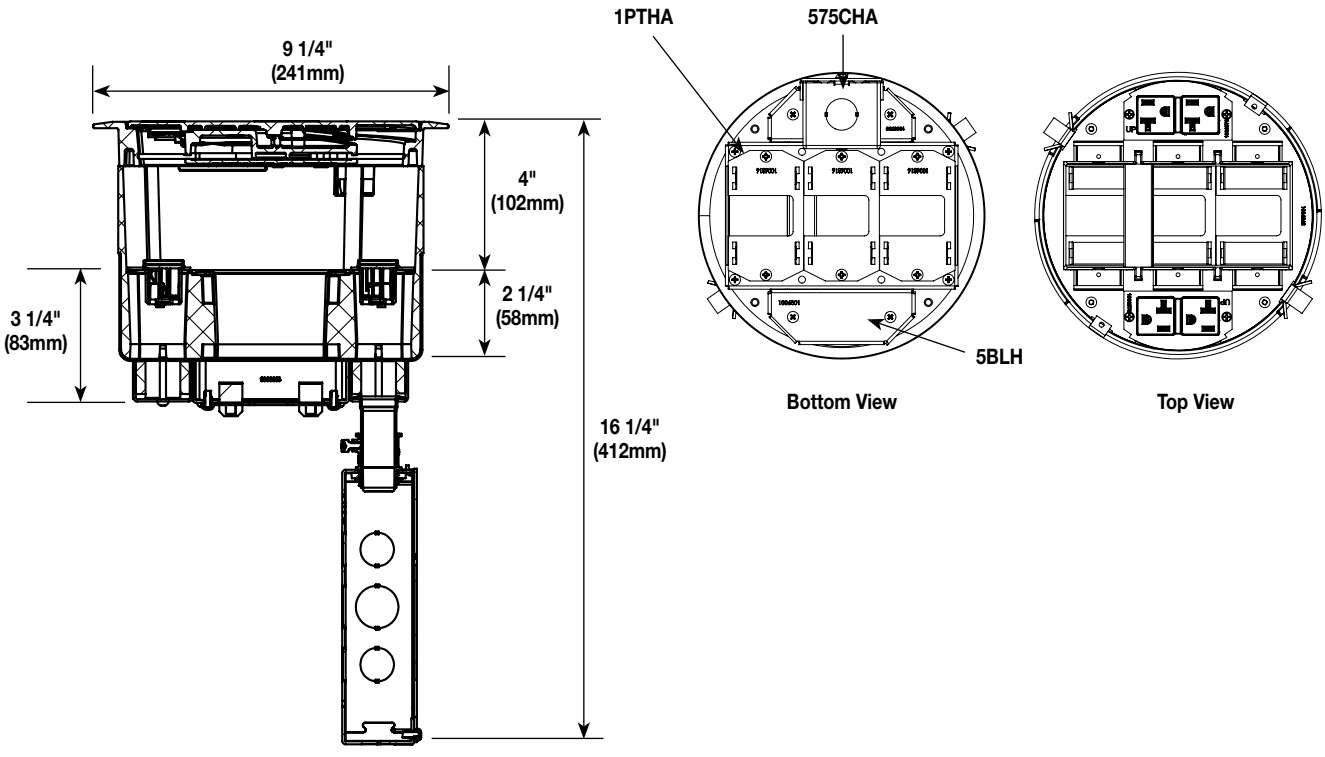
NOTE: Receptacles can be wired as a standard or isolated ground device.

INCLUDED

For Side Compartments:
- Two (2) proprietary Tamper-Resistant 20AMP Duplex Receptacles installed

For Center Compartment:
- No Device Plates are included

For Bottom Feed Compartment:
- One (1) 5BLH 1/2-Gang Blank Housing
- Three (3) 1PTHA 1-Gang Pass-Through Housing Assembly
- One (1) 575CHA 1/2-Gang 3/4" Conduit Housing Assembly**
- One (1) 8DIV 8" Divider

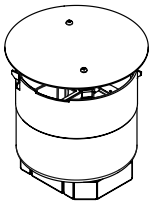


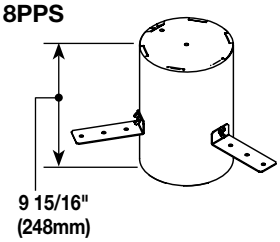
NOTE: For more information on Device Plates and Bottom Feed Plates and on the additional options available, see the Device Plates and Bottom Feed Plates sections found later in this document.

*** Tunneling extends from the 5BLH to 575CHA so that power cables from the 20A duplex receptacle mounted on the left side of the poke-thru device are run into the junction box attached to the 575CHA.**

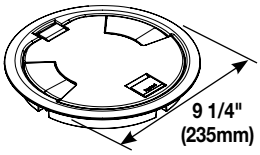
**** Includes junction box attached to the 3/4" trade size conduit.**

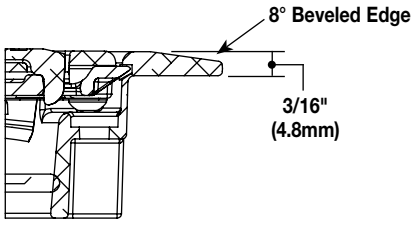
Evolution Series 8" Poke-Thru Devices Ordering Information

Catalog No./Item	Description/Specifications
ABPLUG8 	**Abandonment Plug Assembly –** Complete abandonment plug assembly for 8" opening. Assembly includes intumescent fire stop material to maintain a 2 hour fire rating of the floor. **Country of Origin: USA**

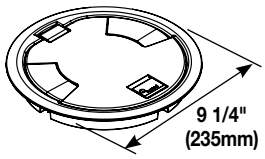
Catalog No./Item	Description/Specifications
8PPS 	**8" Pre-Pour Poke-Thru Sleeve –** Nonmetallic sleeve attaches to structural decking and maintains 8"- 8 1/8" diameter cast in core hole. Unit includes three (3) attachment legs, two (2) end caps and three (3) thumb screws. **Country of Origin: USA**

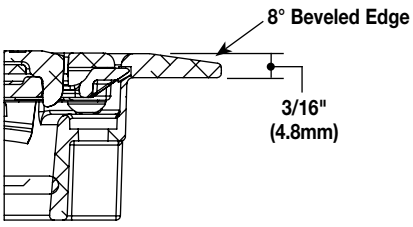
Evolution Series 8" Poke-Thru Devices Cover Assemblies Ordering Information

Catalog No./Item	Description/Specifications
Powder Coat Finishes **8CTC2BK** **8CTC2GY** **8CTC2BZ** **Durable Finishes** **8CTC2AA** **8CTC2SB** **8CTC2SN** 	**Surface Style Cover Assembly –** Low profile cover designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies. Each cover is made from die-cast aluminum materials and equipped with a durable hinge which allows the cover to rotate open 180°, two (2) slide egress doors that lock in the open position and auto close around the cables when the covers are closed, an 8° beveled edge that meet ADA guidelines and reduces tripping hazards. These covers are designed to sit on top of the finished floor surfaces such as: carpet, tile, wood, polished concrete and terrazzo. Available in three (3) aesthetic powder coated finishes: black (BK), gray (GY), bronze (BZ) and three durable finishes: brushed aluminum (AA), satin brass plated (SB) and satin nickel plated (SN). **Country of Origin: India or Mexico**



NOTE: All surface style poke-thru devices come with a transition angle to aid in the change in floor elevation.

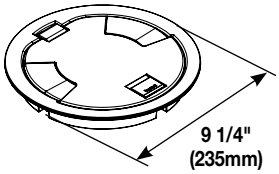
Catalog No./Item	Description/Specifications
Powder Coat Finishes **8CTC2BKTR** **8CTC2GYTR** **8CTC2BZTR** **Durable Finishes** **8CTC2AATR** **8CTC2SBTR** **8CTC2SNTR** 	**Tamper-Resistant Surface Style Cover Assembly –** Low profile cover designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies. Each cover is made from die-cast aluminum materials and equipped with a tamper-resistant screw to keep out unauthorized personnel, a durable hinge which allows the cover to rotate open 180°, two (2) slide egress doors that lock in the open position and auto close around the cables when the covers are closed, an 8° beveled edge that meet ADA guidelines and reduces tripping hazards. These covers are designed to sit on top of the finished floor surfaces such as: carpet, tile, wood, polished concrete and terrazzo. Available in three (3) aesthetic powder coated finishes: black (BK), gray (GY), bronze (BZ) and three durable finishes: brushed aluminum (AA), satin brass plated (SB) and satin nickel plated (SN). **Country of Origin: India or Mexico**

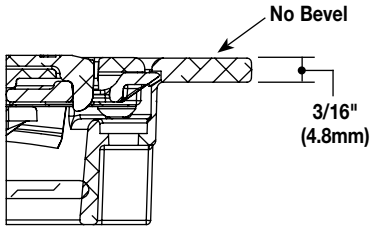


NOTE: All surface style poke-thru devices come with a transition angle to aid in the change in floor elevation.

Evolution Series 8" Poke-Thru Devices Cover Assemblies Ordering Information

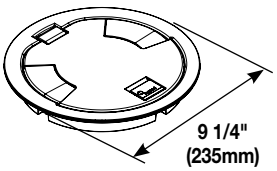
Catalog No./Item	Description/Specifications
Powder Coat Finishes **8CT2BK** **8CT2GY** **8CT2BZ** **Durable Finishes** **8CT2AA** **8CT2SB** **8CT2SN**	**Flush Style Cover Assembly –** Low profile covers that are designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies. Each cover is made from die-cast aluminum materials and equipped with a durable hinge which allows the cover to rotate open 180°, two (2) slide egress doors that lock in the open position and auto close around the cables when the covers are closed. These covers are designed to sit flush with the finished floor surfaces such as: carpet, tile, and wood. Available in three (3) aesthetic powder coated finishes: black (BK), gray (GY), bronze (BZ) and three durable finishes: brushed aluminum (AA), satin brass plated (SB) and satin nickel plated (SN). **Country of Origin: India or Mexico**

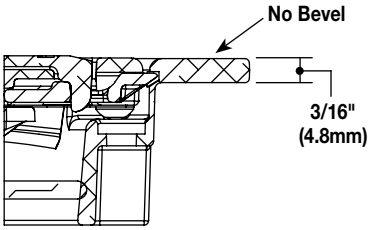




NOTE: Includes 8TS Tile Shim.

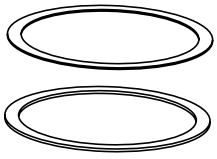
Catalog No./Item	Description/Specifications
Powder Coat Finishes **8CT2BKTR** **8CT2GYTR** **8CT2BZTR** **Durable Finishes** **8CT2AATR** **8CT2SBTR** **8CT2SNTR**	**Tamper-Resistant Flush Style Cover Assembly –** Low profile covers that are designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies. Each cover is made from die-cast aluminum materials and equipped with a tamper-resistant screw to keep out unauthorized personnel, a durable hinge which allows the cover to rotate open 180°, two (2) slide egress doors that lock in the open position and auto close around the cables when the covers are closed. These covers are designed to sit flush with the finished floor surfaces such as: carpet, tile, and wood. Available in three (3) aesthetic powder coated finishes: black (BK), gray (GY), bronze (BZ) and three durable finishes: brushed aluminum (AA), satin brass plated (SB) and satin nickel plated (SN). **Country of Origin: India or Mexico**





NOTE: Includes 8TS Tile Shim.

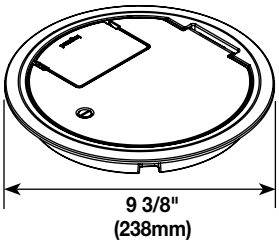
8TS	**Tile Shim –** Used for floor coverings greater than 3/16" (4.8mm). The 8TS will allow the top surface of the cover to be flush with the finished floor. Includes: six (6) 1/16" (1.6mm) thick shims. Up to a total of 3/8" (9.5mm) of adjustment. **Country of Origin: USA**



Evolution Series Heavy Duty 8" Round Cover Assemblies Ordering Information

Catalog No./Item	Description/Specifications

8CTCHDSS

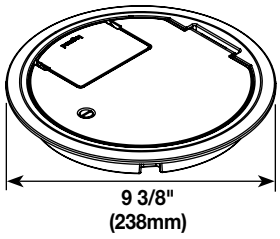


Stainless Steel Surface Style Cover Assembly – High load cover designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies, as well as RFB6E and CRFB4 floor boxes.

- Cover is made from stainless steel.
- Equipped with a dampened self-closing hinge.
- 8° beveled edge meets ADA guidelines and reduces tripping hazards.
- Designed to sit on top of finished floor surfaces such as: carpet, tile, wood, polished concrete and terrazzo.

Country of Origin: China

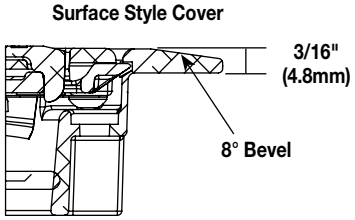
8CTCHDBS



Brass Surface Style Cover Assembly – High load cover designed to attach to the 8STC, and 8STCP Poke-Thru Stem Assemblies, as well as RFB6E and CRFB4 floor boxes.

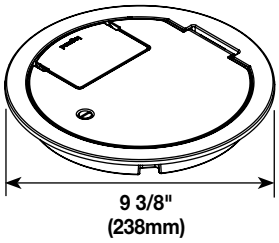
- Cover is made from brass.
- Equipped with a dampened self-closing hinge.
- 8° beveled edge meets ADA guidelines and reduces tripping hazards.
- Designed to sit on top of finished floor surfaces such as: carpet, tile, wood, polished concrete and terrazzo.
- Finished with a clear coating.

Country of Origin: China



Catalog No./Item	Description/Specifications

8CTHDSS

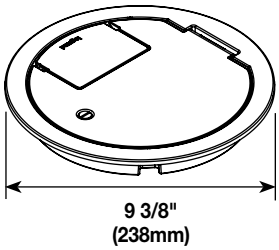


Stainless Steel Flush Style Cover Assembly – High load cover designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies, as well as RFB6E and CRFB4 floor boxes.

- Cover is made from stainless steel.
- Equipped with a dampened self-closing hinge.
- Designed to sit flush with finished floor coverings such as: carpet, tile, wood and terrazzo. (Terrazzo requires use of the 8CT-CTR Terrazzo Ring.)

Country of Origin: China

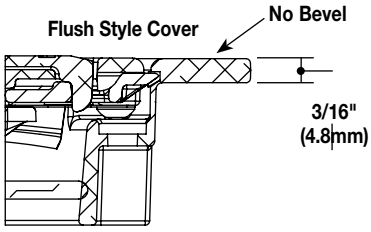
8CTHDBS



Brass Flush Style Cover Assembly – High load cover designed to attach to the 8STC and 8STCP Poke-Thru Stem Assemblies as well as RFB6E and CRFB4 floor boxes.

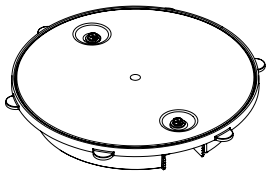
- Cover is made from brass.
- Equipped with a dampened self-closing hinge.
- Designed to sit flush with finished floor coverings such as: carpet, tile, wood and terrazzo. (Terrazzo requires use of the 8CT-CTR Terrazzo Ring.)
- Finished with a clear coating.

Country of Origin: China



NOTE: Includes 8TS Tile Shim.

8CT-CTR

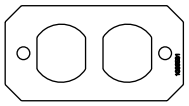
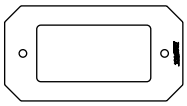
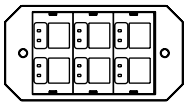
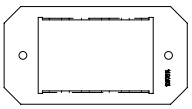
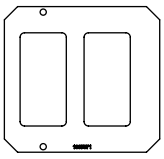
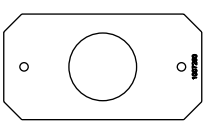


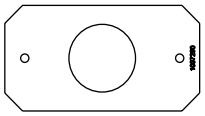
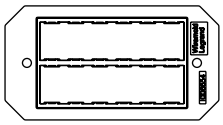
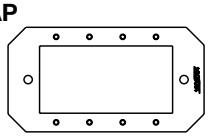
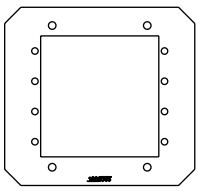
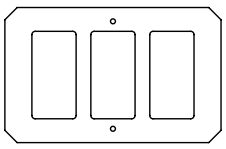
8" Terrazzo Ring –

- Nonmetallic ring for use on terrazzo floor applications with Heavy Duty Flush Style Covers.

Country of Origin: USA

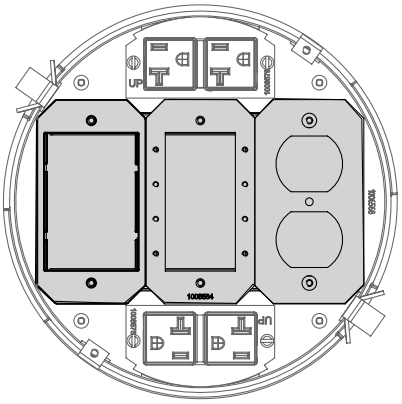
Evolution Series 8" Poke-Thru Devices Center Mount Device Plates Ordering Information

Catalog No./Item	Description/Specifications
8B 	**Device Mounting Plate –** Single-gang device plate used to blank off any one (1) of the center compartments, when no devices are used. **Country of Origin: USA**
8DP 	**Device Mounting Plate –** Single-gang device plate that accepts standard 15A or 20A duplex receptacle, a duplex Turnlok receptacle, fits in any one (1) of the center compartments. Devices supplied by others. **Country of Origin: USA**
8DEC 	**Device Mounting Plate –** Single-gang device plate that will accept Decorator style devices such as 20A receptacles, GFCIs, 106 adapters or A/V devices. Fits in any one (1) of the center compartments. Devices supplied by others. **Country of Origin: USA**
8ACT6A 	**Device Mounting Plate –** Single-gang device plate that will accept up to six (6) ports of communication devices. Fits in any one (1) of the center compartments. Devices supplied by others. **Country of Origin: USA**
8MOS 	**Mosaic Device Plate –** Device plate accepts three (3) standard Mosaic devices (45mm x 22.5mm). Devices supplied by others. **Country of Origin: USA** **NOTE: Not designed to accept adorne style devices.**
8CREST 	**Two-Gang Plate –** Device plate accepts most A/V manufacturer's double-gang decorator style devices. Takes up two of the center locations. **Country of Origin: USA**
8S1 	**Device Plate –** Receptacle opening 1 3/8" (35mm). For 8" poke-thru units only. **Country of Origin: USA**

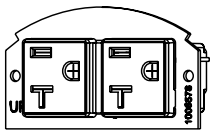
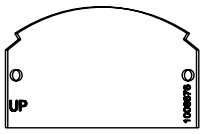
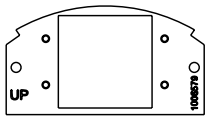
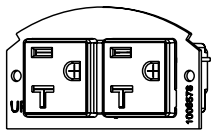
Catalog No./Item	Description/Specifications
8S2 	**Device Plate –** Receptacle opening 1 9/16" (40mm). For 8" poke-thru units only. **Country of Origin: USA**
8TRAC 	**Device Mounting Plate –** Single-gang device plate that will accept up to six (6) Ortronics TracJack devices. Fits in any one (1) of the center compartments. Devices supplied by others. **Country of Origin: USA**
8SER 	**Device Mounting Plate –** Single-gang device plate that will accept up to three (3) Ortronics Series II dual modular inserts. Fits in any one (1) of the center compartments. Devices supplied by others. **Country of Origin: USA**
8MAAP 	**Device Mounting Plate –** Single-gang device plate that will accept up to four (4) Legrand AVIP or Extron Electronics MAAP style plates. Fits in any one (1) of the center compartments. Devices supplied by others. **Country of Origin: USA**
8AAP 	**Device Mounting Plate –** Two-gang device plate that will accept up to four (4) Extron Electronics AAP style plates. 8AAP takes up 2 of the 3 gangs in the center compartment. Devices supplied by others. **Country of Origin: USA**
8CREST3G 	**Three-Gang Device Plate –** Accepts a three-gang device including Crestron Digital Media™ devices. **Country of Origin: USA**

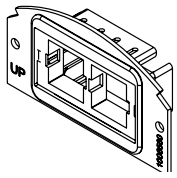
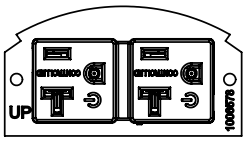
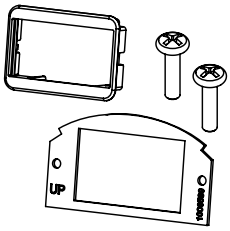
8AT Center Mount Device Plate Mounting Locations

Mounting plates on this page can be installed in the shaded location indicated in this illustration.



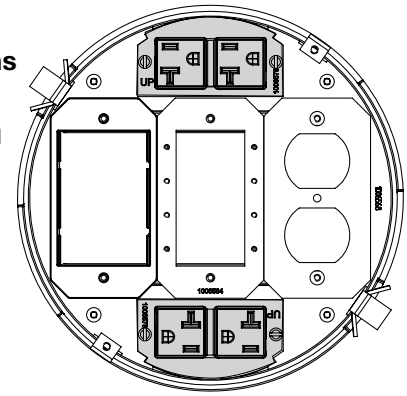
Evolution Series 8" Poke-Thru Devices Side Mount Device Plates Ordering Information

Catalog No./Item	Description/Specifications
68REC 	**20A Duplex Receptacles –** Two (2) proprietary Tamper-Resistant 20A duplex power receptacles with mounting plates. Designed to fit into the 6", 8" and 10" Poke-Thru Devices. Receptacle can be wired as a standard or isolated ground device. **Country of Origin: USA**
68B 	**Device Mounting Plate –** Blank plate. Used to blank off either of the side compartments when no devices or cabling are to be used. **Country of Origin: USA**
68MAAP 	**Device Mounting Plate –** Device plate that will accept up to two (2) Legrand AVIP or Extron® Electronics MAAP device plates. For use in either of the two side compartments only. Not for use in the center compartment. Extron Devices supplied by others. **Country of Origin: USA**
68REC-25 	**20A Duplex Receptacles –** Two (2) proprietary 20A tamper-resistant duplex power receptacles with mounting plates and 25' leads. Designed to fit into the 6", 8" and 10" Poke-Thru Devices. Receptacle can be wired as a standard or isolated ground device. **Country of Origin: USA**

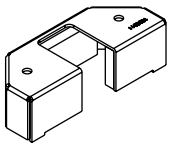
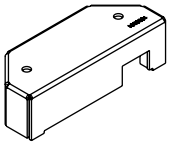
Catalog No./Item	Description/Specifications
682A 	**Device Mounting Plate –** Device plate that will accept up to two (2) ports of communication devices. For use in either of the two side compartments only. Not for use in the center compartment. Communication devices supplied by others. **Country of Origin: USA**
68REC-CTRL* 	**Controlled Receptacle –** One (1) 20A proprietary tamper-resistant duplex receptacle marked with a permanent controlled receptacle marking . **Country of Origin: USA**
682A-PT 	**Device Plate –** Device plate that allows for communication cabling to pass through. Includes one (1) rectangular adapter ring. **Country of Origin: USA**

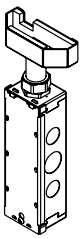
8AT Side Mount Device Plates Mounting Locations

Device Plates in this section can be installed in the shaded locations indicated in this illustration.



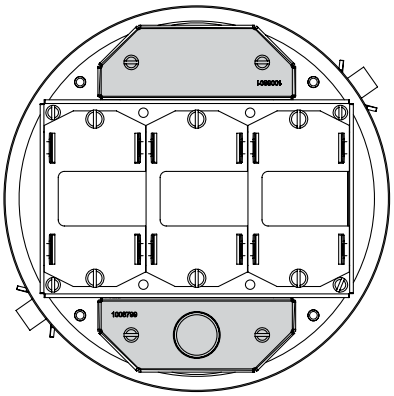
Evolution Series 8" Bottom Feed Side Mount Device Plates Ordering Information

Catalog No./Item	Description/Specifications
5PTHA 	**Bottom Housing Assembly** – Half-gang pass through housing assembly. Designed to allow pass through of communication cables when no conduit is required. For use in 6" and 8" poke-thru devices. **Country of Origin: USA**
5BLH 	**Bottom Housing Assembly –** Half-gang blank housing assembly. Designed to blank off compartment when no cable pass through is required. For use on side compartments only. For use in 6" and 8" poke-thru devices. Includes tunnels for 6" and 8" poke-thru devices. **Country of Origin: USA**

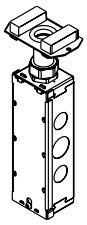
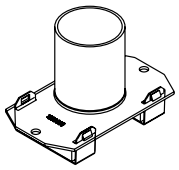
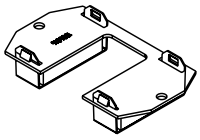
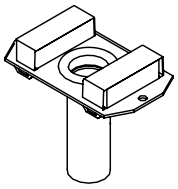
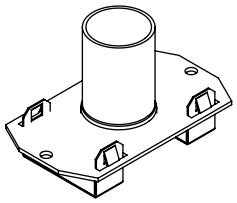
Catalog No./Item	Description/Specifications
575CHA 	**Bottom Housing Assembly –** Half-gang 3/4" trade size conduit housing assembly. Includes junction box attached to 3/4" trade size conduit for electrical power connections. For use in 6" and 8" poke-thru devices. **Country of Origin: USA**

8AT Bottom Feed Side Mount Device Plate Mounting Locations

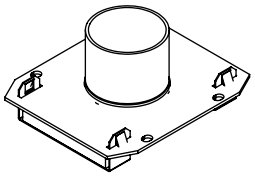
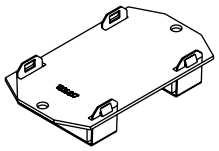
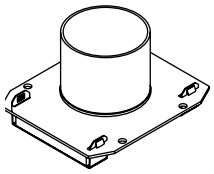
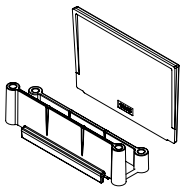
Device Plates in this section can be installed in the shaded locations indicated in this illustration.



Evolution Series 8" Bottom Feed Center Mount Device Plates Ordering Information

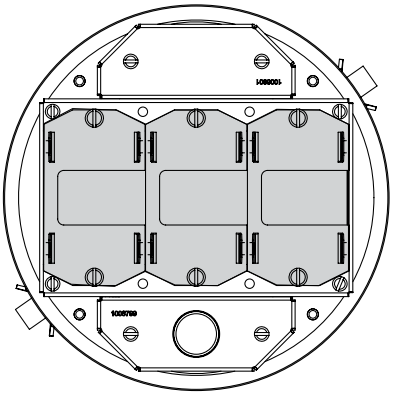
Catalog No./Item	Description/Specifications
175CHA 	**Bottom Housing Assembly –** One-gang 3/4" trade size conduit housing assembly. Includes junction box attached to 3/4" trade size conduit for electrical power connections. For use in the center compartments of 6", 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: When using on a 6ATCFF Furniture Feed unit, 1BHA (sold separately) is required.**
1125CHA 	**Bottom Housing Assembly –** One-gang 1 1/4" trade size conduit housing assembly. For use in the center compartments of 6", 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: When using on a 6ATCFF Furniture Feed unit, 1BHA (sold separately) is required.**
1PTHA 	**Bottom Housing Assembly –** One-gang pass through housing assembly. Designed to allow pass through of communication cables when no conduit is required. For use in the center compartments of 6", 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: When using on a 6ATCFF Furniture Feed unit, 1BHA (sold separately) is required.**
175CHA-LJB 	**Bottom Housing Assembly –** One-gang 3/4" trade size conduit housing assembly. For use in the center compartments of 6", 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: When using on a 6ATCFF Furniture Feed unit, 1BHA (sold separately) is required.**
1100CHA 	**Bottom Housing Assembly –** One-gang 1" trade size conduit housing assembly. For use in the center compartments of 6", 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: When using on a 6ATCFF Furniture Feed unit, 1BHA (sold separately) is required.**

CAUTION: Receptacle supplied with this Poke-Thru is not suitable for direct field wiring. Contact manufacturer for replacement. Field modifications will void UL Listing and Classification. Replacement receptacle is limited to this manufacturers' Catalog No 68REC.

Catalog No./Item	Description/Specifications
1150CHA 	**Bottom Housing Assembly –** Two-gang 1 1/2" trade size conduit housing assembly. Use on 8STC Series Devices. Covers two available center compartments. Both compartments will be the same service. For use in the center compartments of 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: Designed to work on 8AT and 8STC units only.**
1BLH 	**Bottom Housing Assembly –** One-gang blank housing assembly. Designed to blank off compartment when no cable pass through is required. For use in the center compartments of 6", 8" and 10" poke-thru devices. **Country of Origin: USA** **NOTE: When using on a 6ATCFF Furniture Feed unit, 1BHA (sold separately) is required.**
22CHA 	**Bottom Housing Assembly –** Two-gang 2" trade size conduit housing assembly. Used on 8AT and 8STC Series devices. Covers two (2) of the center compartment.Both compartments will be the same service. **Country of Origin: USA** **NOTE: Designed to work on 8AT and 8STC units only.**
8DIV 	**8" (203mm) Divider –** Center compartment divider. Separates services when required maintaining signal strength and product listing. **Country of Origin: USA**

8AT Bottom Feed Center Mount Device Plate Location

All bottom housing assemblies on this page can be installed in the shaded locations indicated in these illustrations.



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FOLLOW US

Commercial grade straight blade duplex receptacles

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:



BR15



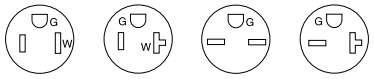
CR20



1877

Description

2-Pole, 3-Wire Grounding
15A 125V/AC; 15A 250V/AC
20A 125V/AC; 20A 250V/AC
NEMA 5-15, 5-20, 6-15, 6-20



5-15R **5-20R** **6-15R** **6-20R**

Design features

- Galvanized steel, wrap-around yoke mounting strap for superior assembly security; extra length/width helps reach large panel cutouts for Code Compliance
- Automatic grounding system eliminates need for bonding jumper in grounded metal enclosure, provides redundant measure of ground continuity where jumper used
- Screw-Catch feature on duplex devices speeds mounting of wallplates
- Tamper Resistant receptacles provide compliance with 2014 NEC® Article 406.12 that states that all 15A & 20A, 125V receptacles installed in dwelling units must be tamper resistant

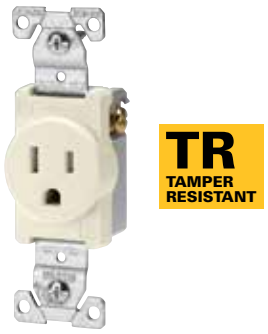
Table 1. Commercial Grade Receptacles

Catalog No.	Description	Amps	Volts	Color Suffix
☐ BR15__	NEMA 5-15R Duplex Receptacle, Back & Side Wire	15	125	A, B, BK, GY, LA, V, W
☐ CR15__	NEMA 5-15R Duplex Receptacle, Side Wire	15	125	A, B, BK, GY, LA, V, W
☐ 817__	NEMA 5-15R Single Receptacle, Side Wire	15	125	B, BK, LA, V, W
☐ BR20__	NEMA 5-20R Duplex Receptacle, Back & Side Wire	20	125	A, B, BK, GY, LA, RD, V, W
☐ CR20__	NEMA 5-20R Duplex Receptacle, Side Wire	20	125	A, B, BK, GY, LA, V, W
☐ 1877__	NEMA 5-20R Single Receptacle, Side Wire	20	125	A, B, BK, LA, V, W
☐ 826__	NEMA 6-15R Duplex Receptacle, Side Wire	15	250	B, V, W
☐ 816__	NEMA 6-15R Single Receptacle, Side Wire	15	250	B, V, W
☐ 815__	NEMA 6-20R Duplex Receptacle, Side Wire	20	250	B, V, W
☐ 1876__	NEMA 6-20R Single Receptacle, Side Wire	20	250	A, B, BK, LA, V, W

Compliances, specifications and availability are subject to change without notice.

Powering Business Worldwide

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:



TR817

Table 2. Dual Voltage Commercial Grade Receptacles, Side Wire

Catalog No.	Description	Amps	Volts	Color
☐ 829V	NEMA 5-15R/6-15R Dual Voltage Duplex Receptacle, Side Wire	15	125/250	V

Table 3. Commercial Grade Tamper Resistant Receptacles

Catalog No.	Description	Amps	Volts	Color Suffix
☐ TRBR15__	NEMA 5-15R Tamper Resistant Duplex Receptacle, Back & Side Wire	15	125	A, B, BK, GY, LA, V, W
☐ TRCR15__	NEMA 5-15R Tamper Resistant Duplex Receptacle, Side Wire	15	125	A, B, BK, GY, LA, V, W
☐ TR817__	NEMA 5-15R Single Receptacle, Side Wire	15	125	A, B, BK, LA, V, W
☐ TRBR20__	NEMA 5-20R Tamper Resistant Duplex Receptacle, Back & Side Wire	20	125	A, B, BK, GY, LA, RD, V, W
☐ TRCR20__	NEMA 5-20R Tamper Resistant Duplex Receptacle, Side Wire	20	125	A, B, BK, GY, LA, V, W
☐ TR1877__	NEMA 5-20 Single Receptacle, Side Wire	20	125	A, B, BK, LA, V, W

Compliances, specifications and availability are subject to change without notice.

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Applications

Commercial grade duplex receptacles are challenged on a daily basis to provide a consistent, reliable means of connectivity in a wide variety of environments. The applications vary greatly by environment, and provide challenges from impact and chemical resistance to environmental extremes such as heat and moisture. The breadth of the Arrow Hart Straight Blade Receptacle line provides solutions for all environments and applications.

Table 4. Specifications

Catalog No.	BR15, BR20, Series	CR15, CR20 Series	815, 826 Series
Device Type	**Straight Blade Duplex Receptacles, BR Series**	**Straight Blade Duplex Receptacles, CR Series**	**Straight Blade Duplex Receptacles**
Wiring Type	Back & side wire	Side wire	Side wire
Testing & Code Compliance	• cULus Listed to UL 498, file no. E15058 • CSA Certified to C22.2, no. 42, file no. 6914, class 6233-01 • UL verified to Federal Spec. WC-596G • NOM certified	• cULus Listed to UL 498, file no. E15058 • UL verified to Federal Spec. WC-596G • NOM certified	• cULus Listed to UL 498, file no. E15058 • UL verified to Federal Spec. WC-596G • NOM certified
Environmental Specifications	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)
Electrical Specifications	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload @ 150% of rated current (DC)	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload @ 150% of rated current (DC)	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload WW@ 150% of rated current (DC)
Mechanical Specifications	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device

Table 5. Materials

Catalog No.	BR15, BR20, Series	CR15, CR20 Series	815, 826 Series
Top Housing	Nylon	PVC	PC
Bottom Housing	PVC	PVC	PC
Strap	0.046" thick galvinated steel	0.040" thick galvinated steel	0.040" thick galvinated steel
Ground Contact	0.030" thick brass	0.030" thick brass	0.030" thick brass
Auto Ground	Phosphor bronze staple	Phosphor bronze staple	Phosphor bronze staple
Line Contacts	.030" thick 3-leaf brass	.030" thick 3-leaf neutral/2-leaf hot brass	.030" thick 3-leaf brass
Terminal Screws	#8-32 Steel brass plated hot	#8-32 Steel brass plated hot	#8-32 Steel brass plated hot
Ground Screw	#8-32 Steel (Green)	#8-32 Steel (Green)	#8-32 Steel (Green)
Tamper Resistant Shutters	N/A	N/A	N/A

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Table 6. Specifications

Catalog No.	829 Series	817, 1877 Series	816, 1876 Series
Device Type	**Straight Blade Dual Voltage Duplex Receptacles**	**Straight Blade Single Receptacles**	**Straight Blade Single Receptacles**
Wiring Type	Side wire	Side wire	Side wire
Testing & Code Compliance	• UL Listed to UL 498, file no. E15058 • CSA Certified to C22.2, no. 42, file no. 6914, class 6233-01 • NOM certified	• UL Listed to UL 498, file no. E15058 • CSA Certified to C22.2, no. 42, file no. 6914, class 6233-01 • NOM certified	• cULus Listed to UL 498, file no. E15058 • NOM certified
Environmental Specifications	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)
Electrical Specifications	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload @ 150% of rated current (DC)	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload @ 150% of rated current (DC)	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload WW@ 150% of rated current (DC)
Mechanical Specifications	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device

Table 7. Materials

Catalog No.	829 Series	817, 1877 Series	816, 1876 Series
Top Housing	PC	PVC	Nylon
Bottom Housing	PC	PVC	PVC
Strap	0.040" thick galvinated steel	0.040" thick galvinated steel	0.040" thick galvinated steel
Ground Contact	0.030" thick brass	0.030" thick brass	0.030" thick brass
Auto Ground	Phosphor bronze staple	N/A	N/A
Line Contacts	.030" thick 3-leaf neutral/2-leaf hot brass	.030" thick 3-leaf brass	.030" thick 3-leaf brass
Terminal Screws	#8-32 Steel brass plated hot	#8-32 Steel brass plated hot	#8-32 Steel brass plated hot
Ground Screw	#8-32 Steel (Green)	#8-32 Steel (Green)	#8-32 Steel (Green)
Tamper Resistant Shutters	N/A	N/A	N/A

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Table 8. Specifications

Catalog No.	TRBR15, TRCR15, TRBR20, TRCR20 Series	TR817, TR1877 Series
Device Type	**Tamper Resistant Straight Blade Duplex Receptacles**	**Tamper Resistant Straight Blade Single Receptacles**
Wiring Type	Back & side wire (TRCR side wire only)	Side wire
Testing & Code Compliance	• cULus Listed to UL 498, file no. E15058 • UL verified to Federal Spec. WC-596G (TRBR only) • NOM certified	• cULus Listed to UL 498, file no. E15058 • NOM certified
Environmental Specifications	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)	**Flammability:** Meets UL 94 requirements; V2 rated **Temperature Rating:** -20ºC to 60ºC (-4ºF to 140ºF)
Electrical Specifications	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload @ 150% of rated current (DC)	**Dielectric Voltage:** Withstands 2000V per UL 498 **Current Interrupting:** Yes, at full-rated current **Temperature Rise:** Max. 30ºC (86°F) after 100 cycles of overload @ 150% of rated current (DC)
Mechanical Specifications	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device	**Terminal Accommodation:** #14 - 10 AWG **Voltage Ratings:** Permanently marked on device

Table 9. Materials

Catalog No.	TRBR15, TRCR15, TRBR20, TRCR20 Series	TR817, TR1877 Series
Top Housing	PVC	PVC
Bottom Housing	PVC	PVC
Strap	0.040" thick galvinated steel	0.040" thick galvinated steel
Ground Contact	0.030" thick brass	0.030" thick brass
Auto Ground	Phosphor bronze staple	Phosphor bronze staple
Line Contacts	.030" thick 3-leaf neutral/2-leaf hot brass	.030" thick 3-leaf brass
Terminal Screws	#8-32 Steel brass plated hot	#8-32 Steel brass plated hot
Ground Screw	#8-32 Steel (Green)	#8-32 Steel (Green)
Tamper Resistant Shutters	Reliable Delrin® shutter assembly	Reliable Delrin® shutter assembly

Table 10. Color Ordering Information

For ordering devices, include Cat. No. followed by the color code: A (Almond), B (Brown), BK (Black), GY (Gray) LA (Light Almond), RD (Red), V (Ivory), W (White)

A	B	BK	GY	LA	RD	V	W
Almond	Brown	Black	Gray	Lt. Almond	Red	Ivory	White

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Product Dimensions

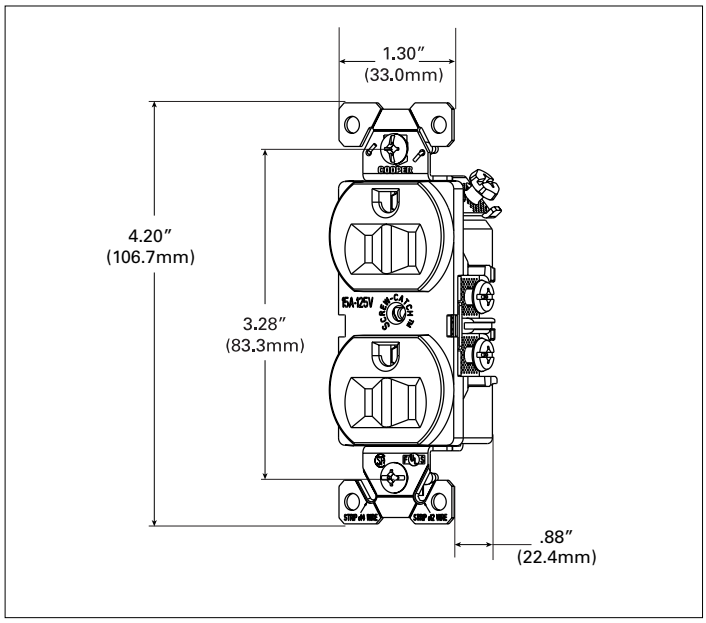


Figure 1. BR15 Line Art with Dimensions

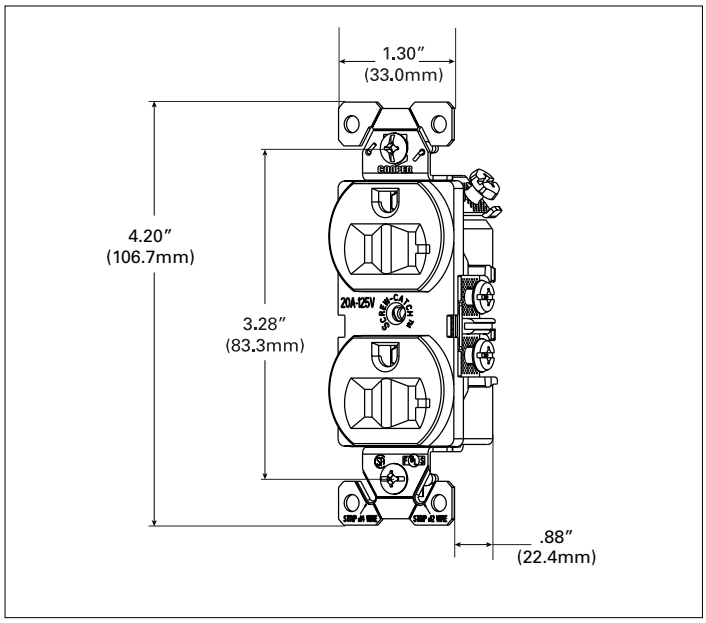


Figure 2. BR20 Line Art with Dimensions

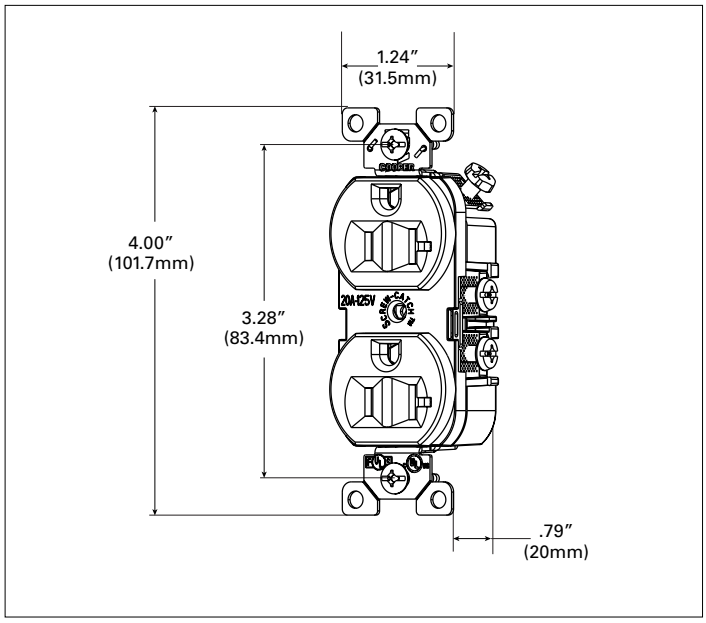


Figure 3. CR20 Line Art with Dimensions

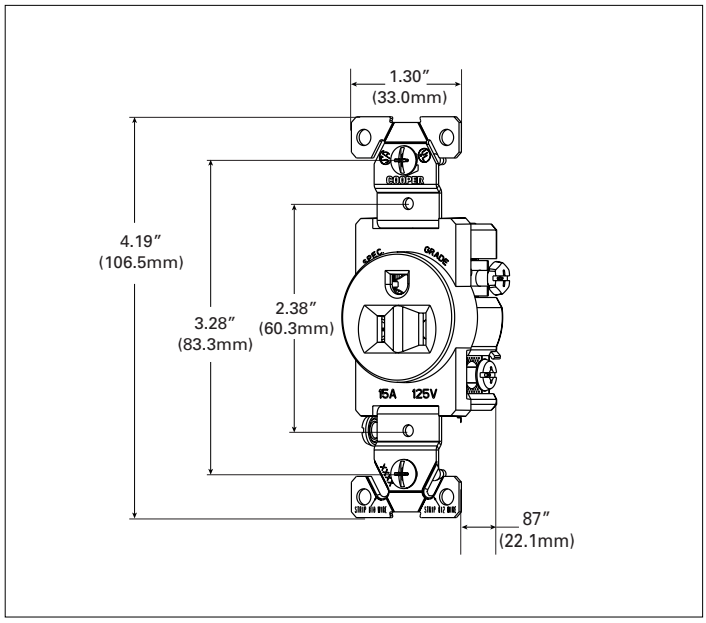


Figure 4. 817 Line Art with Dimensions

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Product Dimensions

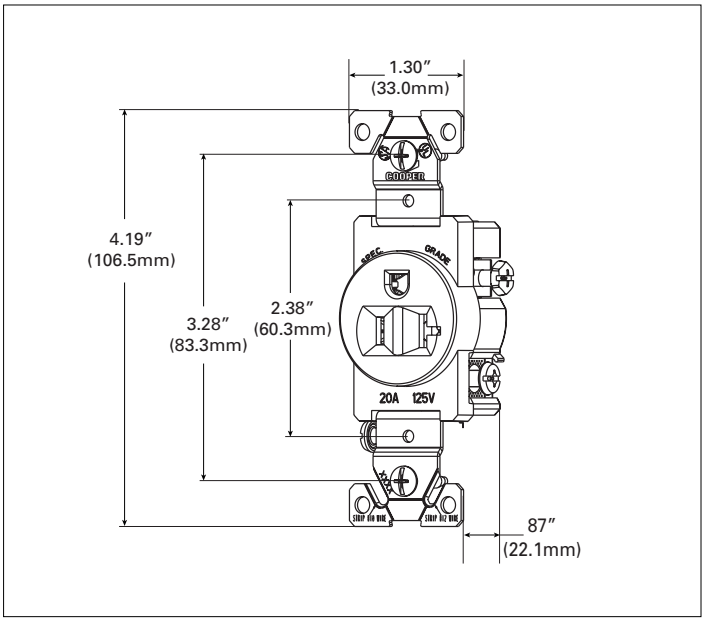


Figure 5. 1877 Line Art with Dimensions

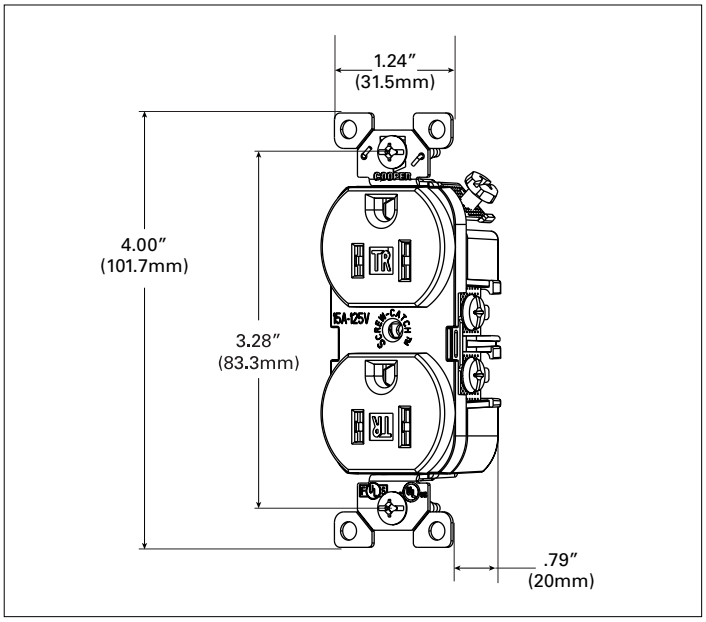


Figure 6. TRBR15 Line Art with Dimensions

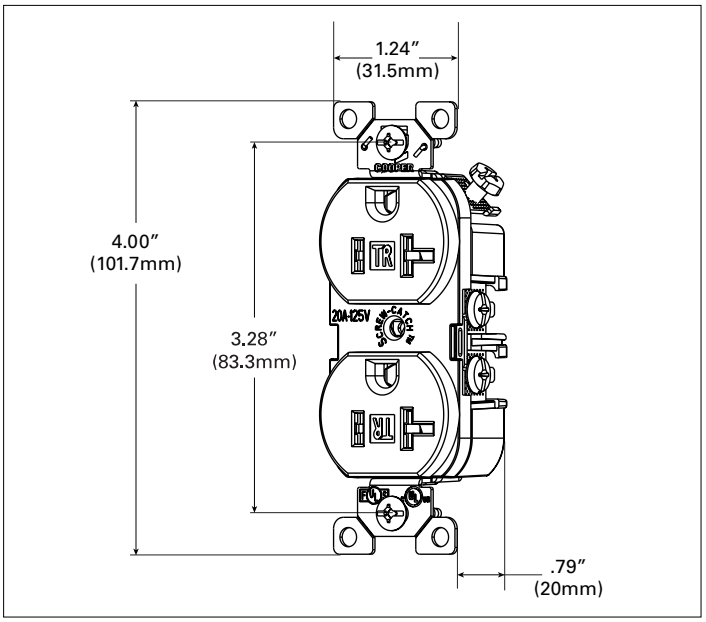


Figure 7. TRBR20 Line Art with Dimensions

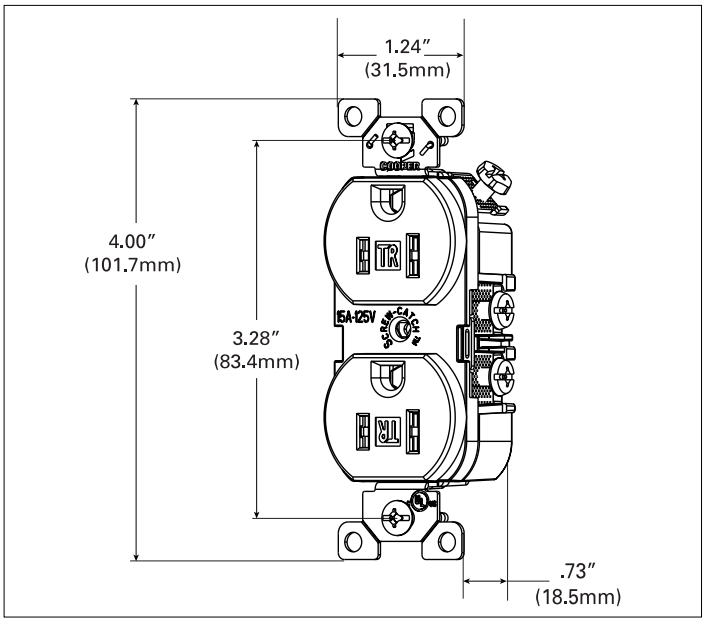


Figure 8. TRCR15 Line Art with Dimensions

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Product Dimensions

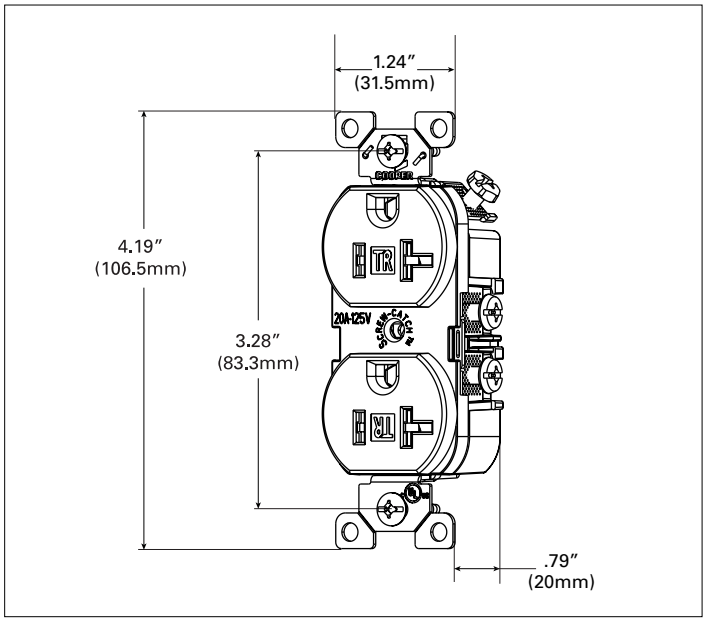


Figure 9. TRCR20 Line Art with Dimensions

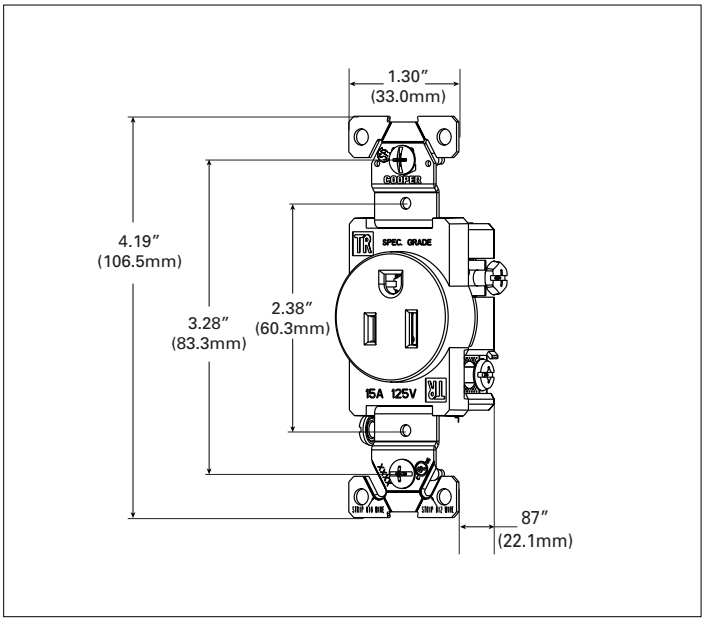


Figure 10. TR817 Line Art with Dimensions

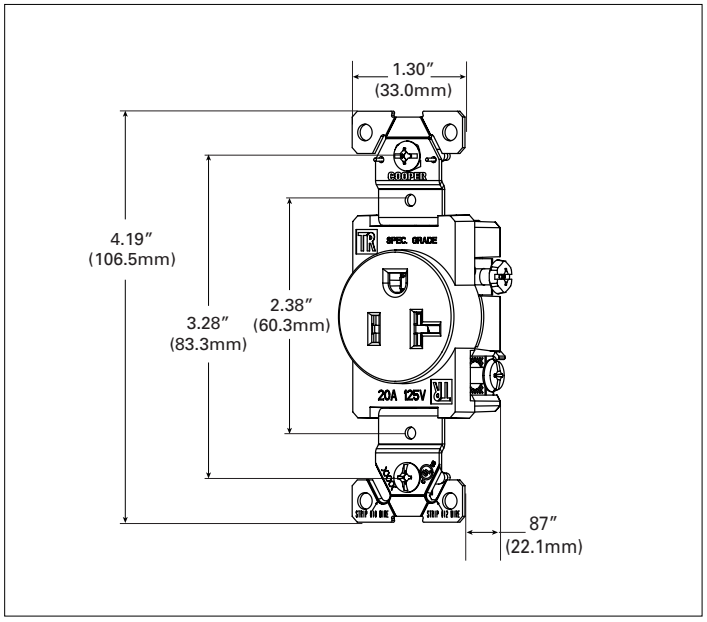


Figure 11. TR1877 Line Art with Dimensions

Compliances, specifications and availability are subject to change without notice.

Commercial grade straight blade duplex receptacles

Project Name:	Prepared By:
Project Number:	Date:
Catalog Number:	Type:

Certifications & compliances

Catalog No.	cULus	UL	Fed Spec	NAFTA	CSA	NOM 426	Arrowlink	Build-To-Spec	ROHS
BR15	•	•	•	•	•	•	•	•	•
CR15	•		•			•		•	•
817		•		•	•	•		•	•
BR20	•	•	•	•	•	•	•	•	•
CR20	•		•			•		•	•
1877		•		•	•	•		•	•
826	•		•			•			•
816	•			•		•		•	•
815	•	•	•		•	•			•
1876	•			•		•		•	•
829		•	•		•	•			•
TRBR15	•		•			•	•	•	•
TRCR15	•					•			•
TR817	•			•		•		•	•
TRBR20	•		•			•	•	•	•
TRCR20	•					•			•
TR1877	•					•		•	•

KEY: cULus · UL · Fed Spec · NAFTA · CSA · NOM 426 · Arrowlink · Build-To-Spec · ROHS

Parts are manufactured and designed in accordance with article 4 of the European Union's RoHS2 directive 2011/65/EU

Build-To-Spec Customizable Devices

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Electrical Sector
203 Cooper Circle
Peachtree City, GA 30269
United States
Eaton.com
Eaton.com/arrowhart

Electrical Sector
Canada Operations
5925 McLaughlin Road
Mississauga, Ontario, L5R 1B8
Canada
EatonCanada.ca
Eaton.com/arrowhart

Electrical Sector
Mexico Operations
Carr. Tlalnepantla -
Cuautitlan Km 17.8 s/n
Col. Villa Jardin esq.
Cerrada 8 de Mayo
Cuautitlan, Mexico CP 54800
Mexico
Eaton.mx
Eaton.com/arrowhart

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prescolite

LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

DATE: | LOCATION:

TYPE: D2 | PROJECT:

CATALOG #:

LITEISTRY

FEATURES

- 4" architectural LED downlight delivering 600 – 4000 lm
- Five beam distributions from 0.3 to 1.2 Spacing Criteria
- Quiet reflector appearance with superior 50° optical cutoff
- 2700K – 5000K, 80+ and 90+ CRI options
- Available for New Construction (non-IC), IC and Chicago Plenum applications
- Variety of dimming protocol options including 0–10V, DALI, DMX, Lutron Forward Phase and EcoSystem
- NX Distributed Intelligence™ wired and wireless controls capability available

WET LOCATION | C SA US | ENERGY STAR | BUY AMERICAN SOLUTIONS — See Certification Specifications



RELATED PRODUCTS

- LTR-4RD-RFH Retrofit
- LTR-4RD SpectraSync
- 4" LITEISTRY Family
- LTR-4RD PowerHUBB

SERVICE PROGRAMS

STOCK | QS10

CONTROL TECHNOLOGY

NX DISTRIBUTED™ INTELLIGENCE

SPECIFICATIONS

CONSTRUCTION

- Standard Non-IC. Chicago Plenum and IC options
- Painted black durable steel platform with pre-installed bar hangers
- Pre-wired junction box with snap-on covers for easy access
- Snap-in connection from driver compartment allows easy installation
- Light Engine connections use plenum rated (CMP) cable

OPTICS

- Visually pleasing 50° cutoff to source and source image
- The light distribution is free of distracting bright spots or pixelation and the perimeter has a smooth transition
- Optical grade silicone lens integral to light engine
- High purity spun aluminum reflector, self-flanged
- Flush Mount flange option with mud-in ring available
- Large selection of anodized finishes and colors
- Painted cones and flange options available

ELECTRICAL

- Chip-on-board LED with 2 SDCM
- Multiple CCTs, 80+ or 90+ CRI
- Long LED life: L90 at >55,000 hours (TM-21)
- Universal voltage 120V–277V driver, 347V optional
- UL Class 2, inherent short circuit and overload protection, RoHS compliant
- Flicker free 0-10V dimming with 1% or <1% performance
- DALI, DMX, and Lutron Forward Phase and EcoSystem options
- Integral and remote emergency controller and battery pack options available
- NX or Lutron Vive control options available
- Refer to additional spec sheets for information on SpectraSync™ Tunable White or Dim-to-Warm or PowerHUBB™ PoE enabled solutions

INSTALLATION

- Accommodates ceiling thickness up to 2"
- Universal adjustable mounting brackets also accept 0.5" EMT conduit or 1.5" or 0.75" lathing channel (by others) or Prescolite accessory bar hangers (B24 or B6)
- Light Engine/Driver fully serviceable from above or below the ceiling

CERTIFICATIONS

- cCSAus certified to UL 1598
- Suitable for wet locations, covered ceiling. EM/ EMR: Suitable for damp locations.
- EM/EMR: Certified under UL 924 standard for emergency lighting and power equipment
- Approved for 8 (4 in/4 out) No. 12AWG conductors rated for 90°C through wiring
- ENERGY STAR® certified models available (See list and additional information on page 7)
- This product qualifies as a "designated country construction material" per FAR 52.225-11 Buy American-Construction. Materials under Trade Agreements effective 6/6/2020. See Buy American Solutions.

WARRANTY

- 5 year warranty
- See HLI Standard Warranty for additional information

KEY DATA	
Lumen Range	600-4000
Wattage Range	8-52
Efficacy Range (LPW)	90-99*
Reported Life (Hours)	L90 / >55,000
Input Current (mA)	65-433 (120V)

*Based on Specular, 35K, 80 CRI

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HUBBELL Lighting

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LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

DATE: LOCATION:

TYPE: PROJECT:

CATALOG #:

= Service Program

STOCK QS10

Click icons for a list of Stocked or Quick-Ship options

ORDERING GUIDE

Example: LTR–4RD–H–SL10L–DM1–LTR–4RD–T–SL35K8MD–S

CATALOG #

HOUSING

LTR-4RD-H –

Aperture/Shape/Function		Lumen Package		Lumen Output		Driver Options		Control Options		Voltage		Housing Options	
LTR-4RD-H	4" Round Downlight New Construction Housing	SL	Standard Lumen	06L	600	DM1	0-10V Dimming to 1%	NXE	NX Enabled, Dual SmartPorts [3]	*Standard 120-277V*		CP	Chicago Plenum [7,9]
		ML	Medium Lumen	10L	1000	DM01	0-10V Dimming to < 1%	NXWE	NX Wireless Enabled [3]	34	347V [6]	IC	IC rated [8,9]
		HL	High Lumen	15L	1500	DMX	DMX with RDM dimming to < 0.1% [2]	NXWD	NX Wireless Enabled, Dual SmartPorts [3]			EM	Emergency Battery Pack with integral test switch and indicator light [9]
				20L	2000	DALI	DALI Dimming to 1%	LV	Lutron Vive Enabled, 0-10V (requires 0-10V driver)			EMR	Emergency Battery Pack with remote test switch and indicator light [9]
				25L	2500	2DM	Lutron Hi-Lume 2-wire Dimming to 1% (120V Forward Phase only) [2]	LVE	Lutron Vive Enabled, EcoSystem, (requires EDM)			DTS	Device Transfer Switch with Dimming Bypass [9,11]
				30L	3000	EDM	Lutron Hi-Lume EcoSystem Dimming to 1% [2]					GTD	Generator Transfer Device [9]
				35L	3500							F	Fuse
				40L	4000								

TRIM

LTR-4RD-T –

Aperture/Shape/Function		Lumen Package		CCT		CRI		Distribution	
LTR-4RD-T	4" Round Downlight Light Engine/Trim Assembly	SL	Standard Lumen	27K	2700K	8	80+CRI	VNR	Very Narrow (0.3 SC/20°) [13]
		ML	Medium Lumen	30K	3000K	9	90+CRI	NR	Narrow (0.4 SC/29°)
		HL	High Lumen	35K	3500K			MD	Medium (0.7 SC/44°)
				40K	4000K			WD	Wide (0.9 SC/61°)
				50K	5000K [1]			XW	Extra Wide (1.2 SC/78°)

TRIM CONTINUED

–

Reflector Finish		Reflector Color		Flange Color Options		Lower Trim Options		Reflector Options	
Finish not applicable with painted reflectors (WC or BC)		*Standard Clear*		*Standard matches reflector color*		EM	Pre-punched reflector for EM integral test switch and indicator	AM	Antimicrobial Coating [5]
S	Specular	CG	Champagne Gold	WT	White Flange [4]	FM	Flush Mount Mud-in Ring [10]		
SS	Semi-Specular	BL	Black	BT	Black Flange [4]	WF	Wide Flange		
MFC	American Matte™	LW	Light Wheat						
VS	Softglow®	PW	Pewter						
VSS	SoftSheen™	WC	Painted White Cone and Flange						
		BC	Painted Black Cone and Flange						

Accessories	
☐ B24	Set of two (2) 24" bar hangers for T-bar ceilings
☐ B6	Set of two bar hangers for ceiling joist up to 24" centers
☐ FMR4-R	Flush Mount Mud-In Ring Accessory, 4" Round
☐ LiteGear	LiteGear® Inverter, 125VA-250VA
☐ LPS Series	LightPower Micro-Inverter, 20VA-55VA
☐ MOR4-R-WH	Metal Oversized Ring, 4" Round, White (8.25" outside diameter)
☐ MOR4-R-BL	Metal Oversized Ring, 4" Round, Black (8.25" outside diameter)
☐ LTR-SCA4-__	Sloped Ceiling Adapter, 4", White [12]

Notes:

1 5000K available in 80+ CRI only.
2 2DM, EDM, DMX available in 10L-35L.
3 NX requires DM1 driver option.
4 WT not needed for WC, BT not needed for BC.
5 AM available with WC or Specular Clear (S or SWT). Consult factory for other colors.
6 347V requires DM1 driver option; not available in 06L or with Controls F, DTS, GTD, EM, EMR.
7 CP available up to 20L; not available with DMX, Controls, or EMR options.
8 IC available up to 20L; not available with Controls options.
9 Housing options (except Fuse) not available in combination.
10 Flush Mount Flange (FM) requires FMR accessory (sold separately).
11 DTS available with DM1, DM01, DALI, or EDM; not available with LVE.
12 Specify slope angle 5°-35° in 5° increments. Not available with EM, WF, or FM options.
13 VNR available up to 30L.

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HUBBELL Lighting

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LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

DATE: LOCATION:

TYPE: PROJECT:

CATALOG #:

CONTROLS

NX Distributed Intelligence™ Lighting Controls:

Supports applications in a variety of deployment options- wired, wireless, hybrid. Integrates with and enables a wide array of luminaires including those with SpectraSync™ Color Tuning Technology.

NX DISTRIBUTED™ INTELLIGENCE

NX INTEGRATED CONTROLS REFERENCE								
NX Option	Sensor	Networkable	Scheduling	Occupancy	Daylight Harvesting	0–10V Dimming	On/off Control	Bluetooth® App Programming
NX Networked – Wired								
NXE	N/A	Yes	Yes	No	No	Yes	Yes	Requires NXBTC/R[1]
NX Networked – Wireless								
NXWE[2]	N/A	Yes	Yes	No	No	Yes	Yes	No[3]
NX Networked – Wired/Wireless								
NXWD	N/A	Yes	Yes	No	No	Yes	Yes	Requires NXBTC/R[1,3]

1 NXBTC/R needs to be plugged into an available NX SmartPort™ on the fixture network

2 Programming via App requires factory assistance

3 To program NXWE option, need to consult factory. If connected to an area controller, programming can be done from that

NX Design & Application Guide

NX Brochure

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HUBBELL Lighting

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LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

DATE: LOCATION:

TYPE: PROJECT:

CATALOG #:

PERFORMANCE DATA TABLE

Performance data provided below is for 3500K, 80 CRI with Specular Clear reflector finish/color

Lumen Package	Nominal Lumens	Distribution	"Delivered Lumens"	Watts	LPW
06L	600	Very Narrow	691	7.6	91
		Narrow	785	7.8	101
		Medium	726	7.8	93
		Wide	664	7.8	85
		Extra Wide	644	7.8	83
10L	1000	Very Narrow	1132	11.8	96
		Narrow	1255	12.0	105
		Medium	1160	12.0	97
		Wide	1062	12.0	89
		Extra Wide	1030	12.0	86
15L	1500	Very Narrow	1623	17.2	94
		Narrow	1795	18.6	97
		Medium	1660	18.6	89
		Wide	1519	18.6	82
		Extra Wide	1474	18.6	79
20L	2000	Very Narrow	2032	22.4	91
		Narrow	2238	22.5	99
		Medium	2152	22.5	96
		Wide	2059	22.5	92
		Extra Wide	2028	22.5	90
25L	2500	Very Narrow	2447	28.6	86
		Narrow	2985	27.8	107
		Medium	2760	27.8	99
		Wide	2526	27.8	91
		Extra Wide	2451	27.8	88
30L	3000	Very Narrow	2855	35.9	80
		Narrow	3583	34.6	104
		Medium	3313	34.6	96
		Wide	3032	34.6	88
		Extra Wide	2941	34.6	85
35L	3500	Narrow	4280	42.9	100
		Medium	3957	42.9	92
		Wide	3622	42.9	84
		Extra Wide	3514	42.9	82
40L	4000	Narrow	4885	51.5	95
		Medium	4517	51.5	88
		Wide	4134	51.5	80
		Extra Wide	4011	51.5	78

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LTR-4RD

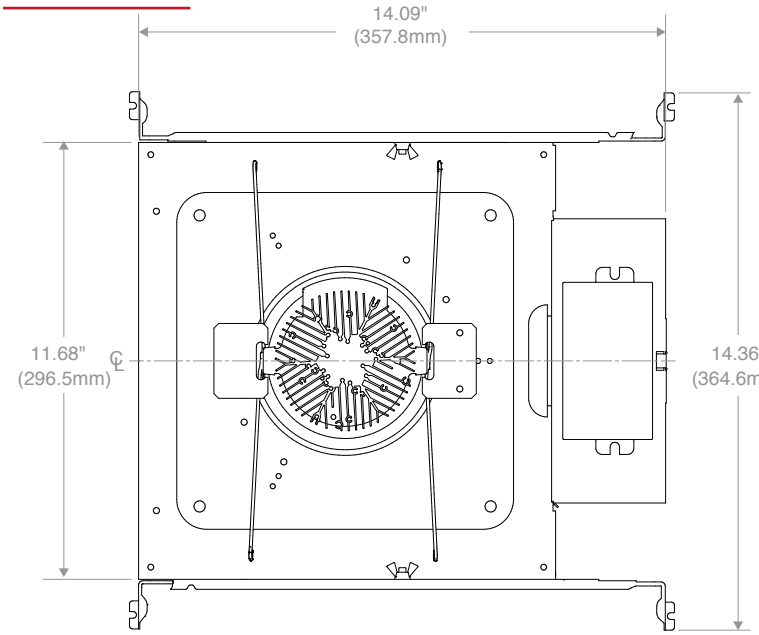
LITEISTRY 4" ROUND DOWNLIGHT

DATE: LOCATION:

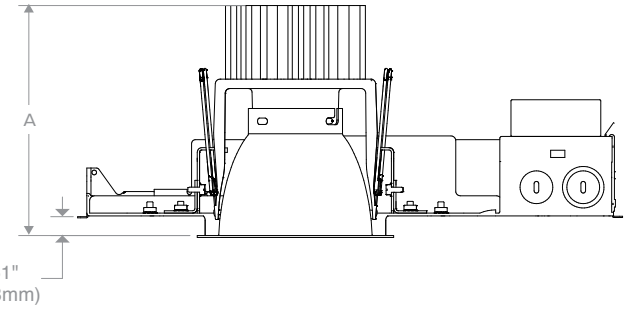
TYPE: PROJECT:

CATALOG #:

DIMENSIONS



Top View

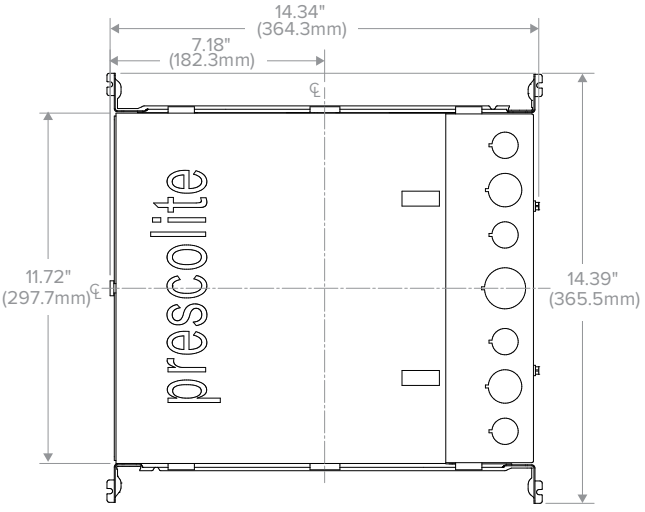


Dimensional Data		
Aperture		4.00" (101.6mm)
Flange:	Standard	5.25" (133.4mm)
	Flush Mount	4.50" (114.3mm)
Ceiling Cutout:	Standard	5.00" (127.0mm)
	Flush Mount	5.12" (130.0mm)
Ceiling Thickness:	Standard or w/ SCA 5-20° slope	0.50" to 2.00" (12.7mm to 50.8mm)
	With SCA 25-35° slope	0.50" to 1.75" (12.7mm to 44.6mm)

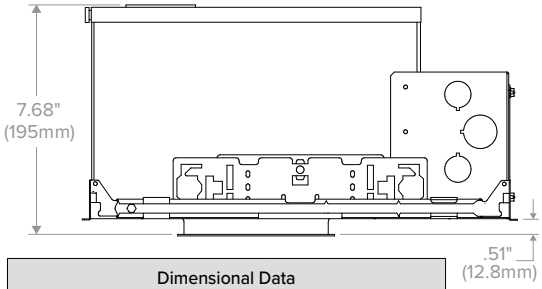
Lumen Package	"A"
06L-15L	4.97" (126.2mm)
20L-30L	6.15" (156.2mm)
35L-40L	7.33" (186.2mm)

SCA Sloped Ceiling Adapter accessory available, see LTR-SCA specification sheet and installation instructions for dimensional data and other details.

LTR-4RD-H New Construction



Top View



Dimensional Data		
Aperture		4.00" (101.6mm)
Flange:	Standard	5.25" (133.4mm)
	Flush Mount	4.50" (114.3mm)
Ceiling Cutout:	Standard	5.00" (127.0mm)
	Flush Mount	5.12" (130.0mm)
Ceiling Thickness:	Standard or w/ SCA 5-20° slope	0.50" to 2.00" (12.7mm to 50.8mm)
	With SCA 25-35° slope	0.50" to 1.75" (12.7mm to 44.6mm)

SCA Sloped Ceiling Adapter accessory available, see LTR-SCA specification sheet and installation instructions for dimensional data and other details.

LTR-4RD-H IC/CP

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LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

DATE: LOCATION:

TYPE: PROJECT:

CATALOG #:

PHOTOMETRY

LTR-4RD-H-ML20L-DM1 / LTR-4RD-T-ML35K8VNR-S

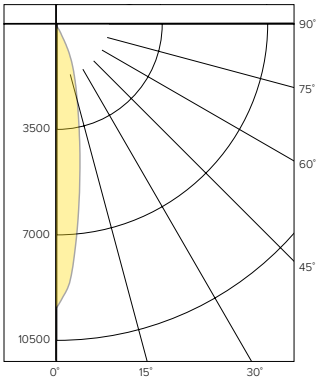
LUMINAIRE DATA

Test No.	**20.01331**
Description	**2000 lm, Very Narrow, 3500K, 80 CRI**
Delivered Lumens	**2032**
Watts	**22.4W**
Efficacy	**91**
Mounting	**Recessed**
Spacing Criterion	**0.3**
Beam Angle (FWHM)	**20**

ZONAL LUMEN SUMMARY

Zone	Lumens	% Luminaire
0-40	2011	99.0
0-60	2032	100.0
0-90	2032	100.0
0-180	2032	100.0

POLAR GRAPH



CANDELA DISTRIBUTION

Degree	Candela
0	9388
5	7360
15	2780
25	1073
35	198
45	20
55	0
65	0
75	0
85	0
90	0

LUMINANCE DATA*

Vertical Angle	Average
45°	3489
55°	0
65°	0
75°	0
85°	0

*Candela/Square Meter

LTR-4RD-H-ML20L-DM1 / LTR-4RD-T-ML35K8NR-S

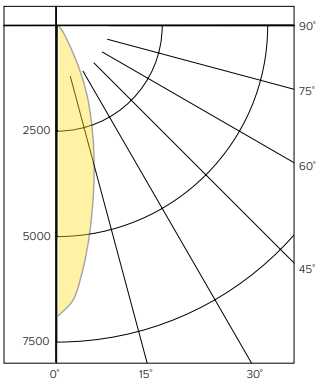
LUMINAIRE DATA

Test No.	**19.00532**
Description	**2000 lm, Narrow, 3500K, 80 CRI**
Delivered Lumens	**2238**
Watts	**22.5W**
Efficacy	**99.3**
Mounting	**Recessed**
Spacing Criterion	**0.4**
Beam Angle (FWHM)	**29**

ZONAL LUMEN SUMMARY

Zone	Lumens	% Luminaire
0-40	2208	98.6
0-60	2237	99.9
0-90	2238	100.0
0-180	2238	100.0

POLAR GRAPH



CANDELA DISTRIBUTION

Degree	Candela
0	6877
5	6035
15	3284
25	1313
35	260
45	26
55	3
65	1
75	0
85	0
90	0

LUMINANCE DATA*

Vertical Angle	Average
45°	4535
55°	645
65°	292
75°	0
85°	0

*Candela/Square Meter

LTR-4RD-H-ML20L-DM1 / LTR-4RD-T-ML35K8MD-S

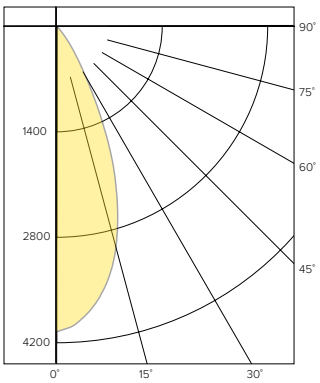
LUMINAIRE DATA

Test No.	**19.00533**
Description	**2000 lm, Medium, 3500K, 80 CRI**
Delivered Lumens	**2152**
Watts	**22.5W**
Efficacy	**95.6**
Mounting	**Recessed**
Spacing Criterion	**0.7**
Beam Angle (FWHM)	**44**

ZONAL LUMEN SUMMARY

Zone	Lumens	% Luminaire
0-40	2113	98.2
0-60	2151	99.9
0-90	2152	100.0
0-180	2152	100.0

POLAR GRAPH



CANDELA DISTRIBUTION

Degree	Candela
0	4053
5	3893
15	3037
25	1493
35	366
45	34
55	3
65	1
75	0
85	0
90	0

LUMINANCE DATA*

Vertical Angle	Average
45°	5931
55°	645
65°	292
75°	0
85°	0

*Candela/Square Meter

IES FILE

IES FILE

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PHOTOMETRY CONTINUED

LTR-4RD-H-ML20L-DM1 / LTR-4RD-T-ML35K8WD-S

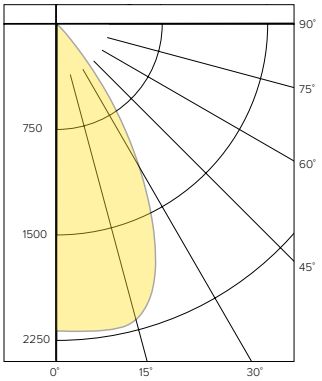
LUMINAIRE DATA

Test No.	**19.00534**
Description	**2000 lm, Wide, 3500K, 80 CRI**
Delivered Lumens	**2059**
Watts	**22.5W**
Efficacy	**91.6**
Mounting	**Recessed**
Spacing Criterion	**0.9**
Beam Angle (FWHM)	**61**

ZONAL LUMEN SUMMARY

Zone	Lumens	% Luminaire
0-40	1983	96.3
0-60	2056	99.8
0-90	2059	100.0
0-180	2059	100.0

POLAR GRAPH



CANDELA DISTRIBUTION

Degree	Candela
0	2201
5	2210
15	2051
25	1504
35	692
45	169
55	10
65	3
75	1
85	0
90	0

LUMINANCE DATA*

Vertical Angle	Average
45°	11338
55°	1075
65°	584
75°	477
85°	0

*Candela/Square Meter

IES FILE

LTR-4RD-H-ML20L-DM1 / LTR-4RD-T-ML35K8XW-S

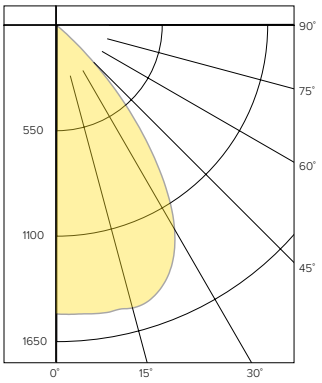
LUMINAIRE DATA

Test No.	**19.00535**
Description	**2000 lm, Extra Wide, 3500K, 80 CRI**
Delivered Lumens	**2028**
Watts	**22.5W**
Efficacy	**90.2**
Mounting	**Recessed**
Spacing Criterion	**1.2**
Beam Angle (FWHM)	**78**

ZONAL LUMEN SUMMARY

Zone	Lumens	% Luminaire
0-40	1794	88.5
0-60	2025	99.8
0-90	2028	100.0
0-180	2028	100.0

POLAR GRAPH



CANDELA DISTRIBUTION

Degree	Candela
0	1235
5	1252
15	1392
25	1454
35	1010
45	256
55	6
65	2
75	1
85	0
90	0

LUMINANCE DATA*

Vertical Angle	Average
45°	44656
55°	1290
65°	584
75°	231
85°	477

*Candela/Square Meter

IES FILE

LUMEN MULTIPLIER

Option	27K8	30K8	35K8	40K8	50K8	27K9	30K9	35K9	40K9
Multiplier	0.94	0.98	1.00	1.01	1.02	0.81	0.84	0.85	0.85

Photometrics are published below at a nominal 3500 Kelvin, 80+ CRI. This table may be used to approximate the lumen values at different Kelvin temperatures. Power consumption would stay the same.

REFLECTOR FINISH MULTIPLIER (Based on Clear (Standard) Color)

Option	Specular (S)	Semi-Specular (SS)	American Matte (MFC)	Softglow (VS)	Softsheen (VSS)
Multiplier	1	1	0.984	0.888	0.938

REFLECTOR COLOR MULTIPLIER (Based on Semi-Specular (SS) Finish)

Option	Clear (Standard)	Champagne Gold (CG)	Black (BL)	Light Wheat (LW)	Pewter (PW)	White Cone (WC)	Black Cone (BC)
Multiplier	1	0.974	0.444	0.861	0.915	0.984	0.442

Multiply FINISH x COLOR to calculate other reflector finish and color combinations. Example: SoftGlow Pewter (VSPW) = 0.888 (VS) x 0.915 (PW) = 0.813

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LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

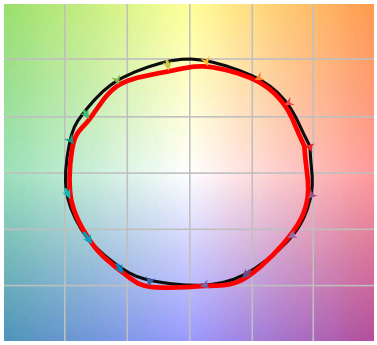
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TYPE: PROJECT:

CATALOG #:

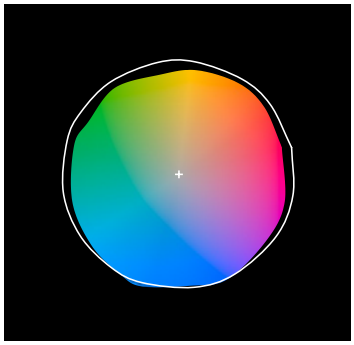
TM-30 DATA

COLOR VECTOR GRAPHIC 3500K, 90 CRI



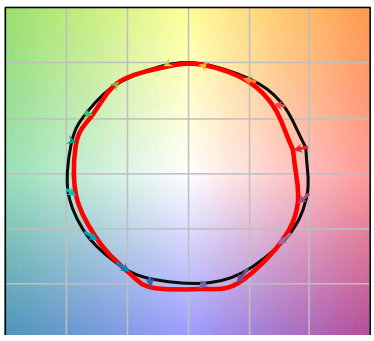
Reference Illuminant — Test Source

COLOR DISTORTION GRAPHIC 3500K, 90 CRI



TEST RESULTS - 3500K		
Value	80+ CRI	90+ CRI
R_f	84	88
R_g	95	95
CCT (K)	3411	3419
D_{UV}	0.0015	0.0042
x	0.4120	0.4147
y	0.3974	0.4052
CIE R_a	84	93
CIE R_9	11	62

COLOR VECTOR GRAPHIC 3500K, 80 CRI



Reference Illuminant — Test Source

COLOR DISTORTION GRAPHIC 3500K, 80 CRI



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DATE: LOCATION:

TYPE: PROJECT:

CATALOG #:

LTR-4RD

LITEISTRY 4" ROUND DOWNLIGHT

ELECTRICAL DATA

DRIVER DATA		
Input Voltage	120-277 V	347 V
Input Frequency	50/60 Hz	50/60 Hz
Power Factor	≥0.90	≥0.90
THD	<20%	<20%
EMI Filtering (FCC 47 CFR Part 15)	Class A	Class A

* Values for DM1 option shown, values for other dimming options may vary.

WATTAGE DATA		
Lumen Output	Nominal Lumens	Wattage
06L	600	8
10L	1000	12
15L	1500	19
20L	2000	23
25L	2500	28
30L	3000	35
35L	3500	43
40L	4000	52

* Wattage may vary based on configuration and options selected

ADDITIONAL INFORMATION

DIMMING COMPATIBILITY CHART		
Dimming Driver	Manufacturer	Web Link
DM1 /DM01	Lutron DVTV	http://bit.ly/11jSvZg
DM1	Leviton AWRMG-7xx, AWSMG-7xx, AWSMT-7xx	http://bit.ly/1BJn2R9
EDM	Lutron	http://bit.ly/1vtjHAl
2DM	Lutron	http://bit.ly/1S4WjXK

DMX

See instruction sheet on www.prescolite.com for connection & installation information.

Central Inverters

For full fixture output in back-up mode, we recommend you visit www.dual-lite.com for your Central Lighting Inverter options. Please contact your local Hubbell representative for any assistance with proper sizing and loading of your inverter selection. Central lighting inverters must be ordered separately.
LiteGear: www.dual-lite.com/products/litegear_lg_series
LPS Series: www.dual-lite.com/products/lps

ENERGY STAR®

For a list of certified models, click on the ENERGY STAR® MODELS link or visit www.energystar.gov.

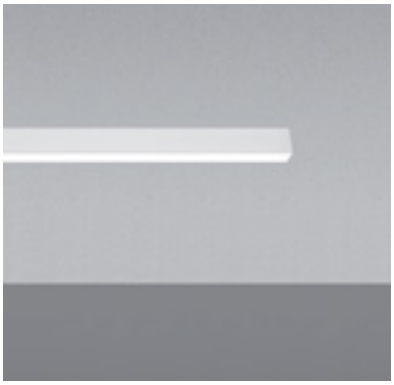
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20 Linear Surface

inter•lux

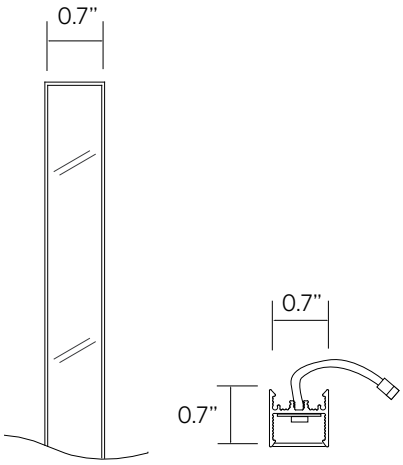


Ordering Information

WG-20LDL-SM

Model	Fixation	Pattern	Length	Power[1]	CRI/ CCT[2]	Driver[3]	Lens	Finish	Cable
WG-20LDL-SM	GT9 GT15 MM SC A90 A180	S P[1] PZ[1] PPI PPO	A A x B A x B x C A x B x A x B	L M H	927 930 935 940	X S D010 L3DAE L3D0E DFPN EL96	OD (std) SD	W (std) B S F	C4 (std) C10 C20 C30

GT9T (TEGULAR GRID CLIP)



Luminaire

- Continuous, evenly illuminated snap-in lens without visible LED pattern.
- Standard Opal Diffuser for even illumination and no LED appearance. Satin Diffuser for high efficiency and minimal LED appearance.
- Field replaceable LED boards.
- 90+ CRI, 3 steps MacAdam.
- Lengths and angles factory cut to exact field dimensions.
- Standard and custom corners.
- Powder coat painted white - RAL 9010.
- 4' class 2 plenum rated feed cable standard (Options – "C4").

Fixation

- GT9 = 9/16" T-bar grid clip
- GT15 = 15/16" T-bar grid clip
- MM = Magnet mounting
- SC = Screw clip
- A90 = Adjustable 90° bracket
- A180 = Adjustable 180° bracket

Pattern

- S = Straight run
- P = Standard patterns 2, 3 or 4 sided with 90° corners on the same plane[1]
- PZ = Non-standard patterns and/or corners other than 90° on multiple planes, consult factory[1]
- PPI = Pattern, Plane to Plane, Inside. 2-3-4 sided pattern with inside corners. Direction of light inwards.
- PPO = Pattern, Plane to Plane, Outside. 2-3-4 sided pattern with outside corners. Direction of light outwards.

Length

- A, B, C = specify inches to the nearest 0.25" (i.e. 72"). For pattens specify each length (i.e. 2 sided: A x B = 72" x 48"; 3 sided: A x B x C; 4 sided: A x B x A x B).

Power[1]

- L = 3W/ft low power (24V)
- M = 6W/ft mid power (24V)
- H = 10W/ft high power (24V)

CRI/CCT[2]

90+ CRI (Low/Mid/High Power)

- 927 = 2700K (169/338/591 lm/ft)
- 930 = 3000K, (184/367/642 lm/ft)
- 935 = 3500K, (218/436/763 lm/ft)
- 940 = 4000K, (259/518/907 lm/ft)

Driver (remote)[3]

- X = No driver, ordered separately
- S = Standard driver 120-277V
- D010 = Osram, 10%, 0-10V dimming, 120-277V
- L3DAE = Lutron Hi-lume 1% EcoSystem, 120-277V
- L3D0E = Lutron Hi-lume Premier 0.1% EcoSystem, 120-277V
- DFPN = Lutron Forward Phase 1%, 120VAC
- EL96 = Osram / EldoLED, 24V, 1% 0-10V Dimming (1"x3"x23" driver enclosure)

Lens

- OD = Satin opal diffuser (standard)
- SD = Satin clear diffuser (high efficiency)

Finish

- W = White, 15% gloss, RAL9010 (standard)
- B = Black, 15% gloss, Tiger Drylac 44/90053
- S = Silver, 15% gloss, Tiger Drylac 49/90500
- F = Custom finished trim, specify RAL

Cable

- C4 = 4' tray cable (plenum rated) (standard)
- C10 = 10' tray cable (plenum rated)
- C20 = 20' tray cable (plenum rated)
- C30 = 30' tray cable (plenum rated)

Emergency (remote only)

- Emergency LED driver available, order separately.

1 See pattern spec sheet.
2 Wattage shown does not include power supplies/drivers.
3 Delivered lumens with satin opal diffuser shown.
4 Remote power supply required. See power supply page for details.

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	X1

FEATURES & SPECIFICATIONS

INTENDED USE — Suitable for applications requiring attractive edge-lit exit signage, universal installation and low energy consumption.

CONSTRUCTION — Extruded brushed aluminum finish.

Clear acrylic panels- letters measure 6" high with 3/4" stroke, with 100 ft viewing distance rating, based upon UL 924 standard.

For single-face clear panels, EXIT is seen as a reversed image from the back.

OPTICS — LEDs mounted on printed circuit board. The typical life of the exit LED lamp is 10 years.

The LED operating frequency is 120Hz.

ELECTRICAL — Dual voltage input capacity (120/277V).

Battery: (EL Option) – Sealed, maintenance free nickel-cadmium battery delivers 90 minutes capacity to emergency lamps. Test switch provides manual activation of 30-second diagnostic testing for on-demand visual inspection.

Self-diagnostic testing (EL Option Only) for 30 seconds every 30 days and 90 minutes annually. Diagnostic evaluation of LED light source, AC to DC transfer, charging and battery condition.

INSTALLATION — EDG – Universal surface (top, end or back) mounting. Canopy provided.

EDGR – Recessed mounting. Bar hanger and brackets provided for both new or restricted ceiling access installation applications. Back wall mount (WM) option.

Universal directional indicators. Field selected and attached.

LISTINGS — UL damp location listed 32°-122°F (0°-50°C) standard. Meets UL924, NFPA 101 (current Life Safety Code), NEC and OSHA illumination standards.

WARRANTY — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/support/customer-support/terms-and-conditions

NOTE: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25°C.

Specifications subject to change without notice.



EDG (surface mount)



EDGR (recessed mount)

LED Edge-Lit Exits

EDG
EDGR

LED Lamps

LED

Specifications

EDG (End Mount)
Length: 13-5/8 (34.6)
Depth: 5-1/2(14.0)
Height: 11-1/8 (28.3)
Shipping Weight : 4 lbs (1.8 kgs)

EDG (Top Mount)
Length: 13 (33.0)
Depth: 4-5/16 (11.0)
Height: 11-3/4 (29.8)
Shipping Weight : 4 lbs (1.8 kgs)

EDG (Back Mount)
Length: 13 (33.0)
Depth: 3 (7.6)
Height: 11-1/8 (28.3)
Shipping Weight : 4 lbs (1.8 kgs)

EDGR
Length: 13 (33.0)
Depth: 1-3/4 (4.4)
Height: 8 (20.3)
Shipping Weight : 6.8 lbs (3.1 kgs)
Shipping Weight (WM option) : 8.1 lbs (3.7 kgs)

All dimensions are inches (centimeters) unless otherwise noted.

ORDERING INFORMATION

For shortest lead times, configure products using **bolded options**.

Example: EDG 1 R EL

Family		Housing color		Number of faces		Letter color		Operations		Options	
EDG	Surface mount LED edge-lit exit	**(blank)**	Brushed aluminum	**1**	Single face	**R**	Red on clear (single face only)[1]	**(blank)**	AC only	**(blank)**	None
EDGR	Recessed LED edge-lit exit	W	White	**2**	Double face	**G**	Green on clear (single face only)[1]	**EL**	Nickel-cadmium battery	WM	Recessed wall mount[6]
						RMR	Red on mirror[2]	X2	Lamp wired on two separate AC circuits (specify 120V or 277V)[4]		
						GMR	Green on mirror[2]	SD	Self-diagnostics[5]		
						RW	Red on white[3]				
						GW	Green on white[3]				

Accessories: Order as separate item.

ELA US12	12" stem kit with brushed aluminum canopy[7]
ELA W US12	12" stem kit with white canopy[7]
ELA WG1	Wireguard[8]

Notes

1 For single-face clear panels, EXIT is seen as a reversed image from the back.
2 Available with single and double face.
3 White panel standard for double and single face.
4 Not available with EL and SD options. Both circuits can be energized at the same time.
5 Available with EL option only.
6 Available on EDGR single face only
7 See spec sheet ELA-StemKits. Only available for EDG.
8 Back mount only.

EDG-EDGR LED, Surface and Recessed Mount Edge-Lit Exits

SPECIFICATIONS

ELECTRICAL						
Primary Circuit						
Type	**Typical LED life[1]**	**Supply voltage**	**EDG**		**EDGR**	
			Input Watts	**Max amps.**	**Input Watts**	**Max amps.**
Red LED AC only	10 years	120	2.5	0.020	3.8	0.030
		277	2.8	0.010	4.5	0.014
Green LED AC only	10 years	120	2.2	0.020	3.8	0.030
		277	2.2	0.010	4.5	0.020
Red LED emergency	10 years	120	3.0	0.030	3.8	0.031
		277	3.1	0.010	4.5	0.015
Green LED emergency	10 years	120	2.6	0.020	3.8	0.031
		277	2.8	0.010	4.5	0.020

BATTERY (EL option)			
Sealed Nickel-Cadmium			
Shelf life[2]	Typical life[2]	Maintenance[3]	Optimum temperature[4]
3 years	7-9 years	none	32-122°F (0-50°C)

Notes

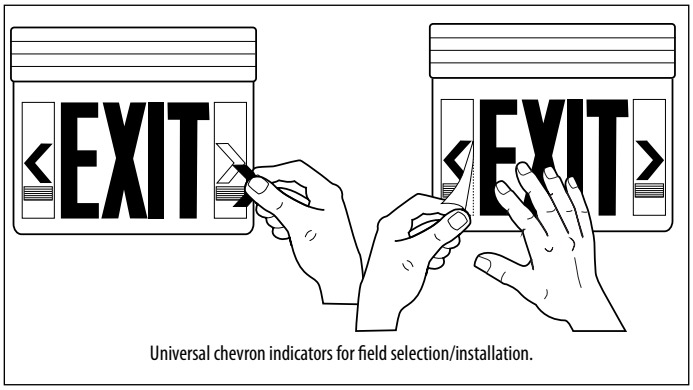
1 Based on continuous operation. The typical life of the exit LED lamp is 10 years.

2 At 77°F (25°C).

3 All life safety equipment, including emergency lighting for path of egress must be maintained, serviced, and tested in accordance with all National Fire Protection Association (NFPA) and local codes. Failure to perform the required maintenance, service, or testing could jeopardize the safety of occupants and will void all warranties.

4 Optimum ambient temperature range where unit will provide capacity for 90 minutes. Higher and lower temperatures affect life and capacity.

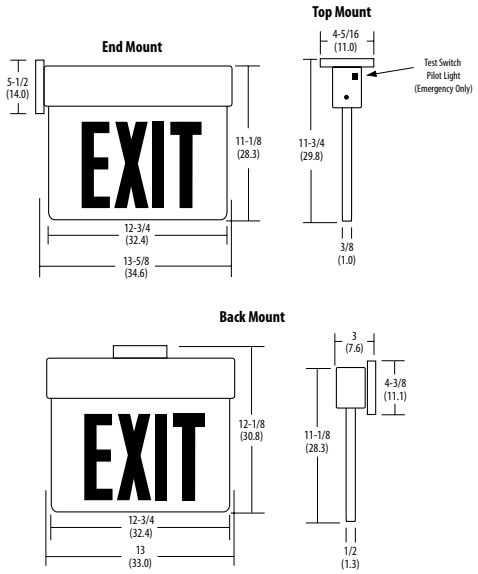
KEY FEATURES



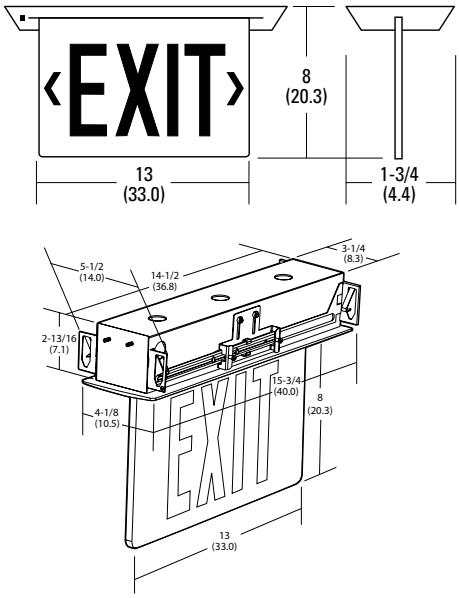
Universal chevron indicators for field selection/installation.

MOUNTING

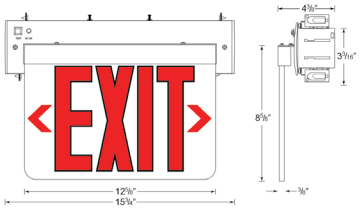
EDG



EDGR



EDGR WM option



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MOD™ 4 LED Recessed Direct

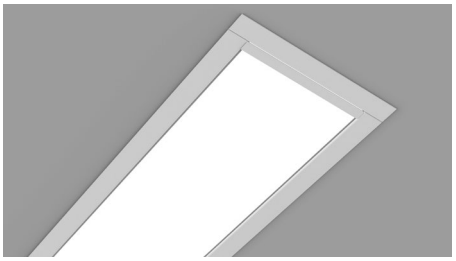
Fixture Type:

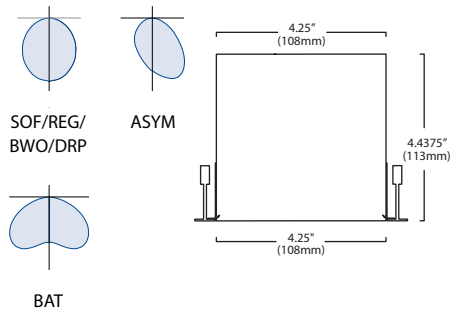
Project Name:

Ordering Guide

Feature	Code	Options	Description
Series		4L	MOD
Ceiling Type*		DW PT LG NG SS	Drywall Drywall with plaster trim (trimless finish) 15/16 Grid 9/16 Grid 9/16 Screw Slot *Ceiling Type cannot be retrofitted in the field
Fixture distribution		D AD	Direct Asymmetric Direct
Row length (in feet)		___'	Enter in foot increments. Note fixture lengths below.
Row length adder (in inches)		.3 .6 .9	Row length +3" Row length +6" Row length +9" *Excludes Individual Grid Mounts
Max length in row		02 03 04 05 06 08	2', 609mm 3', 914mm 4', 1219mm 5', 1524mm 6', 1829mm 8', 2438mm
Downlight diffuser		SOF REG BWO ASYM BAT DRP	Soft Diffuse Lens Regressed Diffuse Lens* Blade Baffle with Overlay* Asymmetric Diffuser Lens*/** Batwing Lens Drop Lens*+ *Not available with Patterns **Must be ordered with AD
Finish/Color		C1 C2 C3 C4 C5 C6 CC	Matte White (Default) Textured Matte White Light Silver Machined Aluminum Carbon Black Textured Camera Black Custom Color
Color temperature		27K 30K 35K 40K 50K 27K9 30K9 35K9 40K9 50K9 2230TD 2750T 2765T	2700K+ 3000K 3500K 4000K 5000K+ 2700K, 90 CRI+ 3000K, 90 CRI 3500K, 90 CRI 4000K, 90 CRI 5000K, 90 CRI+ 2200K-3000K SpectraSync™ Dim-to-Warm* 2700K-5000K SpectraSync™ Tunable White* 2700K-6500K SpectraSync™ Tunable White* *Must be ordered with D05 Driver option; excludes 2' lengths and patterns
Direct output/ft *(specifiable in 50 lumens/ft increments)*		D030 D125	300 (not available in 2') 1250

+ Additional lead time may be applicable. Contact factory.





Key Features

- Variable Intensity technology provides specifiable lumen output/wattage
- End cap design eliminates visible diffuser seams/gaps
- 2 SDCM color variation

Performance

Nomenclature	Lumens/ft	W/ft	Efficacy
D030	300	2.6	118
D035	350	3.0	118
D040	400	3.4	118
D045	450	3.8	118
D050	500	4.2	118
D055	550	4.7	117
D060	600	4.8	117
D065	650	5.6	116
D070	700	6.1	116
D075	750	6.5	115
D080	800	7.0	115
D085	850	7.5	113
D090	900	7.9	113
D095	950	8.5	112
D100	1000	9.0	112
D105	1050	9.4	111
D110	1100	10.0	110

(wattage may vary up to 5% from published)

Quick Find litecontrol.com **4L-R-D**

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MOD™ 4 LED Recessed Direct

Ordering Guide (continued)

Driver		NDM	Non Dimming
		D05	5% Dimming, 0-10V*
		D01	1% Dimming, 0-10V
		DS1	Soft-Start 1% Dimming, 0-10V
		D00	Dim-to-off (1%), 0-10V
		DS0	Soft-Start Dim-to-off (1%), 0-10V
		LEC	Hi-lume 1% EcoSystem LED driver
		DALI	DALI+
		DALIP	Powered DALI (2.0)+
			*Must be ordered with 2230TD, 2750T or 2765T Option
Circuiting		1C	1 Circuit
Voltage		UNV	Universal Voltage (120V through 277V)
		347	347 Volt*+
			*Excludes Emergency Battery Pack 'EF' Option. Excludes DALI, DALIP and Lutron (LEC) Dimming Drivers
Optional Features	**Code**	**Options**	**Description**
Nightlight		NL	Nightlight Circuit Required. Enter quantity. 2NL = 2 nightlight circuits/row
Emergency		EF	10W Emergency Battery Backup Enter quantity. 2EF = 2 Emergency batteries/row. See Details for restrictions.
Thru-wiring		W1	No Thru Wire
		W2	Provide Normal and Emergency/Nightlight Thru Wiring*
		W3	Provide Normal Thru Wiring Only
			*Only applicable when specified with Emergency/Nightlight
Patterns+*		C90L	Illuminated 90° corner
		C120L	Illuminated 120° corner
		C135L	Illuminated 135° corner
			*Contact Factory for pattern configurations. Approval drawings required. See page 5.
Chicago Environmental Air Modification		CCEA	Chicago Environmental Air Modification
Control Options	**Code**	**Options**	**Description**
NX*+		NXE	NX Enabled, Dual SmartPorts
		NXWE	NX Wireless Enabled
		NXES	NX Enabled, Dual SmartPorts, PIR Occupancy Sensor, Dimming Daylight Harvesting
		NXS	NX, PIR Occupancy Sensor, Dimming Daylight Harvesting (standalone)
		NXSW	NX Wireless, PIR Occupancy Sensor, Dimming Daylight Harvesting
		NXWD	NX Wireless Enabled, Dual SmartPORTs
		NXSWD	NX Wireless, PIR Occupancy Sensor, Dimming Daylight Harvesting, Dual SmartPORTs
			*Not available for row mounting; Only available with 0-10V Driver options; Contact factory for Length restrictions
Sensors+		SD1	Daylight Sensor Required. Enter quantity 2SD1=2 daylight sensors/row
		SO1	Occupancy Sensor Required. Enter quanity. 2SO1= 2 occupancy sensors/row
		SZ1	Zigbee Radio Module Required. Enter quantity. 2SZ1=2 radio modules/row Radio controls up to 10 drivers. Must be ordered with D00.

+ Additional lead time may be applicable. Contact factory.

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Output Restrictions

Driver options listed below are not available for the output and length as shown

Restrictions-Direct		Output
		300
Length (feet)	2	Not Available

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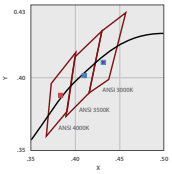
Details

Construction:
Die-formed and welded steel. Wiring knockouts in top.
End caps- Die formed steel. Install from below via magnetic interface.
Overlaps diffuser at each fixture end to eliminate gaps/LED visibility.

Downlight diffuser:
SOF-Soft diffuse acrylic lens.
REG- ½" regressed softglo lens with painted steel inserts. Output multiplier (.77).
BWO- White blade baffle with softglo lens overlay. Output multiplier (.70).
ASYM- Highly transmissive diffuse acrylic lens with linear prisms.
BAT- Highly transmissive diffuse acrylic lens with linear prisms.
DRP- ½" protruding soft diffuse lens.
Please see the installation instruction sheets for more details.

Finish/Color:
Visit www.litecontrol.com/finishes for details.

CCT:
27K-2700K output multiplier (0.95)
30K-3000K output multiplier (0.98)
35K-3500K output multiplier (1.00)*
40K-4000K output multiplier (1.03)
50K-5000K output multiplier (1.05)
27K9-2700K 90 CRI output multiplier (0.83)
30K9-3000K 90 CRI output multiplier (0.85)
35K9-3500K 90 CRI output multiplier (0.88)
40K9-4000K 90 CRI output multiplier (0.90)
50K9-5000K 90 CRI output multiplier (0.93)
*Scale all values from 35K



Color Variation:
2 step MacAdam ellipse

Output (VI technology):
Variable Intensity (VI) technology allows precise specification of fixture output/wattage. Fixture will be programmed and labeled to specification. Specify each in 50 lumen increments/ft within the below range:

	Lumens/ft	Nomenclature
Direct		
Min:	300	D030
Max:	1250	D125

Field Accessibility:
LED boards and drivers can be accessed and removed from fixture, while installed. LED boards can be replaced either individually or as part of 2' module.

Circuiting:
1C (1 Circuit) Fixture wired for a single circuit.

Emergency:
EF - 10W battery powered driver.
Provides a minimum of 90 minutes of emergency lighting.
Inverter-Compatible. Provided by others.
Available in 4'+ fixtures.

Driver:

NDM:	Non-dimming. Fixture will be wired for fixed light output.
D05:	Osram 100%-5% dimming range, Fixture will be wired for low voltage 0-10V dimming control. Only applicable if either 2230TD, 2750T or 2765T is selected.
D01:	100%-1% dimming range. Fixture will be wired for low voltage 0-10V dimming control.
DS1:	Soft-Start 100%-1% dimming range. Fixture will be wired for low voltage 0-10V dimming control.
D00:	Dim-to-off 100%-1% Dimming range. Fixture will be wired for low voltage 0-10V dimming control.
DS0:	Soft-Start Dim-to-off 100%-1% dimming range. Fixture will be wired for low voltage 0-10V dimming control.
LEC:	Hi-Lume 1% EcoSystem LED Driver with Soft-on, Fade-to-Black dimming technology.
DALI:	DALI compatible.
DALIP:	Self-Powered DALI bus (e.g. DEXAL)

*See driver limitations in Output Restrictions above.

Nightlight:
See separate LC-Nightlight spec sheet for additional details.

NX Distributed Intelligence: NX DISTRIBUTED INTELLIGENCE™
Supports indoor and outdoor applications, wired, wireless and hybrid networked NX lighting control deployments and enables emerging applications such as Hubbell Lighting's SpectraSync™ color tuning technology.
See separate NX™ Application Guide for additional details.
See Hubbell Controls Solution NX Brochure.

Sensors:

SD1:	Daylight sensor(Wattstopper part #FD301). Installs between diffusers.
SO1:	Occupancy sensor(Wattstopper FS-305 with FS-L6 lens). Installs between difffusers.
SZ1:	Zigbee radio module(Osram Sylvania part #ZBHA-CLM-DIM). Installs in knockout.
NX:	NX Sensors installs between diffusers.

See separate Control Options Guide for additional details.

SpectraSync™ Color Tuning Technology: SpectraSync™ Color Tuning Technology
Control your space based on the needs of the application, specific activities throughout the day and preferences of the occupants with two distinct SpectraSync™ Color Tuning Technology.

Dim to Warm:	Dim to Warm mimics the familiar warming effect that occurs with traditional incandescent sources as they are dimmed. (Available with 2200K-3000K).
Tunable White:	Tunable White offers users the ability to tailor CCT to their personal preference, enhancing task visibility, material and colors or the aesthetics of the space. (Available with 2700K-5000K or 2700K-6500K).

See separate SpectraSync™ Tech Sheet for additional details.
See separate NX™ Solutions Guide for additional details.

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Details (continued)

Patterns:
90°, 120°, 135° illuminated corners available. One piece construction, ready to install, with diffusers that match adjoining fixtures. Corner system connectors must be used to form patterns. The length of each outside or inside lighted corner is 12".

Rated Life (LED Board):
Tested in accordance to LM79-2008 & derived from EPA TM-21 calculator
L70: 280,000 (calculated per TM-21 extrapolated curve)
L70: >61,000 (reported per TM-21/LM80 6x's limitation)
L90: 72,000 (calculated per TM-21 extrapolated curve)
L90: >61,000 (reported per TM-21/LM80 6x's limitation)

Thru wiring:
See separate LC-Thruwire spec sheet for additional details.

Fixture Mounting:
PT: Continuous spackle trim with beaded edge welded to housing. Spackle trim allows plaster coat up to fixture edge for clean ceiling appearance.
LG/NG/SS: Side rails provide continuous mounting, lateral spacing between T-bars and allows clearance for T-bar supporting wire. For Tegular grid mount, fixture will sit level with the T-bar.
DW: Side rails allow installation into drywall slot. Visible flange is located on all 4 sides of fixture

Rated Life (Driver):
Standard = 100,000 hours
Lutron = 50,000 hours

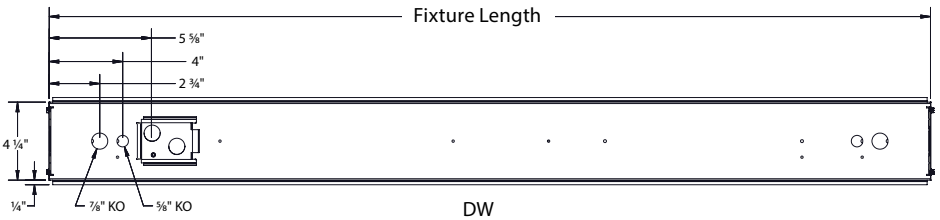
Fixture weight:
3 lbs/ft.

Ratings:
CSA listed for damp locations. IBEW. AF of L. UL924. IC Rated.
This product qualifies as a "designated country construction material" per FAR 52.225-11 Buy American-Construction. Materials under Trade Agreements effective 8/14/2020.
See Buy American Act Solutions. Contact factory forconfigurations including SpectraSync, Emergency Battery, NX, or sensors.

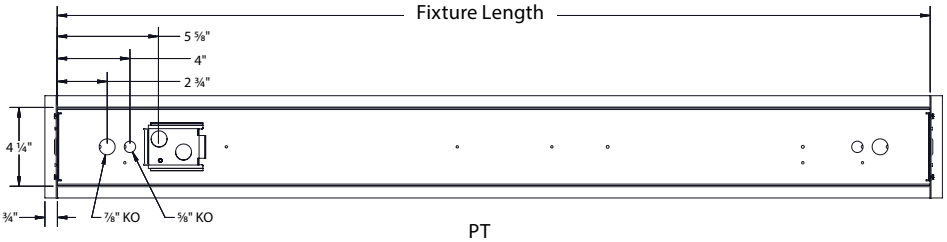
BUY AMERICAN SOLUTIONS
See Certification Specifications

Warranty:
5 years. See www.litecontrol.com for details.

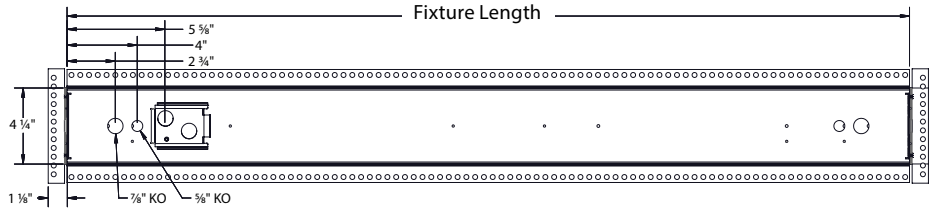
LG/NG/SS
Fixture Length

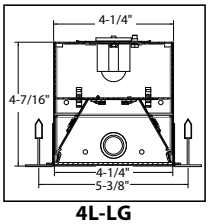


DW
Fixture Length

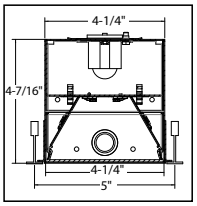


PT
Fixture Length

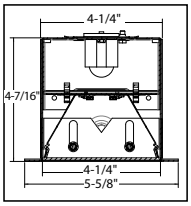




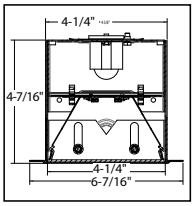
4L-LG



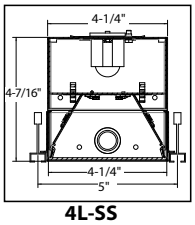
4L-NG



4L-DW

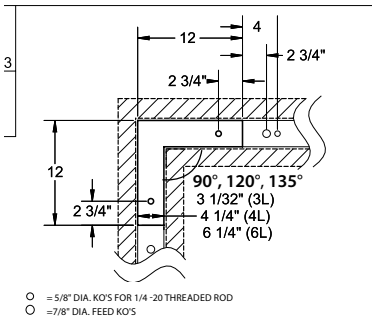


4L-PT

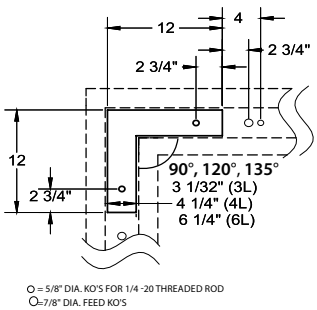


4L-SS

Patterns: **Drywall**



Grid



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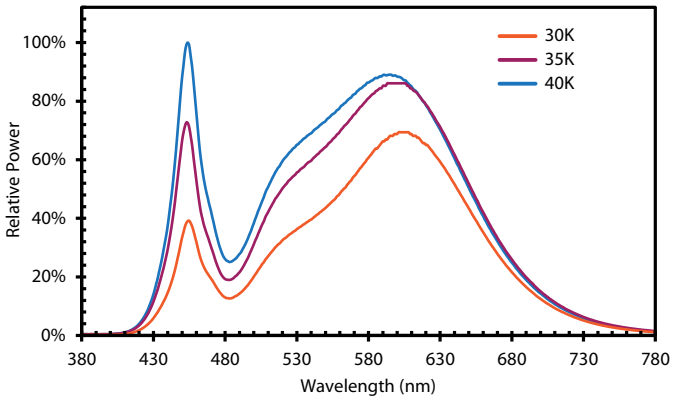
MOD™ 4 LED Recessed Direct

Details (continued)

Color Characteristics:

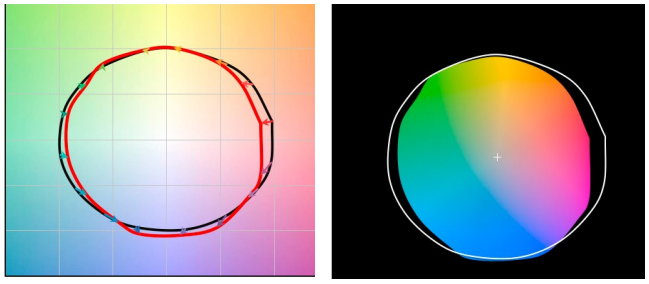
Value	Ordering Code		
	30K	35K	40K
Rf	83	82	82
Rg	96	96	96
CCT (K)	3009	3494	3975
Duv	-0.0009	-0.0004	-0.0003
x	0.435	0.4052	0.3814
y	0.4012	0.3898	0.3768
CIE Ra	83	83	84

Spectral Distribution:

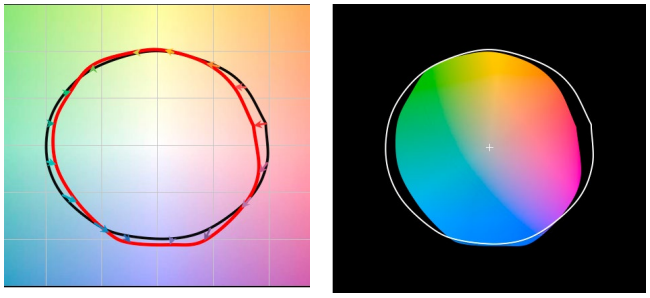


Color Vector Graphic:

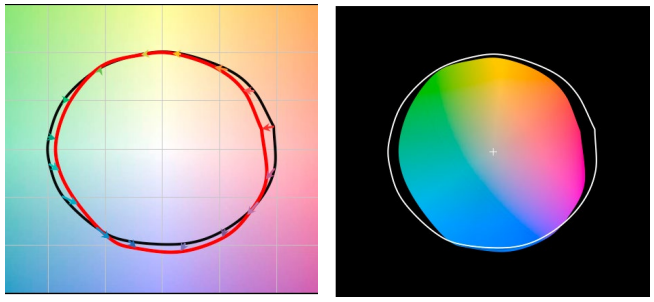
30K:



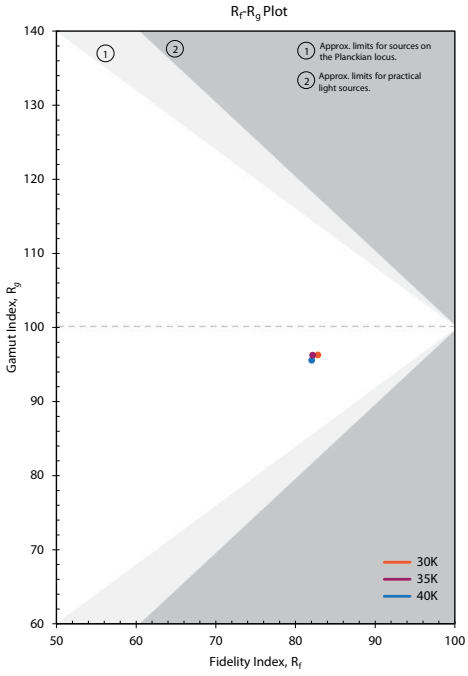
35K:



40K:



Color Gamut/Fidelity Plot



CRI:
80 minimum

CCT	CRI	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
30K	83	82	91	97	81	82	89	84	62	13	79	79	69	84	99
35K	83	81	89	95	81	81	85	86	65	13	73	79	62	83	97
40K	84	82	90	94	82	82	85	87	68	17	74	80	60	84	97

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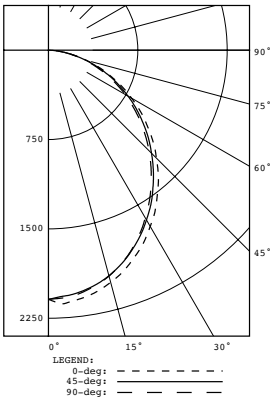
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Photometry

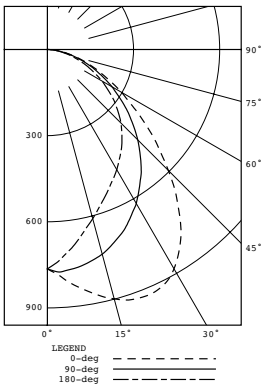
Fixture: 4L-R-D-XX-XX-SOF-CX-35K-D100
CCT: 3500K
Output: D100
Nominal lumens: 1000 lumens/ft
Efficacy: 112 lm/W
Test report: 4L-R-D-04-SOF-X-CX-35K-D100.IES



Zonal Lumens

Zone	Lumens	Lamp %
0-40	1885.8	47.1%
0-60	3214.6	80.4%
0-90	4000.1	100.0%
90-180	0.0	0.0%
0-180	4000.1	100.0%

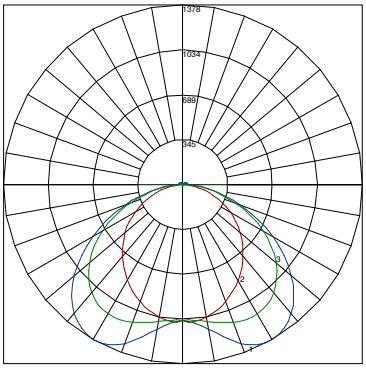
Fixture: 4L-R-AD-XX-XX-ASYM-CX-35K-D050
CCT: 3500K
Output: D050
Nominal lumens: 500 lumens/ft
Efficacy: 124 lm/W
Test report: 4L-R-AD-XX-XX-ASYM-CX-35K-D050.IES



Zonal Lumens

Zone	Lumens	Lamp %
0-40	982	48.7%
0-60	1658	82.3%
0-90	2016	100.0%
90-180	0	0.0%
0-180	2016	100.0%

Fixture: 4L-X-D-04-BAT-CX-35K-D100
CCT: 3500K
Output: D100
Nominal lumens: 1000 lumens/ft
Efficacy: 111 lm/W
Test report: 4L-X-D-04-BAT-CX-35K-D100.IES



Legend:
0-deg: Blue
45-deg: Green
90-deg: Red

Zonal Lumens

Zone	Lumens	Lamp %
0-40	1625.84	40.64
0-60	3056.77	76.42
0-90	3948.2	98.70
90-180	51.97	1.30
0-180	4000.17	100.00

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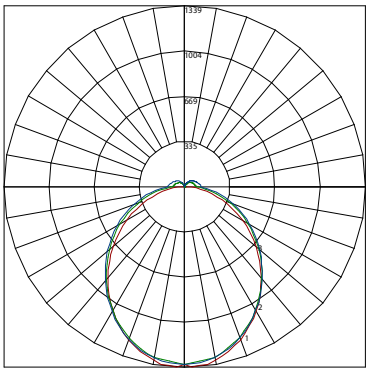
LITECONTROL
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4L-R-D

MOD™ 4 LED Recessed Direct

Photometry (continued)

Fixture: 4L-X-D-04-DRP-CX-35K-D100
CCT: 3500K
Output: D100
Nominal lumens: 1000 lumens/ft
Efficacy: 110 lm/W
Test report: 4L-X-D-04-DRP-CX-35K-D100.IES



Legend:
0-deg: Blue
45-deg: Green
90-deg: Red

Zonal Lumens

Zone	Lumens	Lamp %
0-40	1613.08	40.60
0-60	2797.69	70.50
0-90	3677.99	92.70
90-180	291.34	7.30
0-180	3969.32	100.00

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4L-R-D

MOD™ 4 LED Recessed Direct

Ordering Guide (continued)

Driver		NDM	Non Dimming
		D05	5% Dimming, 0-10V*
		D01	1% Dimming, 0-10V
		DS1	Soft-Start 1% Dimming, 0-10V
		D00	Dim-to-off (1%), 0-10V
		DS0	Soft-Start Dim-to-off (1%), 0-10V
		LEC	Hi-lume 1% EcoSystem LED driver
		DALI	DALI+
		DALIP	Powered DALI (2.0)+
			*Must be ordered with 2230TD, 2750T or 2765T Option
Circuiting		1C	1 Circuit
Voltage		UNV	Universal Voltage (120V through 277V)
		347	347 Volt*+
			*Excludes Emergency Battery Pack 'EF' Option. Excludes DALI, DALIP and Lutron (LEC) Dimming Drivers

Optional Features	Code	Options	Description
Nightlight		NL	Nightlight Circuit Required. Enter quantity. 2NL = 2 nightlight circuits/row
Emergency		EF	10W Emergency Battery Backup Enter quantity. 2EF = 2 Emergency batteries/row. See Details for restrictions.
Thru-wiring		W1	No Thru Wire
		W2	Provide Normal and Emergency/Nightlight Thru Wiring*
		W3	Provide Normal Thru Wiring Only
			*Only applicable when specified with Emergency/Nightlight
Patterns+*		C90L	Illuminated 90° corner
		C120L	Illuminated 120° corner
		C135L	Illuminated 135° corner
			*Contact Factory for pattern configurations. Approval drawings required. See page 5.
Chicago Environmental Air Modification		CCEA	Chicago Environmental Air Modification

Control Options	Code	Options	Description
NX*+		NXE	NX Enabled, Dual SmartPorts
		NXWE	NX Wireless Enabled
		NXES	NX Enabled, Dual SmartPorts, PIR Occupancy Sensor, Dimming Daylight Harvesting
		NXS	NX, PIR Occupancy Sensor, Dimming Daylight Harvesting (standalone)
		NXSW	NX Wireless, PIR Occupancy Sensor, Dimming Daylight Harvesting
		NXWD	NX Wireless Enabled, Dual SmartPORTs
		NXSWD	NX Wireless, PIR Occupancy Sensor, Dimming Daylight Harvesting, Dual SmartPORTs
			*Not available for row mounting; Only available with 0-10V Driver options; Contact factory for Length restrictions
Sensors+		SD1	Daylight Sensor Required. Enter quantity 2SD1=2 daylight sensors/row
		SO1	Occupancy Sensor Required. Enter quanity. 2SO1= 2 occupancy sensors/row
		SZ1	Zigbee Radio Module Required. Enter quantity. 2SZ1=2 radio modules/row Radio controls up to 10 drivers. Must be ordered with D00.

+ Additional lead time may be applicable. Contact factory.

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Output Restrictions

Driver options listed below are not available for the output and length as shown

Restrictions-Direct		Output
		300
Length (feet)	2	Not Available

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4L-R-D

MOD™ 4 LED Recessed Direct

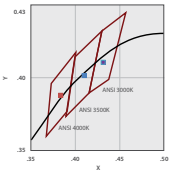
Details

Construction:
Die-formed and welded steel. Wiring knockouts in top.
End caps- Die formed steel. Install from below via magnetic interface.
Overlaps diffuser at each fixture end to eliminate gaps/LED visibility.

Downlight diffuser:
SOF-Soft diffuse acrylic lens.
REG- ½" regressed softglo lens with painted steel inserts. Output multiplier (.77).
BWO- White blade baffle with softglo lens overlay. Output multiplier (.70).
ASYM- Highly transmissive diffuse acrylic lens with linear prisms.
BAT- Highly transmissive diffuse acrylic lens with linear prisms.
DRP- ½" protruding soft diffuse lens.
Please see the installation instruction sheets for more details.

Finish/Color:
Visit www.litecontrol.com/finishes for details.

CCT:
27K-2700K output multiplier (0.95)
30K-3000K output multiplier (0.98)
35K-3500K output multiplier (1.00)*
40K-4000K output multiplier (1.03)
50K-5000K output multiplier (1.05)
27K9-2700K 90 CRI output multiplier (0.83)
30K9-3000K 90 CRI output multiplier (0.85)
35K9-3500K 90 CRI output multiplier (0.88)
40K9-4000K 90 CRI output multiplier (0.90)
50K9-5000K 90 CRI output multiplier (0.93)
*Scale all values from 35K



Color Variation:
2 step MacAdam ellipse

Output (VI technology):
Variable Intensity (VI) technology allows precise specification of fixture output/wattage. Fixture will be programmed and labeled to specification. Specify each in 50 lumen increments/ft within the below range:

	Lumens/ft	Nomenclature
Direct		
Min:	300	D030
Max:	1250	D125

Field Accessibility:
LED boards and drivers can be accessed and removed from fixture, while installed. LED boards can be replaced either individually or as part of 2' module.

Circuiting:
1C (1 Circuit) Fixture wired for a single circuit.

Emergency:
EF - 10W battery powered driver.
Provides a minimum of 90 minutes of emergency lighting.
Inverter-Compatible. Provided by others.
Available in 4'+ fixtures.

Driver:

NDM:	Non-dimming. Fixture will be wired for fixed light output.
D05:	Osram 100%-5% dimming range, Fixture will be wired for low voltage 0-10V dimming control. Only applicable if either 2230TD, 2750T or 2765T is selected.
D01:	100%-1% dimming range. Fixture will be wired for low voltage 0-10V dimming control.
DS1:	Soft-Start 100%-1% dimming range. Fixture will be wired for low voltage 0-10V dimming control.
D00:	Dim-to-off 100%-1% Dimming range. Fixture will be wired for low voltage 0-10V dimming control.
DS0:	Soft-Start Dim-to-off 100%-1% dimming range. Fixture will be wired for low voltage 0-10V dimming control.
LEC:	Hi-Lume 1% EcoSystem LED Driver with Soft-on, Fade-to-Black dimming technology.
DALI:	DALI compatible.
DALIP:	Self-Powered DALI bus (e.g. DEXAL)

*See driver limitations in Output Restrictions above.

Nightlight:
See separate LC-Nightlight spec sheet for additional details.

NX Distributed Intelligence: NX DISTRIBUTED INTELLIGENCE™
Supports indoor and outdoor applications, wired, wireless and hybrid networked NX lighting control deployments and enables emerging applications such as Hubbell Lighting's SpectraSync™ color tuning technology.
See separate NX™ Application Guide for additional details.
See Hubbell Controls Solution NX Brochure.

Sensors:

SD1:	Daylight sensor(Wattstopper part #FD301). Installs between diffusers.
SO1:	Occupancy sensor(Wattstopper FS-305 with FS-L6 lens). Installs between difffusers.
SZ1:	Zigbee radio module(Osram Sylvania part #ZBHA-CLM-DIM). Installs in knockout.
NX:	NX Sensors installs between diffusers.

See separate Control Options Guide for additional details.

SpectraSync™ Color Tuning Technology: SpectraSync™ Color Tuning Technology
Control your space based on the needs of the application, specific activities throughout the day and preferences of the occupants with two distinct SpectraSync™ Color Tuning Technology.

Dim to Warm:	Dim to Warm mimics the familiar warming effect that occurs with traditional incandescent sources as they are dimmed. (Available with 2200K-3000K).
Tunable White:	Tunable White offers users the ability to tailor CCT to their personal preference, enhancing task visibility, material and colors or the aesthetics of the space. (Available with 2700K-5000K or 2700K-6500K).

See separate SpectraSync™ Tech Sheet for additional details.
See separate NX™ Solutions Guide for additional details.

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4L-R-D

MOD™ 4 LED Recessed Direct

Details (continued)

Patterns:
90°, 120°, 135° illuminated corners available. One piece construction, ready to install, with diffusers that match adjoining fixtures. Corner system connectors must be used to form patterns. The length of each outside or inside lighted corner is 12".

Rated Life (LED Board):
Tested in accordance to LM79-2008 & derived from EPA TM-21 calculator
L70: 280,000 (calculated per TM-21 extrapolated curve)
L70: >61,000 (reported per TM-21/LM80 6x's limitation)
L90: 72,000 (calculated per TM-21 extrapolated curve)
L90: >61,000 (reported per TM-21/LM80 6x's limitation)

Thru wiring:
See separate LC-Thruwire spec sheet for additional details.

Fixture Mounting:
PT: Continuous spackle trim with beaded edge welded to housing. Spackle trim allows plaster coat up to fixture edge for clean ceiling appearance.
LG/NG/SS: Side rails provide continuous mounting, lateral spacing between T-bars and allows clearance for T-bar supporting wire. For Tegular grid mount, fixture will sit level with the T-bar.
DW: Side rails allow installation into drywall slot. Visible flange is located on all 4 sides of fixture

Rated Life (Driver):
Standard = 100,000 hours
Lutron = 50,000 hours

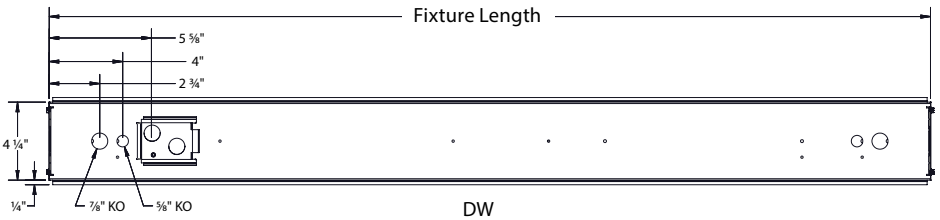
Fixture weight:
3 lbs/ft.

Ratings:
CSA listed for damp locations. IBEW. AF of L. UL924. IC Rated.
This product qualifies as a "designated country construction material" per FAR 52.225-11 Buy American-Construction. Materials under Trade Agreements effective 8/14/2020.
See Buy American Act Solutions. Contact factory forconfigurations including SpectraSync, Emergency Battery, NX, or sensors.

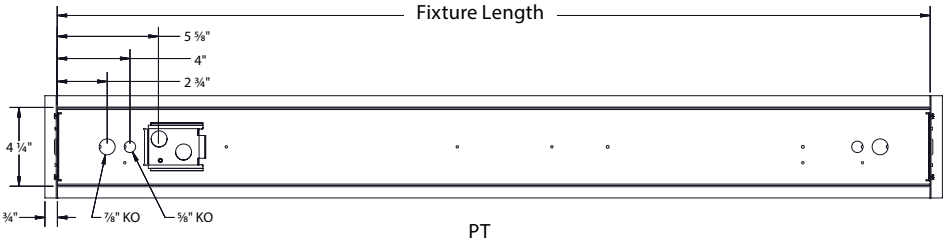
BUY AMERICAN SOLUTIONS
See Certification Specifications

Warranty:
5 years. See www.litecontrol.com for details.

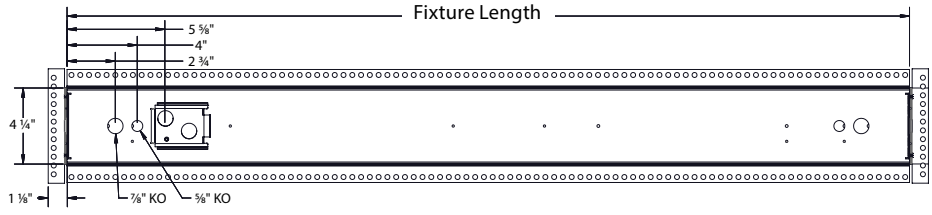
LG/NG/SS
Fixture Length

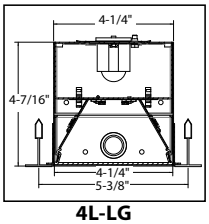


DW
Fixture Length

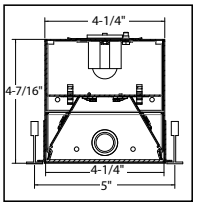


PT
Fixture Length

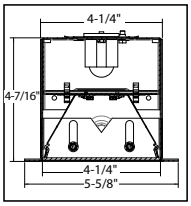




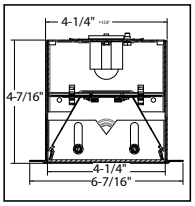
4L-LG



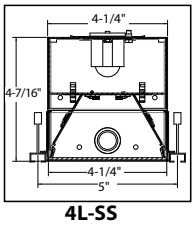
4L-NG



4L-DW

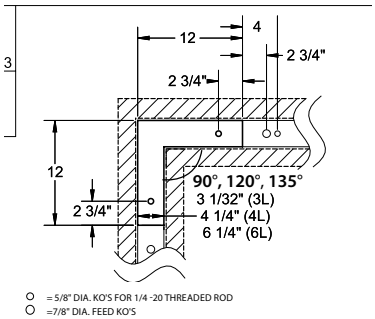


4L-PT



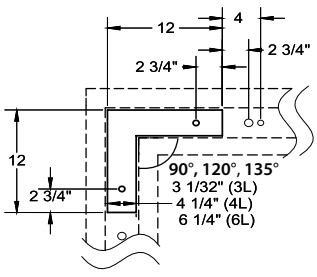
4L-SS

Patterns: **Drywall**



○ = 5/8" DIA. KO'S FOR 1/4 -20 THREADED ROD
○ =7/8" DIA. FEED KO'S

Grid



○ = 5/8" DIA. KO'S FOR 1/4 -20 THREADED ROD
○=7/8" DIA. FEED KO'S

Quick Find litecontrol.com **4L-R-D**

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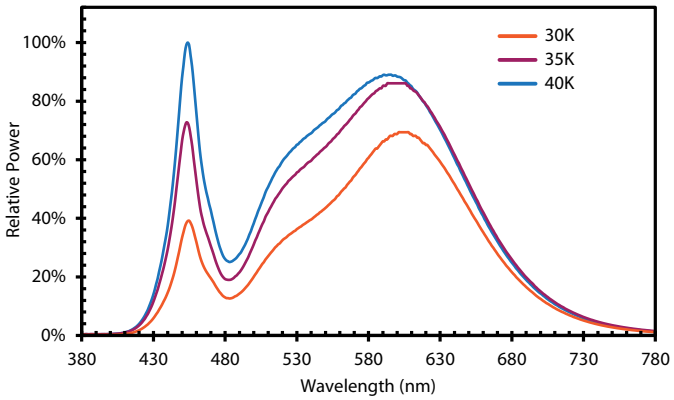
MOD™ 4 LED Recessed Direct

Details (continued)

Color Characteristics:

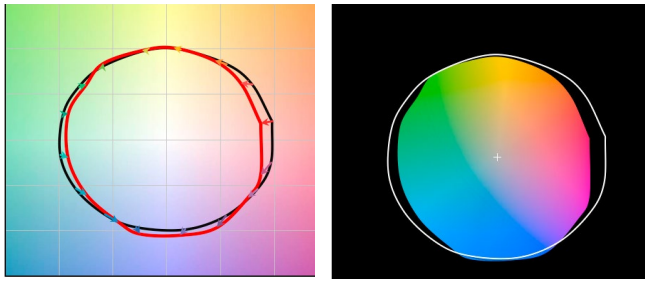
Value	Ordering Code		
	30K	35K	40K
Rf	83	82	82
Rg	96	96	96
CCT (K)	3009	3494	3975
Duv	-0.0009	-0.0004	-0.0003
x	0.435	0.4052	0.3814
y	0.4012	0.3898	0.3768
CIE Ra	83	83	84

Spectral Distribution:

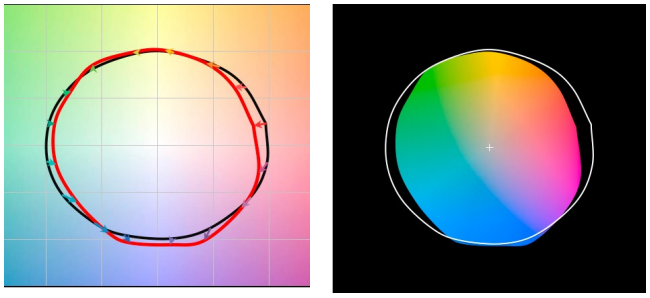


Color Vector Graphic:

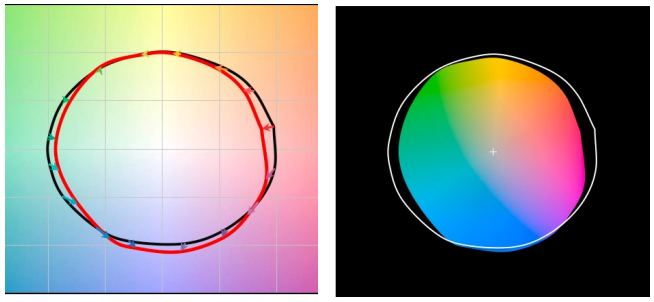
30K:



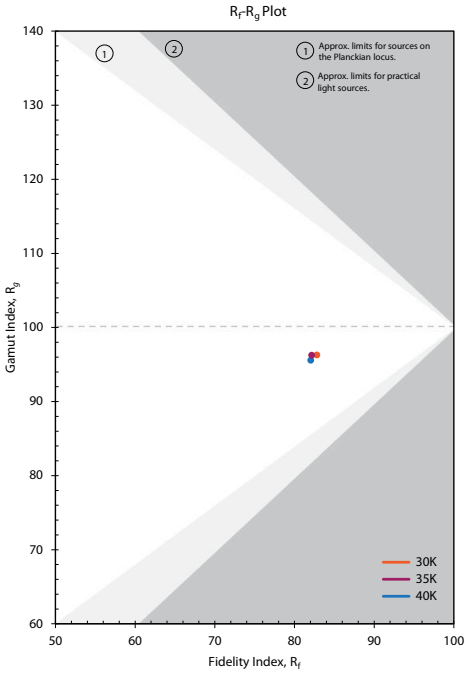
35K:



40K:



Color Gamut/Fidelity Plot



CRI:
80 minimum

CCT	CRI	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
30K	83	82	91	97	81	82	89	84	62	13	79	79	69	84	99
35K	83	81	89	95	81	81	85	86	65	13	73	79	62	83	97
40K	84	82	90	94	82	82	85	87	68	17	74	80	60	84	97

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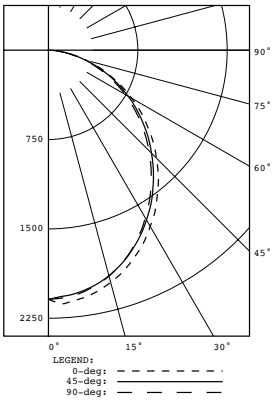
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4L-R-D

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Photometry

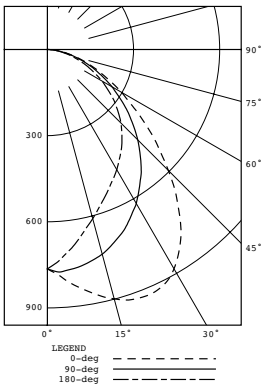
Fixture: 4L-R-D-XX-XX-SOF-CX-35K-D100
CCT: 3500K
Output: D100
Nominal lumens: 1000 lumens/ft
Efficacy: 112 lm/W
Test report: 4L-R-D-04-SOF-X-CX-35K-D100.IES



Zonal Lumens

Zone	Lumens	Lamp %
0-40	1885.8	47.1%
0-60	3214.6	80.4%
0-90	4000.1	100.0%
90-180	0.0	0.0%
0-180	4000.1	100.0%

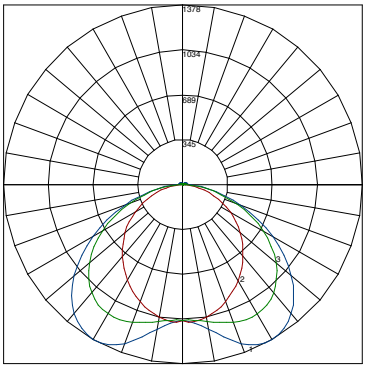
Fixture: 4L-R-AD-XX-XX-ASYM-CX-35K-D050
CCT: 3500K
Output: D050
Nominal lumens: 500 lumens/ft
Efficacy: 124 lm/W
Test report: 4L-R-AD-XX-XX-ASYM-CX-35K-D050.IES



Zonal Lumens

Zone	Lumens	Lamp %
0-40	982	48.7%
0-60	1658	82.3%
0-90	2016	100.0%
90-180	0	0.0%
0-180	2016	100.0%

Fixture: 4L-X-D-04-BAT-CX-35K-D100
CCT: 3500K
Output: D100
Nominal lumens: 1000 lumens/ft
Efficacy: 111 lm/W
Test report: 4L-X-D-04-BAT-CX-35K-D100.IES



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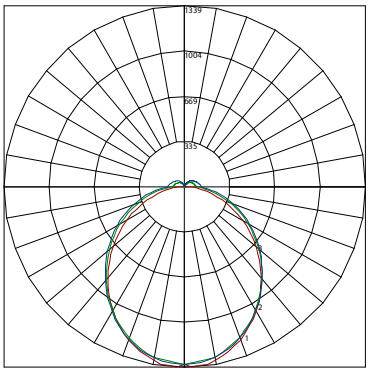
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4L-R-D

MOD™ 4 LED Recessed Direct

Photometry (continued)

Fixture: 4L-X-D-04-DRP-CX-35K-D100
CCT: 3500K
Output: D100
Nominal lumens: 1000 lumens/ft
Efficacy: 110 lm/W
Test report: 4L-X-D-04-DRP-CX-35K-D100.IES



Legend:
0-deg: Blue
45-deg: Green
90-deg: Red

Zonal Lumens

Zone	Lumens	Lamp %
0-40	1613.08	40.60
0-60	2797.69	70.50
0-90	3677.99	92.70
90-180	291.34	7.30
0-180	3969.32	100.00

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HUBBELL Lighting

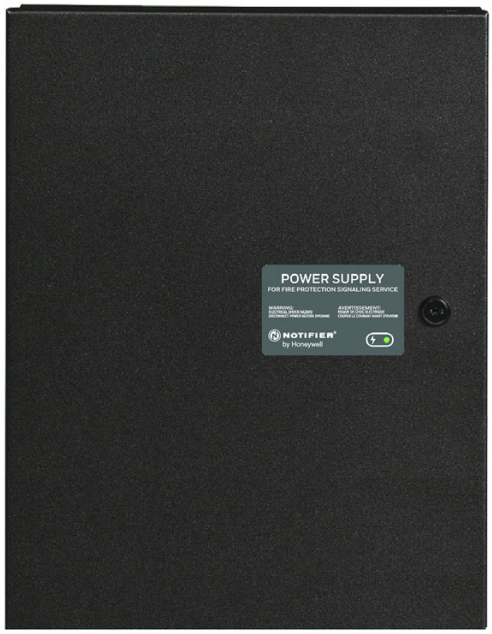
PSE-6/PSE-10 Series 6/10 Amp, 24 Volt Power Supply Expanders

General

The PS Series is a remote power supply line from NOTIFIER. The PSE-6(C)(E) is a 6 amp and the PSE-10(C)(E) is a 10 amp, remote power supply with battery charger that may be connected to any 12 or 24 volt fire alarm control panel (FACP) or used as a standalone power supply. The PS Series provides 24 VDC power for NACs (notification appliance circuits) configured as either Class B or Class A (requires the ZNAC-PS option card) with multiple sync protocol options. The PS Series also provides auxiliary power, constant or resettable, suited for detectors, annunciators, door holders, and other fire alarm system peripherals. The PS Series cabinet can hold two 7 AH or 18 AH batteries and can charge up to 33 AH batteries in a separate cabinet. The PSE-6E and PSE-10E are models rated for 240V operation.

Features

- Up to five (6 amp model) or seven (10 amp model) independently-configurable, power-limited output circuits for:
  - Class B and/or Class A NACs
  - Class B and/or Class A resettable or non-resettable 24V auxiliary power
  - door holder power
- Converts from Class B to Class A wiring without losing any outputs using the ZNAC-PS converter card (sold separately)
- Optimal for powering four-wire smoke detectors, annunciators, and other system peripherals requiring regulated power
- Configurable for ANSI® Temporal 3 or Temporal 4 coded output
- UL-Listed NAC synchronization using System Sensor®, Wheelock®, Gentex®, or AMSECO® appliances
- Synchronization can be triggered from FACP NAC/remote sync outputs, cascaded power supply, or a control module, single or multi, which may be housed within the power supply cabinet
- Ability to cascade up to four power supplies
- Two (6 amp model) or three (10 amp model) fully-isolated input/control circuits which can be programmed to any output
- Two Form C normally-closed trouble relays for AC Trouble and General Trouble, Ground Fault relay available on Canadian models only
- 6 or 10 amp full load output, respectively, with 3 A maximum/circuit
- Individual NAC power and trouble LEDs for diagnostic efficiency
- Trouble history modes for diagnostic support
- Wide range end-of-line supervision value (normal: 2K-27K ohms)
- Selectable earth fault detection (enable or disable)
- AC trouble report delay timer
- Completely configurable via onboard DIP switches, no extra software required
- Self-contained in compact, locking cabinet constructed of heavy gauge steel with a corrosion-resistant powder coat chip and scratch-resistant finish
- Cabinet designed with ten double knockouts and a removable door for ease of installation and wiring
- Includes integral battery charger capable of charging up to 33 AH batteries
- Cabinet can house two 7 AH or 18 AH batteries
- Battery charger may be disabled via DIP switch for applications requiring larger batteries and external battery charger



- Removable terminal blocks accommodate up to 12 AWG (3.1mm^2) wire
- Works with any UL 864 FACP which utilizes an industry-standard reverse-polarity notification circuit
- Optional devices include addressable control, monitor, and relay modules and power-supervision relay (EOLR-1)

Standards and Codes

The PSE Series comply with the following standards:

- **NFPA 72** National Fire Alarm Code
- **UL 864** Standard for Control Units for Fire Alarm Systems (NAC expander mode), 10th Edition
- **UL 1481** Power Supplies for Fire Alarm Systems
- **IBC 2009** (when using SEISKIT-MULTI-1)
- **CBC 2007** (when using SEISKIT-MULTI-1)

Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Listed:** S635, S674
- **ULC Listed:** S635 (PSE-6/10C)
- **CSFM Approved:** 7315-0028:0513
- **FDNY Approved**
- **FM Approved**

Primary (AC) Power:

- **PSE-6(C):** 120 VAC, 50/60 Hz, 5.0A maximum
- **PSE-10(C):** 120VAC, 50/60 Hz, 6.2 A maximum
- **PSE-6E:** 240 VAC, 50/60 Hz, 2.7A maximum
- **PSE-10E:** 240 VAC, 50/60 Hz, 3.5A maximum
- **Wire Size:** #12-14 AWG with 600 V insulation

Command Input Circuit:

- **Trigger Input Voltage:** 9 to 32 VDC
- **Trigger Current:** 2.0 mA (16 - 32 V); Per Input: 1.0 mA (9 - 16 V)

Trouble Contact Rating: 4 A at 24 VDC

Output Circuits:

- 24 VDC filtered, regulated
- PSE-6: TB8-TB9 – 1A Regulated, 3A special applications; TB10-TB12 – 0.3A Regulated, 3A special applications
- PSE-10: TB8-TB11 – 1.5A Regulated, 3A special applications; TB12-TB14 – 0.3A Regulated, 3A special applications
- 6.0 A (PSE-6) or 10.0 A (PSE-10) maximum total continuous current for all outputs

Secondary Power (Battery) Charging Circuit:

- Supports lead-acid batteries only
- Float-charge voltage: 27.6 VDC
- Maximum current charge: 1.5 A
- Maximum battery capacity: 18 AH (inside cabinet)
- Maximum battery charging capacity: 33 AH (external cabinet)

Physical:

- **Dimensions:** 20.0”H x 14.5”W x 3.5”D (cm: 50.8H x 36.83W x 8.9D)
- **Weight:** with two 7Ah batteries is 24 pounds (10.9 kg), with two 18 AH batteries is 39 pounds (17.7 kg)

Ordering Information

PSE-6: 6.0 A, 120 VAC remote charger power supply in a lockable, metal enclosure

PSE-6C: Same as above, ULC-listed model

PSE-6R: Same as PSE-6 with red enclosure

PSE-6E: 6.0 A, 240 VAC remote charger power supply in a lockable, metal enclosure

PSE-10: 10.0 A, 120 VAC remote charger power supply in a lockable, metal enclosure

PSE-10C: Same as above, ULC-listed model

PSE-10R: Same as PSE-10 with red enclosure

PSE-10E: 10.0 A, 240 VAC remote charger power supply in a lockable, metal enclosure

ZNAC-PS: Optional Class A output converter module

FCM-1: Addressable Control Module for one Class B or Class A zone of supervised, polarized Notification Appliances. Notification Appliance Circuit option requires external 24 VDC to power notification appliances.

FRM-1: Addressable relay module containing two isolated sets of Form-C contacts, which operate as a DPDT switch

FMM-1: Addressable Monitor Module for one zone of normally open dry-contact initiating devices. Includes plastic cover plate and end-of-line resistor. Module may be configured for either a Class B or Class A IDC.

FDM-1: Dual Monitor Module. Same as FMM-1 except it provides two inputs for Class B wiring only

FDRM-1: Provides two monitored inputs and two Form-C relays. Functions in Class B wiring only.

XP6-C: Six-circuit supervised control module

XP6-R: Six Form-C relay control module

EOLR-1: 12/24 VDC end-of-line relay for monitoring four-wire smoke detector power

BAT-1270: Battery, 12 volt, 7.0 AH (two required, see BAT Series data sheet DN-6933).

BAT-12180: Battery, 12 volt, 18AH

BAT-12330: Battery, 12 volt, 33AH

SEISKIT-MULTI-1: Seismic kit for the FL-PSE Series. Includes bracket and hardware for two 7AH or two 18AH batteries.

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ENGINEERING & MANUFACTURING QUALITY SYSTEMS

This document is not intended to be used for installation purposes.
We try to keep our product information up-to-date and accurate.
We cannot cover all specific applications or anticipate all requirements.
All specifications are subject to change without notice.

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Country of Origin: USA

NOTIFIER
12 Clintonville Road
Northford, CT 06472
203.484.7161
www.notifier.com

NOTIFIER® by Honeywell

FCM-1(A) & FRM-1(A) Series

Control and Relay Modules

NOTIFIER® by Honeywell

Intelligent / Addressable Devices

General

FCM-1(A) Control Module: The FCM-1(A) Addressable Control Module provides Notifier intelligent fire alarm control panels a circuit for Notification Appliances (horns, strobes, speakers, etc.). Addressability allows the FCM-1(A) to be activated, either manually or through panel programming, on a select (zone or area of coverage) basis.

FRM-1(A) Relay Module: The FRM-1(A) Addressable Relay Module provides the system with a dry-contact output for activating a variety of auxiliary devices, such as fans, dampers, control equipment, etc. Addressability allows the dry contact to be activated, either manually or through panel programming, on a select basis.

FlashScan® (U.S. Patent 5,539,389) is a communication protocol developed by NOTIFIER Engineering that greatly enhances the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of other designs.



FCM-1(A)

Features

- Built-in type identification automatically identifies these devices to the control panel.
- Internal circuitry and relay powered directly by two-wire SLC loop. The FCM-1(A) module requires power (for horns, strobes, etc.), or audio (for speakers).
- Integral LED "blinks" green each time a communication is received from the control panel and turns on in steady red when activated.
- LED blink may be deselected globally (affects all devices).
- High noise immunity (EMF/RFI).
- The FCM-1(A) may be used to switch 24-volt NAC power, audio (up to 70.7 Vrms).
- Wide viewing angle of LED.
- SEMS screws with clamping plates for wiring ease.
- Direct-dial entry of address 01– 159 for FlashScan loops, 01 – 99 for CLIP mode loops.
- Speaker, and audible/visual applications may be wired for Class B or A (Style Y or Z).

Applications

The FCM-1(A) is used to switch 24 VDC audible/visual power, high-level audio (speakers). The FRM-1(A) may be programmed to operate dry contacts for applications such as door holders or Air Handling Unit shutdown, and to reset four-wire smoke detector power.

NOTE: *Refer to the SLC Manual (PN 51253) for details regarding releasing applications with the FCM-1(A). Refer to the FCM-1-REL datasheet (DN-60390) for new FlashScan® releasing applications.*

Construction

- The face plate is made of off-white heat-resistant plastic.
- Controls include two rotary switches for direct-dial entry of address (01-159).
- The FCM-1(A) is configured for a single Class B (Style Y) or Class A (Style Z) Notification Appliance Circuit.
- The FRM-1(A) provides two Form-C dry contacts that switch together.

Operation

Each FCM-1(A) or FRM-1(A) uses one of 159 possible module addresses on a SLC loop (99 on CLIP loops). It responds to regular polls from the control panel and reports its type and status, including the open/normal/short status of its Notification Appliance Circuit (NAC). The LED blinks with each poll received. On command, it activates its internal relay. The FCM-1(A) supervises Class B (Style Y) or Class A (Style Z) notification or control circuits.

Upon code command from the panel, the FCM-1(A) will disconnect the supervision and connect the external power supply in the proper polarity across the load device. The disconnection of the supervision provides a positive indication to the panel that the control relay actually turned ON. The external power supply is always relay isolated from the communication loop so that a trouble condition on the external power supply will never interfere with the rest of the system.

Rotary switches set a unique address for each module. The address may be set before or after mounting. The built-in TYPE CODE (not settable) will identify the module to the control panel, so as to differentiate between a module and a sensor address.

Specifications for FCM-1(A)

Normal operating voltage: 15 to 32 VDC.

Maximum current draw: 6.5 mA (LED on).

Average operating current: 350 µA direct poll, 375 µA group poll with LED flashing, 485 µA Max. (LED flashing, NAC shorted.)

Maximum NAC Line Loss: 4 VDC.

External supply voltage (between Terminals T10 and T11): Maximum (NAC): Regulated 24 VDC; Maximum (Speakers): 70.7 V RMS, 50W.

Drain on external supply: 1.7 mA maximum using 24 VDC supply; 2.2 mA Maximum using 80 VRMS supply.

Max NAC Current Ratings: For class B wiring system, the current rating is 3A; For class A wiring system, the current rating is 2A.

Temperature range: 32°F to 120°F (0°C to 49°C).

Humidity range: 10% to 93% non-condensing.

Dimensions: 4.5" (114.3 mm) high x 4" (101.6 mm) wide x 1.25" (31.75 mm) deep. Mounts to a 4" (101.6 mm) square x 2.125" (53.975 mm) deep box.

Accessories: SMB500 Electrical Box; CB500 Barrier

Specifications for FRM-1(A)

Normal operating voltage: 15 to 32 VDC.

Maximum current draw: 6.5 mA (LED on).

Average operating current: 230 µA direct poll; 255 µA group poll.

EOL resistance: not used.

Temperature range: 32°F to 120°F (0°C to 49°C).

Humidity range: 10% to 93% non-condensing.

Dimensions: 4.5" (114.3 mm) high x 4" (101.6 mm) wide x 1.25" (31.75 mm) deep. Mounts to a 4" (101.6 mm) square x 2.125" (53.975 mm) deep box.

Accessories: SMB500 Electrical Box; CB500 Barrier

Agency Listings and Approvals

In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S635
- **ULC:** S3705 (A version only)
- **FM Approved**
- **CSFM:** 7300-0028:0219
- **MEA:** 14-00-E
- **FDNY:** COA #6067, #6065

Contact Ratings for FRM-1(A)

Current Rating	Maximum Voltage	Load Description	Application
3 A	30 VDC	Resistive	Non-Coded
2 A	30 VDC	Resistive	Coded
.9 A	110 VDC	Resistive	Non-Coded
.9 A	125 VDC	Resistive	Non-Coded
.5 A	30 VDC	Inductive (L/R=5ms)	Coded
1 A	30 VDC	Inductive (L/R=2ms)	Coded
.3 A	125 VAC	Inductive (PF=0.35)	Non-Coded
1.5 A	25 VAC	Inductive (PF=0.35)	Non-Coded
.7 A	70.7 VAC	Inductive (PF=0.35)	Non-Coded
2 A	25 VAC	Inductive (PF=0.35)	Non-Coded

NOTE: *Maximum (Speakers): 70.7 V RMS, 50 W*

Product Line Information

NOTE: *"A" suffix indicates ULC Listed model.*

FCM-1(A): Intelligent Addressable Control Module.

FRM-1(A): Intelligent Addressable Relay Module.

A2143-20: Capacitor, required for Class A (Style Z) operation of speakers.

SMB500: Optional Surface-Mount Backbox.

CB500: Control Module Barrier — required by UL for separating power-limited and non-power limited wiring in the same junction box as FCM-1(A).

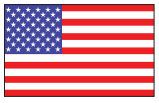
NOTE: *For installation instructions, see the following documents:*

- *FCM-1(A) Installation document I56-1169.*
- *FRM-1(A) Installation document I56-3502.*
- *Notifier SLC Wiring Manual, document 51253.*

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Made in the U.S. A.

For more information, contact Notifier. Phone: (203) 484-7161, FAX: (203) 484-7118.
www.notifier.com

BAT Series Batteries

Sealed Lead-Acid

NOTIFIER® by Honeywell

Power Supplies

General

BAT Series Batteries are Power-Sonic brand batteries. BAT Series (or Power-Sonic brand) batteries are recommended for secondary power or backup power for all NOTIFIER fire alarm control equipment.

Features

- Provide secondary power for control panels.
- Sealed and maintenance-free.
- Overcharge protected.
- Easy handling with leak-proof construction.
- Ruggedly constructed, high-impact case (ABS).
- Long service life.
- Compact design.

Agency Listings and Approvals

The listings and approvals below apply to BAT Series Batteries. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Recognized Components**: MH20845 *(Power-Sonic).*



6933cov.jpg

Ordering Information

BAT-1250-BP: 10-unit bulk pack of BAT-1250 (12 V 5 AH).

BAT-1270-BP: 5-unit bulk pack of BAT-1270 (12 V 7 AH).

BAT-12120-BP: 4-unit bulk pack of BAT-12120 (12V 12 AH).

BAT-12180-BP: 2-unit bulk pack of BAT-12180 (12 V 18 AH).

BAT-12260-BP: 2-unit bulk pack of BAT-12260 (12 V 26 AH).

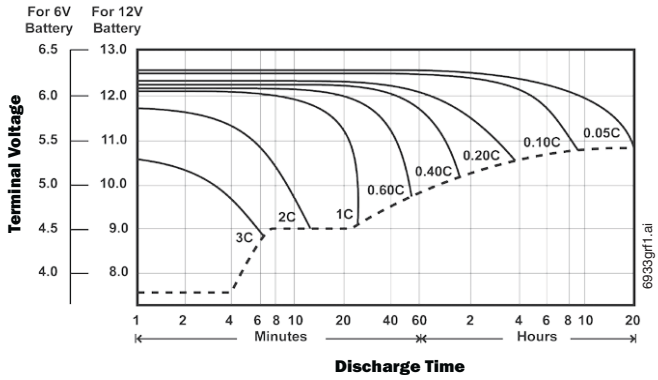
BAT-12550: single battery (12 V 55 AH).

BAT-121000: single battery (12 V 100 AH).

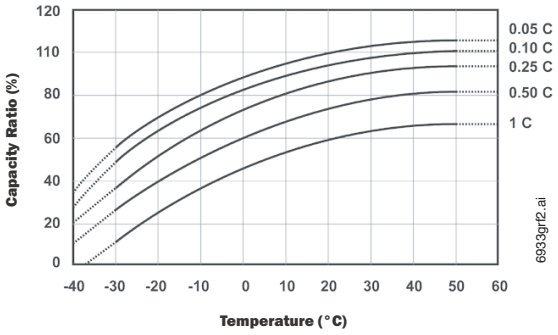
Part Number Reference & Specifications

Part Number	Power-Sonic Part Number	Battery Description			DIMENSIONS									
		Nominal Voltage V	Nominal Capacity @ 20 hr. rate A.H.		Width		Depth		Height		Height over terminal		Weight	
					in.	mm	in.	mm	in.	mm	in.	mm	lb.	kg.
BAT-1250	PS-1250	12	5	sealed	3.54	90	2.76	70	3.98	101	4.21	107	3.50	1.59
BAT-1270	PS-1270	12	7	sealed	5.95	151	2.56	65	3.7	94	3.86	98	4.8	2.18
BAT-12120	PS-12120	12	12	sealed	5.95	151	3.86	98	3.7	94	3.94	100	7.92	3.59
BAT-12180	PS-12180	12	18	sealed	7.13	181	3.00	76	6.59	167	6.59	167	12.6	5.72
BAT-12260	PS-12260	12	26	sealed	6.5	167	6.97	177	4.92	125	4.92	125	17	7.71
BAT-12550	PS-12550	12	55	sealed	9.04	230	5.45	138	8.15	207	8.98	228	36	16.33
BAT-121000	PS-121000	12	100	sealed	12	305	6.6	168	8.15	207	8.98	228	68	30.84

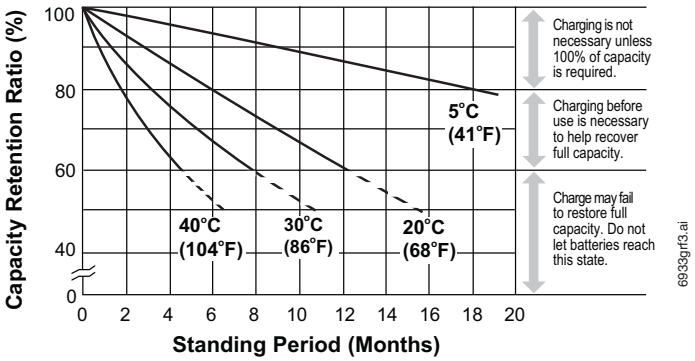
Discharge Characteristic Curves at 20°C (68°F)



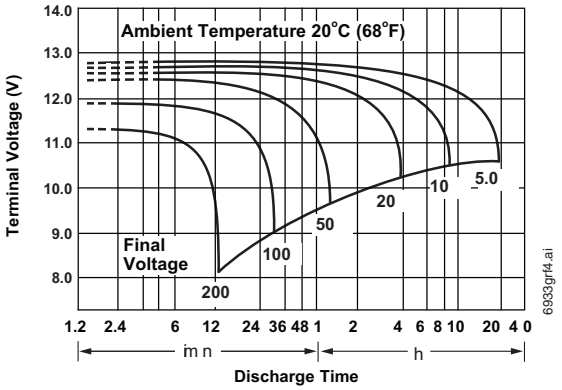
Effect of Temperature on Capacity



PS-121000 Shelf-Life and Storage



PS-121000 Discharge Characteristics



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NOTIFIER® by Honeywell

FSP-951 Series Addressable Photoelectric Smoke Detectors

The NOTIFIER® FSP-951 Series intelligent plug-in smoke detectors are designed for both performance and aesthetics, and are direct replacements for the FSP-851 Series. A new modern, sleek, contemporary design and enhanced optical sensing chamber is engineered to sense smoke produced by a wide range of combustion sources in accordance with more stringent code standards.

The FSP-951 Series detector sensitivity can be programmed in the control panel software. Sensitivity is continuously monitored and reported to the panel. Point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector location for selective maintenance when chamber contamination reaches an unacceptable level. Dual electronic thermistors add 135°F (57°C) fixed temperature thermal sensing on the FSP-951T. The FSP-951R is a remote test capable detector for use with DNR Series duct detector housings. FSP-951 series detectors are available for both FlashScan® and CLIP applications as designated.



Features

SLC LOOP:

- Two-wire SLC loop connection
- Unit uses base for wiring
- Compatible with FlashScan® and CLIP protocol systems
- Stable communication technique with noise immunity

ADDRESSING:

- Addressable by device
- Rotary, decimal addressing
  (Refer to the *NOTIFIER panel manuals* for device capacity.)

ARCHITECTURE:

- Sleek, low-profile, stylish design
- Unique single-source design to respond quickly and dependably to a broad range of fires
- Integral communications and built-in device-type identification
- Built-in tamper resistant feature
- Remote test feature from the panel
- Walk test with address display (an address on 121 will blink the detector LED: 12-[pause]-1*(FlashScan systems only)*
- Built-in functional test switch activated by external magnet
- Removable cover and insect-resistant screen for simple field cleaning
- Expanded color options

OPERATION:

- Designed to meet UL 268 7th Edition
- Factory preset at 1.5% nominal sensitivity for panel alarm threshold level
- LED "blinks" when the unit is polled (communicating with the fire panel) and latches in alarm.
- Low standby current

MECHANICALS:

- Sealed against back pressure
- SEMS screws for wiring of the separate base
- Designed for direct-surface or electrical-box mounting
- Plugs into separate base for ease of installation and maintenance
- Separate base allows interchange of photoelectric, ionization and thermal sensors

OPTIONS:

- Optional relay, isolator, and sounder bases

Installation

FSP-951 Series plug-in intelligent smoke detectors use a detachable base to simplify installation, service and maintenance. Installation instructions are shipped with each detector.

Mount detector base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see *DN-60054.*

NOTE: *Because of the inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Class "B" wiring only.*
When using relay or sounder bases, consult the ISO-X(A) installation sheet I56-1380 for device limitations between isolator modules and isolator bases.

Construction

These detectors are constructed of fire-resistant plastic. The FSP-951 Series plug-in intelligent smoke detectors are designed to commercial standards and offer an attractive appearance.

Operation

Each FSP-951 Series detector uses one of the panel's addresses (total limit is panel dependent) on the NOTIFIER Signaling Line Circuit (SLC). It responds to regular polls from the control panel and reports its type and the status. If it receives a test command from the panel (or a local magnet test), it stimulates its electronics and reports an alarm. It blinks its LEDs when polled and turns the LEDs on when commanded by the panel. The FSP-951 Series offers features and performance that represent the latest in smoke detector technology.

Product Line Information

NOTE: *"-IV" suffix indicates CLIP and FlashScan device.*

FSP-951: White, low-profile intelligent photoelectric sensor, FlashScan only

FSP-951A: Same as FSP-951 but with ULC listing

FSP-951-IV: Ivory, low-profile intelligent photoelectric sensor

FSP-951A-IV: Same as FSP-951-IV but with ULC listing

FSP-951T: White, same as FSP-951 but includes a built-in 135°F (57°C) fixed-temperature thermal device, FlashScan only

FSP-951TA: Same as FSP-951T but with ULC listing

FSP-951T-IV: Ivory, same as FSP-951T but includes a built-in 135°F (57°C) fixed-temperature thermal device

FSP-951TA-IV: Same as FSP-951T-IV but with ULC listing

FSP-951R: White, low-profile intelligent photoelectric sensor, remote test capable, for use with DNR/DNRW, FlashScan only

FSP-951RA: Same as FSP-951R but with ULC listing, for use with DNRA

FSP-951R-IV: Ivory, low-profile intelligent photoelectric sensor, remote test capable, for use with DNR/DNRW

FSP-951RA-IV: Same as FSP-951R-IV but with ULC listing, for use with DNRA

INTELLIGENT BASES

NOTE: *For details on intelligent bases, see DN-60981.*

B300-6: White, 6" base, standard flanged low-profile mounting base *(CSFM: 7300-1653:0109)*

B300-6-IV: Ivory,6" base, standard flanged low-profile mounting base *(CSFM: 7300-1653:0109)*

B300A-6: Same as B300-6, ULC listed

B300A-6-IV: Ivory, 6" standard flanged low-profile mounting base, ULC listed

B300-6-BP: Bulk pack of B300-6, package contains 10

B501-WHITE: White, 4" standard European flangeless mounting base. UL/ULC listed *(CSFM: 7300-1653:0109)*

B501-BL: Black, 4" standard European flangeless mounting base. UL/ULC listed *(CSFM: 7300-1653:0109)*

B501-IV: Ivory color, 4" standard European flangeless mounting base. UL/ULC listed *(CSFM: 7300-1653:0109)*

B501-WHITE-BP: Bulk pack of B501-WHITE contains 10

B224RB-WH: White, relay base (*CSFM: 7300-1653:0216)*

B224RB-IV: Ivory, relay base (*CSFM: 7300-1653:0216)*

B224RBA-WH: White, relay base, ULC listing

B224RBA-IV: Ivory, relay base, ULC listing

B224BI-WH: White, isolator detector base (CSFM: 7300-1653:0216)

B224BI-IV: Ivory isolator detector base (CSFM: 7300-1653:0216)

B224BIA-WH: White, isolator detector base, ULC listing

B224BIA-IV: Ivory isolator detector base, ULC listing

B200S-WH: White, Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone. Uses FlashScan protocol. *(CSFM: 7300-1653:0213)*

B200S-IV: Ivory, Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone. Uses FlashScan protocol. *(CSFM: 7300-1653:0213)*

B200SA-WH: Same as B200S-WH, ULC listing

B200SA-IV: Same as B200S-IV, ULC listing

B200SCOA-WH: White, Intelligent, programmable sounder base in English/French (required in Canada for ULC applications with CO Series detector applications

B200SCOA-IV: Ivory Intelligent, programmable sounder base in English/French (required in Canada for ULC applications with CO Series detector applications, ULC listing

B200S-LF-WH: White, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. (*CSFM: 7300-1653:0238)*

B200S-LF-IV: Ivory, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. (*CSFM: 7300-1653:0238)*

B200SR-WH: White, Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Intended for retrofit applications. *(CSFM: 7300-1653:0213)*

B200SR-IV: Ivory, Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Intended for retrofit applications. *(CSFM: 7300-1653:0213)*

B200SRA-WH: Same as B200SR-WH with, ULC listing

B200SRA-IV: Same as B200SR-IV in Ivory color, ULC listing

B200SR-LF-WH: White, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. Intended for retrofit applications. (*CSFM: 7300-1653:0238)*

B200SR-LF-IV: Ivory, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. Intended for retrofit applications. (*CSFM: 7300-1653:0238)*

MOUNTING KITS AND ACCESSORIES

TR300: White, replacement flange for B210LP(A) base

TR300-IV: Ivory, replacement flange for B210LP(A) base

RA100Z(A): Remote LED annunciator. 3-32 VDC. Mounts to a U.S. single-gang electrical box. For use with B501(A) and B300-6(A).

M02-04-00: Test magnet

M02-09-00: Test magnet with telescoping handle

CK300: Color Kit (includes cover and trim ring), white, 10-pack

CK300-IV: Color Kit (includes cover and trim ring), ivory, 10-pack

CK300-BL: Color Kit (includes cover and trim ring), black, 10-pack

Sensitivity:

- UL Applications: 0.5% to 4.0% per foot obscuration.
- ULC Applications: 0.5% to 3.5% per foot obscuration

Size: 2.0" (51mm) high; base determines diameter

  – **B300-6 series:** 6.1" (15.6 cm) diameter

  – **B501 series:** 4" (10.2 cm) diameter

For a complete list of detector bases see DN-60981

Shipping weight: 3.4 oz. (95 g)

Operating temperature range:

- FSP-951 Series: 32°F to 122°F (0°C to 50°C)
- FSP-951T Series: 32°F to 100°F(0°C to 38°C)
- FSP-951R Series installed in DNR/DNRA/DNRW, -4°F to 158°F (-20°C to 70°C)

UL/ULC Listed Velocity Range: 0-4000 ft/min. (1219.2 m/min.), suitable for installation in ducts

Relative humidity: 10% – 93% non-condensing

Thermal ratings: fixed-temperature set point 135°F (57°C), rate-of-rise detection 15°F (8.3°C) per minute, high temperature heat 190°F (88°C)

ELECTRICAL SPECIFICATIONS

Voltage range: 15 - 32 volts DC peak

Standby current (max. avg.): 200µA @ 24 VDC (one communication every 5 seconds with LED enabled)

Max current: 4.5 mA @ 24 VDC (“ON”)

DETECTOR SPACING AND APPLICATIONS

NOTIFIER recommends spacing detectors in compliance with NFPA 72. In low airflow applications with smooth ceiling, space detectors 30 feet (9.1m). For specific information regarding detector spacing, placement, and special applications refer to NFPA 72. A *System Smoke Detector Application Guide*, document SPAG91, is available at **www.systemsensor.com.**

Listings and Approvals

Listings and approvals below apply to the FSP-951 Series detectors. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- UL/ULC Listing: S1115
- FM Approved
- CSFM: 7272-0028:0503

NOTIFIER
12 Clintonville Road
Northford, CT 06472
203.484.7161
www.notifier.com

ISO 9001 CERTIFIED ENGINEERING & MANUFACTURING QUALITY SYSTEMS

This document is not intended to be used for installation purposes.
We try to keep our product information up-to-date and accurate.
We cannot cover all specific applications or anticipate all requirements.
All specifications are subject to change without notice.

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Country of Origin: Mexico

NOTIFIER® by Honeywell

Technical Data TD450023EN

Effective April 2018
Supersedes January 2016

Wheelock E50 & E60 Speakers & Speaker Strobes







Description

The Wheelock E50 Wall and E60 Ceiling Speakers and Speaker Strobes are designed for high efficiency sound output for indoor applications. The E product line features intelligible communications with crisp, clear voice messages and tone signaling, ideal for mass notification and voice evacuation.

Providing a sleek aesthetic appearance, the wall and ceiling appliances feature dual voltage (25/70 VRMS) capability and field-selectable taps from 1/8 to 2 watts. For faster and easier installation, the low profile design incorporates a speaker mounting plate, and each model has a built-in level adjustment feature and snap-on cover with no visible mounting screws.

For visible signaling to meet the hearing impaired, the E Speaker Strobe models incorporate the low current draw of the RSS Strobes.

Strobe options for wall mount models include Wheelock patented MCW multi-candela strobe with field selectable candela settings of 15/30/75/110cd or the high intensity MCWH strobe with field selectable 135/185cd.

Ceiling mount models are available in Wheelock patented MCC multi-candela ceiling strobe with field selectable intensities of 15/30/75/95cd or the high intensity MCCH strobe with field selectable 115/177cd.

The strobe portion of all E Speaker Strobes may be synchronized when used in conjunction with the Wheelock DSM Sync Modules, Wheelock Power Supplies or other manufacturers panels incorporating the Wheelock Patented Sync Protocol. Wheelock synchronized strobes offer an easy way to comply with ADA recommendations concerning photosensitive epilepsy.

E Speaker Strobes are UL Listed for indoor use under Standard 1971 (Signaling Devices for the Hearing-Impaired) and Standard 1480 (Speaker Appliances). All inputs employ IN/OUT wiring terminals for fast installation using #12 to #18 AWG wiring.

Color options for the E Speakers and Speaker Strobes are red and white.

Powering Business Worldwide

Features

- Intelligible Communications
  - Efficient design for high intelligibility at minimum wattage across a frequency range of 400 to 4000 HZ
- Field Selectable Settings
  - Wall mount models are available with Field Selectable Candela Settings of 15/30/75/110cd or 135/185cd (Multi-Candela models)
  - Ceiling mount models are available with field selectable candela settings of 15/30/75/95cd or 115/177cd (Multi-candela models)
- Field Selectable Taps
  - 1/8 watt up to 2 watts
  - 25 or 70 VRMS operation
- Easy-to-Install
  - Low profile design incorporates speaker mounting plate for faster and easier installation
  - Snap on grille cover with no visible mounting screws
  - Quick installation with IN/OUT screw terminals using #12 to #18 AWG wires
  - 4" square backbox prevents wire damage
  - E50- No extension ring required
  - E60- Optional Extender (E60 Ext) is available for mounting to 4" square backboxes
- Strobe Synchronization Components
  - Meet synchronizing standards with Wheelock's DSM Sync Modules, Power Supplies or SAFEPATH products
- Compliance
  - UL 1971, UL 1480
  - California State Fire Marshal (CSFM)
  - ADA/NFPA/ANSI/OSHA
  - FCC Part 15, ICES

Note: Please read these specifications and associated installation instructions, before using, specifying, or installing this product. Visit Eaton.com/massnotification for current installation instructions.

Drawings

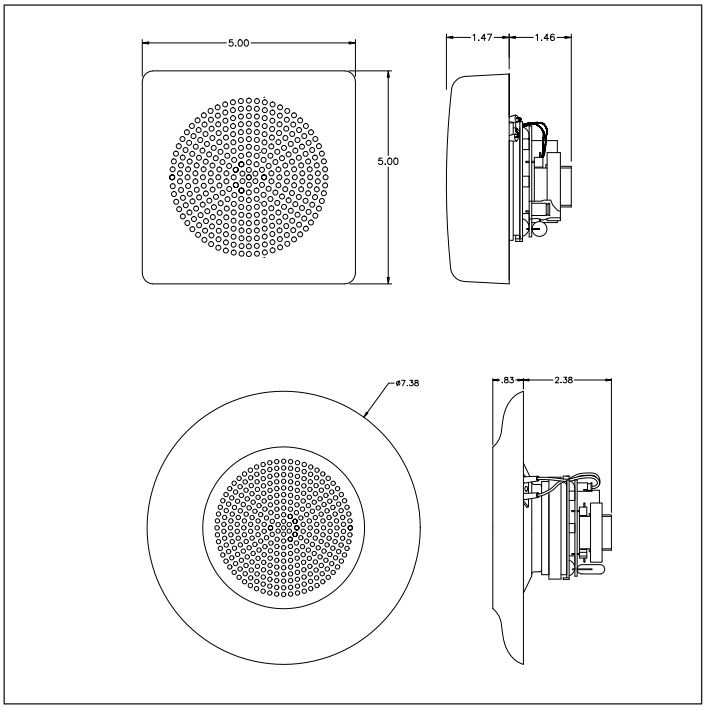


Figure 1. E50 (top) and E60 (bottom) Speakers - Front & Side Views

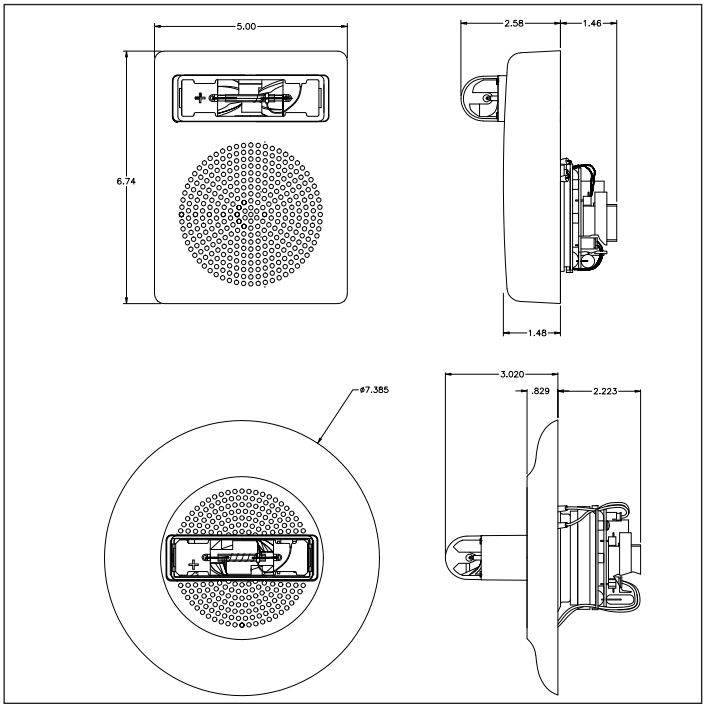


Figure 2. E50 (top) and E60 (bottom) Speaker Strobes - Front & Side Views

General Notes

- Strobes are designed to flash at 1 flash per second minimum over their "Regulated Voltage Range." Note that NFPA-72 specifies a flash rate of 1 to 2 flashes per second and ADA Guidelines specify a flash rate of 1 to 3 flashes per second.
- All candela ratings represent minimum effective Strobe intensity based on UL 1971.

Table 1. Maximum RMS Current

		UL Max Current ①								
		24MCW/24MCC 241575W				24MCWH/24MCCH				
Model	Regulated Voltage Range VDC	15	30	75	95	110	115	135	177	185
E50	16.0-33.0	0.060	0.092	0.165		0.220		0.300		0.420
E60	16.0-33.0	0.065	0.105	0.189	0.249		0.300		0.420	

Table 2. UL Listed Models and Ratings

	UL Reverberant dBA at 10 Feet ②				
Model	1/8 watts ③	1/4 watts	1/2 watts	1 watts	2 watts
E50 Speaker Strobe	77	79.5	82.5	85	88
E60 Speaker	77	79.5	82.5	85	88
E60 Speaker Strobe	77	79.5	82.5	85	88

Table 3. Specification & Ordering Information

Model	Order #	Strobe Candela	Red	White	Lettering	Wall	Ceiling	Mounting Options	Sync w/ DSM or Wheelock Power Supplies
Speakers									
E50-R	0222		X		No Lettering	X	X	E,O,P,Q,R,U,Y,A	
E50-W	0223			X	No Lettering	X	X	E,O,P,Q,R,U,Y,A	
E60-R	3746		X		No Lettering		X	Q,U	
E60-W	3745			X	No Lettering		X	Q,U	
Speaker Strobes									
E50-24MCW-FR	0092	15/30/75/110	X		FIRE	X		E, BB	X
E50-24MCW-FW	0093	15/30/75/110		X	FIRE	X		E, BB	X
E50-24MCWH-FR	0094	135/185	X		FIRE	X		E, BB	X
E50-24MCWH-FW	0097	135/185		X	FIRE	X		E, BB	X
E60-24MCC-FR	3748	15/30/75/95	X		FIRE		X	Q,U,V	X
E60-24MCC-FW	3747	15/30/75/95		X	FIRE		X	Q,U,V	X
E60-24MCCH-FR	3750	115/177	X		FIRE		X	Q,U,V	X
E60-24MCCH-FW	3749	115/177		X	FIRE		X	Q,U,V	X
Extender Ring									
E60EXT-R ④	3578		X						
E60EXT-W ④	3757			X					

Table 4. Specifications

Physical	
Material	Red or white textured UV stabilized, colored impregnated engineered plastic. Exceeds 94V-0 UL flammability rating
Weight	E50 Speaker: 1.5 lbs (0.68 kg); E50 Speaker Strobe 1.6 lbs (0.73 kg); E60 Speaker: 1.6 lbs (0.73 kg); E60 Speaker Strobe 1.7 lbs (0.77 kg);
Dimensions	E50 Speaker: 5" W x 5" H x 1.7"D; E50 Speaker Strobe: 5" W x 6.74" H x 2.58"D; E60 Speaker: 7.38" Diameter x .83" D; E60 Speaker Strobe: 7.38" Diameter x 3.02" D
Operating Temperature	Indoor: 33.8°F to 120.2°F (0°C to 49°C) and maximum humidity of 93%
Lens (material type)	GE Lexan 943 A
Mounting & Wire Connections	
Mounting (indoor only)	4" square backbox prevents wire damage; Series E50 No extension ring required; Series E60 Optional Extender (E60 Ext) is available for mounting to 4" square backboxes, E50 SSB, E50 SB for surface mount of E50
Wire Connections	#12 through #18 AWG
Power & General	
Operating voltage	25/70 VRMS
Strobe Output Rating	UL 1971
Strobe Flash Rate	Strobes are designed to flash at 1 flash per second
Synchronization Models	Strobes can be synchronized with Wheelock's DSM Sync Modules, Power Supplies or SAFEPATH products, using Wheelock patented sync protocol
Frequency Range	400 Hz to 4000 Hz

① RMS current ratings are per UL maximum RMS method. UL max current rating is the maximum RMS current within the listed voltage range (16-33v for 24v units). For strobes the UL max current is usually at the minimum listed voltage (16v for 24v units). For audibles the max current is usually at the maximum listed voltage (33v for 24v units). For unfiltered FWR ratings, see installation instructions.

b dBA ratings are based on testing under UL Standard 1480.
c 1/8 watt tap is for private mode only.
d E60 EXT is an attractive extender ring that mounts behind the speaker to permit mounting to a 4" square x 2 1/8" deep electrical box without need for an extension ring on the box.

Architects and Engineers Specifications

Wheelock E50- The speaker appliances shall be Wheelock E50 Speakers, and the Speaker Strobe appliances shall be Wheelock E50 Speaker Strobes or approved equals. The speakers shall be UL Listed under UL 1480 for Fire Protective Service and speakers equipped with strobes shall be listed under UL 1971 for Emergency Devices for the Hearing-Impaired. In addition, the strobes shall be certified to meet the requirements of FCC Part 15, Class A.

All speakers shall be designed for a field selectable input of either 25 or 70 VRMS, with selectable power taps from 1/8 watt to 2 watts. All models shall have listed sound output of up to 87 dBA at 10 feet and a listed frequency response of 400 to 4000 Hz. The speaker shall incorporate a sealed back construction. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes. The strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall be of low current design. Where Multi-Candela Speaker Strobes are specified, the strobe intensity shall have field selectable settings and shall be rated per UL 1971 at 15/30/75/110cd or 135/185cd for wall mounting. The selector switch for selecting the candela shall be tamper resistant.

When synchronization is required,the strobe portion of the appliance shall be compatible with the Wheelock's DSM sync modules or Wheelock Power Supplies with built-in Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync module or Power Supply fails to operate, (i.e., contacts remain closed), the strobe shall revert to a non-synchronized flash rate.

The speaker and speaker strobe appliances shall be designed for indoor flush mounting to 4" x 2-1/8" electrical boxes without need for an extension ring or surface mounting to Wheelock's E50SB or E50SSB surface boxes. The speaker and speaker strobe shall incorporate a speaker mounting plate with a snap-on grille cover. The finish of the Series E50 speakers and speakers strobes shall be white or red.

UL 1971, UL 1480, CSFM, FCC.

Wheelock E60 - The speaker appliances shall be Wheelock E60 Speakers, and the Speaker Strobe appliances shall be Wheelock Series E60 Speaker Strobes or approved equals. The speakers shall be UL Listed under UL 1480 for Fire Protective Service and speakers equipped with strobes shall be listed under UL 1971 for Emergency Devices for the Hearing-Impaired. In addition, the strobes shall be certified to meet the requirements of FCC Part 15, Class A.

All speakers shall be designed for a field selectable input of either 25 or 70 VRMS, with selectable power taps from 1/8 watt to 2 watts. All models shall have listed sound output of up to 87 dB at 10 feet and a listed frequency response of 400 to 4000 Hz. The speaker shall also incorporate a sealed back construction. All inputs shall employ terminals that accept #12 to #18 AWG wire sizes. The strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range. The strobe shall be of low current design. Where Multi-Candela Speaker Strobes are specified, the strobe intensity shall have field selectable settings and shall be rated per UL 1971 15/30/75/95cd or 115/177cd for ceiling mount. The selector switch for selecting the candela shall be tamper resistant. When synchronization is required, the strobe portion of the appliance shall be compatible with Wheelock DSM sync modules or the Wheelock Power Supplies with built-in Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync module or Power Supply fails to operate, (i.e., contacts remain closed), the strobe shall revert to a non-synchronized flash rate.

The speaker and speaker strobe appliances shall be designed for indoor flush mounting. The speaker and speaker strobe shall incorporate a speaker mounting plate with a snap-on grille cover with no visible screws for a level, aesthetic finish and shall mount to standard electrical hardware. The finish of the Series E60 Speakers and Speaker Strobes shall be white or red. All speaker and speaker strobe appliances shall be backward compatible.

UL 1971, UL 1480, CSFM, FCC.

Note: Due to continuous development of our products, specifications and offerings are subject to change without notice in accordance with Cooper Wheelock Inc., dba Eaton standard terms and conditions.

NEMA Member

WE ENCOURAGE AND SUPPORT NICET CERTIFICATION
3 YEAR WARRANTY

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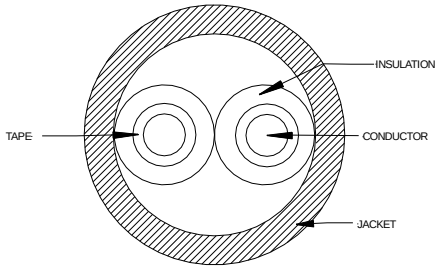
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April 2018

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Powering Business Worldwide

VITALink®
18 AWG Solid 2/C Non-Shielded Circuit Integrity Cable



1. Construction:

1.1. Conductors: 18 AWG (0.82 mm^2) Solid Bare Copper, 0.0403" (1.02 mm) Nominal Diameter
1.2. Tape: Flame Retardant Tape
1.3. Insulation: Low Smoke Zero Halogen Thermoset Fire-Roc® 0.118" (3 mm) Nominal Diameter & 0.029" (0.73 mm) Nominal Wall Thickness
1.4. Color Code: Red, Black
1.5. Assembly: Cable (2) Conductors 4.25" (108 mm) Nominal LHL
1.6. Jacket: Non-Halogen Flame Retardant Polyolefin Compound, Nominal Overall Diameter 0.305" (7.74 mm), Nominal Wall Thickness 0.034" (0.86 mm)
Color: RED
1.7. **Jacket Print:**
COMTRAN LSZH VITALink® FPLR-CI-ST1 CMR-CI-LS CL3R-CI-ST1 2/C 18AWG 105C SUN RES WET or FAS105 LL14444 FRR-2HR FHIT.40A/FHIT7.40A UL2196/ULC S139 MAX VOLTAGE 72V PN36337 --- NYC APPROVED (MMYY) 000002 (01-12345)

NOTE: MMYY is 4 Digit Month/Year
Sequential Footage Markings Every Two Feet (01-12345)- Traceability Marking

2. Compliance:

2.1. (UL) Listed Type FPLR-CI-ST1
2.2. (UL) Listed Type CMR-CI-LS
2.3. (UL) Listed CL3R-CI-ST1
2.4. CSA Listed FAS 105
2.5. UL Subject 1424 Power Limited Fire Alarm Circuits; 300V/105°C Classified
2.6. UL Subject 13 Power Limited Circuit Cables; 300V/105°C Classified
2.7. UL Subject 444 Communications Cable; 300V/105°C Classified
2.8. ANSI/UL 2196 2-Hour Fire Rating for use in FHIT System 40A
2.9. CAN/ULC-S139 2-Hour Fire Rating with Hose Stream for use in FHIT7 System 40A
2.10. NFPA 70 & 72
2.11. NFPA 130
2.12. NFPA 502
2.13. California State Fire Marshal Approved
2.14. NYC Electrical Advisory Board #54502, April 2017
2.15. RoHS Compliant

3. Physical Characteristics:

3.1. Nominal Weight per 1000 FT: 41 Lbs. (18.5 kg)
3.2. Min Bend Radius: 2" (50.8 mm)
3.3. Maximum Pull Tension – Straight runs: 26 Lbs. /ft. (11.7 kg/Ft.)

4. Electrical Characteristics:

4.1. Nominal Conductor DCR @ 68F (20 ºC): 6.51 Ω / 1000 Ft.
4.2. Nominal Capacitance C-C: 13 pF/Ft.

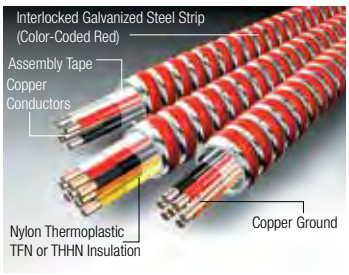
TITLE:	DESCRIPTION:	COMTRAN 330A Turner Street South Attleboro, MA 02703 Phone: 508-399-7004 Fax: 508-399-8839	COMTRAN Innovative Systems. Engineered Solutions. A Marmon Wire & Cable/Berkshire Hathaway Company
DS36337	18 AWG Solid 2 Conductor VITALink® Non-shielded Circuit Integrity Cable		

Rev	Date	Detail	Eng.	App.	
12	05/12/20	Update legend per UL update	PB	KB	ECN 20-042
11	01/09/20	Update Capacitance per physical test.	PB	WC	
10	07/09/19	Change legend per UL update; add electrical data	PB	WC	ECN 19-071
09	02/27/19	Add regulatory approvals	PB	WC	
08	01/29/19	Change logo and basic corrections	SM	WC	

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Fire Alarm® Control Cable – Type MC – Dual Rated Type MC/FPLP

Plenum Rated Technical Specifications



Armor
Interlocked Galvanized Steel Strip (Painted Red)

Conductors
Solid Copper

Conductor Insulation
TFN 18 & 16 AWG and/or THHN 14 & 12 AWG

Assembly
Polyester Assembly Tape; Twisted Shielded: Laminated Aluminum/Mylar® Shield with Tinned Copper Drain Wire

Maximum Temperature Rating
FPLP: 105°C (Dry)
MC: 90°C (Dry)

Grounding
One or More Grounding Conductors May Be Bare or Insulated Green, See Chart Below

Neutral Conductor
White (Where Applicable)

Maximum Voltage Rating
300V (FPLP)
600V (MC)

References & Ratings
- UL 66, 83, 1424, 1479, 1569, 1581, 2556, File Reference E80042
- NEC® 300.22(C), 392, 330, 430.2, 501, 502, 503, 530, 504, 505, 518, 530, 645, 725, 760, 760.154(A)
- Cable Tray Rated, install per NEC®
- Federal Specification A-A-59544 (formerly J-C-30B)
- UL Classified 1, 2, and 3 hour through (Fire) penetration product, R14141
- NFPA 262 (formerly UL 910) Plenum Rated - Type FPLP
- Made in USA of US and/or imported materials

Product Code		Trade Size	Grounding Conductor AWG	Approx. Weight/ 1,000ft (lbs)	Approx. Armor O.D. (In)
250' Coil	1000' Reel				
Solid TFN					
1801R42-00	1801R60-00	18-2 Solid (Black, White)	18 bare	110	0.470
1803R42-00	1803R60-00	18-4 Solid (Black, White, Red, Blue)	18 bare	130	0.430
1805R42-00	1805R60-00	18-6 Solid (Black, White, Red, Blue, Yellow, Orange)	18 bare	170	0.490
1810R42-00	1810R60-00	16-2 Solid (Black, White)	16 bare	120	0.470
1813R42-00	1813R60-00	16-4 Solid (Black, White, Red, Blue)	16 bare	147	0.491
Solid THHN					
1834R42-00	1834R60-00	14-2 Solid (Black, White)	14 Solid (Green)	142	0.471
1837R42-00	1837R60-00	14-4 Solid (Black, White, Red, Blue)	14 Solid (Green)	192	0.529
1835R42-00	1835R60-00	12-2 Solid (Black, White)	12 Solid (Green)	177	0.514
1840R42-00	1840R60-00	12-4 Solid (Black, White, Red, Blue)	12 Solid (Green)	249	0.584
Twisted Shielded Pairs					
1895R42-05	1895R60-05	16-2 Solid (1 TSP) (Blue, White) †	16 Solid (Green)	147	0.526
1895R42-06	1895R60-06	16-2 Solid (1 TSP) (Black, Red) †	16 Solid (Green)	147	0.526
4901R42-00	4901R60-00	16-2 Solid (1 TSP) (Black, White) & un-shielded 12-2 Solid (Black, Red) †	12 Solid (Green)	236	0.606
1828R42-00	1828R60-00	14-2 Solid (1 TSP) (Black, White) †	14 Solid (Green)	217	0.565
1828R42-05	1828R60-05	14-2 Solid (1 TSP) (Blue, White) †	14 Solid (Green)	217	0.565
1881R42-00	1881R60-00	14-4 Solid (2 TSP) (Black, Red) (Blue, White) †	14 Solid (Green)	255	0.690
Specialty Colors					
1828R42-05	1828R60-05	14-2 Solid (1TSP) (Blue, White) †	14 Solid (Green)	217	0.565
1834R42-05	1834R60-05	14-2 Solid (Blue, White)	14 Solid (Green)	195	0.627
1834R42-06	1834R60-06	14-2 Solid (Black, Red)	14 Solid (Green)	195	0.627
1834R42-23	1834R60-23	14-2 Solid (Orange, Yellow)	14 Solid (Green)	195	0.627
1834R42-37	1834R60-37	14-2 Solid (Brown, Purple)	14 Solid (Green)	195	0.627
1834R42-44	1834R60-44	14-2 Solid (Gray, Gray*)	14 Solid (Green)	195	0.627
1835R42-05	1835R60-05	12-2 Solid (Blue, White)	12 Solid (Green)	177	0.514
1837R42-05	1837R60-05	14-4 Solid (Blue, Blue*, White, White*)	14 Solid (Green)	192	0.529
1837R42-06	1837R60-06	14-4 Solid (Black, Black*, Red, Red*)	14 Solid (Green)	192	0.529
1895R42-06	1895R60-06	16-2 Solid (1 TSP) (Black, Red) †	16 Solid (Green)	147	0.526

SIGNALING LINE, AND SPEAKER CIRCUITS

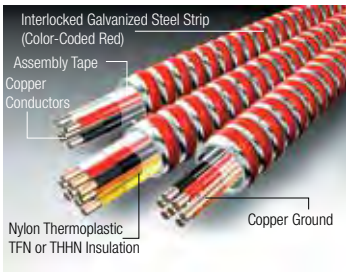
STROBE CIRCUITS

CONTROL AND INTERFACED CIRCUITS

NOTE: All dimensions and weights are subject to normal manufacturing tolerances.
* One conductor insulation has identifying stripe
† All drain wires are 18AWG Tinned Copper in TSP construction
Mylar is a Registered trademark of DuPont

For the electrical properties of Fire Alarm® Control Cable and twists per foot information, see page 30.

Fire Alarm® Control Cable Performance Charts



Conductor Size AWG	XL, Reactance[1]	Rac, Resistance, 75°C[2]	Z, Effective[3] Impedance
Electrical Properties (ohms to neutral per 1000 feet)			
18	0.047	7.77	6.24
16	0.043	4.89	3.93
14	0.042	3.07	2.48
12	0.04	1.93	1.57

[1] In Steel Armor
[2] To correct for 90°C, multiply by 1.048
[3] Effective Impedance is defined as R cos (Theta) + X sin (Theta) where Theta is the power factor angle of the circuit. Effective impedance values shown in the table above are valid at 80% power factor.

Conductor Size AWG	Twisted Pair[1]	Twisted Shielded Pair[2]
Mutual Capacitance (pico farads per foot)		
18	30	47.3
16	33.5	54.8
14	36.3	60.7
12	38.8	66.4

[1] In Steel Armor
[2] To correct for 90°C, multiply by 1.048
[3] Effective Impedance is defined as R cos (Theta) + X sin (Theta) where Theta is the power factor angle of the circuit. Effective impedance values shown in the table above are valid at 80% power factor.

Inductance (L) to neutral, per 1000 feet is typically 0.0002mH for sizes 18 AWG through 250 kcmil

= 0.1404 Log10(GMD/GMR) x 10-3 Henrys to neutral per 1000 feet]

Size	Total Number of Conductors Including Ground	Conductor Diameter	Length of Lay	Twists per Foot
Twists per Foot				
18	2	0.08	2.4	5
18	3	0.08	2.8	4.3
18	4	0.08	3.2	3.8
18	5	0.08	3.3	3.7
16	2	0.09	2.7	4.4
16	3	0.09	3.2	3.8
16	4	0.09	3.6	3.3
16	5	0.09	3.7	3.3
14	2	0.105	3.15	3.8
14	3	0.105	3.7	3.3
14	4	0.105	4.2	2.9
14	5	0.105	4.3	2.8
12	2	0.125	3.75	3.2
12	3	0.125	4.4	2.7
12	4	0.125	5	2.4
12	5	0.125	5.1	2.4

Power Limited Fire Alarm Circuit Cable – Type FPLP

Plenum Rated Technical Specifications

Armor
Interlocked Galvanized Steel Strip (Red-Striped)

Conductors
Solid Copper

Conductor Insulation
TFN 18 & 16 AWG and/or THHN 14 & 12 AWG

Assembly
Polyester Assembly Tape; Twisted Shielded: Laminated Aluminum/Mylar® Shield with Tinned Copper Drain Wire

Maximum Temperature Rating
FPLP: 105°C (Dry)

Neutral Conductor
White (Where Applicable)

References & Ratings
- UL 66, 83, 1424, 1479, 1581, 2556, File Reference E83514
- NEC® 300.22(C), 392, 330, 430.2, 501, 502, 503, 530, 504, 505, 518, 530, 645, 725, 760, 760.154(A)
- Cable Tray Rated, install per NEC®
- Federal Specification A-A-59544 (formerly J-C-30B)
- UL Classified 1, 2, and 3 hour through (Fire) penetration product, R14141
- NFPA 262 (formerly UL 910) Plenum Rated - Type FPLP
- Made in USA of US and/or imported materials

Product Code		Trade Size	Approx. Weight/ 1,000ft (lbs)	Approx. Armor O.D. (In)
250' Coil	1000' Reel			
Metal Sheathed Type FPLP Cable				
1850R42-00	1850R60-00	18-2 Solid (1 TSP) (Black, White) †	111	0.470
1827R42-00	1827R60-00	18-2 Solid (1 TSP) (Black, Red) & 14-2 Solid (1 TSP) (Black, White) †	204	0.637
1860R42-00	1860R60-00	16-2 Solid (1 TSP) (Black, White) †	118	0.470
1843R42-00	1843R60-00	16-4 Solid (2 TSP) (Black, White) (Red, Blue) †	195	0.627

NOTE: All dimensions and weights are subject to normal manufacturing tolerances.
* One conductor insulation has identifying stripe
† All drain wires are 18AWG Tinned Copper in TSP construction
Mylar is a Registered trademark of DuPont

For the electrical properties of Fire Alarm® Control Cable and twists per foot information, see page 30.

Series TY-FRB, 5.6 K-factor Upright, Pendent, and Recessed Pendent Sprinklers Quick Response, Standard Coverage

General Description

The TYCO Series TY-FRB, 5.6 K-factor, Upright (TY313) and Pendent (TY323) Sprinklers described in this data sheet are quick response, standard coverage, decorative 3 mm glass bulb-type spray sprinklers designed for use in light or ordinary hazard, commercial occupancies such as banks, hotels, and shopping malls.

The recessed version of the Series TY-FRB Pendent Sprinkler, where applicable, is intended for use in areas with a finished ceiling. This recessed pendent sprinkler uses one of the following:

- A two-piece Style 15 Recessed Escutcheon with recessed adjustment up to 5/8 in. (15,9 mm) from the flush pendent position.
- A two-piece Style 20 Recessed Escutcheon with recessed adjustment up to 1/2 in. (12,7 mm) from the flush pendent position.

The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the fixed pipe drops to the sprinklers must be cut.

Intermediate level versions of Series TY-FRB Sprinklers are described in Technical Data Sheet TFP357. Sprinkler guards and shields are described in Technical Data Sheet TFP780.

IMPORTANT

Refer to Technical Data Sheet TFP2300 for warnings pertaining to regulatory and health information.

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.

NOTICE

The TYCO Series TY-FRB Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. Contact the installing contractor or product manufacturer with any questions.

Sprinkler Identification Number (SIN)

TY313 . . . . Upright 5.6K, 1/2 in. NPT
TY323 . . . .Pendent 5.6K, 1/2 in. NPT

Technical Data

Approvals
Refer to Table A

Maximum Working Pressure
175 psi (12.1 bar)
250 psi (17.2 bar)*

* The maximum working pressure of 250 psi (17.2 bar) only applies to the listing by Underwriters Laboratories, Inc. (UL).

Discharge Coefficient
K=5.6 GPM/psi$^{1/2}$ (80,6 LPM/bar$^{1/2}$)

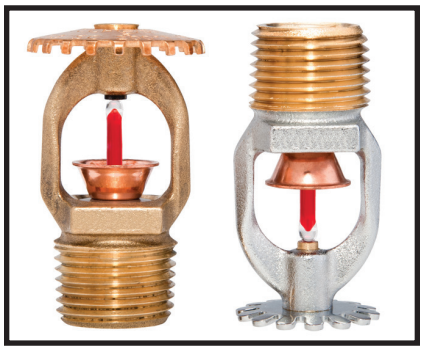
Temperature Rating
Refer to Table A

Finishes
Sprinkler: Refer to Table B

Recessed Escutcheon: White Coated, Black Coated, Chrome Plated, or Brass Plated

Physical Characteristics

Frame	Bronze
Button	Brass/Copper
Sealing Assembly	Stainless Steel w/TEFLON
Bulb	Glass
Compression Screw	Bronze
Deflector	Bronze





Operation

The glass bulb contains a fluid which expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb, allowing the sprinkler to activate and water to flow.

Design Criteria

The TYCO Series TY-FRB, 5.6 K-factor, Upright (TY313) and Pendent (TY323) Sprinklers are intended for fire protection systems designed in accordance with the standard installation rules recognized by the applicable Listing or Approval agency (such as, UL Listing is based on the requirements of NFPA 13, and FM Approval is based on the requirements of FM's Loss Prevention Data Sheets). Only the Style 15 or Style 20 Recessed Escutcheon is to be used for recessed pendent installations.

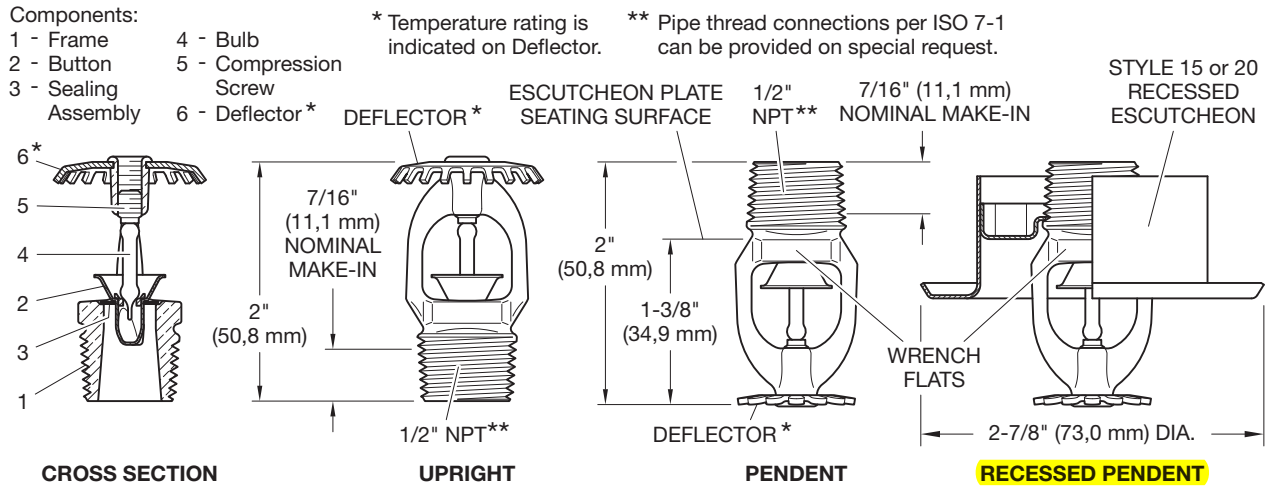


FIGURE 1
SERIES TY-FRB UPRIGHT (TY313) AND PENDENT (TY323) SPRINKLERS
5.6 K-FACTOR, 1/2 INCH NPT, QUICK RESPONSE

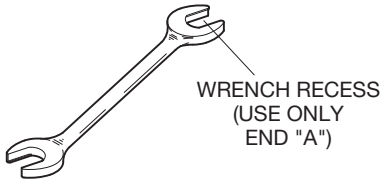


FIGURE 2
W-TYPE 6
SPRINKLER WRENCH

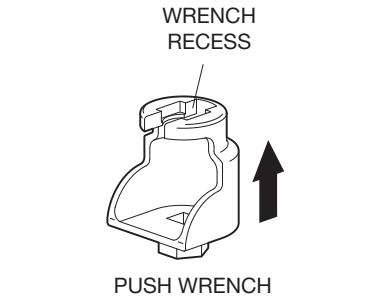


FIGURE 3
W-TYPE 7 RECESSED
SPRINKLER WRENCH

Installation

The TYCO Series TY-FRB, 5.6 K-factor, Upright (TY313) and Pendent (TY323) Sprinklers must be installed in accordance with this section.

General Instructions
Do not install any bulb-type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 in. (1,6 mm) for the 135°F (57°C) and 3/32 in. (2,4 mm) for the 286°F (141°C) temperature ratings.

A leak-tight 1/2 in. NPT sprinkler joint should be obtained by applying a minimum to maximum torque of 7 to 14 lb-ft (9,5 to 19,0 N·m). Higher levels of torque can distort the sprinkler Inlet with consequent leakage or impairment of the sprinkler.

Do not attempt to compensate for insufficient adjustment in the Escutcheon Plate by under- or over-tightening the sprinkler. Re-adjust the position of the sprinkler fitting to suit.

Upright and Pendent Sprinklers
The Series TY-FRB Upright and Pendent Sprinklers must be installed in accordance with the following instructions.

Step 1. Install Pendent sprinklers in the pendent position. Install upright sprinklers in the upright position.

Step 2. With pipe-thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

Step 3. Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Figure 2). With reference to Figure 1, apply the W-Type 6 Sprinkler Wrench to the wrench flats. Torque sprinklers 7 to 14 lb-ft (9,5 to 19,0 N·m).

Recessed Pendent Sprinklers
The Series TY-FRB Recessed Pendent Sprinklers must be installed in accordance with the following instructions.

Step A. After installing the Style 15 or Style 20 Mounting Plate over the sprinkler threads, and with pipe-thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

Step B. Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Figure 3). With reference to Figure 1, apply the W-Type 7 Recessed Sprinkler Wrench to the sprinkler wrench flats. Torque sprinklers 7 to 14 lb-ft (9,5 to 19,0 N·m).

Step C. After ceiling installation and finishing, slide on the Style 15 or Style 20 Closure over the Series TY-FRB Sprinkler and push the Closure over the Mounting Plate until its flange comes in contact with the ceiling.

Care and Maintenance

The TYCO Series TY-FRB, 5.6 K-factor, Upright (TY313) and Pendent (TY323) Sprinklers must be maintained and serviced in accordance with this section.

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, obtain permission to shut down the affected fire protection systems from the proper authorities and notify all personnel who may be affected by this action.

Absence of the outer piece of an escutcheon, which is used to cover a clearance hole, can delay sprinkler operation in a fire situation.

The owner must assure that the sprinklers are not used for hanging any objects and that the sprinklers are only cleaned by means of gently dusting with a feather duster; otherwise, non-operation in the event of a fire or inadvertent operation may result.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section.)

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. Contact the installing contractor or product manufacturer with any questions.

Automatic sprinkler systems are recommended to be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

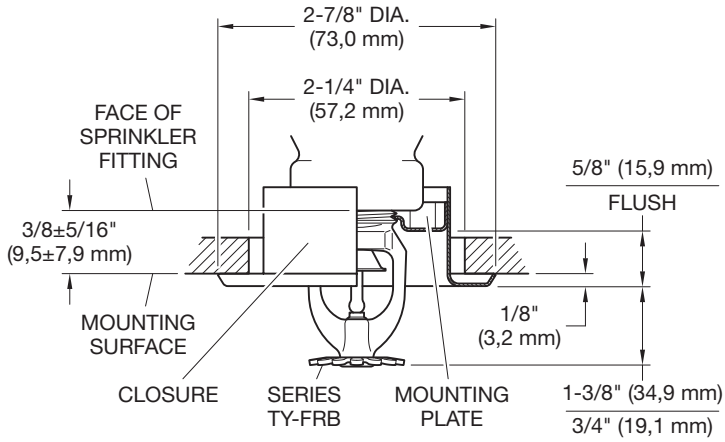


FIGURE 4
SERIES TY-FRB RECESSED PENDENT SPRINKLER ASSEMBLY (TY323) WITH TWO PIECE 5/8 INCH TOTAL ADJUSTMENT STYLE 15 RECESSED ESCUTCHEON

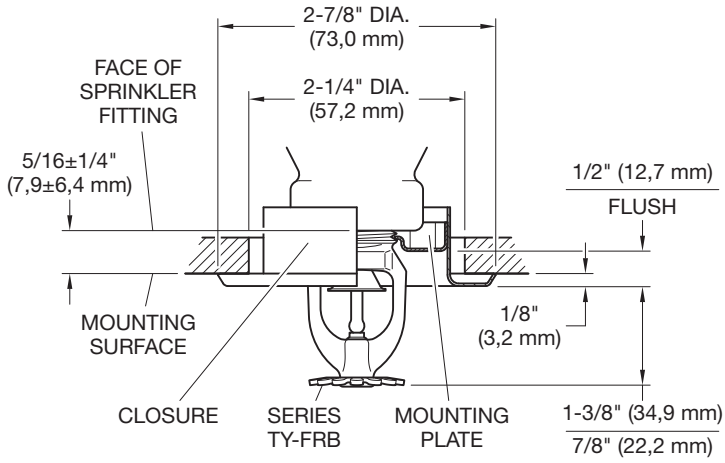


FIGURE 5
SERIES TY-FRB RECESSED PENDENT SPRINKLER ASSEMBLY (TY323) WITH TWO PIECE 1/2 INCH TOTAL ADJUSTMENT STYLE 20 RECESSED ESCUTCHEON

Limited Warranty

For warranty terms and conditions, visit www.tyco-fire.com.

Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

Sprinkler Assemblies with NPT Thread Connections
Specify: Series TY-FRB Upright or Pendent (specify) Sprinkler, SIN (specify), K=5.6, Quick Response, (specify) temperature rating, (specify) finish, P/N (specify, refer to Table A).

Recessed Escutcheon
Specify: Style 15 Recessed Escutcheon with (specify*) finish, P/N (specify*)

Specify: Style 20 Recessed Escutcheon with (specify*) finish, P/N (specify*)

* Refer to Technical Data Sheet TFP770

Sprinkler Wrench
Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387

Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001

K FACTOR	TYPE	TEMPERATURE	SPRINKLER FINISH (See Note 7) BULB LIQUID COLOR	NATURAL BRASS	CHROME PLATED	POLYESTER[c]
5.6 1/2 in. NPT	UPRIGHT (TY313) and PENDENT (TY323)	135°F (57°C)	Orange	1, 2, 3, 4, 5, 6		
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
		286°F (141°C)	Blue			
	RECESSED PENDENT (TY323) Figures 4[a] and 5[b]	135°F (57°C)	Orange	1, 2, 3, 4		
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			

Notes:
1. Listed by Underwriters Laboratories, Inc., (UL) as Quick Response Sprinklers.
2. Listed by Underwriters Laboratories, Inc., for use in Canada (C-UL) as Quick Response Sprinklers.
3. Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers.
4. Approved by the City of New York under MEA 354-01-E.
5. VdS Approved (For details, contact Johnson Controls, Enschede, Netherlands, Tel. 31-53-428-4444/Fax 31-54-428-3377.)
6. Approved by the Loss Prevention Certification Board (LPCB Ref. No. 094a/06) as Quick Response Sprinklers.
7. Where Polyester Coated Sprinklers are noted to be UL and C-UL Listed, the sprinklers are UL and C-UL Listed as Corrosion-Resistant Sprinklers.

a. Installed with Style 15 (1/2 in. NPT) 5/8 in. Total Adjustment Recessed Escutcheon, as applicable.
b. Installed with Style 20 (1/2 in. NPT) 1/2 in. Total Adjustment Recessed Escutcheon, as applicable.
c. Frame and Deflector only. Listings and approvals apply to color (Special Order).

TABLE A
LABORATORY LISTINGS AND APPROVALS FOR
5.6 K-FACTOR SPRINKLERS

P/N[a] 77 – XXX – X – XXX

		SIN
370	5.6K UPRIGHT (1/2 in.NPT)	TY313
371	5.6K PENDENT (1/2 in.NPT)	TY323

Notes:
a. Use suffix "I" for ISO 7-1 connection; for example, 77-370-4-175-I

	SPRINKLER FINISH
1	NATURAL BRASS
3	PURE WHITE (RAL9010)[a] POLYESTER
4	SIGNAL WHITE (RAL9003) POLYESTER
5	JET BLACK (RAL9005) POLYESTER
9	CHROME PLATED

Notes:
a. Eastern Hemisphere sales only

	TEMPERATURE RATINGS
135	135°F (57°C)
155	155°F (68°C)
175	175°F (79°C)
200	200°F (93°C)
286	286°F (141°C)

TABLE B
SERIES TY-FRB UPRIGHT AND PENDENT SPRINKLERS
PART NUMBER SELECTION

1400 Pennbrook Parkway, Lansdale, PA 19446 | Telephone +1-215-362-0700

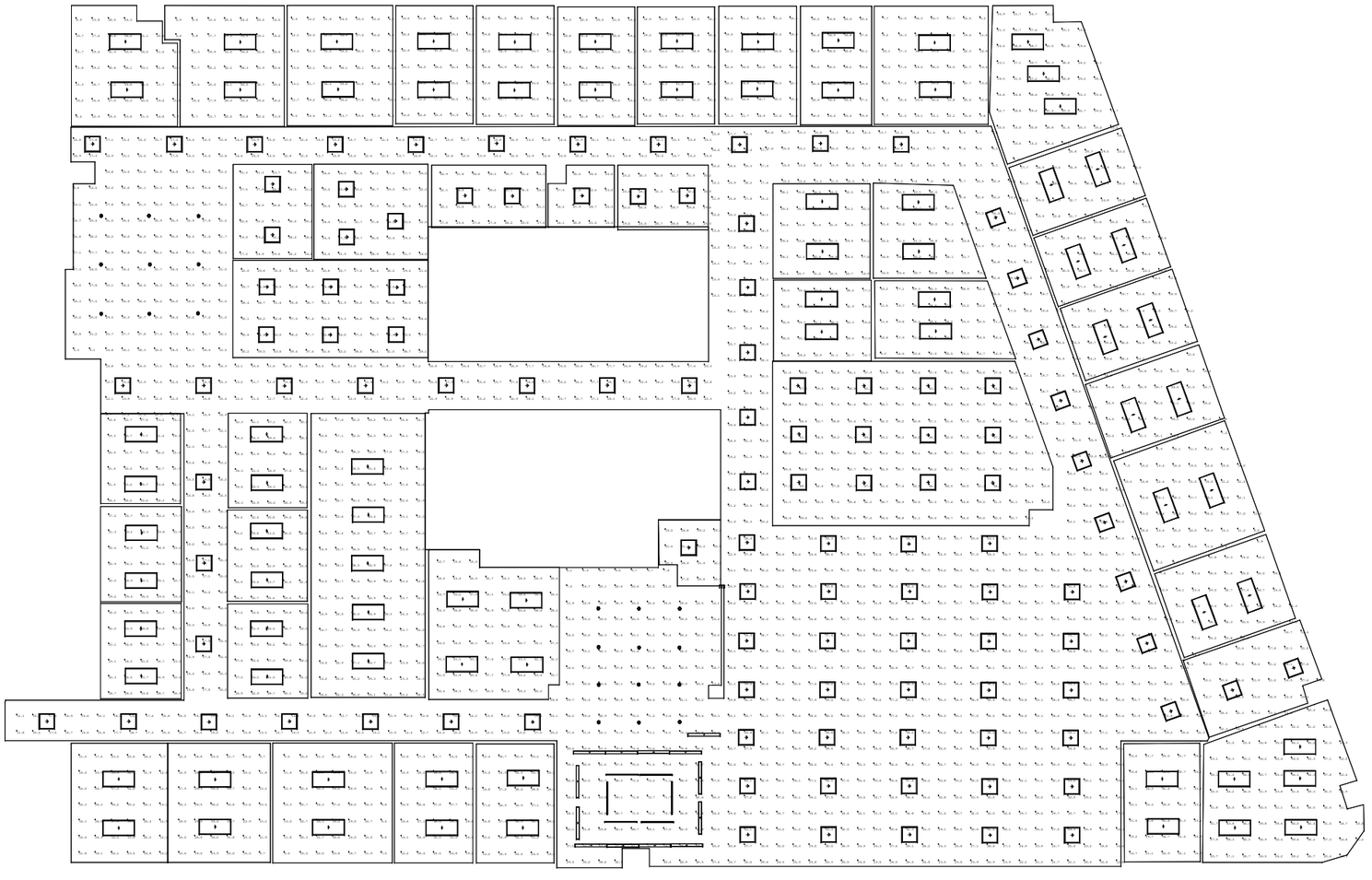
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TEFLON is a registered trademark of DuPont

Johnson Controls

SI NMAL 4E RENOVATION - LIGHTING CALCULATIONS

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts_1	Illuminance	Fc	18.23	36.4	5.3	3.44	6.87
CalcPts_2	Illuminance	Fc	14.80	22.2	0.0	N.A.	N.A.
CalcPts_3	Illuminance	Fc	28.01	32.7	19.0	1.47	1.72
CalcPts_4	Illuminance	Fc	32.68	75.1	4.1	7.97	18.32
CONFERENCE 4002E_Workplane	Illuminance	Fc	35.60	44.0	21.6	1.65	2.04
CONFERENCE 4040E_Workplane	Illuminance	Fc	40.20	51.9	20.2	1.99	2.57
COPY PRINT MAIL 4066E_Workplane	Illuminance	Fc	32.13	44.3	16.0	2.01	2.77
FLEX 4016E_Workplane	Illuminance	Fc	33.00	44.2	12.7	2.60	3.48
FOCUS 4060E_Workplane	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.
FOCUS 4062E_Workplane	Illuminance	Fc	24.35	35.6	14.1	1.73	2.52
FOCUS 4064E_Workplane	Illuminance	Fc	30.21	40.1	17.0	1.78	2.36
LACTATION WELLNESS 4068E_Workpla	Illuminance	Fc	29.16	43.7	16.0	1.82	2.73
Office 401_Workplane	Illuminance	Fc	21.84	39.9	8.4	2.60	4.75
Office 403_Workplane	Illuminance	Fc	21.85	40.0	4.9	4.46	8.16
OFFICE 4044E_Workplane	Illuminance	Fc	26.71	49.6	9.3	2.87	5.33
OFFICE 4046E_Workplane	Illuminance	Fc	30.55	45.7	15.5	1.97	2.95
OFFICE 4048E_Workplane	Illuminance	Fc	31.81	45.6	14.9	2.13	3.06
Office 405_Workplane	Illuminance	Fc	21.00	39.8	8.2	2.56	4.85
OFFICE 4050E_Workplane	Illuminance	Fc	33.25	51.1	14.7	2.26	3.48
Office 407_Workplane	Illuminance	Fc	26.62	41.0	14.6	1.82	2.81
Office 409_Workplane	Illuminance	Fc	26.58	41.1	14.6	1.82	2.82
Office 411_Workplane	Illuminance	Fc	26.60	41.1	14.6	1.82	2.82
Office 413_Workplane	Illuminance	Fc	26.64	41.0	14.8	1.80	2.77
Office 415_Workplane	Illuminance	Fc	26.63	41.5	14.8	1.80	2.80
Office 417_Workplane	Illuminance	Fc	29.34	40.0	18.0	1.63	2.22
Office 419_Workplane	Illuminance	Fc	20.69	39.6	7.7	2.69	5.14
Office 421_Workplane	Illuminance	Fc	27.68	54.1	8.2	3.38	6.60
Office 423_Workplane	Illuminance	Fc	26.86	40.8	12.7	2.11	3.21
Office 425_Workplane	Illuminance	Fc	26.96	40.1	13.3	2.03	3.02
Office 427_Workplane	Illuminance	Fc	26.03	40.2	12.3	2.12	3.27
Office 429_Workplane	Illuminance	Fc	26.17	41.1	10.8	2.42	3.81
Office 431_Workplane	Illuminance	Fc	19.75	39.2	7.2	2.74	5.44
Office 433_Workplane	Illuminance	Fc	23.35	39.6	7.6	3.07	5.21
Office 435_Workplane	Illuminance	Fc	19.19	28.5	8.1	2.37	3.52
Office 436_Workplane	Illuminance	Fc	37.81	51.5	20.4	1.85	2.52
Office 437_Workplane	Illuminance	Fc	34.00	56.1	10.8	3.15	5.19
Office 438_Workplane	Illuminance	Fc	33.03	43.7	19.2	1.72	2.28
Office 439_Workplane	Illuminance	Fc	26.74	41.4	14.7	1.82	2.82
Office 440_Workplane	Illuminance	Fc	36.13	49.6	19.5	1.85	2.54
Office 445_Workplane	Illuminance	Fc	26.20	38.9	12.2	2.15	3.19
Office 447_Workplane	Illuminance	Fc	26.08	39.2	12.0	2.17	3.27
Office 449_Workplane	Illuminance	Fc	20.47	39.0	7.4	2.77	5.27
Office 451_Workplane	Illuminance	Fc	22.91	39.6	9.7	2.36	4.08
Office 453_Workplane	Illuminance	Fc	22.54	37.9	9.7	2.32	3.91
Office 455_Workplane	Illuminance	Fc	29.05	41.7	17.9	1.62	2.33
Office 457_Workplane	Illuminance	Fc	28.97	42.1	17.2	1.68	2.45
Office 459_Workplane	Illuminance	Fc	27.04	40.7	14.6	1.85	2.79
PANTRY CLOSET_Workplane	Illuminance	Fc	27.81	33.5	19.0	1.46	1.76
STORAGE 4014E_Workplane	Illuminance	Fc	25.64	45.9	9.2	2.79	4.99

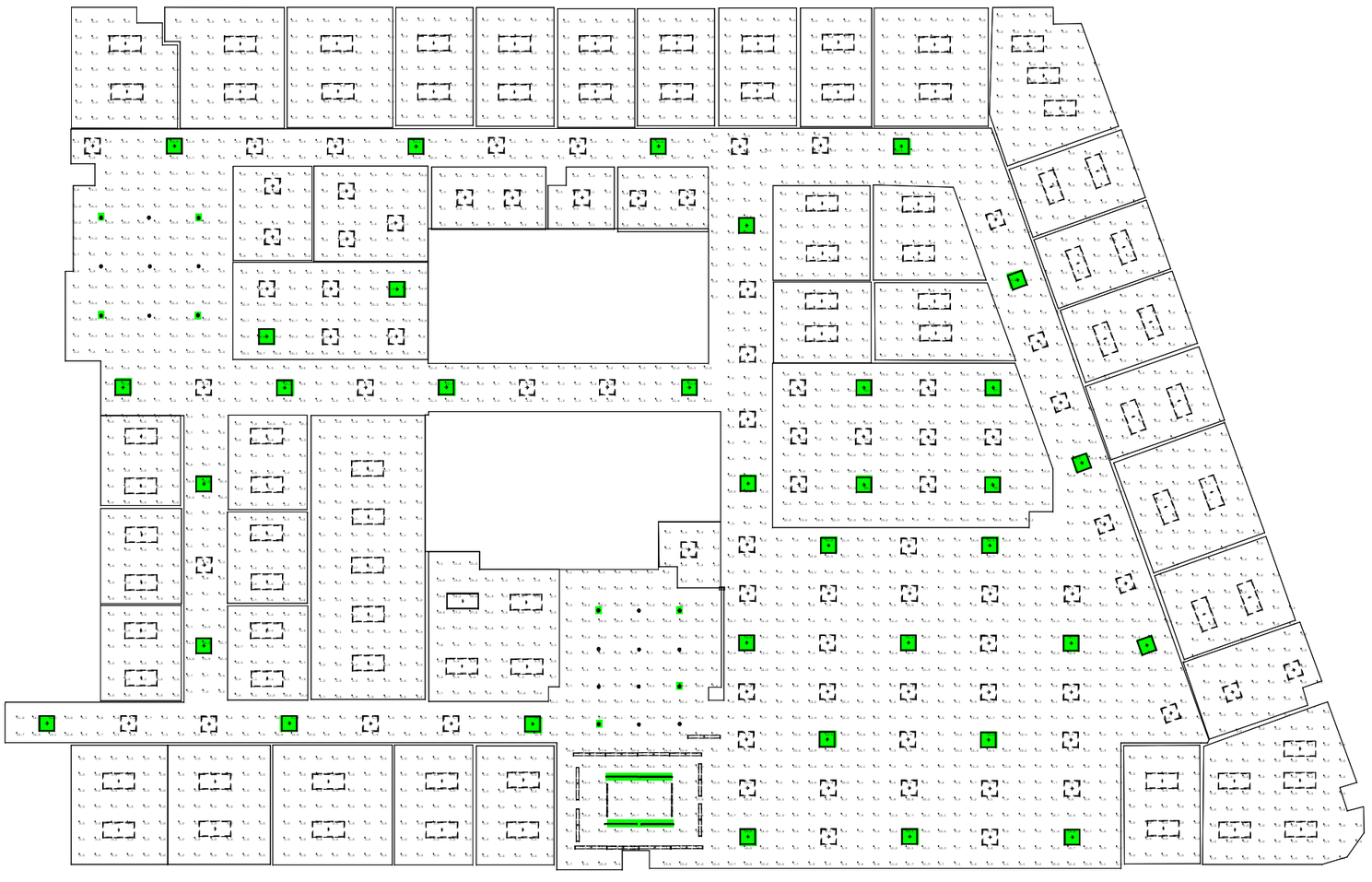


MUELLER ASSOCIATES

SI NMAL 4E RENOVATION - EMERGENCY LIGHTING CALCULATIONS

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts_1	Illuminance	Fc	8.15	23.1	0.9	9.06	25.67
CalcPts_2	Illuminance	Fc	5.56	12.3	0.0	N.A.	N.A.
CalcPts_3	Illuminance	Fc	6.58	9.9	3.0	2.19	3.30
CalcPts_4	Illuminance	Fc	9.85	30.2	0.8	12.31	37.75
CONFERENCE 4002E_Workplane	Illuminance	Fc	12.08	31.6	4.2	2.88	7.52
CONFERENCE 4040E_Workplane	Illuminance	Fc	13.81	30.5	3.8	3.63	8.03
COPY PRINT MAIL 4066E_Workplane	Illuminance	Fc	2.61	15.0	0.6	4.35	25.00
FLEX 4016E_Workplane	Illuminance	Fc	9.23	28.6	2.2	4.20	13.00
FOCUS 4060E_Workplane	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.
FOCUS 4062E_Workplane	Illuminance	Fc	0.32	1.3	0.1	3.20	13.00
FOCUS 4064E_Workplane	Illuminance	Fc	1.23	8.5	0.1	12.30	85.00
LACTATION WELLNESS 4068E_Workpla	Illuminance	Fc	0.74	1.8	0.4	1.85	4.50
OFFICE 4044E_Workplane	Illuminance	Fc	1.54	8.6	0.3	5.13	28.67
OFFICE 4046E_Workplane	Illuminance	Fc	2.85	7.3	1.0	2.85	7.30
OFFICE 4048E_Workplane	Illuminance	Fc	2.73	8.3	0.6	4.55	13.83
Office 405_Workplane	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.
OFFICE 4050E_Workplane	Illuminance	Fc	0.33	1.5	0.1	3.30	15.00
Office 436_Workplane	Illuminance	Fc	6.51	14.0	2.0	3.26	7.00
Office 437_Workplane	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.
Office 438_Workplane	Illuminance	Fc	1.04	4.7	0.2	5.20	23.50
Office 439_Workplane	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.
Office 440_Workplane	Illuminance	Fc	5.86	12.0	1.7	3.45	7.06
PANTRY CLOSET_Workplane	Illuminance	Fc	1.71	6.2	0.5	3.42	12.40
STORAGE 4014E_Workplane	Illuminance	Fc	0.63	6.7	0.1	6.30	67.00

EMERGENCY
FIXTURES
HIGHLIGHTED



MUELLER ASSOCIATES

Bookmark Summary

Supply Diffusers	Page 2
Return Diffusers	Page 4
Linear Diffusers	Page 7
Duct Silencers	Page 11
Overhead Water Source Heat Pumps	Page 12

OMNI / OMNI-AA - ARCHITECTURAL CEILING / SQUARE PLAQUE

		Neck Velocity	400	500	600	700	800	900	1000	1200	1400
		Velocity Pressure	0.010	0.016	0.022	0.031	0.040	0.051	0.062	0.090	0.122
12"x12" Module Size	4" Round Neck	Airflow, cfm	35	44	52	61	70	79	87	105	122
		Total Pressure, Inches WG	0.034	0.053	0.076	0.103	0.134	0.170	0.210	0.303	0.412
		Throw Feet	1-2-3	1-2-4	2-2-5	2-3-6	2-3-6	2-4-7	3-4-8	3-5-10	4-6-11
		NC (Noise Criteria)	-	-	12	17	21	24	27	33	38
	5" Round Neck	Airflow, cfm	55	68	82	95	109	123	136	164	191
		Total Pressure, Inches WG	0.040	0.063	0.091	0.124	0.161	0.204	0.252	0.363	0.494
		Throw Feet	2-2-5	2-3-6	2-3-7	3-4-8	3-5-9	3-5-10	4-6-12	5-7-14	5-8-15
		NC (Noise Criteria)	-	-	12	17	21	24	28	33	38
	6" Round Neck	Airflow, cfm	78	98	118	137	157	176	196	235	274
		Total Pressure, Inches WG	0.049	0.076	0.109	0.149	0.194	0.246	0.303	0.437	0.594
		Throw Feet	2-3-6	3-4-8	3-5-9	4-5-11	4-6-12	5-7-14	5-8-15	6-9-17	7-11-18
		NC (Noise Criteria)	-	-	12	17	21	24	28	33	38
	7" Round Neck	Airflow, cfm	107	134	160	187	214	240	267	320	374
		Total Pressure, Inches WG	0.058	0.091	0.131	0.178	0.233	0.295	0.364	0.524	0.714
		Throw Feet	3-4-8	3-5-9	4-6-11	4-7-13	5-8-15	6-9-17	6-9-18	8-11-20	9-13-21
		NC (Noise Criteria)	-	-	12	17	21	24	28	33	38
	8" Round Neck	Airflow, cfm	140	175	209	244	279	314	349	419	489
		Total Pressure, Inches WG	0.070	0.109	0.156	0.213	0.278	0.352	0.434	0.626	0.852
		Throw Feet	3-5-9	4-6-11	5-7-14	5-8-16	6-9-18	7-10-19	8-11-20	9-14-22	11-16-24
		NC (Noise Criteria)	-	-	12	17	21	24	28	33	38
20" x 20" Module Size	6" Dia.	Airflow, cfm	78	98	118	137	157	173	196	235	274
		Total Pressure	0.016	0.025	0.036	0.049	0.063	.080	0.100	0.142	0.193
		NC (Noise Criteria)	-	-	-	16	20	24	28	34	39
		Throw feet	1-1-3	1-1-4	1-2-4	1-3-5	1-3-6	2-3-6	2-4-7	3-5-8	3-5-8
	8" Dia.	Airflow, cfm	140	175	209	244	279	314	349	419	489
		Total Pressure	0.019	0.030	0.043	0.058	0.075	.096	0.118	0.169	0.229
		NC (Noise Criteria)	-	-	-	18	22	26	30	36	41
		Throw feet	1-2-4	2-3-6	2-4-6	3-4-7	3-5-7	3-5-8	4-6-8	5-6-9	5-7-10
	10" Dia.	Airflow, cfm	218	273	327	382	436	491	545	654	763
		Total Pressure	0.024	0.038	0.055	0.074	0.096	.123	0.151	0.215	0.292
		NC (Noise Criteria)	-	-	-	18	23	27	31	37	42
		Throw feet	3-4-6	3-4-7	4-5-8	4-6-8	5-6-9	5-7-9	6-7-10	6-8-11	7-9-12
24"x24" Module Size	6" Round Neck	Airflow, cfm	78	98	118	137	157	176	196	235	274
		Total Pressure, Inches WG	0.011	0.017	0.025	0.034	0.044	0.056	0.069	0.099	0.135
		Throw Feet	1-1-4	1-2-4	1-3-5	2-3-6	2-4-7	3-4-8	3-4-9	4-5-11	4-6-11
		NC (Noise Criteria)	-	-	-	-	13	17	21	28	34
	8" Round Neck	Airflow, cfm	140	175	209	244	279	314	349	419	489
		Total Pressure, Inches WG	0.018	0.028	0.040	0.055	0.072	0.091	0.112	0.162	0.220
		Throw Feet	2-3-6	2-4-7	3-4-9	3-5-10	4-6-12	4-6-12	5-7-13	6-9-14	7-10-15
		NC (Noise Criteria)	-	-	-	12	17	21	25	32	38
	10" Round Neck	Airflow, cfm	218	273	327	382	436	491	545	654	763
		Total Pressure, Inches WG	0.027	0.042	0.060	0.082	0.107	0.136	0.168	0.241	0.329
		Throw Feet	3-4-8	3-5-10	4-6-12	5-7-13	5-8-14	6-9-15	7-10-16	8-12-18	10-13-19
		NC (Noise Criteria)	-	-	-	15	20	24	28	35	41
	12" Round Neck	Airflow, cfm	314	393	471	550	628	707	785	942	1099
		Total Pressure, Inches WG	0.038	0.059	0.085	0.115	0.151	0.191	0.235	0.339	0.461
		Throw Feet	4-5-11	5-7-14	5-8-15	6-9-16	7-11-17	8-12-18	9-14-19	11-15-21	13-16-23
		NC (Noise Criteria)	-	-	12	18	23	27	31	38	43
	14" Round Neck	Airflow, cfm	428	535	641	748	855	962	1069	1283	1497
		Total Pressure, Inches WG	0.051	0.079	0.114	0.155	0.202	0.256	0.316	0.455	0.619
		Throw Feet	4-7-13	6-8-16	7-10-17	8-12-19	9-13-20	10-15-21	11-16-23	13-17-25	15-19-27
		NC (Noise Criteria)	-	-	14	20	25	29	33	40	45
	15" Round Neck	Airflow, cfm	491	614	736	859	982	1104	1227	1472	1718
		Total Pressure, Inches WG	0.058	0.090	0.130	0.177	0.231	0.292	0.360	0.519	0.706
		Throw Feet	5-7-15	6-9-17	7-11-19	9-13-20	10-15-22	11-16-23	12-17-24	15-19-26	17-20-29
		NC (Noise Criteria)	-	-	15	21	26	30	34	41	46

Performance notes appear at end of performance data

- Data obtained from tests conducted in accordance with ANSI/ASHRAE Standard 70-2006. Actual performance, with flexible duct inlet, may vary in the field. See the Engineering Guidelines section of this catalog for additional information.
- If the diffuser is mounted on an exposed duct, the throw values are 70% of those listed in the table
- Throw values are given for terminal velocities of 150, 100 and 50 fpm and for isothermal conditions. See the section, Engineering Guidelines for catalog throw data information.
- NC values based on octave band 2 to 7 sound power levels minus a room absorption of 10 dB
- Dash (-) in space denotes an NC value of less than 10
- Each NC value represents the noise criteria curve which will not be exceeded by the sound pressure in any of the octave bands, 2 through 7, with a room absorption of 10 dB, re 10^{-12} watts.
- All pressures are given in inches of water
- To obtain static pressure, subtract the velocity pressure from the total pressure



- Data obtained from tests conducted in accordance with ANSI / ASHRAE Standard 70-2006. Actual performance, with flexible duct inlet, may vary in the field. See the Engineering Guidelines section of this catalog for additional information.
- Throw values given are for terminal velocities of 150, 100 and 50 fpm and for isothermal conditions
- For an explanation of catalog throw data, see the section, Engineering Guidelines
- NC values based on octave band 2 to 7 sound power levels minus a room absorption of 10 dB
- Each NC value represents the noise criteria curve that will not be exceeded by the sound pressure in any of the octave bands, 2 through 7, with a room absorption of 10 dB, re 10^{-12} watts
- Dash (-) in space denotes an NC value of less than 10
- All pressures are given in inches of water
- To obtain static pressure, subtract the velocity pressure from the total pressure

PAR, PXP, PMR, PXP–DR, PDR PERFORMANCE DATA

PAR, PXP, PMR - FLUSH FACE - RETURN; PXP-DR, PDR - DROP FACE - RETURN

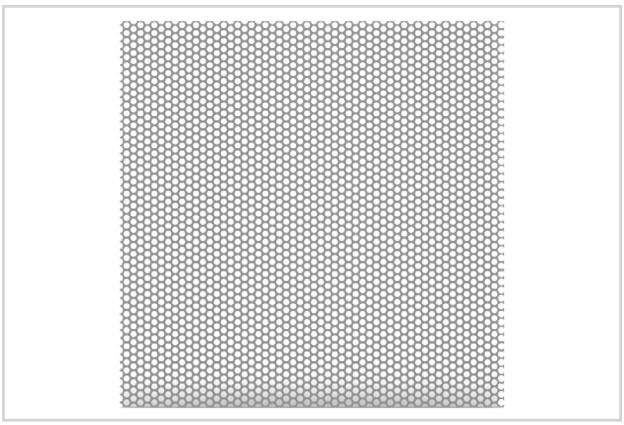
12 x 12 Face	Neck Size	Neck Vel, fpm	300	400	500	600	700	800	1000	1200	1400
		Vp, in. Wg	0.01	0.01	0.02	0.02	0.03	0.04	0.06	0.09	0.12
		Ps (-), in. Wg	0.03	0.06	0.09	0.13	0.17	0.23	0.36	0.51	0.70
	6 Dia. *	Flow Rate, cfm	59	78	98	118	137	157	196	235	275
		Room NC	-	-	-	14	18	21	27	32	36
	6 x 6 Neck *	Flow Rate, cfm	75	100	125	150	175	200	250	300	350
		Room NC	-	-	12	17	21	24	30	35	39
	10 x 10 Neck	Flow Rate, cfm	208	278	347	417	486	556	694	833	972
		Room NC	15	23	29	33	37	41	47	51	55
24 x 24 Face	Neck Size	Neck Vel, fpm	300	400	500	600	700	800	1000	1200	1400
		Vp, in. Wg	0.01	0.01	0.02	0.02	0.03	0.04	0.06	0.09	0.12
		Ps (-), in. Wg	0.03	0.06	0.09	0.13	0.18	0.24	0.37	0.54	0.73
	6 Dia. *	Flow Rate, cfm	59	78	98	118	137	157	196	235	275
		Room NC	-	-	-	13	17	20	26	31	34
	6 x 6 Neck *	Flow Rate, cfm	75	100	125	150	175	200	250	300	350
		Room NC	-	-	-	14	18	21	27	32	35
	8 Dia. *	Flow Rate, cfm	105	140	174	209	244	279	349	419	488
		Room NC	-	-	13	17	21	24	30	35	38
	8 x 8 Neck *	Flow Rate, cfm	133	178	222	267	311	356	444	533	622
		Room NC	-	-	14	18	22	25	31	36	39
	10 Dia.*	Flow Rate, cfm	164	218	273	327	382	436	545	654	763
		Room NC	-	-	16	20	24	27	33	38	41
	10 x 10 Neck *	Flow Rate, cfm	208	278	347	417	486	556	694	833	972
		Room NC	-	11	17	21	25	28	34	39	42
	12 Dia. *	Flow Rate, cfm	235	314	392	471	549	628	785	942	1099
		Room NC	-	12	17	22	26	29	34	39	43
	12 x 12 Neck *	Flow Rate, cfm	300	400	500	600	700	800	1000	1200	1400
		Room NC	-	14	20	24	28	31	37	42	45
	14 Dia. *	Flow Rate, cfm	320	427	534	641	748	855	1068	1282	1495
		Room NC	-	15	21	25	29	32	38	43	46
	15 x 15 Neck *	Flow Rate, cfm	469	625	781	938	1094	1250	1563	1875	2188
		Room NC	-	16	22	26	30	33	39	44	47
	16 Dia. *	Flow Rate, cfm	419	558	698	837	977	1116	1395	1674	1953
		Room NC	11	18	24	28	32	35	41	46	49
	18 x 18 Neck *	Flow Rate, cfm	675	900	1125	1350	1575	1800	2250	2700	3150
		Room NC	11	18	24	28	32	36	41	46	49
	22 x 22 Neck	Flow Rate, cfm	1008	1344	1681	2017	2353	2689	3361	4033	4706
		Room NC	13	20	26	30	34	37	43	47	51
Other Sizes	Neck Size	Neck Vel, fpm	300	400	500	600	700	800	1000	1200	1400
		Vp, in. Wg	0.01	0.01	0.02	0.02	0.03	0.04	0.06	0.09	0.12
		Ps (-), in. Wg	0.03	0.06	0.09	0.13	0.17	0.23	0.36	0.51	0.70
	10 x 22 (12 x 24 Face)	Flow Rate, cfm	458	611	764	917	1069	1222	1528	1833	2139
		Room NC	-	-	-	14	18	21	27	32	36
	14 x 14 (16 x 16 Face)	Flow Rate, cfm	408	544	681	817	953	1089	1361	1633	1906
		Room NC	-	-	12	17	21	24	30	35	39
	18 x 18 (20 x 20 Face)	Flow Rate, cfm	675	900	1125	1350	1575	1800	2250	2700	3150
		Room NC	-	11	17	22	26	29	35	40	44
	22 x 46 (24 x 48 Face)	Flow Rate, cfm	2108	2811	3514	4217	4919	5622	7028	8433	9839
		Room NC	12	20	25	30	34	38	43	48	52

PAR, PXP, PMR, PXP-DR, PDR PERFORMANCE NOTES

- Supply unit with deflectors removed
- Static pressures are negative, in inches of water, measured per ANSI/ASHRAE Standard 70-2006
- Noise Criteria (NC) based on a room absorption of 10 dB, re 10^{-12} watts, measured per ANSI/ASHRAE Standard 70-2006
- These products have been tested per ANSI/ASHRAE Standard 70-2006. Actual performance, with flexible duct inlet, may vary in the field.
- See the section, Engineering Guidelines for additional information

PXP / PXP-DF / PXP-AA

- Model PXP Series perforated panels are designed for return or exhaust applications
- Panels match Models PAS, PDS, and PAS-AA supply diffusers in appearance after installation
- Installed by laying between T-bars
- Perforated panel has $^{3}/_{16}$" diameter holes on ¼" staggered centers
- Material is heavy gauge steel or aluminum
- MRI compatible (PXP-AA)



PXP / PXP-DF / PXP-AA

MRI compatible

See website for Specifications

MODELS:

Steel Models:
PXP / Return Panel / Flush Face
PXP-DF / Return Panel / Drop Face

Aluminum Model:
PXP-AA / Return Panel / Flush Face

FINISH:

Standard Finish - #26 White

OVERVIEW

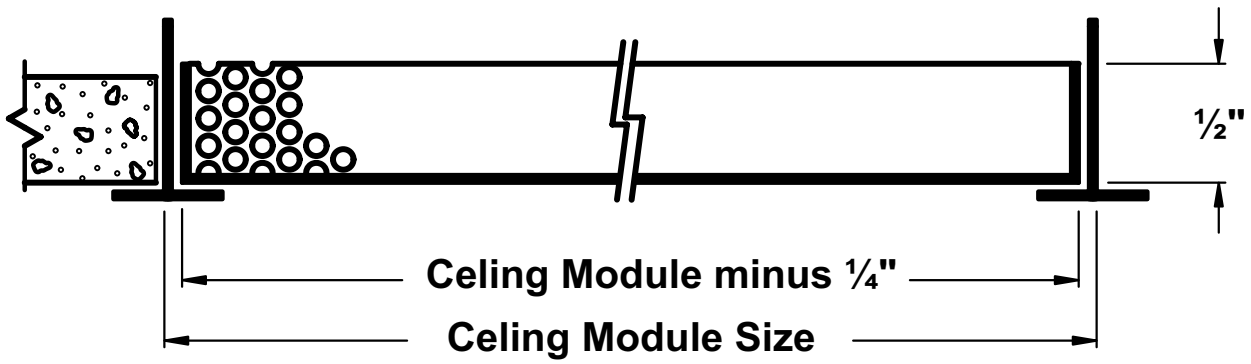
Return Panels

Model PXP Series perforated panels are designed for return or exhaust applications. Panels match Models PAS, PDS, and PAS-AA supply diffusers in appearance after installation.

For Performance Data and notes, please refer to the PAR / PXP / PMR /PXP-DR / PDR table on page F89.

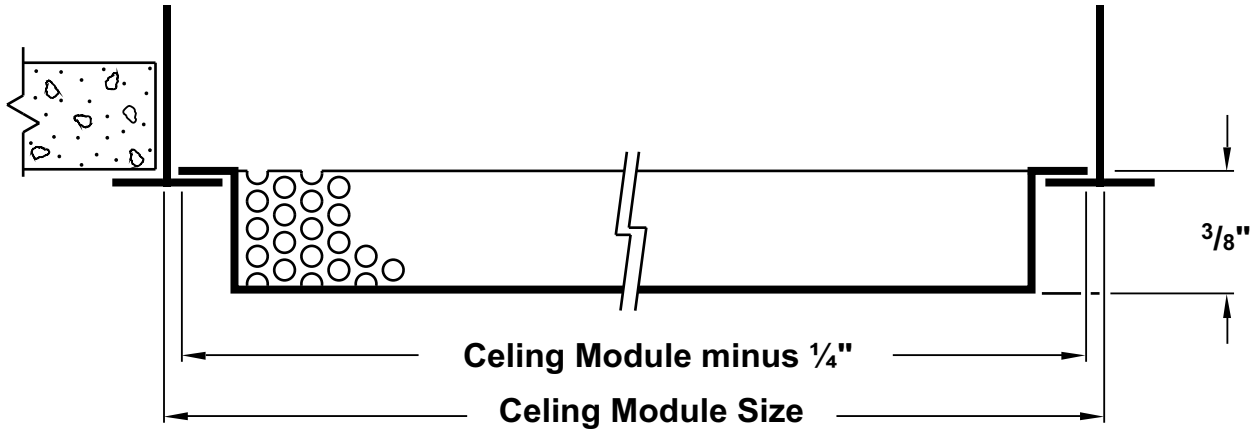
PXP / PXP-DF / PXP-AA UNIT DIMENSIONS

Model PXP and PXP-AA
(Lay-In)



Ceiling Module Sizes Available: 12 x 12, 16 x 16, 20 x 20, 24 x 12, 24 x 24, 48 x 24

Model PXP-DF (Lay-In or Tegular)
(Lay-In shown)



Ceiling Module Sizes Available: 12 x 12, 16 x 16, 20 x 20, 24 x 12, 24 x 24, 48 x 24

ML-37 / ½" SLOT SPACING WIDTH / SUPPLY WITH CONTINUOUS PLENUM

1-Slot	Airflow, cfm/ft.	5	10	16	21	26	31	36	42	47
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	-	20	27	32	37	40	44	46
	Horizontal	1-1-6	3-6-12	6-11-15	10-12-17	11-14-19	12-15-21	13-16-23	14-17-25	15-18-26
	Vertical	2	6	9	11	12	14	15	16	17
2-Slot	Airflow, cfm/ft.	10	21	31	42	52	62	73	83	94
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	13	23	30	35	40	43	47	49
	Horizontal	1-3-10	5-10-17	10-15-21	14-17-25	16-19-28	17-21-30	19-23-33	20-25-35	21-26-37
	Vertical	4	8	13	16	17	19	20	22	24
3-Slot	Airflow, cfm/ft.	16	31	47	62	78	94	109	125	140
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	15	25	32	37	41	45	48	51
	Horizontal	2-4-13	7-13-21	13-18-26	17-21-30	19-24-34	21-26-37	23-28-40	25-30-43	26-32-45
	Vertical	5	10	15	19	21	23	25	27	28
4-Slot	Airflow, cfm/ft.	21	42	62	83	104	125	146	166	187
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	16	26	33	38	43	46	50	52
	Horizontal	3-6-14	10-14-25	14-21-30	19-25-35	22-28-39	25-30-43	27-33-46	28-35-49	30-37-52
	Vertical	7	12	18	22	25	27	29	31	33
5-Slot	Airflow, cfm/ft.	26	52	78	104	130	156	182	208	234
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	17	27	34	39	44	47	51	53
	Horizontal	3-7-16	11-16-28	16-24-34	22-28-39	25-31-44	28-34-48	30-36-52	32-39-55	34-41-58
	Vertical	7	14	20	25	28	30	32	35	37
6-Slot	Airflow, cfm/ft.	31	62	94	125	156	187	218	250	281
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	18	28	35	40	44	48	51	54
	Horizontal	4-9-18	12-18-30	18-26-37	24-30-43	28-34-48	30-37-52	33-40-56	35-43-60	37-45-64
	Vertical	7	16	22	27	30	33	35	38	40
7-Slot	Airflow, cfm/ft.	36	73	109	146	182	218	255	291	328
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	19	29	35	41	45	49	52	55
	Horizontal	6-10-19	13-19-33	19-28-40	25-33-46	30-36-52	33-40-56	35-43-61	38-46-65	40-49-69
	Vertical	8	16	24	29	32	35	38	41	43
8-Slot	Airflow, cfm/ft.	42	83	125	166	208	250	291	333	374
	Static Pressure	0.006	0.023	0.051	0.090	0.141	0.203	0.277	0.362	0.458
	NC (Noise Criteria)	-	19	29	36	41	46	49	53	55
	Horizontal	7-10-20	14-20-35	20-30-43	27-35-49	32-39-55	35-43-60	38-46-65	40-49-70	43-52-74
	Vertical	8	17	26	31	35	38	41	43	45

NC corrections for various diffuser lengths

Length	2	4	6	8	10
Supply	-3	0	+2	+3	+5
Return	0	+3	+5	+6	+8

Throw correction multiplier for length

Length	2	4	8	10
Throw Correction	0.72	1.0	1.5	1.7

Performance notes appear at end of performance data

ML-38, -TZ / ¾" SLOT SPACING WIDTH / SUPPLY WITH CONTINUOUS PLENUM

1-Slot	Airflow, cfm/ft.	6	12	19	25	31	37	43	50	56
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	-	14	20	26	30	34	37	40
	Horizontal	1-2-6	3-6-16	6-12-20	11-16-23	13-18-26	16-20-28	18-22-31	19-23-33	20-25-35
	Vertical	2	6	10	12	14	15	16	17	18
2-Slot	Airflow, cfm/ft.	12	25	37	50	62	74	87	99	112
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	-	17	23	29	33	37	40	43
	Horizontal	1-3-11	5-11-22	11-17-28	15-22-33	19-26-37	22-28-40	25-31-43	27-33-46	28-35-49
	Vertical	4	9	14	17	19	21	23	24	25
3-Slot	Airflow, cfm/ft.	19	37	56	74	93	112	130	149	167
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	-	18	25	31	35	39	42	45
	Horizontal	2-5-14	8-14-27	14-20-35	18-27-40	23-32-45	27-35-49	31-38-53	33-40-57	35-43-60
	Vertical	6	11	17	21	23	26	28	30	32
4-Slot	Airflow, cfm/ft.	25	50	74	99	124	149	174	198	223
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	-	20	26	32	36	40	43	46
	Horizontal	3-6-16	11-16-32	16-24-40	21-32-46	26-37-52	32-40-57	36-43-61	38-46-66	40-49-70
	Vertical	6	13	19	24	27	30	32	34	36
5-Slot	Airflow, cfm/ft.	31	62	93	124	155	186	217	248	279
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	-	21	27	33	37	41	44	47
	Horizontal	4-8-18	12-18-35	18-26-45	24-35-52	29-41-58	35-45-64	40-49-69	42-52-73	45-55-78
	Vertical	7	14	21	27	30	33	36	38	40
6-Slot	Airflow, cfm/ft.	37	74	112	149	186	223	260	298	335
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	12	21	28	34	38	42	45	48
	Horizontal	5-10-19	13-19-39	19-29-49	26-39-57	32-45-64	39-49-70	43-53-75	46-57-81	49-60-85
	Vertical	8	15	24	30	33	36	39	42	45
7-Slot	Airflow, cfm/ft.	43	87	130	174	217	260	304	347	391
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	12	22	29	34	39	42	45	48
	Horizontal	6-10-21	14-21-42	21-31-53	28-42-61	35-49-69	42-53-75	47-58-81	50-61-87	53-65-92
	Vertical	8	16	24	32	36	39	42	45	48
8-Slot	Airflow, cfm/ft.	50	99	149	198	248	298	347	397	446
	Static Pressure	0.004	0.016	0.037	0.065	0.102	0.146	0.199	0.260	0.330
	NC (Noise Criteria)	-	13	23	29	35	39	43	46	49
	Horizontal	7-11-22	15-22-45	22-33-57	30-45-66	37-52-73	45-57-81	50-61-87	54-66-93	57-70-99
	Vertical	8	16	24	33	38	42	45	48	51

NC corrections for various diffuser lengths

Length	2	4	6	8	10
Supply	-3	0	+2	+3	+5
Return	0	+3	+5	+6	+8

Throw correction multiplier for length

Length	2	4	8	10
Throw Correction	0.72	1.0	1.5	1.7

Performance notes appear at end of performance data

ML-39 / 1" SLOT SPACING WIDTH / SUPPLY WITH CONTINUOUS PLENUM

1-Slot	Airflow, cfm/ft.	7	13	20	26	33	40	46	53	59
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	-	13	20	26	30	34	37	40
	Horizontal	1-2-6	3-6-16	6-12-21	11-16-24	14-19-27	16-21-29	18-22-32	20-24-34	21-25-36
	Vertical	2	8	12	14	15	17	18	19	20
2-Slot	Airflow, cfm/ft.	13	26	40	53	66	79	92	106	119
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	-	16	23	29	33	37	40	43
	Horizontal	1-3-12	5-12-23	12-17-29	15-23-34	19-27-38	23-29-42	26-32-45	28-34-48	29-36-51
	Vertical	5	11	16	19	22	24	26	28	30
3-Slot	Airflow, cfm/ft.	20	40	59	79	99	119	139	158	178
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	-	18	25	30	35	39	42	45
	Horizontal	2-5-14	8-14-28	14-21-36	19-28-42	23-33-46	28-36-51	32-39-55	34-42-59	36-44-62
	Vertical	7	13	20	24	27	29	32	34	36
4-Slot	Airflow, cfm/ft.	26	53	79	106	132	158	185	211	238
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	-	19	26	32	36	40	43	46
	Horizontal	3-6-16	11-16-33	16-24-42	22-33-48	27-38-54	33-42-59	37-45-63	39-48-68	42-51-72
	Vertical	8	15	23	28	31	34	36	39	42
5-Slot	Airflow, cfm/ft.	33	66	99	132	165	198	231	264	297
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	-	20	27	33	37	41	44	47
	Horizontal	4-8-18	12-18-36	18-27-46	24-36-54	30-42-60	36-46-66	41-50-71	44-54-76	46-57-80
	Vertical	9	17	25	31	34	38	41	43	45
6-Slot	Airflow, cfm/ft.	40	79	119	158	198	238	277	317	356
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	12	21	28	33	38	42	45	48
	Horizontal	5-10-20	13-20-40	20-30-51	27-40-59	33-46-66	40-51-72	45-55-78	48-59-83	51-62-88
	Vertical	9	19	28	34	38	41	45	48	51
7-Slot	Airflow, cfm/ft.	46	92	139	185	231	277	323	370	416
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	12	22	29	34	38	42	45	48
	Horizontal	6-11-22	14-22-43	22-32-55	29-43-63	36-50-71	43-55-78	48-59-84	52-63-90	55-67-95
	Vertical	10	20	30	36	41	45	48	52	55
8-Slot	Airflow, cfm/ft.	53	106	158	211	264	317	370	422	475
	Static Pressure	0.004	0.014	0.032	0.057	0.089	0.128	0.174	0.228	0.288
	NC (Noise Criteria)	-	13	23	29	35	39	43	46	49
	Horizontal	8-12-23	15-23-46	23-35-59	31-46-68	38-54-76	46-59-83	52-63-90	55-68-96	59-72-102
	Vertical	11	22	32	39	43	48	52	55	58

NC corrections for various diffuser lengths

Length	2	4	6	8	10
Supply	-3	0	+2	+3	+5
Return	0	+3	+5	+6	+8

Throw correction multiplier for length

Length	2	4	8	10
Throw Correction	0.72	1.0	1.5	1.7

- Data obtained from tests conducted in accordance with ANSI/ ASHRAE Standard 70-2006. Actual performance, with flexible duct inlet, may vary in the field. See the engineering section of this catalog for additional information.
- Horizontal throw values given are for terminal velocities of 150, 100 and 50 fpm
- Throw values given are for isothermal conditions, and are based on 4-foot active section. For other lengths, see the Throw Correction Table.
- Pressure is given in inches of WG for ML only
- Vertical throw values are given for terminal velocities of 50 fpm
- For divided throw, use the cfm-per-foot value for the number of slots in each direction. For sound, use the NC values for cfm-per-foot for the total number of slots.
- Each NC value represents the noise criteria curve which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with a room absorption of 10 dB, re 10^{-12} watts
- For vertical throw, deduct 11 NC
- Dash (-) in space denotes an NC value of less than 10
- NC is based on 4-foot lengths; for other lengths use the NC correction table
- Throws listed are for the 1-way pattern. For divided airflow, select the airflow in each direction according to the number of slots aimed in that direction, with the total airflow apportioned between slots. For an explanation of catalog throw data, see the Engineering Guidelines section of the catalog.
- Data obtained using plenums with duct velocities less than 800 fpm. See model MP (pages F34-F45) for data with Titus plenums.
- For continuous lengths it is recommended that maximum active lengths are no longer than 10 feet

RETURN PERFORMANCE DATA FOR PLENUM APPLICATIONS

- All pressures are in inches of water
- NC values are based on a room absorption of 10 dB, re 10^{-12} watts, with a 10-foot active diffuser section (see the table below)
- Dash (—) in space denotes NC value less than 10
- Data obtained from tests conducted in accordance with ANSI/ASHRAE Standard 70-2006
- For continuous lengths it is recommended that maximum active lengths are no longer than 10 feet

NC Correction for Various MLR Lengths

Length (ft.)	2	4	10	15	20
MLR	-7	-4	0	+2	+3

MLR-37

No. of Slots	Negative SP	0.011	0.025	0.045	0.072	0.103	0.180	0.275	0.415
1	cfm per ft.	10	15	20	25	30	40	50	60
	NC	—	—	14	20	25	33	39	44
2	cfm per ft.	20	30	40	50	60	80	100	120
	NC	—	—	17	23	28	36	42	47
3	cfm per ft.	30	45	60	75	90	120	150	180
	NC	—	11	19	25	30	38	44	49
4	cfm per ft.	40	60	80	100	120	160	200	240
	NC	—	12	20	26	31	39	45	50
5	cfm per ft.	50	75	100	125	150	200	250	300
	NC	—	13	21	27	32	40	46	51
6	cfm per ft.	60	90	120	150	180	240	300	360
	NC	—	14	22	28	33	41	47	52
7	cfm per ft.	70	105	140	175	210	280	350	420
	NC	—	15	23	29	34	42	48	53
8	cfm per ft.	80	120	160	200	240	320	400	480
	NC	—	15	23	29	34	42	48	53

MLR-38, -TZ

No. of Slots	Negative SP	0.007	0.028	0.063	0.108	0.170	0.250	0.345	0.450
1	cfm per ft.	10	20	30	40	50	60	70	80
	NC	—	—	18	26	32	37	41	45
2	cfm per ft.	20	40	60	80	100	120	140	160
	NC	—	10	21	29	35	40	44	48
3	cfm per ft.	30	60	90	120	150	180	210	240
	NC	—	12	23	31	37	42	46	50
4	cfm per ft.	40	80	120	160	200	240	280	320
	NC	—	13	24	32	38	43	47	51
5	cfm per ft.	50	100	150	200	250	300	350	400
	NC	—	14	25	33	39	44	48	52
6	cfm per ft.	60	120	180	240	300	360	420	480
	NC	—	15	26	34	40	45	49	53
7	cfm per ft.	70	140	210	280	350	420	490	560
	NC	—	16	27	35	41	46	50	54
8	cfm per ft.	80	160	240	320	400	480	560	640
	NC	—	16	27	35	41	46	50	54

MLR-39

No. of Slots	Negative SP	0.018	0.040	0.070	0.108	0.160	0.215	0.280	0.450
1	cfm per ft.	20	30	40	50	60	70	80	100
	NC	—	11	19	25	30	34	38	44
2	cfm per ft.	40	60	80	100	120	140	160	200
	NC	—	14	22	28	33	37	41	47
3	cfm per ft.	60	90	120	150	180	210	240	300
	NC	—	16	24	30	35	39	43	49
4	cfm per ft.	80	120	160	200	240	280	320	400
	NC	—	17	25	31	36	40	44	50
5	cfm per ft.	100	150	200	250	300	350	400	500
	NC	—	18	26	32	37	41	45	51
6	cfm per ft.	120	180	240	300	360	420	480	600
	NC	—	19	27	33	38	42	46	52
7	cfm per ft.	140	210	280	350	420	490	560	700
	NC	—	20	28	34	39	43	47	53
8	cfm per ft.	160	240	320	400	480	560	640	800
	NC	—	20	28	34	39	43	47	53

CERTIFIED PERFORMANCE DATA

VIBRO-ACOUSTICS®
A Swegon Group company

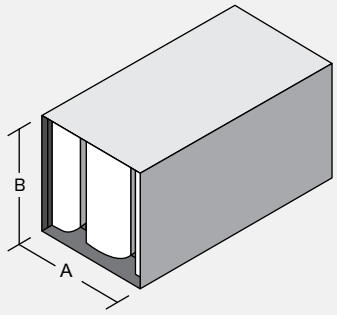
RD-LV-F9

Rectangular Dissipative
Low velocity silencer
(<750 fpm)

How to Specify Example:

21 X **21** **RD-LV-F9** X **60**

Duct Width	Duct Height	Silencer Model	Silencer Length



Insertion Loss (IL)

+ : "forward flow" where noise & airflow move in same direction (e.g. supply side)

- : "reverse flow" where noise & airflow move in opposite directions (e.g. return side)

See Silencer Selection Instructions. DIL above 50dB may be limited due to noise flanking around the silencer or along the duct walls. If more than 50dB DIL is required, contact your local Vibro-Acoustics representative or call **1-800-565-8401**.

Length (in.)	Face Velocity (ft. per min)	Octave Band - Hz/Dynamic Insertion Loss (dB)							
		63	125	250	500	1000	2000	4000	8000
36	- 750	5	7	16	28	39	32	21	13
	0	4	6	15	28	38	32	22	15
	+ 750	3	6	14	26	38	32	23	15
60	- 750	8	12	25	42	50	50	32	20
	0	6	11	23	41	51	55	36	24
	+ 750	6	10	22	40	51	55	38	25
84	- 750	11	21	37	53	52	55	50	27
	0	10	17	33	53	53	55	54	32
	+ 750	8	15	31	52	53	55	55	35
108	- 750	12	23	41	54	51	53	50	29
	0	12	19	38	55	53	55	55	36
	+ 750	10	18	36	54	53	55	55	38

Pressure Drop (PD)

Pressure drops are reported in accordance with ASTM E477 methods and are based upon **ideal** flow conditions (5 diameters of straight duct on silencer inlet and 10 on outlet). Less than ideal conditions will result in an increase in pressure drop due to System Effects. See Silencer System Effects Data.

Length (in.)	Face Velocity (ft. per min) / Pressure Drop (in.w.g.)						
	250	500	750	1000	1250	1500	1750
36	0.02	0.08	0.17	0.31	0.48	0.70	0.95
60	0.03	0.13	0.29	0.51	0.80	1.15	1.56
84	0.04	0.14	0.32	0.56	0.88	1.26	1.72
108	0.04	0.14	0.32	0.58	0.90	1.29	1.76

☐ Acceptable (0 - 0.35") ☐ Caution (>0.35") Pressure Drop may be too high for certain applications

Cross Section Sizes*
"A" dimension (in.) 6 10-13 20-26 30-240
"B" dimension ANY SIZE
Approx. weight 7.3 lbs/cu.ft.
See Rectangular Silencer Cross-Section Dimensions to ensure selection matches ductwork dimensions.

Generated Noise (GN)

@ 5 sq.ft. face area

Length (in.)	Face Velocity (ft. per min)	Octave Band - Hz/Generated Noise (dB re 10^{-12} watts)							
		63	125	250	500	1K	2K	4K	8K
All	- 750	51	44	41	46	52	51	39	27
	- 500	51	41	44	48	46	40	26	24
	+ 500	51	38	34	34	27	23	19	23
	+ 750	50	43	38	37	40	39	31	25

GN correction chart at right must be used to correct GN to other face areas. →

Face Area (sq.ft.)	2.5	5	10	20	40	80
dB	-3	0	+3	+6	+9	+12

Tranquility® Compact (TC) Series

Submittal Data

Models TCH/V006 - 060 60Hz - HFC-410A



LC405

Rev.: March 8, 2018

CLIMATEMASTER®
Water-Source Heat Pump Systems

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TC Compact Packaged Series



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*Document page number is shown next to part number (e.g. LC405 - 3 = page 3). Since not all pages are typically used in the submittals process, the page number in the lower right corner can still be used (page ____of_____).

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TC Compact Packaged Series

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THE TRANQUILITY® 16 COMPACT (TC) SERIES

The award winning Tranquility® 16 Series raises the bar for water-source heat pump efficiencies, features and application flexibility. Not only does the Tranquility® 16 exceed ASHRAE 90.1 efficiencies, but it also uses EarthPure® HFC-410A zero ozone depletion refrigerant, making it an extremely environmentally-friendly option. Tranquility® 16 is eligible for LEED® (Leadership in Energy and Environmental Design) points because of the "green" technology design. With one of the smallest cabinets in the industry, the Tranquility® 16 will easily fit into tight spaces. Designed to be backward compatible with thousands of older water-source heat pumps, the Tranquility® 16 Compact Series heat pump is packed full of the innovation you have come to expect from the experts at ClimateMaster.

Available in sizes from 1/2 ton (1.76 kW) through 5 tons (17.6 kW) with multiple cabinet options (vertical upflow and horizontal) the Tranquility® 16 offers a wide range of units for most any application.

ClimateMaster's exclusive double isolation compressor mounting system makes the Tranquility® 16 one of the quietest units on the market. Compressors are mounted on specially engineered sound-tested EPDM grommets to a heavy gauge mounting plate, which is further isolated from the cabinet base with rubber grommets for maximized vibration/sound attenuation. The easy access control box and large access panels make installing and maintaining the unit easier than other water-source heat pumps currently in production, proving that a small unit can be easy to service.

Options such as tin-plated air coil, DDC controls, and high efficiency pleated MERV rated air filters allow customized design solutions. Optional high static fan motor expands the operating range and helps overcome some of the challenges associated with ductwork for retrofit installations. A cupro-nickel water-coil and sound absorbing UltraQuiet package are options that make a great unit even better. **Optional factory installed Waterside Economizer (WSE) uses cool loop water for "free" cooling. WSE option meets IECC section C403.3.1 and is a requirement in many states. WSE requires heat pump thermostast with two stages of cooling and one stage heating.**

The Tranquility® 16 (TC) Series Water-Source Heat Pumps are designed to meet the challenges of today's HVAC demands with one of the most innovative products available on the market.

UNIT FEATURES

- Sizes 006 (1/2 ton, 1.76 kW) through 060 (5 tons, 17.6 kW)
- EarthPure® HFC-410A refrigerant
- Exceeds ASHRAE 90.1 efficiencies
- Galvanized steel construction
- Epoxy powder painted galvanized steel drain pan
- Sound absorbing glass fiber insulation
- Unique double isolation compressor mounting via vibration isolating rubber grommets for quiet operation
- Insulated divider and separate compressor/air handler compartments
- Copeland scroll compressors (rotary for size 018 and below)
- TXV metering device
- Microprocessor controls standard (optional DXM and/or DDC controls)
- Field convertible discharge air arrangement for horizontal units
- PSC three-speed fan motor
- Internally trapped condensate drain line (vertical units only)
- Unit Performance Sentinel performance monitoring system
- Eight Safeties Standard
- Extended range (20 to 120°F, -6.7 to 48.9°C) capable

AVAILABLE OPTIONS

- High static blowers
- LonWorks, BACnet, Modbus and Johnson N2 compatibility options for DDC controls
- Cupro-nickel water-coil
- Sound absorbing UltraQuiet package
- ECM Blowers
- Waterside Economizer (WSE): Requires HP thermostat with 2 stages cooling
- Stainless steel condensate drain pan

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Reference Calculations

Heating

$$LWT = EWT - \frac{HE}{GPM \times 500}$$

$$LAT = EAT + \frac{HC}{CFM \times 1.08}$$

Cooling

$$LWT = EWT + \frac{HR}{GPM \times 500}$$

$$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$$

$$LC = TC - SC$$

$$S/T = \frac{SC}{TC}$$

Legend and Glossary of Abbreviations

BTUH = BTU(British Thermal Unit) per hour
CFM = airflow, cubic feet/minute
COP = coefficient of performance = BTUH output/BTUH input
DB = dry bulb temperature (°F)
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)
EER = energy efficiency ratio = BTUH output/Watt input
MPT = male pipe thread
ESP = external static pressure (inches w.g.)
EWT = entering water temperature
GPM = water flow in U.S. gallons/minute
HE = total heat of extraction, BTUH
HC = air heating capacity, BTUH
HR = total heat of rejection, BTUH
HWC = hot water generator (desuperheater) capacity, Mbtuh
FPT = female pipe thread
KW = total power unit input, kilowatts
LAT = leaving air temperature, °F
LC = latent cooling capacity, BTUH
LWT = leaving water temperature, °F
MBTUH = 1000 BTU per hour
S/T = sensible to total cooling ratio
SC = sensible cooling capacity, BTUH
TC = total cooling capacity, BTUH
WB = wet bulb temperature (°F)
WPD = waterside pressure drop (psi & ft. of hd.)

Conversion Table - to convert inch-pound (English) to S-I (Metric)

Air Flow	Water Flow	Ext Static Pressure	Water Pressure Drop
Airflow (L/s) = CFM x 0.472	Water Flow (L/s) = gpm x 0.0631	ESP (Pa) = ESP (in of wg) x 249	PD (kPa) = PD (ft of hd) x 2.99

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Step 1 Determine the actual heating and cooling loads at the desired dry bulb and wet bulb conditions.

Step 2 Obtain the following design parameters: Entering water temperature, water flow rate in GPM, air flow in CFM, water flow pressure drop and design wet and dry bulb temperatures. Air flow CFM should be between 300 and 450 CFM per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. Go to the appropriate tables and find the proper indicated water flow and water temperature.

Step 3 Select a unit based on total and sensible cooling conditions. Select a unit which is closest to, but no larger than, the actual cooling load.

Step 4 Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities **(Note: interpolation is permissible, extrapolation is not).**

Step 5 Read the heating capacity. If it exceeds the design criteria it is acceptable. It is quite normal for Water-Source Heat Pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

Step 6 Determine the correction factors associated with the variable factors of dry bulb, wet bulb and air flow.Corrected Total Cooling = tabulated total cooling x wet bulb correction x air flow correction Corrected Sensible Cooling = tabulated sensible cooling x dry bulb correction x air flow correction

Step 7 Compare the corrected capacities to the load requirements. Normally if the capacities are within 10% of the loads, the equipment is acceptable. It is better to undersize than oversize, as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

Step 8 When completed, calculate water temperature rise and assess the selection. If the units selected are not within 10% of the load calculations, then review what effect changing the GPM, water temperature and/or air flow and air temperature would have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat the procedure. Remember, when in doubt, undersize slightly for best performance.

Example Equipment Selection For Cooling

Step 1 Load Determination:

Assume we have determined that the appropriate cooling load at the desired dry bulb 80°F and wet bulb 65°F conditions is as follows:

Total Cooling.....23,700 BTUH
Sensible Cooling.....16,500 BTUH
Entering Air Temp.....80°F Dry Bulb / 65°F Wet Bulb

Step 2 Design Conditions:

Similarly, we have also obtained the following design parameters:

Entering Water Temp.....90°F
Water Flow (Based upon 10°F rise in temp.).....6.0 GPM
Air Flow.....800 CFM

Step 3, 4 & 5 HP Selection:

After making our preliminary selection (TC024), we enter the tables at design water flow and water temperature and read Total Cooling, Sens. Cooling and Heat of Rej. capacities:

Total Cooling.....23,400 BTUH
Sensible Cooling.....17,500 BTUH
Heat of Rejection.....30,200 BTUH

Step 6 & 7 Entering Air and Airflow Corrections:

Next, we determine our correction factors.

	Table	Ent Air	Air Flow	Corrected
Corrected Total Cooling =	23,400	x 0.9681	x 1.0050	= 22,767
Corrected Sens Cooling =	17,500	x 1.1213	x 0.9820	= 19,270
Corrected Heat of Rej. =	30,200	x 0.9747	x 1.0434	= 30,713

Step 8 Water Temperature Rise Calculation & Assessment:

Actual Temperature Rise.....10.2°F

When we compare the Corrected Total Cooling and Corrected Sensible Cooling figures with our load requirements stated in Step 1, we discover that our selection is within +/- 10% of our sensible load requirement. Furthermore, we see that our Corrected Total Cooling figure is within 1,000 Btuh the actual indicated load.

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TC Series Nomenclature

1 2	3	4 5 6	7	8	9	10	11	12	13	14	15
TC	H	036	A	G	C	3	0	A	L	B	S

MODEL TYPE
TC = TRANQUILITY COMPACT R410A

CONFIGURATION
H = HORIZONTAL
V = VERTICAL

UNIT SIZE
006 - E,G
009 - E,G
012 - E,G,
015 - E,G
018 - E,G
024 - E,F,G,H
030 - E,FG,H
036 - E,FG,H
041 - F,G,H,N (TCV ONLY)
042 - F,G,H,N
048 - F,G,H,N
060 - F,G,H,N

REVISION LEVEL
A= CURRENT REVISION FOR ALL SIZES

VOLTAGE
G = 208/230/60/1
E = 265/60/1
H = 208/230/60/3
F = 460/60/3
N = 575/60/3

CONTROLS
C = CXM
D = DXM
L = CXM w/LON
M = DXM w/LON
N = CXM w/MPC
P = DXM w/MPC

CABINET INSULATION

OPTION	RANGE	ULTRA QUIET	1" FILTER RAIL	2" FILTER RAIL	1" FILTER FRAME	2" FILTER FRAME
1	EXTENDED RANGE	NO	YES	NO		
A			NO			YES
J			NO	YES	NO	
K			NO		YES	NO
2		YES	YES	NO		
C			NO			YES
L			NO	YES	NO	
M			NO		YES	NO
3	STANDARD RANGE	NO	YES	NO		
E			NO			YES
N			NO	YES	NO	
P			NO		YES	NO
4		YES	YES	NO		
G			NO			YES
R			NO	YES	NO	
S			NO		YES	NO

FUTURE USE
0 = NONE

HEAT EXCHANGER OPTIONS

OPTION	COPPER WATER COIL	CUPRO-NICKEL WATER COIL	TIN PLATED AIR COIL	E-COATED ECON COIL	WATER SIDE ECONOMIZER
A	YES	NO	YES	N/A	NO
C			NO	N/A	
J	NO	YES	YES	N/A	
N			NO	N/A	
1	YES	NO	YES	YES	YES
2			NO	NO	
3	NO	YES	YES	YES	
4			NO	NO	

RETURN AIR OPTIONS
L = LEFT RETURN
R = RIGHT RETURN
F = FRONT RETURN and VERTICAL 009 - 030 AND 041 ONLY
V = LEFT RETURN S.S. DRAIN PAN
W = RIGHT RETURN S.S. DRAIN PAN
Z = FRONT RETURN S.S. DRAIN PAN and VERTICAL 009-030 AND 041 ONLY

SUPPLY AIR OPTIONS

Option	Supply	Configuration	Motor
T	Top	TCV	PSC
B	Back	TCH	PSC
S	Straight	TCH	PSC
*V	Top	TCV	PSC Hi Static
*Y	Back	TCH	PSC Hi Static
*Z	Straight	TCH	PSC Hi Static
*K	Top	TCV	ECM
*P	Back	TCH	ECM
*W	Straight	TCH	ECM

* N/A for sizes 006, 009, 012, 041

S = STANDARD

Note: Above model nomenclature is a general reference. Not all configurations are available on all models. Consult engineering submittal for detailed information.

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ASHRAE/AHRI/ISO 13256-1. English (I-P) Units

Model	Fan Motor	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
		Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
		Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
TC-006	PSC	5,800	13.2	7,500	4.7	6,900	21.1	6,200	4.0	6,200	15.4	4,900	3.4
TC-009	PSC	8,800	13.4	11,600	4.3	10,100	21.0	9,800	3.9	9,300	15.7	7,900	3.4
TC-012	PSC	11,700	13.5	15,200	4.3	13,700	20.8	12,500	3.8	12,000	14.9	9,900	3.2
TC-015	PSC	14,500	15.4	17,300	5.0	16,800	24.5	14,400	4.4	15,000	17.2	11,100	3.6
	ECM	14,500	15.5	16,800	5.1	16,800	25.0	13,800	4.4	15,000	17.9	10,900	3.6
TC-018	PSC	17,300	14.3	21,500	5.0	20,600	21.6	17,200	4.2	18,400	16.3	13,900	3.4
	ECM	19,600	15.9	22,000	5.3	22,300	23.6	18,200	4.4	20,200	18.1	14,100	3.8
TC-024	PSC	23,700	13.4	28,500	4.7	26,700	20.9	24,000	4.1	24,900	15.4	18,500	3.3
	ECM	23,800	14.3	27,700	4.9	26,700	21.5	23,400	4.1	24,900	16.4	18,500	3.5
TC-030	PSC	28,100	13.4	35,100	4.6	31,700	20.1	29,600	4.1	28,900	15.1	23,400	3.4
	ECM	28,300	14.3	35,800	4.8	32,400	22.0	30,000	4.4	29,300	16.5	23,600	3.7
TC-036	PSC	34,500	13.5	45,200	4.4	38,700	20.7	37,500	4.0	35,300	14.9	29,600	3.3
	ECM	34,500	14.0	43,400	4.5	39,000	20.9	35,800	4.0	35,400	15.5	28,700	3.4
TCV-041	PSC	36,500	13.2	45,700	4.3	41,400	19.7	38,000	3.7	38,000	14.8	30,000	3.2
TC-042	PSC	40,100	13.2	52,700	4.3	45,900	19.6	44,000	3.8	40,500	14.4	34,300	3.2
	ECM	42,100	14.9	50,400	4.5	46,400	22.0	42,400	4.0	42,200	16.8	33,900	3.4
TC-048	PSC	47,700	13.3	55,900	4.7	54,300	20.5	46,500	4.1	49,000	14.7	36,400	3.4
	ECM	47,900	14.2	53,000	4.8	53,600	21.0	45,600	4.3	49,000	16.2	36,400	3.6
TC-060	PSC	59,400	13.4	72,000	4.3	66,600	19.9	60,000	3.9	60,100	14.8	47,500	3.3
	ECM	60,000	14.8	71,200	4.4	67,000	21.0	59,600	4.0	61,400	16.5	47,500	3.4

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature
Heating capacities based upon 68°F DB, 59°F WB entering air temperature
All ratings based upon operation at lower voltage of dual voltage rated models

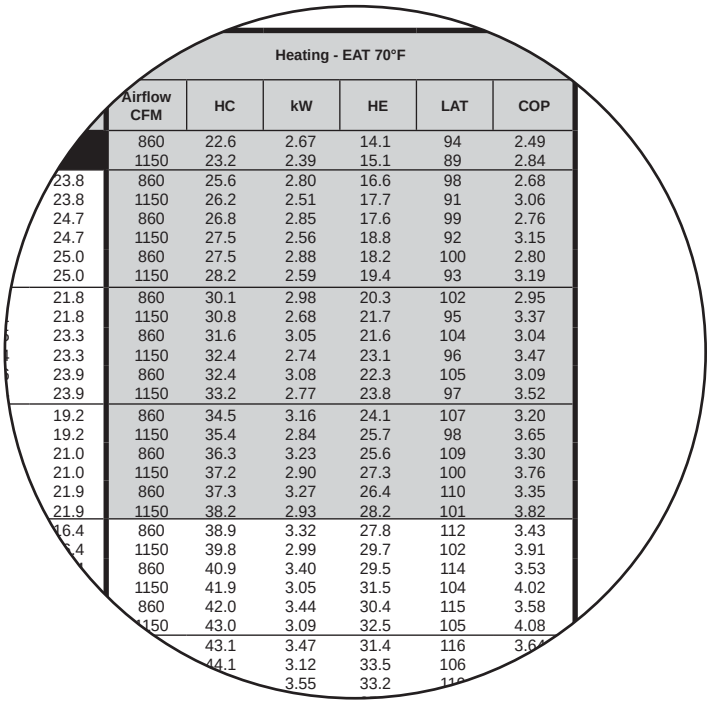
ASHRAE/AHRI/ISO 13256-1. Metric (S-I) Units

Model	Fan Motor	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
		Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Full Cooling 77°F		Full Heating 32°F	
		Capacity Btuh	EER W/W	Capacity Btuh	COP	Capacity Btuh	EER W/W	Capacity Btuh	COP	Capacity Btuh	EER W/W	Capacity Btuh	COP
TC-006	PSC	1.70	3.9	2.20	4.7	2.02	6.2	1.82	4.0	1.82	4.5	1.44	3.4
TC-009	PSC	2.58	3.9	3.40	4.3	2.96	6.2	2.87	3.9	2.72	4.6	2.31	3.4
TC-012	PSC	3.43	4.0	4.45	4.3	4.01	6.1	3.66	3.8	3.52	4.4	2.90	3.2
TC-015	PSC	4.25	4.5	5.07	5.0	4.92	7.2	4.22	4.4	4.39	5.0	3.25	3.6
	ECM	4.25	4.5	4.92	5.1	4.92	7.3	4.04	4.4	4.39	5.2	3.19	3.6
TC-018	PSC	5.07	4.2	6.30	5.0	6.04	6.3	5.04	4.2	5.39	4.8	4.07	3.4
	ECM	5.74	4.7	6.45	5.3	6.54	6.9	5.33	4.4	5.92	5.3	4.13	3.8
TC-024	PSC	6.94	3.9	8.35	4.7	7.82	6.1	7.03	4.1	7.30	4.5	5.42	3.3
	ECM	6.97	4.2	8.12	4.9	7.82	6.3	6.87	4.1	7.30	4.8	5.42	3.5
TC-030	PSC	8.23	3.9	10.28	4.6	9.29	5.9	8.67	4.1	8.47	4.4	6.86	3.4
	ECM	8.29	4.2	10.49	4.8	9.49	6.4	8.79	4.4	8.58	4.8	6.91	3.7
TC-036	PSC	10.11	4.0	13.24	4.4	11.34	6.1	10.99	4.0	10.34	4.4	8.67	3.3
	ECM	10.11	4.1	12.72	4.5	11.43	6.1	10.49	4.0	10.37	4.5	8.41	3.4
TCV-041	PSC	10.69	3.9	13.39	4.3	12.13	5.8	11.13	3.7	11.13	4.3	8.82	3.2
TC-042	PSC	11.75	3.9	15.44	4.3	13.45	5.7	12.89	3.8	11.87	4.2	10.05	3.2
	ECM	12.34	4.4	14.77	4.5	13.60	6.4	12.42	4.0	12.36	4.9	9.93	3.4
TC-048	PSC	13.98	3.9	16.38	4.7	15.91	6.0	13.62	4.1	14.36	4.3	10.67	3.4
	ECM	14.03	4.2	15.53	4.8	15.70	6.2	13.36	4.3	14.36	4.7	10.67	3.6
TC-060	PSC	17.40	3.9	21.10	4.3	19.51	5.8	17.58	3.9	17.61	4.3	14.80	3.3
	ECM	17.58	4.3	20.86	4.4	19.63	6.2	17.46	4.0	17.99	4.8	13.92	3.4

Cooling capacities based upon 27°C DB, 19°C WB entering air temperature
Heating capacities based upon 20°C DB, 15°C WB entering air temperature
All ratings based upon operation at lower voltage of dual voltage rated models

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For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (Leaving Water Temperature) must be calculated. Flow must be maintained to a level such that the LWT is maintained above 40°F [4.4°C] when the JW3 jumper is not clipped (see example below). Otherwise, appropriate levels of a proper antifreeze solution should be used in systems with leaving water temperatures of 40ºF or below and the JW3 jumper should be clipped. This is due to the potential of the refrigerant temperature being as low as 32°F [0°C] with 40°F [4.4°C] LWT, which may lead to a nuisance cutout due to the activation of the Low Temperature Protection. JW3 should never be clipped for standard range equipment or systems without antifreeze.



Heating - EAT 70°F

	Airflow CFM	HC	kW	HE	LAT	COP
	860	22.6	2.67	14.1	94	2.49
	1150	23.2	2.39	15.1	89	2.84
23.8	860	25.6	2.80	16.6	98	2.68
23.8	1150	26.2	2.51	17.7	91	3.06
24.7	860	26.8	2.85	17.6	99	2.76
24.7	1150	27.5	2.56	18.8	92	3.15
25.0	860	27.5	2.88	18.2	100	2.80
25.0	1150	28.2	2.59	19.4	93	3.19
21.8	860	30.1	2.98	20.3	102	2.95
21.8	1150	30.8	2.68	21.7	95	3.37
23.3	860	31.6	3.05	21.6	104	3.04
23.3	1150	32.4	2.74	23.1	96	3.47
23.9	860	32.4	3.08	22.3	105	3.09
23.9	1150	33.2	2.77	23.8	97	3.52
19.2	860	34.5	3.16	24.1	107	3.20
19.2	1150	35.4	2.84	25.7	98	3.65
21.0	860	36.3	3.23	25.6	109	3.30
21.0	1150	37.2	2.90	27.3	100	3.76
21.9	860	37.3	3.27	26.4	110	3.35
21.9	1150	38.2	2.93	28.2	101	3.82
16.4	860	38.9	3.32	27.8	112	3.43
.4	1150	39.8	2.99	29.7	102	3.91
	860	40.9	3.40	29.5	114	3.53
	1150	41.9	3.05	31.5	104	4.02
	860	42.0	3.44	30.4	115	3.58
	150	43.0	3.09	32.5	105	4.08
		43.1	3.47	31.4	116	3.6
		44.1	3.12	33.5	106	
			3.55	33.2		

Example:

At 50°F EWT (Entering Water Temperature) and 2.25 gpm/ton, a 3 ton unit has a HE of 27,300 Btuh. To calculate LWT, rearrange the formula for HE as follows:

HE = TD x GPM x 500, where HE = Heat of Extraction (Btuh); TD = temperature difference (EWT - LWT) and GPM = U.S. Gallons per Minute.

TD = HE / (GPM x 500)

TD = 27,300 / (6.75 x 500)

TD = 8°F

LWT = EWT - TD

LWT = 50 - 8 = 42°F

In this example, as long as the EWT does not fall below 50°F, the system will operate as designed. For EWTs below 50°F, higher flow rates will be required (open loop systems, for example, require at least 2 gpm/ton when EWT is below 50°F).

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Performance Data – TC H/V 006 (PSC Blower)

220 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	1.5	1.7	4.0	Operation not recommended							170	4.3	0.49	2.7	93.3	2.6
	1.5	1.7	4.0								225	4.4	0.44	2.9	88.0	2.9
30	0.8	0.5	1.2	170	7.4	4.2	0.57	0.28	8.4	26.4	170	4.6	0.50	3.0	95.2	2.7
	0.8	0.5	1.2	225	7.7	4.8	0.62	0.29	8.7	26.4	225	4.7	0.45	3.2	89.5	3.1
	1.1	0.8	1.8	170	7.4	4.1	0.55	0.26	8.3	28.5	170	4.8	0.51	3.2	96.2	2.8
	1.1	0.8	1.8	225	7.7	4.6	0.60	0.27	8.6	28.5	225	4.9	0.46	3.4	90.3	3.2
	1.5	1.3	2.9	170	7.3	4.0	0.54	0.25	8.2	29.2	170	4.9	0.51	3.2	96.8	2.8
	1.5	1.3	2.9	225	7.6	4.5	0.59	0.26	8.5	29.2	225	5.0	0.46	3.5	90.7	3.2
40	0.8	0.4	0.9	170	7.3	4.3	0.59	0.31	8.3	23.2	170	5.3	0.52	3.6	98.8	3.0
	0.8	0.4	0.9	225	7.6	4.8	0.64	0.33	8.7	23.2	225	5.4	0.47	3.8	92.3	3.4
	1.1	0.6	1.4	170	7.4	4.2	0.57	0.29	8.4	25.8	170	5.5	0.53	3.8	100.2	3.1
	1.1	0.6	1.4	225	7.7	4.8	0.62	0.30	8.7	25.8	225	5.7	0.47	4.1	93.3	3.5
	1.5	1.0	2.4	170	7.4	4.2	0.56	0.28	8.4	26.9	170	5.7	0.53	3.9	100.9	3.1
	1.5	1.0	2.4	225	7.7	4.7	0.61	0.29	8.7	26.9	225	5.8	0.48	4.2	93.9	3.6
50	0.8	0.3	0.8	170	6.9	4.2	0.61	0.35	8.1	19.9	170	6.0	0.54	4.2	102.7	3.3
	0.8	0.3	0.8	225	7.2	4.8	0.66	0.36	8.5	19.9	225	6.1	0.48	4.5	95.3	3.7
	1.1	0.5	1.2	170	7.2	4.3	0.59	0.32	8.3	22.5	170	6.3	0.55	4.5	104.4	3.4
	1.1	0.5	1.2	225	7.5	4.8	0.64	0.33	8.6	22.5	225	6.5	0.49	4.8	96.6	3.9
	1.5	0.9	2.0	170	7.3	4.3	0.58	0.31	8.3	23.8	170	6.5	0.55	4.6	105.4	3.4
	1.5	0.9	2.0	225	7.6	4.8	0.63	0.32	8.7	23.8	225	6.7	0.50	5.0	97.4	3.9
60	0.8	0.3	0.6	170	6.5	4.1	0.63	0.39	7.9	16.8	170	6.7	0.56	4.9	106.7	3.5
	0.8	0.3	0.6	225	6.8	4.7	0.69	0.40	8.2	16.8	225	6.9	0.50	5.2	98.4	4.0
	1.1	0.5	1.0	170	6.9	4.2	0.61	0.36	8.1	19.1	170	7.1	0.57	5.2	108.6	3.7
	1.1	0.5	1.0	225	7.1	4.8	0.67	0.37	8.4	19.1	225	7.3	0.51	5.5	99.9	4.2
	1.5	0.8	1.8	170	7.0	4.2	0.61	0.34	8.2	20.4	170	7.3	0.57	5.3	109.7	3.7
	1.5	0.8	1.8	225	7.3	4.8	0.66	0.36	8.5	20.4	225	7.5	0.51	5.7	100.7	4.3
70	0.8	0.2	0.5	170	6.0	4.0	0.66	0.43	7.5	14.0	170	7.4	0.58	5.5	110.5	3.8
	0.8	0.2	0.5	225	6.3	4.5	0.72	0.45	7.8	14.0	225	7.6	0.52	5.9	101.4	4.3
	1.1	0.4	0.9	170	6.4	4.1	0.64	0.40	7.8	16.0	170	7.8	0.58	5.8	112.4	3.9
	1.1	0.4	0.9	225	6.7	4.6	0.70	0.42	8.1	16.0	225	8.0	0.53	6.2	102.8	4.5
	1.5	0.7	1.6	170	6.6	4.1	0.63	0.38	7.9	17.1	170	8.0	0.59	5.9	113.4	4.0
	1.5	0.7	1.6	225	6.8	4.7	0.69	0.40	8.2	17.1	225	8.2	0.53	6.4	103.6	4.5
80	0.8	0.2	0.5	170	5.6	3.8	0.68	0.47	7.2	12.0	170	7.9	0.59	5.9	113.2	4.0
	0.8	0.2	0.5	225	5.8	4.3	0.74	0.49	7.5	12.0	225	8.1	0.53	6.3	103.5	4.5
	1.1	0.4	0.8	170	5.9	3.9	0.67	0.45	7.4	13.2	170	8.3	0.60	6.3	115.4	4.1
	1.1	0.4	0.8	225	6.1	4.4	0.73	0.46	7.7	13.2	225	8.5	0.54	6.7	105.1	4.6
	1.5	0.6	1.5	170	6.2	4.0	0.65	0.42	7.6	14.7	170	8.4	0.60	6.3	115.7	4.1
	1.5	0.6	1.5	225	6.4	4.6	0.71	0.44	7.9	14.7	225	8.6	0.54	6.7	105.3	4.6
85	0.8	0.2	0.5	170	5.3	3.7	0.70	0.50	7.0	10.7	170	8.2	0.60	6.2	114.7	4.0
	0.8	0.2	0.5	225	5.5	4.2	0.76	0.52	7.3	10.7	225	8.4	0.50	6.6	104.6	4.6
	1.1	0.3	0.8	170	5.6	3.8	0.68	0.47	7.2	11.9	170	8.5	0.60	6.4	116.2	4.1
	1.1	0.3	0.8	225	5.8	4.3	0.74	0.49	7.5	11.9	225	8.7	0.50	6.8	105.8	4.7
	1.5	0.6	1.4	170	5.8	3.9	0.67	0.45	7.4	13.1	170	8.5	0.60	6.4	116.4	4.1
	1.5	0.6	1.4	225	6.1	4.4	0.73	0.47	7.7	13.1	225	8.7	0.50	6.8	105.9	4.7
90	0.8	0.2	0.4	170	5.0	3.6	0.72	0.53	6.7	9.4	170	8.5	0.61	6.4	116.3	4.1
	0.8	0.2	0.4	225	5.2	4.1	0.79	0.55	7.0	9.4	225	8.7	0.55	6.8	105.8	4.7
	1.1	0.3	0.7	170	5.3	3.7	0.70	0.49	7.0	10.7	170	8.6	0.62	6.5	117.0	4.1
	1.1	0.3	0.7	225	5.5	4.2	0.76	0.52	7.3	10.7	225	8.8	0.55	7.0	106.4	4.7
	1.5	0.6	1.3	170	5.5	3.8	0.69	0.48	7.1	11.5	170	8.7	0.62	6.5	117.1	4.1
	1.5	0.6	1.3	225	5.7	4.3	0.75	0.50	7.4	11.5	225	8.9	0.56	7.0	106.5	4.7
100	0.8	0.2	0.4	170	4.4	3.4	0.76	0.58	6.4	7.6	Operation not recommended					
	0.8	0.2	0.4	225	4.6	3.8	0.83	0.60	6.6	7.6						
	1.1	0.3	0.7	170	4.7	3.5	0.74	0.55	6.6	8.7						
	1.1	0.3	0.7	225	4.9	4.0	0.80	0.57	6.9	8.7						
	1.5	0.5	1.2	170	4.9	3.6	0.73	0.53	6.7	9.3						
	1.5	0.5	1.2	225	5.1	4.0	0.79	0.55	7.0	9.3						
110	0.8	0.2	0.3	170	3.9	3.1	0.81	0.63	6.0	6.2						
	0.8	0.2	0.3	225	4.1	3.6	0.87	0.66	6.3	6.2						
	1.1	0.3	0.6	170	4.2	3.3	0.78	0.60	6.2	7.0						
	1.1	0.3	0.6	225	4.4	3.7	0.85	0.62	6.5	7.0						
	1.5	0.5	1.2	170	4.3	3.3	0.77	0.58	6.3	7.4						
	1.5	0.5	1.2	225	4.5	3.8	0.83	0.61	6.6	7.4						
120	0.8	0.1	0.3	170	3.5	3.0	0.85	0.68	5.8	5.0						
	0.8	0.1	0.3	225	3.6	3.3	0.93	0.71	6.0	5.0						
	1.1	0.3	0.6	170	3.7	3.0	0.83	0.65	5.9	5.6						
	1.1	0.3	0.6	225	3.8	3.4	0.90	0.68	6.2	5.6						
	1.5	0.5	1.1	170	3.8	3.1	0.81	0.64	6.0	6.0						
	1.5	0.5	1.1	225	4.0	3.5	0.88	0.67	6.2	6.0						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

325 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	2.3	4.5	10.5	Operation not recommended							250	6.5	0.73	4.2	94.2	2.6
	2.3	4.5	10.5								330	6.7	0.66	4.4	88.8	3.0
30	1.1	1.3	3.0	250	10.2	6.0	0.59	0.39	11.6	26.6	250	7.1	0.74	4.7	96.3	2.8
	1.1	1.3	3.0	330	10.7	6.8	0.64	0.40	12.0	26.6	330	7.3	0.67	5.0	90.4	3.2
	1.7	1.9	4.4	250	10.5	6.0	0.57	0.36	11.7	29.5	250	7.4	0.75	4.9	97.4	2.9
	1.7	1.9	4.4	330	10.9	6.8	0.62	0.37	12.2	29.5	330	7.6	0.67	5.3	91.2	3.3
	2.3	3.5	8.1	250	10.6	6.0	0.56	0.34	11.8	31.1	250	7.5	0.75	5.1	97.9	2.9
	2.3	3.5	8.1	330	11.0	6.8	0.61	0.36	12.3	31.1	330	7.7	0.68	5.4	91.7	3.4
40	1.1	0.9	2.0	250	9.9	6.0	0.61	0.43	11.3	22.8	250	8.0	0.76	5.5	99.8	3.1
	1.1	0.9	2.0	330	10.3	6.8	0.66	0.45	11.8	22.8	330	8.2	0.69	5.9	93.1	3.5
	1.7	1.5	3.5	250	10.1	6.0	0.59	0.40	11.5	25.4	250	8.4	0.77	5.8	101.1	3.2
	1.7	1.5	3.5	330	10.5	6.8	0.64	0.41	12.0	25.4	330	8.6	0.69	6.2	94.1	3.6
	2.3	3.0	6.8	250	10.3	6.0	0.59	0.38	11.6	26.8	250	8.6	0.78	6.0	101.8	3.2
	2.3	3.0	6.8	330	10.7	6.8	0.64	0.40	12.0	26.9	330	8.8	0.70	6.4	94.7	3.7
50	1.1	0.6	1.5	250	9.4	6.0	0.63	0.48	11.1	19.5	250	9.0	0.79	6.4	103.3	3.4
	1.1	0.6	1.5	330	9.8	6.7	0.69	0.50	11.6	19.5	330	9.2	0.71	6.8	95.8	3.8
	1.7	1.3	2.9	250	9.7	6.0	0.62	0.45	11.3	21.7	250	9.4	0.80	6.7	104.8	3.5
	1.7	1.3	2.9	330	10.1	6.8	0.67	0.47	11.7	21.7	330	9.6	0.72	7.2	97.0	3.9
	2.3	2.6	6.0	250	9.9	6.0	0.61	0.43	11.3	23.0	250	9.6	0.80	6.9	105.6	3.5
	2.3	2.6	6.0	330	10.3	6.8	0.66	0.45	11.8	23.0	330	9.8	0.72	7.4	97.6	4.0
60	1.1	0.5	1.2	250	9.0	5.9	0.65	0.54	10.8	16.5	250	9.9	0.81	7.2	106.8	3.6
	1.1	0.5	1.2	330	9.4	6.7	0.71	0.57	11.3	16.5	330	10.2	0.73	7.7	98.5	4.1
	1.7	1.1	2.5	250	9.3	5.9	0.64	0.50	11.0	18.5	250	10.4	0.82	7.6	108.4	3.7
	1.7	1.1	2.5	330	9.7	6.7	0.69	0.52	11.5	18.5	330	10.6	0.74	8.1	99.8	4.2
	2.3	2.3	5.4	250	9.5	6.0	0.63	0.48	11.1	19.6	250	10.6	0.83	7.8	109.3	3.7
	2.3	2.3	5.4	330	9.8	6.7	0.69	0.50	11.6	19.6	330	10.9	0.75	8.3	100.5	4.3
70	1.1	0.4	0.9	250	8.5	5.8	0.68	0.61	10.6	14.0	250	10.8	0.84	8.0	110.1	3.8
	1.1	0.4	0.9	330	8.8	6.5	0.74	0.63	11.0	14.0	330	11.1	0.75	8.5	101.1	4.3
	1.7	1.0	2.3	250	8.8	5.8	0.66	0.56	10.7	15.6	250	11.3	0.85	8.4	111.9	3.9
	1.7	1.0	2.3	330	9.2	6.6	0.72	0.59	11.2	15.6	330	11.6	0.77	9.0	102.5	4.4
	2.3	2.1	4.9	250	9.1	5.9	0.65	0.53	10.9	17.1	250	11.4	0.85	8.5	112.1	3.9
	2.3	2.1	4.9	330	9.5	6.7	0.71	0.55	11.3	17.1	330	11.6	0.77	9.0	102.7	4.4
80	1.1	0.3	0.8	250	8.0	5.6	0.70	0.67	10.3	11.8	250	11.7	0.87	8.7	113.3	4.0
	1.1	0.3	0.8	330	8.3	6.3	0.77	0.70	10.7	11.8	330	12.0	0.78	9.3	103.6	4.5
	1.7	0.9	2.1	250	8.3	5.7	0.69	0.63	10.5	13.2	250	12.2	0.88	9.1	115.1	4.0
	1.7	0.9	2.1	330	8.6	6.5	0.75	0.66	10.9	13.2	330	12.5	0.79	9.8	105.0	4.6
	2.3	2.0	4.6	250	8.6	5.8	0.67	0.59	10.6	14.4	250	12.2	0.88	9.2	115.4	4.1
	2.3	2.0	4.6	330	8.9	6.5	0.73	0.62	11.1	14.4	330	12.5	0.79	9.8	105.2	4.6
85	1.1	0.3	0.7	250	7.7	5.5	0.71	0.70	10.1	11.0	250	12.0	0.88	9.0	114.5	4.0
	1.1	0.3	0.7	330	8.0	6.2	0.78	0.73	10.5	11.0	330	12.3	0.80	9.6	104.6	4.6
	1.7	0.9	2.0	250	8.0	5.6	0.70	0.67	10.3	12.1	250	12.6	0.90	9.5	116.5	4.1
	1.7	0.9	2.0	330	8.4	6.4	0.76	0.69	10.7	12.1	330	12.9	0.80	10.1	106.1	4.7
	2.3	1.9	4.4	250	8.3	5.7	0.69	0.63	10.5	13.3	250	12.6	0.90	9.5	116.8	4.1
	2.3	1.9	4.4	330	8.7	6.5	0.75	0.65	10.9	13.3	330	12.9	0.80	10.2	106.3	4.7
90	1.1	0.3	0.6	250	7.5	5.4	0.72	0.73	10.0	10.2	250	12.3	0.89	9.3	115.7	4.1
	1.1	0.3	0.6	330	7.8	6.2	0.79	0.76	10.4	10.2	330	12.6	0.80	9.9	105.5	4.6
	1.7	0.8	1.9	250	7.7	5.5	0.71	0.70	10.1	11.1	250	12.9	0.91	9.8	117.9	4.2
	1.7	0.8	1.9	330	8.1	6.3	0.78	0.73	10.6	11.1	330	13.3	0.82	10.5	107.2	4.8
	2.3	1.8	4.3	250	8.0	5.6	0.70	0.66	10.3	12.1	250	13.0	0.91	9.9	118.2	4.2
	2.3	1.8	4.3	330	8.4	6.4	0.76	0.69	10.7	12.1	330	13.3	0.82	10.5	107.4	4.8
100	1.1	0.2	0.6	250	6.8	5.1	0.76	0.82	9.6	8.2	Operation not recommended					
	1.1	0.2	0.6	330	7.0	5.8	0.82	0.86	10.0	8.2						
	1.7	0.8	1.7	250	7.1	5.3	0.74	0.78	9.8	9.2						
	1.7	0.8	1.7	330	7.4	6.0	0.81	0.81	10.2	9.2						
	2.3	1.7	4.0	250	7.3	5.4	0.73	0.75	9.9	9.7						
	2.3	1.7	4.0	330	7.6	6.1	0.80	0.78	10.3	9.7						
110	1.1	0.2	0.5	250	6.1	4.8	0.79	0.90	9.2	6.8						
	1.1	0.2	0.5	330	6.3	5.4	0.85	0.94	9.5	6.8						
	1.7	0.7	1.6	250	6.5	5.0	0.77	0.86	9.4	7.6						
	1.7	0.7	1.6	330	6.8	5.6	0.84	0.89	9.8	7.6						
	2.3	1.6	3.8	250	6.7	5.1	0.76	0.83	9.5	8.0						
	2.3	1.6	3.8	330	7.0	5.8	0.83	0.87	9.9	8.0						
120	1.1	0.2	0.4	250	5.4	4.4	0.82	0.98	8.7	5.5						
	1.1	0.2	0.4	330	5.6	5.0	0.89	1.02	9.1	5.5						
	1.7	0.7	1.6	250	5.8	4.6	0.80	0.94	9.0	6.2						
	1.7	0.7	1.6	330	6.0	5.2	0.87	0.98	9.4	6.2						
	2.3	1.6	3.6	250	6.0	4.7	0.79	0.91	9.1	6.5						
	2.3	1.6	3.6	330	6.2	5.4	0.86	0.95	9.5	6.5						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 012 (PSC Blower)

400 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	3.0	8.5	19.6	Operation not recommended							300	8.5	0.98	5.3	96.2	2.5
	3.0	8.5	19.6								400	8.7	0.88	5.7	90.2	2.9
30	1.5	1.9	4.3	300	14.2	8.2	0.58	0.55	16.1	25.8	300	9.3	1.00	6.0	98.6	2.7
	1.5	1.9	4.3	400	14.8	9.3	0.63	0.57	16.8	25.8	400	9.5	0.90	6.4	91.9	3.1
	2.3	3.6	8.4	300	14.3	8.2	0.58	0.51	16.1	27.9	300	9.6	1.01	6.3	99.7	2.8
	2.3	3.6	8.4	400	14.9	9.3	0.63	0.53	16.7	27.9	400	9.9	0.91	6.8	92.8	3.2
	3.0	6.7	15.5	300	14.3	8.2	0.58	0.50	16.0	28.8	300	9.8	1.02	6.5	100.4	2.8
	3.0	6.7	15.5	400	14.9	9.3	0.63	0.52	16.6	28.8	400	10.1	0.92	7.0	93.3	3.2
40	1.5	1.4	3.2	300	14.0	8.1	0.58	0.61	16.0	22.9	300	10.6	1.04	7.1	102.6	3.0
	1.5	1.4	3.2	400	14.5	9.2	0.63	0.63	16.7	22.9	400	10.8	0.93	7.6	95.0	3.4
	2.3	3.0	6.9	300	14.2	8.2	0.58	0.57	16.1	25.1	300	11.0	1.05	7.6	104.1	3.1
	2.3	3.0	6.9	400	14.8	9.3	0.63	0.59	16.8	25.1	400	11.3	0.94	8.1	96.2	3.5
	3.0	5.7	13.1	300	14.3	8.2	0.58	0.54	16.1	26.2	300	11.3	1.06	7.8	104.9	3.1
	3.0	5.7	13.1	400	14.8	9.3	0.63	0.57	16.8	26.2	400	11.6	0.95	8.3	96.8	3.6
50	1.5	1.1	2.5	300	13.5	7.9	0.58	0.67	15.8	20.1	300	11.9	1.08	8.3	106.8	3.2
	1.5	1.1	2.5	400	14.1	8.9	0.63	0.70	16.5	20.1	400	12.2	0.97	8.9	98.2	3.7
	2.3	2.6	6.0	300	13.9	8.0	0.58	0.62	16.0	22.2	300	12.5	1.09	8.9	108.6	3.4
	2.3	2.6	6.0	400	14.4	9.1	0.63	0.65	16.7	22.2	400	12.8	0.98	9.5	99.6	3.8
	3.0	5.0	11.5	300	14.0	8.1	0.58	0.60	16.1	23.3	300	12.8	1.10	9.1	109.6	3.4
	3.0	5.0	11.5	400	14.6	9.2	0.63	0.63	16.7	23.3	400	13.1	0.99	9.8	100.4	3.9
60	1.5	0.9	2.1	300	12.9	7.6	0.59	0.74	15.5	17.4	300	13.3	1.11	9.6	111.1	3.5
	1.5	0.9	2.1	400	13.5	8.6	0.64	0.77	16.1	17.4	400	13.6	1.00	10.2	101.5	4.0
	2.3	2.3	5.3	300	13.4	7.8	0.58	0.69	15.7	19.3	300	14.0	1.13	10.2	113.1	3.6
	2.3	2.3	5.3	400	13.9	8.8	0.63	0.72	16.4	19.3	400	14.3	1.02	10.8	103.1	4.1
	3.0	4.5	10.3	300	13.6	7.9	0.58	0.67	15.8	20.4	300	14.3	1.14	10.5	114.2	3.7
	3.0	4.5	10.3	400	14.1	8.9	0.63	0.69	16.5	20.4	400	14.7	1.03	11.2	104.0	4.2
70	1.5	0.8	1.8	300	12.2	7.3	0.60	0.82	15.0	14.9	300	14.7	1.15	10.8	115.3	3.7
	1.5	0.8	1.8	400	12.7	8.3	0.65	0.85	15.6	14.9	400	15.0	1.04	11.5	104.8	4.2
	2.3	2.1	4.8	300	12.5	7.4	0.59	0.77	15.2	16.3	300	15.4	1.18	11.4	117.6	3.8
	2.3	2.1	4.8	400	13.1	8.4	0.64	0.80	15.8	16.3	400	15.8	1.06	12.2	106.5	4.4
	3.0	4.1	9.5	300	12.7	7.5	0.59	0.75	15.3	17.0	300	15.8	1.19	11.7	118.8	3.9
	3.0	4.1	9.5	400	13.3	8.5	0.64	0.78	15.9	17.0	400	16.2	1.07	12.5	107.5	4.4
80	1.5	0.7	1.5	300	11.4	7.0	0.61	0.90	14.5	12.7	300	16.0	1.20	11.9	119.4	3.9
	1.5	0.7	1.5	400	11.9	7.9	0.67	0.94	15.1	12.7	400	16.4	1.08	12.7	108.0	4.5
	2.3	1.9	4.4	300	11.8	7.1	0.60	0.85	14.7	13.9	300	16.8	1.22	12.6	121.7	4.0
	2.3	1.9	4.4	400	12.3	8.0	0.65	0.88	15.3	13.9	400	17.2	1.10	13.4	109.8	4.6
	3.0	3.8	8.8	300	12.0	7.2	0.60	0.83	14.8	14.5	300	17.2	1.24	12.9	123.0	4.1
	3.0	3.8	8.8	400	12.5	8.1	0.65	0.86	15.4	14.5	400	17.6	1.11	13.8	110.7	4.6
85	1.5	0.6	1.5	300	10.9	6.8	0.62	0.9	14.2	11.7	300	16.6	1.22	12.5	121.3	4.0
	1.5	0.6	1.5	400	11.4	7.7	0.68	0.98	14.7	11.7	400	17.0	1.1	13.3	109.4	4.6
	2.3	1.8	4.2	300	11.4	6.9	0.61	0.89	14.4	12.8	300	17.4	1.3	13.1	123.6	4.1
	2.3	1.8	4.2	400	11.9	7.9	0.66	0.93	15.0	12.8	400	17.8	1.1	14.0	111.2	4.6
	3.0	3.7	8.5	300	11.6	7.0	0.60	0.87	14.5	13.4	300	17.7	1.3	13.4	124.8	4.1
	3.0	3.7	8.5	400	12.1	7.9	0.66	0.90	15.1	13.4	400	18.2	1.1	14.3	112.1	4.7
90	1.5	0.6	1.4	300	10.5	6.7	0.63	0.99	13.9	10.7	300	17.3	1.24	13.0	123.3	4.1
	1.5	0.6	1.4	400	10.9	7.5	0.69	1.03	14.4	10.7	400	17.7	1.12	13.9	110.9	4.6
	2.3	1.8	4.1	300	11.0	6.8	0.62	0.93	14.1	11.7	300	18.0	1.28	13.6	125.5	4.1
	2.3	1.8	4.1	400	11.4	7.7	0.67	0.97	14.7	11.7	400	18.4	1.15	14.5	112.6	4.7
	3.0	3.6	8.2	300	11.2	6.8	0.61	0.91	14.3	12.3	300	18.3	1.29	13.9	126.6	4.2
	3.0	3.6	8.2	400	11.6	7.7	0.67	0.95	14.8	12.3	400	18.8	1.16	14.8	113.5	4.7
100	1.5	0.5	1.2	300	9.5	6.4	0.67	1.07	13.2	8.9	Operation not recommended					
	1.5	0.5	1.2	400	9.9	7.2	0.72	1.12	13.8	8.9						
	2.3	1.7	3.8	300	10.1	6.5	0.65	1.02	13.5	9.8						
	2.3	1.7	3.8	400	10.5	7.3	0.70	1.06	14.1	9.8						
	3.0	3.3	7.7	300	10.4	6.6	0.64	1.00	13.8	10.4						
	3.0	3.3	7.7	400	10.8	7.5	0.69	1.04	14.3	10.4						
110	1.5	0.5	1.1	300	8.5	6.0	0.71	1.17	12.5	7.3						
	1.5	0.5	1.1	400	8.9	6.8	0.77	1.22	13.1	7.3						
	2.3	1.6	3.6	300	9.1	6.2	0.68	1.12	12.9	8.1						
	2.3	1.6	3.6	400	9.4	7.0	0.74	1.16	13.4	8.1						
	3.0	3.2	7.3	300	9.4	6.3	0.67	1.09	13.1	8.6						
	3.0	3.2	7.3	400	9.8	7.1	0.73	1.14	13.7	8.6						
120	1.5	0.4	1.0	300	7.5	5.7	0.76	1.27	11.8	5.9						
	1.5	0.4	1.0	400	7.8	6.4	0.82	1.32	12.3	5.9						
	2.3	1.5	3.4	300	8.0	5.8	0.73	1.22	12.2	6.6						
	2.3	1.5	3.4	400	8.3	6.6	0.79	1.27	12.7	6.6						
	3.0	3.0	7.0	300	8.3	5.9	0.71	1.19	12.4	7.0						
	3.0	3.0	7.0	400	8.7	6.7	0.77	1.24	12.9	7.0						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 015 (PSC Blower)

525 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	3.8	4.1	9.5	Operation not recommended							395	9.5	1.07	6.1	92	2.62
	3.8	4.1	9.5								525	9.8	0.96	6.5	87	2.98
30	1.9	1.0	2.3	395	17.3	10.8	0.62	0.61	19.4	28.4	395	10.6	1.09	7.1	95	2.84
	1.9	1.0	2.3	525	18.1	12.2	0.67	0.64	20.2	28.4	525	10.9	0.98	7.5	89	3.24
	2.8	1.8	4.3	395	17.5	10.8	0.62	0.56	19.4	31.1	395	11.1	1.11	7.5	96	2.94
	2.8	1.8	4.3	525	18.2	12.2	0.67	0.59	20.2	31.1	525	11.4	0.99	8.0	90	3.35
	3.8	3.3	7.7	395	17.5	10.8	0.62	0.54	19.4	32.2	395	11.3	1.11	7.7	97	2.99
	3.8	3.3	7.7	525	18.3	12.2	0.67	0.57	20.2	32.2	525	11.6	1.00	8.2	90	3.41
40	1.9	0.8	1.8	395	17.0	10.6	0.63	0.68	19.3	24.8	395	12.3	1.13	8.5	99	3.18
	1.9	0.8	1.8	525	17.7	12.0	0.68	0.71	20.1	24.8	525	12.6	1.02	9.1	92	3.62
	2.8	1.6	3.6	395	17.2	10.7	0.62	0.63	19.4	27.3	395	12.8	1.14	9.0	100	3.29
	2.8	1.6	3.6	525	18.0	12.1	0.68	0.66	20.2	27.3	525	13.1	1.03	9.7	93	3.75
	3.8	2.9	6.6	395	17.4	10.8	0.62	0.60	19.4	28.8	395	13.1	1.15	9.3	101	3.35
	3.8	2.9	6.6	525	18.1	12.2	0.67	0.63	20.2	28.8	525	13.5	1.03	10.0	94	3.82
50	1.9	0.6	1.5	395	16.4	10.4	0.63	0.76	19.0	21.6	395	13.9	1.16	10.0	103	3.50
	1.9	0.6	1.5	525	17.1	11.8	0.69	0.79	19.8	21.6	525	14.2	1.05	10.7	95	3.99
	2.8	1.4	3.1	395	16.8	10.6	0.63	0.71	19.2	23.8	395	14.6	1.18	10.6	104	3.63
	2.8	1.4	3.1	525	17.5	12.0	0.68	0.74	20.0	23.8	525	14.9	1.06	11.3	96	4.13
	3.8	2.5	5.8	395	17.0	10.6	0.63	0.68	19.3	25.0	395	14.9	1.18	10.9	105	3.69
	3.8	2.5	5.8	525	17.7	12.0	0.68	0.71	20.1	25.0	525	15.3	1.06	11.7	97	4.21
60	1.9	0.6	1.3	395	15.7	10.2	0.65	0.84	18.6	18.7	395	15.5	1.20	11.5	106	3.81
	1.9	0.6	1.3	525	16.4	11.5	0.70	0.88	19.4	18.7	525	15.9	1.07	12.2	98	4.34
	2.8	1.2	2.8	395	16.2	10.4	0.64	0.79	18.9	20.5	395	16.3	1.21	12.1	108	3.94
	2.8	1.2	2.8	525	16.9	11.7	0.69	0.82	19.7	20.5	525	16.7	1.09	13.0	99	4.50
	3.8	2.3	5.3	395	16.4	10.4	0.63	0.76	19.0	21.6	395	16.7	1.22	12.5	109	4.02
	3.8	2.3	5.3	525	17.1	11.8	0.69	0.79	19.8	21.6	525	17.1	1.09	13.3	100	4.58
70	1.9	0.5	1.1	395	15.2	10.1	0.66	0.93	18.3	16.2	395	17.1	1.22	12.9	110	4.10
	1.9	0.5	1.1	525	15.8	11.4	0.72	0.97	19.1	16.3	525	17.5	1.10	13.8	101	4.68
	2.8	1.1	2.5	395	15.5	10.1	0.65	0.88	18.5	17.6	395	18.0	1.24	13.7	112	4.25
	2.8	1.1	2.5	525	16.1	11.4	0.71	0.91	19.2	17.6	525	18.4	1.11	14.6	102	4.85
	3.8	2.1	4.9	395	15.8	10.2	0.65	0.85	18.6	18.6	395	18.4	1.25	14.1	113	4.33
	3.8	2.1	4.9	525	16.4	11.5	0.70	0.88	19.4	18.6	525	18.8	1.12	15.0	103	4.94
80	1.9	0.4	1.0	395	14.3	9.8	0.68	1.03	17.8	13.9	395	18.7	1.25	14.3	114	4.38
	1.9	0.4	1.0	525	14.9	11.1	0.74	1.07	18.5	13.9	525	19.2	1.12	15.3	104	5.00
	2.8	1.0	2.4	395	14.7	9.8	0.67	0.97	18.0	15.1	395	19.6	1.27	15.1	116	4.54
	2.8	1.0	2.4	525	15.3	11.1	0.73	1.01	18.7	15.1	525	20.1	1.14	16.2	105	5.18
	3.8	2.0	4.6	395	14.9	9.9	0.66	0.94	18.2	15.9	395	20.1	1.27	15.6	117	4.62
	3.8	2.0	4.6	525	15.6	11.2	0.72	0.98	18.9	15.9	525	20.6	1.14	16.6	106	5.27
85	1.9	0.4	0.9	395	13.8	9.6	0.70	1.1	17.5	12.8	395	19.5	1.26	15.0	116	4.52
	1.9	0.4	0.9	525	14.4	10.9	0.76	1.13	18.2	12.8	525	19.9	1.13	16.0	105	5.15
	2.8	1.0	2.3	395	14.2	9.7	0.68	1.02	17.7	13.9	395	20.4	1.28	15.9	118	4.68
	2.8	1.0	2.3	525	14.8	11.0	0.74	1.07	18.4	13.9	525	20.9	1.15	16.9	107	5.34
	3.8	1.9	4.4	395	14.5	9.8	0.67	0.99	17.9	14.7	395	20.9	1.29	16.3	119	4.77
	3.8	1.9	4.4	525	15.1	11.1	0.73	1.03	18.6	14.7	525	21.4	1.15	17.4	108	5.43
90	1.9	0.4	0.9	395	13.3	9.5	0.71	1.14	17.2	11.7	395	20.2	1.28	15.7	117	4.65
	1.9	0.4	0.9	525	13.9	10.7	0.77	1.19	18.0	11.7	525	20.7	1.15	16.8	107	5.30
	2.8	1.0	2.2	395	13.7	9.5	0.69	1.08	17.4	12.8	395	21.2	1.29	16.6	120	4.82
	2.8	1.0	2.2	525	14.3	10.8	0.75	1.12	18.1	12.8	525	21.7	1.16	17.7	108	5.49
	3.8	1.9	4.3	395	14.1	9.6	0.69	1.04	17.6	13.5	395	21.7	1.30	17.1	121	4.90
	3.8	1.9	4.3	525	14.6	10.9	0.74	1.08	18.3	13.5	525	22.2	1.17	18.2	109	5.59
100	1.9	0.4	0.8	395	12.4	9.2	0.74	1.25	16.6	9.9	Operation not recommended					
	1.9	0.4	0.8	525	12.9	10.4	0.80	1.31	17.3	9.9						
	2.8	0.9	2.1	395	12.8	9.2	0.72	1.19	16.8	10.8						
	2.8	0.9	2.1	525	13.3	10.4	0.78	1.23	17.5	10.8						
	3.8	1.8	4.1	395	13.1	9.3	0.71	1.15	17.0	11.4						
	3.8	1.8	4.1	525	13.6	10.5	0.77	1.20	17.7	11.4						
110	1.9	0.3	0.7	395	11.3	8.8	0.78	1.37	16.0	8.3						
	1.9	0.3	0.7	525	11.8	10.0	0.84	1.43	16.7	8.3						
	2.8	0.8	1.9	395	11.8	8.9	0.75	1.30	16.2	9.0						
	2.8	0.8	1.9	525	12.2	10.0	0.82	1.36	16.9	9.0						
	3.8	1.7	3.9	395	12.1	9.0	0.74	1.27	16.4	9.5						
	3.8	1.7	3.9	525	12.6	10.2	0.81	1.32	17.1	9.5						
120	1.9	0.3	0.7	395	10.3	8.5	0.82	1.50	15.5	6.9						
	1.9	0.3	0.7	525	10.8	9.6	0.89	1.56	16.1	6.9						
	2.8	0.8	1.8	395	10.7	8.5	0.79	1.43	15.6	7.5						
	2.8	0.8	1.8	525	11.2	9.6	0.86	1.48	16.2	7.5						
	3.8	1.6	3.7	395	11.0	8.6	0.78	1.39	15.8	7.9						
	3.8	1.6	3.7	525	11.5	9.8	0.85	1.45	16.4	7.9						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 015 (ECM Blower)

500 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	3.8	4.1	9.5	Operation not recommended							395	9.6	1.01	6.1	92.0	2.8
	3.8	4.1	9.5								500	9.6	0.90	6.5	87.0	3.1
30	1.9	1.0	2.3	395	17.3	10.8	0.62	0.55	19.2	31.3	395	10.6	1.03	7.1	95.0	3.0
	1.9	1.0	2.3	500	18.1	12.2	0.67	0.58	20.1	31.0	500	10.7	0.92	7.5	89.0	3.4
	2.8	1.8	4.3	395	17.5	10.8	0.62	0.50	19.2	34.8	395	11.1	1.05	7.5	96.0	3.1
	2.8	1.8	4.3	500	18.2	12.2	0.67	0.53	20.0	34.1	500	11.2	0.93	8.0	90.0	3.5
	3.8	3.3	7.7	395	17.5	10.8	0.62	0.48	19.1	36.2	395	11.3	1.05	7.7	97.0	3.1
	3.8	3.3	7.7	500	18.3	12.2	0.67	0.51	20.1	35.6	500	11.4	0.94	8.2	90.0	3.5
40	1.9	0.8	1.8	395	17.0	10.6	0.62	0.62	19.1	27.3	395	12.2	1.07	8.5	99.0	3.3
	1.9	0.8	1.8	500	17.7	12.0	0.68	0.65	19.9	27.1	500	12.4	0.96	9.1	92.0	3.8
	2.8	1.6	3.6	395	17.2	10.7	0.62	0.57	19.2	30.0	395	12.7	1.08	9.0	100.0	3.4
	2.8	1.6	3.6	500	18.0	12.1	0.67	0.60	20.1	29.8	500	13.0	0.97	9.7	93.0	3.9
	3.8	2.9	6.6	395	17.4	10.8	0.62	0.54	19.3	32.0	395	13.0	1.09	9.3	101.0	3.5
	3.8	2.9	6.6	500	18.1	12.2	0.67	0.57	20.1	31.6	500	13.3	0.97	10.0	94.0	4.0
50	1.9	0.6	1.5	395	16.4	10.4	0.63	0.70	18.8	23.3	395	13.8	1.10	10.0	103.0	3.7
	1.9	0.6	1.5	500	17.1	11.8	0.69	0.73	19.6	23.3	500	14.1	0.99	10.7	95.0	4.2
	2.8	1.4	3.1	395	16.8	10.6	0.63	0.65	19.0	25.7	395	14.4	1.12	10.6	104.0	3.8
	2.8	1.4	3.1	500	17.5	12.0	0.69	0.68	19.8	25.6	500	14.7	1.00	11.3	96.0	4.3
	3.8	2.5	5.8	395	17.0	10.6	0.62	0.62	19.1	27.3	395	14.7	1.12	10.9	105.0	3.8
	3.8	2.5	5.8	500	17.7	12.0	0.68	0.65	19.9	27.1	500	15.1	1.00	11.7	97.0	4.4
60	1.9	0.6	1.3	395	15.7	10.2	0.65	0.78	18.4	20.0	395	15.4	1.14	11.5	106.0	3.9
	1.9	0.6	1.3	500	16.4	11.5	0.70	0.82	19.2	19.9	500	15.7	1.01	12.2	98.0	4.5
	2.8	1.2	2.8	395	16.2	10.4	0.64	0.73	18.7	22.1	395	16.0	1.15	12.1	108.0	4.1
	2.8	1.2	2.8	500	16.9	11.7	0.69	0.76	19.5	22.1	500	16.5	1.03	13.0	99.0	4.7
	3.8	2.3	5.3	395	16.4	10.4	0.63	0.70	18.8	23.3	395	16.5	1.16	12.5	109.0	4.1
	3.8	2.3	5.3	500	17.1	11.8	0.69	0.73	19.6	23.3	500	16.8	1.03	13.3	100.0	4.8
70	1.9	0.5	1.1	395	15.2	10.1	0.66	0.87	18.2	17.4	395	16.9	1.16	12.9	110.0	4.2
	1.9	0.5	1.1	500	15.8	11.4	0.72	0.91	18.9	17.3	500	17.4	1.04	13.8	101.0	4.9
	2.8	1.1	2.5	395	15.5	10.1	0.65	0.82	18.3	18.8	395	17.7	1.18	13.7	112.0	4.4
	2.8	1.1	2.5	500	16.1	11.4	0.71	0.85	19.0	18.9	500	18.2	1.05	14.6	102.0	5.1
	3.8	2.1	4.9	395	15.8	10.2	0.65	0.79	18.5	19.9	395	18.2	1.19	14.1	113.0	4.5
	3.8	2.1	4.9	500	16.4	11.5	0.70	0.82	19.2	19.9	500	18.6	1.06	15.0	103.0	5.1
80	1.9	0.4	1.0	395	14.3	9.8	0.69	0.97	17.6	14.7	395	18.4	1.19	14.3	114.0	4.5
	1.9	0.4	1.0	500	14.9	11.1	0.74	1.01	18.4	14.7	500	18.9	1.06	15.3	104.0	5.2
	2.8	1.0	2.4	395	14.7	9.8	0.67	0.91	17.8	16.1	395	19.2	1.21	15.1	116.0	4.6
	2.8	1.0	2.4	500	15.3	11.1	0.73	0.95	18.6	16.0	500	19.9	1.08	16.2	105.0	5.4
	3.8	2.0	4.6	395	14.9	9.9	0.66	0.88	17.9	16.9	395	19.7	1.21	15.6	117.0	4.8
	3.8	2.0	4.6	500	15.6	11.2	0.72	0.92	18.8	16.9	500	20.3	1.08	16.6	106.0	5.5
85	1.9	0.4	0.9	395	13.8	9.6	0.70	1.04	17.4	13.2	395	19.1	1.20	15.0	116.0	4.7
	1.9	0.4	0.9	500	14.4	10.9	0.76	1.07	18.1	13.4	500	19.7	1.07	16.0	105.0	5.4
	2.8	1.0	2.3	395	14.2	9.7	0.68	0.96	17.5	14.7	395	20.1	1.22	15.9	118.0	4.8
	2.8	1.0	2.3	500	14.8	11.0	0.74	1.01	18.3	14.6	500	20.6	1.09	16.9	107.0	5.5
	3.8	1.9	4.4	395	14.5	9.8	0.68	0.93	17.7	15.5	395	20.5	1.23	16.3	119.0	4.9
	3.8	1.9	4.4	500	15.1	11.1	0.74	0.97	18.4	15.5	500	21.1	1.09	17.4	108.0	5.7
90	1.9	0.4	0.9	395	13.3	9.5	0.71	1.08	17.0	12.3	395	19.9	1.22	15.7	117.0	4.8
	1.9	0.4	0.9	500	13.9	10.7	0.77	1.13	17.8	12.3	500	20.5	1.09	16.8	107.0	5.5
	2.8	1.0	2.2	395	13.7	9.5	0.69	1.02	17.2	13.4	395	20.8	1.23	16.6	120.0	4.9
	2.8	1.0	2.2	500	14.3	10.8	0.76	1.06	17.9	13.4	500	21.5	1.10	17.7	108.0	5.7
	3.8	1.9	4.3	395	14.1	9.6	0.68	0.98	17.5	14.3	395	21.3	1.24	17.1	121.0	5.0
	3.8	1.9	4.3	500	14.6	10.9	0.75	1.02	18.1	14.3	500	22.0	1.11	18.2	109.0	5.8
100	1.9	0.4	0.8	395	12.4	9.2	0.74	1.19	16.5	10.4	Operation not recommended					
	1.9	0.4	0.8	500	12.9	10.4	0.81	1.25	17.2	10.3						
	2.8	0.9	2.1	395	12.8	9.2	0.72	1.13	16.7	11.3						
	2.8	0.9	2.1	500	13.3	10.4	0.78	1.17	17.3	11.3						
	3.8	1.8	4.1	395	13.1	9.3	0.71	1.09	16.8	12.0						
	3.8	1.8	4.1	500	13.6	10.5	0.77	1.14	17.5	11.9						
110	1.9	0.3	0.7	395	11.3	8.8	0.78	1.31	15.8	8.6						
	1.9	0.3	0.7	500	11.8	10.0	0.85	1.37	16.5	8.6						
	2.8	0.8	1.9	395	11.8	8.9	0.75	1.24	16.0	9.5						
	2.8	0.8	1.9	500	12.2	10.0	0.82	1.30	16.6	9.4						
	3.8	1.7	3.9	395	12.1	9.0	0.74	1.21	16.2	10.0						
	3.8	1.7	3.9	500	12.6	10.2	0.81	1.26	16.9	10.0						
120	1.9	0.3	0.7	395	10.3	8.5	0.83	1.44	15.2	7.1						
	1.9	0.3	0.7	500	10.8	9.6	0.89	1.50	15.9	7.2						
	2.8	0.8	1.8	395	10.7	8.5	0.79	1.37	15.4	7.8						
	2.8	0.8	1.8	500	11.2	9.6	0.86	1.42	16.1	7.9						
	3.8	1.6	3.7	395	11.0	8.6	0.78	1.33	15.5	8.2						
	3.8	1.6	3.7	500	11.5	9.8	0.85	1.39	16.3	8.3						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 018 (PSC Blower)

600 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	4.5	7.2	16.7	Operation not recommended							450	11.2	1.25	7.2	93	2.61
	4.5	7.2	16.7								600	11.4	1.13	7.6	88	2.98
30	2.3	2.1	4.9	450	22.1	14.2	0.64	0.72	24.5	30.7	450	12.4	1.29	8.2	96	2.83
	2.3	2.1	4.9	600	23.0	16.1	0.70	0.75	25.5	30.8	600	12.7	1.16	8.8	90	3.22
	3.4	3.4	7.9	450	22.9	14.4	0.63	0.64	25.1	35.8	450	12.9	1.30	8.7	97	2.92
	3.4	3.4	7.9	600	23.9	16.3	0.68	0.67	26.1	35.8	600	13.3	1.17	9.3	90	3.33
	4.5	5.9	13.7	450	23.3	14.4	0.62	0.60	25.3	39.0	450	13.2	1.31	9.0	97	2.97
	4.5	5.9	13.7	600	24.3	16.3	0.67	0.62	26.4	39.0	600	13.5	1.17	9.6	91	3.38
40	2.3	1.7	3.9	450	21.1	13.9	0.66	0.82	23.9	25.6	450	14.3	1.33	9.9	99	3.15
	2.3	1.7	3.9	600	22.0	15.7	0.72	0.86	24.9	25.6	600	14.7	1.20	10.6	93	3.59
	3.4	2.9	6.7	450	21.9	14.2	0.65	0.75	24.4	29.3	450	15.0	1.35	10.5	101	3.26
	3.4	2.9	6.7	600	22.8	16.0	0.70	0.78	25.4	29.3	600	15.3	1.21	11.2	94	3.72
	4.5	5.1	11.8	450	22.5	14.5	0.64	0.71	24.9	31.9	450	15.3	1.35	10.8	102	3.32
	4.5	5.1	11.8	600	23.5	16.4	0.70	0.74	25.9	31.9	600	15.7	1.22	11.6	94	3.78
50	2.3	1.4	3.3	450	20.4	13.7	0.67	0.93	23.5	21.9	450	16.3	1.37	11.7	103	3.47
	2.3	1.4	3.3	600	21.2	15.5	0.73	0.97	24.5	22.0	600	16.6	1.23	12.5	96	3.96
	3.4	2.6	5.9	450	20.8	13.8	0.66	0.85	23.7	24.4	450	17.0	1.39	12.4	105	3.60
	3.4	2.6	5.9	600	21.7	15.6	0.72	0.89	24.7	24.4	600	17.4	1.25	13.2	97	4.10
	4.5	4.6	10.6	450	21.2	13.9	0.66	0.81	23.9	26.1	450	17.4	1.39	12.7	106	3.67
	4.5	4.6	10.6	600	22.1	15.8	0.72	0.85	24.9	26.1	600	17.9	1.25	13.6	98	4.18
60	2.3	1.3	2.9	450	19.3	13.2	0.68	1.04	22.8	18.6	450	18.2	1.41	13.4	107	3.79
	2.3	1.3	2.9	600	20.1	14.9	0.74	1.08	23.8	18.6	600	18.6	1.26	14.3	99	4.32
	3.4	2.3	5.3	450	19.8	13.4	0.68	0.96	23.0	20.6	450	19.1	1.42	14.2	109	3.93
	3.4	2.3	5.3	600	20.6	15.1	0.73	1.00	24.0	20.6	600	19.6	1.28	15.2	100	4.49
	4.5	4.2	9.6	450	20.1	13.5	0.67	0.92	23.3	21.9	450	19.6	1.43	14.7	110	4.01
	4.5	4.2	9.6	600	21.0	15.3	0.73	0.96	24.2	21.9	600	20.1	1.29	15.7	101	4.58
70	2.3	1.1	2.6	450	18.2	12.7	0.69	1.15	22.1	15.8	450	20.2	1.44	15.2	112	4.11
	2.3	1.1	2.6	600	19.0	14.3	0.76	1.20	23.1	15.8	600	20.7	1.29	16.2	102	4.68
	3.4	2.1	4.9	450	18.7	12.8	0.69	1.07	22.3	17.4	450	21.2	1.46	16.1	114	4.27
	3.4	2.1	4.9	600	19.4	14.5	0.75	1.12	23.2	17.4	600	21.7	1.31	17.2	103	4.86
	4.5	3.9	8.9	450	19.1	13.0	0.68	1.03	22.6	18.4	450	21.7	1.46	16.6	115	4.35
	4.5	3.9	8.9	600	19.8	14.7	0.74	1.08	23.5	18.4	600	22.3	1.32	17.8	104	4.96
80	2.3	1.0	2.3	450	17.0	12.1	0.71	1.28	21.4	13.3	450	22.1	1.47	17.0	116	4.41
	2.3	1.0	2.3	600	17.7	13.7	0.77	1.33	22.3	13.3	600	22.7	1.32	18.2	105	5.03
	3.4	2.0	4.5	450	17.5	12.3	0.70	1.20	21.6	14.7	450	23.3	1.49	18.0	118	4.59
	3.4	2.0	4.5	600	18.3	13.9	0.76	1.25	22.5	14.7	600	23.9	1.34	19.3	107	5.23
	4.5	3.6	8.3	450	17.9	12.5	0.69	1.15	21.9	15.5	450	23.9	1.50	18.6	119	4.68
	4.5	3.6	8.3	600	18.7	14.1	0.76	1.20	22.8	15.5	600	24.5	1.35	19.9	108	5.34
85	2.3	1.0	2.2	450	16.4	11.8	0.72	1.35	21.0	12.2	450	23.1	1.49	17.9	118	4.56
	2.3	1.0	2.2	600	17.1	13.3	0.78	1.40	21.9	12.2	600	23.7	1.33	19.1	107	5.20
	3.4	1.9	4.4	450	16.9	12.0	0.71	1.26	21.2	13.5	450	24.3	1.50	19.0	120	4.74
	3.4	1.9	4.4	600	17.6	13.5	0.77	1.31	22.1	13.5	600	24.9	1.35	20.3	108	5.41
	4.5	3.5	8.1	450	17.3	12.2	0.70	1.22	21.5	14.3	450	25.0	1.51	19.6	121	4.84
	4.5	3.5	8.1	600	18.0	13.8	0.76	1.27	22.4	14.3	600	25.6	1.36	20.9	110	5.51
90	2.3	0.9	2.1	450	15.8	11.5	0.73	1.42	20.6	11.1	450	24.1	1.50	18.8	120	4.71
	2.3	0.9	2.1	600	16.4	13.0	0.79	1.48	21.5	11.1	600	24.7	1.35	20.1	108	5.37
	3.4	1.8	4.2	450	16.3	11.7	0.71	1.33	20.8	12.3	450	25.4	1.52	20.0	122	4.89
	3.4	1.8	4.2	600	17.0	13.2	0.78	1.38	21.7	12.3	600	26.0	1.37	21.3	110	5.58
	4.5	3.4	7.9	450	16.7	11.9	0.71	1.28	21.1	13.0	450	26.1	1.53	20.6	124	4.99
	4.5	3.4	7.9	600	17.4	13.4	0.77	1.34	22.0	13.0	600	26.7	1.38	22.0	111	5.69
100	2.3	0.9	2.0	450	14.4	10.8	0.75	1.57	19.8	9.2	Operation not recommended					
	2.3	0.9	2.0	600	15.0	12.2	0.82	1.63	20.6	9.2						
	3.4	1.7	4.0	450	15.0	11.0	0.74	1.48	20.0	10.1						
	3.4	1.7	4.0	600	15.6	12.5	0.80	1.54	20.8	10.1						
	4.5	3.2	7.4	450	15.4	11.2	0.73	1.43	20.3	10.8						
	4.5	3.2	7.4	600	16.0	12.7	0.79	1.49	21.1	10.8						
110	2.3	0.8	1.8	450	12.9	10.1	0.78	1.74	18.8	7.4						
	2.3	0.8	1.8	600	13.4	11.4	0.85	1.81	19.6	7.4						
	3.4	1.6	3.8	450	13.5	10.3	0.76	1.64	19.1	8.2						
	3.4	1.6	3.8	600	14.0	11.6	0.83	1.71	19.9	8.2						
	4.5	3.1	7.1	450	13.9	10.5	0.75	1.59	19.4	8.8						
	4.5	3.1	7.1	600	14.5	11.9	0.82	1.65	20.2	8.8						
120	2.3	0.7	1.7	450	11.2	9.2	0.82	1.92	17.8	5.8						
	2.3	0.7	1.7	600	11.6	10.4	0.89	2.00	18.5	5.8						
	3.4	1.6	3.6	450	11.8	9.5	0.80	1.82	18.1	6.5						
	3.4	1.6	3.6	600	12.3	10.7	0.87	1.89	18.8	6.5						
	4.5	2.9	6.8	450	12.3	9.7	0.79	1.77	18.4	7.0						
	4.5	2.9	6.8	600	12.8	11.0	0.86	1.84	19.1	7.0						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 018 (ECM Blower)

600 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	4.5	7.2	16.7	Operation not recommended							450	11.3	1.20	7.2	92.0	2.8
	4.5	7.2	16.7								600	11.2	1.10	7.6	87.0	3.1
30	2.3	2.1	4.9	450	22.1	14.2	0.64	0.66	24.3	33.5	450	12.4	1.20	8.2	95.0	3.0
	2.3	2.1	4.9	600	23.0	16.1	0.70	0.69	25.4	33.4	600	12.5	1.10	8.8	89.0	3.3
	3.4	3.4	7.9	450	22.9	14.4	0.63	0.58	24.9	39.6	450	12.9	1.20	8.7	96.0	3.1
	3.4	3.4	7.9	600	23.9	16.3	0.68	0.61	26.0	39.2	600	13.1	1.10	9.3	90.0	3.5
	4.5	5.9	13.7	450	23.3	14.4	0.62	0.54	25.1	43.2	450	13.3	1.20	9.0	97.0	3.1
	4.5	5.9	13.7	600	24.3	16.3	0.67	0.56	26.2	43.5	600	13.4	1.10	9.6	90.0	3.5
40	2.3	1.7	3.9	450	21.1	13.9	0.66	0.76	23.7	27.8	450	14.2	1.30	9.9	99.0	3.3
	2.3	1.7	3.9	600	22.0	15.7	0.71	0.80	24.7	27.5	600	14.5	1.10	10.6	92.0	3.7
	3.4	2.9	6.7	450	21.9	14.2	0.65	0.69	24.3	31.8	450	14.9	1.30	10.5	100.0	3.4
	3.4	2.9	6.7	600	22.8	16.0	0.70	0.72	25.3	31.7	600	15.1	1.10	11.2	93.0	3.9
	4.5	5.1	11.8	450	22.5	14.5	0.64	0.65	24.7	34.7	450	15.2	1.30	10.8	101.0	3.5
	4.5	5.1	11.8	600	23.5	16.4	0.70	0.68	25.8	34.6	600	15.6	1.20	11.6	94.0	3.9
50	2.3	1.4	3.3	450	20.4	13.7	0.67	0.87	23.4	23.5	450	16.2	1.30	11.7	103.0	3.6
	2.3	1.4	3.3	600	21.2	15.5	0.73	0.91	24.3	23.3	600	16.5	1.20	12.5	95.0	4.1
	3.4	2.6	5.9	450	20.8	13.8	0.66	0.79	23.5	26.4	450	16.9	1.30	12.4	104.0	3.7
	3.4	2.6	5.9	600	21.7	15.6	0.72	0.83	24.5	26.2	600	17.3	1.20	13.2	96.0	4.3
	4.5	4.6	10.6	450	21.2	13.9	0.66	0.75	23.8	28.3	450	17.2	1.30	12.7	105.0	3.8
	4.5	4.6	10.6	600	22.1	15.8	0.71	0.79	24.8	28.0	600	17.7	1.20	13.6	97.0	4.4
60	2.3	1.3	2.9	450	19.3	13.2	0.68	0.98	22.6	19.7	450	18.0	1.30	13.4	106.0	3.9
	2.3	1.3	2.9	600	20.1	14.9	0.74	1.02	23.6	19.7	600	18.4	1.20	14.3	98.0	4.5
	3.4	2.3	5.3	450	19.8	13.4	0.68	0.90	22.9	22.0	450	18.8	1.40	14.2	108.0	4.1
	3.4	2.3	5.3	600	20.6	15.1	0.73	0.94	23.8	21.9	600	19.4	1.20	15.2	99.0	4.7
	4.5	4.2	9.6	450	20.1	13.5	0.67	0.86	23.0	23.4	450	19.4	1.40	14.7	109.0	4.1
	4.5	4.2	9.6	600	21.0	15.3	0.73	0.90	24.1	23.4	600	19.9	1.20	15.7	100.0	4.7
70	2.3	1.1	2.6	450	18.2	12.7	0.70	1.09	21.9	16.7	450	19.9	1.40	15.2	110.0	4.2
	2.3	1.1	2.6	600	19.0	14.3	0.75	1.14	22.9	16.7	600	20.4	1.20	16.2	101.0	4.9
	3.4	2.1	4.9	450	18.7	12.8	0.68	1.01	22.1	18.5	450	20.9	1.40	16.1	112.0	4.4
	3.4	2.1	4.9	600	19.4	14.5	0.75	1.06	23.0	18.3	600	21.5	1.20	17.2	102.0	5.0
	4.5	3.9	8.9	450	19.1	13.0	0.68	0.97	22.4	19.7	450	21.4	1.40	16.6	113.0	4.5
	4.5	3.9	8.9	600	19.8	14.7	0.74	1.02	23.3	19.4	600	22.1	1.30	17.8	103.0	5.1
80	2.3	1.0	2.3	450	17.0	12.1	0.71	1.22	21.2	13.9	450	21.8	1.40	17.0	114.0	4.5
	2.3	1.0	2.3	600	17.7	13.7	0.77	1.27	22.0	13.9	600	22.5	1.30	18.2	104.0	5.2
	3.4	2.0	4.5	450	17.5	12.3	0.70	1.14	21.4	15.4	450	22.9	1.40	18.0	116.0	4.7
	3.4	2.0	4.5	600	18.3	13.9	0.76	1.19	22.4	15.4	600	23.7	1.30	19.3	105.0	5.4
	4.5	3.6	8.3	450	17.9	12.5	0.70	1.09	21.6	16.4	450	23.5	1.40	18.6	117.0	4.8
	4.5	3.6	8.3	600	18.7	14.1	0.75	1.14	22.6	16.4	600	24.3	1.30	19.9	106.0	5.5
85	2.3	1.0	2.2	450	16.4	11.8	0.72	1.29	20.8	12.7	450	22.8	1.40	17.9	116.0	4.7
	2.3	1.0	2.2	600	17.1	13.3	0.78	1.34	21.7	12.8	600	23.4	1.30	19.1	105.0	5.4
	3.4	1.9	4.4	450	16.9	12.0	0.71	1.20	21.0	14.1	450	23.9	1.40	19.0	118.0	4.9
	3.4	1.9	4.4	600	17.6	13.5	0.77	1.25	21.9	14.1	600	24.7	1.30	20.3	107.0	5.6
	4.5	3.5	8.1	450	17.3	12.2	0.71	1.16	21.3	14.9	450	24.5	1.40	19.6	119.0	5.0
	4.5	3.5	8.1	600	18.0	13.8	0.77	1.21	22.1	14.9	600	25.3	1.30	20.9	108.0	5.7
90	2.3	0.9	2.1	450	15.8	11.5	0.73	1.36	20.4	11.6	450	23.7	1.40	18.8	117.0	4.8
	2.3	0.9	2.1	600	16.4	13.0	0.79	1.42	21.2	11.6	600	24.5	1.30	20.1	107.0	5.6
	3.4	1.8	4.2	450	16.3	11.7	0.72	1.27	20.6	12.8	450	25.0	1.50	20.0	120.0	5.0
	3.4	1.8	4.2	600	17.0	13.2	0.78	1.32	21.5	12.9	600	25.8	1.30	21.3	108.0	5.8
	4.5	3.4	7.9	450	16.7	11.9	0.71	1.22	20.9	13.7	450	25.6	1.50	20.6	121.0	5.1
	4.5	3.4	7.9	600	17.4	13.4	0.77	1.28	21.8	13.6	600	26.5	1.30	22.0	109.0	5.9
100	2.3	0.9	2.0	450	14.4	10.8	0.75	1.51	19.5	9.5	Operation not recommended					
	2.3	0.9	2.0	600	15.0	12.2	0.81	1.57	20.4	9.6						
	3.4	1.7	4.0	450	15.0	11.0	0.73	1.42	19.8	10.6						
	3.4	1.7	4.0	600	15.6	12.5	0.80	1.48	20.6	10.5						
	4.5	3.2	7.4	450	15.4	11.2	0.73	1.37	20.1	11.2						
	4.5	3.2	7.4	600	16.0	12.7	0.79	1.43	20.9	11.2						
110	2.3	0.8	1.8	450	12.9	10.1	0.78	1.68	18.6	7.7						
	2.3	0.8	1.8	600	13.4	11.4	0.85	1.75	19.4	7.7						
	3.4	1.6	3.8	450	13.5	10.3	0.76	1.58	18.9	8.5						
	3.4	1.6	3.8	600	14.0	11.6	0.83	1.65	19.6	8.5						
	4.5	3.1	7.1	450	13.9	10.5	0.76	1.53	19.1	9.1						
	4.5	3.1	7.1	600	14.5	11.9	0.82	1.59	19.9	9.1						
120	2.3	0.7	1.7	450	11.2	9.2	0.82	1.86	17.5	6.0						
	2.3	0.7	1.7	600	11.6	10.4	0.90	1.94	18.2	6.0						
	3.4	1.6	3.6	450	11.8	9.5	0.81	1.76	17.8	6.7						
	3.4	1.6	3.6	600	12.3	10.7	0.87	1.83	18.5	6.7						
	4.5	2.9	6.8	450	12.3	9.7	0.79	1.71	18.1	7.2						
	4.5	2.9	6.8	600	12.8	11.0	0.86	1.78	18.9	7.2						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 024 (PSC Blower)

850 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	6.0	8.5	19.6	Operation not recommended							640	15.5	1.91	9.5	92	2.39
	6.0	8.5	19.6								850	15.9	1.71	10.1	87	2.72
30	3.0	2.2	5.2	640	27.7	17.4	0.63	1.12	31.5	24.8	640	17.2	1.93	11.0	95	2.61
	3.0	2.2	5.2	850	28.9	19.7	0.68	1.16	32.8	24.8	850	17.6	1.74	11.8	89	2.98
	4.5	4.0	9.3	640	28.2	17.5	0.62	1.05	31.8	26.9	640	18.0	1.95	11.7	96	2.70
	4.5	4.0	9.3	850	29.4	19.8	0.67	1.09	33.1	26.9	850	18.4	1.75	12.5	90	3.08
	6.0	7.2	16.7	640	28.5	17.5	0.62	1.02	31.9	28.0	640	18.4	1.95	12.1	97	2.76
	6.0	7.2	16.7	850	29.6	19.8	0.67	1.06	33.2	28.0	850	18.8	1.76	12.9	91	3.14
40	3.0	1.9	4.4	640	26.9	17.1	0.64	1.23	31.1	21.9	640	19.9	1.98	13.4	99	2.94
	3.0	1.9	4.4	850	28.0	19.4	0.69	1.28	32.4	21.9	850	20.4	1.78	14.4	92	3.36
	4.5	3.6	8.2	640	27.5	17.3	0.63	1.15	31.4	24.0	640	20.8	2.00	14.3	100	3.06
	4.5	3.6	8.2	850	28.7	19.6	0.68	1.19	32.7	24.0	850	21.3	1.79	15.3	93	3.49
	6.0	6.4	14.9	640	27.8	17.4	0.63	1.11	31.5	25.1	640	21.3	2.01	14.7	101	3.12
	6.0	6.4	14.9	850	28.9	19.7	0.68	1.16	32.8	25.1	850	21.9	1.80	15.7	94	3.55
50	3.0	1.7	3.9	640	26.2	16.9	0.65	1.36	30.8	19.3	640	22.6	2.03	15.9	103	3.27
	3.0	1.7	3.9	850	27.3	19.1	0.70	1.42	32.1	19.3	850	23.2	1.82	17.0	95	3.72
	4.5	3.2	7.4	640	26.7	17.0	0.64	1.26	31.0	21.1	640	23.7	2.05	16.9	104	3.39
	4.5	3.2	7.4	850	27.8	19.3	0.69	1.32	32.2	21.1	850	24.3	1.84	18.0	96	3.87
	6.0	5.9	13.6	640	27.0	17.1	0.64	1.22	31.1	22.1	640	24.3	2.06	17.4	105	3.46
	6.0	5.9	13.6	850	28.1	19.4	0.69	1.27	32.4	22.1	850	24.9	1.85	18.6	97	3.94
60	3.0	1.5	3.5	640	25.3	16.6	0.66	1.52	30.4	16.7	640	25.3	2.08	18.3	107	3.57
	3.0	1.5	3.5	850	26.3	18.8	0.71	1.58	31.7	16.7	850	25.9	1.87	19.6	98	4.07
	4.5	3.0	6.9	640	25.7	16.7	0.65	1.40	30.5	18.3	640	26.6	2.10	19.4	108	3.70
	4.5	3.0	6.9	850	26.8	18.9	0.70	1.46	31.7	18.3	850	27.2	1.89	20.7	100	4.22
	6.0	5.5	12.6	640	26.1	16.8	0.64	1.35	30.6	19.3	640	27.2	2.12	20.0	109	3.77
	6.0	5.5	12.6	850	27.1	19.0	0.70	1.41	31.9	19.3	850	27.9	1.90	21.4	100	4.30
70	3.0	1.4	3.2	640	24.1	16.2	0.67	1.70	29.9	14.2	640	27.9	2.13	20.7	110	3.84
	3.0	1.4	3.2	850	25.1	18.3	0.73	1.77	31.1	14.2	850	28.6	1.91	22.1	101	4.38
	4.5	2.8	6.4	640	24.6	16.3	0.66	1.57	30.0	15.7	640	29.2	2.16	21.8	112	3.97
	4.5	2.8	6.4	850	25.6	18.4	0.72	1.63	31.2	15.7	850	29.9	1.94	23.3	103	4.53
	6.0	5.2	11.9	640	25.0	16.4	0.66	1.51	30.1	16.6	640	29.9	2.17	22.5	113	4.04
	6.0	5.2	11.9	850	26.0	18.6	0.71	1.57	31.4	16.6	850	30.6	1.95	24.0	103	4.60
80	3.0	1.3	3.0	640	22.9	15.7	0.69	1.91	29.4	12.0	640	30.4	2.18	22.9	114	4.08
	3.0	1.3	3.0	850	23.8	17.8	0.75	1.99	30.6	12.0	850	31.1	1.96	24.4	104	4.65
	4.5	2.6	6.1	640	23.4	15.8	0.67	1.76	29.4	13.3	640	31.7	2.21	24.0	116	4.20
	4.5	2.6	6.1	850	24.4	17.9	0.73	1.84	30.7	13.3	850	32.5	1.99	25.7	105	4.79
	6.0	4.9	11.3	640	23.8	16.0	0.67	1.70	29.6	14.1	640	32.4	2.23	24.6	117	4.26
	6.0	4.9	11.3	850	24.8	18.1	0.73	1.77	30.8	14.1	850	33.1	2.00	26.3	106	4.85
85	3.0	1.3	2.9	640	22.2	15.5	0.70	2.03	29.2	11.0	640	31.5	2.21	23.8	116	4.18
	3.0	1.3	2.9	850	23.1	17.5	0.76	2.12	30.4	11.0	850	32.3	1.98	25.5	105	4.77
	4.5	2.6	5.9	640	22.8	15.6	0.68	1.88	29.2	12.2	640	32.7	2.24	25.0	117	4.29
	4.5	2.6	5.9	850	23.7	17.6	0.74	1.95	30.4	12.2	850	33.5	2.01	26.7	107	4.89
	6.0	4.8	11.0	640	23.2	15.7	0.68	1.80	29.3	12.9	640	33.4	2.25	25.5	118	4.34
	6.0	4.8	11.0	850	24.1	17.8	0.74	1.88	30.5	12.9	850	34.2	2.02	27.2	107	4.95
90	3.0	1.2	2.8	640	21.6	15.3	0.71	2.16	28.9	10.0	640	32.6	2.23	24.8	117	4.28
	3.0	1.2	2.8	850	22.4	17.3	0.77	2.25	30.1	10.0	850	33.4	2.01	26.5	106	4.88
	4.5	2.5	5.8	640	22.2	15.4	0.69	1.99	29.0	11.1	640	33.8	2.26	25.9	119	4.38
	4.5	2.5	5.8	850	23.1	17.4	0.75	2.07	30.1	11.1	850	34.6	2.03	27.6	108	4.99
	6.0	4.7	10.7	640	22.5	15.4	0.69	1.91	29.0	11.8	640	34.4	2.28	26.4	120	4.42
	6.0	4.7	10.7	850	23.4	17.5	0.75	1.99	30.2	11.8	850	35.2	2.05	28.2	108	5.04
100	3.0	1.2	2.7	640	20.2	14.8	0.74	2.44	28.5	8.3	Operation not recommended					
	3.0	1.2	2.7	850	21.0	16.8	0.80	2.54	29.7	8.3						
	4.5	2.4	5.5	640	20.8	14.9	0.72	2.25	28.5	9.2						
	4.5	2.4	5.5	850	21.6	16.9	0.78	2.34	29.7	9.2						
	6.0	4.5	10.3	640	21.1	15.0	0.71	2.16	28.5	9.8						
	6.0	4.5	10.3	850	22.0	17.0	0.77	2.25	29.7	9.8						
110	3.0	1.1	2.5	640	18.8	14.4	0.77	2.77	28.3	6.8						
	3.0	1.1	2.5	850	19.5	16.3	0.84	2.88	29.4	6.8						
	4.5	2.3	5.3	640	19.3	14.4	0.75	2.55	28.1	7.6						
	4.5	2.3	5.3	850	20.1	16.3	0.81	2.66	29.2	7.6						
	6.0	4.3	9.9	640	19.7	14.5	0.74	2.45	28.1	8.0						
	6.0	4.3	9.9	850	20.5	16.4	0.80	2.55	29.3	8.0						
120	3.0	1.0	2.4	640	17.1	13.9	0.81	3.13	27.9	5.5						
	3.0	1.0	2.4	850	17.8	15.7	0.88	3.26	29.0	5.5						
	4.5	2.2	5.1	640	17.8	14.0	0.78	2.89	27.8	6.2						
	4.5	2.2	5.1	850	18.6	15.8	0.85	3.01	28.9	6.2						
	6.0	4.2	9.6	640	18.3	14.1	0.77	2.78	27.9	6.6						
	6.0	4.2	9.6	850	19.1	16.0	0.84	2.89	29.0	6.6						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 024 (ECM Blower)

800 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	6.0	8.5	19.6	Operation not recommended							640	15.9	1.87	9.5	92.0	2.5
	6.0	8.5	19.6								800	15.8	1.67	10.1	87.0	2.8
30	3.0	2.2	5.2	640	27.7	17.4	0.63	1.08	31.4	25.6	640	17.5	1.89	11.0	95.0	2.7
	3.0	2.2	5.2	800	28.9	19.7	0.68	1.12	32.7	25.8	800	17.6	1.70	11.8	89.0	3.0
	4.5	4.0	9.3	640	28.2	17.5	0.62	1.01	31.7	27.9	640	18.2	1.91	11.7	96.0	2.8
	4.5	4.0	9.3	800	29.4	19.8	0.67	1.05	33.0	28.0	800	18.3	1.71	12.5	90.0	3.1
	6.0	7.2	16.7	640	28.5	17.5	0.61	0.98	31.8	29.0	640	18.6	1.91	12.1	97.0	2.9
	6.0	7.2	16.7	800	29.6	19.8	0.67	1.02	33.1	29.0	800	18.8	1.72	12.9	90.0	3.2
40	3.0	1.9	4.4	640	26.9	17.1	0.64	1.19	31.0	22.6	640	20.0	1.94	13.4	99.0	3.0
	3.0	1.9	4.4	800	28.0	19.4	0.69	1.24	32.2	22.6	800	20.3	1.74	14.4	92.0	3.4
	4.5	3.6	8.2	640	27.5	17.3	0.63	1.11	31.3	24.7	640	21.0	1.96	14.3	100.0	3.1
	4.5	3.6	8.2	800	28.7	19.6	0.68	1.15	32.6	24.9	800	21.3	1.75	15.3	93.0	3.6
	6.0	6.4	14.9	640	27.8	17.4	0.63	1.07	31.5	25.9	640	21.4	1.97	14.7	101.0	3.2
	6.0	6.4	14.9	800	28.9	19.7	0.68	1.12	32.7	25.8	800	21.7	1.76	15.7	94.0	3.6
50	3.0	1.7	3.9	640	26.2	16.9	0.65	1.32	30.7	19.8	640	22.7	1.99	15.9	103.0	3.3
	3.0	1.7	3.9	800	27.3	19.1	0.70	1.38	32.0	19.8	800	23.1	1.78	17.0	95.0	3.8
	4.5	3.2	7.4	640	26.7	17.0	0.64	1.22	30.9	21.9	640	23.8	2.01	16.9	104.0	3.5
	4.5	3.2	7.4	800	27.8	19.3	0.69	1.28	32.2	21.7	800	24.1	1.80	18.0	96.0	3.9
	6.0	5.9	13.6	640	27.0	17.1	0.63	1.18	31.0	22.9	640	24.3	2.02	17.4	105.0	3.5
	6.0	5.9	13.6	800	28.1	19.4	0.69	1.23	32.3	22.8	800	24.8	1.81	18.6	97.0	4.0
60	3.0	1.5	3.5	640	25.3	16.6	0.66	1.48	30.4	17.1	640	25.3	2.04	18.3	106.0	3.6
	3.0	1.5	3.5	800	26.3	18.8	0.71	1.54	31.6	17.1	800	25.8	1.83	19.6	98.0	4.1
	4.5	3.0	6.9	640	25.7	16.7	0.65	1.36	30.3	18.9	640	26.4	2.06	19.4	108.0	3.8
	4.5	3.0	6.9	800	26.8	18.9	0.71	1.42	31.6	18.9	800	27.0	1.85	20.7	99.0	4.3
	6.0	5.5	12.6	640	26.1	16.8	0.64	1.31	30.6	19.9	640	27.1	2.08	20.0	109.0	3.8
	6.0	5.5	12.6	800	27.1	19.0	0.70	1.37	31.8	19.8	800	27.8	1.86	21.4	100.0	4.4
70	3.0	1.4	3.2	640	24.1	16.2	0.67	1.66	29.8	14.5	640	27.8	2.09	20.7	110.0	3.9
	3.0	1.4	3.2	800	25.1	18.3	0.73	1.73	31.0	14.5	800	28.5	1.87	22.1	101.0	4.5
	4.5	2.8	6.4	640	24.6	16.3	0.66	1.53	29.8	16.1	640	29.0	2.12	21.8	112.0	4.0
	4.5	2.8	6.4	800	25.6	18.4	0.72	1.59	31.0	16.1	800	29.8	1.90	23.3	102.0	4.6
	6.0	5.2	11.9	640	25.0	16.4	0.66	1.47	30.0	17.0	640	29.8	2.13	22.5	113.0	4.1
	6.0	5.2	11.9	800	26.0	18.6	0.72	1.53	31.2	17.0	800	30.5	1.91	24.0	103.0	4.7
80	3.0	1.3	3.0	640	22.9	15.7	0.69	1.87	29.3	12.2	640	30.2	2.14	22.9	114.0	4.1
	3.0	1.3	3.0	800	23.8	17.8	0.75	1.95	30.5	12.2	800	31.0	1.92	24.4	104.0	4.7
	4.5	2.6	6.1	640	23.4	15.8	0.68	1.72	29.3	13.6	640	31.4	2.17	24.0	116.0	4.2
	4.5	2.6	6.1	800	24.4	17.9	0.73	1.80	30.5	13.5	800	32.4	1.95	25.7	105.0	4.9
	6.0	4.9	11.3	640	23.8	16.0	0.67	1.66	29.5	14.3	640	32.1	2.19	24.6	117.0	4.3
	6.0	4.9	11.3	800	24.8	18.1	0.73	1.73	30.7	14.3	800	33.0	1.96	26.3	106.0	4.9
85	3.0	1.3	2.9	640	22.2	15.5	0.70	1.99	29.0	11.1	640	31.2	2.17	23.8	116.0	4.2
	3.0	1.3	2.9	800	23.1	17.5	0.76	2.08	30.2	11.1	800	32.1	1.94	25.5	105.0	4.8
	4.5	2.6	5.9	640	22.8	15.6	0.68	1.84	29.1	12.4	640	32.5	2.20	25.0	118.0	4.3
	4.5	2.6	5.9	800	23.7	17.6	0.74	1.91	30.2	12.4	800	33.4	1.97	26.7	107.0	5.0
	6.0	4.8	11.0	640	23.2	15.7	0.68	1.76	29.2	13.2	640	33.0	2.21	25.5	119.0	4.4
	6.0	4.8	11.0	800	24.1	17.8	0.74	1.84	30.4	13.1	800	34.0	1.98	27.2	108.0	5.0
90	3.0	1.2	2.8	640	21.6	15.3	0.71	2.12	28.8	10.2	640	32.3	2.19	24.8	117.0	4.3
	3.0	1.2	2.8	800	22.4	17.3	0.77	2.21	29.9	10.1	800	33.2	1.97	26.5	107.0	4.9
	4.5	2.5	5.8	640	22.2	15.4	0.69	1.95	28.9	11.4	640	33.5	2.22	25.9	120.0	4.4
	4.5	2.5	5.8	800	23.1	17.4	0.75	2.03	30.0	11.4	800	34.4	1.99	27.6	108.0	5.1
	6.0	4.7	10.7	640	22.5	15.4	0.68	1.87	28.9	12.0	640	34.0	2.24	26.4	121.0	4.5
	6.0	4.7	10.7	800	23.4	17.5	0.75	1.95	30.1	12.0	800	35.1	2.01	28.2	109.0	5.1
100	3.0	1.2	2.7	640	20.2	14.8	0.73	2.40	28.4	8.4	Operation not recommended					
	3.0	1.2	2.7	800	21.0	16.8	0.80	2.50	29.5	8.4						
	4.5	2.4	5.5	640	20.8	14.9	0.72	2.21	28.3	9.4						
	4.5	2.4	5.5	800	21.6	16.9	0.78	2.30	29.5	9.4						
	6.0	4.5	10.3	640	21.1	15.0	0.71	2.12	28.3	9.9						
	6.0	4.5	10.3	800	22.0	17.0	0.77	2.21	29.5	9.9						
110	3.0	1.1	2.5	640	18.8	14.4	0.77	2.73	28.1	6.9						
	3.0	1.1	2.5	800	19.5	16.3	0.84	2.84	29.2	6.9						
	4.5	2.3	5.3	640	19.3	14.4	0.75	2.51	27.9	7.7						
	4.5	2.3	5.3	800	20.1	16.3	0.81	2.62	29.0	7.7						
	6.0	4.3	9.9	640	19.7	14.5	0.74	2.41	27.9	8.2						
	6.0	4.3	9.9	800	20.5	16.4	0.80	2.51	29.1	8.2						
120	3.0	1.0	2.4	640	17.1	13.9	0.81	3.09	27.6	5.5						
	3.0	1.0	2.4	800	17.8	15.7	0.88	3.22	28.8	5.5						
	4.5	2.2	5.1	640	17.8	14.0	0.79	2.85	27.5	6.2						
	4.5	2.2	5.1	800	18.6	15.8	0.85	2.97	28.7	6.3						
	6.0	4.2	9.6	640	18.3	14.1	0.77	2.74	27.7	6.7						
	6.0	4.2	9.6	800	19.1	16.0	0.84	2.85	28.8	6.7						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 030 (PSC Blower)

1,000 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	7.5	5.0	11.6	Operation not recommended							750	20.0	2.31	12.6	95	2.53
	7.5	5.0	11.6								1000	20.4	2.08	13.4	89	2.89
30	3.8	1.3	2.9	750	33.3	20.3	0.61	1.38	38.0	24.0	750	21.6	2.37	14.0	97	2.67
	3.8	1.3	2.9	1000	34.7	22.9	0.66	1.44	39.5	24.0	1000	22.1	2.13	14.9	90	3.04
	5.6	2.3	5.4	750	33.5	20.2	0.60	1.31	37.9	25.7	750	22.5	2.40	14.7	98	2.75
	5.6	2.3	5.4	1000	34.9	22.8	0.65	1.36	39.5	25.7	1000	23.0	2.15	15.7	91	3.13
	7.5	4.2	9.7	750	33.6	20.0	0.60	1.27	37.9	26.5	750	22.9	2.41	15.1	98	2.79
	7.5	4.2	9.7	1000	35.0	22.7	0.65	1.32	39.4	26.5	1000	23.5	2.16	16.2	92	3.18
40	3.8	1.0	2.4	750	32.6	20.2	0.62	1.51	37.7	21.6	750	24.7	2.45	16.7	100	2.95
	3.8	1.0	2.4	1000	34.0	22.8	0.67	1.57	39.3	21.6	1000	25.3	2.20	17.8	93	3.36
	5.6	2.0	4.7	750	33.1	20.3	0.61	1.42	37.9	23.3	750	25.7	2.48	17.6	102	3.04
	5.6	2.0	4.7	1000	34.5	22.9	0.67	1.48	39.5	23.3	1000	26.4	2.23	18.8	94	3.47
	7.5	3.7	8.6	750	33.7	20.5	0.61	1.38	38.3	24.4	750	26.3	2.49	18.1	102	3.10
	7.5	3.7	8.6	1000	35.1	23.2	0.66	1.44	39.9	24.4	1000	26.9	2.24	19.4	95	3.53
50	3.8	0.9	2.1	750	31.6	19.9	0.63	1.65	37.2	19.2	750	27.8	2.52	19.5	104	3.24
	3.8	0.9	2.1	1000	32.9	22.5	0.68	1.72	38.8	19.2	1000	28.5	2.26	20.8	96	3.69
	5.6	1.8	4.2	750	32.3	20.1	0.62	1.55	37.6	20.9	750	29.1	2.55	20.6	106	3.35
	5.6	1.8	4.2	1000	33.7	22.8	0.68	1.61	39.1	20.9	1000	29.8	2.29	22.0	98	3.82
	7.5	3.4	7.8	750	32.6	20.2	0.62	1.50	37.7	21.7	750	29.8	2.56	21.3	107	3.41
	7.5	3.4	7.8	1000	34.0	22.9	0.67	1.57	39.3	21.7	1000	30.5	2.30	22.7	98	3.89
60	3.8	0.8	1.8	750	30.4	19.4	0.64	1.81	36.6	16.8	750	31.0	2.58	22.4	108	3.52
	3.8	0.8	1.8	1000	31.7	21.9	0.69	1.89	38.1	16.8	1000	31.8	2.32	23.9	99	4.02
	5.6	1.7	3.8	750	31.1	19.6	0.63	1.70	36.9	18.3	750	32.5	2.61	23.7	110	3.65
	5.6	1.7	3.8	1000	32.4	22.2	0.69	1.77	38.4	18.3	1000	33.3	2.34	25.3	101	4.16
	7.5	3.1	7.2	750	31.4	19.7	0.63	1.65	37.0	19.0	750	33.3	2.63	24.4	111	3.71
	7.5	3.1	7.2	1000	32.7	22.3	0.68	1.71	38.5	19.1	1000	34.1	2.36	26.0	102	4.24
70	3.8	0.7	1.6	750	29.0	18.8	0.65	2.00	35.8	14.5	750	34.2	2.64	25.2	112	3.79
	3.8	0.7	1.6	1000	30.2	21.2	0.70	2.08	37.3	14.5	1000	35.1	2.37	26.9	102	4.33
	5.6	1.5	3.6	750	30.0	19.2	0.64	1.87	36.3	16.0	750	35.8	2.68	26.7	114	3.92
	5.6	1.5	3.6	1000	31.2	21.7	0.70	1.95	37.8	16.0	1000	36.7	2.40	28.5	104	4.47
	7.5	2.9	6.7	750	30.4	19.4	0.64	1.81	36.6	16.8	750	36.7	2.70	27.4	115	3.99
	7.5	2.9	6.7	1000	31.7	21.9	0.69	1.89	38.1	16.8	1000	37.6	2.42	29.3	105	4.55
80	3.8	0.7	1.5	750	27.7	18.3	0.66	2.21	35.3	12.5	750	37.3	2.71	28.0	116	4.04
	3.8	0.7	1.5	1000	28.8	20.7	0.72	2.30	36.7	12.5	1000	38.2	2.43	29.9	105	4.60
	5.6	1.4	3.3	750	28.5	18.5	0.65	2.07	35.5	13.7	750	39.0	2.75	29.5	118	4.15
	5.6	1.4	3.3	1000	29.6	21.0	0.71	2.16	37.0	13.7	1000	40.0	2.47	31.5	107	4.74
	7.5	2.7	6.3	750	29.0	18.7	0.65	2.00	35.8	14.5	750	40.2	2.78	30.6	120	4.24
	7.5	2.7	6.3	1000	30.2	21.2	0.70	2.08	37.3	14.5	1000	41.2	2.50	32.6	108	4.84
85	3.8	0.6	1.4	750	26.7	17.8	0.67	2.34	34.7	11.5	750	38.8	2.75	29.3	118	4.14
	3.8	0.6	1.4	1000	27.8	20.1	0.72	2.43	36.1	11.5	1000	39.8	2.5	31.3	107	4.72
	5.6	1.4	3.2	750	27.6	18.2	0.66	2.18	35.1	12.7	750	40.5	2.8	30.8	120	4.24
	5.6	1.4	3.2	1000	28.8	20.6	0.71	2.27	36.5	12.7	1000	41.5	2.5	32.9	108	4.84
	7.5	2.7	6.2	750	28.2	18.4	0.65	2.11	35.4	13.4	750	41.6	2.8	31.7	121	4.30
	7.5	2.7	6.2	1000	29.3	20.8	0.71	2.20	36.8	13.4	1000	42.6	2.5	33.9	109	4.91
90	3.8	0.6	1.4	750	25.7	17.3	0.67	2.46	34.1	10.5	750	40.3	2.79	30.6	120	4.23
	3.8	0.6	1.4	1000	26.8	19.6	0.73	2.56	35.5	10.5	1000	41.3	2.51	32.7	108	4.83
	5.6	1.4	3.1	750	26.8	17.8	0.66	2.30	34.7	11.7	750	42.0	2.85	32.1	122	4.33
	5.6	1.4	3.1	1000	27.9	20.1	0.72	2.39	36.1	11.7	1000	43.0	2.56	34.3	110	4.93
	7.5	2.6	6.0	750	27.3	18.0	0.66	2.22	34.9	12.3	750	42.9	2.88	32.9	123	4.36
	7.5	2.6	6.0	1000	28.5	20.4	0.72	2.31	36.4	12.3	1000	44.0	2.59	35.1	111	4.98
100	3.8	0.6	1.3	750	24.0	16.6	0.69	2.74	33.3	8.7	Operation not recommended					
	3.8	0.6	1.3	1000	24.9	18.8	0.75	2.85	34.7	8.7						
	5.6	1.3	3.0	750	25.1	17.0	0.68	2.56	33.8	9.8						
	5.6	1.3	3.0	1000	26.1	19.3	0.74	2.67	35.2	9.8						
	7.5	2.5	5.7	750	25.6	17.3	0.67	2.48	34.1	10.3						
	7.5	2.5	5.7	1000	26.7	19.6	0.73	2.58	35.5	10.3						
110	3.8	0.5	1.2	750	22.5	16.1	0.72	3.07	33.0	7.4						
	3.8	0.5	1.2	1000	23.5	18.2	0.78	3.19	34.4	7.4						
	5.6	1.2	2.8	750	23.2	16.3	0.70	2.86	33.1	8.1						
	5.6	1.2	2.8	1000	24.2	18.4	0.76	2.98	34.4	8.1						
	7.5	2.4	5.5	750	23.8	16.5	0.69	2.77	33.3	8.6						
	7.5	2.4	5.5	1000	24.8	18.7	0.75	2.88	34.6	8.6						
120	3.8	0.5	1.1	750	20.4	15.2	0.74	3.44	32.2	5.9						
	3.8	0.5	1.1	1000	21.2	17.2	0.81	3.58	33.5	5.9						
	5.6	1.2	2.7	750	21.4	15.6	0.73	3.21	32.4	6.7						
	5.6	1.2	2.7	1000	22.3	17.6	0.79	3.34	33.8	6.7						
	7.5	2.3	5.3	750	22.0	15.8	0.72	3.10	32.6	7.1						
	7.5	2.3	5.3	1000	22.9	17.8	0.78	3.23	33.9	7.1						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 030 (ECM Blower)

1000 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	7.5	5.0	11.6	Operation not recommended							750	20.3	2.25	12.6	92.0	2.6
	7.5	5.0	11.6								1000	20.3	2.02	13.4	87.0	2.9
30	3.8	1.3	2.9	750	33.3	20.3	0.61	1.32	37.8	25.2	750	21.9	2.31	14.0	95.0	2.8
	3.8	1.3	2.9	1000	34.7	22.9	0.66	1.38	39.4	25.1	1000	22.0	2.07	14.9	89.0	3.1
	5.6	2.3	5.4	750	33.5	20.2	0.60	1.25	37.8	26.8	750	22.7	2.34	14.7	96.0	2.8
	5.6	2.3	5.4	1000	34.9	22.8	0.65	1.30	39.3	26.8	1000	22.8	2.09	15.7	90.0	3.2
	7.5	4.2	9.7	750	33.6	20.0	0.60	1.21	37.7	27.7	750	23.1	2.35	15.1	97.0	2.9
	7.5	4.2	9.7	1000	35.0	22.7	0.65	1.26	39.3	27.7	1000	23.4	2.10	16.2	90.0	3.3
40	3.8	1.0	2.4	750	32.6	20.2	0.62	1.45	37.6	22.5	750	24.9	2.39	16.7	99.0	3.0
	3.8	1.0	2.4	1000	34.0	22.8	0.67	1.51	39.2	22.5	1000	25.1	2.14	17.8	92.0	3.4
	5.6	2.0	4.7	750	33.1	20.3	0.61	1.36	37.7	24.3	750	25.9	2.42	17.6	100.0	3.1
	5.6	2.0	4.7	1000	34.5	22.9	0.66	1.42	39.4	24.3	1000	26.2	2.17	18.8	93.0	3.5
	7.5	3.7	8.6	750	33.7	20.5	0.61	1.32	38.2	25.5	750	26.4	2.43	18.1	101.0	3.2
	7.5	3.7	8.6	1000	35.1	23.2	0.66	1.38	39.8	25.4	1000	26.8	2.18	19.4	94.0	3.6
50	3.8	0.9	2.1	750	31.6	19.9	0.63	1.59	37.0	19.9	750	27.9	2.46	19.5	103.0	3.3
	3.8	0.9	2.1	1000	32.9	22.5	0.68	1.66	38.6	19.8	1000	28.3	2.20	20.8	95.0	3.8
	5.6	1.8	4.2	750	32.3	20.1	0.62	1.49	37.4	21.7	750	29.1	2.49	20.6	104.0	3.4
	5.6	1.8	4.2	1000	33.7	22.8	0.68	1.55	39.0	21.7	1000	29.6	2.23	22.0	96.0	3.9
	7.5	3.4	7.8	750	32.6	20.2	0.62	1.44	37.5	22.6	750	29.8	2.50	21.3	105.0	3.5
	7.5	3.4	7.8	1000	34.0	22.9	0.67	1.51	39.2	22.5	1000	30.3	2.24	22.7	97.0	4.0
60	3.8	0.8	1.8	750	30.4	19.4	0.64	1.75	36.4	17.4	750	31.0	2.52	22.4	106.0	3.6
	3.8	0.8	1.8	1000	31.7	21.9	0.69	1.83	37.9	17.3	1000	31.6	2.26	23.9	98.0	4.1
	5.6	1.7	3.8	750	31.1	19.6	0.63	1.64	36.7	18.9	750	32.4	2.55	23.7	108.0	3.7
	5.6	1.7	3.8	1000	32.4	22.2	0.69	1.71	38.2	18.9	1000	33.1	2.28	25.3	99.0	4.2
	7.5	3.1	7.2	750	31.4	19.7	0.63	1.59	36.8	19.7	750	33.2	2.57	24.4	109.0	3.8
	7.5	3.1	7.2	1000	32.7	22.3	0.68	1.65	38.3	19.8	1000	33.9	2.30	26.0	100.0	4.3
70	3.8	0.7	1.6	750	29.0	18.8	0.65	1.94	35.6	14.9	750	34.0	2.58	25.2	110.0	3.9
	3.8	0.7	1.6	1000	30.2	21.2	0.70	2.02	37.1	14.9	1000	34.8	2.31	26.9	101.0	4.4
	5.6	1.5	3.6	750	30.0	19.2	0.64	1.81	36.2	16.6	750	35.6	2.62	26.7	112.0	4.0
	5.6	1.5	3.6	1000	31.2	21.7	0.70	1.89	37.7	16.5	1000	36.5	2.34	28.5	102.0	4.6
	7.5	2.9	6.7	750	30.4	19.4	0.64	1.75	36.4	17.4	750	36.4	2.64	27.4	113.0	4.0
	7.5	2.9	6.7	1000	31.7	21.9	0.69	1.83	37.9	17.3	1000	37.4	2.36	29.3	103.0	4.6
80	3.8	0.7	1.5	750	27.7	18.3	0.66	2.15	35.0	12.9	750	37.0	2.65	28.0	114.0	4.1
	3.8	0.7	1.5	1000	28.8	20.7	0.72	2.24	36.4	12.8	1000	38.0	2.37	29.9	104.0	4.7
	5.6	1.4	3.3	750	28.5	18.5	0.65	2.01	35.4	14.2	750	38.7	2.69	29.5	116.0	4.2
	5.6	1.4	3.3	1000	29.6	21.0	0.71	2.10	36.8	14.1	1000	39.7	2.41	31.5	105.0	4.8
	7.5	2.7	6.3	750	29.0	18.7	0.64	1.94	35.6	14.9	750	39.9	2.72	30.6	117.0	4.3
	7.5	2.7	6.3	1000	30.2	21.2	0.70	2.02	37.1	14.9	1000	40.9	2.44	32.6	106.0	4.9
85	3.8	0.6	1.4	750	26.7	17.8	0.67	2.28	34.5	11.7	750	38.5	2.69	29.3	116.0	4.2
	3.8	0.6	1.4	1000	27.8	20.1	0.72	2.37	35.9	11.7	1000	39.6	2.44	31.3	105.0	4.8
	5.6	1.4	3.2	750	27.6	18.2	0.66	2.12	34.8	13.0	750	40.2	2.74	30.8	118.0	4.3
	5.6	1.4	3.2	1000	28.8	20.6	0.72	2.21	36.3	13.0	1000	41.2	2.44	32.9	107.0	4.9
	7.5	2.7	6.2	750	28.2	18.4	0.65	2.05	35.2	13.7	750	41.1	2.74	31.7	119.0	4.4
	7.5	2.7	6.2	1000	29.3	20.8	0.71	2.14	36.6	13.7	1000	42.2	2.44	33.9	108.0	5.1
90	3.8	0.6	1.4	750	25.7	17.3	0.67	2.40	33.9	10.7	750	39.9	2.73	30.6	117.0	4.3
	3.8	0.6	1.4	1000	26.8	19.6	0.73	2.50	35.3	10.7	1000	41.1	2.45	32.7	107.0	4.9
	5.6	1.4	3.1	750	26.8	17.8	0.66	2.24	34.4	12.0	750	41.6	2.79	32.1	120.0	4.4
	5.6	1.4	3.1	1000	27.9	20.1	0.72	2.33	35.9	12.0	1000	42.8	2.50	34.3	108.0	5.0
	7.5	2.6	6.0	750	27.3	18.0	0.66	2.16	34.7	12.6	750	42.5	2.82	32.9	121.0	4.4
	7.5	2.6	6.0	1000	28.5	20.4	0.72	2.25	36.2	12.7	1000	43.7	2.53	35.1	109.0	5.1
100	3.8	0.6	1.3	750	24.0	16.6	0.69	2.68	33.1	8.9	Operation not recommended					
	3.8	0.6	1.3	1000	24.9	18.8	0.76	2.79	34.4	8.9						
	5.6	1.3	3.0	750	25.1	17.0	0.68	2.50	33.6	10.0						
	5.6	1.3	3.0	1000	26.1	19.3	0.74	2.61	35.0	10.0						
	7.5	2.5	5.7	750	25.6	17.3	0.68	2.42	33.9	10.6						
	7.5	2.5	5.7	1000	26.7	19.6	0.73	2.52	35.3	10.6						
110	3.8	0.5	1.2	750	22.5	16.1	0.72	3.01	32.8	7.5						
	3.8	0.5	1.2	1000	23.5	18.2	0.77	3.13	34.2	7.5						
	5.6	1.2	2.8	750	23.2	16.3	0.70	2.80	32.8	8.3						
	5.6	1.2	2.8	1000	24.2	18.4	0.76	2.92	34.2	8.3						
	7.5	2.4	5.5	750	23.8	16.5	0.69	2.71	33.1	8.8						
	7.5	2.4	5.5	1000	24.8	18.7	0.75	2.82	34.4	8.8						
120	3.8	0.5	1.1	750	20.4	15.2	0.75	3.38	31.9	6.0						
	3.8	0.5	1.1	1000	21.2	17.2	0.81	3.52	33.2	6.0						
	5.6	1.2	2.7	750	21.4	15.6	0.73	3.15	32.2	6.8						
	5.6	1.2	2.7	1000	22.3	17.6	0.79	3.28	33.5	6.8						
	7.5	2.3	5.3	750	22.0	15.8	0.72	3.04	32.4	7.2						
	7.5	2.3	5.3	1000	22.9	17.8	0.78	3.17	33.7	7.2						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 036 (PSC Blower)

1,200 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	9.0	6.4	14.8	Operation not recommended							860	22.6	2.67	14.1	94	2.49
	9.0	6.4	14.8								1150	23.2	2.39	15.1	89	2.84
30	4.5	1.8	4.3	860	39.9	24.2	0.61	1.67	45.6	23.8	860	25.6	2.80	16.6	98	2.68
	4.5	1.8	4.3	1150	41.5	27.4	0.66	1.74	47.4	23.8	1150	26.2	2.51	17.7	91	3.06
	6.8	3.1	7.1	860	40.1	24.3	0.61	1.62	45.5	24.7	860	26.8	2.85	17.6	99	2.76
	6.8	3.1	7.1	1150	41.7	27.5	0.66	1.69	47.4	24.7	1150	27.5	2.56	18.8	92	3.15
	9.0	5.4	12.5	860	40.0	24.3	0.61	1.60	45.5	25.0	860	27.5	2.88	18.2	100	2.80
	9.0	5.4	12.5	1150	41.7	27.5	0.66	1.67	47.3	25.0	1150	28.2	2.59	19.4	93	3.19
40	4.5	1.6	3.6	860	39.2	24.0	0.61	1.80	45.3	21.8	860	30.1	2.98	20.3	102	2.95
	4.5	1.6	3.6	1150	40.8	27.2	0.67	1.87	47.1	21.8	1150	30.8	2.68	21.7	95	3.37
	6.8	2.7	6.2	860	39.7	24.2	0.61	1.71	45.5	23.3	860	31.6	3.05	21.6	104	3.04
	6.8	2.7	6.2	1150	41.4	27.4	0.66	1.78	47.4	23.3	1150	32.4	2.74	23.1	96	3.47
	9.0	4.8	11.1	860	39.9	24.3	0.61	1.67	45.6	23.9	860	32.4	3.08	22.3	105	3.09
	9.0	4.8	11.1	1150	41.6	27.4	0.66	1.74	47.4	23.9	1150	33.2	2.77	23.8	97	3.52
50	4.5	1.4	3.2	860	38.0	23.6	0.62	1.98	44.7	19.2	860	34.5	3.16	24.1	107	3.20
	4.5	1.4	3.2	1150	39.5	26.7	0.68	2.06	46.5	19.2	1150	35.4	2.84	25.7	98	3.65
	6.8	2.4	5.6	860	38.8	23.9	0.62	1.85	45.1	21.0	860	36.3	3.23	25.6	109	3.30
	6.8	2.4	5.6	1150	40.4	27.0	0.67	1.92	47.0	21.0	1150	37.2	2.90	27.3	100	3.76
	9.0	4.4	10.1	860	39.2	24.0	0.61	1.79	45.3	21.9	860	37.3	3.27	26.4	110	3.35
	9.0	4.4	10.1	1150	40.8	27.2	0.67	1.87	47.2	21.9	1150	38.2	2.93	28.2	101	3.82
60	4.5	1.3	2.9	860	36.1	22.9	0.63	2.20	43.6	16.4	860	38.9	3.32	27.8	112	3.43
	4.5	1.3	2.9	1150	37.6	25.9	0.69	2.29	45.4	16.4	1150	39.8	2.99	29.7	102	3.91
	6.8	2.3	5.2	860	37.5	23.5	0.63	2.04	44.4	18.4	860	40.9	3.40	29.5	114	3.53
	6.8	2.3	5.2	1150	39.1	26.5	0.68	2.13	46.3	18.4	1150	41.9	3.05	31.5	104	4.02
	9.0	4.0	9.3	860	38.0	23.6	0.62	1.97	44.7	19.3	860	42.0	3.44	30.4	115	3.58
	9.0	4.0	9.3	1150	39.6	26.7	0.68	2.05	46.5	19.3	1150	43.0	3.09	32.5	105	4.08
70	4.5	1.2	2.7	860	34.6	22.5	0.65	2.46	42.9	14.0	860	43.1	3.47	31.4	116	3.64
	4.5	1.2	2.7	1150	36.0	25.5	0.71	2.56	44.7	14.0	1150	44.1	3.12	33.5	106	4.15
	6.8	2.1	4.9	860	35.8	22.9	0.64	2.28	43.6	15.7	860	45.2	3.55	33.2	119	3.74
	6.8	2.1	4.9	1150	37.3	25.9	0.70	2.38	45.4	15.7	1150	46.3	3.19	35.4	107	4.26
	9.0	3.8	8.7	860	36.4	23.1	0.63	2.20	43.9	16.6	860	46.4	3.59	34.2	120	3.79
	9.0	3.8	8.7	1150	37.9	26.1	0.69	2.29	45.7	16.6	1150	47.5	3.22	36.5	108	4.32
80	4.5	1.1	2.5	860	32.5	21.8	0.67	2.76	41.9	11.8	860	47.0	3.61	34.8	121	3.82
	4.5	1.1	2.5	1150	33.8	24.7	0.73	2.88	43.7	11.8	1150	48.2	3.24	37.1	109	4.36
	6.8	2.0	4.6	860	33.9	22.3	0.66	2.56	42.6	13.2	860	49.2	3.68	36.6	123	3.92
	6.8	2.0	4.6	1150	35.3	25.2	0.72	2.67	44.4	13.2	1150	50.4	3.30	39.1	111	4.47
	9.0	3.6	8.3	860	34.5	22.5	0.65	2.47	42.9	14.0	860	50.3	3.71	37.6	124	3.97
	9.0	3.6	8.3	1150	35.9	25.5	0.71	2.57	44.7	14.0	1150	51.5	3.34	40.1	111	4.53
85	4.5	1.0	2.4	860	31.5	21.5	0.68	2.9	41.5	10.8	860	48.8	3.67	36.3	123	3.90
	4.5	1.0	2.4	1150	32.8	24.4	0.74	3.05	43.3	10.8	1150	50.0	3.29	38.8	110	4.45
	6.8	1.9	4.4	860	32.8	21.9	0.67	2.72	42.1	12.1	860	50.9	3.73	38.1	125	4.00
	6.8	1.9	4.4	1150	34.1	24.8	0.73	2.84	43.8	12.1	1150	52.2	3.35	40.7	112	4.56
	9.0	3.5	8.1	860	33.4	22.1	0.66	2.62	42.3	12.8	860	52.0	3.76	39.0	126	4.05
	9.0	3.5	8.1	1150	34.7	25.0	0.72	2.73	44.1	12.8	1150	53.2	3.38	41.7	113	4.62
90	4.5	1.0	2.3	860	30.5	21.2	0.70	3.10	41.1	9.8	860	50.6	3.72	37.9	125	3.99
	4.5	1.0	2.3	1150	31.8	24.0	0.76	3.23	42.8	9.8	1150	51.9	3.34	40.4	112	4.54
	6.8	1.9	4.3	860	31.7	21.6	0.68	2.88	41.6	11.0	860	52.7	3.79	39.6	127	4.08
	6.8	1.9	4.3	1150	33.0	24.4	0.74	3.00	43.3	11.0	1150	54.0	3.40	42.3	113	4.65
	9.0	3.4	7.9	860	32.2	21.7	0.67	2.78	41.7	11.6	860	53.7	3.82	40.5	128	4.12
	9.0	3.4	7.9	1150	33.5	24.5	0.73	2.89	43.4	11.6	1150	55.0	3.43	43.2	114	4.70
100	4.5	0.9	2.2	860	28.3	20.5	0.72	3.47	40.2	8.1	Operation not recommended					
	4.5	0.9	2.2	1150	29.5	23.1	0.79	3.62	41.9	8.2						
	6.8	1.8	4.1	860	29.5	20.8	0.71	3.24	40.6	9.1						
	6.8	1.8	4.1	1150	30.7	23.5	0.77	3.37	42.2	9.1						
	9.0	3.3	7.5	860	30.1	21.0	0.70	3.13	40.8	9.6						
	9.0	3.3	7.5	1150	31.3	23.7	0.76	3.25	42.5	9.6						
110	4.5	0.9	2.1	860	26.2	19.8	0.75	3.88	39.5	6.8						
	4.5	0.9	2.1	1150	27.3	22.4	0.82	4.04	41.1	6.8						
	6.8	1.7	4.0	860	27.2	20.0	0.73	3.63	39.7	7.5						
	6.8	1.7	4.0	1150	28.4	22.6	0.80	3.78	41.3	7.5						
	9.0	3.1	7.2	860	27.6	20.0	0.72	3.51	39.6	7.9						
	9.0	3.1	7.2	1150	28.8	22.7	0.79	3.65	41.3	7.9						
120	4.5	0.9	2.0	860	24.1	19.0	0.79	4.31	38.9	5.6						
	4.5	0.9	2.0	1150	25.1	21.4	0.86	4.49	40.4	5.6						
	6.8	1.6	3.8	860	25.1	19.2	0.77	4.05	39.0	6.2						
	6.8	1.6	3.8	1150	26.1	21.8	0.83	4.21	40.6	6.2						
	9.0	3.0	7.0	860	25.4	19.2	0.76	3.92	38.9	6.5						
	9.0	3.0	7.0	1150	26.5	21.8	0.82	4.08	40.5	6.5						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

1125 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	9.0	6.4	14.8	Operation not recommended							860	23.1	2.63	14.1	92.0	2.6
	9.0	6.4	14.8								1125	23.1	2.35	15.1	87.0	2.9
30	4.5	1.8	4.3	860	39.9	24.2	0.61	1.63	45.5	24.4	860	26.0	2.76	16.6	95.0	2.8
	4.5	1.8	4.3	1125	41.5	27.4	0.66	1.70	47.3	24.4	1125	26.1	2.47	17.7	89.0	3.1
	6.8	3.1	7.1	860	40.1	24.3	0.61	1.58	45.5	25.3	860	27.2	2.81	17.6	96.0	2.8
	6.8	3.1	7.1	1125	41.7	27.5	0.66	1.65	47.3	25.2	1125	27.4	2.52	18.8	90.0	3.2
	9.0	5.4	12.5	860	40.0	24.3	0.61	1.56	45.3	25.6	860	27.9	2.84	18.2	97.0	2.9
	9.0	5.4	12.5	1125	41.7	27.5	0.66	1.63	47.3	25.5	1125	28.1	2.55	19.4	90.0	3.2
40	4.5	1.6	3.6	860	39.2	24.0	0.61	1.76	45.2	22.2	860	30.3	2.94	20.3	99.0	3.0
	4.5	1.6	3.6	1125	40.8	27.2	0.67	1.83	47.1	22.3	1125	30.7	2.64	21.7	92.0	3.4
	6.8	2.7	6.2	860	39.7	24.2	0.61	1.67	45.4	23.7	860	31.9	3.01	21.6	100.0	3.1
	6.8	2.7	6.2	1125	41.4	27.4	0.66	1.74	47.3	23.8	1125	32.3	2.70	23.1	93.0	3.5
	9.0	4.8	11.1	860	39.9	24.3	0.61	1.63	45.5	24.4	860	32.7	3.04	22.3	101.0	3.1
	9.0	4.8	11.1	1125	41.6	27.4	0.66	1.70	47.4	24.4	1125	33.1	2.73	23.8	94.0	3.6
50	4.5	1.4	3.2	860	38.0	23.6	0.62	1.94	44.6	19.6	860	34.8	3.12	24.1	103.0	3.3
	4.5	1.4	3.2	1125	39.5	26.7	0.68	2.02	46.4	19.5	1125	35.3	2.80	25.7	95.0	3.7
	6.8	2.4	5.6	860	38.8	23.9	0.62	1.81	45.0	21.4	860	36.5	3.19	25.6	104.0	3.4
	6.8	2.4	5.6	1125	40.4	27.0	0.67	1.88	46.8	21.5	1125	37.1	2.86	27.3	96.0	3.8
	9.0	4.4	10.1	860	39.2	24.0	0.61	1.75	45.2	22.4	860	37.4	3.23	26.4	105.0	3.4
	9.0	4.4	10.1	1125	40.8	27.2	0.67	1.83	47.1	22.3	1125	38.1	2.89	28.2	97.0	3.9
60	4.5	1.3	2.9	860	36.1	22.9	0.63	2.16	43.5	16.7	860	39.0	3.28	27.8	106.0	3.5
	4.5	1.3	2.9	1125	37.6	25.9	0.69	2.25	45.3	16.7	1125	39.8	2.95	29.7	98.0	3.9
	6.8	2.3	5.2	860	37.5	23.5	0.63	2.00	44.3	18.7	860	41.0	3.36	29.5	108.0	3.6
	6.8	2.3	5.2	1125	39.1	26.5	0.68	2.09	46.2	18.7	1125	41.8	3.01	31.5	99.0	4.1
	9.0	4.0	9.3	860	38.0	23.6	0.62	1.93	44.6	19.7	860	42.0	3.40	30.4	109.0	3.6
	9.0	4.0	9.3	1125	39.6	26.7	0.67	2.01	46.5	19.7	1125	42.9	3.05	32.5	100.0	4.1
70	4.5	1.2	2.7	860	34.6	22.5	0.65	2.42	42.9	14.3	860	43.1	3.43	31.4	110.0	3.7
	4.5	1.2	2.7	1125	36.0	25.5	0.71	2.52	44.6	14.3	1125	44.0	3.08	33.5	101.0	4.2
	6.8	2.1	4.9	860	35.8	22.9	0.64	2.24	43.5	16.0	860	45.2	3.51	33.2	112.0	3.8
	6.8	2.1	4.9	1125	37.3	25.9	0.69	2.34	45.3	15.9	1125	46.2	3.15	35.4	102.0	4.3
	9.0	3.8	8.7	860	36.4	23.1	0.63	2.16	43.8	16.8	860	46.3	3.55	34.2	113.0	3.8
	9.0	3.8	8.7	1125	37.9	26.1	0.69	2.25	45.6	16.8	1125	47.4	3.18	36.5	103.0	4.4
80	4.5	1.1	2.5	860	32.5	21.8	0.67	2.72	41.8	11.9	860	47.0	3.57	34.8	114.0	3.9
	4.5	1.1	2.5	1125	33.8	24.7	0.73	2.84	43.5	11.9	1125	48.0	3.20	37.1	104.0	4.4
	6.8	2.0	4.6	860	33.9	22.3	0.66	2.52	42.5	13.4	860	49.0	3.64	36.6	116.0	3.9
	6.8	2.0	4.6	1125	35.3	25.2	0.71	2.63	44.3	13.4	1125	50.2	3.26	39.1	105.0	4.5
	9.0	3.6	8.3	860	34.5	22.5	0.65	2.43	42.8	14.2	860	50.1	3.67	37.6	117.0	4.0
	9.0	3.6	8.3	1125	35.9	25.5	0.71	2.53	44.5	14.2	1125	51.4	3.30	40.1	106.0	4.6
85	4.5	1.0	2.4	860	31.5	21.5	0.68	2.86	41.3	11.0	860	48.7	3.63	36.3	116.0	3.9
	4.5	1.0	2.4	1125	32.8	24.4	0.74	3.01	43.1	10.9	1125	49.9	3.25	38.8	105.0	4.5
	6.8	1.9	4.4	860	32.8	21.9	0.67	2.68	42.0	12.2	860	50.7	3.69	38.1	118.0	4.0
	6.8	1.9	4.4	1125	34.1	24.8	0.73	2.80	43.7	12.2	1125	52.0	3.31	40.7	107.0	4.6
	9.0	3.5	8.1	860	33.4	22.1	0.66	2.58	42.2	12.9	860	51.7	3.72	39.0	119.0	4.1
	9.0	3.5	8.1	1125	34.7	25.0	0.72	2.69	43.9	12.9	1125	53.1	3.34	41.7	108.0	4.7
90	4.5	1.0	2.3	860	30.5	21.2	0.70	3.06	40.9	10.0	860	50.5	3.68	37.9	117.0	4.0
	4.5	1.0	2.3	1125	31.8	24.0	0.75	3.19	42.7	10.0	1125	51.7	3.30	40.4	107.0	4.6
	6.8	1.9	4.3	860	31.7	21.6	0.68	2.84	41.4	11.2	860	52.4	3.75	39.6	120.0	4.1
	6.8	1.9	4.3	1125	33.0	24.4	0.74	2.96	43.1	11.1	1125	53.8	3.36	42.3	108.0	4.7
	9.0	3.4	7.9	860	32.2	21.7	0.67	2.74	41.6	11.7	860	53.4	3.78	40.5	121.0	4.1
	9.0	3.4	7.9	1125	33.5	24.5	0.73	2.85	43.2	11.7	1125	54.8	3.39	43.2	109.0	4.7
100	4.5	0.9	2.2	860	28.3	20.5	0.72	3.43	40.0	8.2	Operation not recommended					
	4.5	0.9	2.2	1125	29.5	23.1	0.78	3.58	41.7	8.2						
	6.8	1.8	4.1	860	29.5	20.8	0.71	3.20	40.4	9.2						
	6.8	1.8	4.1	1125	30.7	23.5	0.77	3.33	42.1	9.2						
	9.0	3.3	7.5	860	30.1	21.0	0.70	3.09	40.7	9.7						
	9.0	3.3	7.5	1125	31.3	23.7	0.76	3.21	42.3	9.7						
110	4.5	0.9	2.1	860	26.2	19.8	0.76	3.84	39.3	6.8						
	4.5	0.9	2.1	1125	27.3	22.4	0.82	4.00	41.0	6.8						
	6.8	1.7	4.0	860	27.2	20.0	0.74	3.59	39.5	7.6						
	6.8	1.7	4.0	1125	28.4	22.6	0.80	3.74	41.2	7.6						
	9.0	3.1	7.2	860	27.6	20.0	0.72	3.47	39.4	7.9						
	9.0	3.1	7.2	1125	28.8	22.7	0.79	3.61	41.1	8.0						
120	4.5	0.9	2.0	860	24.1	19.0	0.79	4.27	38.7	5.6						
	4.5	0.9	2.0	1125	25.1	21.4	0.85	4.45	40.3	5.6						
	6.8	1.6	3.8	860	25.1	19.2	0.76	4.01	38.8	6.3						
	6.8	1.6	3.8	1125	26.1	21.8	0.84	4.17	40.3	6.3						
	9.0	3.0	7.0	860	25.4	19.2	0.76	3.88	38.6	6.5						
	9.0	3.0	7.0	1125	26.5	21.8	0.82	4.04	40.3	6.6						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
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All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
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1125 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	10.0	8.8	20.3	Operation not recommended						845	26.6	3.17	16.5	99.1	2.5
	10.0	8.8	20.3							1125	27.2	2.85	17.6	92.4	2.8
30	5.0	2.2	5.0	845	45.0	25.2	1.64	50.5	27.4	845	28.8	3.23	18.4	101.6	2.6
	5.0	2.2	5.0	1125	46.8	28.5	1.71	52.6	27.4	1125	29.5	2.90	19.7	94.3	3.0
	7.5	4.6	10.7	845	45.8	25.3	1.51	50.8	30.4	845	29.9	3.26	19.4	102.8	2.7
	7.5	4.6	10.7	1125	47.6	28.6	1.57	52.9	30.4	1125	30.7	2.93	20.7	95.2	3.1
	10.0	7.7	17.9	845	46.1	25.3	1.44	50.9	32.1	845	30.5	3.28	20.0	103.5	2.7
	10.0	7.7	17.9	1125	48.0	28.6	1.50	53.0	32.1	1125	31.3	2.94	21.3	95.7	3.1
40	5.0	1.9	4.3	845	43.8	24.9	1.81	50.0	24.2	845	32.4	3.33	21.6	105.6	2.9
	5.0	1.9	4.3	1125	45.6	28.1	1.89	52.0	24.2	1125	33.2	2.99	23.1	97.4	3.3
	7.5	4.0	9.3	845	44.3	25.0	1.75	50.2	25.3	845	33.8	3.37	22.8	107.0	2.9
	7.5	4.0	9.3	1125	46.1	28.3	1.82	52.3	25.3	1125	34.6	3.02	24.3	98.5	3.4
	10.0	6.9	19.9	845	44.6	25.1	1.70	50.4	26.2	845	34.5	3.39	23.4	107.8	3.0
	10.0	6.9	19.9	1125	46.5	28.4	1.77	52.4	26.2	1125	35.3	3.04	25.0	99.1	3.4
50	5.0	1.6	3.6	845	42.4	24.4	1.99	49.2	21.3	845	36.1	3.43	24.8	109.6	3.1
	5.0	1.6	3.6	1125	44.2	27.6	2.07	51.2	21.3	1125	37.0	3.08	26.5	100.4	3.5
	7.5	3.5	8.0	845	43.5	24.8	1.86	49.8	23.4	845	37.6	3.47	26.2	111.2	3.2
	7.5	3.5	8.0	1125	45.3	28.0	1.93	51.8	23.4	1125	38.5	3.12	27.9	101.7	3.6
	10.0	6.1	14.2	845	44.0	24.9	1.79	50.1	24.6	845	38.4	3.50	26.9	112.1	3.2
	10.0	6.1	14.2	1125	45.8	28.2	1.86	52.1	24.6	1125	39.4	3.14	28.7	102.4	3.7
60	5.0	1.3	3.0	845	40.9	23.8	2.18	48.3	18.8	845	39.7	3.53	28.0	113.5	3.3
	5.0	1.3	3.0	1125	42.6	27.0	2.27	50.3	18.8	1125	40.7	3.17	29.9	103.5	3.8
	7.5	3.0	7.0	845	42.1	24.3	2.04	49.0	20.6	845	41.5	3.58	29.5	115.4	3.4
	7.5	3.0	7.0	1125	43.8	27.4	2.12	51.0	20.6	1125	42.5	3.22	31.5	104.9	3.9
	10.0	5.5	12.8	845	42.6	24.5	1.97	49.3	21.7	845	42.4	3.61	30.3	116.4	3.4
	10.0	5.5	12.8	1125	44.4	27.7	2.05	51.3	21.7	1125	43.4	3.24	32.4	105.7	3.9
70	5.0	1.1	2.6	845	39.2	23.2	2.39	47.3	16.4	845	43.4	3.64	31.2	117.5	3.5
	5.0	1.1	2.6	1125	40.8	26.2	2.49	49.3	16.4	1125	44.4	3.27	33.3	106.6	4.0
	7.5	2.6	6.1	845	40.5	23.6	2.23	48.1	18.1	845	45.3	3.69	32.8	119.6	3.6
	7.5	2.6	6.1	1125	42.1	26.8	2.33	50.0	18.1	1125	46.4	3.32	35.1	108.2	4.1
	10.0	5.1	11.7	845	41.1	23.9	2.16	48.4	19.0	845	46.3	3.73	33.7	120.7	3.6
	10.0	5.1	11.7	1125	42.8	27.0	2.25	50.4	19.0	1125	47.4	3.35	36.0	109.0	4.2
80	5.0	0.9	2.2	845	37.4	22.5	2.63	46.4	14.2	845	47.0	3.75	34.3	121.5	3.7
	5.0	0.9	2.2	1125	38.9	25.4	2.74	48.3	14.2	1125	48.1	3.37	36.7	109.6	4.2
	7.5	2.3	5.4	845	38.7	23.0	2.46	47.1	15.8	845	49.1	3.81	36.1	123.8	3.8
	7.5	2.3	5.4	1125	40.3	26.0	2.56	49.0	15.8	1125	50.3	3.43	38.6	111.4	4.3
	10.0	4.7	11.0	845	39.4	23.2	2.37	47.4	16.6	845	50.2	3.85	37.1	125.0	3.8
	10.0	4.7	11.0	1125	41.0	26.3	2.47	49.4	16.6	1125	51.4	3.46	39.6	112.3	4.4
85	5.0	0.9	2.0	845	36.4	22.1	2.8	45.9	13.2	845	48.8	3.81	35.9	123.5	3.8
	5.0	0.9	2.0	1125	37.9	25.0	2.88	47.8	13.2	1125	50.0	3.4	38.3	111.1	4.3
	7.5	2.2	5.1	845	37.8	22.6	2.58	46.6	14.7	845	51.0	3.9	37.8	125.9	3.9
	7.5	2.2	5.1	1125	39.3	25.6	2.69	48.5	14.7	1125	52.2	3.5	40.3	113.0	4.4
	10.0	4.6	10.7	845	38.4	22.9	2.49	46.9	15.5	845	52.1	3.9	38.8	127.1	3.9
	10.0	4.6	10.7	1125	40.0	25.9	2.60	48.9	15.5	1125	53.4	3.5	41.4	114.0	4.4
90	5.0	0.8	1.9	845	35.5	21.8	2.91	45.4	12.2	845	50.6	3.86	37.4	125.5	3.8
	5.0	0.8	1.9	1125	36.9	24.6	3.03	47.3	12.2	1125	51.8	3.47	40.0	112.7	4.4
	7.5	2.1	4.4	845	36.8	22.3	2.71	46.1	13.6	845	52.9	3.94	39.4	127.9	3.9
	7.5	2.1	4.4	1125	38.3	25.2	2.82	48.0	13.6	1125	54.1	3.54	42.0	114.6	4.5
	10.0	4.6	10.6	845	37.5	22.5	2.62	46.4	14.3	845	54.1	3.99	40.4	129.3	4.0
	10.0	4.6	10.6	1125	39.0	25.5	2.72	48.3	14.3	1125	55.4	3.58	43.2	115.6	4.5
100	5.0	0.7	1.7	845	31.4	20.4	3.61	43.7	8.7	Operation not recommended					
	5.0	0.7	1.7	1125	32.7	23.0	3.76	45.5	8.7						
	7.5	2.0	4.5	845	32.8	20.8	3.35	44.2	9.8						
	7.5	2.0	4.5	1125	34.1	23.6	3.49	46.1	9.8						
	10.0	4.5	10.5	845	33.5	21.1	3.23	44.5	10.4						
	10.0	4.5	10.5	1125	34.9	23.8	3.36	46.4	10.4						
110	5.0	0.7	1.5	845	29.3	19.7	4.05	43.2	7.2						
	5.0	0.7	1.5	1125	30.5	22.3	4.22	44.9	7.2						
	7.5	1.9	4.4	845	30.7	20.1	3.75	43.5	8.2						
	7.5	1.9	4.4	1125	31.9	22.8	3.91	45.3	8.2						
	10.0	4.6	10.7	845	31.4	20.4	3.61	43.7	8.7						
	10.0	4.6	10.7	1125	32.7	23.0	3.76	45.5	8.7						
120	5.0	0.7	1.5	845	27.6	19.2	4.45	42.9	6.2						
	5.0	0.7	1.5	1125	28.7	21.7	4.63	44.6	6.2						
	7.5	1.9	4.4	845	29.0	19.6	4.11	43.1	7.1						
	7.5	1.9	4.4	1125	30.2	22.2	4.28	44.9	7.1						
	10.0	4.8	11.2	845	29.7	19.8	3.95	43.3	7.5						
	10.0	4.8	11.2	1125	30.9	22.4	4.12	45.0	7.5						

Operation not recommended

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 042 (PSC Blower)

1350 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	10.5	9.2	21.3	Operation not recommended							1050	28.8	3.37	18.1	95	2.51
	10.5	9.2	21.3								1400	29.5	3.03	19.3	90	2.86
30	5.3	2.3	5.3	1050	47.4	30.6	0.65	1.87	53.7	25.4	1050	31.6	3.45	20.5	98	2.68
	5.3	2.3	5.3	1400	49.3	34.7	0.70	1.95	55.9	25.4	1400	32.4	3.10	21.9	91	3.06
	7.9	4.3	10.0	1050	48.4	31.1	0.64	1.76	54.4	27.5	1050	32.9	3.49	21.6	99	2.76
	7.9	4.3	10.0	1400	50.4	35.2	0.70	1.83	56.6	27.5	1400	33.7	3.14	23.1	92	3.15
	10.5	7.9	18.2	1050	48.9	31.3	0.64	1.71	54.7	28.6	1050	33.6	3.52	22.3	100	2.80
	10.5	7.9	18.2	1400	50.9	35.5	0.70	1.78	57.0	28.6	1400	34.5	3.16	23.8	93	3.20
40	5.3	2.0	4.6	1050	45.9	29.9	0.65	2.05	52.8	22.4	1050	36.1	3.59	24.4	102	2.95
	5.3	2.0	4.6	1400	47.8	33.9	0.71	2.13	55.0	22.4	1400	37.0	3.23	26.1	94	3.36
	7.9	3.9	8.9	1050	47.0	30.4	0.65	1.92	53.4	24.5	1050	37.8	3.64	25.8	103	3.04
	7.9	3.9	8.9	1400	48.9	34.4	0.70	2.00	55.6	24.5	1400	38.7	3.27	27.6	96	3.46
	10.5	7.1	16.4	1050	47.5	30.7	0.65	1.86	53.8	25.5	1050	38.7	3.67	26.6	104	3.09
	10.5	7.1	16.4	1400	49.4	34.7	0.70	1.94	56.0	25.5	1400	39.6	3.30	28.4	96	3.52
50	5.3	1.8	4.1	1050	44.4	29.2	0.66	2.26	52.0	19.6	1050	40.8	3.74	28.5	106	3.20
	5.3	1.8	4.1	1400	46.2	33.1	0.72	2.35	54.2	19.6	1400	41.8	3.36	30.4	98	3.65
	7.9	3.5	8.1	1050	45.4	29.7	0.65	2.11	52.6	21.5	1050	42.8	3.80	30.2	108	3.30
	7.9	3.5	8.1	1400	47.3	33.6	0.71	2.20	54.8	21.5	1400	43.8	3.41	32.2	99	3.76
	10.5	6.5	15.0	1050	46.0	30.0	0.65	2.04	52.9	22.5	1050	43.9	3.83	31.1	109	3.35
	10.5	6.5	15.0	1400	47.9	33.9	0.71	2.12	55.1	22.5	1400	44.9	3.44	33.2	100	3.82
60	5.3	1.6	3.7	1050	43.1	28.8	0.67	2.51	51.7	17.2	1050	45.6	3.89	32.6	110	3.44
	5.3	1.6	3.7	1400	44.9	32.6	0.73	2.61	53.8	17.2	1400	46.7	3.49	34.8	101	3.92
	7.9	3.3	7.5	1050	43.9	29.0	0.66	2.34	51.8	18.8	1050	47.8	3.96	34.5	112	3.54
	7.9	3.3	7.5	1400	45.7	32.8	0.72	2.43	53.9	18.8	1400	49.0	3.56	36.9	102	4.04
	10.5	6.1	14.0	1050	44.4	29.2	0.66	2.25	52.1	19.7	1050	49.0	4.00	35.6	113	3.60
	10.5	6.1	14.0	1400	46.2	33.1	0.72	2.35	54.2	19.7	1400	50.2	3.59	38.0	103	4.10
70	5.3	1.5	3.4	1050	41.3	28.1	0.68	2.80	50.9	14.8	1050	50.3	4.04	36.7	114	3.65
	5.3	1.5	3.4	1400	43.0	31.8	0.74	2.91	52.9	14.8	1400	51.5	3.63	39.2	104	4.16
	7.9	3.1	7.1	1050	42.2	28.3	0.67	2.60	51.0	16.2	1050	52.8	4.11	38.8	117	3.76
	7.9	3.1	7.1	1400	43.9	32.0	0.73	2.71	53.1	16.2	1400	54.1	3.70	41.5	106	4.29
	10.5	5.7	13.2	1050	42.8	28.5	0.67	2.51	51.3	17.1	1050	54.1	4.16	40.0	118	3.82
	10.5	5.7	13.2	1400	44.5	32.3	0.73	2.61	53.4	17.1	1400	55.4	3.73	42.7	107	4.35
80	5.3	1.4	3.2	1050	39.5	27.4	0.70	3.13	50.1	12.6	1050	54.9	4.18	40.7	118	3.85
	5.3	1.4	3.2	1400	41.1	31.0	0.76	3.26	52.2	12.6	1400	56.3	3.76	43.4	107	4.39
	7.9	2.9	6.7	1050	40.4	27.6	0.68	2.91	50.3	13.9	1050	57.6	4.27	43.0	121	3.96
	7.9	2.9	6.7	1400	42.1	31.3	0.74	3.03	52.4	13.9	1400	59.0	3.83	45.9	109	4.51
	10.5	5.4	12.6	1050	41.0	27.9	0.68	2.80	50.6	14.6	1050	59.0	4.31	44.2	122	4.01
	10.5	5.4	12.6	1400	42.7	31.5	0.74	2.92	52.6	14.6	1400	60.4	3.87	47.2	110	4.58
85	5.3	1.3	3.1	1050	38.4	27.1	0.71	3.32	49.8	11.6	1050	57.2	4.25	42.6	120	3.94
	5.3	1.3	3.1	1400	40.0	30.7	0.77	3.46	51.8	11.6	1400	58.6	3.82	45.5	109	4.49
	7.9	2.8	6.5	1050	39.4	27.3	0.69	3.08	50.0	12.8	1050	59.9	4.34	44.9	123	4.05
	7.9	2.8	6.5	1400	41.1	30.9	0.75	3.21	52.0	12.9	1400	61.3	3.89	48.0	111	4.61
	10.5	5.3	12.3	1050	40.1	27.5	0.69	2.97	50.2	13.5	1050	61.3	4.38	46.2	124	4.10
	10.5	5.3	12.3	1400	41.7	31.2	0.75	3.09	52.3	13.6	1400	62.7	3.93	49.3	111	4.68
90	5.3	1.3	3.0	1050	37.4	26.8	0.72	3.51	49.4	10.7	1050	59.4	4.32	44.6	122	4.03
	5.3	1.3	3.0	1400	39.0	30.3	0.78	3.65	51.5	10.7	1400	60.8	3.88	47.6	110	4.59
	7.9	2.8	6.4	1050	38.5	27.0	0.70	3.26	49.6	11.8	1050	62.1	4.40	46.9	125	4.13
	7.9	2.8	6.4	1400	40.1	30.6	0.76	3.39	51.6	11.8	1400	63.6	3.96	50.1	112	4.71
	10.5	5.2	12.0	1050	39.1	27.2	0.70	3.14	49.8	12.5	1050	63.5	4.45	48.1	126	4.19
	10.5	5.2	12.0	1400	40.7	30.8	0.76	3.27	51.9	12.5	1400	65.1	3.99	51.4	113	4.77
100	5.3	1.2	2.8	1050	35.2	26.2	0.74	3.94	48.7	8.9	Operation not recommended					
	5.3	1.2	2.8	1400	36.7	29.6	0.81	4.10	50.7	8.9						
	7.9	2.7	6.1	1050	36.4	26.4	0.73	3.66	48.9	9.9						
	7.9	2.7	6.1	1400	37.9	29.9	0.79	3.81	50.9	9.9						
	10.5	5.0	11.6	1050	37.1	26.6	0.72	3.52	49.1	10.5						
	10.5	5.0	11.6	1400	38.6	30.1	0.78	3.67	51.1	10.5						
110	5.3	1.2	2.7	1050	32.8	25.5	0.78	4.41	47.9	7.4						
	5.3	1.2	2.7	1400	34.2	28.9	0.85	4.60	49.9	7.4						
	7.9	2.6	5.9	1050	34.1	25.7	0.76	4.11	48.1	8.3						
	7.9	2.6	5.9	1400	35.5	29.1	0.82	4.28	50.1	8.3						
	10.5	4.8	11.2	1050	34.8	25.9	0.75	3.96	48.4	8.8						
	10.5	4.8	11.2	1400	36.2	29.4	0.81	4.12	50.4	8.8						
120	5.3	1.1	2.6	1050	30.2	24.8	0.82	4.95	47.1	6.1						
	5.3	1.1	2.6	1400	31.4	28.0	0.89	5.15	49.1	6.1						
	7.9	2.5	5.7	1050	31.5	25.0	0.79	4.61	47.3	6.8						
	7.9	2.5	5.7	1400	32.8	28.3	0.86	4.80	49.3	6.8						
	10.5	4.7	10.8	1050	32.3	25.3	0.78	4.45	47.6	7.3						
	10.5	4.7	10.8	1400	33.7	28.6	0.85	4.63	49.5	7.3						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
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1400 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	10.5	9.2	21.3	Operation not recommended							1050	29.1	3.21	18.1	92.0	2.7
	10.5	9.2	21.3								1400	29.1	2.87	19.3	87.0	3.0
30	5.3	2.3	5.3	1050	47.4	30.6	0.65	1.71	53.2	27.7	1050	31.7	3.29	20.5	95.0	2.8
	5.3	2.3	5.3	1400	49.3	34.7	0.70	1.79	55.4	27.5	1400	31.9	2.94	21.9	89.0	3.2
	7.9	4.3	10.0	1050	48.4	31.1	0.64	1.60	53.9	30.2	1050	33.0	3.33	21.6	96.0	2.9
	7.9	4.3	10.0	1400	50.4	35.2	0.70	1.67	56.1	30.2	1400	33.3	2.98	23.1	90.0	3.3
	10.5	7.9	18.2	1050	48.9	31.3	0.64	1.55	54.2	31.5	1050	33.8	3.36	22.3	97.0	2.9
	10.5	7.9	18.2	1400	50.9	35.5	0.70	1.62	56.4	31.4	1400	34.0	3.00	23.8	90.0	3.3
40	5.3	2.0	4.6	1050	45.9	29.9	0.65	1.89	52.4	24.3	1050	36.1	3.43	24.4	99.0	3.1
	5.3	2.0	4.6	1400	47.8	33.9	0.71	1.97	54.5	24.3	1400	36.6	3.07	26.1	92.0	3.5
	7.9	3.9	8.9	1050	47.0	30.4	0.65	1.76	53.0	26.7	1050	37.7	3.48	25.8	100.0	3.2
	7.9	3.9	8.9	1400	48.9	34.4	0.70	1.84	55.2	26.6	1400	38.2	3.11	27.6	93.0	3.6
	10.5	7.1	16.4	1050	47.5	30.7	0.65	1.70	53.3	27.9	1050	38.6	3.51	26.6	101.0	3.2
	10.5	7.1	16.4	1400	49.4	34.7	0.70	1.78	55.5	27.8	1400	39.1	3.14	28.4	94.0	3.7
50	5.3	1.8	4.1	1050	44.4	29.2	0.66	2.10	51.6	21.1	1050	40.7	3.58	28.5	103.0	3.3
	5.3	1.8	4.1	1400	46.2	33.1	0.72	2.19	53.7	21.1	1400	41.3	3.20	30.4	95.0	3.8
	7.9	3.5	8.1	1050	45.4	29.7	0.65	1.95	52.1	23.3	1050	42.6	3.64	30.2	104.0	3.4
	7.9	3.5	8.1	1400	47.3	33.6	0.71	2.04	54.3	23.2	1400	43.3	3.25	32.2	96.0	3.9
	10.5	6.5	15.0	1050	46.0	30.0	0.65	1.88	52.4	24.5	1050	43.6	3.67	31.1	105.0	3.5
	10.5	6.5	15.0	1400	47.9	33.9	0.71	1.96	54.6	24.4	1400	44.4	3.28	33.2	97.0	4.0
60	5.3	1.6	3.7	1050	43.1	28.8	0.67	2.35	51.1	18.3	1050	45.3	3.73	32.6	106.0	3.6
	5.3	1.6	3.7	1400	44.9	32.6	0.73	2.45	53.3	18.3	1400	46.2	3.33	34.8	98.0	4.1
	7.9	3.3	7.5	1050	43.9	29.0	0.66	2.18	51.3	20.1	1050	47.5	3.80	34.5	108.0	3.7
	7.9	3.3	7.5	1400	45.7	32.8	0.72	2.27	53.4	20.1	1400	48.5	3.40	36.9	99.0	4.2
	10.5	6.1	14.0	1050	44.4	29.2	0.66	2.09	51.5	21.2	1050	48.7	3.84	35.6	109.0	3.7
	10.5	6.1	14.0	1400	46.2	33.1	0.72	2.19	53.7	21.1	1400	49.7	3.43	38.0	100.0	4.2
70	5.3	1.5	3.4	1050	41.3	28.1	0.68	2.64	50.3	15.6	1050	49.9	3.88	36.7	110.0	3.8
	5.3	1.5	3.4	1400	43.0	31.8	0.74	2.75	52.4	15.6	1400	51.0	3.47	39.2	101.0	4.3
	7.9	3.1	7.1	1050	42.2	28.3	0.67	2.44	50.5	17.3	1050	52.3	3.95	38.8	112.0	3.9
	7.9	3.1	7.1	1400	43.9	32.0	0.73	2.55	52.6	17.2	1400	53.6	3.54	41.5	102.0	4.4
	10.5	5.7	13.2	1050	42.8	28.5	0.67	2.35	50.8	18.2	1050	53.6	4.00	40.0	113.0	3.9
	10.5	5.7	13.2	1400	44.5	32.3	0.73	2.45	52.9	18.2	1400	54.9	3.57	42.7	103.0	4.5
80	5.3	1.4	3.2	1050	39.5	27.4	0.69	2.97	49.6	13.3	1050	54.4	4.02	40.7	114.0	4.0
	5.3	1.4	3.2	1400	41.1	31.0	0.75	3.10	51.7	13.3	1400	55.7	3.60	43.4	104.0	4.5
	7.9	2.9	6.7	1050	40.4	27.6	0.68	2.75	49.8	14.7	1050	57.0	4.11	43.0	116.0	4.1
	7.9	2.9	6.7	1400	42.1	31.3	0.74	2.87	51.9	14.7	1400	58.4	3.67	45.9	105.0	4.7
	10.5	5.4	12.6	1050	41.0	27.9	0.68	2.64	50.0	15.5	1050	58.4	4.15	44.2	117.0	4.1
	10.5	5.4	12.6	1400	42.7	31.5	0.74	2.76	52.1	15.5	1400	59.9	3.71	47.2	106.0	4.7
85	5.3	1.3	3.1	1050	38.4	27.1	0.71	3.16	49.2	12.2	1050	56.6	4.09	42.6	116.0	4.1
	5.3	1.3	3.1	1400	40.0	30.7	0.77	3.30	51.3	12.1	1400	58.0	3.66	45.5	105.0	4.6
	7.9	2.8	6.5	1050	39.4	27.3	0.69	2.92	49.4	13.5	1050	59.2	4.18	44.9	118.0	4.1
	7.9	2.8	6.5	1400	41.1	30.9	0.75	3.05	51.5	13.5	1400	60.7	3.73	48.0	107.0	4.8
	10.5	5.3	12.3	1050	40.1	27.5	0.69	2.81	49.7	14.3	1050	60.6	4.22	46.2	119.0	4.2
	10.5	5.3	12.3	1400	41.7	31.2	0.75	2.93	51.7	14.2	1400	62.2	3.77	49.3	108.0	4.8
90	5.3	1.3	3.0	1050	37.4	26.8	0.72	3.35	48.8	11.2	1050	58.8	4.16	44.6	117.0	4.1
	5.3	1.3	3.0	1400	39.0	30.3	0.78	3.49	50.9	11.2	1400	60.3	3.72	47.6	107.0	4.8
	7.9	2.8	6.4	1050	38.5	27.0	0.70	3.10	49.1	12.4	1050	61.4	4.24	46.9	120.0	4.2
	7.9	2.8	6.4	1400	40.1	30.6	0.76	3.23	51.1	12.4	1400	63.1	3.80	50.1	108.0	4.9
	10.5	5.2	12.0	1050	39.1	27.2	0.70	2.98	49.3	13.1	1050	62.7	4.29	48.1	121.0	4.3
	10.5	5.2	12.0	1400	40.7	30.8	0.76	3.11	51.3	13.1	1400	64.5	3.83	51.4	109.0	4.9
100	5.3	1.2	2.8	1050	35.2	26.2	0.74	3.78	48.1	9.3	Operation not recommended					
	5.3	1.2	2.8	1400	36.7	29.6	0.81	3.94	50.1	9.3						
	7.9	2.7	6.1	1050	36.4	26.4	0.73	3.50	48.3	10.4						
	7.9	2.7	6.1	1400	37.9	29.9	0.79	3.65	50.4	10.4						
	10.5	5.0	11.6	1050	37.1	26.6	0.72	3.36	48.6	11.0						
	10.5	5.0	11.6	1400	38.6	30.1	0.78	3.51	50.6	11.0						
110	5.3	1.2	2.7	1050	32.8	25.5	0.78	4.25	47.3	7.7						
	5.3	1.2	2.7	1400	34.2	28.9	0.85	4.44	49.4	7.7						
	7.9	2.6	5.9	1050	34.1	25.7	0.75	3.95	47.6	8.6						
	7.9	2.6	5.9	1400	35.5	29.1	0.82	4.12	49.6	8.6						
	10.5	4.8	11.2	1050	34.8	25.9	0.74	3.80	47.8	9.2						
	10.5	4.8	11.2	1400	36.2	29.4	0.81	3.96	49.7	9.1						
120	5.3	1.1	2.6	1050	30.2	24.8	0.82	4.79	46.5	6.3						
	5.3	1.1	2.6	1400	31.4	28.0	0.89	4.99	48.4	6.3						
	7.9	2.5	5.7	1050	31.5	25.0	0.79	4.45	46.7	7.1						
	7.9	2.5	5.7	1400	32.8	28.3	0.86	4.64	48.6	7.1						
	10.5	4.7	10.8	1050	32.3	25.3	0.78	4.29	46.9	7.5						
	10.5	4.7	10.8	1400	33.7	28.6	0.85	4.47	49.0	7.5						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 048 (PSC Blower)

1,600 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	12.0	6.8	15.6	Operation not recommended							1200	30.9	3.54	19.6	94	2.56
	12.0	6.8	15.6								1600	31.6	3.18	20.9	88	2.92
30	6.0	1.8	4.1	1200	56.4	34.4	0.61	2.25	64.0	25.1	1200	33.9	3.60	22.3	96	2.76
	6.0	1.8	4.1	1600	58.8	39.0	0.66	2.34	66.7	25.1	1600	34.7	3.24	23.8	90	3.14
	9.0	3.4	7.8	1200	57.5	34.6	0.60	2.11	64.6	27.2	1200	34.4	3.63	22.7	97	2.78
	9.0	3.4	7.8	1600	59.8	39.1	0.65	2.20	67.2	27.2	1600	35.3	3.26	24.2	90	3.17
	12.0	6.2	14.3	1200	57.9	34.5	0.60	2.05	64.8	28.2	1200	35.1	3.65	23.3	97	2.82
	12.0	6.2	14.3	1600	60.3	39.1	0.65	2.14	67.5	28.2	1600	36.0	3.27	24.9	91	3.22
40	6.0	1.6	3.7	1200	54.8	34.0	0.62	2.47	63.2	22.2	1200	37.9	3.70	25.8	99	3.00
	6.0	1.6	3.7	1600	57.1	38.5	0.67	2.57	65.8	22.2	1600	38.8	3.33	27.5	92	3.42
	9.0	3.1	7.2	1200	56.0	34.3	0.61	2.31	63.8	24.3	1200	39.5	3.74	27.2	100	3.10
	9.0	3.1	7.2	1600	58.3	38.9	0.67	2.40	66.4	24.3	1600	40.5	3.36	29.1	93	3.53
	12.0	5.8	13.4	1200	56.6	34.5	0.61	2.23	64.1	25.4	1200	40.7	3.76	28.3	101	3.18
	12.0	5.8	13.4	1600	58.9	39.0	0.66	2.32	66.8	25.4	1600	41.7	3.37	30.2	94	3.62
50	6.0	1.5	3.4	1200	52.9	33.3	0.63	2.72	62.1	19.4	1200	43.6	3.81	31.0	104	3.36
	6.0	1.5	3.4	1600	55.1	37.7	0.68	2.83	64.7	19.4	1600	44.7	3.42	33.0	96	3.83
	9.0	3.0	6.8	1200	54.3	33.8	0.62	2.53	62.9	21.4	1200	44.9	3.85	32.1	105	3.42
	9.0	3.0	6.8	1600	56.5	38.3	0.68	2.64	65.5	21.4	1600	46.0	3.46	34.3	97	3.90
	12.0	5.5	12.7	1200	55.0	34.0	0.62	2.45	63.2	22.5	1200	46.0	3.87	33.1	106	3.49
	12.0	5.5	12.7	1600	57.2	38.5	0.67	2.55	65.8	22.5	1600	47.1	3.48	35.3	97	3.98
60	6.0	1.4	3.2	1200	50.7	32.5	0.64	3.02	61.0	16.8	1200	48.2	3.91	35.0	107	3.61
	6.0	1.4	3.2	1600	52.8	36.8	0.70	3.15	63.5	16.8	1600	49.3	3.51	37.4	99	4.11
	9.0	2.8	6.5	1200	52.3	33.1	0.63	2.81	61.8	18.6	1200	50.5	3.96	37.1	109	3.74
	9.0	2.8	6.5	1600	54.5	37.5	0.69	2.92	64.4	18.6	1600	51.8	3.56	39.6	100	4.26
	12.0	5.3	12.2	1200	53.0	33.4	0.63	2.70	62.2	19.6	1200	51.8	3.99	38.3	110	3.81
	12.0	5.3	12.2	1600	55.2	37.8	0.68	2.81	64.8	19.6	1600	53.1	3.58	40.9	101	4.34
70	6.0	1.3	3.0	1200	48.3	31.5	0.65	3.38	59.9	14.3	1200	53.5	4.02	39.8	111	3.90
	6.0	1.3	3.0	1600	50.3	35.7	0.71	3.52	62.3	14.3	1600	54.8	3.61	42.4	102	4.44
	9.0	2.7	6.3	1200	50.0	32.2	0.64	3.13	60.7	16.0	1200	56.2	4.08	42.2	113	4.03
	9.0	2.7	6.3	1600	52.1	36.4	0.70	3.25	63.2	16.0	1600	57.5	3.67	45.0	103	4.60
	12.0	5.1	11.8	1200	50.9	32.5	0.64	3.01	61.1	16.9	1200	57.6	4.12	43.4	114	4.10
	12.0	5.1	11.8	1600	53.0	36.8	0.70	3.13	63.6	16.9	1600	59.0	3.70	46.4	104	4.68
80	6.0	1.3	2.9	1200	45.7	30.5	0.67	3.79	58.6	12.1	1200	58.8	4.14	44.5	115	4.16
	6.0	1.3	2.9	1600	47.6	34.5	0.72	3.94	61.0	12.1	1600	60.2	3.72	47.5	105	4.74
	9.0	2.6	6.1	1200	47.5	31.2	0.66	3.50	59.5	13.6	1200	61.7	4.21	47.1	118	4.29
	9.0	2.6	6.1	1600	49.5	35.3	0.71	3.64	61.9	13.6	1600	63.2	3.78	50.2	107	4.90
	12.0	4.9	11.4	1200	48.4	31.6	0.65	3.37	59.9	14.4	1200	63.3	4.25	48.4	119	4.36
	12.0	4.9	11.4	1600	50.4	35.7	0.71	3.50	62.4	14.4	1600	64.8	3.82	51.7	107	4.97
85	6.0	1.2	2.8	1200	44.3	29.9	0.68	4.02	58.0	11.1	1200	61.3	4.20	46.7	117	4.28
	6.0	1.2	2.8	1600	46.1	33.8	0.73	4.19	60.4	11.1	1600	62.8	3.78	49.9	106	4.88
	9.0	2.6	6.0	1200	46.2	30.6	0.66	3.72	58.8	12.5	1200	64.3	4.28	49.4	120	4.40
	9.0	2.6	6.0	1600	48.1	34.7	0.72	3.87	61.3	12.5	1600	65.9	3.84	52.7	108	5.02
	12.0	4.9	11.3	1200	47.1	31.0	0.66	3.57	59.3	13.2	1200	65.9	4.32	50.7	121	4.47
	12.0	4.9	11.3	1600	49.0	35.1	0.72	3.72	61.7	13.2	1600	67.5	3.88	54.1	109	5.09
90	6.0	1.2	2.8	1200	42.9	29.3	0.68	4.26	57.4	10.1	1200	63.9	4.27	49.0	119	4.39
	6.0	1.2	2.8	1600	44.6	33.2	0.74	4.43	59.8	10.1	1600	65.5	3.83	52.3	108	5.01
	9.0	2.6	5.9	1200	44.8	30.1	0.67	3.93	58.2	11.4	1200	66.9	4.35	51.7	122	4.51
	9.0	2.6	5.9	1600	46.6	34.1	0.73	4.10	60.6	11.4	1600	68.6	3.91	55.1	110	5.14
	12.0	4.8	11.1	1200	45.7	30.5	0.67	3.78	58.6	12.1	1200	68.5	4.39	53.0	123	4.57
	12.0	4.8	11.1	1600	47.6	34.5	0.72	3.94	61.1	12.1	1600	70.2	3.95	56.6	111	5.21
100	6.0	1.2	2.7	1200	39.8	28.2	0.71	4.79	56.2	8.3	Operation not recommended					
	6.0	1.2	2.7	1600	41.4	31.9	0.77	4.99	58.5	8.3						
	9.0	2.5	5.8	1200	41.8	28.9	0.69	4.43	57.0	9.4						
	9.0	2.5	5.8	1600	43.5	32.7	0.75	4.62	59.3	9.4						
	12.0	4.7	10.9	1200	42.8	29.3	0.69	4.26	57.4	10.0						
	12.0	4.7	10.9	1600	44.6	33.2	0.74	4.44	59.7	10.0						
110	6.0	1.1	2.6	1200	36.5	26.9	0.74	5.40	55.0	6.8						
	6.0	1.1	2.6	1600	38.0	30.4	0.80	5.62	57.3	6.8						
	9.0	2.4	5.6	1200	38.6	27.7	0.72	5.00	55.8	7.7						
	9.0	2.4	5.6	1600	40.2	31.4	0.78	5.21	58.0	7.7						
	12.0	4.6	10.6	1200	39.7	28.1	0.71	4.81	56.1	8.2						
	12.0	4.6	10.6	1600	41.3	31.8	0.77	5.01	58.5	8.2						
120	6.0	1.1	2.5	1200	33.0	25.5	0.77	6.09	53.9	5.4						
	6.0	1.1	2.5	1600	34.4	28.9	0.84	6.34	56.1	5.4						
	9.0	2.4	5.5	1200	35.2	26.4	0.75	5.65	54.6	6.2						
	9.0	2.4	5.5	1600	36.7	29.9	0.81	5.88	56.8	6.2						
	12.0	4.5	10.4	1200	36.3	26.8	0.74	5.44	55.0	6.7						
	12.0	4.5	10.4	1600	37.8	30.3	0.80	5.66	57.2	6.7						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 048 (ECM Blower)

1500 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	12.0	6.8	15.6	Operation not recommended							1200	31.4	3.45	19.6	92.0	2.7
	12.0	6.8	15.6								1500	31.5	3.09	20.9	87.0	3.0
30	6.0	1.8	4.1	1200	56.4	34.4	0.61	2.16	63.8	26.1	1200	34.3	3.51	22.3	95.0	2.9
	6.0	1.8	4.1	1500	58.8	39.0	0.66	2.25	66.5	26.1	1500	34.6	3.15	23.8	89.0	3.2
	9.0	3.4	7.8	1200	57.5	34.6	0.60	2.02	64.4	28.4	1200	34.8	3.54	22.7	96.0	2.9
	9.0	3.4	7.8	1500	59.8	39.1	0.65	2.11	67.0	28.3	1500	35.0	3.17	24.2	90.0	3.2
	12.0	6.2	14.3	1200	57.9	34.5	0.60	1.96	64.6	29.5	1200	35.5	3.56	23.3	97.0	2.9
	12.0	6.2	14.3	1500	60.3	39.1	0.65	2.05	67.3	29.4	1500	35.8	3.18	24.9	90.0	3.3
40	6.0	1.6	3.7	1200	54.8	34.0	0.62	2.38	62.9	23.0	1200	38.1	3.61	25.8	99.0	3.1
	6.0	1.6	3.7	1500	57.1	38.5	0.67	2.48	65.6	23.0	1500	38.6	3.24	27.5	92.0	3.5
	9.0	3.1	7.2	1200	56.0	34.3	0.61	2.22	63.6	25.2	1200	39.7	3.65	27.2	100.0	3.2
	9.0	3.1	7.2	1500	58.3	38.9	0.67	2.31	66.2	25.2	1500	40.3	3.27	29.1	93.0	3.6
	12.0	5.8	13.4	1200	56.6	34.5	0.61	2.14	63.9	26.4	1200	40.8	3.67	28.3	101.0	3.3
	12.0	5.8	13.4	1500	58.9	39.0	0.66	2.23	66.5	26.4	1500	41.4	3.28	30.2	94.0	3.7
50	6.0	1.5	3.4	1200	52.9	33.3	0.63	2.63	61.9	20.1	1200	43.7	3.72	31.0	103.0	3.4
	6.0	1.5	3.4	1500	55.1	37.7	0.68	2.74	64.5	20.1	1500	44.4	3.33	33.0	95.0	3.9
	9.0	3.0	6.8	1200	54.3	33.8	0.62	2.44	62.6	22.2	1200	44.9	3.76	32.1	104.0	3.5
	9.0	3.0	6.8	1500	56.5	38.3	0.68	2.55	65.2	22.1	1500	45.8	3.37	34.3	96.0	4.0
	12.0	5.5	12.7	1200	55.0	34.0	0.62	2.36	63.1	23.3	1200	46.0	3.78	33.1	105.0	3.6
	12.0	5.5	12.7	1500	57.2	38.5	0.67	2.46	65.6	23.2	1500	46.9	3.39	35.3	97.0	4.0
60	6.0	1.4	3.2	1200	50.7	32.5	0.64	2.93	60.7	17.3	1200	48.0	3.82	35.0	106.0	3.7
	6.0	1.4	3.2	1500	52.8	36.8	0.70	3.06	63.3	17.2	1500	49.1	3.42	37.4	98.0	4.2
	9.0	2.8	6.5	1200	52.3	33.1	0.63	2.72	61.6	19.2	1200	50.3	3.87	37.1	108.0	3.8
	9.0	2.8	6.5	1500	54.5	37.5	0.69	2.83	64.2	19.2	1500	51.5	3.47	39.6	99.0	4.3
	12.0	5.3	12.2	1200	53.0	33.4	0.63	2.61	61.9	20.3	1200	51.6	3.90	38.3	109.0	3.9
	12.0	5.3	12.2	1500	55.2	37.8	0.68	2.72	64.5	20.3	1500	52.8	3.49	40.9	100.0	4.4
70	6.0	1.3	3.0	1200	48.3	31.5	0.65	3.29	59.5	14.7	1200	53.2	3.93	39.8	110.0	4.0
	6.0	1.3	3.0	1500	50.3	35.7	0.71	3.43	62.0	14.6	1500	54.4	3.52	42.4	101.0	4.5
	9.0	2.7	6.3	1200	50.0	32.2	0.64	3.04	60.4	16.4	1200	55.8	3.99	42.2	112.0	4.1
	9.0	2.7	6.3	1500	52.1	36.4	0.70	3.16	62.9	16.5	1500	57.2	3.58	45.0	102.0	4.7
	12.0	5.1	11.8	1200	50.9	32.5	0.64	2.92	60.9	17.4	1200	57.2	4.03	43.4	113.0	4.2
	12.0	5.1	11.8	1500	53.0	36.8	0.69	3.04	63.4	17.4	1500	58.7	3.61	46.4	103.0	4.8
80	6.0	1.3	2.9	1200	45.7	30.5	0.67	3.70	58.3	12.3	1200	58.3	4.05	44.5	114.0	4.2
	6.0	1.3	2.9	1500	47.6	34.5	0.72	3.85	60.8	12.3	1500	59.9	3.63	47.5	104.0	4.8
	9.0	2.6	6.1	1200	47.5	31.2	0.66	3.41	59.2	13.9	1200	61.2	4.12	47.1	116.0	4.3
	9.0	2.6	6.1	1500	49.5	35.3	0.71	3.55	61.6	13.9	1500	62.8	3.69	50.2	105.0	5.0
	12.0	4.9	11.4	1200	48.4	31.6	0.65	3.28	59.6	14.7	1200	62.6	4.16	48.4	117.0	4.4
	12.0	4.9	11.4	1500	50.4	35.7	0.71	3.41	62.1	14.8	1500	64.4	3.73	51.7	106.0	5.1
85	6.0	1.2	2.8	1200	44.3	29.9	0.67	3.93	57.7	11.3	1200	60.7	4.11	46.7	116.0	4.3
	6.0	1.2	2.8	1500	46.1	33.8	0.73	4.10	60.1	11.2	1500	62.5	3.69	49.9	105.0	5.0
	9.0	2.6	6.0	1200	46.2	30.6	0.66	3.63	58.6	12.7	1200	63.7	4.19	49.4	118.0	4.5
	9.0	2.6	6.0	1500	48.1	34.7	0.72	3.78	61.0	12.7	1500	65.5	3.75	52.7	107.0	5.1
	12.0	4.9	11.3	1200	47.1	31.0	0.66	3.48	59.0	13.5	1200	65.1	4.23	50.7	119.0	4.5
	12.0	4.9	11.3	1500	49.0	35.1	0.72	3.63	61.4	13.5	1500	67.0	3.79	54.1	108.0	5.2
90	6.0	1.2	2.8	1200	42.9	29.3	0.68	4.17	57.1	10.3	1200	63.3	4.18	49.0	117.0	4.4
	6.0	1.2	2.8	1500	44.6	33.2	0.74	4.34	59.4	10.3	1500	65.1	3.74	52.3	107.0	5.1
	9.0	2.6	5.9	1200	44.8	30.1	0.67	3.84	57.9	11.7	1200	66.3	4.26	51.7	120.0	4.6
	9.0	2.6	5.9	1500	46.6	34.1	0.73	4.01	60.3	11.6	1500	68.1	3.82	55.1	108.0	5.2
	12.0	4.8	11.1	1200	45.7	30.5	0.67	3.69	58.3	12.4	1200	67.7	4.30	53.0	121.0	4.6
	12.0	4.8	11.1	1500	47.6	34.5	0.72	3.85	60.8	12.3	1500	69.8	3.86	56.6	109.0	5.3
100	6.0	1.2	2.7	1200	39.8	28.2	0.71	4.70	55.9	8.5	Operation not recommended					
	6.0	1.2	2.7	1500	41.4	31.9	0.77	4.90	58.1	8.4						
	9.0	2.5	5.8	1200	41.8	28.9	0.69	4.34	56.6	9.6						
	9.0	2.5	5.8	1500	43.5	32.7	0.75	4.53	59.0	9.6						
	12.0	4.7	10.9	1200	42.8	29.3	0.68	4.17	57.0	10.3						
	12.0	4.7	10.9	1500	44.6	33.2	0.74	4.35	59.5	10.2						
110	6.0	1.1	2.6	1200	36.5	26.9	0.74	5.31	54.6	6.9						
	6.0	1.1	2.6	1500	38.0	30.4	0.80	5.53	56.9	6.9						
	9.0	2.4	5.6	1200	38.6	27.7	0.72	4.91	55.4	7.9						
	9.0	2.4	5.6	1500	40.2	31.4	0.78	5.12	57.7	7.8						
	12.0	4.6	10.6	1200	39.7	28.1	0.71	4.72	55.8	8.4						
	12.0	4.6	10.6	1500	41.3	31.8	0.77	4.92	58.1	8.4						
120	6.0	1.1	2.5	1200	33.0	25.5	0.77	6.00	53.5	5.5						
	6.0	1.1	2.5	1500	34.4	28.9	0.84	6.25	55.7	5.5						
	9.0	2.4	5.5	1200	35.2	26.4	0.75	5.56	54.2	6.3						
	9.0	2.4	5.5	1500	36.7	29.9	0.81	5.79	56.5	6.3						
	12.0	4.5	10.4	1200	36.3	26.8	0.74	5.35	54.6	6.8						
	12.0	4.5	10.4	1500	37.8	30.3	0.80	5.57	56.8	6.8						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at **climatemaster.com**.

Performance Data – TC H/V 060 (PSC Blower)

1950 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	15.0	14.0	32.2	Operation not recommended							1460	41.6	4.98	25.8	96	2.45
	15.0	14.0	32.2								1950	42.6	4.48	27.5	90	2.79
30	7.5	3.4	7.9	1460	68.2	41.6	0.61	3.00	78.3	22.8	1460	45.5	5.08	29.2	99	2.62
	7.5	3.4	7.9	1950	71.0	47.0	0.66	3.12	81.6	22.8	1950	46.6	4.56	31.1	92	2.99
	11.3	6.8	15.8	1460	69.0	41.5	0.60	2.87	78.7	24.0	1460	47.4	5.13	30.9	100	2.71
	11.3	6.8	15.8	1950	71.8	47.0	0.65	2.99	82.0	24.0	1950	48.6	4.61	33.0	93	3.09
	15.0	12.6	29.2	1460	69.3	41.3	0.60	2.82	78.8	24.6	1460	48.5	5.16	31.8	101	2.75
	15.0	12.6	29.2	1950	72.1	46.8	0.65	2.94	82.1	24.6	1950	49.7	4.64	34.0	94	3.14
40	7.5	3.1	7.0	1460	66.6	41.1	0.62	3.21	77.4	20.8	1460	52.2	5.27	35.1	103	2.91
	7.5	3.1	7.0	1950	69.3	46.5	0.67	3.34	80.6	20.8	1950	53.5	4.73	37.5	95	3.31
	11.3	6.3	14.6	1460	67.8	41.5	0.61	3.05	78.1	22.2	1460	54.8	5.34	37.3	105	3.01
	11.3	6.3	14.6	1950	70.6	47.0	0.67	3.18	81.3	22.2	1950	56.1	4.80	39.8	97	3.43
	15.0	11.8	27.2	1460	68.3	41.6	0.61	2.98	78.4	22.9	1460	56.2	5.38	38.5	106	3.06
	15.0	11.8	27.2	1950	71.1	47.0	0.66	3.10	81.6	22.9	1950	57.5	4.83	41.1	97	3.49
50	7.5	2.8	6.4	1460	64.7	40.3	0.62	3.47	76.4	18.7	1460	59.5	5.48	41.4	108	3.18
	7.5	2.8	6.4	1950	67.3	45.6	0.68	3.61	79.6	18.7	1950	60.9	4.92	44.2	99	3.63
	11.3	5.9	13.7	1460	66.0	40.9	0.62	3.28	77.1	20.1	1460	62.6	5.57	44.1	110	3.29
	11.3	5.9	13.7	1950	68.7	46.3	0.67	3.41	80.3	20.1	1950	64.1	5.01	47.1	100	3.75
	15.0	11.1	25.7	1460	66.7	41.2	0.62	3.19	77.5	20.9	1460	64.3	5.63	45.6	111	3.35
	15.0	11.1	25.7	1950	69.4	46.6	0.67	3.32	80.7	20.9	1950	65.9	5.05	48.7	101	3.82
60	7.5	2.6	6.0	1460	62.4	39.3	0.63	3.78	75.3	16.5	1460	66.9	5.70	47.8	112	3.44
	7.5	2.6	6.0	1950	65.0	44.5	0.69	3.93	78.4	16.5	1950	68.5	5.12	51.0	103	3.92
	11.3	5.6	13.0	1460	63.7	39.9	0.63	3.56	75.8	17.9	1460	70.4	5.82	50.9	115	3.55
	11.3	5.6	13.0	1950	66.3	45.1	0.68	3.70	78.9	17.9	1950	72.1	5.22	54.4	104	4.05
	15.0	10.7	24.6	1460	64.2	40.0	0.62	3.45	75.9	18.6	1460	72.4	5.88	52.6	116	3.61
	15.0	10.7	24.6	1950	66.8	45.3	0.68	3.59	79.0	18.6	1950	74.1	5.28	56.2	105	4.12
70	7.5	2.4	5.6	1460	59.6	38.0	0.64	4.15	73.7	14.3	1460	74.2	5.93	54.1	117	3.66
	7.5	2.4	5.6	1950	62.0	43.0	0.69	4.32	76.7	14.3	1950	75.9	5.33	57.8	106	4.18
	11.3	5.4	12.5	1460	61.1	38.6	0.63	3.89	74.3	15.7	1460	78.0	6.05	57.5	119	3.78
	11.3	5.4	12.5	1950	63.6	43.7	0.69	4.05	77.4	15.7	1950	79.9	5.44	61.4	108	4.31
	15.0	10.3	23.7	1460	61.6	38.8	0.63	3.77	74.4	16.3	1460	80.1	6.12	59.2	121	3.84
	15.0	10.3	23.7	1950	64.2	43.9	0.68	3.92	77.5	16.3	1950	82.0	5.50	63.2	109	4.37
80	7.5	2.3	5.4	1460	56.4	36.7	0.65	4.59	72.1	12.3	1460	81.1	6.15	60.1	121	3.86
	7.5	2.3	5.4	1950	58.8	41.5	0.71	4.78	75.1	12.3	1950	83.0	5.52	64.2	109	4.41
	11.3	5.2	12.0	1460	58.1	37.3	0.64	4.29	72.7	13.5	1460	84.9	6.27	63.4	124	3.97
	11.3	5.2	12.0	1950	60.4	42.2	0.70	4.47	75.7	13.5	1950	87.0	5.63	67.7	111	4.52
	15.0	9.9	22.9	1460	58.7	37.5	0.64	4.15	72.8	14.1	1460	86.9	6.33	65.1	125	4.02
	15.0	9.9	22.9	1950	61.1	42.4	0.69	4.32	75.8	14.1	1950	89.0	5.69	69.5	112	4.58
85	7.5	2.3	5.2	1460	54.8	36.1	0.66	4.84	71.3	11.4	1460	84.1	6.25	62.8	123	3.95
	7.5	2.3	5.2	1950	57.0	40.8	0.72	5.04	74.2	11.4	1950	86.2	5.6	67.0	111	4.50
	11.3	5.1	11.8	1460	56.4	36.6	0.65	4.52	71.9	12.5	1460	87.8	6.4	65.9	126	4.04
	11.3	5.1	11.8	1950	58.7	41.4	0.70	4.71	74.8	12.5	1950	89.9	5.7	70.4	113	4.61
	15.0	9.8	22.6	1460	57.1	36.8	0.64	4.37	72.0	13.1	1460	89.6	6.4	67.5	127	4.09
	15.0	9.8	22.6	1950	59.5	41.6	0.70	4.55	75.0	13.1	1950	91.8	5.8	72.0	114	4.66
90	7.5	2.2	5.1	1460	53.1	35.4	0.67	5.09	70.5	10.4	1460	87.2	6.35	65.4	125	4.03
	7.5	2.2	5.1	1950	55.3	40.1	0.73	5.30	73.4	10.4	1950	89.3	5.70	69.9	112	4.59
	11.3	5.0	11.6	1460	54.8	35.9	0.66	4.76	71.0	11.5	1460	90.7	6.45	68.4	128	4.12
	11.3	5.0	11.6	1950	57.1	40.7	0.71	4.95	74.0	11.5	1950	92.9	5.80	73.1	114	4.70
	15.0	9.6	22.2	1460	55.5	36.1	0.65	4.60	71.2	12.1	1460	92.3	6.50	69.8	129	4.16
	15.0	9.6	22.2	1950	57.8	40.9	0.71	4.78	74.1	12.1	1950	94.5	5.84	74.5	115	4.74
100	7.5	2.1	4.9	1460	49.6	34.3	0.69	5.67	69.0	8.8	Operation not recommended					
	7.5	2.1	4.9	1950	51.7	38.9	0.75	5.90	71.9	8.8						
	11.3	4.9	11.3	1460	51.4	34.7	0.68	5.29	69.5	9.7						
	11.3	4.9	11.3	1950	53.5	39.3	0.73	5.51	72.3	9.7						
	15.0	9.4	21.7	1460	52.1	34.8	0.67	5.11	69.6	10.2						
	15.0	9.4	21.7	1950	54.2	39.4	0.73	5.32	72.4	10.2						
110	7.5	2.0	4.7	1460	46.6	33.8	0.73	6.33	68.2	7.4						
	7.5	2.0	4.7	1950	48.5	38.2	0.79	6.59	71.0	7.4						
	11.3	4.8	11.0	1460	47.8	33.6	0.70	5.91	68.0	8.1						
	11.3	4.8	11.0	1950	49.8	38.1	0.76	6.15	70.8	8.1						
	15.0	9.2	21.2	1460	48.6	33.7	0.69	5.71	68.2	8.5						
	15.0	9.2	21.2	1950	50.6	38.2	0.75	5.94	71.0	8.5						
120	7.5	2.0	4.6	1460	43.0	33.1	0.77	7.07	67.2	6.1						
	7.5	2.0	4.6	1950	44.7	37.5	0.84	7.36	70.0	6.1						
	11.3	4.7	10.7	1460	44.2	32.8	0.74	6.61	66.8	6.7						
	11.3	4.7	10.7	1950	46.0	37.1	0.81	6.88	69.6	6.7						
	15.0	9.0	20.7	1460	44.9	32.7	0.73	6.38	66.8	7.0						
	15.0	9.0	20.7	1950	46.8	37.0	0.79	6.64	69.5	7.0						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Performance Data – TC H/V 060 (ECM Blower)

1950 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F							Heating - EAT 70°F					
		PSI	FT	Airflow CFM	TC	SC	Sens/Tot Ratio	kW	HR	EER	Airflow CFM	HC	kW	HE	LAT	COP
20	15.0	14.0	32.2	Operation not recommended							1460	42.0	4.7	25.8	92.0	2.6
	15.0	14.0	32.2								1950	42.0	4.2	27.5	87.0	2.9
30	7.5	3.4	7.9	1460	68.2	41.6	0.61	2.8	77.6	24.8	1460	45.7	4.8	29.2	95.0	2.8
	7.5	3.4	7.9	1950	71.0	47.0	0.66	2.9	80.8	24.7	1950	45.8	4.3	31.1	89.0	3.1
	11.3	6.8	15.8	1460	69.0	41.5	0.60	2.6	78.0	26.3	1460	47.6	4.9	30.9	96.0	2.9
	11.3	6.8	15.8	1950	71.8	47.0	0.65	2.7	81.2	26.2	1950	47.9	4.4	33.0	90.0	3.2
	15.0	12.6	29.2	1460	69.3	41.3	0.60	2.6	78.1	26.9	1460	48.6	4.9	31.8	97.0	2.9
	15.0	12.6	29.2	1950	72.1	46.8	0.65	2.7	81.3	26.7	1950	49.0	4.4	34.0	90.0	3.3
40	7.5	3.1	7.0	1460	66.6	41.1	0.62	3.0	76.7	22.5	1460	52.2	5.0	35.1	99.0	3.0
	7.5	3.1	7.0	1950	69.3	46.5	0.67	3.1	79.9	22.4	1950	52.8	4.5	37.5	92.0	3.5
	11.3	6.3	14.6	1460	67.8	41.5	0.61	2.8	77.4	24.2	1460	54.7	5.1	37.3	100.0	3.1
	11.3	6.3	14.6	1950	70.6	47.0	0.67	2.9	80.6	24.1	1950	55.3	4.6	39.8	93.0	3.6
	15.0	11.8	27.2	1460	68.3	41.6	0.61	2.7	77.6	25.0	1460	56.0	5.1	38.5	101.0	3.2
	15.0	11.8	27.2	1950	71.1	47.0	0.66	2.9	80.8	24.9	1950	56.7	4.6	41.1	94.0	3.6
50	7.5	2.8	6.4	1460	64.7	40.3	0.62	3.2	75.7	20.1	1460	59.3	5.2	41.4	103.0	3.3
	7.5	2.8	6.4	1950	67.3	45.6	0.68	3.4	78.8	20.0	1950	60.2	4.7	44.2	95.0	3.8
	11.3	5.9	13.7	1460	66.0	40.9	0.62	3.0	76.4	21.7	1460	62.3	5.3	44.1	104.0	3.4
	11.3	5.9	13.7	1950	68.7	46.3	0.67	3.2	79.5	21.7	1950	63.4	4.8	47.1	96.0	3.9
	15.0	11.1	25.7	1460	66.7	41.2	0.62	2.9	76.7	22.6	1460	64.0	5.4	45.6	105.0	3.5
	15.0	11.1	25.7	1950	69.4	46.6	0.67	3.1	79.9	22.6	1950	65.1	4.8	48.7	97.0	4.0
60	7.5	2.6	6.0	1460	62.4	39.3	0.63	3.5	74.5	17.7	1460	66.4	5.5	47.8	106.0	3.6
	7.5	2.6	6.0	1950	65.0	44.5	0.68	3.7	77.6	17.6	1950	67.6	4.9	51.0	98.0	4.1
	11.3	5.6	13.0	1460	63.7	39.9	0.63	3.3	75.0	19.2	1460	69.9	5.6	50.9	108.0	3.7
	11.3	5.6	13.0	1950	66.3	45.1	0.68	3.5	78.1	19.2	1950	71.4	5.0	54.4	99.0	4.2
	15.0	10.7	24.6	1460	64.2	40.0	0.62	3.2	75.1	20.0	1460	71.8	5.6	52.6	109.0	3.7
	15.0	10.7	24.6	1950	66.8	45.3	0.68	3.3	78.2	20.0	1950	73.4	5.0	56.2	100.0	4.3
70	7.5	2.4	5.6	1460	59.6	38.0	0.64	3.9	72.9	15.3	1460	73.5	5.7	54.1	110.0	3.8
	7.5	2.4	5.6	1950	62.0	43.0	0.69	4.1	75.9	15.2	1950	75.2	5.1	57.8	101.0	4.3
	11.3	5.4	12.5	1460	61.1	38.6	0.63	3.6	73.5	16.8	1460	77.3	5.8	57.5	112.0	3.9
	11.3	5.4	12.5	1950	63.6	43.7	0.69	3.8	76.6	16.7	1950	79.1	5.2	61.4	102.0	4.5
	15.0	10.3	23.7	1460	61.6	38.8	0.63	3.5	73.6	17.5	1460	79.2	5.9	59.2	113.0	4.0
	15.0	10.3	23.7	1950	64.2	43.9	0.68	3.7	76.7	17.5	1950	81.1	5.3	63.2	103.0	4.5
80	7.5	2.3	5.4	1460	56.4	36.7	0.65	4.3	71.2	13.0	1460	80.2	5.9	60.1	114.0	4.0
	7.5	2.3	5.4	1950	58.8	41.5	0.71	4.5	74.3	13.0	1950	82.2	5.3	64.2	104.0	4.6
	11.3	5.2	12.0	1460	58.1	37.3	0.64	4.0	71.9	14.4	1460	84.0	6.0	63.4	116.0	4.1
	11.3	5.2	12.0	1950	60.4	42.2	0.70	4.2	74.8	14.3	1950	86.1	5.4	67.7	105.0	4.7
	15.0	9.9	22.9	1460	58.7	37.5	0.64	3.9	72.0	15.0	1460	85.9	6.1	65.1	117.0	4.1
	15.0	9.9	22.9	1950	61.1	42.4	0.69	4.1	75.0	15.0	1950	88.1	5.4	69.5	106.0	4.7
85	7.5	2.3	5.2	1460	54.8	36.1	0.66	4.6	70.5	11.9	1460	83.3	6.0	62.8	116.0	4.1
	7.5	2.3	5.2	1950	57.0	40.8	0.72	4.8	73.4	11.9	1950	85.3	5.4	67.0	105.0	4.7
	11.3	5.1	11.8	1460	56.4	36.6	0.65	4.3	71.0	13.2	1460	86.9	6.2	65.9	118.0	4.1
	11.3	5.1	11.8	1950	58.7	41.4	0.71	4.5	73.9	13.1	1950	89.0	5.5	70.4	107.0	4.8
	15.0	9.8	22.6	1460	57.1	36.8	0.64	4.1	71.2	13.8	1460	88.5	6.2	67.5	119.0	4.2
	15.0	9.8	22.6	1950	59.5	41.6	0.70	4.3	74.2	13.8	1950	91.0	5.6	72.0	108.0	4.8
90	7.5	2.2	5.1	1460	53.1	35.4	0.67	4.8	69.6	11.0	1460	86.2	6.1	65.4	117.0	4.1
	7.5	2.2	5.1	1950	55.3	40.1	0.73	5.1	72.5	10.9	1950	88.5	5.5	69.9	107.0	4.8
	11.3	5.0	11.6	1460	54.8	35.9	0.66	4.5	70.2	12.1	1460	89.6	6.2	68.4	120.0	4.2
	11.3	5.0	11.6	1950	57.1	40.7	0.71	4.7	73.2	12.1	1950	92.1	5.6	73.1	108.0	4.9
	15.0	9.6	22.2	1460	55.5	36.1	0.65	4.4	70.4	12.7	1460	91.1	6.3	69.8	121.0	4.3
	15.0	9.6	22.2	1950	57.8	40.9	0.71	4.5	73.3	12.7	1950	93.6	5.6	74.5	109.0	4.9
100	7.5	2.1	4.9	1460	49.6	34.3	0.69	5.4	68.1	9.1	Operation not recommended					
	7.5	2.1	4.9	1950	51.7	38.9	0.75	5.7	71.0	9.1						
	11.3	4.9	11.3	1460	51.4	34.7	0.68	5.0	68.6	10.2						
	11.3	4.9	11.3	1950	53.5	39.3	0.73	5.3	71.5	10.2						
	15.0	9.4	21.7	1460	52.1	34.8	0.67	4.9	68.7	10.7						
	15.0	9.4	21.7	1950	54.2	39.4	0.73	5.1	71.5	10.7						
110	7.5	2.0	4.7	1460	46.6	33.8	0.73	6.1	67.4	7.7						
	7.5	2.0	4.7	1950	48.5	38.2	0.79	6.3	70.2	7.6						
	11.3	4.8	11.0	1460	47.8	33.6	0.70	5.7	67.1	8.4						
	11.3	4.8	11.0	1950	49.8	38.1	0.77	5.9	69.9	8.4						
	15.0	9.2	21.2	1460	48.6	33.7	0.69	5.5	67.2	8.9						
	15.0	9.2	21.2	1950	50.6	38.2	0.75	5.7	70.0	8.9						
120	7.5	2.0	4.6	1460	43.0	33.1	0.77	6.8	66.3	6.3						
	7.5	2.0	4.6	1950	44.7	37.5	0.84	7.1	69.0	6.3						
	11.3	4.7	10.7	1460	44.2	32.8	0.74	6.4	65.9	6.9						
	11.3	4.7	10.7	1950	46.0	37.1	0.81	6.6	68.6	6.9						
	15.0	9.0	20.7	1460	44.9	32.7	0.73	6.1	65.8	7.3						
	15.0	9.0	20.7	1950	46.8	37.0	0.79	6.4	68.6	7.3						

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

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Entering Air Correction Table - Cooling

Cooling Corrections											
Ent Air WB °F	Total Clg Cap	Sens Clg Cap Multipliers - Entering DB °F								Power	Heat of Rejection
		65	70	75	80	80.6	85	90	95		
50	0.7800	0.9778	*	*	*	*	*	*	*	0.9972	0.8243
55	0.8327	0.8966	1.0556	*	*	*	*	*	*	0.9980	0.8667
60	0.8954	0.7505	0.9184	1.1056	*	*	*	*	*	0.9988	0.9169
65	0.9681		0.6778	0.8992	1.1213	1.1480	1.3439	*	*	0.9996	0.9747
66.2	0.9871		0.6103	0.8420	1.0698	1.0969	1.2938	*	*	0.9999	0.9897
67	1.0000		0.5507	0.7782	1.0000	1.0262	1.2161	1.4266	*	1.0000	1.0000
70	1.0508			0.6408	0.8856	0.9135	1.1082	1.3087	1.4869	1.0005	1.0403
75	1.1435	Operation not recommended			0.6085	0.6403	0.8566	1.0663	1.2376	1.0014	1.1135

* Sensible capacity equals total capacity.
AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F DB/ 66.2°F WB, and Heating - 68°F DB/ 59°F WB entering air temperature.

Entering Air Correction Table - Heating

Heating Corrections			
Ent Air DB °F	Heating Capacity	Heating Power	Heat of Extraction
45	1.0507	0.7802	1.1314
50	1.0327	0.8227	1.0953
55	1.0195	0.8683	1.0646
60	1.0102	0.9168	1.0380
65	1.0033	0.9680	1.0139
68	1.0000	1.0000	1.0000
70	0.9979	1.0218	0.9908
75	0.9928	1.0781	0.9673
80	0.9866	1.1367	0.9419

Air Flow Correction Table

Airflow	Heating			Cooling				
% of Rated	Heating Capacity	Heating Power	Heat of Extraction	Total Capacity	Sensible Capacity	Sens/Total Ratio	Power	Heat of Rejection
75	0.9764	1.1134	0.9368	0.9605	0.8837	0.9200	0.9606	0.9605
81.25	0.9829	1.0789	0.9551	0.9730	0.9130	0.9384	0.9691	0.9722
87.5	0.9889	1.0484	0.9717	0.9837	0.9393	0.9548	0.9784	0.9826
93.75	0.9947	1.0222	0.9867	0.9927	0.9668	0.9739	0.9887	0.9919
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
106.25	1.0050	0.9820	1.0116	1.0055	1.0434	1.0377	1.0122	1.0069
112.5	1.0096	0.9681	1.0216	1.0093	1.1016	1.0915	1.0253	1.0126
118.75	1.0138	0.9583	1.0299	1.0113	1.1790	1.1658	1.0394	1.0171
125	1.0177	0.9527	1.0365	1.0116	1.2798	1.2652	1.0544	1.0204

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Antifreeze Correction Table

Antifreeze Type	Antifreeze %	Cooling			Heating		WPD Corr. Fct. EWT 30°F
		EWT 90°F			EWT 30°F		
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

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Blower Performance Data – Standard Unit – PSC

Airflow in CFM with wet coil and clean air filter

Model	Fan Speed	Rated Airflow	Min CFM	Airflow (cfm) at External Static Pressure (in. wg)															
				0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
TCH/V 006	HI	220	150			310	300	290	280	270	250	230	210	180	Operation not recommended				
	MED					260	250	240	230	210	200	190	150						
	LOW					210	200	190	180	160	150								
TCH/V 009	HI	325	225			410	400	380	360	350	330	320	300	280					
	MED					390	370	360	340	320	310	290	280	260					
	LOW					340	330	322	310	300	280	260	250						
TCH/V 012	HI	400	300			470	460	450	440	430	420	400	390	380	320				
	MED					420	410	400	390	380	370	360	350	340					
	LOW					360	360	350	340	320	320	310	300						
TCH/V 015	HI	525	375			745	725	706	696	686	666	637	588	539	451				
	MED			686	676	666	657	647	637	617	608	588	549	510					
	LOW			608	598	588	578	568	559	549	529	510	480	451					
TCH/V 018	HI	600	450			745	725	706	696	686	666	637	588	539	451				
	MED			686	676	666	657	647	637	617	608	588	549	510					
	LOW			608	598	588	578	568	559	549	529	510	480	451					
TCH/V 024	HI	800	600									950	922	884	827	732	656		
	MED			960	950	941	931	912	893	874	855	836	817	789	732	665			
	LOW			779	770	760	751	741	732	722	713	694	684	665	618				
TCH/V 030	HI	1000	750							1102	1074	1045	1017	979	903	798			
	MED			1188	1169	1140	1121	1093	1064	1036	1017	988	960	922	846				
	LOW			1064	1045	1017	998	979	960	931	912	884	855	827	751				
TCH/V 036	HI	1200	900	1474	1455	1436	1416	1387	1358	1329	1310	1280	1232	1174	1077	931			
	MED			1174	1164	1106	1106	1096	1096	1086	1077	1067	1038	1009	912				
	LOW			980	980	970	970	960	960	951	951	941	922	902					
TCV 041	HI	1125	845	1328	1300	1269	1235	1198	1157	1114	1037	1018	965						
	MED			1181	1164	1142	1118	1090	1058	1023	985								
	LOW			1031	1021	1008	991	971	947										
TCH/V 042	HI	1350	1050	1558	1530	1501	1473	1444	1416	1378	1340	1302	1264	1226	1131				
	MED			1416	1397	1368	1349	1321	1302	1273	1245	1207	1169	1131	1064				
	LOW			1083	1083	1074	1074	1064	1055										
TCH/V 048	HI	1600	1200					1881	1853	1815	1767	1710	1653	1596	1416	1216	1216		
	MED			1843	1824	1805	1786	1767	1729	1682	1653	1625	1577	1520	1340				
	LOW			1682	1663	1644	1625	1606	1587	1568	1530	1492	1435	1378	1264				
TCH/V 060	HI	2000	1500	2195	2195	2185	2176	2156	2117	2078	2048	2019	1999	1970	1921	1842	1754	1627	
	MED			2009	2009	1999	1980	1950	1931	1901	1882	1852	1823	1793	1744	1676	1588		
	LOW			1813	1813	1803	1793	1774	1764	1744	1725	1695	1666	1637	1568				

Black areas denote ESP where operation is not recommended.
Units factory shipped on medium speed. Other speeds require field selection.
All airflow is rated and shown above at the lower voltage if unit is dual voltage rated, e.g. 208V for 208-230V units.
Only two speed fan (H & M) available on 575V units.
Performance stated is at the rated power supply, performance may vary as the power supply varies from the rated.

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Blower Performance Data – High Static – PSC

Model	Fan Speed	Rated Airflow	Min CFM	Airflow (cfm) at External Static Pressure (in. wg)															
				0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
TCH/V 015	HS HI	525	375				774	764	755	745	735	715	696	676	637	519			
	HS MED			735	725	706	696	686	676	657	657	647	637	617	588	480			
	HS LOW			657	647	627	617	608	598	588	578	568	568	559	519				
TCH/V 018	HS HI	600	450				774	764	755	745	735	715	696	676	637	519			
	HS MED			735	725	706	696	686	676	657	657	647	637	617	588	480			
	HS LOW			657	647	627	617	608	598	588	578	568	568	559	519				
TCH/V 024	HS HI	800	600	Operation not recommended										979	903	798	665		
	HS MED											988	960	922	846	713			
	HS LOW							979	960	931	912	884	855	827	751	675			
TCH/V 030	HS HI	1000	750											1102	988	874	760		
	HS MED											1074	1026	979	884	779			
	HS LOW			998	988	979	960	941	931	912	893	865	836	798					
TCH/V 036	HS HI	1200	900									1484	1455	1426	1358	1251	1135	931	
	HS MED			1319	1310	1300	1290	1280	1271	1261	1242	1222	1213	1193	1116	1038			
	HS LOW			999	989	980	980	970	970	960	951	931	922	902					
TCH/V 042	HS HI	1350	1050					1473	1463	1444	1425	1397	1387	1378	1311	1178			
	HS MED			1321	1311	1302	1292	1283	1273	1254	1245	1235	1216	1188	1121				
	HS LOW																		
TCH/V 048	HS HI	1600	1200									1957	1938	1910	1862	1786	1701	1577	1435
	HS MED			1948	1948	1938	1919	1891	1872	1843	1824	1796	1767	1739	1691	1625	1539	1416	1254
	HS LOW			1758	1758	1748	1739	1720	1710	1691	1672	1644	1615	1587	1520	1435	1311		
TCH/V 060	HS HI	2000	1500	2352	2352	2342	2332	2323	2313	2293	2274	2254	2225	2195	2156	2087	2019	1940	1852
	HS MED			2117	2117	2107	2107	2097	2068	2038	2019	1999	1989	1980	1940	1891	1842	1460	1715
	HS LOW			1891	1891	1882	1882	1872	1862	1852	1852	1842	1833	1813	1793	1764	1715	1666	1588

Black areas denote ESP where operation is not recommended.
Units factory shipped on medium speed. Other speeds require field selection.
All airflow is rated and shown above at the lower voltage if unit is dual voltage rated, e.g. 208V for 208-230V units.
Only two speed fan (H & M) available on 575V units.
Performance stated is at the rated power supply, performance may vary as the power supply varies from the rated.

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Blower Performance Data (ECM Motor)

Airflow in CFM with wet coil and clean air filter

Model	Max ESP (in. wg)	Fan Motor (hp)	Tap Setting	Cooling Mode			Dehumid Mode			Heating Mode		
				Stg 1	Stg 2	Fan	Stg 1	Stg 2	Fan	Stg 1	Stg 2	Fan
TC 015	0.50	1/3	4	470	550	275	376	440	275	470	550	275
	0.50		3	425	500	250	340	400	250	425	500	250
	0.50		2	380	450	225	304	360	225	380	450	225
	0.50		1	340	400	200				340	400	200
TC 018	0.50	1/3	4	550	650	325	440	520	325	550	650	325
	0.50		3	510	600	300	408	480	300	510	600	300
	0.50		2	465	550	275	372	440	275	465	550	275
	0.50		1	425	500	250				425	500	250
TC 024	0.50	1/2	4	745	875	438	596	700	438	745	875	438
	0.50		3	680	800	400	544	640	400	680	800	400
	0.50		2	615	725	363	492	580	363	615	725	363
	0.50		1	550	650	325				550	650	325
TC 030	0.50	1/2	4	890	1050	525	712	840	525	890	1050	525
	0.50		3	810	950	475	648	760	475	810	950	475
	0.50		2	745	875	438	596	700	438	745	875	438
	0.50		1	680	800	400				680	800	400
TC 036	0.50	3/4	4	1085	1275	638	868	1020	638	1085	1275	638
	0.50		3	1020	1200	600	816	960	600	1020	1200	600
	0.50		2	955	1125	563	764	900	563	955	1125	563
	0.50		1	850	1000	500				850	1000	500
TC 042	0.50	3/4	4	1255	1475	738	1004	1180	738	1255	1475	738
	0.50		3	1120	1320	660	896	1056	660	1120	1320	660
	0.50		2	1020	1200	600	816	960	600	1020	1200	600
	0.50		1	935	1100	550				935	1100	550
TC 048	0.75	1	4	1445	1700	850	1156	1360	850	1445	1700	850
	0.75		3	1275	1500	750	1020	1200	750	1275	1500	750
	0.75		2	1190	1400	700	952	1120	700	1190	1400	700
	0.75		1	1105	1300	650				1105	1300	650
TC 060	0.75	1	4	1740	2050	1025	1392	1640	1025	1740	2050	1025
	0.75		3	1615	1900	950	1292	1520	950	1615	1900	950
	0.75		2	1490	1750	875	1192	1400	875	1490	1750	875
	0.75		1	1360	1600	800				1360	1600	800

See ECM control section for details on setting taps.
Airflow is controlled within 5% up to the Max ESP shown with wet coil.
Do not select Dehumidification mode if HP CFM is on setting 1.
ClimaDry is factory wired to operate in stage 2 airflow.

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WSE Cooling Performance Data

Model		Water Side			Airside		Capacity	
		FLOW (gpm)	PD (psi)	PD (ft)	CFM	PD (in. wg.)	TC	SC
Vertical	006	1.5	1.9	4.4	225	0.05	6.641	4.922
	009	2.3	3.2	7.3	300	0.07	8.288	6.631
	012	3.0	1.9	4.3	400	0.11	8.485	7.569
	015	3.8	2.6	5.9	500	0.06	15.467	12.181
	018	4.5	3.5	8.2	600	0.09	17.123	14.375
	024	6.0	2.1	4.8	800	0.07	18.828	16.091
	030	7.5	3.0	7.0	1000	0.11	21.711	19.242
	036	9.0	1.6	3.8	1200	0.09	24.105	21.108
	042	10.5	2.3	5.2	1400	0.11	26.739	23.785
	048	12.0	1.8	4.2	1600	0.08	34.790	30.193
	060	15.0	2.5	5.8	2000	0.14	39.031	35.758
Horizontal	006	1.5	1.9	4.4	225	0.05	6.641	4.922
	009	2.3	3.2	7.3	300	0.07	8.288	6.631
	012	3.0	1.9	4.3	400	0.11	8.485	7.569
	015	3.8	2.9	6.6	500	0.05	15.118	11.905
	018	4.5	4.0	9.2	600	0.07	16.740	14.039
	024	6.0	1.2	2.8	800	0.08	19.110	16.294
	030	7.5	1.8	4.1	1000	0.12	22.209	19.672
	036	9.0	1.7	4.0	1200	0.11	25.142	21.717
	042	10.5	2.4	5.6	1400	0.14	27.879	24.488
	048	12.0	2.1	4.9	1600	0.10	37.671	31.675
	060	15.0	3.0	6.9	2000	0.15	42.388	37.813

Entering water 45° F, Entering air DB 80° F/WB 67° F

Physical Data-Unit With WSE Option

TC Series	006	009	012	015	018	024	030	036	042	048	060
Water Connection Size FTP	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"
Vertical											
WSE Coil Dimensions (H x W)	10x15	10x15	10x15	20x17.25	20x17.25	20x17.25	20x17.25	24x21.75	24x21.76	24x28.25	24x28.25
WSE Coil Volume (Gal)	0.150	0.150	0.144	0.348	0.348	0.357	0.357	0.746	0.746	1.001	1.001
Weight - Operating (lbs.)	138	140	149	219	224	259	267	289	303	353	368
Weight - Packaged (lbs.)	148	150	159	224	229	264	272	295	310	360	375
Horizontal											
WSE Coil Dimensions (H x W)	10x15	10x15	10x15	16x22	16x22	16x22	16x22	20x25	20x25	20x35	20x35
WSE Coil Volume (Gal)	0.150	0.150	0.139	0.341	0.341	0.382	0.382	0.735	0.735	1.041	1.041
Weight - Operating (lbs.)	145	147	156	220	225	257	265	311	326	372	387
Weight - Packaged (lbs.)	155	157	166	225	230	262	270	317	332	379	394

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Waterside Economizer Data

225 CFM Nominal Airflow TC-006

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	0.8	1.0	2.4	5.051	4.125	58.5
45	1.1	1.4	3.3	5.965	4.627	55.6
45	1.5	1.9	4.4	6.641	4.922	53.9
50	0.8	1.0	2.4	4.297	3.578	61.5
50	1.1	1.4	3.2	4.956	4.064	58.8
50	1.5	1.9	4.3	5.420	4.345	57.2
55	0.8	1.0	2.4	3.640	2.950	64.7
55	1.1	1.4	3.2	4.112	3.418	62.3
55	1.5	1.9	4.3	4.425	3.682	60.9
60	0.8	1.0	2.4	3.045	2.230	68.1
60	1.1	1.4	3.2	3.400	2.676	66.0
60	1.5	1.9	4.3	3.619	2.926	64.8

300 CFM Nominal Airflow TC-009

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	1.1	1.4	3.3	6.442	5.757	56.5
45	1.7	2.2	5.0	7.518	6.312	53.9
45	2.3	3.2	7.3	8.288	6.631	52.4
50	1.1	1.4	3.2	5.394	5.041	59.6
50	1.7	2.2	5.0	6.140	5.572	57.3
50	2.3	3.1	7.3	6.652	5.878	55.9
55	1.1	1.4	3.2	4.507	4.219	63.0
55	1.7	2.1	4.9	5.016	4.721	60.9
55	2.3	3.1	7.2	5.346	5.002	59.8
60	1.1	1.4	3.2	3.742	3.274	66.7
60	1.7	2.1	4.9	4.103	3.750	64.9
60	2.3	3.1	7.2	4.321	4.011	63.8

400 CFM Nominal Airflow TC-012

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	1.5	0.7	1.5	6.898	6.590	54.2
45	2.3	1.2	2.8	7.820	7.189	52.0
45	3.0	1.9	4.3	8.485	7.569	50.7
50	1.5	0.6	1.5	5.843	5.771	57.8
50	2.3	1.2	2.7	6.410	6.232	55.7
50	3.0	1.9	4.3	6.784	6.509	54.5
55	1.5	0.6	1.4	4.937	4.927	61.6
55	2.3	1.2	2.7	5.369	5.344	59.8
55	3.0	1.8	4.3	5.611	5.568	58.7
60	1.5	0.6	1.4	3.892	3.874	65.2
60	2.3	1.2	2.7	4.326	4.314	63.8
60	3.0	1.8	4.2	4.558	4.548	63.0

500 CFM Nominal Airflow TC-015

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	1.9	0.8	1.9	11.606	10.149	57.4
45	2.8	1.7	3.9	13.603	11.282	54.7
45	3.8	2.9	6.6	15.118	11.905	53.1
50	1.9	0.8	2.0	9.883	8.861	60.5
50	2.8	1.7	3.9	11.233	9.896	58.0
50	3.8	2.8	6.5	12.189	10.519	56.5
55	1.9	0.8	2.0	8.377	7.518	63.9
55	2.8	1.7	3.9	9.367	8.419	61.7
55	3.8	2.8	6.5	9.986	8.946	60.3
60	1.9	0.8	2.0	6.822	6.075	67.3
60	2.8	1.7	3.8	7.696	6.883	65.5
60	3.8	2.8	6.4	8.189	7.343	64.4

600 CFM Nominal Airflow TC-018

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	2.3	1.1	2.7	12.933	12.189	56.5
45	3.4	2.4	5.4	15.110	13.404	54.0
45	4.5	4.0	9.2	16.740	14.039	52.4
50	2.3	1.1	2.7	10.918	10.653	59.7
50	3.4	2.3	5.4	12.351	11.788	57.3
50	4.5	3.9	9.1	13.359	12.462	55.9
55	2.3	1.1	2.6	9.223	9.052	63.2
55	3.4	2.3	5.4	10.225	10.028	61.1
55	4.5	3.9	9.0	10.854	10.597	59.8
60	2.3	1.1	2.6	7.543	7.346	66.7
60	3.4	2.3	5.3	8.400	8.216	65.0
60	4.5	3.8	8.9	8.880	8.705	63.9

800 CFM Nominal Airflow TC-024

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	3.0	0.4	0.8	13.625	12.035	54.1
45	4.5	0.7	1.6	16.786	14.548	52.5
45	6.0	1.2	2.8	19.110	16.294	51.4
50	3.0	0.4	0.8	11.758	10.732	57.8
50	4.5	0.7	1.6	14.407	12.993	56.4
50	6.0	1.2	2.7	16.265	14.484	55.4
55	3.0	0.4	0.8	10.064	9.250	61.7
55	4.5	0.7	1.6	12.225	11.250	60.4
55	6.0	1.2	2.7	13.632	12.481	59.5
60	3.0	0.4	0.8	8.560	7.569	65.7
60	4.5	0.7	1.6	10.254	9.307	64.6
60	6.0	1.2	2.7	11.223	10.277	63.7

1000 CFM Nominal Airflow TC-030

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	3.8	0.5	1.2	16.369	15.150	53.7
45	5.6	1.1	2.4	19.937	18.055	52.1
45	7.5	1.8	4.1	22.209	19.672	50.9
50	3.8	0.5	1.2	14.115	13.516	57.5
50	5.6	1.1	2.4	17.032	16.062	56.1
50	7.5	1.8	4.1	18.697	17.317	55.0
55	3.8	0.5	1.2	12.056	11.674	61.4
55	5.6	1.1	2.4	14.344	13.853	60.1
55	7.5	1.8	4.1	15.418	14.742	59.1
60	3.8	0.5	1.2	10.208	9.604	65.4
60	5.6	1.0	2.4	11.889	11.414	64.2
60	7.5	1.8	4.1	12.383	11.935	63.3

1200 CFM Nominal Airflow TC-036

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	4.5	0.3	0.7	18.768	17.626	53.3
45	6.8	0.9	2.1	22.404	20.058	51.6
45	9.0	1.7	4.0	25.142	21.717	50.6
50	4.5	0.3	0.6	16.318	15.344	57.3
50	6.8	0.9	2.0	19.284	17.552	55.7
50	9.0	1.7	4.0	21.383	19.009	54.8
55	4.5	0.3	0.6	13.912	12.951	61.2
55	6.8	0.9	2.1	16.212	14.929	59.8
55	9.0	1.8	4.1	17.675	16.181	58.9
60	4.5	0.4	0.8	11.549	10.445	65.1
60	6.8	1.0	2.3	13.190	12.188	63.9
60	9.0	1.9	4.5	14.020	13.232	63.1

Interpolation is permissable, extrapolation is not. All entering air conditions are 80°F DB and 67°F WB. See performance correction tables for operating conditions other than those listed above.

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Waterside Economizer Data

1400 CFM Nominal Airflow TC-042

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	5.3	0.5	1.1	21.057	20.113	53.0
45	7.9	1.3	3.0	25.064	22.800	51.4
45	10.5	2.4	5.6	27.879	24.488	50.3
50	5.3	0.4	1.0	18.254	17.544	57.0
50	7.9	1.3	2.9	21.453	19.959	55.4
50	10.5	2.4	5.6	23.492	21.398	54.5
55	5.3	0.5	1.1	15.497	14.853	60.9
55	7.9	1.3	3.0	17.895	16.990	59.5
55	10.5	2.5	5.8	19.160	18.176	58.6
60	5.3	0.6	1.3	12.787	12.039	64.9
60	7.9	1.4	3.3	14.389	13.893	63.7
60	10.5	2.7	6.2	14.884	14.823	62.8

1600 CFM Nominal Airflow TC-048

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	6.0	0.9	2.2	29.364	26.323	54.8
45	9.0	1.5	3.4	34.188	29.606	52.6
45	12.0	2.1	4.9	37.671	31.675	51.3
50	6.0	1.0	2.2	25.063	22.810	58.4
50	9.0	1.5	3.4	28.940	25.807	56.4
50	12.0	2.2	5.0	31.653	27.659	55.3
55	6.0	1.0	2.2	21.061	19.070	62.0
55	9.0	1.5	3.4	24.060	21.779	60.3
55	12.0	2.2	5.0	26.048	23.413	59.3
60	6.0	0.9	2.2	17.384	15.081	65.8
60	9.0	1.5	3.4	19.572	17.506	64.3
60	12.0	2.2	5.0	20.879	18.924	63.5

2000 CFM Nominal Airflow TC-060

	Waterside			Capacity		
EWT °F	FLOW (gpm)	PD (psi)	PD (ft)	TC	SC	LWT
45	7.5	1.2	2.7	33.525	32.134	53.9
45	11.3	1.9	4.5	38.794	35.768	51.9
45	15.0	3.0	6.9	42.388	37.813	50.7
50	7.5	1.2	2.8	28.521	27.934	57.6
50	11.3	2.0	4.6	32.687	31.220	55.8
50	15.0	3.0	6.9	35.360	32.993	54.7
55	7.5	1.2	2.8	23.862	23.471	61.4
55	11.3	2.0	4.6	26.996	26.408	59.8
55	15.0	3.0	7.0	28.793	27.909	58.8
60	7.5	1.2	2.7	19.574	18.723	65.2
60	11.3	2.0	4.6	21.744	21.316	63.9
60	15.0	3.0	7.0	22.709	22.548	63.0

Interpolation is permissable, extrapolation is not. All entering air conditions are 80°F DB and 67°F WB. See performance correction tables for operating conditions other than those listed above.

PD Table For WSE 3 Way Valve

	Econ - On	Econ -Off
Model	CV	
006	5.6	4.9
009	5.6	4.9
012	5.6	4.9
015	11.7	5.8
018	11.7	5.8
024	11.7	5.8
030	11.7	5.8
036	11.7	5.8
042	11.7	5.8
048	18.7	9.3
060	18.7	9.3

Airside PD

		AirSide PD Adder (in. wg) at CFM				
Model	Rated Airflow	150	175	200	225	250
TC*006	225	0.03	0.03	0.04	0.05	0.06
Model	Rated Airflow	225	260	300	340	375
TC*009	300	0.05	0.06	0.07	0.09	0.10
Model	Rated Airflow	300	350	400	450	500
TC*012	400	0.07	0.09	0.11	0.13	0.15
Model	Rated Airflow	375	437.5	500	562.5	625
TC*015	500	0.03	0.04	0.05	0.06	0.07
Model	Rated Airflow	450	525	600	675	750
TC*018	600	0.04	0.06	0.07	0.08	0.10
Model	Rated Airflow	600	700	800	900	1000
TC*024	800	0.05	0.07	0.08	0.10	0.12
Model	Rated Airflow	750	875	1000	1125	1250
TC*030	1000	0.08	0.10	0.12	0.14	0.16
Model	Rated Airflow	900	1050	1200	1350	1500
TC*036	1200	0.07	0.09	0.11	0.13	0.16
Model	Rated Airflow	1050	1225	1400	1575	1750
TC*042	1400	0.09	0.12	0.14	0.17	0.21
Model	Rated Airflow	1200	1400	1600	1800	2000
TC*048	1600	0.06	0.08	0.10	0.12	0.15
Model	Rated Airflow	1500	1750	2000	2250	2500
TC*060	2000	0.09	0.12	0.15	0.17	0.20

Add WSE to your duct static to get total ESP. Check blower performance table to be sure you meet CFM requirement and are within operational range.

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Entering Air Correction Table for WSE

Full Load Cooling Corrections 400 CFM per Ton										
Ent Air WB °F	Total Clg Cap	Sens Clg Cap Multipliers - Entering DB °F								
		65	70	75	80	80.6	85	90	95	100
50	0.352	*	*	*	*	*	*	*	*	*
55	0.507	0.615	0.766	*	*	*	*	*	*	*
60	0.693	0.542	0.740	0.912	*	*	*	*	*	*
65	0.906		0.623	0.842	1.035	1.057	*	*	*	*
66.2	0.962		0.582	0.811	1.016	1.039	1.195	*	*	*
67	1.000		0.551	0.788	1.000	1.024	1.187	*	*	*
70	1.148			0.681	0.920	0.947	1.135	1.324	*	*
75	1.420				0.715	0.748	0.976	1.211	1.421	1.421

* Sensible capacity equals total capacity.
AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F DB/ 66.2°F WB, and Heating -68°F DB/ 59°F WB entering air temperature.

Air Flow Correction Table

Airflow	Cooling Corrections	
% Normal Capacity	Sensible Capacity	Sens/Total Ratio
75	0.834	0.940
81.25	0.878	0.957
87.5	0.921	0.972
93.75	0.962	0.987
100	1.000	1.000
106.25	1.036	1.012
112.5	1.071	1.023
118.75	1.103	1.033
125	1.133	1.042

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The ECM fan is controlled by an interface board that converts thermostat inputs and field selectable CFM settings to signals used by the ECM motor controller. Fan speeds are selected with DIP switch settings. To take full advantage of the ECM motor staging features, a multi-stage thermostat should be used (2-stage heat/2-stage cool or 3-stage heat/2-stage cool).

Note: Power must be off to the unit for at least three seconds before the ECM motor will recognize a speed change. The motor will recognize a change in the CFM Adjust or dehumidification mode settings while the unit is powered.

There are four different airflow settings from lowest airflow rate (speed tap 1) to the highest airflow rate (speed tap 4). The charts below indicate settings for the ECM interface board, followed by detailed information for each setting.

Cooling Settings: The cooling setting determines the cooling (normal) CFM for all units with ECM motor. Cooling (normal) setting is used when the unit is not in dehumidification mode. Tap 1 is the lowest CFM setting, while tap 4 is the highest CFM setting. To avoid air coil freeze-up, tap 1 may not be used if the dehumidification mode is selected. Consult the ECM blower performance data table for the specific unit series and model to correlate speed tap setting to airflow in CFM.

Heating Settings: The heating setting determines the heating CFM. Tap 1 is the lowest CFM setting, while tap 4 is the highest CFM setting. Consult the ECM blower performance data table for the specific unit series and model to correlate speed tap setting to airflow in CFM.

CFM Adjust Settings: The CFM adjust setting allows four selections. The NORM setting is the factory default position. The + or – settings adjust the airflow by +/- 5%. The +/- settings are used to "fine tune" airflow adjustments. The TEST setting runs the ECM motor at 400 cfm/ton, which causes the motor to operate like a standard PSC motor, and disables the CFM counter.

Dehumidification Mode Settings: The dehumidification mode setting provides field selection of humidity control. When operating in the normal mode, the cooling airflow settings are determined by the cooling tap setting above. When dehumidification is enabled there is a reduction in airflow in cooling to increase the moisture removal of the heat pump. Consult submittal data or specifications catalog for the specific unit series and model to correlate speed tap to airflow in CFM. The dehumidification mode can be enabled in two ways.

Cooling settings

Tap Setting	DIP Switch	
	SW1	SW2
1	ON	ON
2	ON	OFF
3	OFF	ON
4	OFF	OFF

Heating settings

Tap Setting	DIP Switch	
	SW3	SW4
1	ON	ON
2	ON	OFF
3	OFF	ON
4	OFF	OFF

CFM Adjust settings

Tap Setting	DIP Switch	
	SW7	SW8
TEST	ON	ON
-	ON	OFF
+	OFF	ON
NORM	OFF	OFF

Dehum Mode settings

Tap Setting	DIP Switch
	SW9
NORM	ON
Dehumid	OFF

Only DIP switch numbers 1 to 4 and 7 to 9 are used.

⚠ WARNING! ⚠

WARNING! When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

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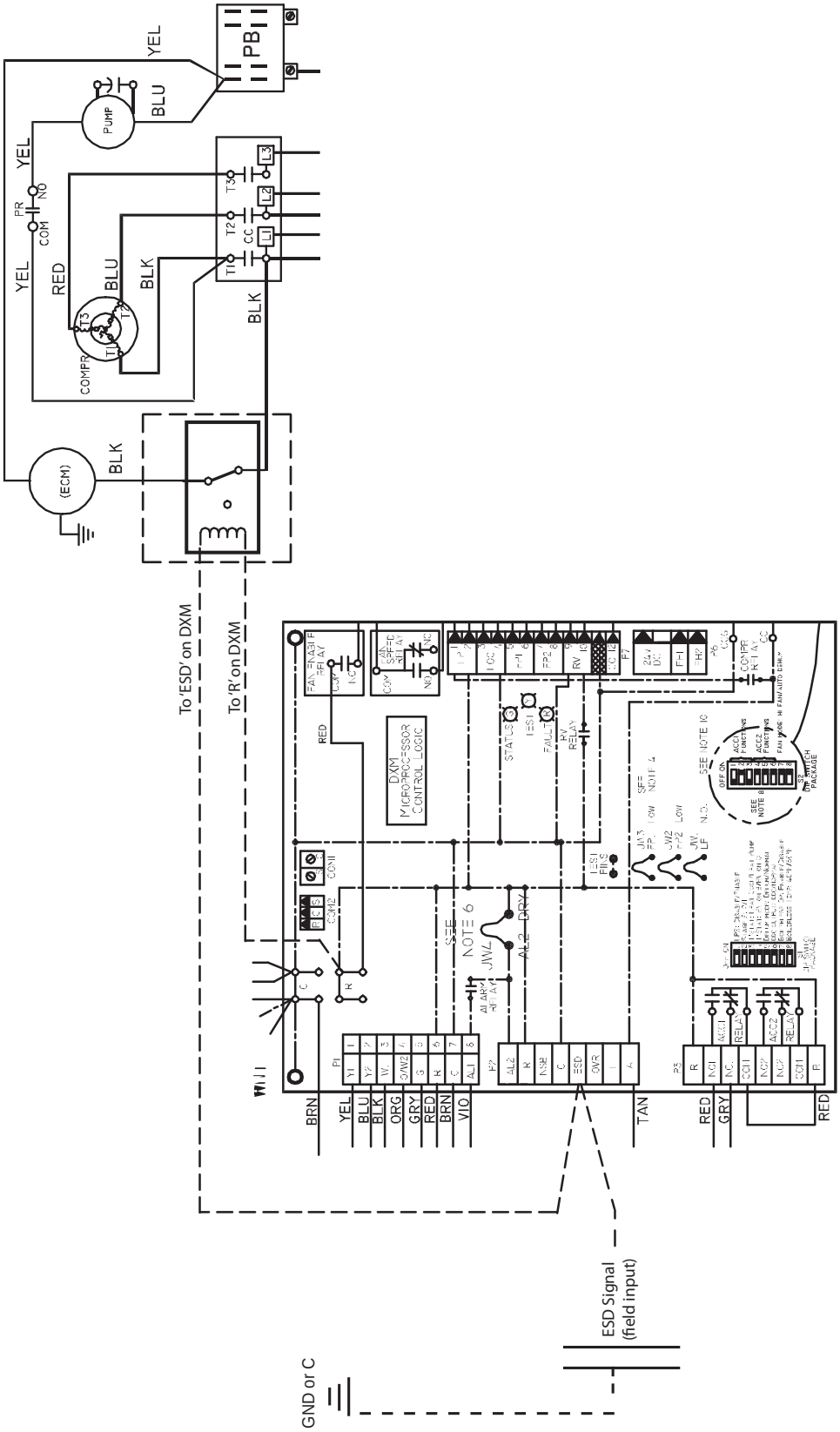
1. **Constant Dehumidification Mode:** When the dehumidification mode is selected (via DIP switch or jumper setting), the ECM motor will operate with a multiplier applied to the cooling CFM settings (approx. 20-25% lower airflow). Any time the unit is running in the cooling mode, it will operate at the lower airflow to improve latent capacity. The "DEHUM" LED will be illuminated at all times. Heating airflow is not affected. Note: Do not select dehumidification mode if cooling setting is tap 1.

2. **Automatic (Humidistat-controlled)** Dehumidification Mode: When the dehumidification mode is selected (via DIP switch) AND a humidistat is connected to terminal DH, the cooling airflow will only be reduced when the humidistat senses that additional dehumidification is required. The DH terminal is reverse logic. Therefore, a humidistat (not dehumidistat) is required. The "DEHUM" LED will be illuminated only when the humidistat is calling for dehumidification mode. Heating airflow is not affected. The ECM motor includes "soft start" and "ramp down" features. The soft start feature is a gentle increase of motor rpm at blower start up. This creates a much quieter blower start cycle.Note: Do not select dehumidification mode if cooling setting is Tap 1.

The ramp down feature allows the blower to slowly decrease rpm to a full stop at the end of each blower cycle. This creates a much quieter end to each blower cycle and adds overall unit efficiency.

The ramp down feature may be eliminated during an ESD (Emergency Shut Down) situation when using a DXM unit controller. A relay is required to break the line voltage to the ECM motor during ESD. This relay can be wired as shown below to eliminate the ramp down (and operation) of the ECM blower motor.

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Physical Data

TC Series	006	009	012	015	018	024	030	036	041	042	048	060
Compressor (1 Each)	Rotary					Scroll						
Factory Charge HFC-410A (oz)	17	18.5	23	32	43	40	47	50	70	70	74	82
ECM Fan Motor & Blower												
Blower Wheel Size (Dia x w)	N/A	N/A	N/A	9x7	9x7	9x7	9x7	9x8	N/A	9x8	10x10	11x10
PSC Fan Motor & Blower												
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC-3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Blower Wheel Size (Dia x w)	5x5	5x5	6x5	8x7	8x7	9x7	9x7	9x8	9x8	9x8	10x10	11x10
Water Connection Size												
FPT	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"
Coax Volume (gallons)	0.123	0.143	0.167	0.286	0.450	0.286	0.323	0.323	0.890	0.890	0.738	0.939
Vertical												
Air Coil Dimensions (H x W)	10x15	10x15	10x15	20x17.25	20x17.25	20x17.25	20x17.25	24x21.75	20x17.25	24x21.76	24x28.25	24x28.25
Filter Standard - 1" Throwaway	10x18	10x18	10x18	20x20	20x20	20x20	20x20	24x24	20x20	24x24	1-14x24, 1-18x24	1-14x24, 1-18x24
Weight - Operating (lbs.)	103	105	114	153	158	189	197	203	210	218	263	278
Weight - Packaged (lbs.)	113	115	124	158	163	194	202	209	217	224	270	285
Horizontal												
Air Coil Dimensions (H x W)	10x15	10x15	10x15	16x22	16x22	16x22	16x22	20x25	N/A	20x25	20x35	20x35
Filter Standard - 1" Throwaway	10x18	10x18	10x18	16x25	16x25	18x25	18x25	20x28 or 2-20x14	N/A	20x28 or 2-20x14	1-20x24, 1-20x14	1-20x24, 1-20x14
Weight - Operating (lbs.)	103	105	114	153	158	174	182	203	N/A	218	263	278
Weight - Packaged (lbs.)	113	115	124	158	163	179	187	209	N/A	224	270	285

Notes:
All units have TXV expansion device, and 1/2" & 3/4" electrical knockouts.
FPT = Female Pipe Thread
Condensate Drain Connection is 3/4" FPT.
575 volt fan motors are two speed.
Models 006, 009, 012 compressor are mounted on springs. Installer must loosen bolts and remove shipping bracket.

Unit Maximum Water Working Pressure	Max Pressure PSIG [kPa]
Base Unit	500 [3447]
WSE Option	300 [2068]

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TC - Horizontal – Dimensional Data

Horizontal Model		Overall Cabinet		
		A Width	B Length	C Height
006 - 012	in	19.1	34.1	11.1
	cm	48.5	86.6	28.2
015 - 018	in	20.1	43.1	17.0
	cm	51.1	109.5	43.2
024 - 030	in	20.1	43.1	18.3
	cm	51.1	109.5	46.5
036 - 042	in	20.1	47.1	21.0
	cm	51.1	119.6	53.3
048 - 060	in	24.1	54.1	21.0
	cm	61.2	137.4	53.3

Horizontal Model		Electrical Knockouts		
		H 1/2”	J 1/2”	K 3/4”
		Low Voltage	Low Voltage	Power Supply
006 - 012	in	8.1	5.1	2.1
	cm	20.6	13.0	5.4
015 - 030	in	12.1	9.1	6.1
	cm	30.8	23.2	15.6
036 - 060	in	16.1	13.1	10.1
	cm	41.0	33.3	25.7

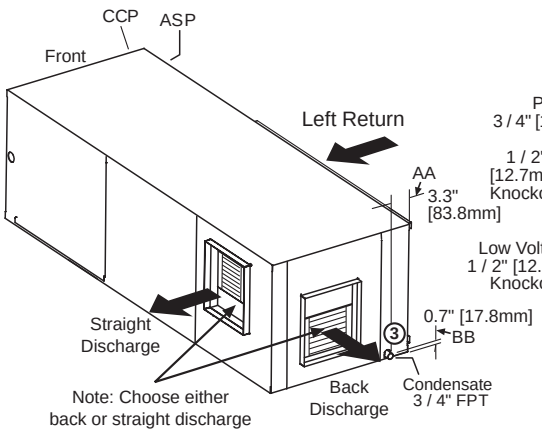
Horizontal Model		Water Connections						
		①		②		③		Loop In/Out FPT
		Loop In D	Loop In E	Loop Out F	Loop Out G	Cond. 3/4” FPT		
						AA	BB	
006 - 012	in	5.6	1.1	1.6	1.1	3.3	0.7	1/2”
	cm	14.2	2.7	4.1	2.7	8.4	1.8	
015	in	15.1	1.4	3.2	1.4	3.3	0.7	1/2”
	cm	38.4	3.4	8.1	3.5	8.4	1.8	
018	in	15.1	1.4	4.1	1.4	3.3	0.7	1/2”
	cm	38.4	3.4	10.4	3.5	8.4	1.8	
024	in	16.4	1.4	4.4	1.4	3.3	0.7	3/4”
	cm	41.7	3.4	11.3	3.5	8.4	1.8	
030	in	16.4	1.4	3.1	1.4	3.3	0.7	3/4”
	cm	41.7	3.4	7.8	3.5	8.4	1.8	
036	in	19.1	1.4	5.3	1.4	3.3	0.7	3/4”
	cm	48.5	3.4	13.4	3.5	8.4	1.8	
042	in	19.1	1.4	4.4	1.4	3.3	0.7	3/4”
	cm	48.5	3.4	11.3	3.5	8.4	1.8	
048	in	19.1	1.4	4.4	1.4	3.3	0.7	1”
	cm	48.5	3.4	11.1	3.5	8.4	1.8	
060	in	19.1	1.4	3.8	1.4	3.3	0.7	1”
	cm	48.5	3.4	9.7	3.5	8.4	1.8	

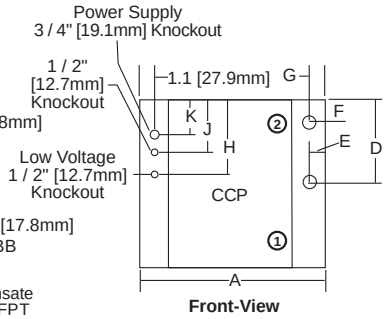
Horizontal Model		Discharge Connection Duct Flange Installed (+/- 0.10 in, +/- 2.5mm)					Return Connection Using Return Air Opening			
		L	M Supply Height	N Supply Width	O	P	Q Return Width	R Return Height	S	T
006 - 012	in	0.8	8.9	6.7	6.0	1.3	16.1	9.8	1.1	0.6
	cm	1.9	22.7	17.0	15.2	3.3	41.0	25.0	2.7	1.5
015 - 018	in	2.6	13.3	9.9	4.1	1.3	23.0	15.0	1.1	1.0
	cm	6.6	33.8	25.1	10.5	3.3	58.4	38.1	2.8	2.5
024 - 030	in	2.6	13.3	9.9	4.1	1.3	23.0	16.3	1.1	1.0
	cm	6.6	33.8	25.1	10.5	3.3	58.4	41.4	2.8	2.5
036 - 042	in	2.5	16.1	11.0	3.0	2.5	25.9	19.0	1.1	1.0
	cm	6.3	40.9	27.9	7.7	6.4	65.8	48.3	2.8	2.5
048	in	3.7	16.1	13.7	4.1	1.3	35.9	19.0	1.1	1.0
	cm	9.5	41.0	34.8	10.3	3.2	91.2	48.3	2.8	2.5
060	in	1.7	18.1	13.7	4.1	1.3	35.9	19.0	1.1	1.0
	cm	4.4	46.0	34.8	10.3	3.2	91.2	48.3	2.8	2.5

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TC - Horizontal – Dimensional Data

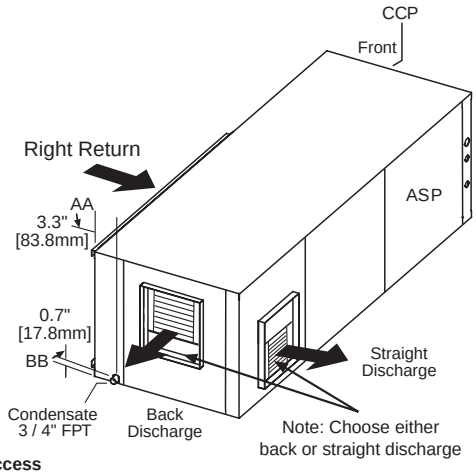
LEFT RETURN



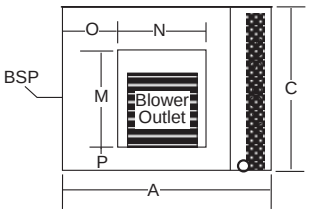


Front-View

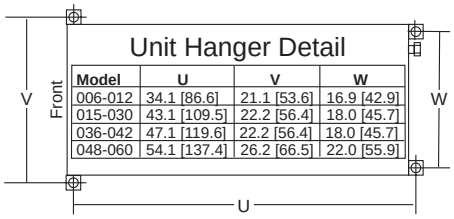
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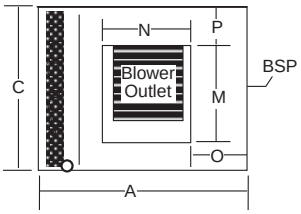


Note: Blower service panel requires 2' service access

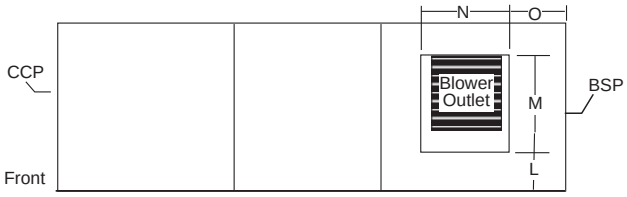


Left Return Back Discharge

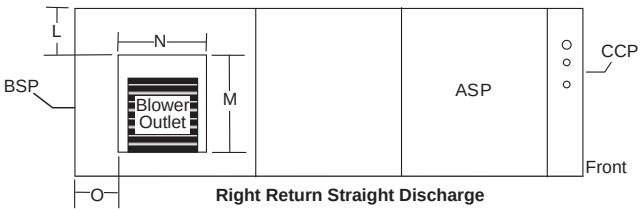




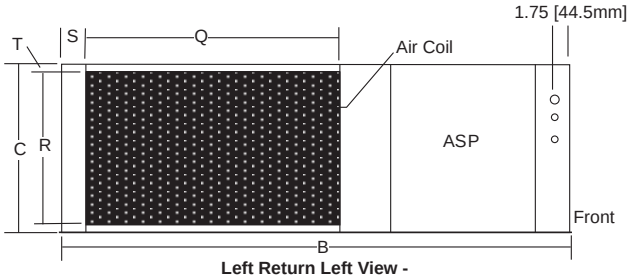
Right Return Back Discharge



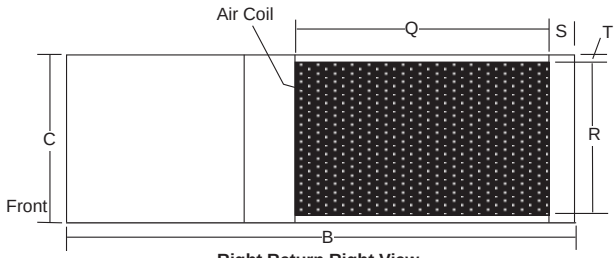
Left Return Straight Discharge



Right Return Straight Discharge



Left Return Left View - Air Coil Opening



Right Return Right View - Air Coil Opening

Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the ClimateMaster Accessory Submittal set for futher information on this frame.
3. Discharge flange and hanger brackets are factory installed.
4. Condensate is 3/4" FPT.
5. Blower service panel requires 2' service access.
6. Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units

Legend:
CCP = Control/Compressor Access Panel
BSP = Blower Service Panel
*ASP = Additional Service Panel (not required)

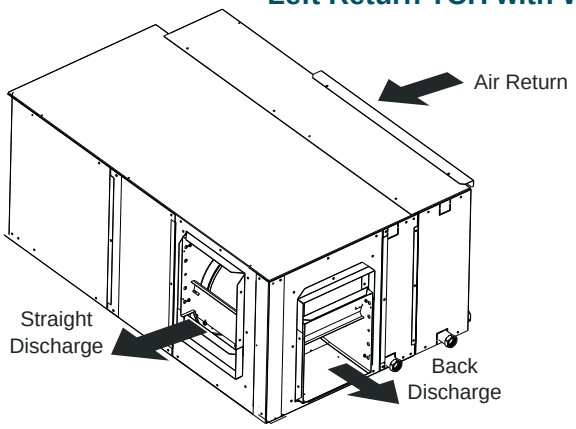
Note:
*ASP are removable panels that provide additional access to the units interior.
Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.

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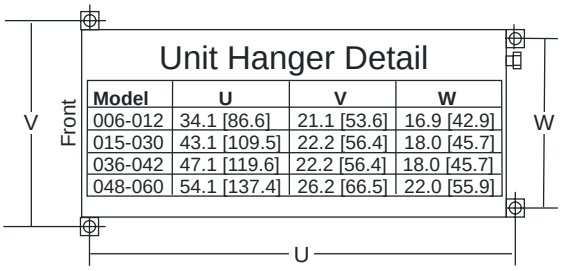
TCH with Left Hand Waterside Economizer-Dimensional Data

Horizontal Model		Overall Cabinet			WSE	Left WSE Connections							Return Connection Using Return Air Opening			
		A Width	B Length	C Height	H Width	In		Out		Cond. 3/4" FBT		Water In/Out FPT	Q Return Width	R Return Height	S	T
						D	E	F	G	AA	BB					
006-012	in	26.1	34.1	11.0	7.1	4.7	3.5	8.0	3.5	3.5	0.8	1/2"	16.1	10.0	1.5	0.3
	cm	66.3	86.6	27.9	18.0	11.9	8.9	20.3	8.9	8.9	2.0		40.9	25.4	3.8	0.8
015-018	in	27.2	43.1	17.0	7.1	5.3	3.5	11.5	3.5	3.5	0.8	1/2"	23.0	16.0	1.5	0.3
	cm	69.1	109.5	43.2	18.0	13.5	8.9	29.2	8.9	8.9	2.0		58.4	40.6	3.8	0.8
024-030	in	27.2	43.1	18.2	7.1	5.1	3.5	21.1	3.5	3.5	0.8	3/4"	22.9	16.0	1.5	0.3
	cm	69.1	109.5	46.2	18.0	13.0	8.9	53.6	8.9	8.9	2.0		58.2	40.6	3.8	0.8
036-042	in	27.2	47.1	21.0	7.1	6.5	3.5	14.0	3.5	3.5	0.8	3/4"	26.0	20.0	1.5	0.3
	cm	69.1	119.6	53.3	18.0	16.5	8.9	35.6	8.9	8.9	2.0		66.0	50.8	3.8	0.8
048-060	in	31.6	54.1	21.0	7.5	5.0	1.3	15.9	1.3	3.5	0.8	3/4"	36.0	20.0	1.5	0.3
	cm	80.3	137.4	53.3	19.1	12.7	3.3	40.4	3.3	8.9	2.0		91.4	50.8	3.8	0.8

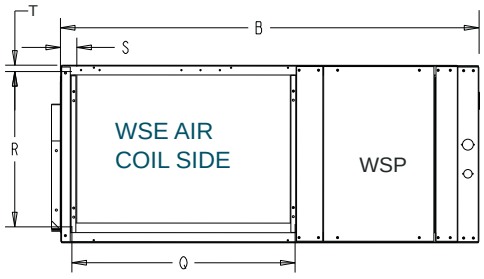
Left Return TCH with WSE

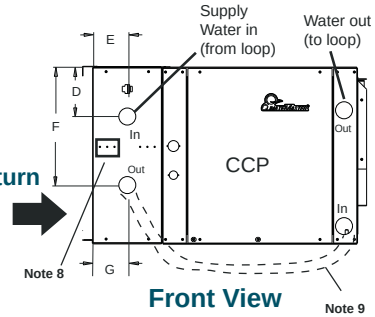


Unit Hanger Detail

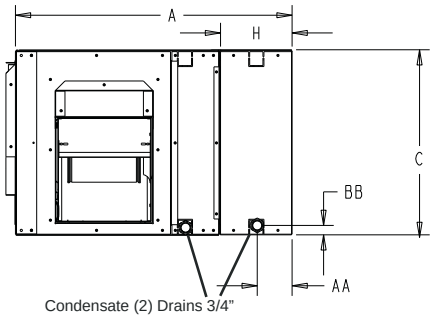


Model	U	V	W
006-012	34.1 [86.6]	21.1 [53.6]	16.9 [42.9]
015-030	43.1 [109.5]	22.2 [56.4]	18.0 [45.7]
036-042	47.1 [119.6]	22.2 [56.4]	18.0 [45.7]
048-060	54.1 [137.4]	26.2 [66.5]	22.0 [55.9]





Front View Left Return



Back View

Notes:

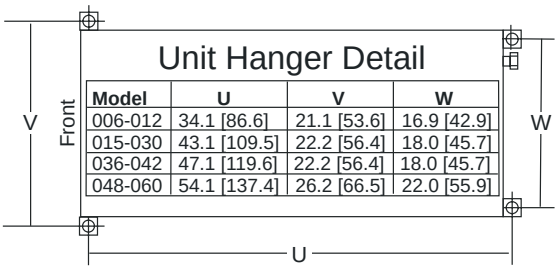
1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the ClimateMaster Accessory Submittal set for futher information on this frame.
3. Discharge flange and hanger brackets are factory installed
6. Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units.
7. Filters same size as standard unit
8. Factory supplied controller (aquastat) is shipped inside unit open waterside economizer panel (WSP), remove, slide onto dinrail, and connect molex.
9. WSE to unit piping to be field fabricated, Run below or in front. Must leave room to remove front access panel (CCP) to service unit.
10. External trap and vent both drains before joining

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TCH with Right Hand Waterside Economizer-Dimensional Data

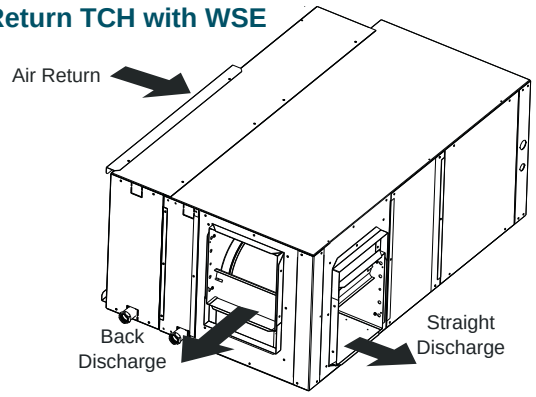
Horizontal Model		Overall Cabinet			WSE	Left WSE Connections							Return Connection Using Return Air Opening			
		A Width	B Length	C Height	H Width	In		Out		Cond. 3/4" FBT		Water In/Out FPT	Q Return Width	R Return Height	S	T
						D	E	F	G	AA	BB					
006-012	in	26.1	34.1	11.0	7.1	8.0	3.5	4.7	3.5	3.5	0.8	1/2"	16.1	10.0	1.5	0.3
	cm	66.3	86.6	27.9	18.0	20.3	8.9	11.9	8.9	8.9	2.0		40.9	25.4	3.8	0.8
015-018	in	27.2	43.1	17.0	7.1	11.5	3.5	5.3	3.5	3.5	0.8	1/2"	23.0	16.0	1.5	0.3
	cm	69.1	109.5	43.2	18.0	29.2	8.9	13.5	8.9	8.9	2.0		58.4	40.6	3.8	0.8
024-030	in	27.2	43.1	18.2	7.1	21.1	3.5	5.1	3.5	3.5	0.8	3/4"	22.9	16.0	1.5	0.3
	cm	69.1	109.5	46.2	18.0	53.6	8.9	13.0	8.9	8.9	2.0		58.2	40.6	3.8	0.8
036-042	in	27.2	47.1	21.0	7.1	14.0	3.5	6.5	3.5	3.5	0.8	3/4"	26.0	20.0	1.5	0.3
	cm	69.1	119.6	53.3	18.0	35.6	8.9	16.5	8.9	8.9	2.0		66.0	50.8	3.8	0.8
048-060	in	31.6	54.1	21.0	7.5	15.9	1.3	5.0	1.3	3.5	0.8	3/4"	36.0	20.0	1.5	0.3
	cm	80.3	137.4	53.3	19.1	40.4	3.3	12.7	3.3	8.9	2.0		91.4	50.8	3.8	0.8

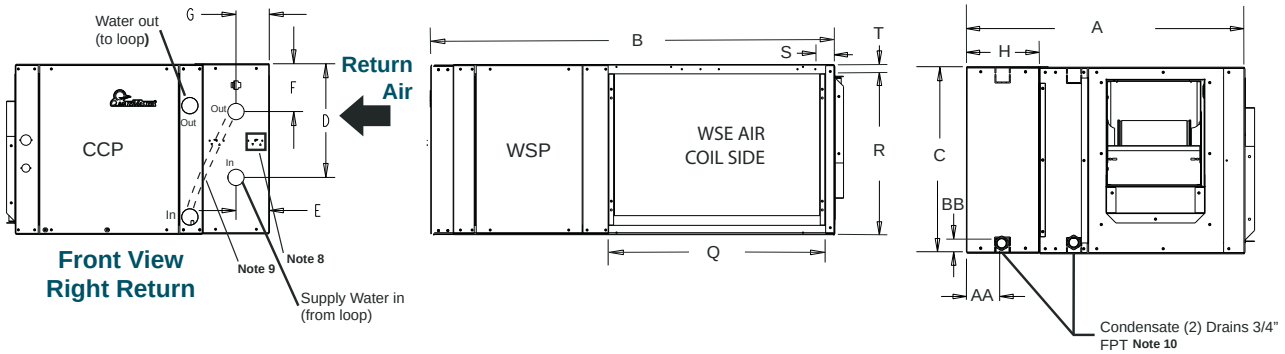
Unit Hanger Detail



Model	U	V	W
006-012	34.1 [86.6]	21.1 [53.6]	16.9 [42.9]
015-030	43.1 [109.5]	22.2 [56.4]	18.0 [45.7]
036-042	47.1 [119.6]	22.2 [56.4]	18.0 [45.7]
048-060	54.1 [137.4]	26.2 [66.5]	22.0 [55.9]

Right Return TCH with WSE





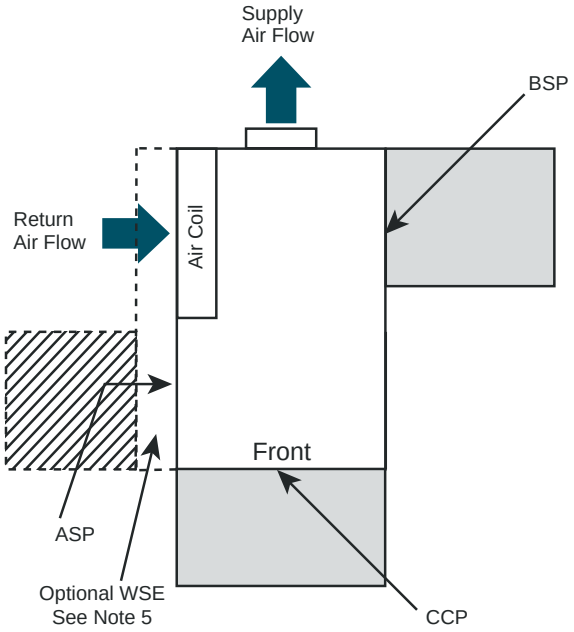
Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the ClimateMaster Accessory Submittal set for futher information on this frame.
3. Discharge flange and hanger brackets are factory installed.
4. Condensate drains are 3/4" FPT.
5. Blower service panel requires 2' service access.
6. Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units.
7. Filters same size as standard unit
8. Factory supplied controller (aquastat) is shipped inside unit open waterside economizer panel (WSP), remove, slide onto dinrail, and connect molex.
9. WSE to unit piping to be field fabricated, Run below or in front. Must leave room to remove front access panel (CCP) to service unit.
10. External trap and vent both drains before joining.

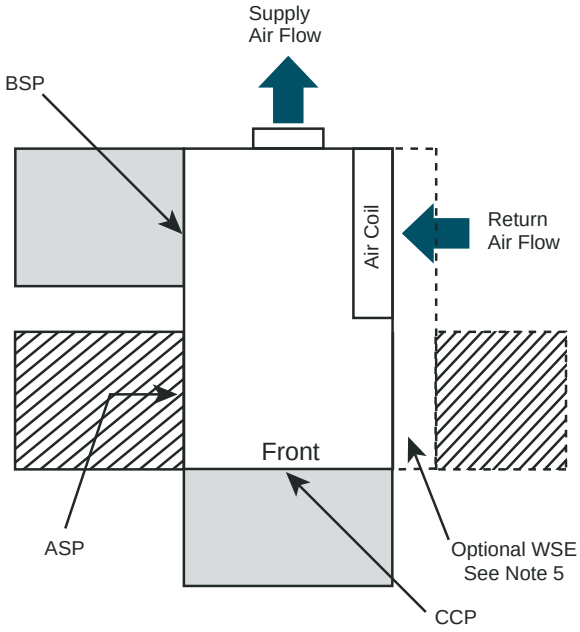
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TC - Horizontal Service Access

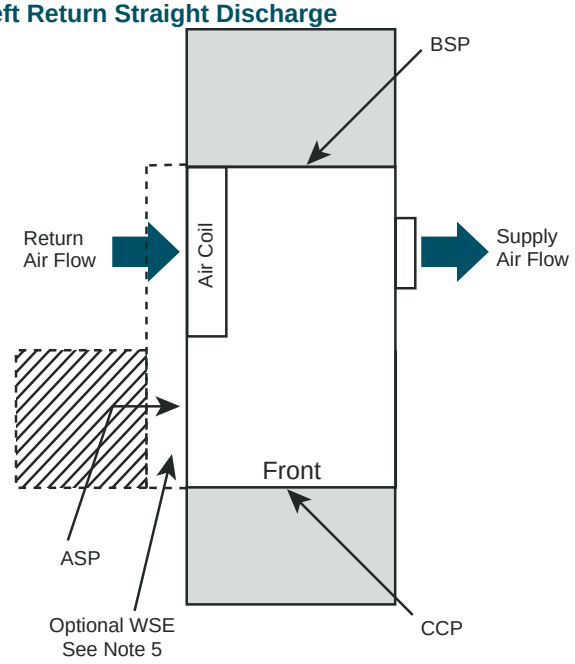
Left Return Back Discharge



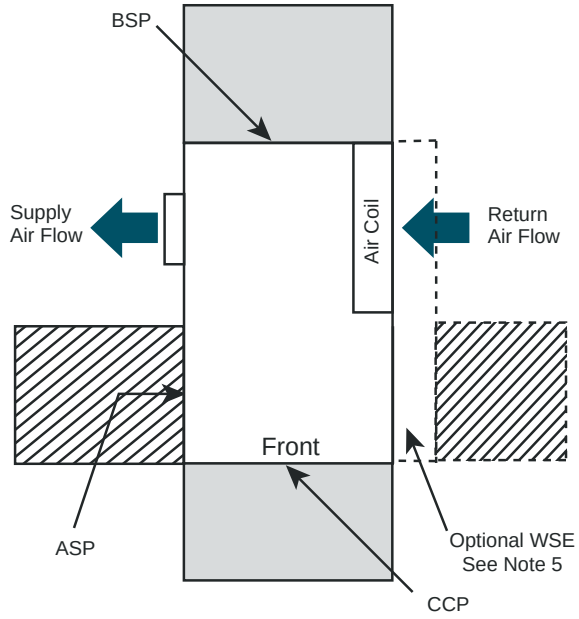
Right Return Back Discharge



Left Return Straight Discharge



Right Return Straight Discharge



= mandatory 2′ service access

= (optional) additional 2′ service access

Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. CCP and BSP requires 2' service access.
3. Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units.
4. ASP are removable panels that provide additional access to the units interior. Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.
5. Units with WSE must have access to water valve through side access panel.

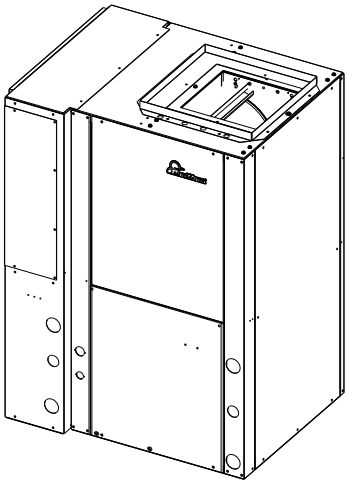
Legend:
CCP = Control/Compressor Access Panel
BSP = Blower Service Panel
ASP = Additional Service Panel (not required)
WSE = Waterside Economizer

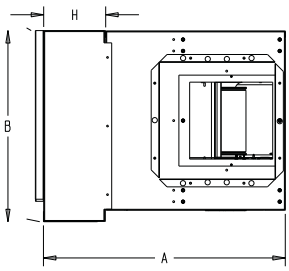
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TCV with Left Hand Waterside Economizer-Dimensional Data

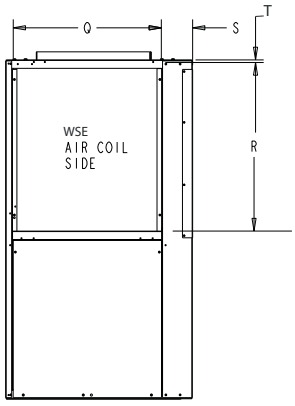
Horizontal Model		Overall Cabinet			WSE	WSE Connections							Return Connection Using Return Air Opening			
		A Width	B Length	C Height	H Width	In		Out		Cond. 3/4" FBT		Water In/Out FPT	Q Return Width	R Return Height	S	T
						D	E	F	G	AA	BB					
006-012	in	26.1	21.2	22.0	7.1	8.1	5.5	2.1	5.5	5.1	5.5	1/2"	16.1	10.0	4.2	0.4
	cm	66.3	53.8	55.9	18.0	20.6	14.0	5.3	14.0	13.0	14.0		40.9	25.4	10.7	1.0
015-018	in	28.9	23.2	38.9	7.4	10.8	6.0	2.6	6.0	7.1	6.0	1/2"	18.1	20.0	3.8	0.3
	cm	73.4	58.9	98.8	18.8	27.4	15.2	6.6	15.2	18.0	15.2		46.0	50.8	9.7	0.8
024-030	in	29.0	24.7	40.0	7.4	11.6	6.0	2.6	6.0	7.1	6.0	3/4"	18.1	20.0	3.8	0.3
	cm	73.7	62.7	101.6	18.8	29.5	15.2	6.6	15.2	18.0	15.2		46.0	50.8	9.7	0.8
036-042	in	29.0	28.7	45.0	7.4	12.1	6.0	2.6	6.0	7.1	6.0	3/4"	22.7	24.0	4.6	0.1
	cm	73.7	72.9	114.3	18.8	29.5	15.2	6.6	15.2	18.0	15.2		57.7	61.0	11.7	0.3
048-060	in	31.2	37.2	46.0	7.0	12.1	5.8	3.1	5.8	7.1	5.8	3/4"	29.3	24.0	5.0	0.1
	cm	79.2	94.5	116.8	17.8	30.7	14.7	7.9	14.7	18.0	14.7		74.4	61.0	12.7	0.3

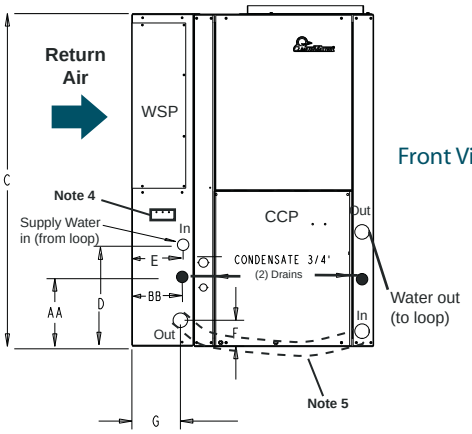
Left Return TCV with WSE





Top View





Front View Left Return

Notes:

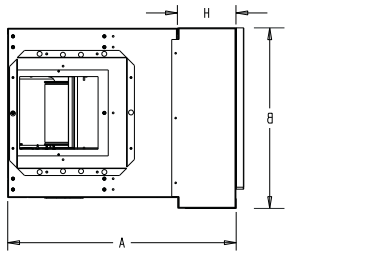
1. Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the Climate Master Accessory Submittal set for futher information on this frame.
2. Condensate drains are 3/4" FPT, both are internally trapped, externally vent both drains before joining.
3. Filters same size as standard unit.
4. Factory supplied controller (aquastat) is shipped inside unit, open waterside economizer panel (WSP), remove, slide onto dinrail, and connect molex.
5. WSE to unit piping to be field fabricated, run below or in front. Must leave room to remove front access panel (CCP) to service unit.

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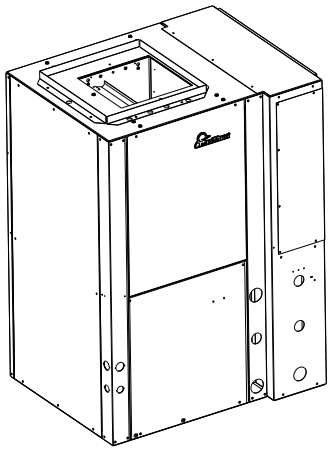
TCV with Right Hand Waterside Economizer-Dimensional Data

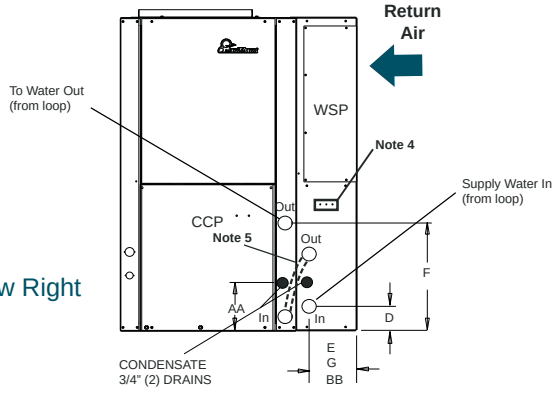
Horizontal Model		Overall Cabinet			WSE	WSE Connections							Return Connection Using Return Air Opening			
		A Width	B Length	C Height	H Width	In		Out		Cond. 3/4" FBT		Water In/Out FPT	Q Return Width	R Return Height	S	T
						D	E	F	G	AA	BB					
006-012	in	26.1	21.2	22.0	7.1	2.1	5.5	8.1	5.5	5.1	5.5	1/2"	16.1	10.0	4.2	0.4
	cm	66.3	53.8	55.9	18.0	5.3	14.0	20.6	14.0	13.0	14.0		40.9	25.4	10.7	1.0
015-018	in	28.9	23.2	38.9	7.4	2.6	6.0	10.8	6.0	7.1	6.0	1/2"	18.1	20.0	3.8	0.3
	cm	73.4	58.9	98.8	18.8	6.6	15.2	27.4	15.2	18.0	15.2		46.0	50.8	9.7	0.8
024-030	in	29.0	24.7	40.0	7.4	2.6	6.0	11.6	6.0	7.1	6.0	3/4"	18.1	20.0	3.8	0.3
	cm	73.7	62.7	101.6	18.8	6.6	15.2	29.5	15.2	18.0	15.2		46.0	50.8	9.7	0.8
036-042	in	29.0	28.7	45.0	7.4	2.6	6.0	12.1	6.0	7.1	6.0	3/4"	22.7	24.0	4.6	0.1
	cm	73.7	72.9	114.3	18.8	6.6	15.2	29.5	15.2	18.0	15.2		57.7	61.0	11.7	0.3
048-060	in	31.2	37.2	46.0	7.0	3.1	5.8	12.1	5.8	7.1	5.8	3/4"	29.3	24.0	5.0	0.1
	cm	79.2	94.5	116.8	17.8	7.9	14.7	30.7	14.7	18.0	14.7		74.4	61.0	12.7	0.3

Right Return TCV with WSE

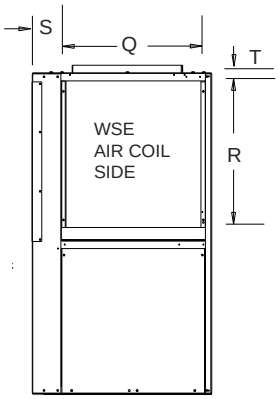


Top View





Front View Right Return



Notes:

1. Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the Climate Master Accessory Submittal set for futher information on this frame.
2. Condensate drains are 3/4" FPT, both are internally trapped, externally vent both drains before joining.
3. Filters same size as standard unit.
4. Factory supplied controller (aquastat) is shipped inside unit, open waterside economizer panel (WSP), remove, slide onto dinrail, and connect molex.
5. WSE to unit piping to be field fabricated below or in front. Must leave room to remove front access panel(CCP) to service unit.

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TC - Vertical Upflow – Dimensional Data

Vertical Upflow Model		Overall Cabinet		
		A Width	B Depth	C Height
006 - 012	in	19.1	19.1	22.0
	cm	48.5	48.5	55.9
015 - 018	in	21.5	21.5	39.0
	cm	54.6	54.6	99.1
024 - 030, 041	in	21.5	21.5	40.0
	cm	54.6	54.6	101.6
036 - 042	in	21.5	26.0	45.0
	cm	54.6	66.0	114.3
048 - 060	in	24.0	32.5	46.0
	cm	61.0	82.6	116.8

Vertical Model		Electrical Knockouts		
		J 1/2"	K 1/2"	L 3/4"
		Low Voltage	Low Voltage	Power Supply
006 - 012	in	2.9	5.9	8.9
	cm	7.3	14.9	22.5
015 - 060	in	4.1	7.1	10.1
	cm	10.5	18.1	25.7
041	in	3.1	7.1	11.1
	cm	7.9	18.0	28.2

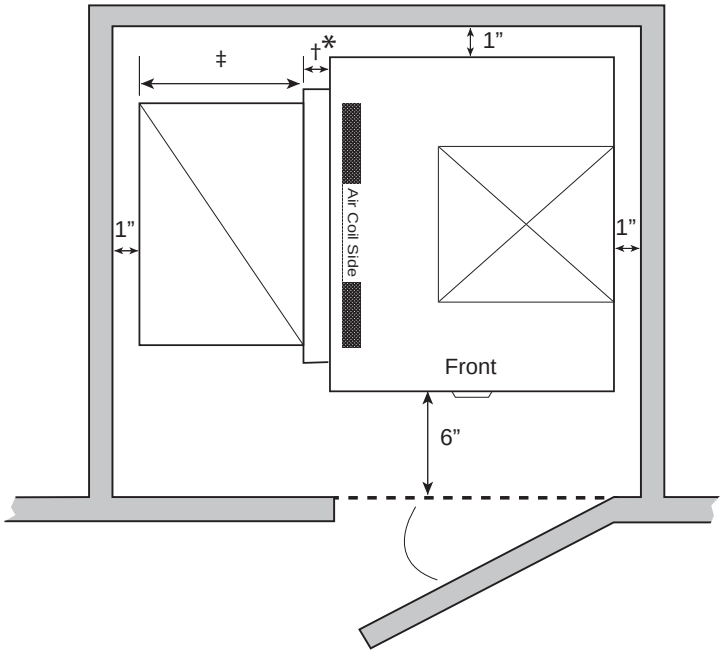
Vertical Upflow Model		Water Connections - Standard Units						
		①		②		③		
		Loop In D	Loop In E	Loop Out F	Loop Out G	Cond. 3/4" FPT H	Cond. 3/4" FPT I	Loop In/Out FPT
006 - 012	in	1.4	1.6	9.5	1.6	6.1	1.6	1/2"
	cm	3.6	4.1	24.1	4.3	15.6	4.1	
015	in	1.9	1.4	13.8	1.4	8.1	1.4	1/2"
	cm	4.8	3.6	35.1	3.6	20.6	3.6	
018	in	1.9	1.4	12.9	1.4	8.1	1.4	1/2"
	cm	4.8	3.6	32.8	3.6	20.6	3.6	
024	in	1.9	1.4	13.8	1.4	8.1	1.4	3/4"
	cm	4.8	3.6	35.1	3.6	20.6	3.6	
030	in	1.9	1.4	15.2	1.4	8.1	1.4	3/4"
	cm	4.8	3.6	38.6	3.6	20.6	3.6	
036	in	1.9	1.4	15.7	1.4	8.1	1.4	3/4"
	cm	4.8	3.6	39.9	3.6	20.6	3.6	
041	in	3.6	2.3	14.0	2.3	8.1	2.3	3/4"
	cm	4.8	5.8	35.6	5.8	20.6	5.8	
042	in	1.9	1.4	16.6	1.4	8.1	1.4	3/4"
	cm	4.8	3.6	42.0	3.6	20.6	3.6	
048	in	1.9	1.4	16.6	1.4	8.1	1.4	1"
	cm	4.8	3.6	42.2	3.6	20.6	3.6	
060	in	1.9	1.4	17.2	1.4	8.1	1.4	1"
	cm	4.8	3.6	43.7	3.6	20.6	3.6	

Notes:
1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front & Side access is preferred for service access. However, all components may be serviced from the front access panel if side access is not available. (Except on TCV 009-030 and 041 with front return) Units with the front return require left side access for the fan.
3. Discharge flange is field installed.
4. Condensate is 3/4" FPT.
5. Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the ClimateMaster Accessory Submittal set for futher information on this frame.

Legend:
CCP = Control/Compressor Access Panel
BSP = Blower Service Panel
ASP = Alternative Service Panel

Recommended Minimum Installation Clearances for Vertical Units*	
1"	Back of unit
	Side opposite return air
6"	Front if hard piped
Return Air Side	
1"	Ducted return - ‡ *Add for duct width - † Add 2" for 1" filter frame/rail or 3" for 2" filter frame/rail
	Free (open) return - calculate required dimension for a maximum velocity of 600 fpm

*Field installed accessories (hoses, air cleaners, etc.) and factory WSE option will require additional space. Top supply air is shown, the same clearances apply to bottom supply air units.

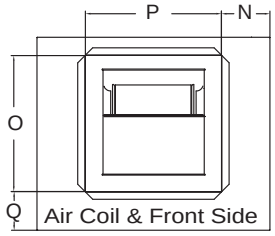


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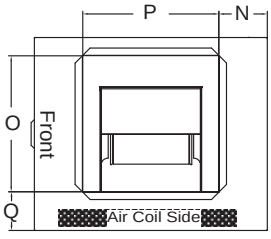
TC - Vertical Upflow – Dimensional Data

Vertical Model		Discharge Connection Duct Flange Installed (+/- 0.10 in, +/- 2.5mm)					Return Connection Using Return Air Opening			
		M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U
006 - 012	in	8.9	5.1	9.0	9.0	5.5	2.1	16.2	9.9	0.7
	cm	22.7	12.9	22.9	22.9	14.0	5.3	41.1	25.1	1.9
015 - 018	in	6.4	3.8	14.0	14.0	5.3	2.3	18.3	20.9	0.7
	cm	16.1	9.5	35.6	35.6	13.6	5.8	46.5	53.1	1.9
024 - 030, *041	in	6.4	5.0	14.0	14.0	5.8	2.0	18.5	19.3	0.9
	cm	16.3	12.7	35.6	35.6	14.7	5.1	47.0	49.0	2.3
036 - 042	in	6.4	3.8	14.0	14.0	5.1	2.3	22.8	23.9	0.7
	cm	16.1	9.5	35.6	35.6	13.1	5.8	57.9	60.7	1.9
048 - 060	in	6.9	7.3	16.0	18.0	5.1	2.3	29.3	22.5	0.7
	cm	17.4	18.4	40.6	45.7	13.1	5.8	74.4	57.0	1.9

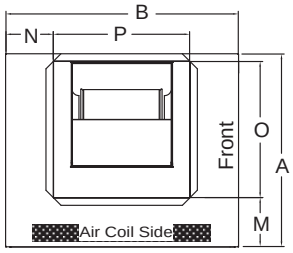
* Size 041 units have unique M, N, Q dimensions due to the position of the blower assembly.
Front Return - N = 4.8 in (12.2 cm), Q = 6.4 in (16.3 cm).
Right Return - N = 3.8 in (9.7 cm), Q = 5.5 in (14.0 cm).
Left Return - M = 6.4 in (16.3 cm), N = 2.8 in (7.1 cm).



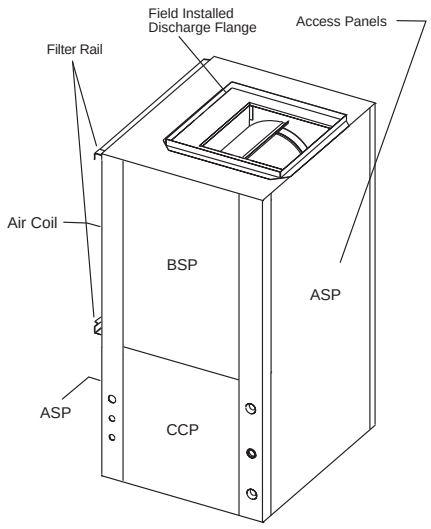
Top View-Front Return



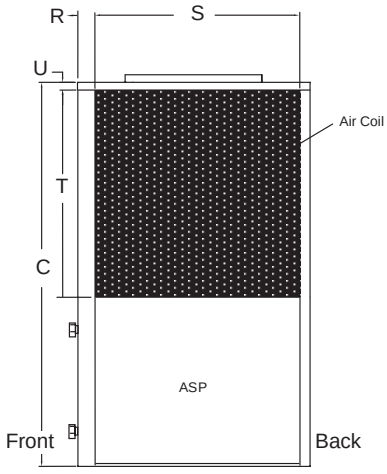
Top View-Right Return



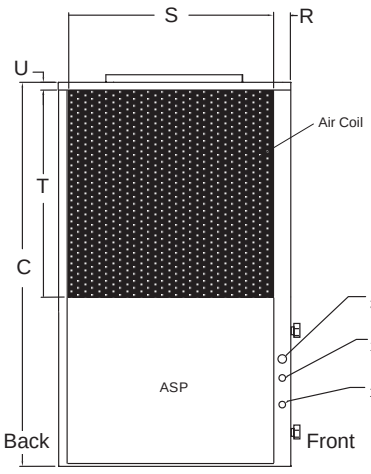
Top View-Left Return



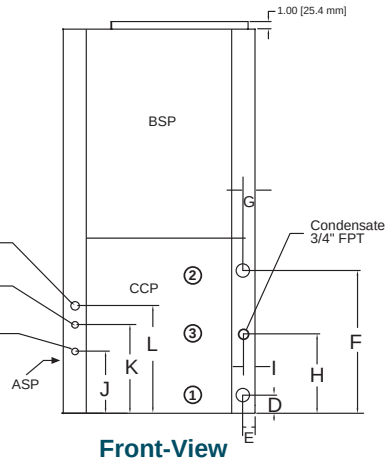
Isometric View



Right Return Right View - Air Coil Opening



Left Return Left View - Air Coil Opening



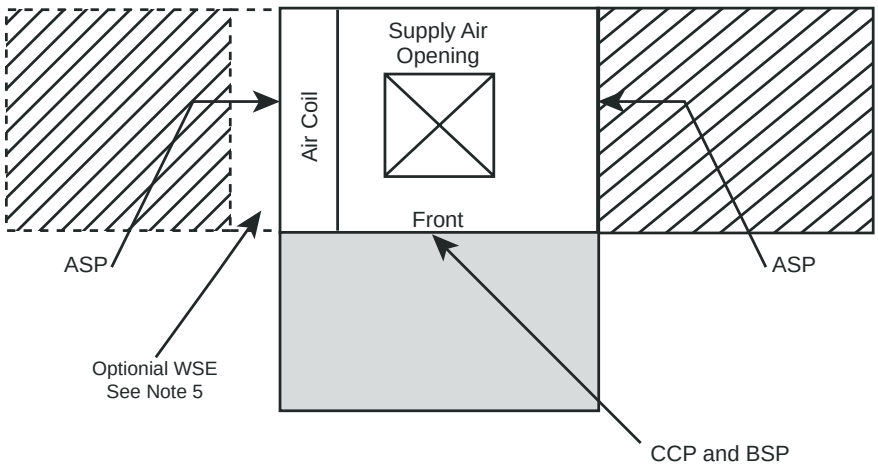
Front-View

Units are shipped with air filter rails that are not suitable for supporting return air ductwork. An air filter frame with duct mounting collar is available as an accessory, see the ClimateMaster Accessory Submittal set for futher information on this frame.

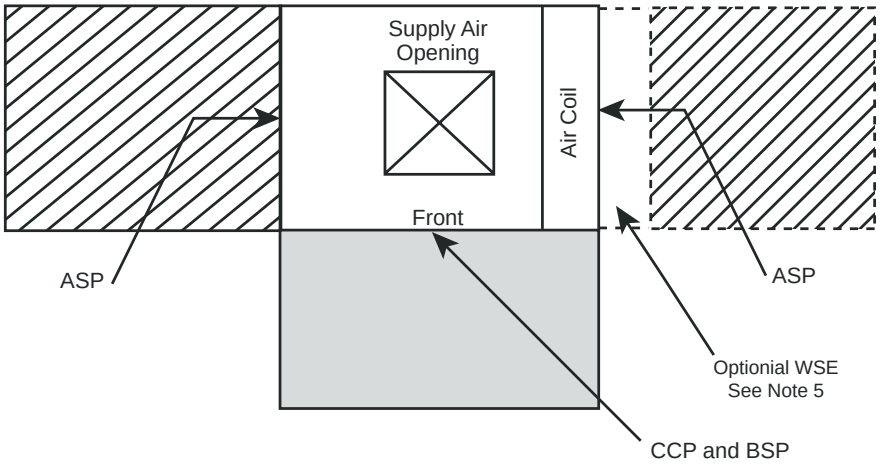
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Vertical Units

Left Return



Right Return



Notes:
1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front & Side access is preferred for service access. However, units without WSE option may be serviced from the front access panel if side access is not available.
3. ASP are removable panels that provide additional access to the units interior. Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.
4. Front return units (not shown) require front access for controls/compressor and left side access for blower.
5. Units with WSE Must have access to water valve through side access panel.

= mandatory 2′ service access

= (optional) additional 2′ service access

Legend:
CCP = Control/Compressor Access Panel
BSP = Blower Service Panel
ASP = Additional Service Panel (not required)
WSE = Waterside Economizer

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Corner Weights for TCH Series Units

Model		Total	Left-Front*	Right-Front*	Left-Back*	Right-Back*
TCH006	Lbs	103	37	24	23	19
	kg	46.72	16.78	10.89	10.43	8.62
TCH009	Lbs	105	38	24	23	20
	kg	47.63	17.24	10.89	10.43	9.07
TCH012	Lbs	114	42	26	25	21
	kg	51.71	19.05	11.79	11.34	9.53
TCH015	Lbs	153	53	36	34	30
	kg	69	24	16	15	14
TCH018	Lbs	158	55	37	35	31
	kg	72	25	17	16	14
TCH024	Lbs	174	62	40	39	33
	kg	79	28	18	18	15
TCH030	Lbs	182	67	41	40	34
	kg	83	30	19	18	15
TCH036	Lbs	203	75	47	44	37
	kg	92	34	21	20	17
TCH042	Lbs	218	81	50	48	39
	kg	99	37	23	22	18
TCH048	Lbs.	263	98	60	58	47
	kg	119	44	27	26	21
TCH060	Lbs.	278	94	59	56	69
	kg	126	43	27	25	31

*Front is control box end.

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Electrical Data – Standard Unit

Model	Voltage Code	Rated Voltage	Voltage Min/ Max	Compressor			Fan Motor FLA	Total Unit FLA	Min Circuit Amp	Max Fuse/ HACR
				QTY	RLA	LRA				
006	G	208/230/60/1	197/254	1	3.3	17.7	0.40	3.7	4.5	15
	E	265/60/1	239/292	1	2.9	13.5	0.40	3.3	4.0	15
009	G	208/230/60/1	197/254	1	4.5	22.2	0.92	5.4	6.5	15
	E	265/60/1	239/292	1	3.8	18.8	0.70	4.5	5.5	15
012	G	208/230/60/1	197/254	1	5.1	32.5	0.92	6.0	7.3	15
	E	265/60/1	239/292	1	4.0	31.5	0.70	4.7	5.7	15
015	G	208/230/60/1	197/254	1	6.0	29.0	1.20	7.2	8.7	15
	E	265/60/1	239/292	1	5.4	28.0	0.86	6.3	7.6	15
018	G	208/230/60/1	197/254	1	7.2	33.0	1.20	8.4	10.2	15
	E	265/60/1	239/292	1	5.9	28.0	0.86	6.8	8.2	15
024	G	208/230/60/1	197/254	1	12.8	58.3	1.50	14.3	17.5	30
	E	265/60/1	239/292	1	9.6	54.0	1.30	10.9	13.3	20
	H	208/230/60/3	197/254	1	7.7	55.4	1.50	9.2	11.1	15
	F	460/60/3	414/506	1	3.6	28.0	0.76	4.4	5.3	15
030	G	208/230/60/1	197/254	1	14.1	73.0	3.00	17.1	20.6	30
	E	265/60/1	239/292	1	11.2	60.0	2.70	13.9	16.7	25
	H	208/230/60/3	197/254	1	8.9	58.0	3.00	11.9	14.1	20
	F	460/60/3	414/506	1	4.2	28.0	1.70	5.9	7.0	15
036	G	208/230/60/1	197/254	1	16.7	79.0	1.80	18.5	22.7	35
	E	265/60/1	239/292	1	13.5	72.0	2.00	15.5	18.9	30
	H	208/230/60/3	197/254	1	10.4	73.0	1.80	12.2	14.8	25
	F	460/60/3	414/506	1	5.8	38.0	1.24	7.0	8.5	15
041	G	208/230/60/1	197/254	1	17.9	112.0	3.00	20.9	25.4	40
	H	208/230/30/3	197/294	1	13.2	88.0	3.00	16.2	19.5	30
	F	460/60/3	414/506	1	6.0	44.0	1.70	7.7	9.2	15
	N	575/60/3	518/633	1	4.2	30.0	1.40	5.6	6.7	15
042	G	208/230/60/1	197/254	1	17.9	112.0	3.00	20.9	25.4	40
	H	208/230/60/3	197/254	1	13.5	88.0	3.00	16.5	19.9	30
	F	460/60/3	414/506	1	6.0	44.0	1.70	7.7	9.2	15
	N	575/60/3	518/633	1	4.9	34.0	1.40	6.3	7.5	15
048	G	208/230/60/1	197/254	1	21.8	117.0	3.40	25.2	30.7	50
	H	208/230/60/3	197/254	1	13.7	83.1	3.40	17.1	20.5	30
	F	460/60/3	414/506	1	6.2	41.0	1.80	8.0	9.6	15
	N	575/60/3	518/633	1	4.8	33.0	1.40	6.2	7.4	15
060	G	208/230/60/1	197/254	1	26.3	134.0	4.90	31.2	37.8	60
	H	208/230/60/3	197/254	1	15.6	110.0	4.90	20.5	24.4	40
	F	460/60/3	414/506	1	7.8	52.0	2.50	10.3	12.3	20
	N	575/60/3	518/633	1	5.8	38.9	1.90	7.7	9.2	15

All fuses Class RK-5

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Electrical Data – High Static Blower

TC Model	Voltage Code	Rated Voltage	Voltage Min/Max	Compressor			Fan Motor FLA	Total Unit FLA	Min Circuit Amp	Max Fuse/ HACR
				QTY	RLA	LRA				
015	G	208/230/60/1	197/254	1	6.0	29.0	1.20	7.2	8.7	15
	E	265/60/1	239/292	1	5.4	28.0	0.86	6.3	7.6	15
018	G	208/230/60/1	197/254	1	7.2	33.0	1.50	8.7	10.5	15
	E	265/60/1	239/292	1	5.9	28.0	1.30	7.2	8.7	15
024	G	208/230/60/1	197/254	1	12.8	58.3	1.50	14.3	17.5	30
	E	265/60/1	239/292	1	9.6	54.0	1.30	10.9	13.3	20
	H	208/230/60/3	197/254	1	7.7	55.4	1.50	9.2	11.1	15
	F	460/60/3	414/506	1	3.6	28.0	0.76	4.4	5.3	15
030	G	208/230/60/1	197/254	1	14.1	73.0	3.00	17.1	20.6	30
	E	265/60/1	239/292	1	11.2	60.0	2.70	13.9	16.7	25
	H	208/230/60/3	197/254	1	8.9	58.0	3.00	11.9	14.1	20
	F	460/60/3	414/506	1	4.2	28.0	1.70	5.9	7.0	15
036	G	208/230/60/1	197/254	1	16.7	79.0	3.00	19.7	23.9	40
	E	265/60/1	239/292	1	13.5	72.0	2.70	16.2	19.6	30
	H	208/230/60/3	197/254	1	10.4	73.0	3.00	13.4	16.0	25
	F	460/60/3	414/506	1	5.8	38.0	1.70	7.5	9.0	15
042	G	208/230/60/1	197/254	1	17.9	112.0	3.00	20.9	25.4	40
	H	208/230/60/3	197/254	1	13.5	88.0	3.00	16.5	19.9	30
	F	460/60/3	414/506	1	6.0	44.0	1.70	7.7	9.2	15
	N	575/60/3	518/633	1	4.9	34.0	1.40	6.3	7.5	15
048	G	208/230/60/1	197/254	1	21.8	117.0	4.90	26.7	32.2	50
	H	208/230/60/3	197/254	1	13.7	83.1	4.90	18.6	22.0	35
	F	460/60/3	414/506	1	6.2	41.0	2.50	8.7	10.3	15
	N	575/60/3	518/633	1	4.8	33.0	1.90	6.7	7.9	15
060	G	208/230/60/1	197/254	1	26.3	134.0	5.80	32.1	38.7	60
	H	208/230/60/3	197/254	1	15.6	110.0	5.80	21.4	25.3	40
	F	460/60/3	414/506	1	7.8	52.0	2.60	10.4	12.4	20
	N	575/60/3	518/633	1	5.8	38.9	2.30	8.1	9.6	15

All fuses Class RK-5

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TC Model	Voltage Code	Rated Voltage	Voltage Min/Max	Compressor			Fan Motor FLA	Total Unit FLA	Min Circuit Amp	Max Fuse/ HACR
				RLA	LRA	QTY				
015	G	208/230/60/1	197/254	6.0	29.0	1	2.70	8.7	10.2	15
	E	265/60/1	239/292	5.4	28.0	1	2.10	7.5	8.9	15
018	G	208/230/60/1	197/254	7.2	33.0	1	2.70	9.9	11.7	15
	E	265/60/1	239/292	5.9	28.0	1	2.10	8.0	9.5	15
024	G	208/230/60/1	197/254	12.8	58.3	1	3.90	16.7	19.9	30
	E	265/60/1	239/292	9.6	54.0	1	3.20	12.8	15.2	20
	H	208/230/60/3	197/254	7.7	55.4	1	3.90	11.6	13.5	20
	*F	*460/60/3	414/506	3.6	28.0	1	3.20	6.8	7.7	15
030	G	208/230/60/1	197/254	14.1	73.0	1	3.90	18.0	21.5	35
	E	265/60/1	239/292	11.2	60.0	1	3.20	14.4	17.2	25
	H	208/230/60/3	197/254	8.9	58.0	1	3.90	12.8	15.0	20
	*F	*460/60/3	414/506	4.2	28.0	1	3.20	7.4	8.5	15
036	G	208/230/60/1	197/254	16.7	79.0	1	5.20	21.9	26.1	40
	E	265/60/1	239/292	13.5	72.0	1	4.70	18.2	21.6	35
	H	208/230/60/3	197/254	10.4	73.0	1	5.20	15.6	18.2	25
	*F	*460/60/3	414/506	5.8	38.0	1	4.70	10.5	12.0	15
042	G	208/230/60/1	197/254	17.9	112.0	1	5.20	23.1	27.6	45
	H	208/230/60/3	197/254	13.5	88.0	1	5.20	18.7	22.1	35
	*F	*460/60/3	414/506	6.0	44.0	1	4.70	10.7	12.2	15
048	G	208/230/60/1	197/254	21.8	117.0	1	6.90	28.7	34.2	50
	H	208/230/60/3	197/254	13.7	83.1	1	6.90	20.6	24.0	35
	*F	*460/60/3	414/506	6.2	41.0	1	6.00	12.2	13.8	20
060	G	208/230/60/1	197/254	26.3	134.0	1	6.90	33.2	39.8	60
	H	208/230/60/3	197/254	15.6	110.0	1	6.90	22.5	26.4	40
	*F	*460/60/3	414/506	7.8	52.0	1	6.00	13.8	15.8	20

* 460 volt units require a neutral connection. All "F" voltage units with ECM require a four wire power supply with neutral.
Motors are 265 volt and are wired between one hot leg and neutral.

All fuses Class RK-5

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TC Series Wiring Diagram Matrix

All current diagrams can be located online at climatemaster.com. Click 'Commercial Professional' (go to 'Resources/literature/wiring diagrams' in the upper right), use part numbers below to lookup wiring diagrams

Model	Wiring Diagram Part Number	Electrical	Control	DDC	Fan Motor
TC Series Standard	96B0228N77	208/230/60/1 265/60/1	CXM	-	ECM
	96B0228N81			LON	
	96B0228N79			MPC	
	96B0228N01			-	PSC
	96B0228N03			LON	
	96B0228N09			MPC	
	96B0228N78		DXM	-	ECM
	96B0228N82			LON	
	96B0228N80			MPC	
	96B0228N02			-	PSC
	96B0228N04			LON	
	96B0228N10			MPC	
TC Series Standard	96B0229N11	208/230/60/3	CXM	-	ECM
	96B0229N13			LON	
	96B0229N16			MPC	
	96B0229N01			-	PSC
	96B0229N03			LON	
	96B0229N06			MPC	
	96B0229N12		DXM	-	ECM
	96B0229N14			LON	
	96B0229N17			MPC	
	96B0229N02			-	PSC
	96B0229N04			LON	
	96B0229N07			MPC	
TC Series Standard	96B0230N11	460/60/3	CXM	-	ECM
	96B0230N13			LON	
	96B0230N18			MPC	
	96B0230N01			-	PSC
	96B0230N03			LON	
	96B0230N08			MPC	
	96B0230N12		DXM	-	ECM
	96B0230N14			LON	
	96B0230N19			MPC	
	96B0230N02			-	PSC
	96B0230N04			LON	
	96B0230N09			MPC	

Table Continued on Next Page

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Table Continued From Previous Page

Model	Wiring Diagram Part Number	Electrical	Control	DDC	Fan Motor
TC with WSE option	96B0300N05	208/230/60/1 265/60/1	CXM	-	ECM
	96B0300N01			-	PSC
	96B0300N06		DXM	-	ECM
	96B0300N07			LON	
	96B0300N08			MPC	
	96B0300N02			-	PSC
	96B0300N03			LON	
	96B0300N04			MPC	
TC with WSE option	96B0301N05	208/230/60/3	CXM	-	ECM
	96B0301N01			-	PSC
	96B0301N06		DXM	-	ECM
	96B0301N07			LON	
	96B0301N08			MPC	
	96B0301N02			-	PSC
	96B0301N03			LON	
	96B0301N04			MPC	
TC with WSE option	96B0302N05	460/60/3	CXM	-	ECM
	96B0302N01			-	PSC
	96B0302N06		DXM	-	ECM
	96B0302N07			LON	
	96B0302N08			MPC	
	96B0302N02			-	PSC
	96B0302N03			LON	
	96B0302N04			MPC	

DIP Setting Table - 99D0061N01

Note: Shade indicates DIP switch locating

TC DIGIT 9 = D + DXM WSE
TC DIGIT 12 = 1,2,3,4 + DXM WSE



TC DIGIT 9 = M + DXM WSE + LON
TC DIGIT 12 = 1,2,3,4 + DXM WSE + LON

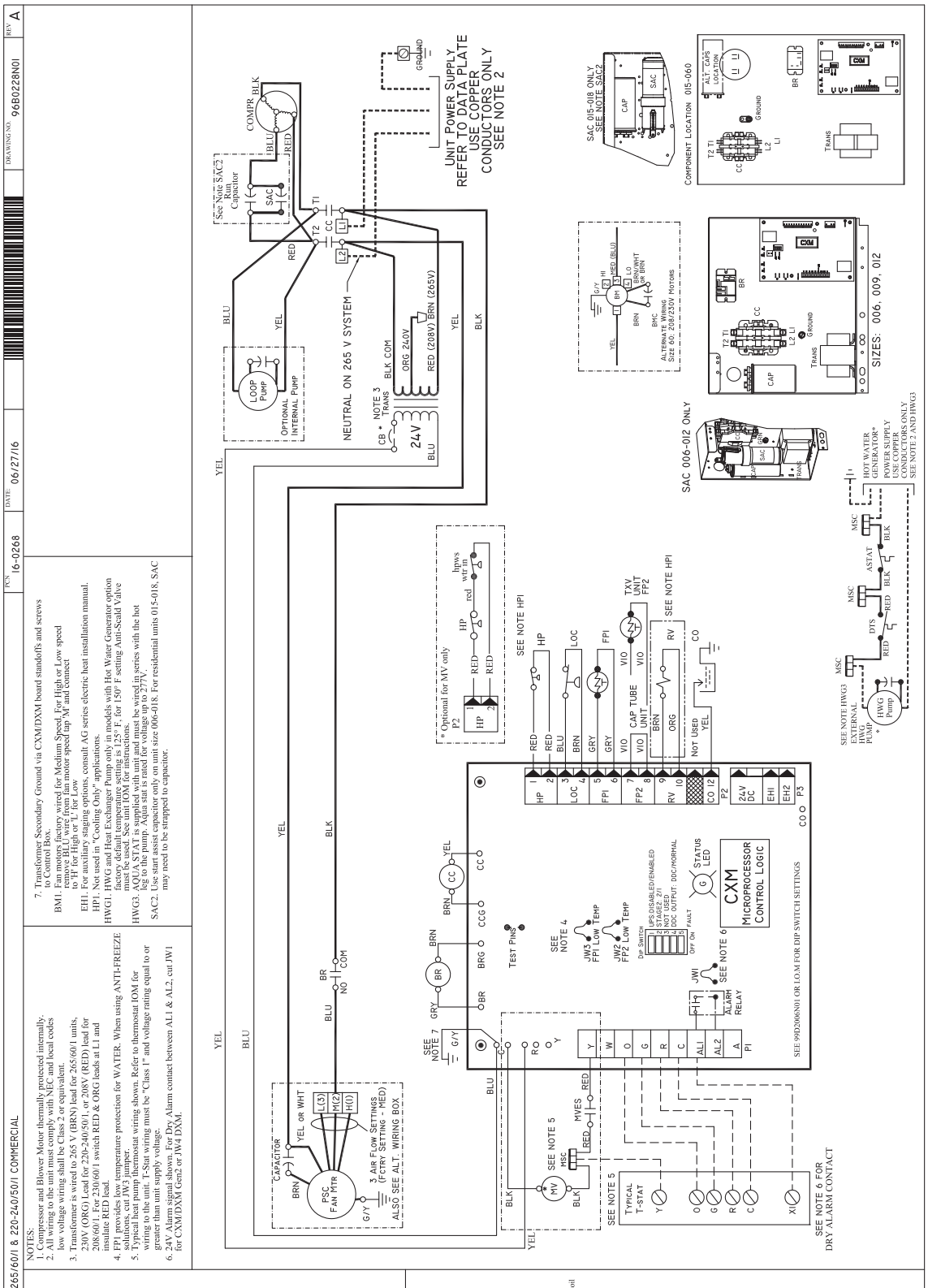


TC DIGIT 9 = P + DXM WSE + MPC
TC DIGIT 12 = 1,2,3,4 + DXM WSE + MPC



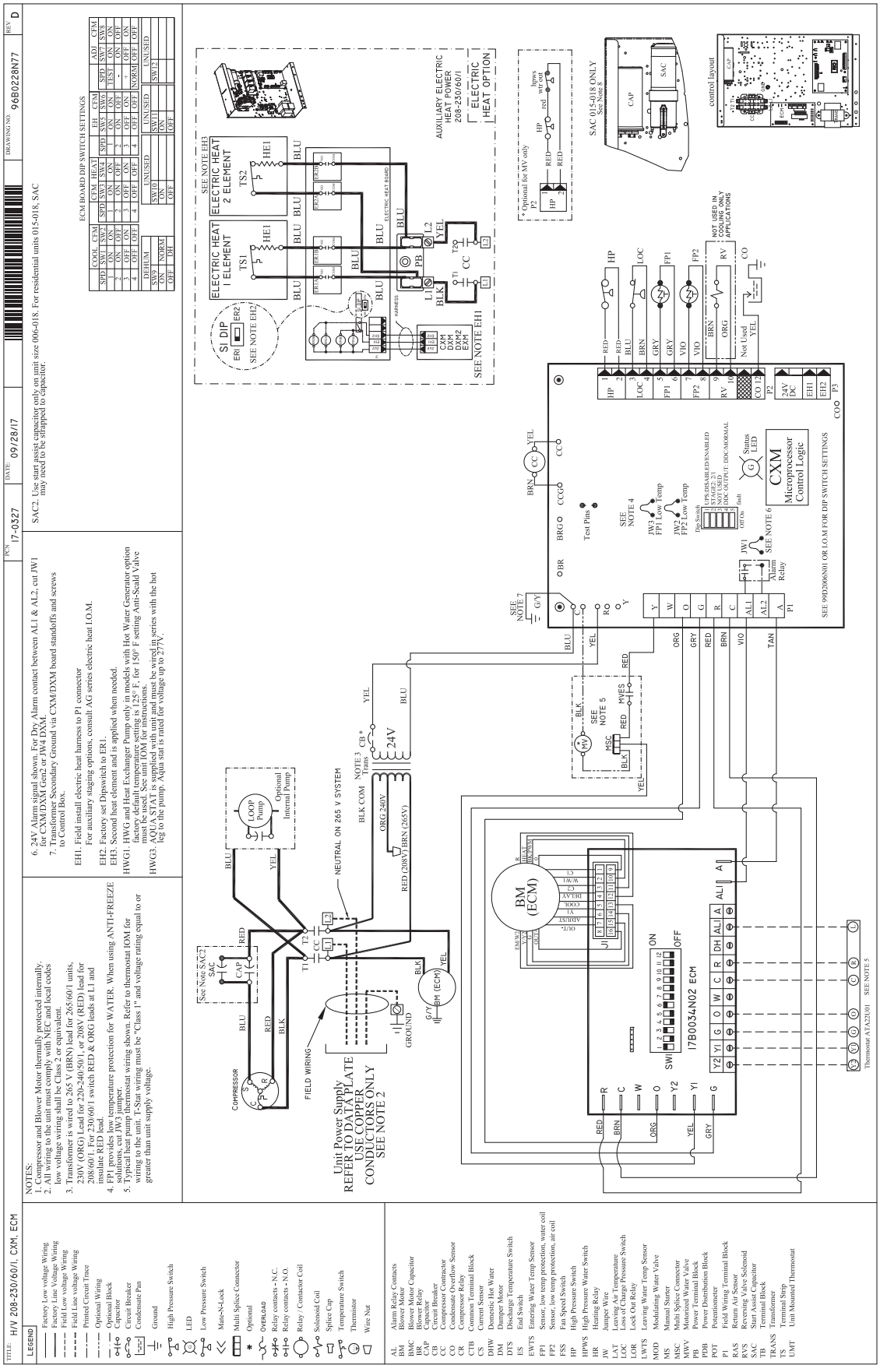
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Typical Wiring Diagram – Single Phase TC Units with CXM Controller



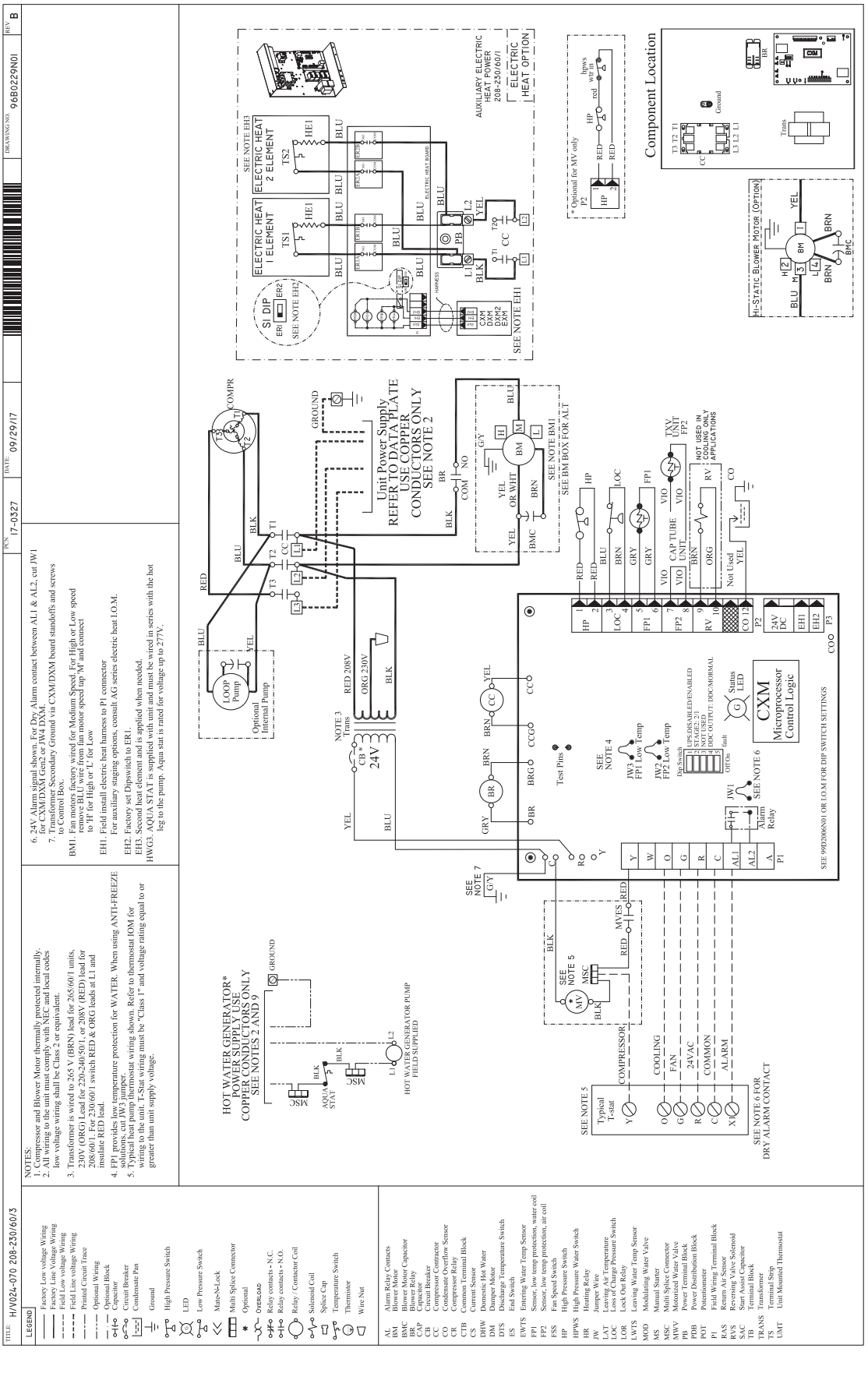
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Typical Wiring Diagram – Single Phase TC Units with CXM Controller, ECM Blower



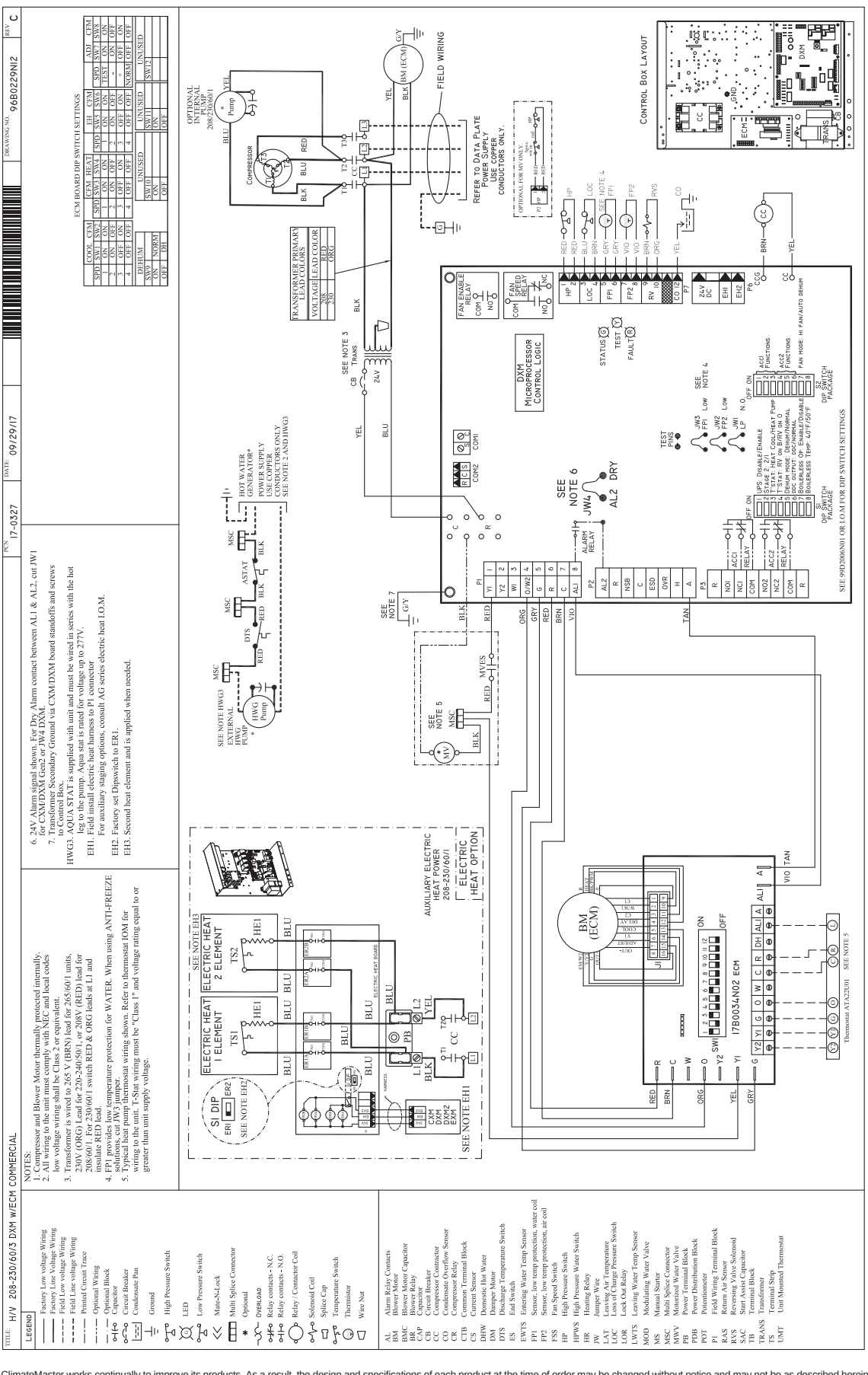
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Typical Wiring Diagram – Three Phase 208/230V TC Units with CXM Controller



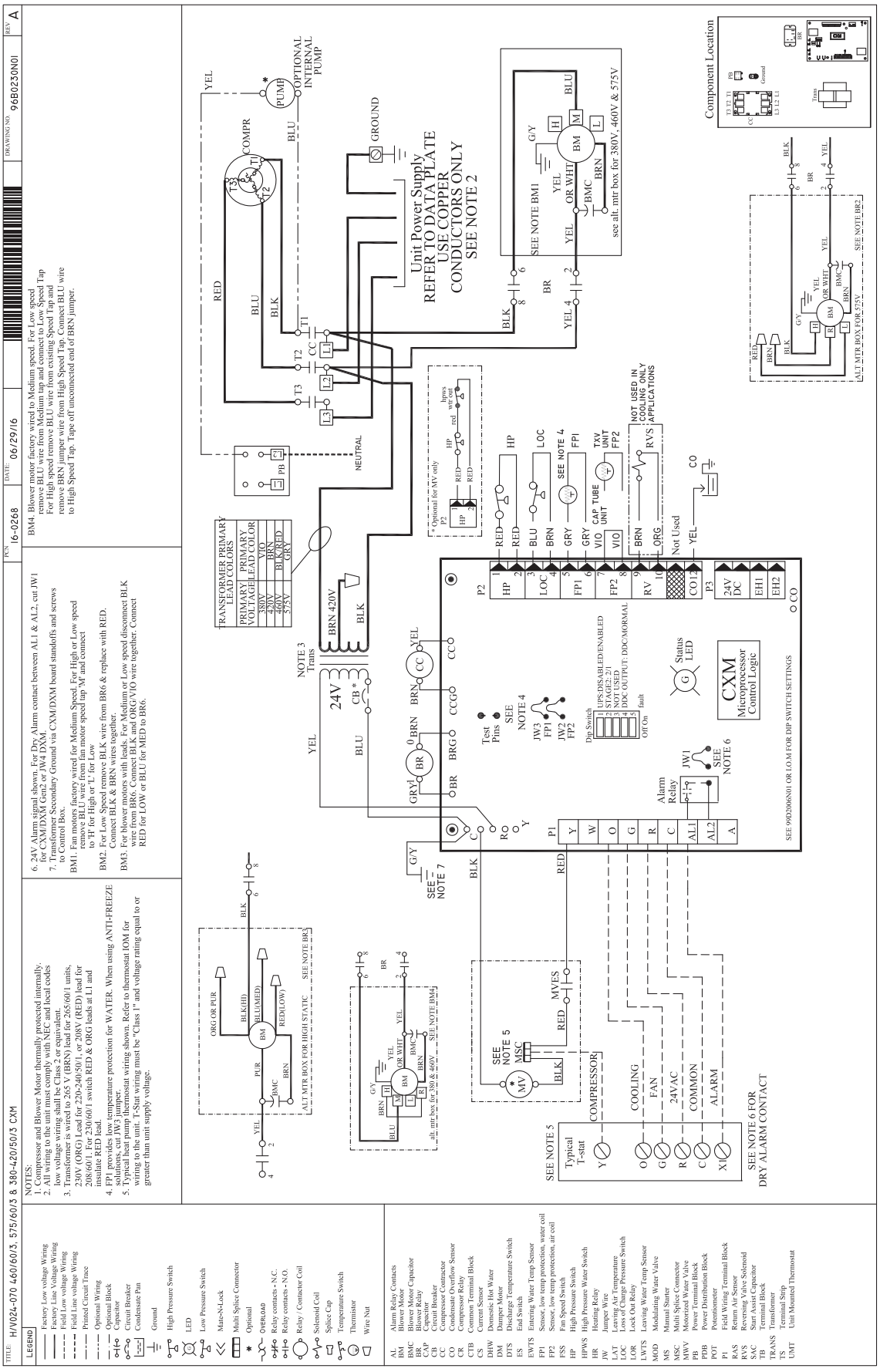
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Typical Wiring Diagram – Three Phase 208/230V TC Units with DXM Controller



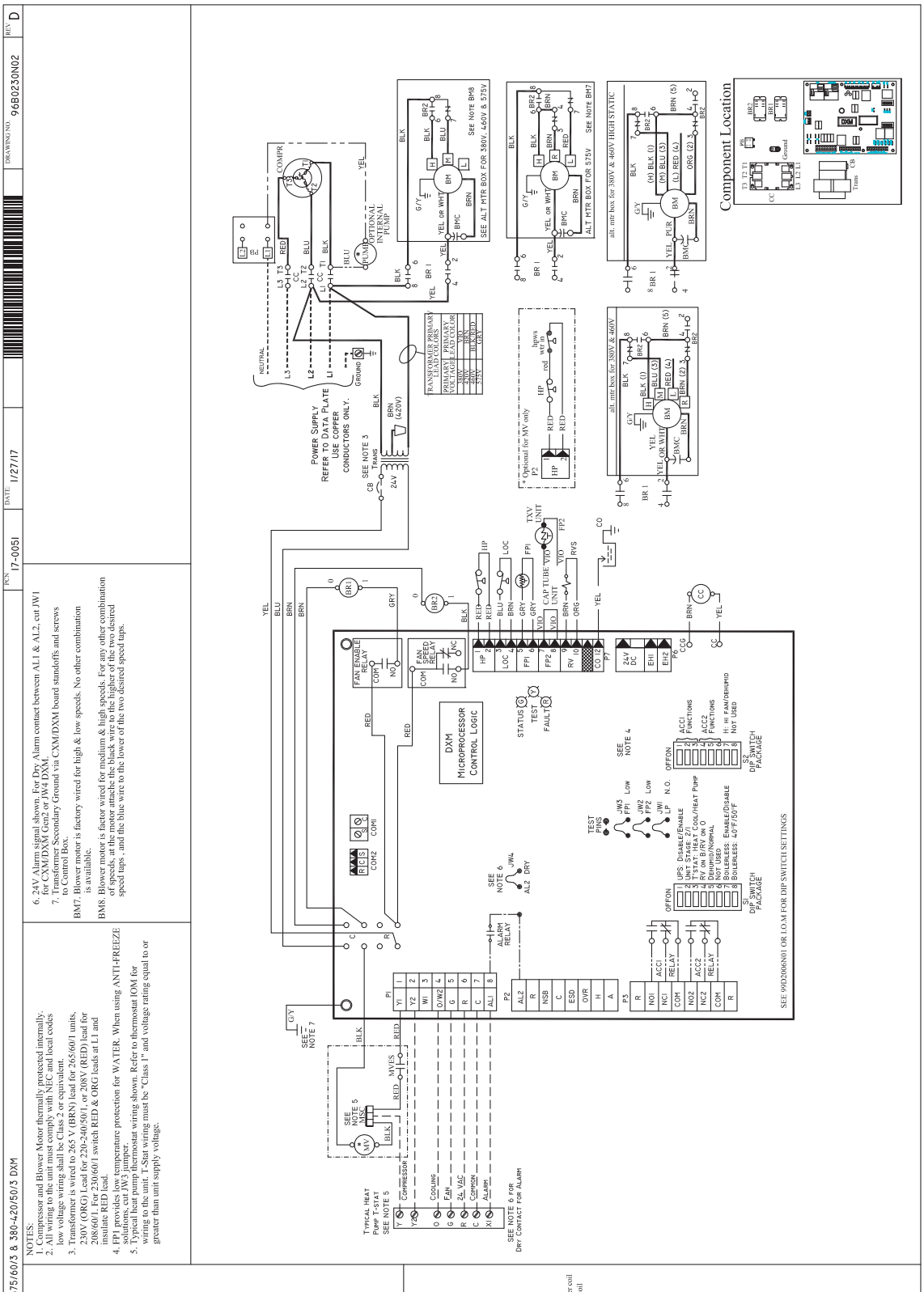
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Typical Wiring Diagram – Three Phase 460/575V TC Units with CXM Controller



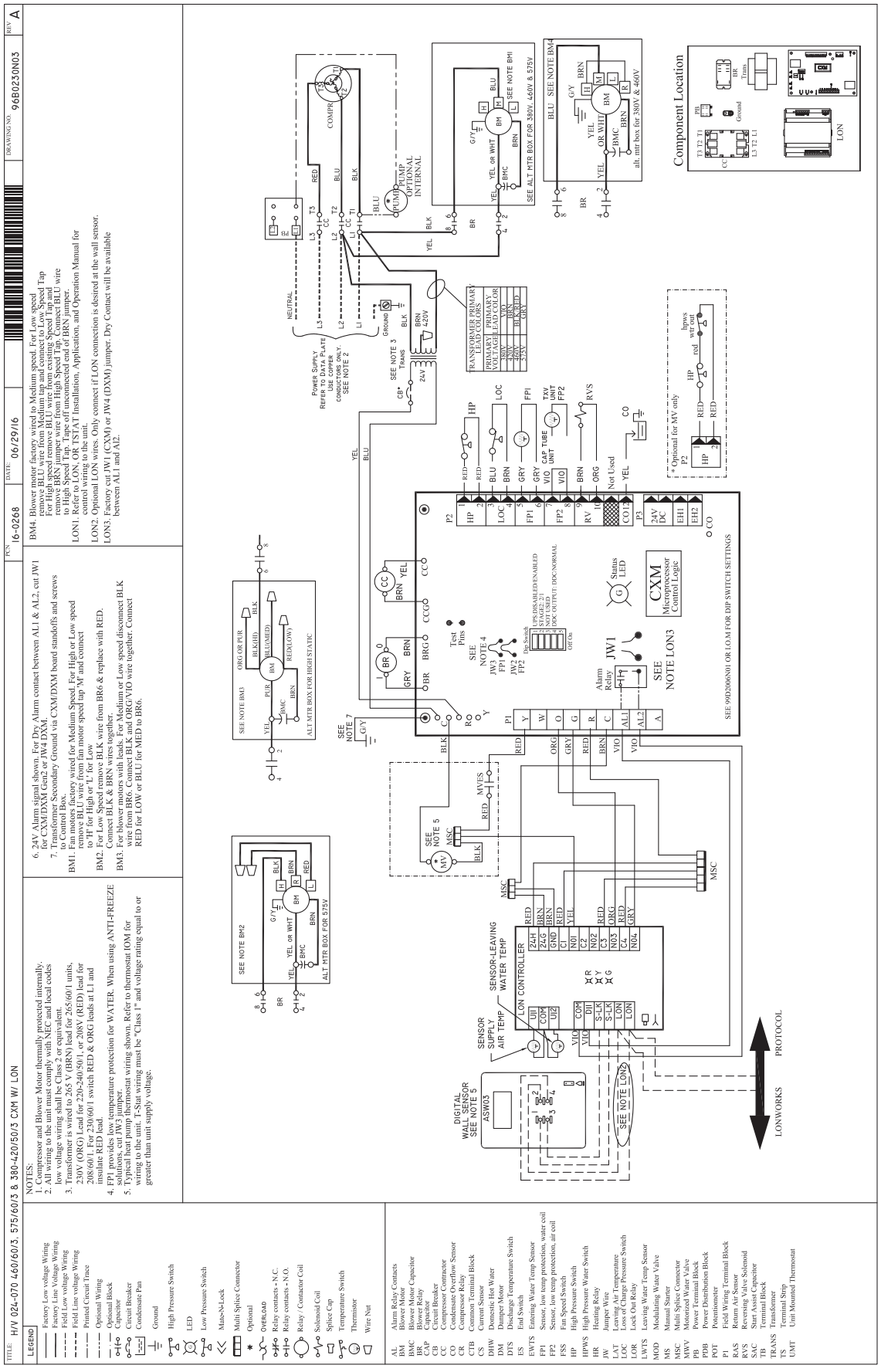
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Typical Wiring Diagram – Three Phase 460/575V TC Units with DXM Controller



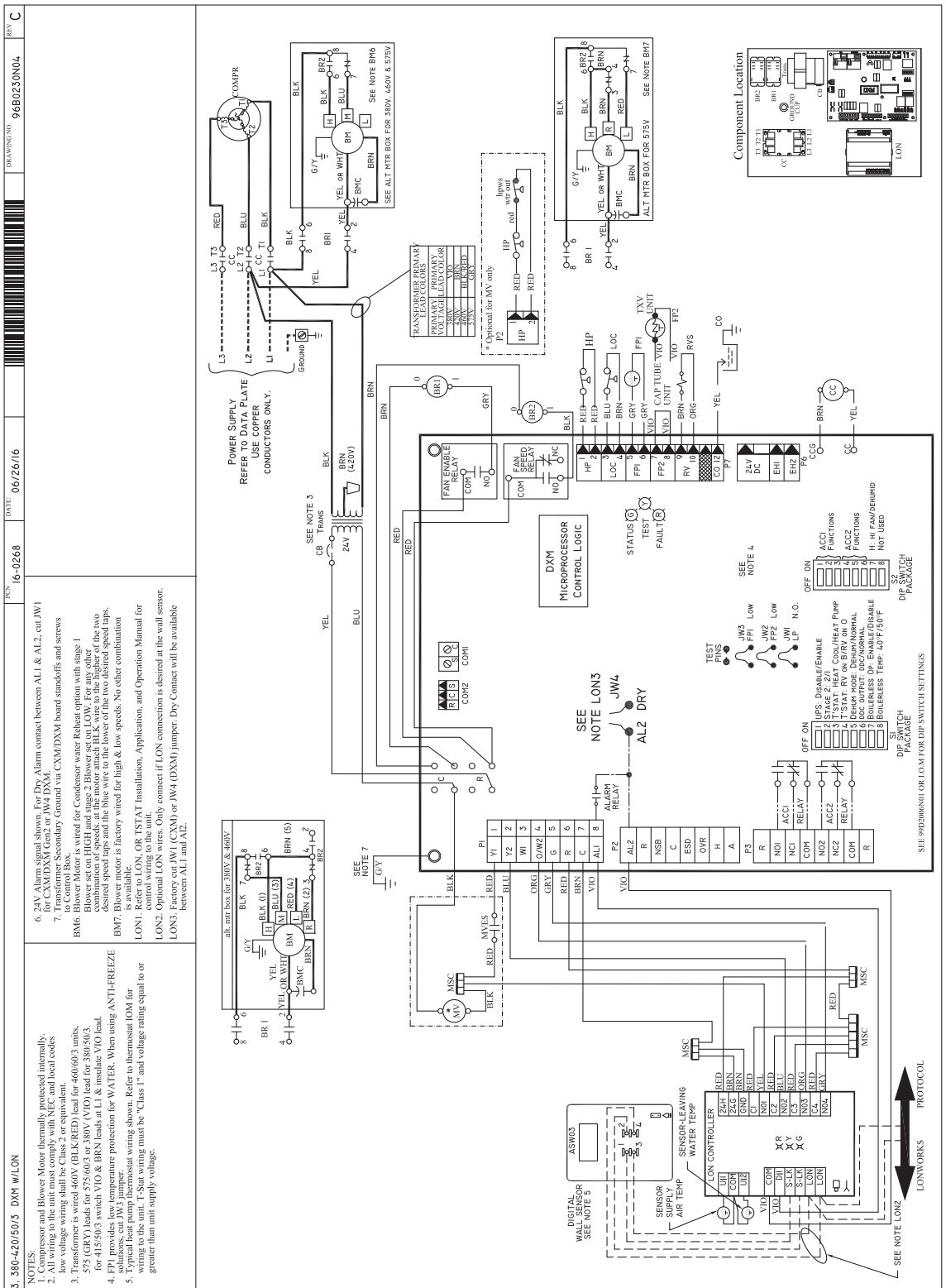
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Typical Wiring Diagram – Three Phase 460/575V TC Units with CXM And LON Controller



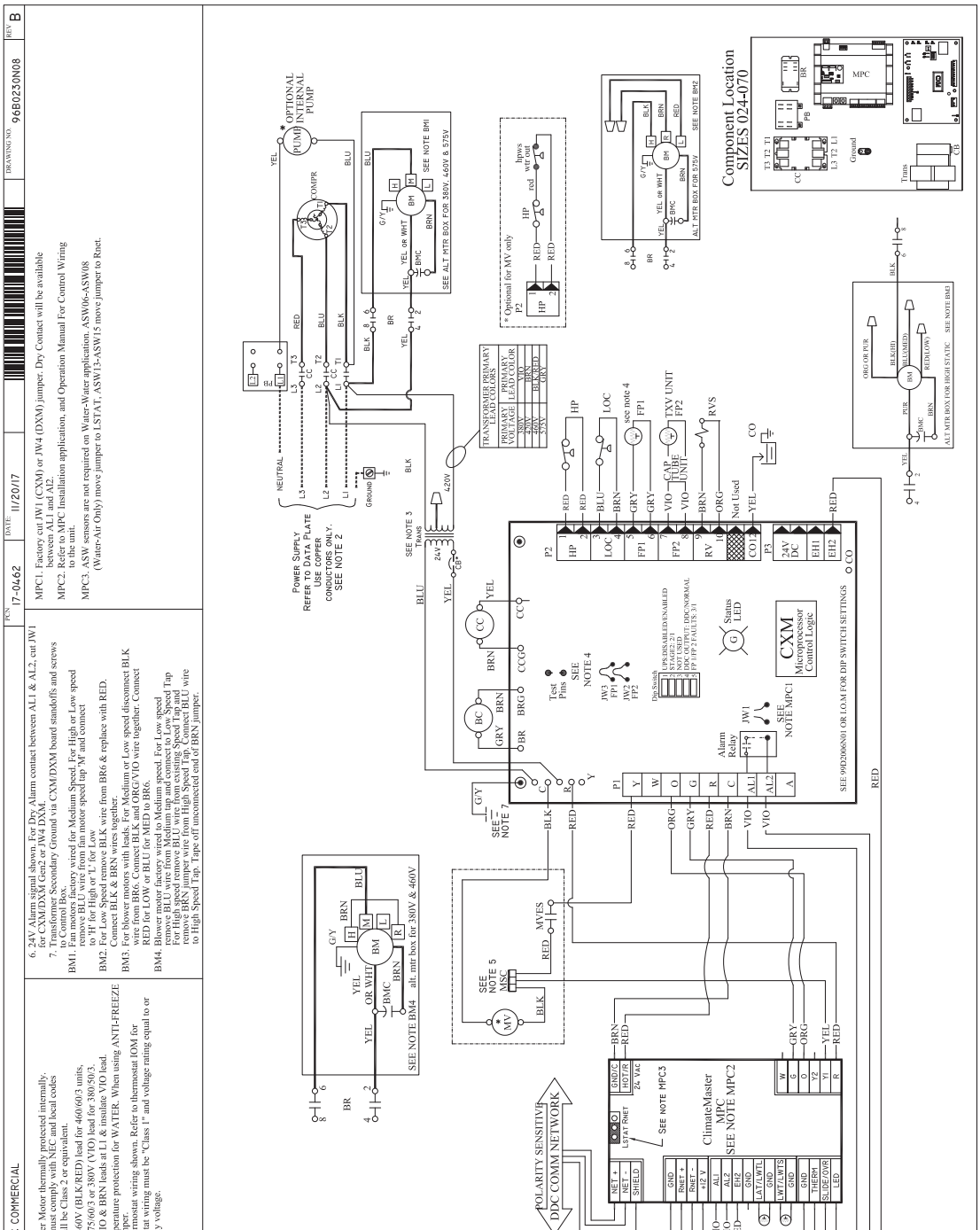
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Typical Wiring Diagram – Three Phase 460/575V TC Units with DXM & LON Controller



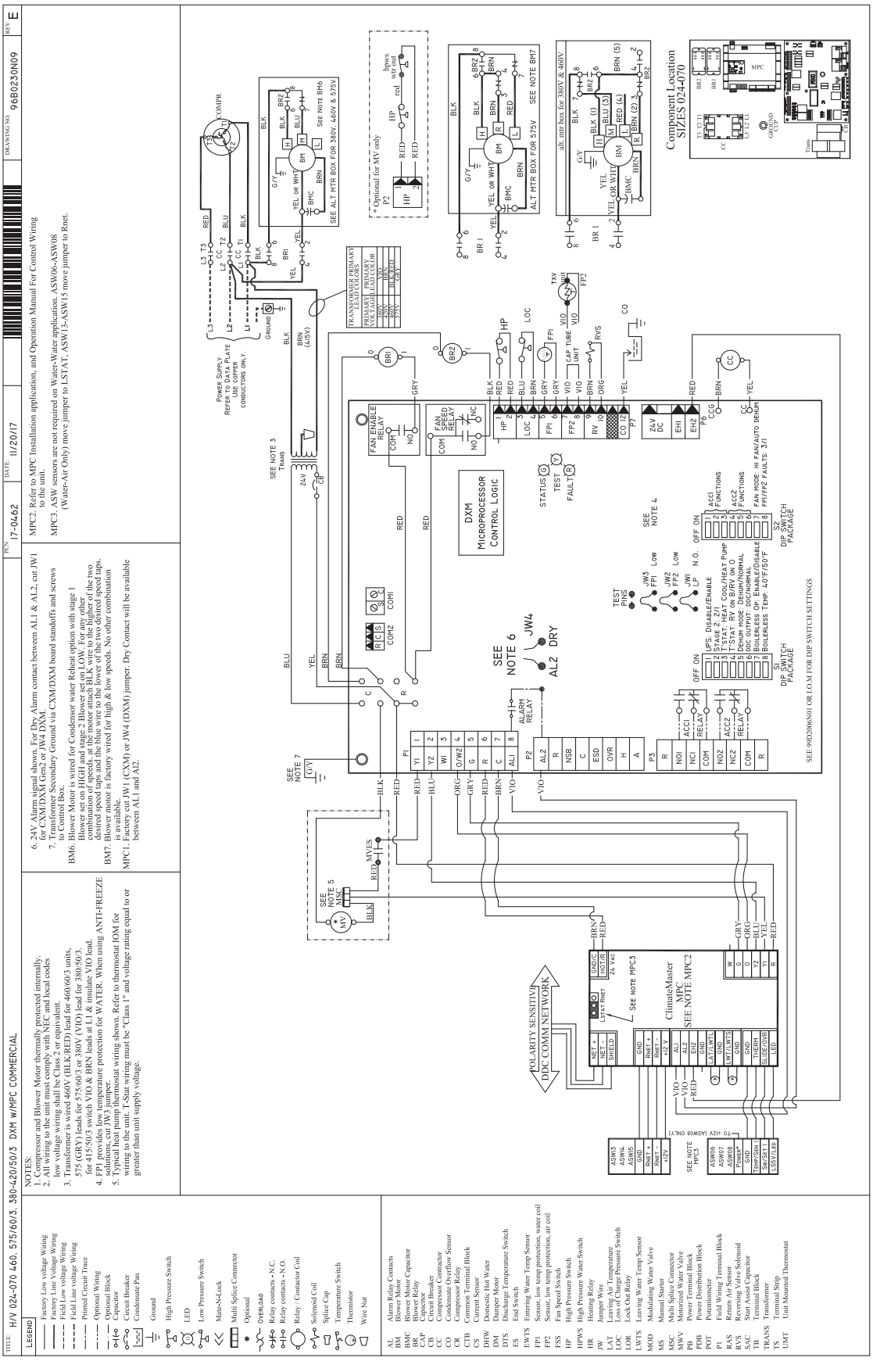
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Typical Wiring Diagram – Three Phase 460/575V TC Units with CXM & MPC Controller



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Typical Wiring Diagram – Three Phase 460/575V TC Units with DXM & MPC Controller



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General:

Furnish and install ClimateMaster Tranquility® "TC" Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

All units shall pass a factory acceptance test. The quality control system shall automatically perform the factory acceptance test via computer. A detailed report card from the factory acceptance test shall ship with each unit. **Note: If unit fails the factory acceptance test it shall not be allowed to ship. Unit serial number will be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.**

Basic Construction:

Horizontal units shall have one of the following air flow arrangements: Left Inlet/Straight (Right) Discharge; Right Inlet/Straight (Left) Discharge; Left Inlet/Back Discharge; or Right Inlet/Back Discharge as shown on the plans. Units must have the ability to be field convertible from straight to back or back to straight discharge with no additional parts or unit structure modification. Horizontal units will have factory installed hanger brackets with rubber isolation grommets packaged separately.

Vertical units shall have one of the following airflow arrangements: Left Return/Top Discharge, Right Return/Top Discharge, as shown on the plans.

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units (horizontal and vertical) must have a minimum of two access panels for serviceability of compressor compartment. **Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable.**

All interior surfaces shall be lined with 1/2 inch (12.7mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream.

The heat pumps shall be fabricated from heavy gauge galvanized steel.

Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. **Unit insulation must meet these stringent requirements or unit(s) will not be accepted.**

All horizontal units to have factory installed 1" (25.4mm) discharge air duct collars, 1" (25.4mm) filter rails with 1" (25.4mm) filters factory installed, and factory installed unit-mounting brackets. Vertical units to have field installed discharge air duct collar, shipped loose and 1" (25.4mm) filter rails with 1" (25.4mm) filters factory installed. **If units with these factory installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.**

All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor

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in the air stream are not acceptable. Units shall have factory installed 1 inch (25.4mm) wide filter rails for filter removal from either side. Units shall have a 1 inch (25.4mm) thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.

Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

Option: Contractor shall install 2-inch (50.8mm) filter frame with removable access door and 2 inch (50.8mm) Glass Fiber throwaway filters on all units.

Option: UltraQuiet package shall consist of discharge muffler (except rotary compressors), and sound attenuating material applied to the fan housing.

Option: The unit shall be supplied with extended range insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.

Option: The unit shall be supplied with Waterside Economizer (WSE). The WSE will consist of hydronic coil, 3 way valve, and aquastat. Aquastat will be adjustable type and factory set at 45° F (72° C). Units with WSE will require heat pump thermostat with 2 stages of cooling.

Fan and Motor Assembly:

Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing. Units shall have a direct-drive centrifugal fan. The fan motor shall be 3-speed (2-speed for 575V), permanently lubricated, PSC type, with internal thermal overload protection. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan motor on small and medium size units (006-042) shall be isolated from the fan housing by a torsionally flexible motor mounting system with rubber type grommets to inhibit vibration induced high noise levels associated with “hard wire belly band” motor mounting. The fan motor on larger units (048 & 060) shall be isolated with flexible rubber type isolation grommets only. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place.

Option: High static motors (Sizes 015-060)

Option: ECM motors (sizes 015 to 060 except 041): ECM variable speed ball bearing type motor. The ECM fan motor shall provide a soft low noise fan start by ramping fan up to full selected speed over a 30 second period, and slowly ramp down fan at the end of each blower cycle, maintain constant CFM, maximize motor efficiency over its static operating range, and provide airflow adjustment in multiple CFM increments via a separate microprocessor board. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode may be constant or automatic (humidistat controlled). ECM motors without controlled ramp up and ramp down features, with constant CFM speed taps, or with no microprocessor controller are not acceptable.

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Refrigerant Circuit:

All units shall contain an EarthPure® (HFC-410A) sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure (loss of charge) switch, water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units that cannot be reset at the thermostat shall not be acceptable.

The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets or springs to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.

Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be “electro-coated” with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced type with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

Option: The unit will be supplied with cupro-nickel coaxial water to refrigerant heat exchanger.

Drain Pan:

The drain pan shall be constructed of galvanized steel and have a powder coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to FPT fitting. **No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted.** The unit as standard will be supplied with solid-state electronic condensate overflow protection. **Mechanical float switches will NOT be accepted.**

Vertical units shall be furnished with a PVC FPT condensate drain connection and an internal factory installed condensate trap. **If units without an internal trap are used, the contractor is responsible for any extra costs to field install these provisions, and/ or the extra costs for his sub-contractor to install these provisions.**

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Option: The unit shall be supplied with stainless steel drain pan.

Electrical:

A control box shall be located within the unit compressor compartment and shall contain a 50VA transformer, 24 volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor.

Solid State Control System (CXM):

Units shall have a solid-state control system. **Units utilizing electro-mechanical control shall not be acceptable.** The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

a Anti-short cycle time delay on compressor operation.
b. Random start on power up mode.
c. Low voltage protection.
d. High voltage protection.
e. Unit shutdown on high or low refrigerant pressures.
f. Unit shutdown on low water temperature.
g. Condensate overflow electronic protection.
h. Option to reset unit at thermostat or disconnect.
i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
j. Ability to defeat time delays for servicing.
k. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
l. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
m. 24V output to cycle a motorized water valve or other device with compressor contactor.
n. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
o. Water coil low temperature sensing (selectable for water or anti-freeze).
p. Air coil low temperature sensing.

NOTE: Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.

Option: Enhanced solid state control system (DXM):

This control system features two stage control of cooling and two stage control of heating modes for exacting temperature and dehumidification purposes.

This control system coupled with a multi-stage thermostat will better dehumidify room air by automatically running the heat pump's fan at lower speed on the first stage of cooling thereby implementing low sensible heat ratio cooling. On the need for higher cooling performance the system will activate the second stage of cooling and automatically switch the fan to the higher fan speed setting. This system may be further enhanced with a humidistat. Units not having automatic low sensible heat ratio cooling will not be accepted; as an alternate a hot gas reheat coil may be provided with control system for automatic activation.

Control shall have all of the above mentioned features of the CXM control system along with the following expanded features:

a. Removable thermostat connector.
b. Night setback control.
c. Random start on return from night setback.

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d. Minimized reversing valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life.).
e. Override temperature control with 2-hour timer for room occupant to override setback temperature at the thermostat.
f. Dry contact night setback output for digital night setback thermostats.
g. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
h. Ability to work with heat pump thermostats using O or B reversing valve control.
i. Emergency shutdown contacts.
j. Boilerless system heat control at low loop water temperature.
k. Ability to allow up to 3 units to be controlled by one thermostat.
l. Relay to operate an external damper.
m. Ability to automatically change fan speed from multistage thermostat.
n. Relay to start system pump.
o. 75 VA control transformer. Control transformer shall have load side short circuit and overload protection via a built in circuit breaker.

Digital Night Setback with Pump Restart (DXM w/ ATP32U03/04)

The unit will be provided with a Digital Night Setback feature using an accessory relay on the DXM controller with an ATP32U03/04 thermostat and an external, field-provided time clock. The external time clock will initiate and terminate the night setback period. The thermostat will have a night setback override feature with a programmable override time period.
An additional accessory relay on the unit DXM controller will energize the building loop pump control for the duration of the override period. **(Note: this feature requires additional low voltage wiring. Consult Application Drawings for details.)**

Remote Service Sentinel (CXM/DXM)

Solid state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout. Upon cycling the G (fan) input 3 times within a 60 second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. **Units that do not provide this remote service sentinel shall not be acceptable.**

Option: Lonworks interface system

Units shall have all the features listed above (either CXM or DXM) and the control board will be supplied with a LONWORKS interface board, which is LONMark certified. This will permit all units to be daisy chained via a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. Space temperature
b. Leaving water temperature
c. Discharge air temperature
d. Command of space temperature setpoint
e. Cooling status
f. Heating status
g. Low temperature sensor alarm
h. Low pressure sensor alarm
i. High pressure switch alarm
j. Condensate sensor alarm
k. Hi/low voltage alarm
l. Fan “ON/AUTO” position of space thermostat as specified above
m. Unoccupied/occupied command
n. Cooling command
o. Heating command
p. Fan “ON/AUTO” command
q. Fault reset command
r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

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This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

Option: MPC (Multiple Protocol Control) interface system

Units shall have all the features listed above (either CXM or DXM) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. **Protocol selection shall not require any additional programming or special external hardware or software tools.** This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. Space temperature
b. Leaving water temperature
c. Discharge air temperature
d. Command of space temperature setpoint
e. Cooling status
f. Heating status
g. Low temperature sensor alarm
h. Low pressure sensor alarm
i. High pressure switch alarm
j. Condensate overflow alarm
k. Hi/low voltage alarm
l. Fan “ON/AUTO” position of space thermostat as specified above
m. Unoccupied/occupied command
n. Cooling command
o. Heating command
p. Fan “ON/AUTO” command
q. Fault reset command
r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

Warranty:

ClimateMaster shall warranty equipment for a period of 12 months from start up or 18 months from shipping (which ever occurs first).

Option: Extended 4-year compressor warranty covers compressor for a total of 5 years.

Option: Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.

Option: Extended 4-year control board warranty covers the CXM/DXM control board for a total of 5 years.

FIELD INSTALLED OPTIONS

Hose Kits:

All units shall be connected with hoses. The hoses shall be 2 feet (61cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted.

Valves:

The following valves are available and will be shipped loose:

a. Ball valve; bronze material, standard port full flow design, FPT connections.
b. Ball valve with memory stop and PT port.

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c. "Y" strainer with blowdown valve; bronze material, FPT connections.
d. Motorized water valve; slow acting, 24v, FPT connections.

Hose Kit Assemblies:

The following assemblies ship with the valves already assembled to the hose described:
a. Supply and return hoses having ball valve with PT port.
b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.
c. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
d. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

Thermostats:

The thermostat shall be a ClimateMaster mechanical or electronic type thermostat as selected below with the described features:

a. Single Stage Standard Manual Changeover (ATM11C11)
Thermostat shall be a single-stage, horizontal mount, manual changeover with HEAT-OFF-COOL system switch and fan ON-AUTO switch. Thermostat shall have a mechanical temperature setpoint indicator. Thermostat shall only require 4 wires for connection. Mercury bulb thermostats are not acceptable.

b. Single Stage Digital Auto or Manual Changeover (ATA11U01)
Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display with temperature and setpoint(s) in ºF or ºC. The Thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall provide temperature display offset for custom applications.

c. Single Stage Digital Automatic or Manual Changeover with Two-Speed Fan Control (ATA11C04) – DXM and PSC Fan required
Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch, fan ON-AUTO switch, and fan LO-HI switch. Thermostat shall have an LCD display with temperature and setpoint(s) in ºF or ºC. A fault LED shall be provided to display specific fault condition. Thermostat shall allow use of an accessory remote temperature sensor (AST009), but may be operated with internal sensor via orientation of a jumper.

d. Multistage Digital Automatic Changeover (ATA22U01)
Thermostat shall be multi-stage (2H/2C), manual or automatic changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for ºF or ºC. The thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to indicate specific fault condition(s). Thermostat shall provide temperature display offset for custom applications. Thermostat shall allow unit to provide better dehumidification with optional DXM controller by automatically using lower fan speed on stage 1 cooling (higher latent cooling) as main cooling mode, and automatically shifting to high speed fan on stage 2 cooling.

e. Multistage Manual Changeover Programmable 5/2 Day (ATP21U01)
Thermostat shall be 5 day/2 day programmable (with up to 4 setpoints per day), multi-stage (2H/1C), manual changeover with HEAT-OFF-COOL-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for ºF or ºC. The thermostat shall provide permanent memory of setpoint(s) without batteries. Thermostat shall provide convenient override feature to temporarily change setpoint.

f. Multistage Automatic or Manual Changeover Programmable 7 Day (ATP32U03)
Thermostat shall be 7 day programmable (with up to 4 setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have a blue backlit dot matrix LCD display with temperature, setpoints, mode, and status indication. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12 or 24-hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be

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accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

g. Multistage Automatic or Manual Changeover Programmable 7 Day with Humidity Control (ATP32U04)
Thermostat shall be 7 day programmable (with up to 4 setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Separate dehumidification and humidification setpoints shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. Installer configuration mode shall allow thermostat dehumidification mode to operate with ClimaDry® reheat or with ECM fan dehumidification mode via settings changes. Thermostat shall have a blue backlit dot matrix LCD display with temperature, relative humidity, setpoints, mode, and status indication. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoin t range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

DDC Sensors:

ClimateMaster wall mounted DDC sensor to monitor room temperature and interfaces with optional interface system described above. Several types as described below:

a. Sensor only with no display (LON and MPC).
b. Sensor with override (LON only).
c. Sensor with setpoint adjustment and override (MPC only).
d. Sensor with setpoint adjustment and override, LCD display, status/fault indication (LON and MPC).

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SUBMITTAL DATA - S-I UNITS

Unit Designation: _____

Job Name: _____

Architect: _____

Engineer: _____

Contractor: _____

PERFORMANCE DATA

Cooling Capacity: _____ kW

EER: _____

Heating Capacity: _____ kW

COP: _____

Ambient Air Temp: _____ °C

Entering Water Temp (Clg): _____ °C

Entering Air Temp (Clg): _____ °C

Entering Water Temp (Htg): _____ °C

Entering Air Temp (Htg): _____ °C

Airflow: _____ l/s

Fan Speed or Motor/RPM/Turns: _____

Operating Weight: _____ (kg)

ELECTRICAL DATA

Power Supply: _____ Volts

_____ Phase _____ Hz

Minimum Circuit Ampacity: _____

Maximum Overcurrent Protection: _____

SUBMITTAL DATA - I-P UNITS

Unit Designation: _____

Job Name: _____

Architect: _____

Engineer: _____

Contractor: _____

PERFORMANCE DATA

Cooling Capacity: _____ Btuh

EER: _____

Heating Capacity: _____ Btuh

COP: _____

Ambient Air Temp: _____ °F

Entering Water Temp (Clg): _____ °F

Entering Air Temp (Clg): _____ °F

Entering Water Temp (Htg): _____ °F

Entering Air Temp (Htg): _____ °F

Airflow: _____ CFM

Fan Speed or Motor/RPM/Turns: _____

Operating Weight: _____ (lb)

ELECTRICAL DATA

Power Supply: _____ Volts

_____ Phase _____ Hz

Minimum Circuit Ampacity: _____

Maximum Overcurrent Protection: _____

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Revision History

Date:	Item:	Action:
4/2/18	Unit photos	Changed unit photos from black to steel color
03/8/18	Page 71	Update Text
11/14/17	Page 43	Updated dimensions D, F, O
11/2/17	Page 58	Added WSE DIP setting table
10/6/17	Page 54	Edit size 015 'E' FLA, MCA
1/30/17	Page 48,49,52	Update WSE Notes
11/4/16	Page 7	Updated 018 awhp rating
11/1/16	Update Document Design	Updated
07/1/16	Page 20,22,25,27,29	Updated Nominal Airflow
06/23/16	All	Updated cabinet photo and description
05/16/16	Table Udates	Updated
10/6/16	Pages 14,18,22,25,27,69	Update Airflow, Heat of rejection, ECM option text
9/27/16	Pages 44,45,48	Corrected TCH Left Hand WSE 048-060 Dim Q
9/7/16	Page 53, cover	updated size 041 voltage codes and cabinet photo
4/20/16	All	Msc. text and wiring diagram updates
4/8/16	Page 8	Update performance data tc009 COP
02/25/16	Page 65 & 66	Updated run test and ECM blower description
02/18/16	Pages 39 & 40	Update Text
11/30/15	Various	Adding WSE to TCH and TCV
10/22/15	Page 25	Updated heating data
08/31/15	Page 7	Revision Level Corrected
07/31/15	Engineering Specifications and Unit Features	Updated, ECM Options Text, Edited Compressors Mount Text
04/29/15	Page 41	Updated Notes
03/03/15	Page 16	Updated 018 ECM Performance Data
02/06/15	Page 7	Changed E-Coated to Tin-Plated
02/03/15	All	Updated Rated Airflows ECM
01/21/15	Engineering Specifications	Added ECM Option Text
01/15/15	Pages 39 & 43	Updated Diagram; Added Text
01/05/15	ECM Blower Option	Added

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Revision History

Date:	Item:	Action:
06/14/17	Page 41	Update drawing
09/30/14	Text Edit - Page 47	Updated
07/15/14	Page 18	Added WPD
06/16/14	Pages 4, 8 & 46	Updated Text & Table
05/29/14	Physical Data Table	Removed Fan Motor (hp)
05/12/14	Physical Data Table	Updated Ref. Charge 024 and Unit Maximum Working Water Pressure
02/11/13	Unit Features	Updated
02/06/13	TCV041 M, N, Q Dimensions page 30	Updated
02/04/13	TCV Right Return Electrical Tables	Updated Blower Orientation Miscellaneous Edits
09/27/12	TCH060 Corner Weights Recommended Minimum Installation Clearances for Vertical Units *	Corrected Added
05/02/12	Size 041	ISO Table Updated
04/30/12	Horizontal Dimensional Data Table	Updated
02/20/12	Engineering Specifications	Updated
01/23/12	Size 041	Added
09/19/11	Size 024	Added “H” and “F” Voltage
08/09/11	Unit Maximum Working Water Pressure	Updated to Reflect New Safeties
08/03/11	Engineering Specifiations	Added Digital Night Setback with Pump Restart (DXM w/ AT-P32U03/04)
06/17/11	Coated Air Coil Option	Changed Description
04/07/11	Engineering Specification NOTICE	Updated
02/11/11	Performance Data Selection Notes	Updated
01/03/11	Format - All Pages	Updated
09/28/10	Engineering Specifications	Updated
09/28/10	Physical Data Table	Updated-Added Coax Volume Data
09/01/10	012 ‘E’ Airflow Correction Table	Added/Corrected
07/26/10	Wiring Diagrams	Updated
07/26/10	Compressor Mounting Information and Graphics Engineering Specifications	Updated to Reflect Spring/Grommet Change
06/11/10	Format - All Pages	Updated
06/11/10	Engineering Specifiations	Updated
04/23/10	Updated (Page 1) of Engineering Specifications	Paragraph edit to update ARI to AHRI
04/22/10	LEED®, Tranquility® 16, EarthPure®	Updated format (® ™ etc)
09/25/09	Performance Data Selection Notes	Example Updated
09/09/09	Engineering Specification - Fan 2 Motor Assembly	Changed ‘dry’ to ‘wet’
09/09/09	Engineering Specification - Thermostat	Changed ATP32U01, 02 to 03, 04
09/03/09	Fan and Motor Assembly Engineering Spec.	Changed ‘dry’ to ‘wet’
09/03/09	Thermostat Engineering Spec.	Removed ATP11N01, Changed ATP32U01, 02 to 03, 04
05/27/09	Stand-Alone and Big Book Submittals	Consolidated
05/06/09	Dimensional Data Tables	Condensate Column Added to Water Connections Table, Rows Consolidated in Cabinet, Knockoutand Discharge Tables
04/14/09	006-012 unit data added	
02/25/09	First Published	

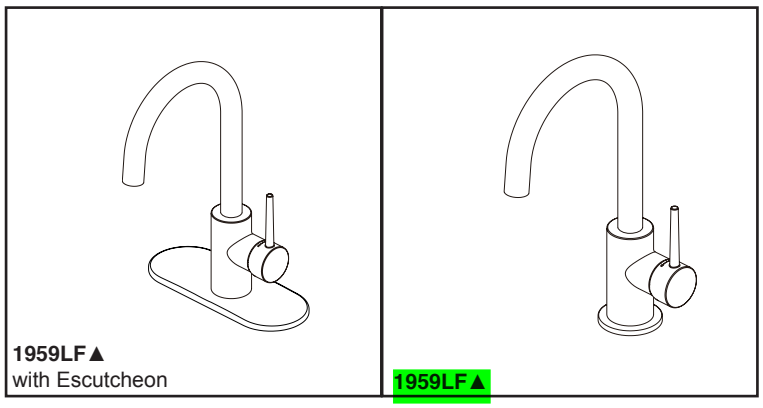
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Water-Source Heat Pump Systems

7300 S.W. 44th Street
Oklahoma City, OK 73179
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Bookmark Summary

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P-1 Sink	Page 3
P-2 Sink	Page 4
P-3,4,5,6 Outlet Boxes	Page 6
Garbage Disposal	Page 7



1959LF▲
with Escutcheon

1959LF▲

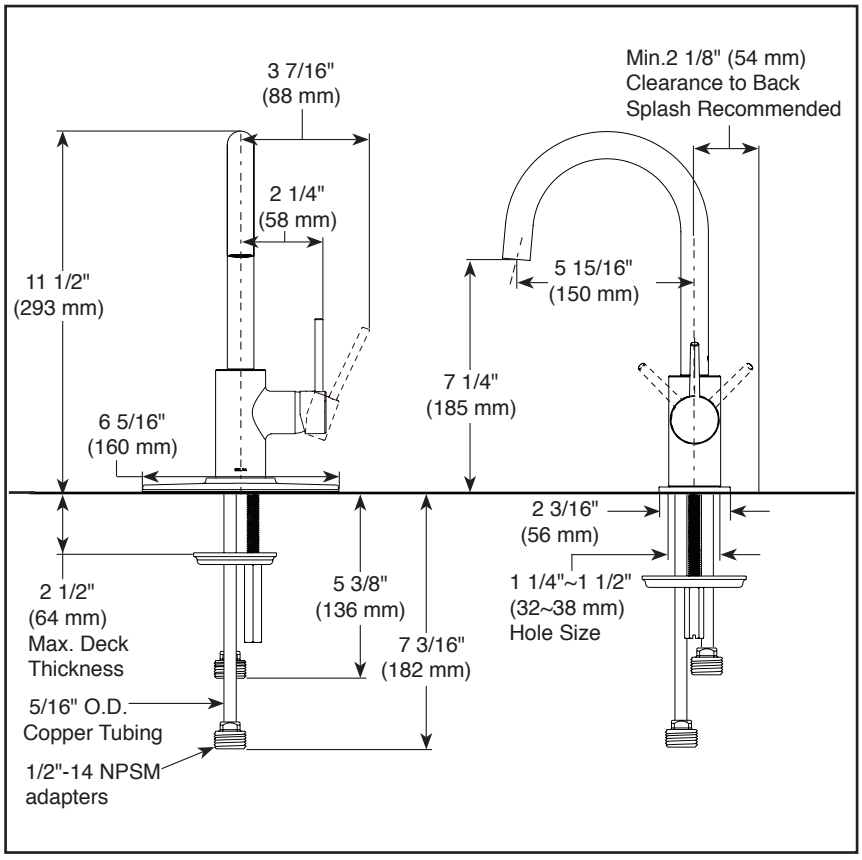
see what Delta can do℠

BAR & PREP SINK FAUCETS

- Contemporary
- Single Handle Deck Mount

Submitted Model No.: _____

Specific Features: _____



▲ Designate proper finish suffix

STANDARD SPECIFICATIONS

- One or three hole mount (escutcheon optional, not included)
- Max flow rate 1.5 gpm @ 60 psi, 5.7 L/min @ 414 kPa
- Solid brass fabricated body
- Spout rotates 120˚
- Hot/Cold logo on handle to indicate temperature
- Ceramic disc cartridge
- 5/16" staggered copper supply lines with 1/2" adapters
- ADA compliante lever handle
- Order RP77702 for optional escutcheon
- Order RP1001 for coordinating soap dispenser

WARRANTY

- Parts and Finish - Lifetime limited warranty; or for commercial purchasers, 10 years for multi-family residential (apartments and condominiums) and 5 years for all other commercial uses, in each case from the date of purchase.
- Electronic Parts and Batteries (if applicable) - 5 years from the date of purchase; or for commercial purchasers, 1 year from the date of purchase. No warranty is provided on batteries.

COMPLIES WITH:

- ASME A112.18.1 / CSA B125.1

Indicates compliance to ICC/ANSI A117.1

Delta reserves the right (1) to make changes in specifications and materials, and (2) to change or discontinue models, both without notice or obligation. Dimensions are for reference only. See current full-line price book or www.deltafaucet.com for finish options and product availability.

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350 South Edgeware Road, St. Thomas, ON N5P 4L1
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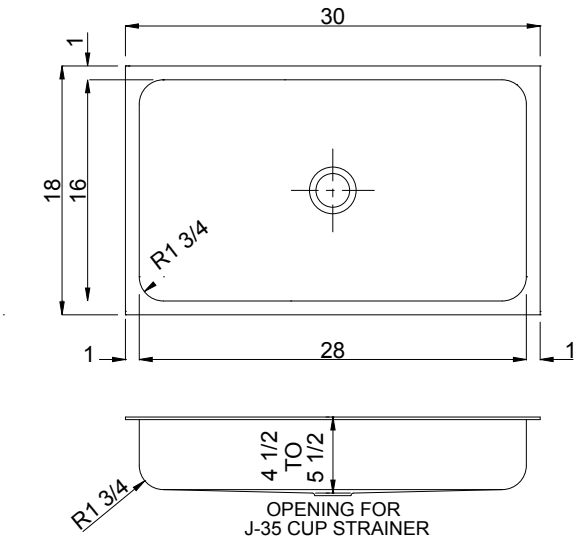
US-ADA-1830-A - 18 GA.

UNDERMOUNT GROUP

ADA COMPLIANT
SINGLE COMPARTMENT

SUBMITTAL DATA





ADA COMPLIANT

SPECIFICATION

Seamless die-drawn construction of 18 gauge, type 304, 18-8 stainless steel. Interior and top surfaces polished to a non-porous Hand-Blended Just Finish with highlighted bowl rim. Smooth, fully coated underside insulates for sound and reduces condensation. Certified to ASME A112.19.3/CSA B45.4, Canadian Standards Association (CSA), Uniform Plumbing Code (UPC), International Plumbing Code (IPC). Drain punched for J-35 drain.

10.36 Gallon Capacity*

Capacity Matters
Max ID sizing with straight sided bowl configuration (non tapered sides). Tight corner radius design.

**Capacity is based on 5-1/2" Depths*

To Be Specified:			
DRAIN LOCATION:			
☑	CENTER (SHOWN)	☐	LEFT REAR
☐	RIGHT REAR	☐	CENTER REAR
LOCATIONS MUST BE A MINIMUM OF 4 1/2" FROM THE BOWL WALL.			
DEPTH* - MUST BE SPECIFIED:			
☐	4 1/2" DEEP	☐ 5" DEEP	☑ 5-1/2" DEEP

* The thickness of the surface material these sinks are mounted under may affect the maximum depth that can be used while maintaining deck height and knee clearances.

APPROVED FOR MANUFACTURING

MODEL NO.: **US-ADA-1830-A** QTY: _____

JOB NAME: _____

TAG/ITEM: _____

CUSTOMER: _____

SIGNATURE: _____

MADE IN U.S.A.

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Elkay Lustertone Classic Stainless Steel 14" x 18-1/2" x 5-3/8" Single Bowl Undermount ADA Sink with Perfect Drain

Model(s) ELUHAD111655PD

ELKAY® SPECIFICATIONS

PRODUCT SPECIFICATIONS

Elkay Lustertone™ Classic Stainless Steel 14" x 18-1/2" x 5-3/8", Single Bowl Undermount ADA Sink with Perfect Drain. Sink is manufactured from 18 gauge 304 Stainless Steel with a Lustrous Satin finish, Rear Center drain placement, and Bottom only pads.

Installation Type:	Undermount
Material:	304 Stainless Steel
Special Features:	Perfect Drain
Finish:	Lustrous Satin
Gauge:	18
Sound Deadening:	Bottom only pads
Number of Bowls:	1
Sink Dimensions:	14" x 18-1/2" x 6-7/8"
Bowl 1 Dimensions:	11-1/2" x 16" x 5-3/8"
Drain Size:	3-3/8" (86mm)
Drain Location:	Rear Center
Minimum Cabinet Size:	18"
Mounting Hardware:	Undermount brackets sold separately
Template Included:	Yes
Cutout Template #:	1000001422

Template is available for download at elkay.com. CAD software will be required to open the template.

Perfect Drain: Seamlessly welded stainless steel collar eliminates the gap between a traditional drain and the sink for a sanitary and gap free installation. An InSinkErator garbage disposer can be installed on either sink bowl for user convenience.
U.S. Patent Nos 9,057,185 and 9,783,968.

insinkerator

Elkay® Perfect Drain™ sinks are designed and approved for compatible disposers manufactured by InSinkErator® utilizing the Quick Lock® mounting configuration. Use of non-approved disposers may void Elkay warranty.

InSinkErator, Quick Lock and the mounting collar configuration are trademarks of Emerson Electric Co.



Included with Product: **One LKPD1 Perfect Drain and strainer**

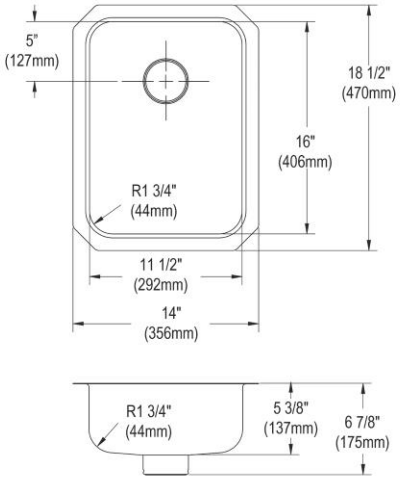
AMERICAN PRIDE. A LIFETIME TRADITION.
Like your family, the Elkay family has values and traditions that endure. For almost a century, Elkay has been a family-owned and operated company, providing thousands of jobs that support our families and communities.

Product Compliance: ADA & ICC A117.1
ASME A112.19.3/CSA B45.4
Buy American Act
Accessory: ASME A112.18.2/CSA B125.2

Sinks are listed by IAPMO® as meeting the applicable requirements of the Uniform Plumbing Code®, International Plumbing Code®, and National Plumbing Code of Canada.

Complies with ADA & ICC A117.1 accessibility requirements when installed according to the requirements outlined in these standards.

Clean and Care Manual (PDF)
Installation Instructions (PDF) - 1000005239
Installation Instructions (PDF) - 74180289_Disposer
Installation Instructions (PDF) - 74180340-USA_Drain
Warranty (PDF)



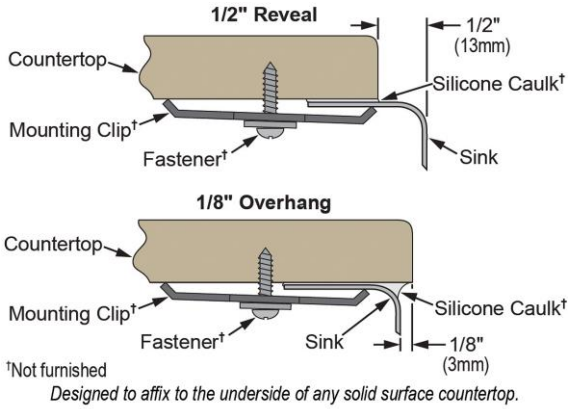
PART:_____QTY: _____
PROJECT:_____
CONTACT:_____
DATE:_____
NOTES:_____
APPROVAL:_____

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

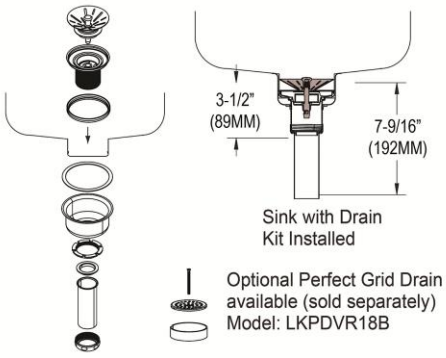
Elkay Lustertone Classic Stainless Steel 14" x 18-1/2" x 5-3/8" Single Bowl Undermount ADA Sink with Perfect Drain

Model(s) ELUHAD111655PD

Installation Profile:



Designed to affix to the underside of any solid surface countertop.



Included Accessories		
LKPD1	Elkay Perfect Drain Fitting Type 304 Stainless Steel Body and Strainer Spec Sheet (PDF)	

Optional Accessories		
LKWOBG1116SS	Elkay Stainless Steel 10-1/2" x 15" x 1" Bottom Grid Spec Sheet (PDF)	
LKDS99	Elkay 3-1/2" Garbage Disposal Stopper / Strainer for use with Perfect Drain-Chrome Polished Stainless Steel Spec Sheet (PDF)	
LKPDAD18B	Elkay Perfect Drain Chrome Plated Brass Body Strainer and LKADOS Tailpiece Spec Sheet (PDF)	
LKPDVR18B	Elkay Perfect Drain Chrome Plated Brass Body Vandal-resistant Strainer Spec Sheet (PDF)	
LKWUCSS	Elkay Stainless Steel 3-1/2" x 5-1/8" x 4-3/8" Utensil Caddy Spec Sheet (PDF)	

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for the most current version of Elkay product specification sheets. This specification describes an Elkay product with design, quality, and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

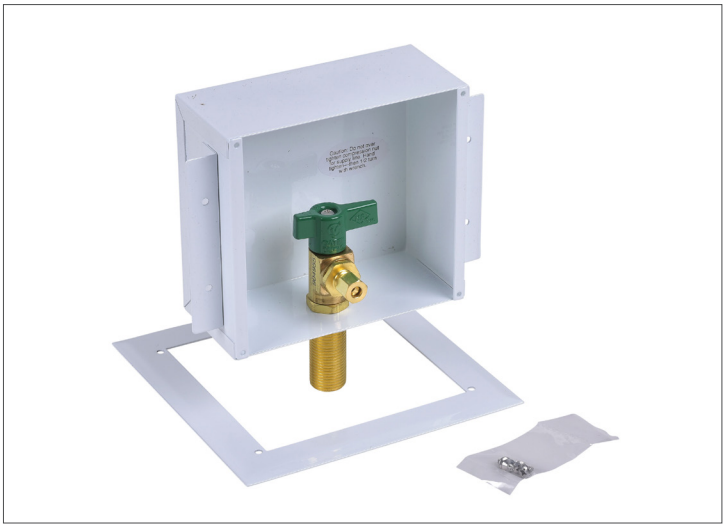
P-3,4,5,6

Job Name _____ Item # _____
Location _____
Engineer _____ Contractor _____
PO # _____ Tag _____
Representative _____

METAL ICE MAKER BOX TECHNICAL SPECIFICATION

SPECIFICATIONS

Oatey Metal Ice Maker Outlet Boxes can be used in applications requiring supply valves recessed into a wall. Unit shall allow for the mounting of supply lines from top or bottom on the left or right side. Unit shall be available with ¼ turn brass ball valves in configurations with and without water hammer arrestors.



APPROVALS & LISTINGS

Valves	ASME A112.18.1/NSF Standard 61, Section 9
Water Hammer Arrestors	ASSE 1010
Boxes	IAPMO-Listed, PS-54

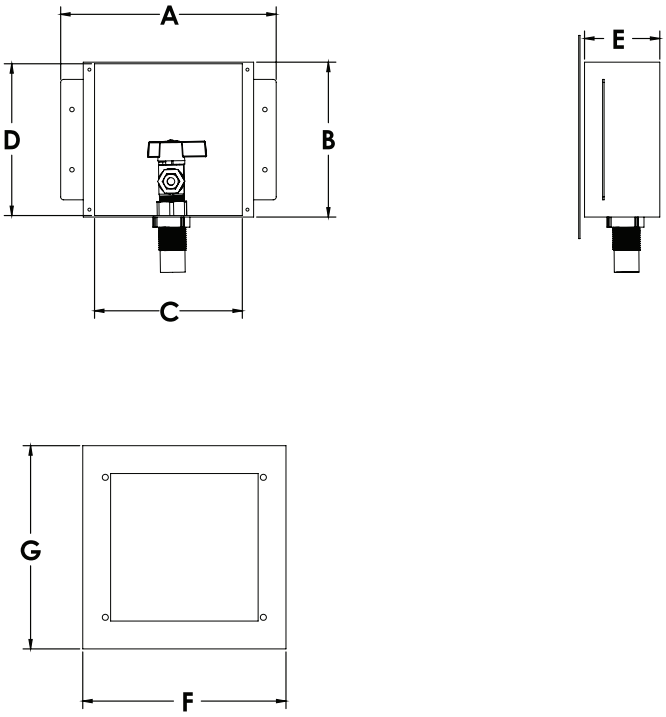
FEATURES & MATERIALS

Outlet Box	20 Gauge Steel
Faceplate	28 Gauge Steel

PRODUCT SELECTOR

✓	Product Number	Description	Ctn. Qty.
METAL ICE MAKER BOX			
	38687	Plain Box – No Valves – Standard Pack	1
	38689	¼" Turn Brass Ball Valve – Copper Sweat – Standard Pack	1
	38688	¼" Turn Brass Ball Hammer Valve – Copper Sweat – Standard Pack	1
	39141	Metal ¼" Turn, Copper, Low Lead-Standard Pack	1
	39140	Metal ¼ Turn, Copper, Hammer, Low Lead – Standard Pack	1
ACCESSORIES			
	38686	Metal Faceplate for Metal IMB	1

Data is subject to manufacturing tolerances.



DIMENSIONS

[A]:	Box Width	7.16"	[E]:	Box Depth	2.50"
[B]:	Box Height	5.15"	[F]:	Faceplate Width	6.75"
[C]:	Box Opening Width	4.91"	[G]:	Faceplate Height	6.75"
[D]:	Box Opening Height	5.04"			

Access BIM/Revit content through www.oatey.com

insinkerator®



ADVANCED SERIES

Evolution® .75HP

Submittal Sheet

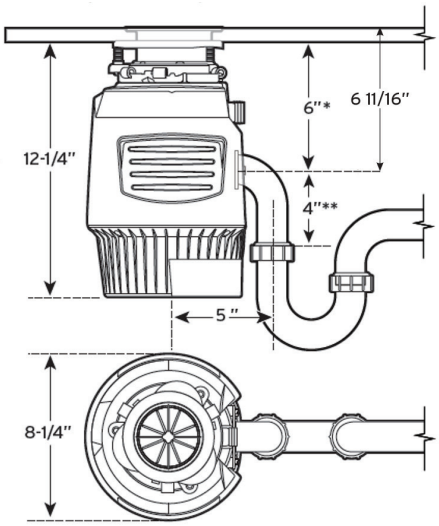
This model offers the following features and benefits:

- **3/4 HP long-lasting, Dura-Drive® Induction motor**
- **Quiet SoundSeal Technology®** delivers quiet disposal operation
- **Advanced Grind** for tough and fibrous food scraps
- **3-Stage MultiGrind® Technology:** Finest grind designed to prevent clogs
- **EZ Connect Disposal** easily connects to a hardwire connection or outlet
- **Removable, Diswasher Safe, Quiet Collar® Sink Baffle**
- Safe for use with properly maintained septic tanks
- **EZ Connect Cord** Sold Separately

Specifications

Type of Feed	Continuous
On/Off Control	Wall Switch
Motor	Single Phase
HP	3/4
Volts	120
HZ	60
RPM	1725
Amp. (Avg. Load)	9.5
Time Rating	Intermittent
Lubrication	Permanently Lubricated Upper & Lower Bearings
Shipping Weight (Approx.)	18.4 lb.
Overall Height	12.25"
Motor Protection	Automatic Reset
Average Water Usage	Approx. 1 Gallon per Person Per Day
Average Electrical Usage	3-4 KWh per Year
Drain Connection	1-1/2" cushioned slip joint
Dishwasher Drain Connection	Yes

Dimensions



Sample Specification

Food Waste Disposer(s) shall be InSinkErator Evolution® .75HP, continuous feed, with 3/4 HP. motor, stainless steel grinding elements with two stainless steel 360° swivel lugs. Exclusive self-service wrench.

Warranty

9-Year *We Come to You*® Limited In Home Warranty

* The complete InSinkErator warranty is included in the Care & Use Booklet packed with each unit.

Food waste is roughly 80% water. By using your disposal regularly, you can help divert food waste from landfills and reduce greenhouse gas emissions. Make sustainability a family affair by using your disposal. After all, the smallest changes can make the biggest impact.

Job Specifications

The ONLY manufacturer with disposers INVENTED, DESIGNED & ASSEMBLED in the USA

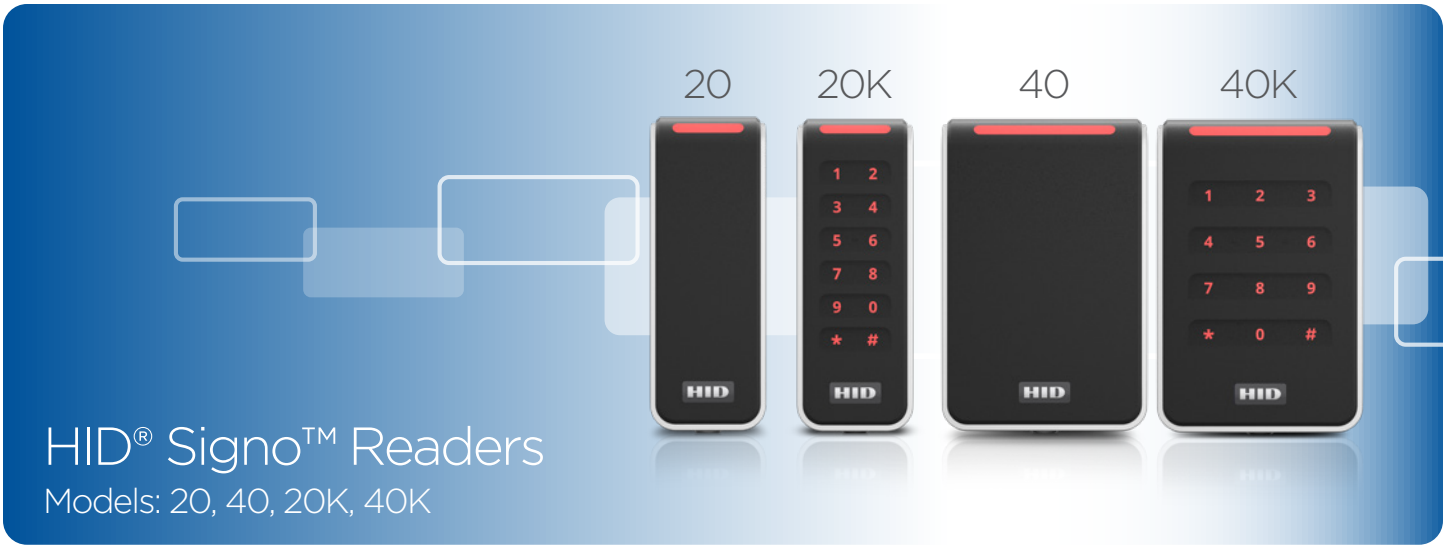
UL LISTED · IAPMO Listed · ASSE 1008 · ASSE Engineering

1-800-558-5700
www.insinkerator.com

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H969-23G-83-10

PHYSICAL ACCESS SOLUTIONS



READY FOR THE FUTURE NOW

- Mobile-ready by default, including Apple's Enhanced Contactless Polling (ECP) to support credentials in Apple Wallet
- Sleek, innovative design to suit modern architecture
- Integrated OSDP for secure authentication and configuration post installation
- Built on a hardware platform designed to be adaptable to support future technology
- Designed to seamlessly integrate into the HID Origo® ecosystem

THE SIGNATURE LINE OF READERS FROM HID GLOBAL

- **Highly Versatile —** Support for the widest range of credential technologies, including HID Mobile Access® via native Bluetooth and Near Field Communication (NFC).
- **Unparalleled Performance —** Ultra secure storage of cryptographic keys on certified secure element hardware, plus a new surface detection feature that enables the reader to automatically recalibrate and optimize read range performance.
- **Connected to the Future —** All readers include out-of-the-box support for Open Supervised Device Protocol (OSDP) for secure bidirectional communication.

HID Signo™ is the signature line of physical access control readers from HID Global. The versatility, performance and connected capabilities of HID Signo readers set a new industry benchmark for the most highly adaptable, interoperable and secure approach to electronic access control.

Offering an unparalleled breadth of functionality, HID Signo affords security system installers and administrators a simple and effective approach to secure access control for almost any scenario.

With support for the widest array of credential technologies — past, present and future — HID Signo is the perfect choice for those looking to make the transition to a secure authentication technology.

HID Signo readers transcend the traditional approach to security by being designed to be connected and managed remotely without needing to physically touch each device. This functionality empowers access control systems to dynamically respond as new needs, configurations or threats arise.

POWERFULLY SECURE

- Multi-Layered security to ensure data authenticity and privacy
- EAL6+ Certified Secure Element Hardware
- Native OSDP secure channel capability
- Trusted secure authentication using the SIO data model
- Supports iCLASS Elite™ and Corporate 1000 Programs

MEET EVERY NEED, ADAPT TO ANY SITUATION

- Go mobile with native Bluetooth and NFC support
- Integrated 125 kHz credential read support for easy migration
- Supports over 15 common credential technologies
- Flush mount terminal block and pigtail wiring options
- Robust outdoor performance with an IP65 rating

MANAGE, UPGRADE AND CONFIGURE

- Easily and securely managed using HID Reader Manager®
- Configure via a mobile device or OSDP
- Update firmware in response to threats
- Personalize by configuring audio visual or keypad settings
- Deactivate legacy credential technology to conclude secure migration

SPECIFICATIONS

HID Signo Reader Model	20	20K	40	40K
2.4 GHz (Bluetooth) Credential Compatibility	Mobile Credentials powered by Seos® (HID Mobile Access)			
13.56 MHz (NFC) Credential Compatibility	Seos, iCLASS SE®, iCLASS SR®, iCLASS®, MIFARE Classic, MIFARE DESFire EV1/EV2, Mobile Credentials powered by Seos (HID Mobile Access)			
125 kHz Credential Compatibility	HID Proximity®, Indala Proximity®, AWID Proximity, and EM Proximity			
Typical Read Range[1]	Seos®, MIFARE Classic, MIFARE DESFire EV1/EV2 & ISO14443A Single Technology Cards – 4 to 10 cm (1.6 to 4 in) HID / AWID Proximity®, Indala Proximity®, EM Proximity & 125 kHz Single Technology Cards – 6 to 10 cm (2.4 to 4 in)			
Mounting	Suited for mullion-mount door installations or any flat surface mounting		Suited to mount and cover single gang switch boxes with a slotted mounting plate for alternate back-box spacing	
Color	Black bezel with silver trim baseplate [2]			
Keypad	No	Yes (2 x 6 layout)	No	Yes (3 x 4 layout)
Dimensions (width x length x depth)	45 mm x 121.5 mm x 19.5 mm (1.77 in x 4.78 in x 0.77 in)	45 mm x 121.5 mm x 21.5 mm (1.78 in x 4.79 in x 0.85 in)	80 mm x 121.5 mm x 19.5 mm (3.15 in x 4.78 in x 0.77 in)	80 mm x 121.5 mm x 21.5 mm (3.16 in x 4.79 in x 0.85 in)
Product Weight	Pigtail: 95 g (3.35 oz) Terminal: 75 g (2.65 oz)	Pigtail: 110 g (3.88 oz) Terminal: 90 g (3.17 oz)	Pigtail: 140 g (4.94 oz) Terminal: 120 g (4.23 oz)	Pigtail: 160 g (5.64 oz) Terminal: 140 g (4.94 oz)
Operating Voltage	12V DC			
Current Draw[3]	NSC[4]: 60 mA Peak: 250 mA Max. Avg: 70 mA IPM[5]: 45 mA	NSC[4]: 65 mA Peak: 250 mA Max. Avg: 75 mA IPM[5]: 48 mA	NSC[4]: 65 mA Peak: 250 mA Max. Avg: 75 mA IPM[5]: 45 mA	NSC[4]: 70 mA Peak: 250 mA Max. Avg: 80 mA IPM[5]: 55 mA
Device Input and Output	Input: Tri-color LED, Buzzer, Hold @ Active Low Output: Tamper Relay 0-60V DC @ 100mA Max (Dry Contact)			
Operating Temperature & Humidity	-35° C to +66° C (-31° F to +150° F) 0% to 95% non-condensing			
Storage Temperature	-40° C to +85° C (-40° F to +185° F)			
Environmental Rating	UL294 Outdoor and Indoor rated, IP65			
Transmit Frequency	125 kHz, 13.56 MHz, and 2.4 GHz			
Communications & Panel Connection	Wiegand and RS-485 Half Duplex (OSDP) via Pigtail (18 in / 0.5 m) or Terminal Strip			
Device Management	HID Reader Manager / OSDP configuration			
Certifications	UL294/cUL (US), FCC (US), IC (Canada), CE (EU), RCM (Australia, New Zealand), SRRC (China), KCC (Korea), NCC (Taiwan), iDA (Singapore), RoHS, MIC (Japan), GreenCircle, Bluetooth SIG, and additional regions. www.hidglobal.com/certifications			
Security Ratings	EAL 6+ Certified Secure Element Hardware			
Patents	www.hidglobal.com/patents			
Housing Materials	Polycarbonate – UL94 V0			
UL Reference Number	20	20K	40	40K
Warranty	Limited Lifetime			

1 Read range listed is statistical mean rounded to nearest centimeter increment for ID-1 or clamshell credentials. HID Global testing occurs in open air. Form factor, technology and environmental conditions, including metallic mounting surface, can degrade read range performance; plastic spacers are recommended to improve performance on metallic mounting surfaces.
2 Black trim baseplate & reader spacers available as an additional accessory at an additional cost.
3 Measured in accordance with UL294 standards; see Installation Guide for details.
4 NSC – Normal Standby Current; see Installation Guide for details.
5 Intelligent Power Management (IPM) – Reduces reader current consumption up to 43%, based on model, compared to standard operating mode.

hidglobal.com

North America: +1 512 776 9000
Toll Free: 1 800 237 7769
Europe, Middle East, Africa: +44 1440 714 850
Asia Pacific: +852 3160 9800
Latin America: +52 55 5081 1670

An ASSA ABLOY Group brand

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2019-12-19-pacs-signo-reader-ds-en PLT-04831

ASSA ABLOY

SOFTWARE HOUSE®

DATA SHEET

RM-DCM-2

Door Control Module with Enclosure



Shown with optional I8 input module, R8 output module, and battery

Features That Make a Difference:

- Full-featured local door control module lowers wiring costs
- Complete set of inputs and outputs to control one door
- Flexible control options for reader LEDs and beep patterns
- Easily expandable
- Additional internal etch connections support magnetic lock features and accommodate local bypass switch
- Optional LCD provides clear instructions that help simplify startup and diagnostics
- Status LEDs on inputs and outputs for quick troubleshooting
- Built-in tamper switch provides secure installation
- Plug-in screw terminals reduce installation time

Put a full-featured RM-4E door control module in a UL listed, tamper-protected enclosure and you have the powerful Software House® RM-DCM-2. RM-DCM-2 is designed to support up to two RM-4Es and a choice of up to two I8 input boards or R8 output boards, providing a single enclosure for doors with IN and OUT readers.

RM-DCM-2 supports both Wiegand and magnetic stripe readers and provides additional wiring to magnetic locks if required.

The RM-4E modules create the connectivity between a reader and a control panel when third party card readers are used on a C•CURE® system. In addition, the RM-4E modules provide two supervised inputs and two SPDT relays (no ARM-1s are necessary). The LEDs and optional LCD display provide diagnostics to simplify the installation.

RM-DCM-2 provides standby power with its built-in uninterruptible power supply (UPS).

With its robust feature set, RM-DCM-2 is designed to handle the most demanding access control applications with ease while offering numerous installation and service features that lower its life cycle cost.

tyco

SOFTWARE HOUSE®

SPECIFICATIONS

Physical

Enclosure Dimensions (H x W x D) . . .356 x 305 x 89 mm (14 x 12 x 3.5 in)
RM-4E Board-Only
Dimensions (H x W) . . . . . .136 x 181 mm (5.375 x 7.125 in)
Weight (with 4Ah battery) . . . . . .5.9 kg (11 lbs)
Weight (without battery) . . . . . .4.5 kg (8 lbs)
Construction. . . . . .20 AWG metal wall mounted locking cabinet with tamper switch on door

Environmental

Operating and Storage
Temperature . . . . . .0 ° to 50°C (32° to 122°F)
5 to 95% RH, non-condensing

Electrical

Power Requirements
without Reader or Relays . . . . . .+12 VDC +/- 5% or +24 VDC +/-10%, 280 mA max
Power Requirements, Maximum,
with Reader and Relays . . . . . .+12 VDC +/- 5% or +24 VDC +/-10%, 550 mA max
Output Relay Power Ratings. . . . . .Up to 30 VAC/DC, 5A maximum
Reader LED Output Controls . . . . . .4.0 volts to 5.25 volts, 20mA max
Power Available for Reader. . . . . .5 VDC +/- 10% or 12 VDC +/- 10%, 125mA max (at 5V or 12V)
Optional Battery . . . . . .12V/4Ah battery provides nominal 4 hours backup time

Regulatory

UL 294
CE, including EN50081-1, EN50130-4, EN50133
FCC Part 15 Class A
RoHS

Communications

Communications Bus . . . . . .RM bus from iSTAR controller or apC/8X panel
Communications Type . . . . . .RS-485 half duplex, two-wire
Maximum Distance. . . . . .1,219 m (4,000 ft)

Reader, Inputs & Outputs

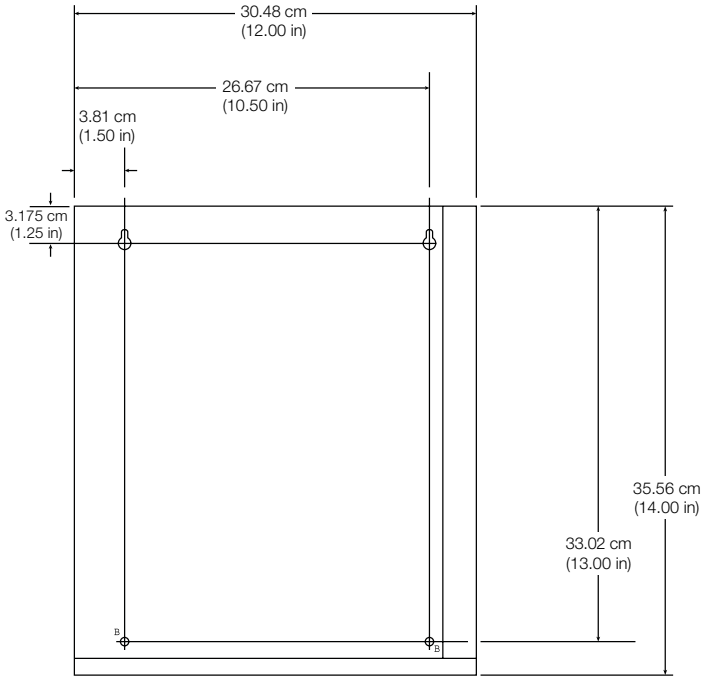
Reader Ports . . . . . .One
Reader Support . . . . . .Wiegand or magnetic stripe
Reader Control Lines Available . . . . .Red LED, green LED, yellow LED, beeper
Keypad Support . . . . . .Terminals provided for external 3x4 matrix keypad
Supervised Inputs. . . . . .Two, double-resistor
Output Relays. . . . . .Two, Form C, dry contact
Tamper Input . . . . . .One

Indicators and Switches

Three status LEDs for each supervised input
LED on each relay output
LEDs for RS-485 transmit and receive
LED for power-on
Optional LCD for diagnostics
Eight position dipswitch for feature selection:

- Wiegand/magnetic stripe reader type
- Tamper bypass
- LED pattern
- RM bus termination
- Input LED disable

Mounting Specifications



Product offerings and specifications are subject to change without notice. Actual products may vary from photos. Not all products include all features. Availability varies by region; contact your sales representative. Certain product names mentioned herein may be trade names and/or registered trademarks of other companies.

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www.swhouse.com

Microsoft GOLD CERTIFIED Partner

ISV/Software Solutions
Networking Infrastructure Solutions

RoHS 2002/95/EC

DS160 Series High Performance Request-to-exit Detectors

www.boschsecurity.com

BOSCH
Invented for life



- Door monitor with sounder alert
- Sequential Logic Input (SLI)
- Internal vertical pointability
- Wrap-around coverage pattern with precise pattern control
- Up to 64 second adjustable latch time

The DS160 Series consists of the DS160 Detector (light gray) and the DS161 Detector (black) specifically designed for Request-to-exit (REX) applications. With features such as timers, door monitor with sounder alert, and pointable coverage, the DS160 and DS161 have the flexibility to meet the most stringent REX requirements. The exclusive Sequential Logic Input (SLI) provides added security that is not offered in any other REX device.

Functions

Sequential Logic Input (SLI)
The SLI terminal allows connection of a second device to require sequential detection. This eliminates the possibility that an object that is slid through the door or underneath the door will activate the detector. This input can also be used to lock the sensor if motion is present outside the premises.

Door Monitor
The sensor can monitor a door contact to allow special control of the internal relay. For example, if the door is opened within the relay time period, the sensor can be programmed to halt the timer. If the door is not opened within a specific time period, the relay can be programmed to deactivate.

Sounder Alert
An integrated sounder can be programmed to activate if the door is left open too long. The sounder volume is fully adjustable to 85 dB.

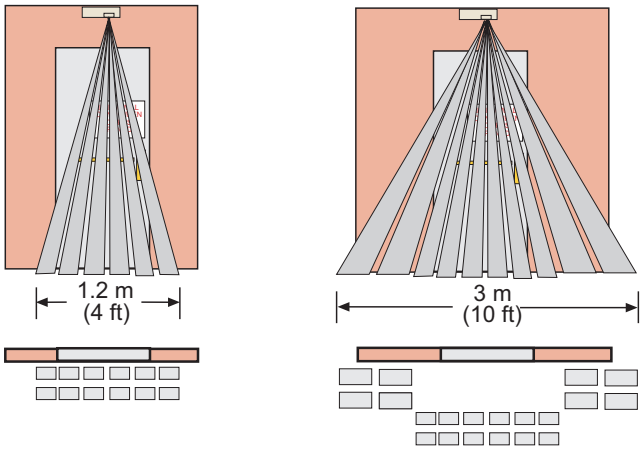
Keycard Input
The keycard input allows the sensor relay to be controlled from an external source, such as an access control system or card reader.

Certifications and approvals

Europe: Complies with EN50131-1 Grade 2

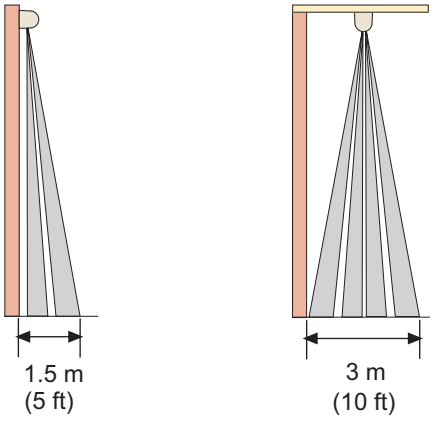
Region	Regulatory compliance/quality marks	
Australia	RCM	[DS160]
Europe	CE	EMC, LVD, RoHS [DS160, DS161]
USA	UL	ALVY: Access Control Systems Units (UL294) [DS160, DS161]

Installation/configuration notes



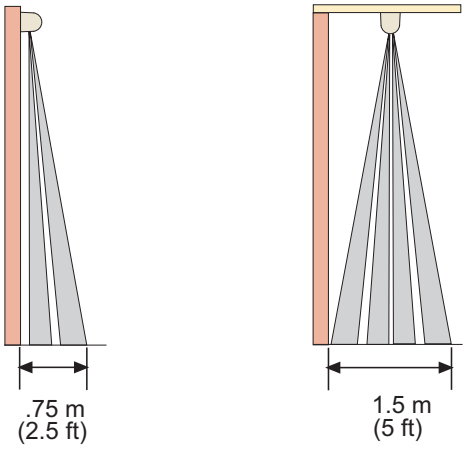
Front View

Mounted on wall above door and mounted on ceiling .75 m (2.5 ft) in front of the door.



Side View

The higher that you mount the unit, the larger the coverage area. Do not mount the DS160/DS161 more than 4.6 m (15 ft) above the floor.
Side view of coverage pattern with the unit mounted at 4.6 m (15 ft) above the floor with the lens pointed straight down.



Side View

The higher that you mount the unit, the larger the coverage area. Do not mount the DS160/DS161 more than 4.6 m (15 ft) above the floor.
Side view of coverage pattern with the unit mounted at 4.6 m (15 ft) above the floor with the lens pointed straight down.

Coverage Information

The coverage (detection area) varies depending on the mounting height above the floor, angle of the lens, and whether the unit is mounted on a wall above the door or on the ceiling. The coverage is 2.4 m x 3 m (8 ft x 10 ft) The coverage patterns for the detector at a height of 2.3 m (7.5 ft) are shown. The coverage pattern increases or decreases with height and detector alignment.

Notice
When you mount the unit on the wall and the lens points straight down, some detection zones point toward the wall and do not detect movement.

The diagrams depict views of the coverage pattern with the detector mounted at 2.3 m (7.5 ft) above the floor with the lens pointed straight down. Zones that are pointed toward the wall are not shown.

Technical specifications

Environmental

Operating Temperature:	-29°C to +49°C (-20°F to +120°F) For UL Certificated installations, 0°C to +49°C (+32°F to +120°F)
Radio Frequency Interference (RFI) Immunity:	No alarm or setup on critical frequencies in the range from 26 MHz to 1000 MHz at 50 V/m
Complies with Environmental Class II (EN50130-5)	

Mechanical

Dimensions:	4.5 cm x 17.1cm x 4.4 cm (1.80 in. x 6.75 in. x 1.75 in.)
Material:	High impact ABS plastic enclosure

Modes

Power Loss Default:	Programmable fail-safe or fail-secure modes.
Timer:	Programmable reset accumulative or non-reset counting mode.

Electrical

Current Draw:	8 mA nominal standby current, 39 mA at 12 VDC in alarm
Voltage:	12 VAC or VDC to 30 VAC or VDC

Alarm Output:	Two Form C relay contacts each rated 1 A at 30 VAC or VDC for resistive loads
Indicators:	1 activation LED
Relay Latch Time:	Adjustable from 0.5 sec to 64 sec.

Ordering information

DS160 Request-to-exit sensor, sounder
For use in request-to-exit (REX) applications. Provides PIR 2.4 m x 3 m (8 ft x 10 ft) coverage, timers, door monitor with sounder alert, and pointable coverage.
Order number **DS160**

EWE-DETCTR-IW 12mths wrty ext detector general
12 months warranty extension
Order number **EWE-DETCTR-IW**

DS161 Request-to-exit sensor, black, sounder
Black enclosure. For use in Request-to-EXit (REX) applications. Provides PIR, 2.4 m x 3 m (8 ft x 10 ft) coverage, timers, door monitor with sounder alert, and pointable coverage.
Order number **DS161**

EWE-DETCTR-IW 12mths wrty ext detector general
12 months warranty extension
Order number **EWE-DETCTR-IW**

Accessories

TP160 Trim plate for DS150 and DS160
A light gray trim plate used when mounting the detector over a standard single-gang box.
Order number **TP160**

TP161 Trim plate for DS151 and DS161, black
A black trim plate used when mounting the sensor over a standard single-gang box.
Order number **TP161**

Represented by:

Europe, Middle East, Africa:
Bosch Security Systems B.V.
P.O. Box 80002
5600 JB Eindhoven, The Netherlands
Phone: + 31 40 2577 284
emea.securitysystems@bosch.com
emea.boschsecurity.com

Germany:
Bosch Sicherheitssysteme GmbH
Robert-Bosch-Ring 5
85630 Grasbrunn
Germany
www.boschsecurity.com

North America:
Bosch Security Systems, LLC
130 Perinton Parkway
Fairport, New York, 14450, USA
Phone: +1 800 289 0096
Fax: +1 585 223 9180
onlinehelp@us.bosch.com
www.boschsecurity.us

Asia-Pacific:
Robert Bosch (SEA) Pte Ltd, Security Systems
11 Bishan Street 21
Singapore 573943
Phone: +65 6571 2808
Fax: +65 6571 2699
apr.securitysystems@bosch.com
www.boschsecurity.asia

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2634909195 | en, V17, 16. Feb 2021

Mallory Sonalert Products, Inc.

Part #: **SC616CP**

Sales Outline Drawing

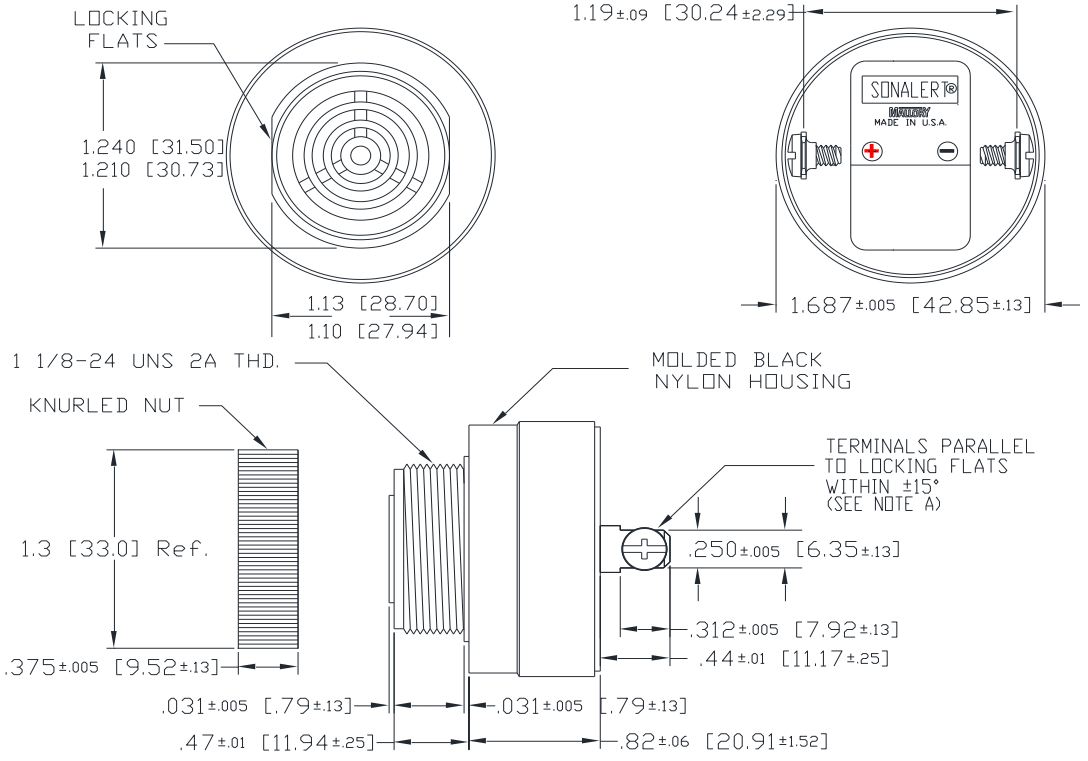
Revision: **G**

Specifications:

Sound Level Category	Medium
Mode of Operation	Chime @ 60% Duty Cycle
Voltage Rating	6 to 16 VDC
Frequency	2900 ± 500 Hz
Loudness @ 2 FT	75 to 83 dB(A) Typ.
Loudness @ Min Vdc	68 dB(A) @ 2 Feet and 6 Vdc
Loudness @ Max Vdc	78 dB(A) @ 2 Feet and 16 Vdc
Current Draw	6-23mA
Duty Cycle (%)	50
Housing Material	6/6 Nylon, Color: Black
Storage Temperature	-40° to +85° C
Operating Temperature	-30° to +65° C
Panel Mounting	Recommended hole size is 1.25"(31.75mm). Thread front will fit standard 30mm(1.181") hole.
Knurled Nut	Used to attach part to panel. The max recommended torque is 10 in-lbs.
Weight (Typical)	1.6 oz (45g)
NEMA 3R,4X, & 12	Approved with use of ACC03.
Options	Please contact factory.

Dimensions: Inches (mm)

cUL Recognized



NOTE A: TERMINALS-.032 BRASS TIN PLATED, TAPPED FOR #6-32 SCREW. TWO #6-32 NICKEL PLATED BRASS SCREWS INCLUDED. WILL ACCEPT 1/4" QUICK CONNECT.

NOTE B: MOUNTING- REMOVE BLACK PLASTIC NUT AND INSERT THREADED FRONT THROUGH 1.25" HOLE PUNCHED IN PANEL, IF ORIENTATION IS NEEDED, NOTE LOCKING FLATS ON DRAWING. SCREW NUT BACK ON. DO NOT OVERTIGHTEN.

4411 South High School Road, Indianapolis, Indiana 46241 U.S.A · Phone: (317) 612-1000 Fax: (317) 612-1010 www.mspindy.com

1490005010

ITSV-5

HD IP Video Phone with 8" Screen



- 16 lines with up to 16 SIP accounts
- 8” (1280×800) capacitive 10-point touch screen HD IPS LCD
- Built-in 2 mega-pixel CMOS tiltable camera with privacy shutter
- 12-way audio conferencing and 3-way 1080p 30fps video conferencing capability
- Dual-mic HD speakerphone with noise reduction, advanced echo cancellation, and excellent double-talk performance
- 4-core 2.0GHz ARM Cortex A55 processor with 4GB RAM and 16GB eMMC Flash

Video Intercom SIP Bluetooth IC-Edge ICX-AlphaCom Audio HD Voice Video H.264

Description

The ITSV-5 is a powerful IP video phone featuring Android 11, an 8” touch screen, real-time HD video telephony, built-in WiFi, Bluetooth, and more. The ITSV-5 delivers advanced SIP telephony features and out-of-the-box integration with our IC-EDGE and ICX-AlphaCom IP Intercom Platforms.

Features:

- 4-core 2.0GHz ARM Cortex A55 processor with 4GB RAM and 16GB eMMC Flash
- Runs on Android 11 operating system
- 8” (1200×800) capacitive 10-point touch screen HD IPS LCD
- Built-in Bluetooth 5.0 for syncing with mobile devices and connecting Bluetooth headsets
- Integrated dual-band WiFi 6 (2.4GHz and 5GHz)
- Built-in PoE/PoE+ to power the device and give it a network connection
- Built-in 2 mega-pixel CMOS tiltable camera with privacy shutter, 1080p 30fps
- 12-way audio conferencing and 3-way video conferencing capability
- Dual-mic HD speakerphone with noise reduction, advanced echo cancellation, and excellent double-talk performance
- Dual-switched auto-sensing 10/100/1000Mbps network ports
- Supports up to 16 SIP accounts

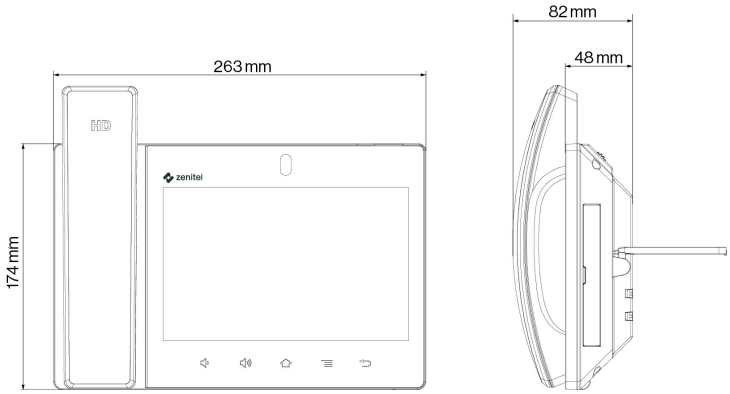
For more information go to Zenitel Wiki

Technical Dimensions

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Specifications

GENERAL	
Graphic Display	8” (1280x800) capacitive (10 points) touch screen IPS LCD
Camera	Tiltable 2 mega-pixel CMOS camera with privacy shutter, 1080P@30fps
Auxiliary Ports	RJ9 headset jack (allowing EHS with Plantronics headsets), 3.5mm stereo headset with microphone, USB 3.0 port, Type-C, HDMI-out, HDMI-in
Feature keys	2 function touch keys VOLUME +/-, 3 dedicated Android touch keys HOME, MENU, and BACK
Video Codec	H.263, H.264 BP/MP/HP
Video resolution	Up to 1080p
Video frame rate	Up to 30 fps
Operating temperature range	0˚C to +40˚C
Storage temperature range	-10˚C to +60˚C
Relative humidity	10% - 90% non-condensing
Power options	Power over Ethernet (PoE & PoE+) or power adapter.
Power over Ethernet	802.3af Class 3, 802.3at Class 4
Power adapter	Input: 100-240VAC 50-60Hz; Output 12VDC 1.5A
Network Interface	2 x RJ45 (Ethernet) 10/100/1000 Mbps with integrated PoE/PoE+
Bluetooth	Integrated, Bluetooth 5 + EDR
Wi-Fi	Integrated, dual-band 2.4 & 5GHz with 802.11 a/b/g/n/ac/ax, 2T2R, Wi-Fi Display & AirPlay
Security	User and administrator level passwords, MD5 and MD5-sess based authentication, 256-bit AES encrypted configuration file, TLS, SRTP, HTTPS, 802.1x media access control, Kensington Security Slot (Kensington Lock) support, anti-hacking secure boot
Protocols/Standards	SIP RFC3261, TCP/IP/UDP, RTP/RTCP, HTTP/HTTPS, ARP, ICMP, DNS (A record, SRV, NAPTR), DHCP, PPPoE, SSH, TFTP, NTP, STUN, SIMPLE, LLDPMED, LDAP, TR-069, 802.1x, TLS, SRTP, IPv6, OpenVPN®.
Audio technology	Wide-band Opus, wide-band G.722, G.711µ/a, G.729A/B, G.726-32, iLBC, in-band and out-ofband DTMF (In audio, RFC2833, SIP INFO), VAD, CNG, AEC, PLC, AJB, AGC, ANS, Noise Shield 2.0
Language support	English, German, Italian, French, Spanish, Portuguese, Russian, Croatian, Chinese, Korean, Japanese, Czech.
Compliance	FCC: CFR 47 Part 15 Subpart B Class B; CFR 47 Part 15 Subpart C; CFR 47 Part 15 Subpart E; UL 60950-1 (power adapter); Part68 (HAC) CE: EN55032 Class B; EN55035;EN61000-3-2; EN61000-3-3; EN62368-1; EN300328; EN301893; EN301489-1; EN301489-17; EN62311; RoHS RCM: AS/ACIF S040 AS/CA S004; AS/NZS CISPR 32; AS/NZS 62368.1; AS/NZS 4268 HDMI Source and Sink, HAC
Dimension (WxLxH)	263 x 174 x 48 (WxLxH) mm
Weight	1.08 kg

Accessories



Wall Mount Bracket for ITSV-5

Used With

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TCIV-2+

IP and SIP Video Intercom



TCIV-3+

IP and SIP Video Intercom



TCIV-5+

IP and SIP Video Intercom



TCIV-6+

IP and SIP Video Intercom



TKIV+

Turbine Video & VoIP Intercom Module

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1008315030

TCIV-3+

IP and SIP Video Intercom

- Powerful audio technology including high sound pressure, automatic volume gain control, and active noise echo canceling
- HD video up to 1080p resolution
- Wide angle lens
- High performance hardware platform with 4x Cortex-A53 CPU cores and 512MB LPDDR4 RAM
- ONVIF Conformant
- Vandal Resistant Design
- IP66 - Dirt, dust and water resistant
- Cybersecurity compliant
- Can operate in SIP, IC-EDGE and ICX-AlphaCom mode

Video Intercom | Door Intercom | SIP | CISCO Certified | ONVIF Conformant | UL Certified Intercom | Turbine | IC-Edge

ICX-AlphaCom | IP66 | IK08 | HD Voice | Active Noise Cancelling | H.264

Description

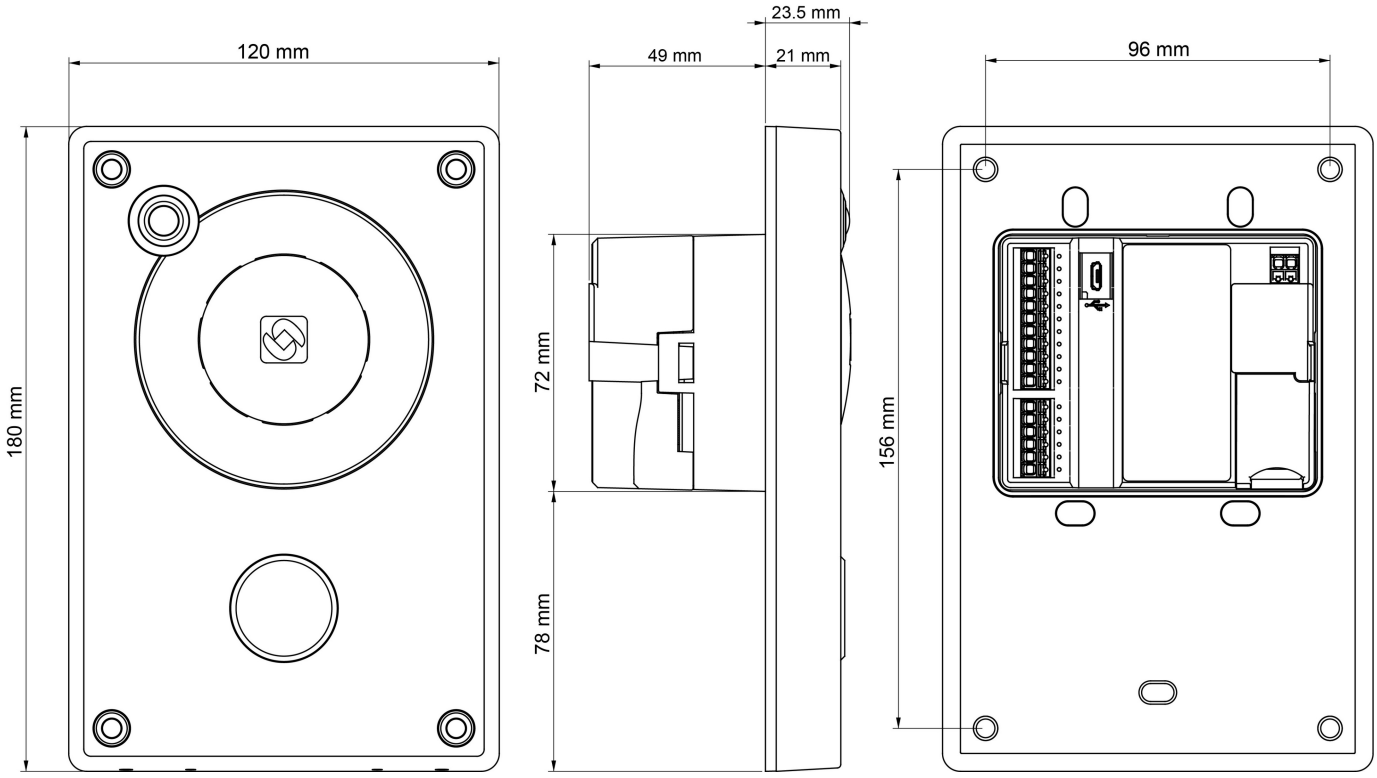
All IP stations in the Turbine series utilize the latest technology to create unparalleled audio quality. Some of the many features include: HD voice quality, Open Duplex, Active Noise Cancellation, MEMS microphone, a 10W Class D amplifier and our unique speaker grille design. These features, in conjunction with the company's 70+ years of experience with acoustic technology, are just a few of the many factors that contribute to our superior audio quality. The Turbine IP Video Intercom range expands this feature set with wide FoV HD Video, Digital PTZ and support for H.264 and MJPEG.

Technical Dimensions

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Specifications

AUDIO

SPL peak power at 1m in open duplex	90 dB
SPL peak power at 1m in half duplex	100 dB
SPL peak power at 1m in program distribution and announcement	100 dB
Noise cancelling	Yes
Codecs	G.711, G.722, G.729
Frequency range, G.722 Codec	200 Hz – 7000 Hz
Audio technology	Modes: Full open duplex, switched open duplex
	Adaptive jitter buffer
	Custom Ringing Tone
	Audio Mixing – Conversation and Group Call
	Automatic gain control (microphone)
	Sound Level Detection / scream alarm (in AlphaCom mode)
Internal speaker amplifier	10 W class D
Internal speaker	10 W
Microphone technology	Digital MEMS, omnidirectional microphone
Automatic Volume Control (AVC)	Yes
Acustic Echo Cancellation (AEC)	Yes

VIDEO

Image Sensor	1/2.5" RGB CMOS
Lens	F 2.0, fixed iris
Light Sensitivity	Down to 1 lux
Resolution	240 / 480p / 960x720p / 1440x1080p*
Frame Rate	Up to 30 FPS in 1440x1080p**
Supported Codecs	MJPEG, H.264 **
Digital PTZ	Yes
Digital Zoom	Up to 2x
Field of View	horizontal=145 degrees, vertical=109 degrees ****
Snapshot Function	No
IR LED	No
Parallel videostreams	6 (1x SIP H.264, 2x HTTP MJPEG, 3x RTSP sessions)
	* MJPEG does not support 720p and 1080p resolution.
	** 30 FPS is only supported in H.264 mode, while MJPEG is limited to 10 FPS.
	*** AlphaCom mode supports only RTSP H.264 mode, while other modes support SIP H.264.
	**** FoV depends on video mode (may be subject to change)

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HARDWARE

Ethernet connector	1 x RJ-45
All other connectors	Tool less, spring loaded, vibration proof terminals
General inputs and outputs	6 (configurable)
Outputs	12mA as LED drivers
Change-over relay (NO+NC+COM)	SELV
Power options	PoE, PoE+
PoE (Power over Ethernet)	IEEE 802.3af standard, IEEE 802.3at
Power consumption	Idle 3.5W, max 12W (depending on volume)
Audio Line out / Induction loop signal	0 dBV
Button backlight	LED
Call indication	Icons/colors for hearing impaired

PROCESSOR/CHIPSET

CPU cores	4 x Cortex-A53
CPU Clock Speed	1.6 GHz
RAM	512 MB LPDDR4
Flash	1 GB
Video encoder	MJPEG, H.264
Dual Image	Yes

CONSTRUCTION

Dimensions (HxWxD)	180 x 120 x 73 mm / 7.1” x 4.7” x 2.9”
Dimensions after flush mount	180 x 120 x 24 mm / 7.1” x 4.7” x 0.9”
Dimensions with on wall box	180 x 120 x 86 mm / 7.1” x 4.7” x 3.4”
Weight	1 kg / 2.2 lbs.
Faceplate material	3 mm / 0.12” stainless steel - AISI 316L
Base / frame material	3 mm / 0.12” Aluminum alloy - A413.0, AlSi12Fe, painted
Electronics cover material	Polycarbonate (semi translucent)
Gasket material	TPV
Fastening bracket material	SECC Steel
Button material	3 mm / 0.12” Polycarbonate (transparent)
Button travel length	1.25 mm
Button activation force	350 gf
Button push-cycles before failure	300 000
Loudspeaker poke protection, large diameter object	3D cast aluminum speaker grille
Loudspeaker poke protection, small diameter objects	Stainless steel mesh, acoustically transparent
Anechoic Design	Open flow anechoic design eliminates "standing waves"

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NETWORKING & PROTOCOLS

Protocols	IPv4 (with DiffServ), SIP, TCP, UDP, HTTPS, TFTP, RTP, RTSP, RTCP, SRTP, DHCP, SNMP, Vingtor-Stentofon CCoIP®, NTP, ONVIF, WS-Discovery
LAN protocols	Power over Ethernet (IEEE 802.3 a-f), Power over Ethernet (IEEE 802.3at), Network Access Control (IEEE 802.1x)
Management and operation	HTTP/HTTPS (Web configuration) DHCP and static IP. Remote automatic software upgrade. Centralized monitoring.
Advanced supervision functions	E.g. network test, tone test, status reports
SIP support	RFC 3261 (SIP base standard) RFC 3515 (SIP refer) RFC 2976 (SIP info), SIP using TLS, RFC 5630 SIPS URI scheme
DTMF support	RFC 2833, 2976 (SIP info)
Integration and API	AlphaCom, Scripting (plugins)

ENVIRONMENTAL

IP rating	IP-66, tested according to EN 60529 (applies when mounted in TA-1 back-box)
Operating temperature range	-30° to 70° C / -22° to 158 ° F
Storage temperature range	-40° to 70° C / -40° to 158 ° F
Relative humidity	< 95% not condensing
UV-resistant	Yes
EMC	CE and FCC Part 15

CERTIFICATIONS

ONVIF Conformant

OTHER SPECIFICATIONS

IP address information	Speaks IP address after system boot
Country of manufacture	Poland

Accessories



TA-1

Turbine Compact Onwall Back Box



TA-2

US 2-Gang 3½" Deep Backbox



TA-5

Bracket for US 2 GANG Double Depth Back Box



TA-18

Turbine Compact Flush-Mount Back Box

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TA-14

Microphone windshield for TCIS / TCIV



Touchless Sensor

Used With



ITSV-3

Powerful Desktop Video Phone with 7” Touch Screen & Real-Time HD Video Telephony This product has been replaced by 1490005010 ITSV-5



ITSV-2

Powerful Desktop Video Phone with 5” capacitive touch screen and support for 720p HD video.

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tyco | Illustra

Data Sheet

Pro Gen4
2MP, 4MP, 8MP Mini-Dome







Key Benefits

- Built in AI delivers accurate object classification, powerful situational awareness and security automation.
- Integrated recess mount, backbox, a range of IO options including Micro HDMI plus WiFi configuration via the Illustra Tools App
- Exposure profile settings allow the mini-dome to adapt to scenarios such as license plate recognition, gaming, and more
- Ultra low light capabilities to maintain color image quality without IR

Edge Intelligence Including AI

Illustra Pro Gen 4 cameras are ready for the rise of intelligence at the edge. With built-in AI based object classification, events can be narrowed to classes such as person, car, bus, motorcycle and more. Forensic searches becomes more accurate and situational awareness more automated with fewer missed incidences and false alarms. Choose from a variety of analytic rules to customize the solution that will be most beneficial to your business and begin gathering transformative data instantly.

Smart Design, Configuration and Operation

With an integrated recess mount, WIFI configuration and application profiles that automatically adjust the camera's settings based on the environment, Illustra Pro Gen 4 cameras are designed with simplicity and ease of use in mind. Smart Wide Dynamic Range further adds to this simplicity. By reading the scene, the Mini-Dome can adjust contrasting and overall scene balance without operator intervention or maintenance. Greatly improving the quality of the video stream in varying lighting environments.

Johnson Controls

Safeguard Against Cyber Attacks Across Devices

Illustra Pro IP cameras have been designed to be resilient against cyber-threats. This solution includes "secure boot" which ensures the camera will not start if software has been tampered with in any way. Additional safeguard controls include an enhanced security mode which forces the use of complex, non-default passwords and encrypted communications. Our products are gated, analyzed, tested and required to meet or exceed the rigorous standards of the Johnson Controls Cyber Solutions Product Security Program for every consecutive release. This holistic approach is aimed at providing peace of mind to our customers. Our security mindset begins at initial design concept and is supported through deployment, including a rapid incident response to meet the comprehensive and evolving cybersecurity environments.

Specifications

Operational	2MP		4MP		8MP	
Video Compression	H.264 / H.265 / MJPEG / IntelliZip					
Max Frame Rate	2MP @ 60fps		4MP @ 60fps		8MP @ 30fps	
Resolution & Aspect Ratio	1920x1080 (1080p) 16:9 1664x936 (HD+) 16:9 1280x720 (720p) 16:9 1024x576 (PAL+) 16:9 960x544 (qHD) 16:9 816x464 16:9 640x360 (nHD) 16:9 480x272 16:9		2560x1920 2560x1444 1920x1080 (1080p) 16:9 1664x936 (HD+) 16:9 1280x960 4:3 1280x720 (720p) 16:9 800x600 (SVGA) 4:3 640x480 (VGA) 4:3 480x360 4:3 384x288 4:3		3840x2160 (4K) 16:9 3264x1840 16:9 2688x1520 16:9 2560 x 1440 16:9 1920x1080 (1080p) 16:9 1664x936 (HD+) 16:9 1280x720 (720p) 16:9 1024x576 (PAL+) 16:9 960x544 (qHD) 16:9 816x464 16:9 640x360 (nHD) 16:9 480x272 16:9	
Imager	Sony IMX327		Sony IMX335		Sony IMX334	
Image Orientation Settings	None, Mirror, Flip, Flip and Mirror, Corridor (rotate 90° right or left)					
Video Streams	Quad Streaming					
Lens Type	Motorized Varifocal and Focus, P-Iris					
Focus Control	One-Touch Auto Focus or Remote Adjustment					
Focal Length	**2.7-13.5mm**	**7-22mm**	**2.7-13.5mm**	**6-22mm**	**3.6-10mm**	**6-22mm**
Field of View Wide (H/V)	112°/58°	40°/21°	103°/74°	40°/30°	95°/53°	50°/28°
Field of View Telephoto (H/V)	35°/20°	18°/10°	33°/25°	18°/13°	49°/28°	24°/14°
Aperture	f/1.4 (W) f/2.8 (T)	f/1.7 (W) f/2.8 (T)	f/1.4 (W) f/2.8 (T)	f/1.6 (W) f/2.4 (T)	f/1.5 (W) f/2.8 (T)	f/1.6 (W f/2.4 (T)
Minimum Illumination						
Color, 1/4s, 30 IRE, AGC	0.01 Lux	0.02 Lux	0.03 Lux	0.02 Lux	0.03 Lux	0.02 Lux
B/W, 1/4s, 30 IRE, AGC	0.0001 Lux	0.0002 Lux	0.0002 Lux	0.0002 Lux	0.0004 Lux	0.0005 Lux
W/IR	0.0 Lux	0.0 Lux	0.0 Lux	0.0 Lux	0.0 Lux	0.0 Lux
IR Distance	50m					
Dynamic Range	True WDR 120 dB Technologies		True WDR 110 dB Technologies		True WDR 120 dB Technologies	
Day/Night	True Day/Night CF Removal					
Shutter Speed	≥ 1/10,000 to 1/4 s					
ONVIF-Compliant	Profiles S					
Video Intelligence Analytics	Linger, Exit, Direction, Abandoned/Removed objects, Queue, Dwell, Enter, Object detection, Crowd, Perimeter					
Object Classification	Classes: Person, Bicycle, Bus, Car, Motorbike Rules: Object Detected, Perimeter, Linger, Dwell					

Motion Detection Zones	3
Face Detection	Yes
Blur Detection	Yes
Privacy Zones	8
Alarm Input/Output	2 input, 2 output
Video Output	HDMI
Audio	Bi-directional; 1 input, 1 output. Built in Microphone
Simultaneous Users	10
Supported Languages	Arabic, Chinese (Simplified), Chinese (Traditional), Czech, Danish, English (default), French, German, Hungarian, Italian, Japanese, Korean, Netherlands, Polish, Portuguese, Russian, Spanish, Swedish, Turkish
Network	
Ethernet Interface	10/100/1000 BaseT, RJ-45, Auto-Negotiation
Supported Protocols	TCP/IP, IPv4, IPv6, TCP, UDP, HTTP, FTP, DHCP, WS-Discovery, DNS, DDNS, RTP, TLS, RTSP, ICMP, Unicast, Multicast, NTP, SMTP, WS-Security, SNMP, CIDS, FSTP, UPnP™, SIP
Configuration Management	
Web Browsers	IE 9 and above, Firefox, Safari, Chrome
Security	Secure Boot, Enhanced Security Mode (forces complex passwords, HTTPS and disables discovery); TLS 1.2 (256 bit cipher minimum); Security Overview Page (status and configuration); RTSP Authentication; IEEE 802.1X Client; Remote Accessible Audit logs; Role-Based Access Control, Video Encryption for local storage and streaming.
Onboard Storage	
Card Support	micro SDXC up to 1TB
Pre-Alarm Recording	Yes
Recording Format	MP4 File Format
Recording Trigger	Dry Contact Alarms, Motion Detection, Face Detection, Video Intelligence, AI Object Classification, Periodic Events
TrickleStor	Yes, encrypted storage
Electrical	
Power	Power over Ethernet (PoE) IEEE 802.3af/802.3at Type 1 Class 3; 24 VAC Max Draw: PoE 12.95W, 24 VAC 16.5W
Physical	
Dimensions (RxH)	Ø138 x 135mm
Weight	1.5KG, 3.31 lbs
Housing Color	Signal White - RAL 9003
Operating Temperature	-50° to +65°C
Humidity	Up to 90% Non-Condensing
Vandal Resistant	IK10
Outdoor Rating	IP66/IP67
Regulatory	
Safety	EN60950-1; UL60950-1; IEC 60950-1; CSA 22.2 No. 60950
Emissions	FCC Part 15 Class A; EN55032 Class A; AS/NZS CISPR 32 Class A; ICES-003/NMB-003 Class A
Immunity	EN55024; EN50130-3
Enviornment	RoHS; WEEE

Accessories

Accessory Type	Image	Model Number	Description	Dimensions	Color
Wall Mount		IPSMDWALL3	Wall Mount Kit: Indoor/Outdoor, White	6.3 x 3.3 x 9.1 in (160.5 x 83 x 230.5 mm)	RAL 9003
Pendant Cap		ADCi6DPCAPIW	Pendant Cap: Outdoor, White	Ø5.16 x 2.17 in (Ø141 x 55 mm)	RAL 9003
Gooseneck Arm		ADLOMARM	For use with Pendant Cap	4.4 x 8.78 x 4.4 in (112.5 x 222.9 x 112.5 mm)	RAL 9003
Pole Mount Adapter		ADCDMPOLE	For use with Pendant Cap and Gooseneck Arm, or directly to the camera back plate	Wraps around pole	RAL 9003
Outside Corner Mount Adapter		ADCDMCRNRO	For use with Pendant Cap and Gooseneck Arm, or directly to the camera back plate.	5.18 x 7.58 in (131.5 x 192.5 mm)	RAL 9003
Flush Mount		IPSMDFLUSHOW3	Recessed mount for walls or ceilings, indoor/outdoor use, white trim ring.	Ø10.236 x 2.459 in (Ø260 x 62.46 mm)	RAL 9003
Bubble Assembly		IA-BBL-CV-P4D	Vandal Clear Bubble Assembly		RAL 9003
Bubble Assembly		IA-BBL-SV-P4D	Vandal Smoked Bubble Assembly		RAL 9003

Ordering Information

Model Numbers	Description
IPS02-D12-OI04	Illustra Pro Gen4 2MP MiniDome, 2.7-13.5mm, Indoor/Outdoor, IP67, IK10, TDN w/IR, TWDR
IPS02-D17-OI04	Illustra Pro Gen4 2MP MiniDome, 7-22mm, Indoor/Outdoor, IP67, IK10, TDN w/IR, TWDR
IPS04-D12-OI04	Illustra Pro Gen4 4MP MiniDome, 2.7-13.5mm, Indoor/Outdoor, IP67, IK10, TDN w/IR, TWDR
IPS04-D14-OI04	Illustra Pro Gen4 4MP MiniDome, 6-22mm, Indoor/Outdoor, IP67, IK10, TDN w/IR, TWDR
IPS08-D13-OI04	Illustra Pro Gen4 8MP MiniDome, 3.6-10mm, Indoor/Outdoor, IP67, IK10, TDN w/IR, TWDR
IPS08-D14-OI04	Illustra Pro Gen4 8MP MiniDome, 6-22mm, Indoor/Outdoor, IP67, IK10, TDN w/IR, TWDR

About Johnson Controls

Johnson Controls is a global diversified technology and multi-industrial leader serving a wide range of customers in more than 150 countries. Our 120,000 employees create intelligent buildings, efficient energy solutions, integrated infrastructure and next generation transportation systems that work seamlessly together to deliver on the promise of smart cities and communities. Our commitment to sustainability dates back to our roots in 1885, with the invention of the first electric room thermostat.

For additional information, please visit www.illustracameras.com or follow Illustra on LinkedIn, Twitter, and Facebook.

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IL-DS-202108-R03-LT-EN

Honeywell

FG-730

GLASSBREAK DETECTOR



Honeywell's FlexGuard® FG-730 incorporates the most reliable, field-proven technology available – setting the industry standard in glassbreak detectors.

FEATURES

- **Field Proven Design**
  The world's best selling glassbreak detector.
- **Dual Technology**
  Flex-Audio Principle
  Positively detects and confirms breaking glass by analyzing both "flex" (impact) and "audio" (shattering) frequencies. For an alarm to occur the flex signal must be followed by an audio signal within a prescribed time frame.
- **Signal Verification**
  Both flex and audio signals must register valid amplitude, duration and frequency for an alarm to occur.
- **Signal Filtering**
  Thorough filtering and processing of all signals provides greater immunity to false alarms.
- **Broad Range**
  Detects glass breakage from distances up to 30' (9 m).
  The FlexGuard FG-730 detector sets the industry standard in glassbreak detectors.
- **Dual Flex/Audio Technology**
  Provides excellent catch performance while virtually eliminating false alarms.
- **Indicator LEDs**
  LED alarm indicator for testing flex and audio technologies.
- **Burst Rejection Circuit**
  Ignores short flex/audio noise burst signals present in some environments.
- **Circuit Protection**
  Prevents shorts, overloads and reverse-polarity connections from causing damage.
- **Alarm Memory**
  Alarm LED can be set to latch upon alarm; helps identify which unit alarmed in multiple detector applications.
- **RFI Immunity**
  100 watts at 3m (10') from all mobile bands 27–1000 MHz.
- **Easy Installation and Set-Up**
  Mount within 9m (30') of the glass to be protected. (Can be adjusted to suit characteristics of each location.)
- **Low Voltage Operation**
  10–14VDC
- **Low Current Draw**
  25mA at 12VDC

FG-730
GLASSBREAK DETECTOR

SPECIFICATIONS

- **Physical Dimensions**
  White, high impact, ABS plastic housing:
  10 cm H x 6.2 cm W x 2 cm D
  (3-7/8" x 2-2/5" x 4/5")
- **Weight**
  85 g (3 oz)
- **Range**
  9 m (30')
- **Mounting Locations**
  Ceiling, opposite wall, adjoining wall, same wall as glass
- **Alarm Relay**
  Form C, 500mA max, 30VDC max
- **Tamper Switch**
  Form A (NC) 50mA, 30VDC
- **Power Requirements**
  10–14VDC 25mA at 12VDC
- **Operating Temperature**
  0°–49° C (32°–120° F)
- **Set-Up Tester**
  FG-701 Glassbreak Simulator
  Also works with FG-700 Glassbreak Simulator
- **Approvals and Listings**
  – UL Listed
- **Glass Type/Thickness**
  Minimum size for all glass types is 11" x 11" (28 cm x 28 cm) square; glass must be framed in the wall of the room or mounted in a barrier of 36" (.9 m) minimum width.

Type*	Minimum	Maximum
Plate	2.4 mm (3/32")	6.4 mm (1/4")
Tempered	3.2 mm (1/8")	6.4 mm (1/4")
Laminated*	3.2 mm (1/8")	14.3 mm (9/16")
Wired	6.4 mm (1/4")	6.4 mm (1/4")
Coated**	3.2 mm (1/8")	6.4 mm (1/4")
Sealed Insulating*	3.2 mm (1/8")	6.4 mm (1/4")

* Laminated and sealed insulating glass types are protected only if both plates of glass are broken.

** For glass coated on the inner surface with 3M Scotchtint™ type RE35NEARL or Hardglass Security Film, reduce maximum effective range to 15’ (4.6 m).

ORDERING

FG-730	Glassbreak Detector
FG-701	Glassbreak Simulator/Tester

Honeywell Security & Custom Electronics
Honeywell
2 Corporate Center Drive
Melville, NY 11747
www.honeywell.com

Honeywell

L/FG730/D
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MAGNASPHERE®



Security Contacts Product Catalog

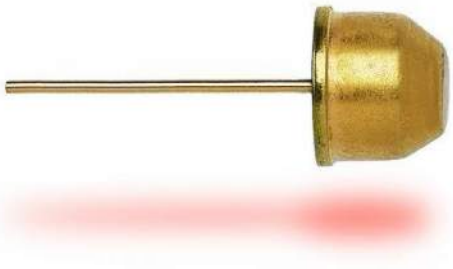
INVENTED and DESIGNED to address the undetected breaches of security that could occur when using easily exploitable and fragile reed switch sensors, MAGNASPHERE'S award-winning and patented technology is virtually unbeatable and unbreakable.

For more product information, visit magnasphere.com or call 262-347-0711

Contacts made with Magnasphere Technology are Superior to reed switch contacts

"Most people don't realize how easy it is for an intruder to defeat a reed switch security system contact and evade detection," said Rick Kirschman, President of MAGNASPHERE Corp. "Magnets are the kryptonite to the common reed switch. If a rogue magnet was placed within range of a reed switch contact, an intruder could enter almost any home undetected without triggering an alarm. How safe are you really if your home security system can be defeated with a simple magnet?"





Invented by Dr. Randall Woods, the MAGNASPHERE® high security switch was designed to address the undetected breaches of security that could occur while using reed switch based home security system contacts. *"When my neighbor's home got robbed and the alarm didn't go off, I wanted to know why," said Dr. Woods. "I soon discovered the reed switch security flaw and set out to design a more secure switch technology that would do the job that I thought the reed switch contact was supposed to do."*

The US Government demanded a more effective countermeasure to protect its highest classified areas. While these Magnasphere defeat resistant HSS devices are now commonly used to detect breaches in high security facilities, their higher cost and large size made them an impractical security solution for most residential applications. Resistant to external magnetic defeat tampering, virtually unbreakable, and contact-weld resistant, MAGNASPHERE's patented "reed switch free" technology provides the absolute highest level of intrusion detection available to any security system owner today. In fact, MAGNASPHERE's MSS series provides the same level of external magnetic defeat protection found in the Federal Government's most secure installations, but at a fraction of the cost and size.

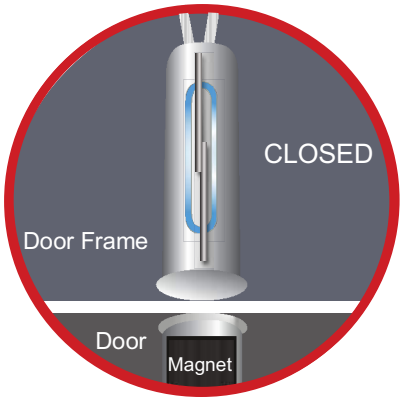
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Reed vs. MAGNASPHERE®

Security contacts are made with a decades-old technology called the Reed switch.

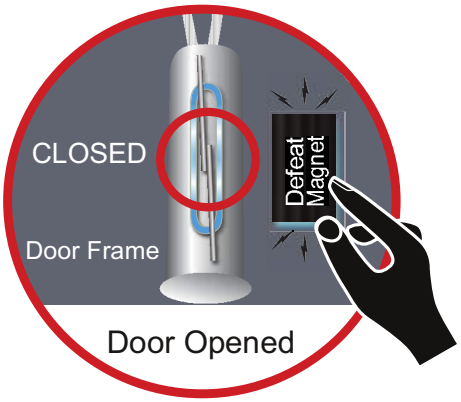
Reed switches have three inherent weaknesses when used in security contacts: (1) Easily defeated with magnets, (2)Prone to permanent contact weld failure (from lightning and power surges), and (3)fragile (made mostly of glass, they are subject to damage even when packaged as security contacts).

SECURE: NO ALARM



Reed contacts operate on magnetic fields. Most contacts are Closed in the secure position (Closed Loop) when the door is closed and the magnet is near the switch.

FAILED: NO ALARM



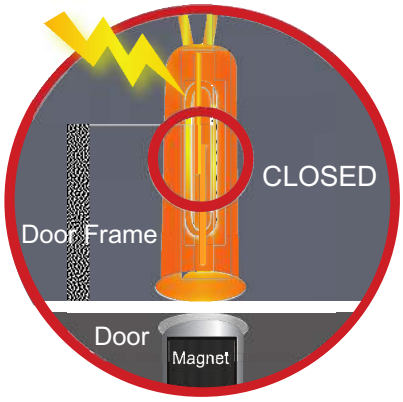
Reed switch contacts are globally magnetic: they will respond to the strongest magnetic field anywhere around the contact — not solely to the door magnet. When compromised, reed contacts will still send secure signals.

Introducing a defeat magnet OUTSIDE the door will keep the reed contacts closed, allowing an intruder to enter without alerting the security system. They FAIL SECURE.



Once contacts have welded closed, they remain in that state though the door is open. They FAIL SECURE.

NO ALARM



When closed reed contacts are exposed to power surges such as lightning strikes, they are prone to permanent contact welding.

FAILED: NO ALARM

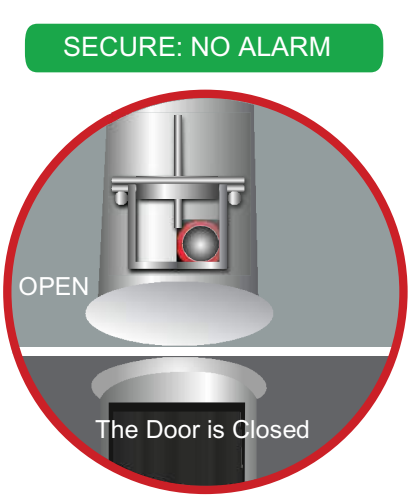


Reed contacts operate by magnetic induction, so they are not attracted to the door magnet.

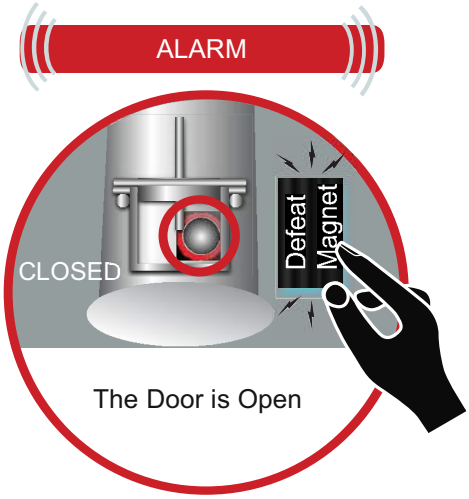
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Reed vs. MAGNASPHERE®

The patented, award-winning MAGNASPHERE switch technology was designed as a security device which over comes the deficiencies of reed contacts. The MAGNASPHERE switch is (1) Resistant to magnetic defeat and tamper,(2) Resistant to permanent contact welding from lightning and power surges, and (3) Robust, all metal welded construction is virtually unbreakable.



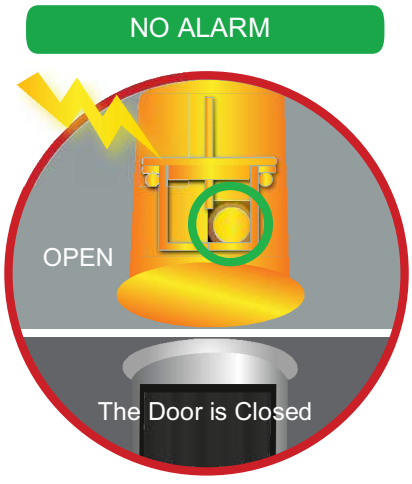
MAGNASPHERE security sensors' magnet ball contact is open in the secure position (Open Loop) when the door is closed and the door magnet is near the switch.



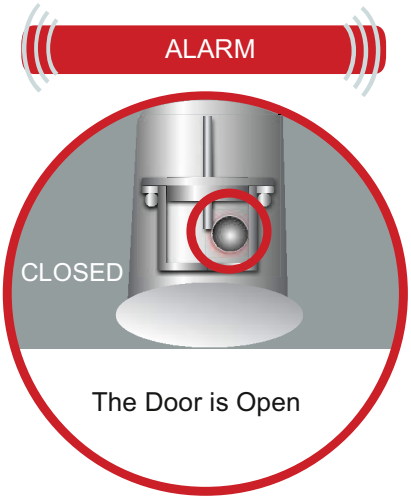
MAGNASPHERE's contact is a spherical magnet and operates in a defined activation zone directed toward the door magnet.

A defeat magnet introduced OUTSIDE the door will have no effect on the ball contact. When the door is opened, the contact will close, and the SYSTEM WILL ALARM.





MAGNASPHERE Security Sensors are Open Loop and highly resistant to contact welding from power surges and lightning strikes.



Because the magnet ball contact will not weld, when the door is opened the contact will close and the SYSTEM WILL ALARM.

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MAGNASPHERE®

Underwriters Laboratories Testing Criteria UL-634 Connectors and Switches for Use with Burgular-Alarm Systems

There are 40 standards that must be met to achieve listing to UL-634, which covers basic contacts, including Balanced Magnetic Switches, defined by UL-634 Section 3, Glossary, as: 3.2 BALANCED MAGNETIC SWITCH (BMS) - A switch that is constructed in such a manner or that includes additional components that increase resistance to magnetic, electrical and mechanical tampering or defeat.

It should be noted that while devices made with BMS provide “higher security” than standard contacts, they are not considered HIGH SECURITY CONTACTS until criteria listed below is met.

In addition,there are 8 testing criteria that must be met to achieve UL-634 Level 1 HIGH SECURITY. They are included in these categories:

- Mechanical Protection Against Tampering®
- Electrical Protection Against Tampering
- Compromise Test – Mechanical and Mercury Switches
- Compromise Test – Magnetic Switches
- Compromise Test – Enclosures
- Detection Test – Measures Activation Distances

Beyond the UL-634 Level 1 listing,there are 8 additional requirements that must be met to achieve UL-634 Level 2 HIGH SECURITY:

- Made with Balanced Magnetic Switches (BMS)
- Nuisance Alarm Test
- Cover or Enclosure Tamper Test (When Applicable)
- Magnet Assembly Cover Removal Alarm Test (When Applicable)
- Switch Assembly Removal Tamper Test (When Applicable)
- Foreign Magnetic Field Tamper Alarm Test
- Foreign Magnetic Field Compromise Tests
- Extended Endurance Test

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MAGNASPHERE®

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Magnasphere MSS Contacts

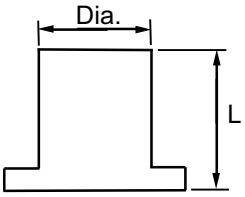
Available Part Numbers

MSS-09CL Recessed Contact



SIZE
3/8" Dia. x 3/4" L

[10mm Dia. x 20mm L]



MAX Gap

1/2" [12.7mm]

Color(s)

Brown, and White

Magnasphere Electrical Specifications
Max Current: **0.25A** Resistive
Max Voltage: **30 VDC**
Max Power: **.25 W** Resistive
Configuration: "**Open Loop**" w/ Target Magnet in Place

#22 AWG

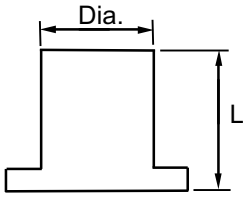
12" [30.5cm] Leads

MSS-09CT Recessed Contact



SIZE
3/8" Dia. x 3/4" L

[10mm Dia. x 20mm L]



MAX Gap

1/2" [12.7mm]

Color(s)

Brown, Grey and White

Magnasphere Electrical Specifications
Max Current: **0.25A** Resistive
Max Voltage: **30 VDC**
Max Power: **.25 W** Resistive
Configuration: "**Open Loop**" w/ Target Magnet in Place

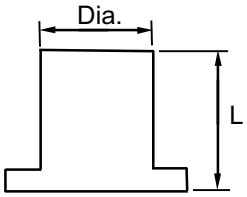
Screw Terminals

MSS-09RL Recessed Contact



SIZE
3/8" Dia. x 1" L w/ 3/4" Flange

[10mm Dia. x 25mm L
w/ 20mm Flange Dia.]



MAX Gap

1/2" [12.7mm]

Color(s)

Brown, Grey and White

Magnasphere Electrical Specifications
Max Current: **0.25A** Resistive
Max Voltage: **30 VDC**
Max Power: **.25 W** Resistive
Configuration: "**Open Loop**" w/ Target Magnet in Place

#22 AWG

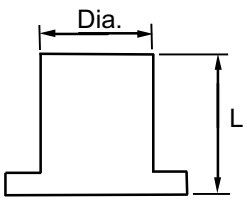
12" [30.5cm] Leads

MSS-19C Recessed Contact



SIZE
3/4" Dia. x .85" L

[20mm Dia. x 21mm L]



MAX Gap

1/2" [12.7mm]

Color(s)

White

Magnasphere Electrical Specifications
Max Current: **0.25A** Resistive
Max Voltage: **30 VDC**
Max Power: **.25 W** Resistive
Configuration: "**Open Loop**" w/ Target Magnet in Place

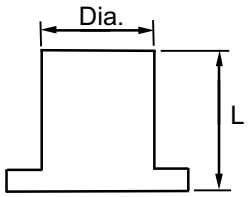
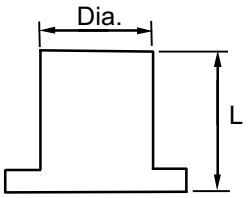
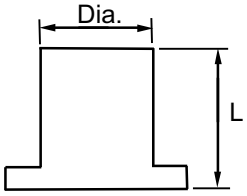
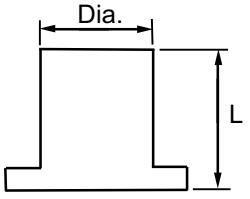
#22 AWG

12" [30.5cm] Leads

Magnasphere MSS Contacts

Available Part Numbers

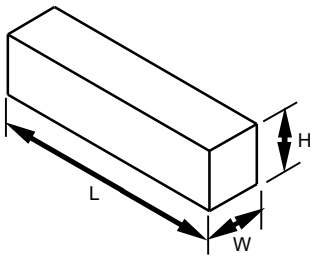
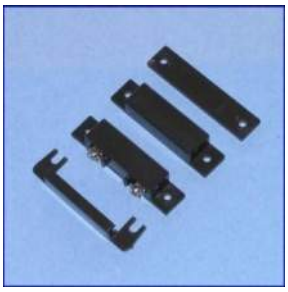
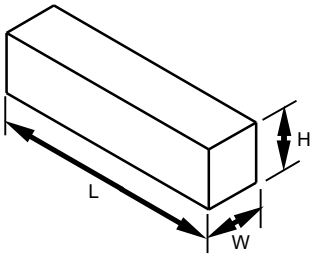
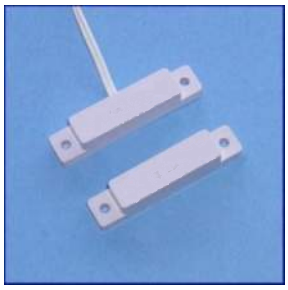
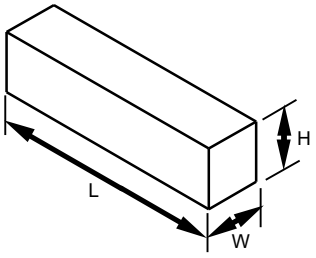
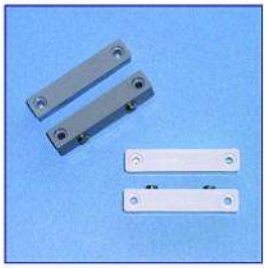
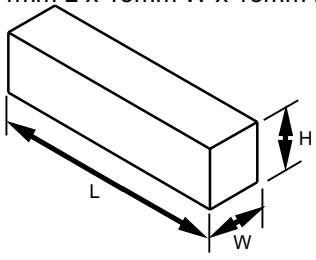
SECURITY c UL us LISTED

MSS-19CT Recessed Contact 	SIZE 3/4" Dia. x 7/8" L [20mm Dia. x 23mm L] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **Screw Terminals**
MSS-19CL Recessed Contact 	SIZE 3/4" Dia. x 7/8" L [20mm Dia. x 23mm L] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place #22 AWG **12" [30.5cm] Leads**
MSS-25C Recessed Contact 	SIZE 1" Dia. x 1.2" L [25mm Dia. x 30mm L] 	MAX Gap **1/2" [12.7mm]** Color(s) **White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place #22 AWG **12" [30.5cm] Leads**
MSS-25CL Recessed Contact 	SIZE 1" Dia. x 7/8" L [25mm Dia. x 23mm L] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place #22 AWG **12" [30.5cm] Leads**

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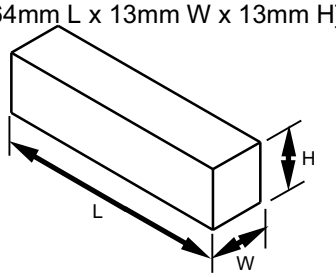
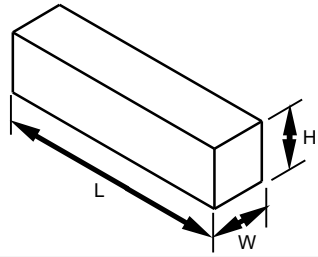
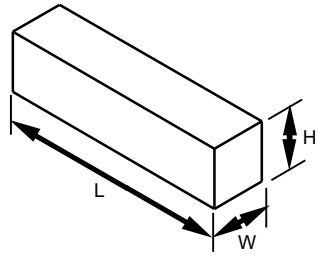
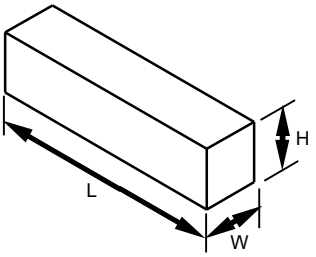
Magnasphere MSS Contacts

Available Part Numbers

MSS-63S Surface Mount Contact 	SIZE 2.5"L x .55"W x .55"H [64mm L x 14mm W x 14mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place #22 AWG **12" [30.5cm] Leads**
MSS-K22 Surface Mount Contact 	SIZE 2 1/2"L x 1/2"W x 1/2" H [64mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **Screw Terminals**
MSS-K22S Surface Mount Contact 	SIZE 2 1/2"L x 1/2"W x 1/2" H [64mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **#22 AWG** **12" [30.5cm] Leads**
MSS-53ST Surface Mount Contact 	SIZE 2 1/2"L x 1/2"W x 1/2"H [64mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **Screw Terminals**

Magnasphere MSS Contacts

Available Part Numbers

MSS-53SL Surface Mount Contact 	SIZE 2 1/2"L x 1/2"W x 1/2"H [64mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **12" Jacketed Leads**
MSS-89SL Surface Mount Contact 	SIZE 4"L x 1/2"W x 1/2"H [100mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **12" Jacketed Leads**
MSS-89ST Surface Mount Contact 	SIZE 4"L x 1/2"W x 1/2"H [100mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Brown, Grey and White**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place **Screw Terminals**
MSS-105S Overhead Door Contact 	SIZE 4"L x 1/2" W x 1/2"H [100mm L x 13mm W x 13mm H] 	MAX Gap **1/2" [12.7mm]** Color(s) **Grey**	**Magnasphere Electrical Specifications** Max Current: **0.25A** Resistive Max Voltage: **30 VDC** Max Power: **.25 W** Resistive Configuration: "**Open Loop**" w/ Target Magnet in Place Jacketed Leads **60" [152cm] Leads**

Magnasphere MSS-300C Series (Recessed)

MSS-3XXC
Recessed Contact

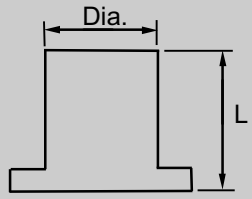


NOMENCLATURE

MSS - 3 x x C

- 3: Triple loop capacity
- x: # of open loops
- x: # of closed loops
- C: Concealed

SIZE
1" Dia. x 3/4" L
[25mm Dia. x 20mm L]



MAX Gap
1/8" [3.2mm]

Magnasphere
Electrical Specifications
Max Current: 0.25A Resistive
Max Voltage: 30 VDC
Max Power: .25 W Resistive

Leads: 22 AWG 12" [30.5cm]
Housing Color: BLACK

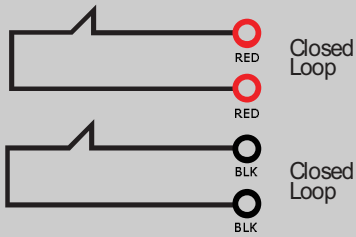
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

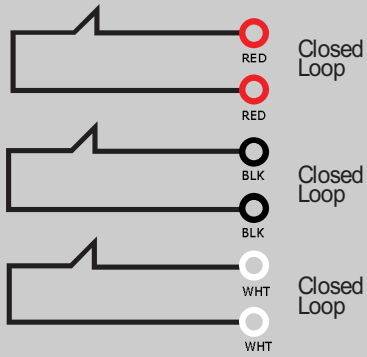
MSS-301C



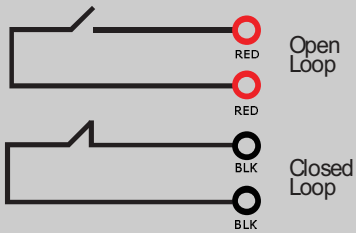
MSS-302C



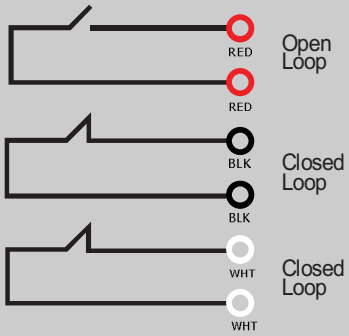
MSS-303C



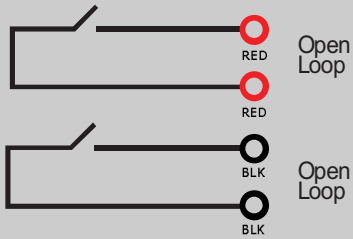
MSS-311C



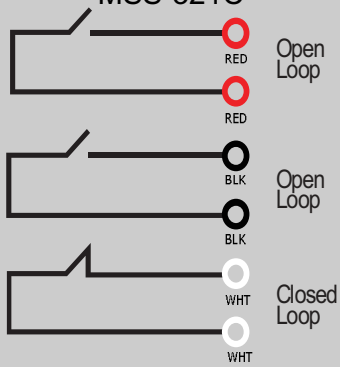
MSS-312C



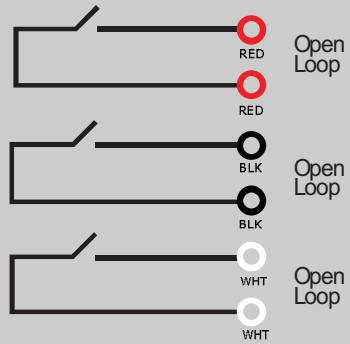
MSS-320C



MSS-321C



MSS-330C



SECURITY c UL us LISTED

Magnasphere MSS-300S Series (Surface Mount)

MSS-3XXS Surface Mount

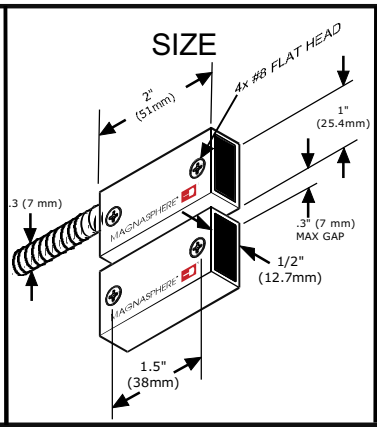


NOMENCLATURE

MSS - 3 x x S

- 3: Surface mount
- x: # of closed loops
- x: Triple loop capacity
- S: # of open loops

SIZE



Magnasphere Electrical Specifications

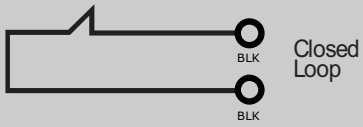
Max Current: 0.25A Resistive
Max Voltage: 30 VDC
Max Power: .25 W Resistive
Max Gap: .3" [7mm]

22 AWG - 24" [61cm] Armored Cable
Housing: Aluminum
See Page 36 for Custom Cable Length

NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

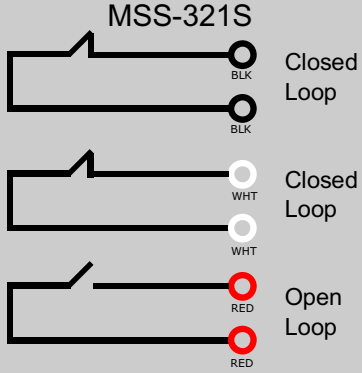
MSS-310S



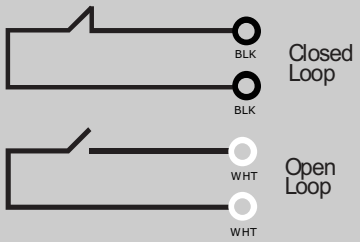
MSS-301S



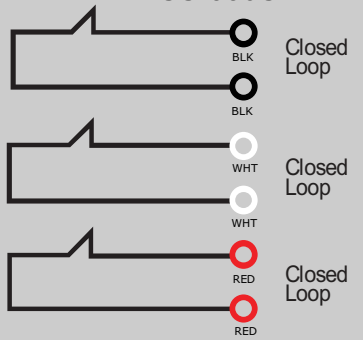
MSS-321S



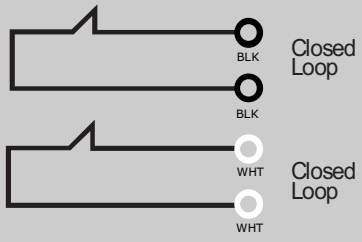
MSS-311S



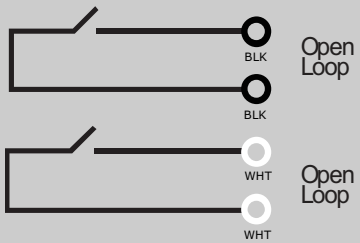
MSS-330S



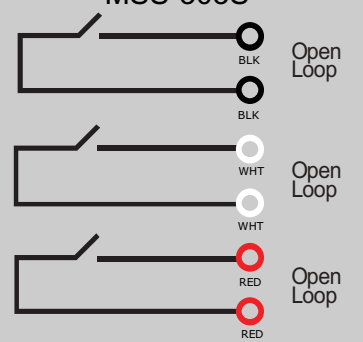
MSS-320S



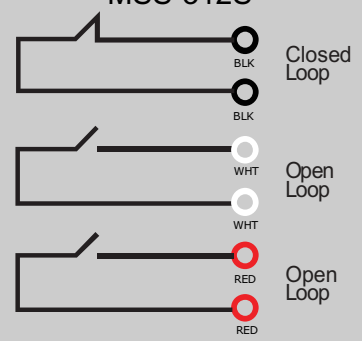
MSS-302S



MSS-303S



MSS-312S



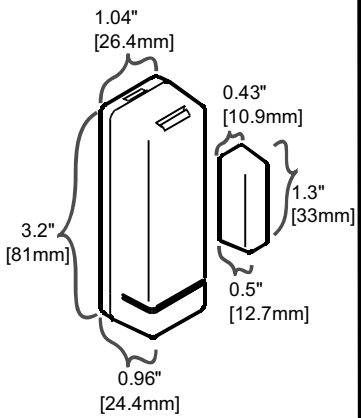
FCC ID: 2ABBZ-RF-SDWS
IC:11817A-RFSDWS

Magnasphere MSS-RFS Series Wireless Surface Mount Contact

MSS-RFS-100/200/300
Surface Mount Contact



SIZE



MAX Gap

0.63" [16 mm]

Magnasphere Electrical Specifications
Max Current: **0.25A** Resistive
Max Voltage: **30 VDC**
Max Power: **.25 W** Resistive
Battery: 3VDC, 1.55Ah, CR123A Lithium Battery

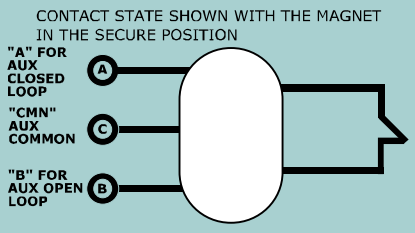
Color(s)

White and Brown

Screw Terminals

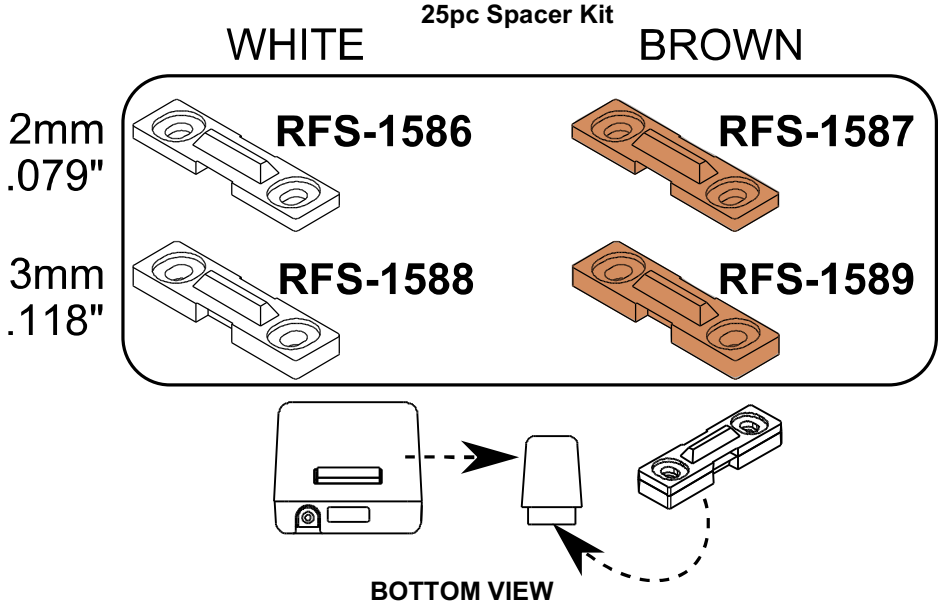
COMPATIBLE WITH THESE OEM* FORMATS:
MSS-RFS-100 = UTC - INTERLOGIX / ITI / ELK
MSS-RFS-200 = HONEYWELL (available Q2 2014)
MSS-RFS-300 = 2 GIG (available Q2 2014)
*UTC, Interlogix and ITI are registered trademarks of United Technologies Corporation, Elk is a registered trademark of Elk Products, Inc., Honeywell is a registered trademark of Honeywell International, Inc., 2 GIG is a registered trademark of Nortek, Inc.

MSS-RFS Series



RFS-158# SPACER KIT FOR THE MSS-RFS WIRELESS SERIES

25pc Spacer Kit



BOTTOM VIEW

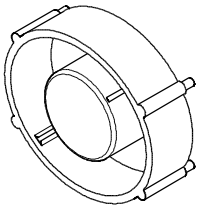
Accessories

Available Part Numbers

MSS Series

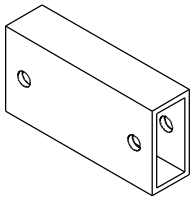
P/N : 1605
KIT: Channel Magnet for Aluminum Doors
QTY: 1

NEW



P/N : 1595
KIT: 1/2" Thick, Spacer for MSS-300S
QTY: 1

NEW



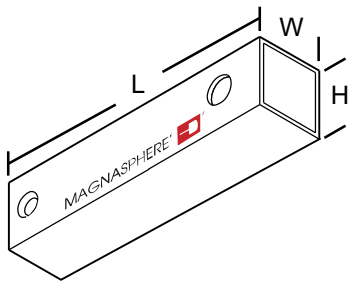
Note : Images are **NOT** to scale.

Magnasphere UL-634 Level 1

HSL-1.5 (Dual Alarm Contact) Level 1 (UL-634)



SIZE



4.25" [107.9mm] L x 1"[25.4mm] W
1" [25.4mm] H

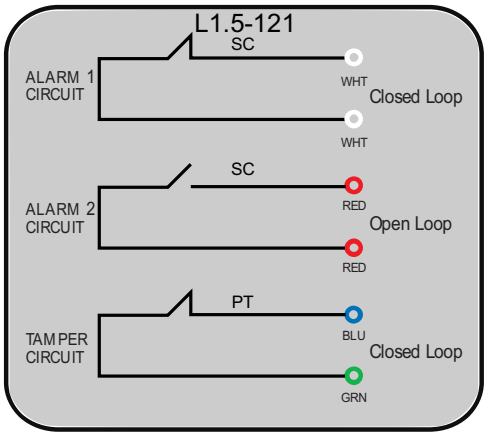
Magnasphere General Information

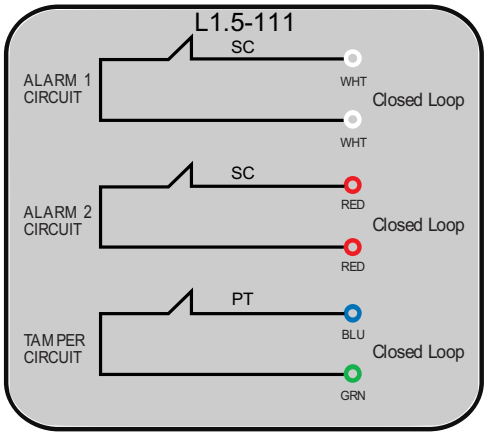
Each Circuit/Contact
Housing: Aluminum
Wire Lead Type: Solid Color-Coded Lead Wires, 22 AWG
Max Current: 0.25 A Resistive
Max Voltage: 30 VDC
Max Power: 0.250 W
Max Gap: .25"

See Page 36 for Custom Cable Length

NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers





Legend / Notes

SC = Secure Contact
PT = Pry Tamper

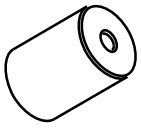
Wire Lead Type: 22Gauge (AWG), 18" [46cm] Armored Cable (Std.), (See Page 37 for Custom Cable Length)

Accessories

Available Part Numbers

HSL-1.5

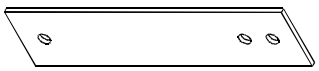
P/N : 1250
KIT: Removal Tamper Magnet
QTY: 3pcs



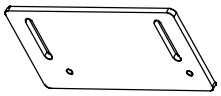
P/N : 1251
KIT: Removal Tamper Cap
QTY: 5pcs



P/N : 1270
KIT: 1/16" Spacers for HSL-1.5
QTY: 4pcs

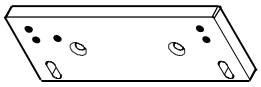


P/N : 1524
KIT: 1/8" Out-Swing Spacer for HS-L1.5
(For use with narrow door stops.)
QTY: 1pc



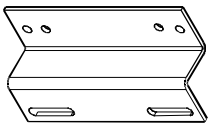
P/N : 1600
KIT: Bracket for HSL1.5 Direct
Replacment to 2700 Series
QTY: 1

NEW



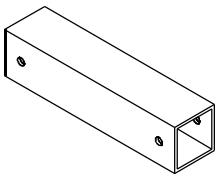
P/N : 1612
KIT: Z Bracket
QTY: 1

NEW



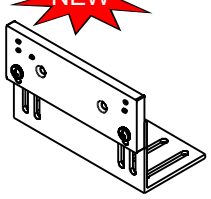
P/N : 1615
KIT: 1" x 1" Aluminum Spacer
QTY: 1

NEW

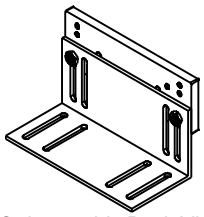


P/N : 1616
KIT: L-Bracket Kit for the HSL1.5
QTY: 1

NEW

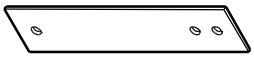


Orthographic Front View



Orthographic Back View

Note : Images are **NOT** to scale.

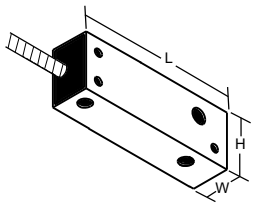
INSTALLER COMPONENTS FOR HSL-1.5 SERIES	
REPLACEMENT KIT P/N: 1542	
Description (Note: Images are **NOT** to scale)	
Pry-tamper Plugs (Plastic) / **Qty: 2**	
Pry-tamper Magnet (Dia. 3/8" x 1/2" Length) / **Qty: 1**	
Plastic Spacers (1/16" Thk.) / **Qty: 2**	
Poly Bag / **Qty:1**	

Magnasphere UL 634 Level 2 High Security Contacts (Surface Mount)

HSS-L2S (Single Alarm Contact) Level 2 (UL-634)



Magnasphere General Information
Aluminum Case: Silver-Gray Anodized
Wire Lead Type: Solid Color-Coded Lead Wires, 22 AWG
Max Current: 0.25 A Resistive
Max Voltage: 30 VDC
Max Power: 0.250 W
Operating Temperature: -40° C to +80°C
Max Gap: .25" (Note: .125" Gap for UL634 Level 2 Installation)
See Page 36 for Custom Cable Length



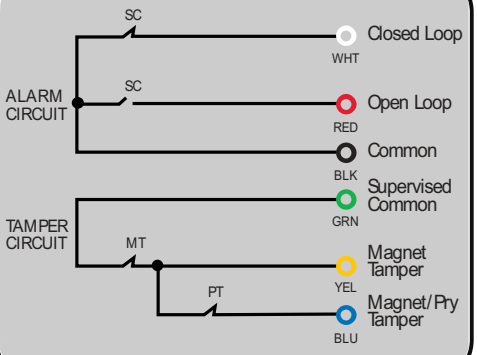
SIZE
4.25"L x 1"W x 1.5"H

[107.9mm L x 25.4mm W x 38.1mm H]

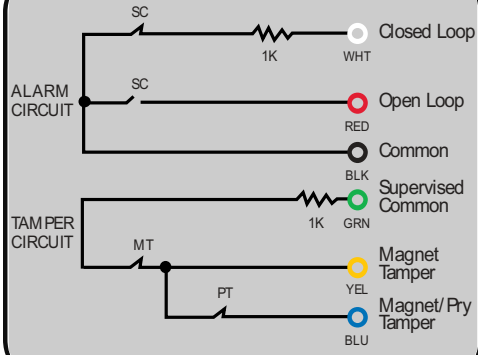
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

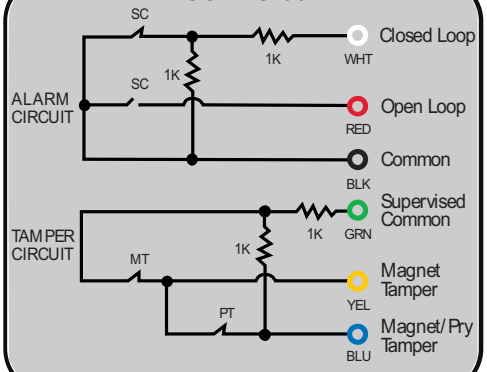
HSS-L2S-000



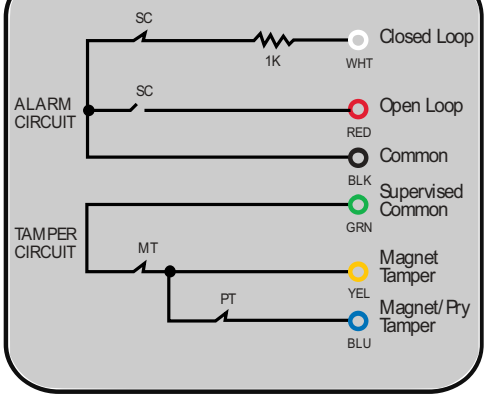
HSS-L2S-001



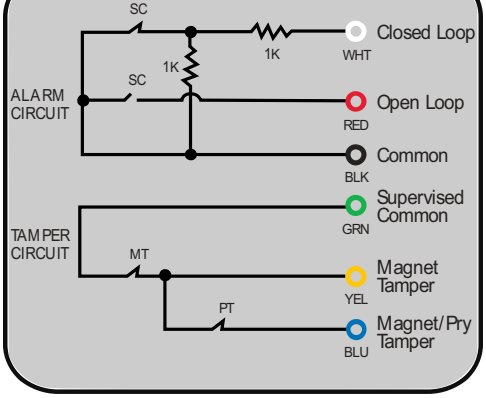
HSS-L2S-002



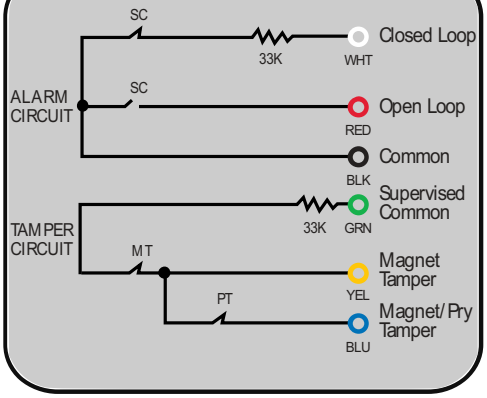
HSS-L2S-003



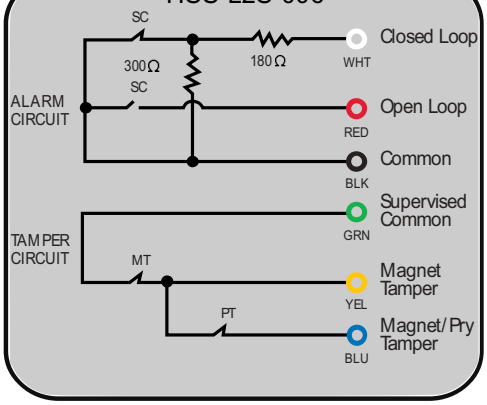
HSS-L2S-004



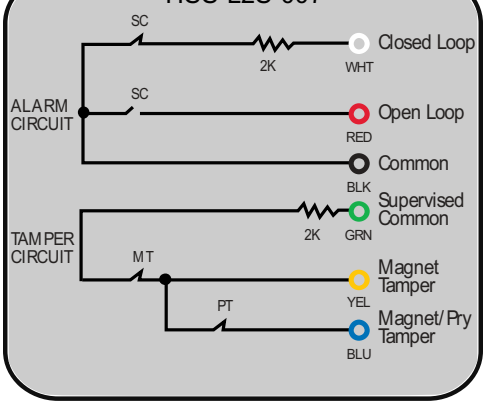
HSS-L2S-005



HSS-L2S-006



HSS-L2S-007



Legend / Notes

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

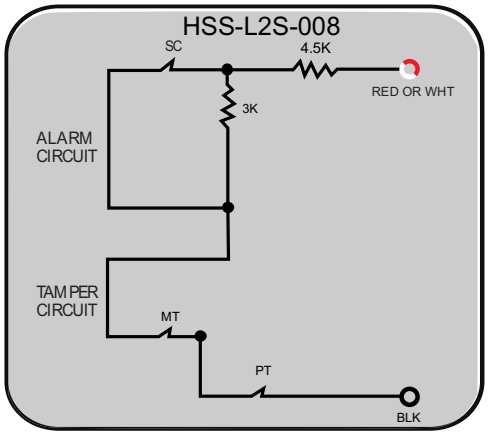
36" [91cm] Armored Cable (Std.), (See Page 37 for Custom Cable Length)

Magnasphere HSS-L2S (Single Alarm Contact) *Continued*
UL 634 Level 2 High Security Contacts (Surface Mount)

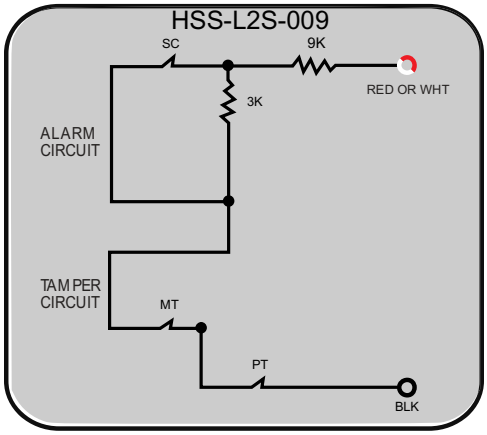
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

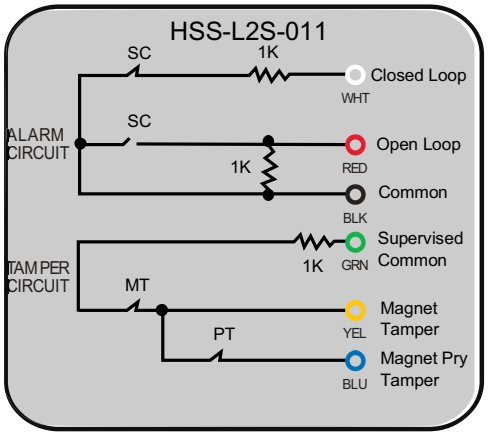
HSS-L2S-008



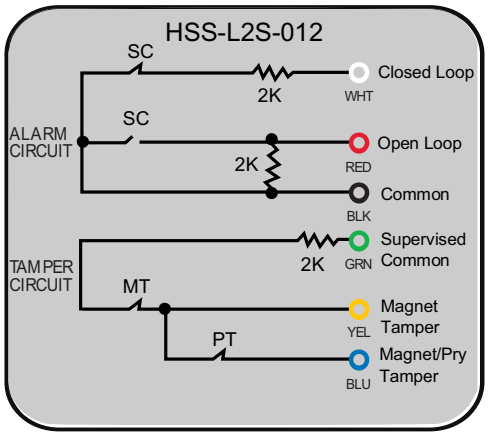
HSS-L2S-009



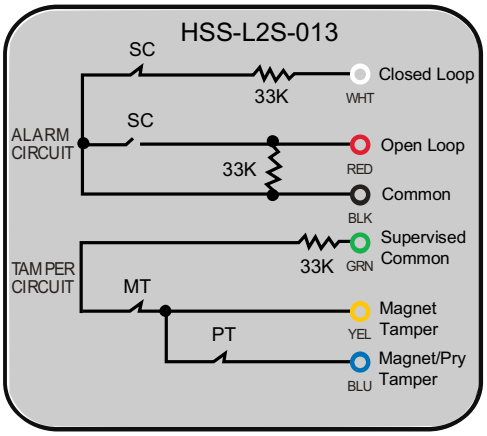
HSS-L2S-011



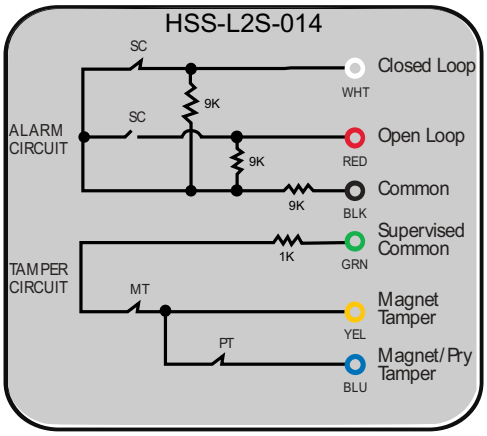
HSS-L2S-012



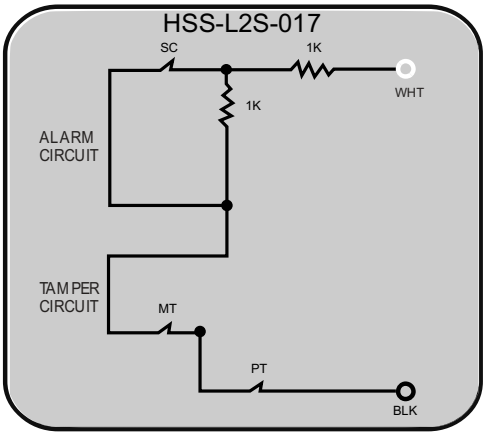
HSS-L2S-013



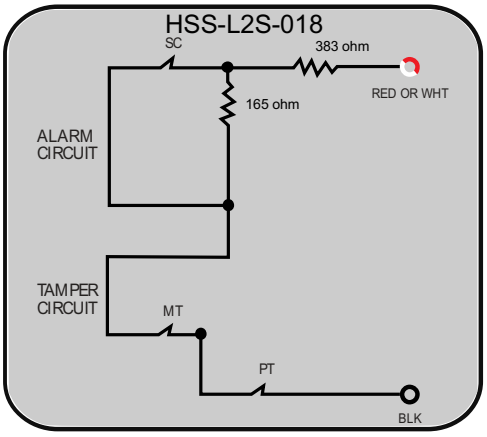
HSS-L2S-014



HSS-L2S-017
WE-1K-J1-LS-J2-MT-PT-BK:J1-1K-J2



L2S-018-RD/WE-0.383K-J1-LS-J2-
MT-PT-BK:J1-0.165K-J2



Legend

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K= Resistor

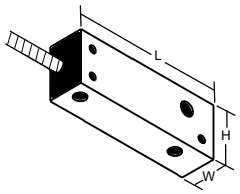
36" [91cm] armored cable (Std.), (See Page 37 for Custom Cable Length)

Magnasphere UL 634 Level 2 High Security Contacts (Surface Mount)

HSS-L2D (Dual Alarm Contacts) Level 2 (UL-634)



Magnasphere General Information
Aluminum Case: Silver-Gray Anodized
Wire Lead Type: Solid Color-Coded Lead Wires, 22 AWG
Max Current: 0.25 A Resistive
Max Voltage: 30 VDC
Max Power: 0.250 W
Operating Temperature: -40° C to +80°C
Max Gap: .25" (Note: .125" Gap for UL634 Level 2 Installation)
See Page 36 for Custom Cable Length



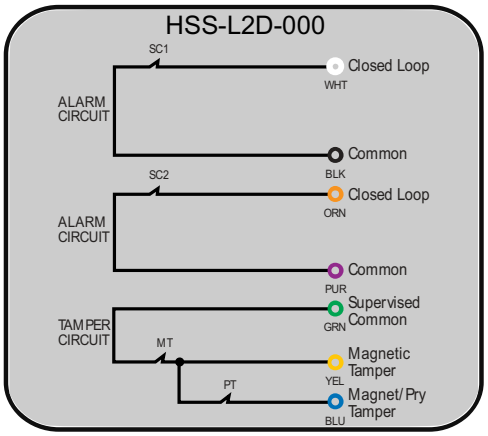
SIZE
4.25"L x 1"W x 1.5"H

[107.9mm L x 25.4mm W x 38.1mm H]

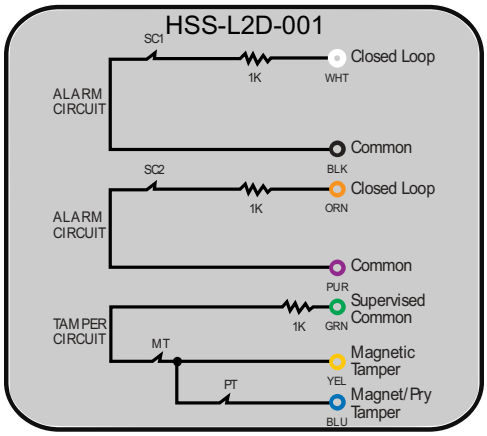
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

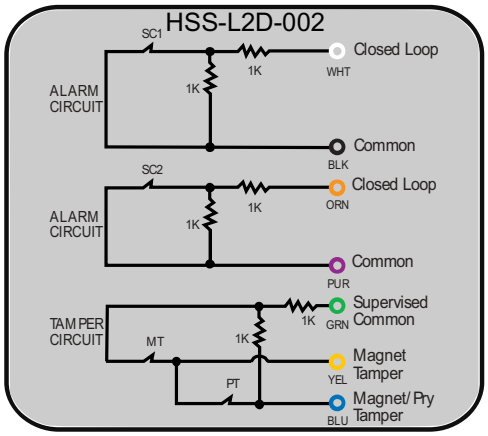
HSS-L2D-000



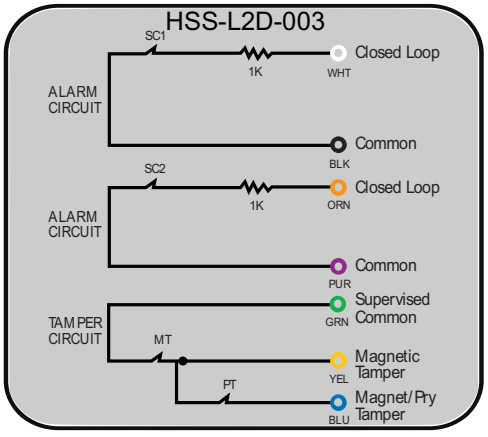
HSS-L2D-001



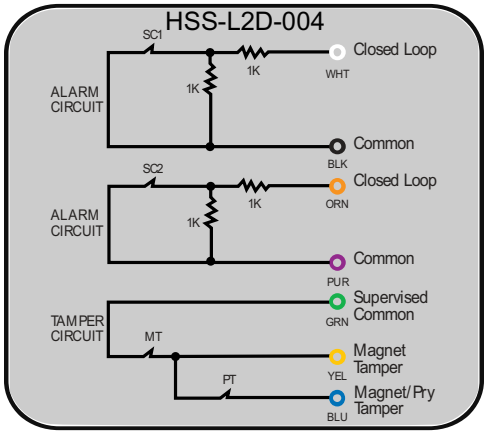
HSS-L2D-002



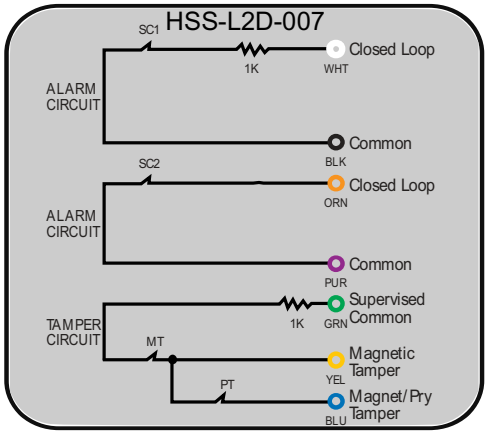
HSS-L2D-003



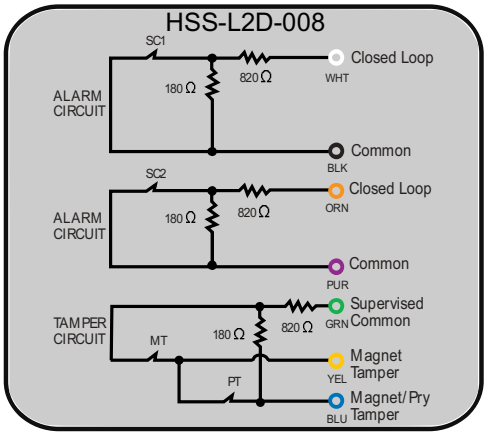
HSS-L2D-004



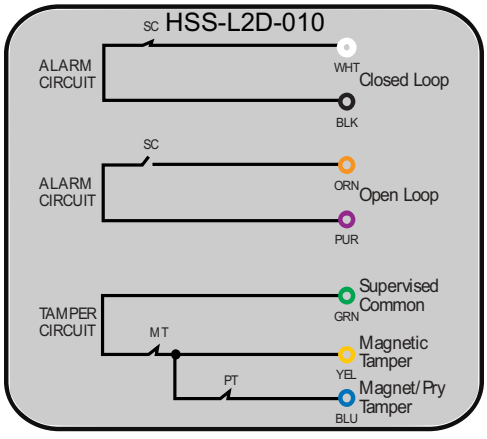
HSS-L2D-007



HSS-L2D-008



HSS-L2D-010



Legend / Notes

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

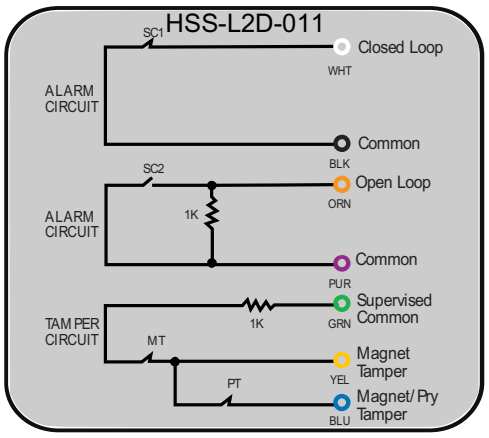
36" [91cm] Armored Cable (Std.), (See Page 37 for Custom Cable Length)

Magnasphere HSS-L2D (Dual Alarm Contacts) *Continued*
UL 634 Level 2 High Security Contacts (Surface Mount)

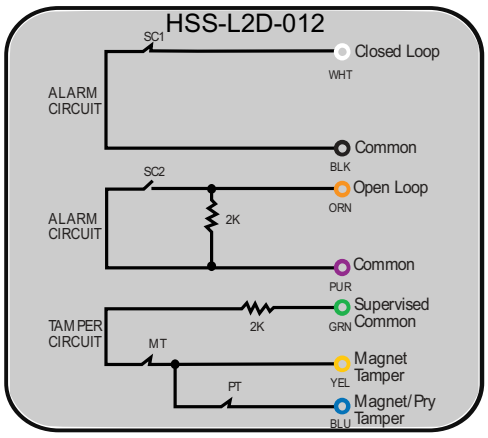
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

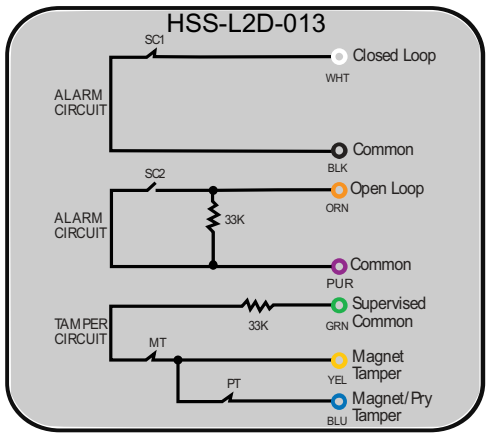
HSS-L2D-011



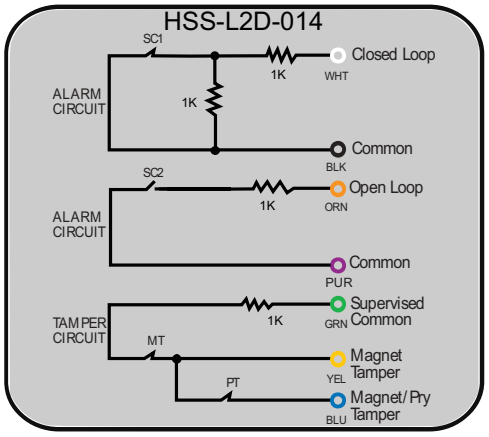
HSS-L2D-012



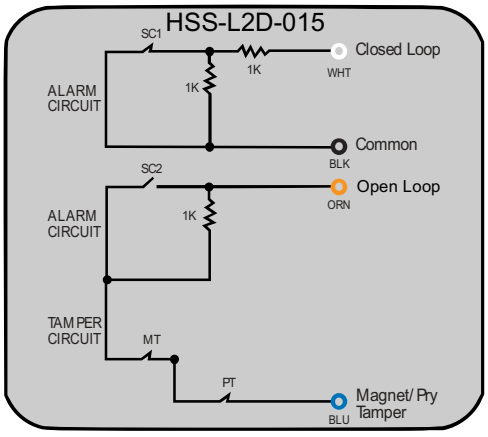
HSS-L2D-013



HSS-L2D-014-
WE-1K-J1-LS-J2-BK:J1-1K-J2:OE-1K-
LS-PE:GN-1K-MT-J3-YW:J3-PT-BE



L2D-015
WE-1K-J1-LS-J2-BK:J1-1K-J2:OE-
J3-NS-J4-MT-PT-BE:J3-1K-J4



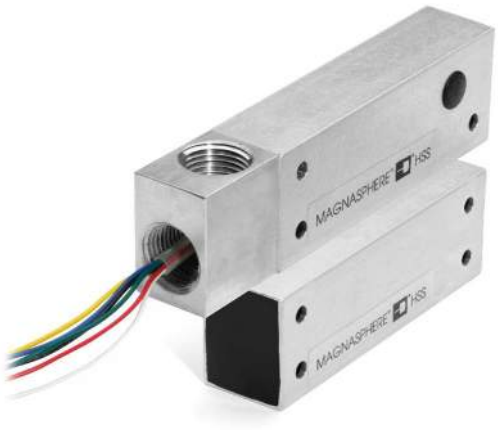
Legend

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

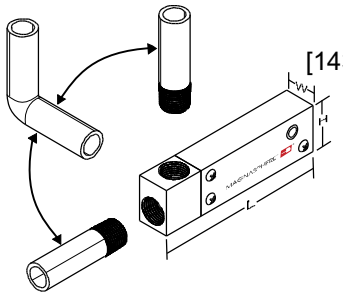
36" [91cm] Armored Cable (Std.),
(See Page 37 for Custom Cable Length)

Magnasphere UL 634 Level 2 High Security Contacts (Surface Mount w/ Conduit Fitting)

HSS 800 Series (Intrinsically Safe) Level 2 (UL-634)



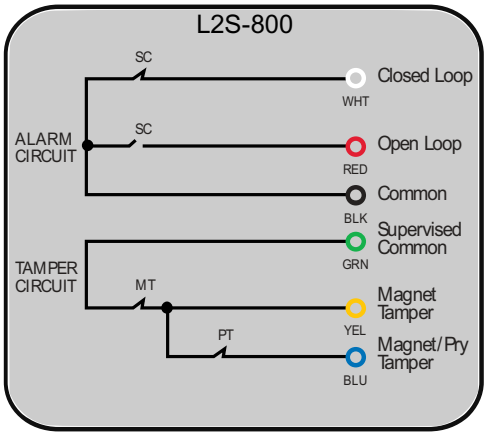
Magnasphere General Information
Aluminum Case: Silver-Gray Anodized
Wire Lead Type: Solid Color-Coded Lead Wires, 22 AWG
Max Current: 0.25 A Resistive
Max Voltage: 30 VDC
Max Power: 0.250 W
Operating Temperature: -40° C to +80°C
Max Gap: .25" (Note: .125" Gap for UL634 Level 2 Installation)

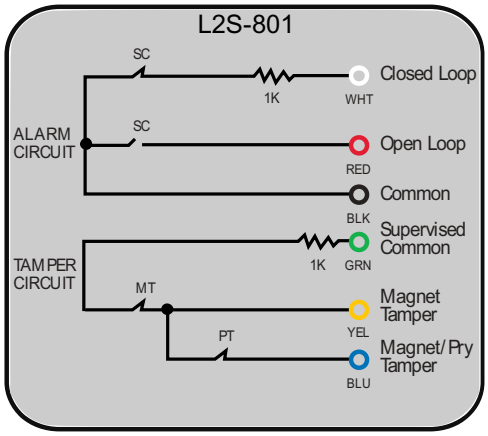


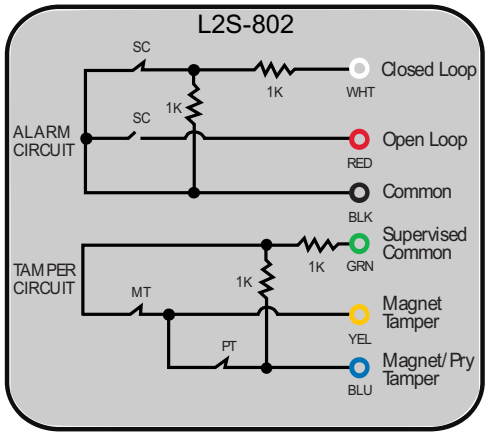
Dual fitting note: either or both

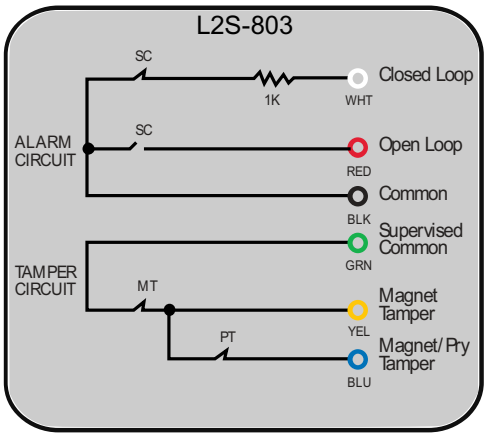
SIZE
5.6"L x 1"W x 1.5"H
[143mm L x 25.4mm W x 38.1mm H]

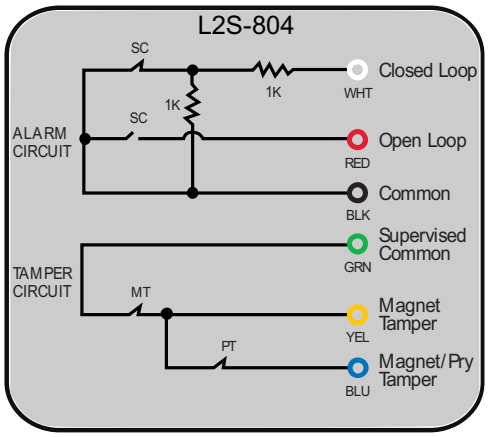
Available in all L2D / L2S Schematic Variants











Legend / Notes

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

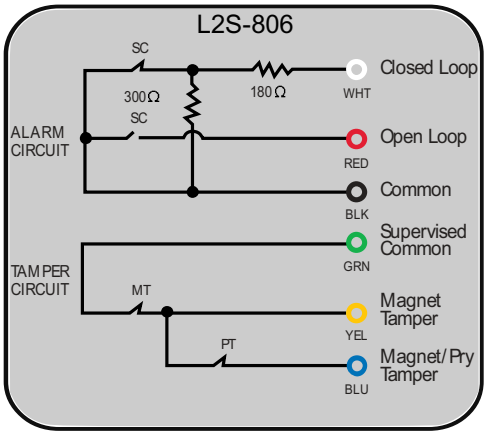
36" [91cm] Leads (Std.)

Magnasphere L2S-800 (Single Alarm Contact) *Continued*
UL 634 Level 2 High Security Contacts (Surface Mount)

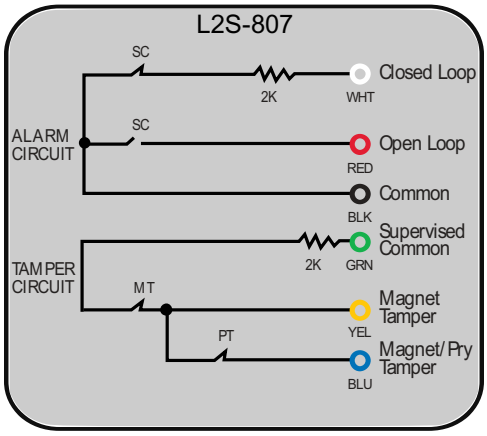
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

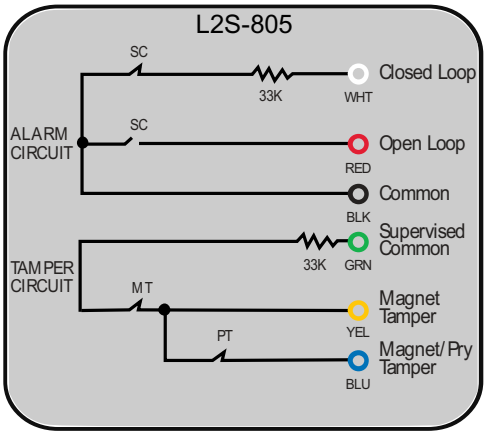
L2S-806



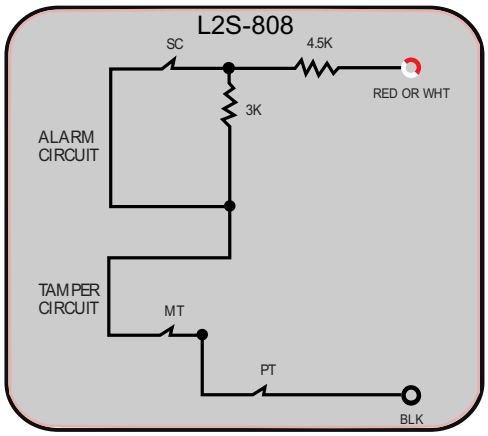
L2S-807



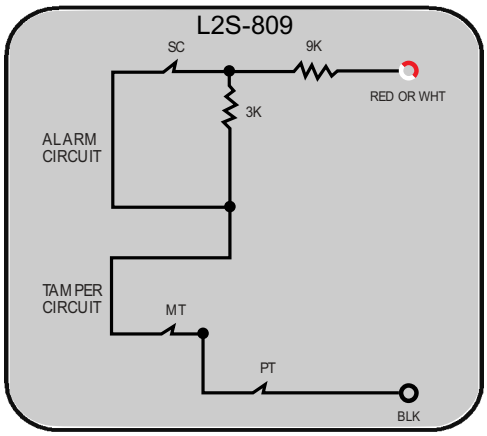
L2S-805



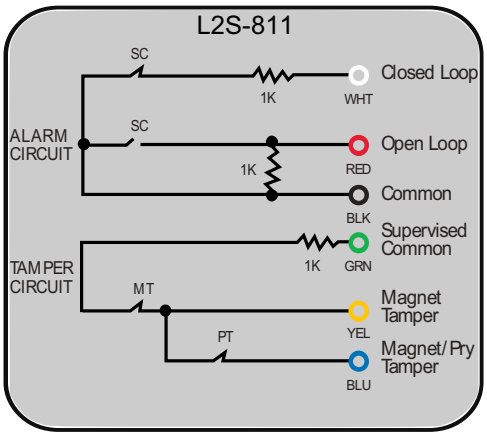
L2S-808



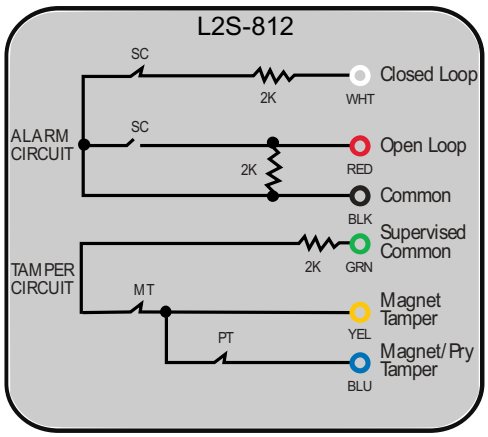
L2S-809



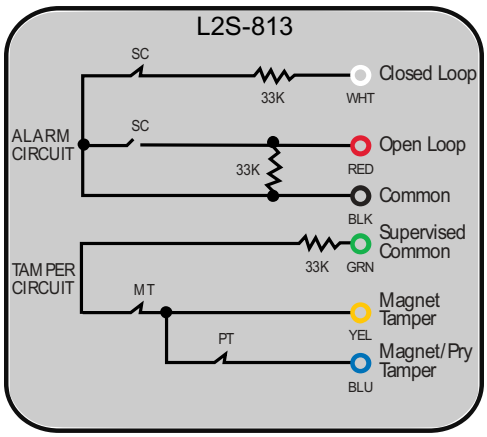
L2S-811



L2S-812



L2S-813



Legend / Notes

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

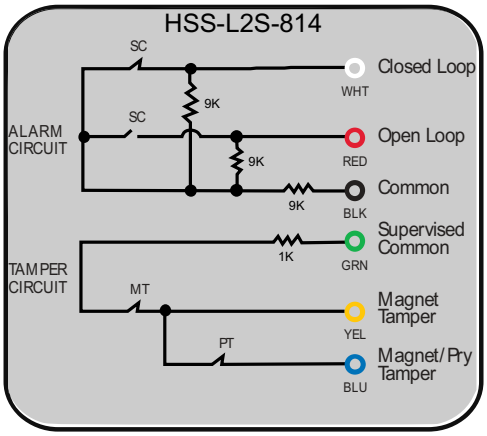
36" [91cm] Leads (Std.)

Magnasphere L2S-800 (Single Alarm Contact) *Continued*
UL 634 Level 2 High Security Contacts (Surface Mount)

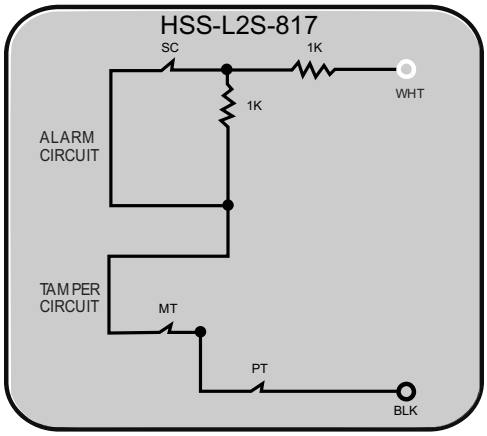
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

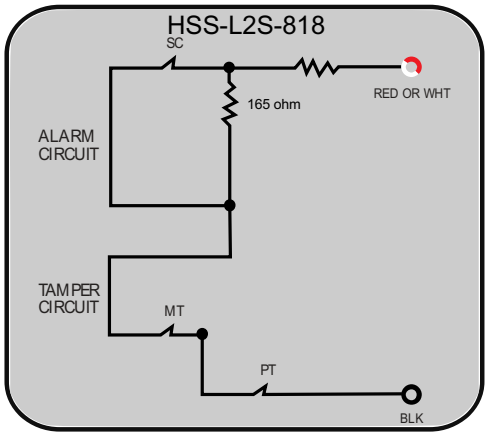
HSS-L2S-814



HSS-L2S-817
WE-1K-J1-LS-J2-MT-PT-BK:J1-1K-J2



L2S-818-RD/WE-0.383K-J1-LS-J2-
MT-PT-BK:J1-0.165K-J2



Legend

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K= Resistor

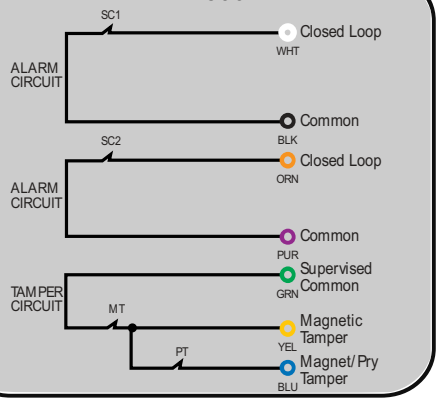
36" [91cm] armored cable (Std.),
(See Page 37 for Custom Cable Length)

Magnasphere L2D-800 (Dual Alarm Contacts)
UL 634 Level 2 High Security Contacts (Surface Mount)

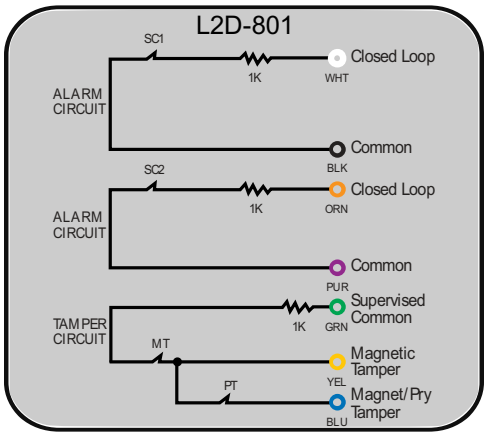
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

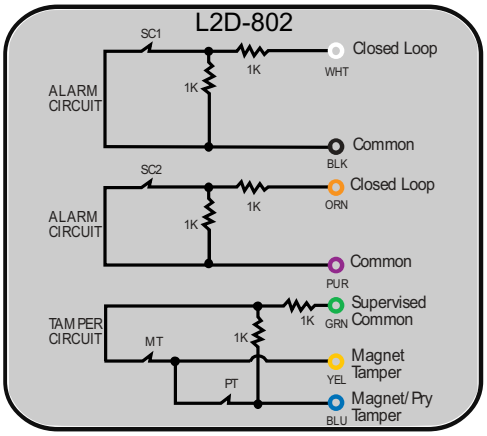
L2D-800



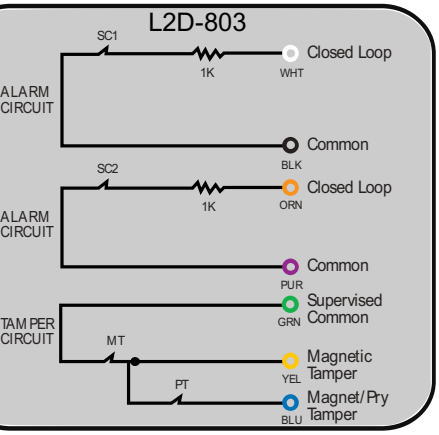
L2D-801



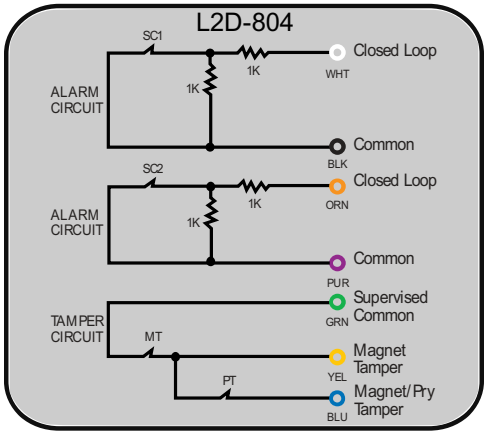
L2D-802



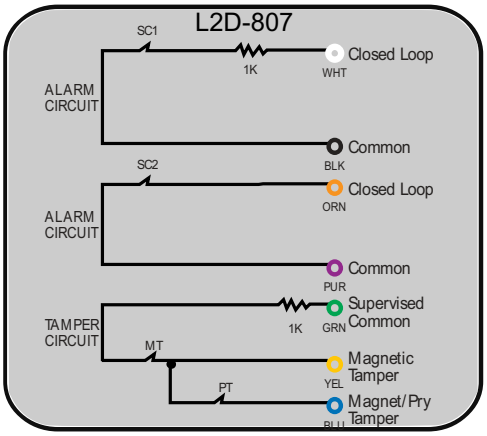
L2D-803



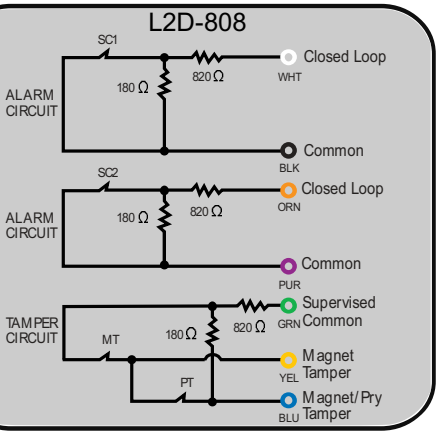
L2D-804



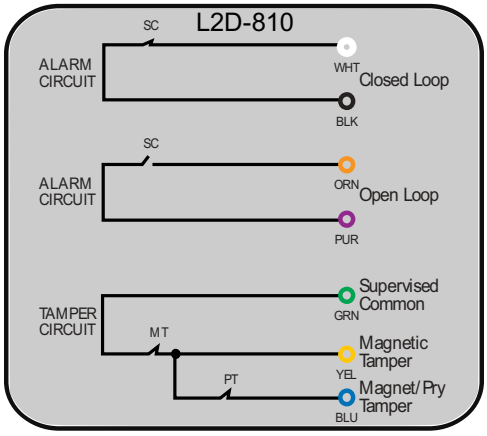
L2D-807



L2D-808



L2D-810



Legend / Notes

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

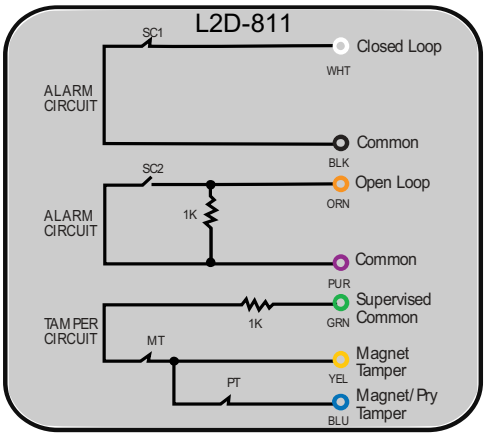
36" [91cm] Leads (Std.)

Magnasphere L2D-800 (Dual Alarm Contacts) *Continued*
UL 634 Level 2 High Security Contacts (Surface Mount)

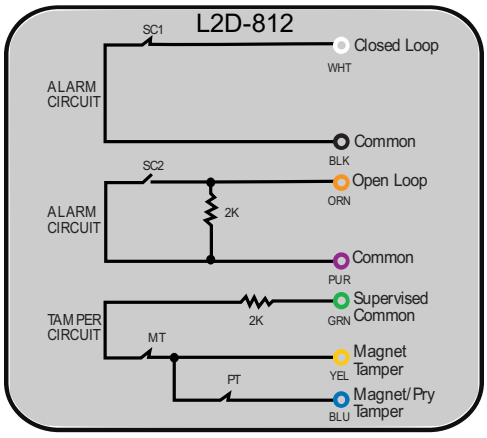
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

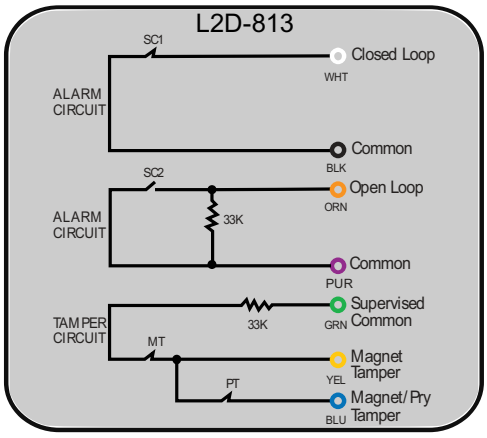
L2D-811



L2D-812

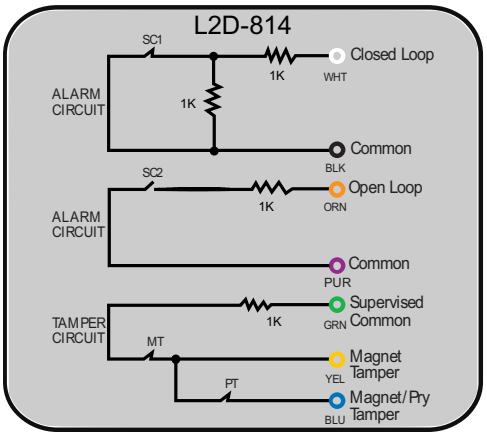


L2D-813

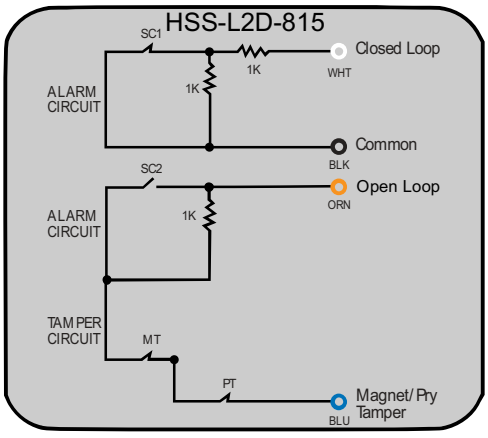


L2D-815
WE-1K-J1-LS-J2-BK:J1-1K-J2:OE-J3-NS-J4-MT-PT-BE:J3-1K-J4

L2D-814



HSS-L2D-815



Legend / Notes

SC = Secure Contact
MT = Magnet Tamper
PT = Pry Tamper
##K = Resistor

36" [91cm] Leads (Std.)

Accessories

Available Part Numbers

HSS

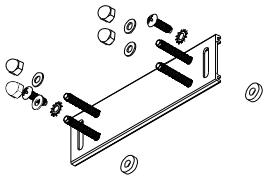
P/N : 1250
KIT: Removal Tamper Magnet
QTY: 3pcs



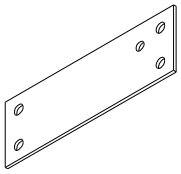
P/N : 1251
KIT: Removal Tamper Cap
QTY: 5pcs



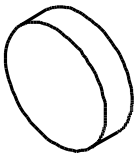
P/N : 1229
KIT: Adjustable Magnet Bracket
QTY: 1



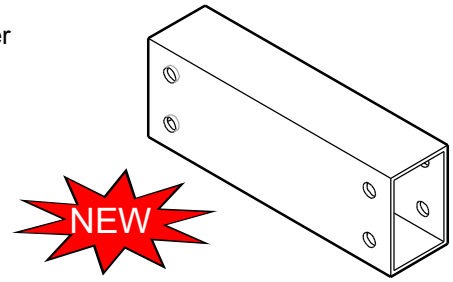
P/N : SP062
KIT: HSS Plastic Shims
QTY: 10pcs



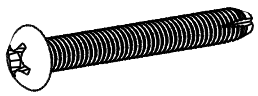
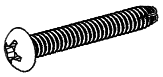
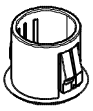
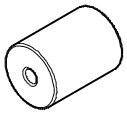
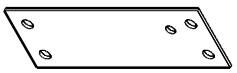
P/N : HSS-1565
KIT: HSS Series Calibration Magnet Spacer
QTY: 10 pcs

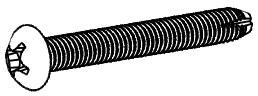
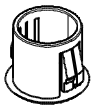
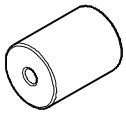
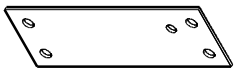
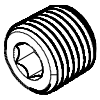


P/N : 1102
KIT: HSS Magnet Housing 1" Spacer
QTY: 1



Note : Images are **NOT** to scale.

INSTALLER COMPONENTS FOR HSS L2X-0XX SERIES	
REPLACEMENT KIT P/N: 1528	
Description (Note: Images are **NOT** to scale)	
#10 x 2" Length / Screws / Type F / **Qty: 7**	
#6 x 1" Length / Screws / Type F / **Qty: 2**	
#8-32 x 7/16" Length / SS Set Screw / **Qty: 1**	
Calibration Magnet Spacer (Metal) / **Qty: 1**	
Pry-tamper Plugs (Plastic) / **Qty: 2**	
Pry-tamper Magnet (Dia. 3/8" x 1/2" Length) / **Qty: 1**	
Plastic Spacers (1/16" Thk.) / **Qty: 2**	
Poly Bag / **Qty:1**	

INSTALLER COMPONENTS FOR HSS L2X-8XX SERIES	
REPLACEMENT KIT P/N: HSS-1543	
Description (Note: Images are **NOT** to scale)	
#10 x 2" Length / Screws / Type F / **Qty: 7**	
#6 x 1" Length / Screws / Type F / **Qty: 2**	
Calibration Magnet Spacer (Metal) / **Qty: 1**	
Pry-tamper Plugs (Plastic) / **Qty: 2**	
Pry-tamper Magnet (Dia. 3/8" x 1/2" Length) / **Qty: 1**	
Plastic Spacers (1/16" Thk.) / **Qty: 2**	
1/2" NPT Plug / **Qty: 1**	
Poly Bag / **Qty:1**	

Magnasphere UL 634 Level 2 High Security Contacts (Recessed/Concealed)

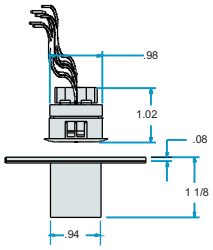
HSS-L2C
Level 2 (UL-634)



Magnasphere General Information

Housing: Brass (Magnet Housing) and ABS (Switch Housing)
Wire Lead Type: Solid Color-Coded Wires,12"L [30 cm] ,22 AWG
Max Current: 0.25 A Resistive
Max Voltage: 30 VDC
Max Power: 0.250 W
Max Gap: .125" (Note: .0625" Gap for UL634 Level 2 Installation)

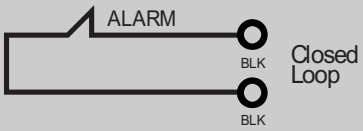
SIZE



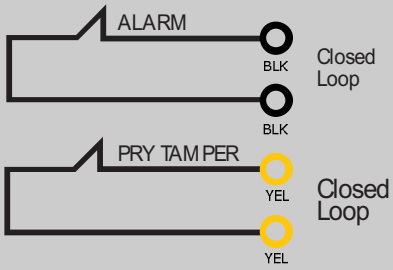
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

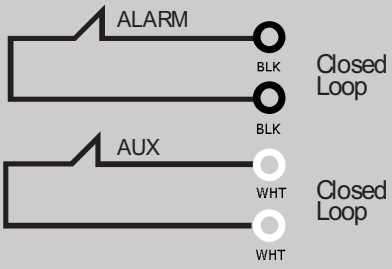
L2C-100



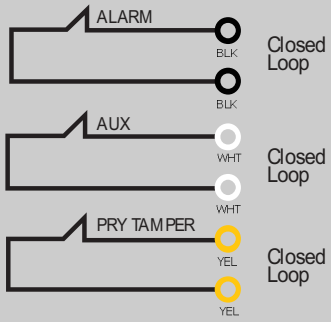
L2C-101



L2C-110



L2C-111



Magnasphere UL 634 Level 2 (Recessed/Concealed: Fits to an ANSI style cutout)

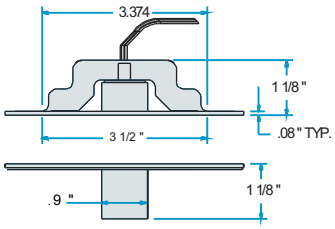
HSS-L2C-A
Level 2 (UL-634)



Magnasphere General Information

Housing: Brass
Wire Lead Type: Color-Coded Lead Wires, 12" [30cm] , 22 AWG
Max Current: 0.25 A Resistive
Max Voltage: 30 VDC
Max Power: 0.250 W
Max Gap: .125" (Note: .0625" Gap for UL634 Level 2 Installation)

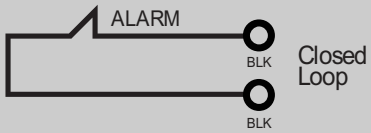
SIZE



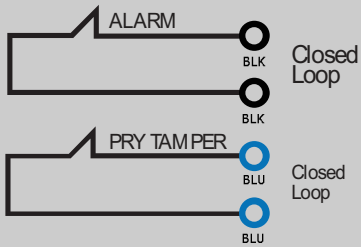
NOTE: CONTACT STATE SHOWN WITH TARGET MAGNET IN PLACE

Available Part Numbers

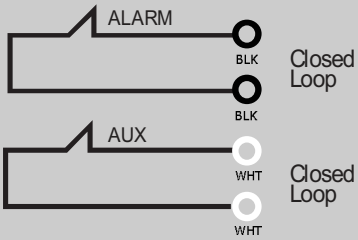
L2C-100-A



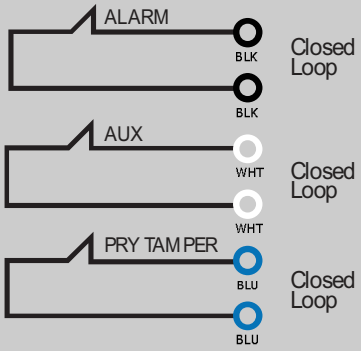
L2C-101-A



L2C-110-A



L2C-111-A

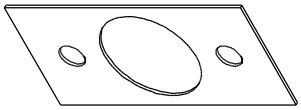


Accessories

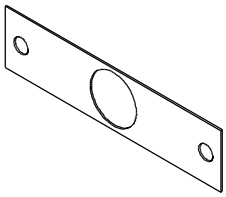
Available Part Numbers

L2C-XXX & L2C-ANSI

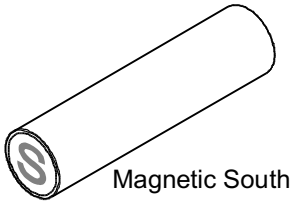
P/N : 1222
KIT: 1/32" Spacers for L2C-XXX Magnet Module
QTY: 10pcs



P/N : 1367
KIT: L2C ANSI 1/32" spacer
QTY: 10pcs

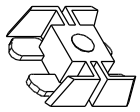
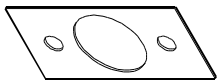
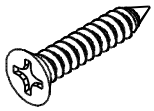


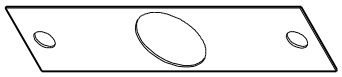
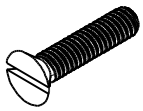
P/N : 1384
KIT: L2C Series Pry Tamper Test Magnet
(1" dia [2.54 cm] x 4"L [10.2 cm])
QTY: 1



Magnetic South Pole at Face

Note : Images are **NOT** to scale.

INSTALLER COMPONENTS FOR HSS L2C	
REPLACEMENT KIT P/N: HSS-1544	
Description (Note: Images are **NOT** to scale)	
Tamper Bracket (Plastic) / **Qty: 1**	
Plastic Spacer (1/32" Thk.) / **Qty: 3**	
#10 x 1" Length / Phillips Undercut Flathead Screw / **Qty: 2**	
Poly Bag / **Qty:1**	

INSTALLER COMPONENTS FOR HSS L2C-A	
REPLACEMENT KIT P/N: HSS-1545	
Description (Note: Images are **NOT** to scale)	
#8-32 x 3/8" Length / SS Phillips Undercut Flathead Screws (Tamper Bracket) / **Qty: 2**	
Plastic Spacer (1/32" Thk.) / **Qty: 3**	
#8-32 x 1/2" Length / Brass Slotted Flathead Screw (Switch and Magnet) / **Qty:4**	
Poly Bag / **Qty: 1**	

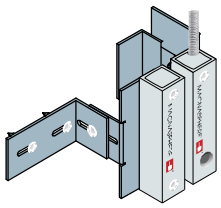
Roll Up Door Bracket Kit and Overhead Door Brackets (OHD)

Available Part Numbers

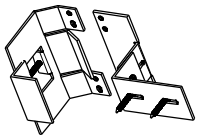
Over Head Rail Mount Brackets (OHD) for HSL-1.5 (Level 1)

P/N : HD-OHD-111
KIT: HSL-L1.5-111 mounted on HS-1271
QTY: 1 pc(s)

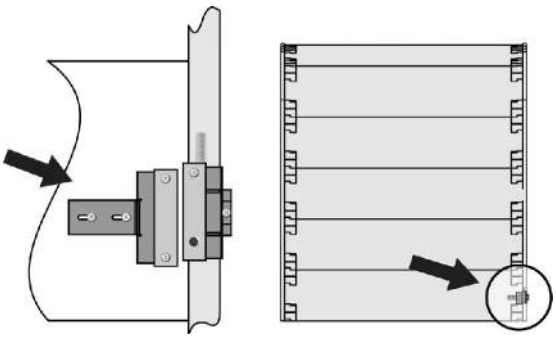
P/N : HD-OHD-121
KIT: HSL-L1.5-121 mounted on HS-1271
QTY: 1 pc(s)



P/N : 1271
KIT: Overhead Door Rail Mount Bracket for HS-L1.5
QTY: 1 pc(s)



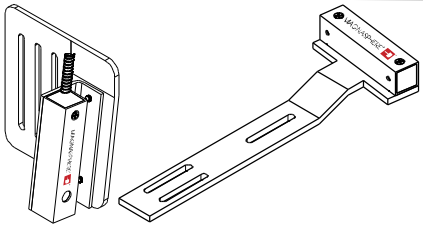
Assembled Representation * for
HSL-1.5 Over Head Rail Mount Bracket
For reference only, visit **www.Magnasphere.com**
for installation instructions.



Roll-up Door Contact (HSL-1.5) Level 1 (Brackets w/ contacts pre-mounted)

P/N : HS1452-L1.5-111 & -121
KIT: Roll Up Door Bracket w/HSL1.5 - Right Side*
QTY: 1 pc(s)

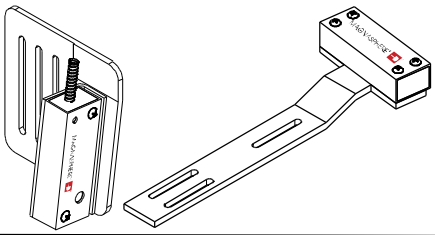
P/N : HS1453-L1.5-111 & -121
KIT: Roll Up Door Bracket w/HSL1.5 - Left Side*
QTY: 1 pc(s)



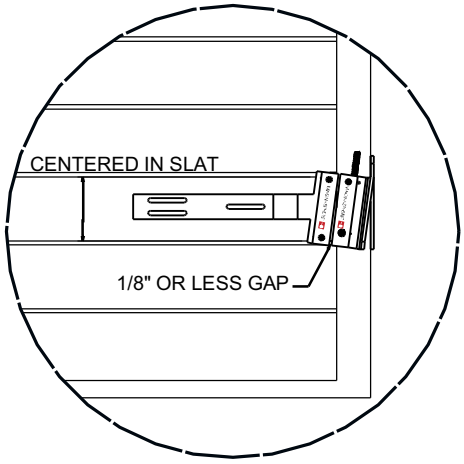
Roll-up Door Contact (HSS) Level 2 (Brackets w/ contacts pre-mounted)

P/N : HSS-1450-L2S/D-XXX
KIT: Roll Up Door Bracket w/HSS L2 - Right Side*
QTY: 1 pc(s)

P/N : HSS-1451-L2S/D-XXX
KIT: Roll Up Door Bracket w/HSS L2 - Left Side*
QTY: 1 pc(s)



Assembled Representation * for
Roll-up Door Contact (HSS / HSL-1.5)
For reference only, visit **www.Magnasphere.com**
for installation instructions.



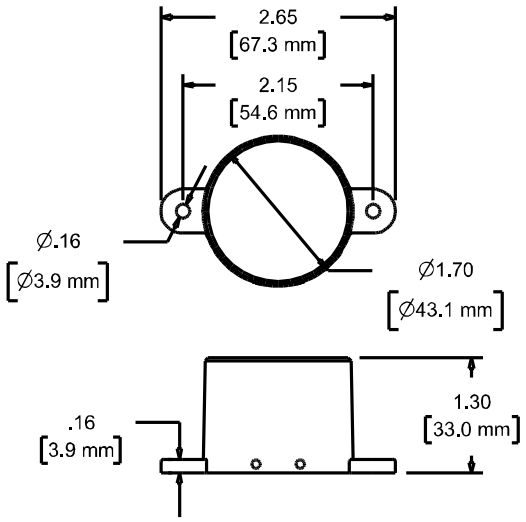
Notes: 1. Images are **NOT** to scale.
2. *Interior Reference Point

Magnasphere T3-B-LS Omnidirectional Tilt / Disturbance Switch

T3-B-LS



SIZE



Mechanical and Electrical Specifications
Poles and Circuits: SPST (ON/OFF)
Max Current: **0.25A**
Max Voltage: **30 VDC** Resistive
Max Power: **.24 W**
Mechanical Life: 1 Million Operations (Typical)
Angles of Operation:
11° above horizontal typical actuation.
6° above horizontal typical return.

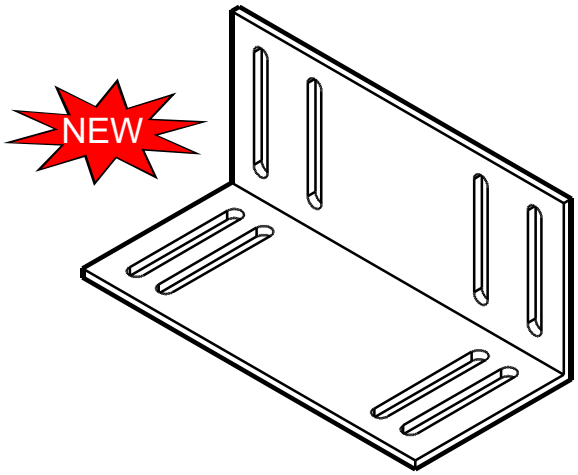
Color(s)
Black ABS
(Flame Rated: 94HB min)

Wire Leads
12" [30.5cm] - 2x 20 AWG Stranded,
Black SXL Insulated

L Bracket for use with Magnasphere T3-B-LS Omni-Directional Tilt / Disturbance Switch Qty:1

P/N: 1610

Description (Note: Image(s) are NOT to scale)



MAGNASPHERE®

How To Order Magnasphere Contacts With Longer Than Standard Armored Cable/Leads

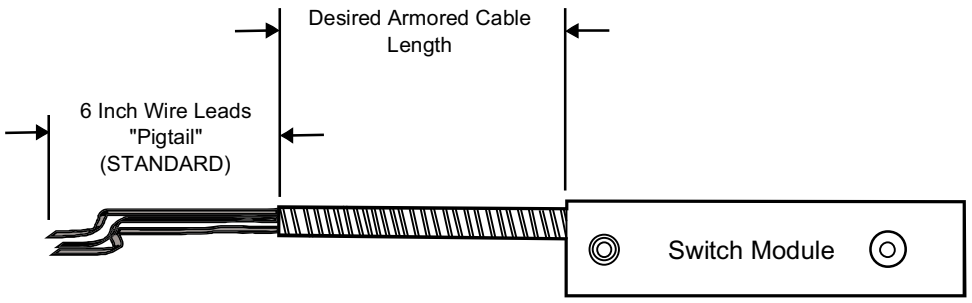
(Example)

HS, HSS or MSS-300S Series P/N	Armored Cable Length (in Inches)	Wire Lead Length (In Feet + 0.5 Foot "Pigtail")
HS-L1.5-111	**C-36**	**L-3.5**
Desired Contact Model	Desired Armored Cable Length in Inches	Desired Wire Lead Length Converted to Feet
Level 1- Two Normally Closed Alarm Contacts & Normally Closed Tamper	Armored Cable 36"	3-1/2 Feet Of Wire Leads (6" of Lead Available - From End of Armored Cable)

HS-L1.5-111-C-36-L-3.5

(Example)

Visual Reference



Note: Same ordering convention applies to HSS, HSL1.5 and MSS contacts.

MAGNASPHERE N14 W23777 Stone Ridge Dr. Suite 160 Waukesha, WI 53188 tel 262.347.0711 fax 262.347.0710 www.magnasphere.com

Room Cooling and Heating Loads by Component

ROOM_4CR04E - Corridor

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 18:00:00				
Outside	DB / WB / HR	90.6 °F	/	74.8 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	46.6 %	/	60.2 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	2,339	0	2,339	25.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	480	0	480	5.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	2,818	0	2,818	-
People	117	152	279	548	5.9
Lights	678	1,018	0	1,696	18.1
Miscellaneous Loads	1,711	1,143	0	2,854	30.5
Internal Subtotal	2,506	2,313	279	5,097	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	661	0	661	7.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-3	0	-3	0.0
Grand Total	2,506	5,788	279	8,573	100.0
RA Sensible (Lights)	778	0	0	778	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		75.3 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-1,579	0	-1,579	66.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-84	0	-84	3.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-1,663	0	-1,663	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-701	0	-701	29.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-2	0	-2	0.1
Grand Total	0	-2,366	0	-2,366	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	411
Cooling ACH	2.01
Sec Fan cfm	0
Input Ventilation cfm	67
Calculated Ventilation cfm	47
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	411
Heating ACH	2.01
Sec Fan cfm	0
Input Ventilation cfm	67
Calculated Ventilation cfm	47
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	1,219
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	4,595
Exterior Floor	0
Internal Floor	1,219
Slab	0
Other Floor	1,219

Engineering Checks For Cooling

Cooling tons	0.71	No People(max)	1.11
%OA	12	People per 1000 ft²	1
cfm/ft²	0.37	Volume (ft³)	12,260.2
cfm/ton	575.32		
ft²/ton	1,560.30		
Btu/h-ft²	7.69		

Engineering Checks For Heating

Heating Mbh	-2.37	No People(max)	1.11
%OA	12	People per 1000 ft²	1
cfm/ft²	0.37	Volume (ft³)	12,260.2
cfm/Mbh	-173.75		
ft²/Mbh	-471.13		
Btu/h-ft²	-2.12		

ROOM_4000E - Reception

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00					
Outside	DB / WB / HR	88.2	°F /	74.1	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	50.6	% /	65.4	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-139	0	-139	-1.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-55	0	-55	-0.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-194	0	-194	-
People	0	0	0	0	0.0
Lights	335	457	0	791	8.7
Miscellaneous Loads	3,904	2,432	1,541	7,877	86.7
Internal Subtotal	4,239	2,888	1,541	8,668	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	236	0	236	2.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-12	0	-12	-0.1
Grand Total	4,239	2,918	1,541	8,698	100.0
RA Sensible (Lights)	384	0	0	384	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-211	0	-211	36.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-51	0	-51	8.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-263	0	-263	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-315	0	-315	54.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-578	0	-578	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	355
Cooling ACH	3.89
Sec Fan cfm	0
Input Ventilation cfm	60
Calculated Ventilation cfm	41
Calculated Ventilation ACH	0.45
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	355
Heating ACH	3.89
Sec Fan cfm	0
Input Ventilation cfm	60
Calculated Ventilation cfm	41
Calculated Ventilation ACH	0.45
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	521
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	1,020
Exterior Floor	0
Internal Floor	521
Slab	0
Other Floor	521

Engineering Checks For Cooling

Cooling tons	0.72	No People(max)	0.00
%OA	12	People per 1000 ft²	0
cfm/ft²	0.71	Volume (ft³)	5,474.8
cfm/ton	489.67		
ft²/ton	686.75		
Btu/h-ft²	17.47		

Engineering Checks For Heating

Heating Mbh	-0.58	No People(max)	0.00
%OA	12	People per 1000 ft²	0
cfm/ft²	0.21	Volume (ft³)	5,474.8
cfm/Mbh	-614.70		
ft²/Mbh	-861.93		
Btu/h-ft²	-1.16		

ROOM_4002E - Conference

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00				
Outside	DB / WB / HR	88.2 °F	/	74.1 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	59.9 %	/	77.6 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-376	0	-376	-5.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-108	0	-108	-1.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-484	0	-484	-
People	1,468	1,844	2,797	6,108	81.0
Lights	317	468	0	785	10.4
Miscellaneous Loads	430	277	0	706	9.4
Internal Subtotal	2,215	2,589	2,797	7,600	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	82	0	82	1.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-21	0	-21	-0.3
Grand Total	2,215	2,166	2,797	7,177	100.0
RA Sensible (Lights)	364	0	0	364	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		75.0 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-21	0	-21	8.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-49	0	-49	18.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-71	0	-71	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-197	0	-197	73.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-268	0	-268	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	218
Cooling ACH	4.25
Sec Fan cfm	0
Input Ventilation cfm	87
Calculated Ventilation cfm	25
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	218
Heating ACH	4.25
Sec Fan cfm	0
Input Ventilation cfm	87
Calculated Ventilation cfm	25
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	298
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	806
Exterior Floor	0
Internal Floor	298
Slab	0
Other Floor	298

Engineering Checks For Cooling

Cooling tons	0.60	No People(max)	13.97
%OA	12	People per 1000 ft²	50
cfm/ft²	0.78	Volume (ft³)	3,077.0
cfm/ton	363.69		
ft²/ton	467.79		
Btu/h-ft²	25.65		

Engineering Checks For Heating

Heating Mbh	-0.27	No People(max)	13.97
%OA	12	People per 1000 ft²	50
cfm/ft²	0.18	Volume (ft³)	3,077.0
cfm/Mbh	-813.02		
ft²/Mbh	-1,045.52		
Btu/h-ft²	-0.96		

ROOM_4003E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00				
Outside	DB / WB / HR	88.2 °F	/	74.1 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	48.6 %	/	62.8 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	65	0	65	5.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	42	0	42	3.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	108	0	108	-
People	61	85	117	263	22.0
Lights	119	191	0	310	25.9
Miscellaneous Loads	179	125	0	304	25.4
Internal Subtotal	360	401	117	877	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	76	0	76	6.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	360	584	117	1,060	100.0
RA Sensible (Lights)	137	0	0	137	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		75.0 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-92	0	-92	48.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-16	0	-16	8.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-108	0	-108	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-80	0	-80	42.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.1
Grand Total	0	-188	0	-188	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	47
Cooling ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	47
Heating ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	128
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	498
Exterior Floor	0
Internal Floor	128
Slab	0
Other Floor	128

Engineering Checks For Cooling

Cooling tons	0.09	No People(max)	0.58
%OA	12	People per 1000 ft²	5
cfm/ft²	0.40	Volume (ft³)	1,283.0
cfm/ton	529.30		
ft²/ton	1,320.87		
Btu/h-ft²	9.08		

Engineering Checks For Heating

Heating Mbh	-0.19	No People(max)	0.58
%OA	12	People per 1000 ft²	5
cfm/ft²	0.30	Volume (ft³)	1,283.0
cfm/Mbh	-249.36		
ft²/Mbh	-622.17		
Btu/h-ft²	-1.61		

ROOM_4004E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 22:00:00						
Outside	DB / WB / HR	83.5	°F	/	72.8	°F	/ 104.2	gr/lb
Room	DB / RH / HR	75.0	°F	/	48.7	%	/ 63.0	gr/lb
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-13	0	-13	-1.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	48	0	48	4.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	36	0	36	-
People	59	82	112	253	23.3
Lights	114	181	0	295	27.1
Miscellaneous Loads	172	116	0	288	26.5
Internal Subtotal	345	380	112	836	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	85	0	85	7.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	345	500	112	956	100.0
RA Sensible (Lights)	131	0	0	131	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F	/	0.0	°F	/ 5.5	gr/lb
Room	DB / RH / HR	70.0	°F	/	4.6	%	/ 5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-20	0	-20	15.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-23	0	-23	18.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-42	0	-42	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-83	0	-83	66.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-125	0	-125	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	42
Cooling ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	42
Heating ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	123
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	489
Exterior Floor	0
Internal Floor	123
Slab	0
Other Floor	123

Engineering Checks For Cooling

Cooling tons	0.08	No People(max)	0.56
%OA	12	People per 1000 ft²	5
cfm/ft²	0.37	Volume (ft³)	1,229.7
cfm/ton	525.20		
ft²/ton	1,403.91		
Btu/h-ft²	8.55		

Engineering Checks For Heating

Heating Mbh	-0.13	No People(max)	0.56
%OA	12	People per 1000 ft²	5
cfm/ft²	0.21	Volume (ft³)	1,229.7
cfm/Mbh	-334.52		
ft²/Mbh	-894.03		
Btu/h-ft²	-1.12		

ROOM_4005E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00					
Outside	DB / WB / HR	88.2	°F /	74.1	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	48.6	% /	62.8	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	68	0	68	5.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	42	0	42	3.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	110	0	110	-
People	61	85	116	263	21.9
Lights	119	191	0	310	25.9
Miscellaneous Loads	179	125	0	304	25.4
Internal Subtotal	359	401	116	876	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	76	0	76	6.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	359	586	116	1,061	100.0
RA Sensible (Lights)	137	0	0	137	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-91	0	-91	48.8
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-16	0	-16	8.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-107	0	-107	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-79	0	-79	42.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.1
Grand Total	0	-187	0	-187	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	47
Cooling ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	47
Heating ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	127
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	498
Exterior Floor	0
Internal Floor	127
Slab	0
Other Floor	127

Engineering Checks For Cooling

Cooling tons	0.09	No People(max)	0.58
%OA	12	People per 1000 ft²	5
cfm/ft²	0.40	Volume (ft³)	1,280.5
cfm/ton	529.48		
ft²/ton	1,315.94		
Btu/h-ft²	9.12		

Engineering Checks For Heating

Heating Mbh	-0.19	No People(max)	0.58
%OA	12	People per 1000 ft²	5
cfm/ft²	0.30	Volume (ft³)	1,280.5
cfm/Mbh	-250.44		
ft²/Mbh	-622.32		
Btu/h-ft²	-1.61		

ROOM_4006E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 22:00:00					
Outside	DB / WB / HR	83.5	°F /	72.8	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	48.7	% /	63.0	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-12	0	-12	-1.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	48	0	48	4.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	36	0	36	-
People	59	82	112	252	23.2
Lights	114	181	0	295	27.1
Miscellaneous Loads	171	116	0	288	26.5
Internal Subtotal	344	379	112	835	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	85	0	85	7.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	344	499	112	955	100.0
RA Sensible (Lights)	131	0	0	131	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-15	0	-15	12.4
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-23	0	-23	19.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-38	0	-38	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-83	0	-83	68.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.1
Grand Total	0	-121	0	-121	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	42
Cooling ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	42
Heating ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	122
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	488
Exterior Floor	0
Internal Floor	122
Slab	0
Other Floor	122

Engineering Checks For Cooling

Cooling tons	0.08	No People(max)	0.56
%OA	12	People per 1000 ft²	5
cfm/ft²	0.37	Volume (ft³)	1,227.2
cfm/ton	525.23		
ft²/ton	1,403.14		
Btu/h-ft²	8.55		

Engineering Checks For Heating

Heating Mbh	-0.12	No People(max)	0.56
%OA	12	People per 1000 ft²	5
cfm/ft²	0.20	Volume (ft³)	1,227.2
cfm/Mbh	-345.51		
ft²/Mbh	-922.83		
Btu/h-ft²	-1.08		

ROOM_4007E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00				
Outside	DB / WB / HR	88.2 °F	/	74.1 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	48.6 %	/	62.8 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	65	0	65	5.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	42	0	42	3.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	108	0	108	-
People	61	85	116	263	22.0
Lights	119	191	0	310	25.9
Miscellaneous Loads	179	125	0	304	25.4
Internal Subtotal	359	401	116	876	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	76	0	76	6.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	359	583	116	1,059	100.0
RA Sensible (Lights)	137	0	0	137	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		75.0 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-92	0	-92	48.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-16	0	-16	8.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-108	0	-108	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-79	0	-79	42.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.1
Grand Total	0	-187	0	-187	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	47
Cooling ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	47
Heating ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.23
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	128
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	498
Exterior Floor	0
Internal Floor	128
Slab	0
Other Floor	128

Engineering Checks For Cooling

Cooling tons	0.09	No People(max)	0.58
%OA	12	People per 1000 ft²	5
cfm/ft²	0.40	Volume (ft³)	1,281.6
cfm/ton	529.31		
ft²/ton	1,319.78		
Btu/h-ft²	9.09		

Engineering Checks For Heating

Heating Mbh	-0.19	No People(max)	0.58
%OA	12	People per 1000 ft²	5
cfm/ft²	0.30	Volume (ft³)	1,281.6
cfm/Mbh	-249.34		
ft²/Mbh	-621.59		
Btu/h-ft²	-1.61		

ROOM_4008E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 22:00:00					
Outside	DB / WB / HR	83.5	°F /	72.8	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	48.7	% /	63.0	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-13	0	-13	-1.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	48	0	48	4.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	36	0	36	-
People	59	82	112	253	23.3
Lights	114	181	0	295	27.1
Miscellaneous Loads	171	116	0	288	26.5
Internal Subtotal	344	379	112	835	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	85	0	85	7.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	344	499	112	955	100.0
RA Sensible (Lights)	131	0	0	131	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-20	0	-20	15.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-23	0	-23	18.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-42	0	-42	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-83	0	-83	66.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-125	0	-125	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	42
Cooling ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	42
Heating ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	123
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	489
Exterior Floor	0
Internal Floor	123
Slab	0
Other Floor	123

Engineering Checks For Cooling

Cooling tons	0.08	No People(max)	0.56
%OA	12	People per 1000 ft²	5
cfm/ft²	0.37	Volume (ft³)	1,228.2
cfm/ton	525.20		
ft²/ton	1,402.64		
Btu/h-ft²	8.56		

Engineering Checks For Heating

Heating Mbh	-0.12	No People(max)	0.56
%OA	12	People per 1000 ft²	5
cfm/ft²	0.21	Volume (ft³)	1,228.2
cfm/Mbh	-334.47		
ft²/Mbh	-893.10		
Btu/h-ft²	-1.12		

ROOM_4009E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00						
Outside	DB / WB / HR	67.4	°F	/	60.0	°F	/	65.4 gr/lb
Room	DB / RH / HR	75.0	°F	/	46.5	%	/	60.1 gr/lb
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	2,013	5,598	0	7,611	113.3
Door	0	0	0	0	0.0
Wall	0	134	0	134	2.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-492	0	-492	-7.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-722	0	-722	-10.7
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	2,013	4,519	0	6,532	-
People	94	112	178	384	5.7
Lights	182	254	0	436	6.5
Miscellaneous Loads	274	188	0	461	6.9
Internal Subtotal	550	554	178	1,282	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,191	0	-1,191	-17.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-117	0	-117	-1.7
Grand Total	2,562	3,765	178	6,506	100.0
RA Sensible (Lights)	209	0	0	209	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F	/	0.0	°F	/	5.5 gr/lb
Room	DB / RH / HR	70.0	°F	/	4.6	%	/	5.0 gr/lb
Supply Air Dry Bulb Temp		76.3	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,196	0	0	-2,196	102.6
Door	0	0	0	0	0.0
Wall	0	-198	0	-198	9.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	172	0	172	-8.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	142	0	142	-6.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,196	116	0	-2,080	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	24	0	24	-1.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-84	0	-84	3.9
Grand Total	-2,196	55	0	-2,141	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	314
Cooling ACH	9.61
Sec Fan cfm	0
Input Ventilation cfm	15
Calculated Ventilation cfm	36
Calculated Ventilation ACH	1.10
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	314
Heating ACH	9.61
Sec Fan cfm	0
Input Ventilation cfm	15
Calculated Ventilation cfm	36
Calculated Ventilation ACH	1.10
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	192
Window	81
Door	0
Wall	135
Below-Grade Wall	0
Other Wall	135
Partition	479
Exterior Floor	0
Internal Floor	192
Slab	0
Other Floor	192

Engineering Checks For Cooling

Cooling tons	0.54	No People(max)	0.89
%OA	12	People per 1000 ft²	5
cfm/ft²	1.76	Volume (ft³)	1,961.0
cfm/ton	578.43		
ft²/ton	328.82		
Btu/h-ft²	36.49		

Engineering Checks For Heating

Heating Mbh	-2.14	No People(max)	0.89
%OA	12	People per 1000 ft²	5
cfm/ft²	1.76	Volume (ft³)	1,961.0
cfm/Mbh	-146.51		
ft²/Mbh	-83.27		
Btu/h-ft²	-12.01		

ROOM_4011E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00					
Outside	DB / WB / HR	67.4	°F /	60.0	°F /	65.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	2,097	5,605	0	7,702	107.3
Door	0	0	0	0	0.0
Wall	0	142	0	142	2.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-155	0	-155	-2.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-616	0	-616	-8.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	2,097	4,977	0	7,074	-
People	98	111	186	395	5.5
Lights	191	251	0	442	6.2
Miscellaneous Loads	286	185	0	471	6.6
Internal Subtotal	575	547	186	1,308	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,301	0	-1,301	-18.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-120	0	-120	-1.7
Grand Total	2,672	4,103	186	6,961	100.0
RA Sensible (Lights)	219	0	0	219	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.2	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,282	0	0	-2,282	101.2
Door	0	0	0	0	0.0
Wall	0	-206	0	-206	9.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	137	0	137	-6.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	153	0	153	-6.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,282	84	0	-2,198	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	29	0	29	-1.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-87	0	-87	3.8
Grand Total	-2,282	26	0	-2,256	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	336
Cooling ACH	9.84
Sec Fan cfm	0
Input Ventilation cfm	16
Calculated Ventilation cfm	39
Calculated Ventilation ACH	1.14
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	336
Heating ACH	9.84
Sec Fan cfm	0
Input Ventilation cfm	16
Calculated Ventilation cfm	39
Calculated Ventilation ACH	1.14
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	200
Window	85
Door	0
Wall	141
Below-Grade Wall	0
Other Wall	141
Partition	485
Exterior Floor	0
Internal Floor	200
Slab	0
Other Floor	200

Engineering Checks For Cooling

Cooling tons	0.58	No People(max)	0.93
%OA	12	People per 1000 ft²	5
cfm/ft²	1.80	Volume (ft³)	2,049.7
cfm/ton	578.81		
ft²/ton	321.22		
Btu/h-ft²	37.36		

Engineering Checks For Heating

Heating Mbh	-2.26	No People(max)	0.93
%OA	12	People per 1000 ft²	5
cfm/ft²	1.80	Volume (ft³)	2,049.7
cfm/Mbh	-148.88		
ft²/Mbh	-82.61		
Btu/h-ft²	-12.11		

ROOM_4013E - 3P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00					
Outside	DB / WB / HR	67.4	°F /	60.0	°F /	65.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	2,483	6,366	0	8,849	107.0
Door	0	0	0	0	0.0
Wall	0	170	0	170	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-222	0	-222	-2.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-600	0	-600	-7.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	2,483	5,714	0	8,197	-
People	115	127	219	461	5.6
Lights	224	286	0	510	6.2
Miscellaneous Loads	337	211	0	548	6.6
Internal Subtotal	677	624	219	1,520	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,564	0	-1,564	-18.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-142	0	-142	-1.7
Grand Total	3,160	4,632	219	8,011	100.0
RA Sensible (Lights)	258	0	0	258	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.2	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,642	0	0	-2,642	102.6
Door	0	0	0	0	0.0
Wall	0	-241	0	-241	9.4
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	180	0	180	-7.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	186	0	186	-7.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,642	125	0	-2,517	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	39	0	39	-1.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-99	0	-99	3.8
Grand Total	-2,642	66	0	-2,576	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	386
Cooling ACH	9.59
Sec Fan cfm	0
Input Ventilation cfm	19
Calculated Ventilation cfm	45
Calculated Ventilation ACH	1.12
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	386
Heating ACH	9.59
Sec Fan cfm	0
Input Ventilation cfm	19
Calculated Ventilation cfm	45
Calculated Ventilation ACH	1.12
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	235
Window	99
Door	0
Wall	165
Below-Grade Wall	0
Other Wall	165
Partition	509
Exterior Floor	0
Internal Floor	235
Slab	0
Other Floor	235

Engineering Checks For Cooling

Cooling tons	0.67	No People(max)	1.10
%OA	12	People per 1000 ft²	5
cfm/ft²	1.76	Volume (ft³)	2,414.1
cfm/ton	578.44		
ft²/ton	328.79		
Btu/h-ft²	36.50		

Engineering Checks For Heating

Heating Mbh	-2.58	No People(max)	1.10
%OA	12	People per 1000 ft²	5
cfm/ft²	1.76	Volume (ft³)	2,414.1
cfm/Mbh	-149.91		
ft²/Mbh	-85.19		
Btu/h-ft²	-11.74		

ROOM_4014E - Storage

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 22:00:00						
Outside	DB / WB / HR	83.5	°F	/	72.8	°F	/ 104.2	gr/lb
Room	DB / RH / HR	75.0	°F	/	45.8	%	/ 59.2	gr/lb
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	120	0	120	4.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	257	0	257	8.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	377	0	377	-
People	0	0	0	0	0.0
Lights	285	365	0	650	22.4
Miscellaneous Loads	755	414	0	1,169	40.3
Internal Subtotal	1,040	779	0	1,819	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	374	0	374	12.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	1,040	1,529	0	2,570	100.0
RA Sensible (Lights)	328	0	0	328	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F	/	0.0	°F	/ 5.5	gr/lb
Room	DB / RH / HR	70.0	°F	/	4.6	%	/ 5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-2	0	-2	0.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-82	0	-82	19.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-84	0	-84	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-339	0	-339	80.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.1
Grand Total	0	-423	0	-423	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	127
Cooling ACH	1.41
Sec Fan cfm	0
Input Ventilation cfm	29
Calculated Ventilation cfm	15
Calculated Ventilation ACH	0.17
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	127
Heating ACH	1.41
Sec Fan cfm	0
Input Ventilation cfm	29
Calculated Ventilation cfm	15
Calculated Ventilation ACH	0.17
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	517
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	1,106
Exterior Floor	0
Internal Floor	517
Slab	0
Other Floor	517

Engineering Checks For Cooling

Cooling tons	0.21	No People(max)	0.00
%OA	12	People per 1000 ft²	0
cfm/ft²	0.26	Volume (ft³)	5,408.4
cfm/ton	594.60		
ft²/ton	2,296.34		
Btu/h-ft²	5.23		

Engineering Checks For Heating

Heating Mbh	-0.42	No People(max)	0.00
%OA	12	People per 1000 ft²	0
cfm/ft²	0.16	Volume (ft³)	5,408.4
cfm/Mbh	-300.93		
ft²/Mbh	-1,161.98		
Btu/h-ft²	-0.86		

ROOM_4015E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00					
Outside	DB / WB / HR	67.4	°F /	60.0	°F /	65.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.0	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,583	4,517	0	6,099	107.4
Door	0	0	0	0	0.0
Wall	0	107	0	107	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-72	0	-72	-1.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-597	0	-597	-10.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,583	3,955	0	5,538	-
People	75	88	142	305	5.4
Lights	145	200	0	345	6.1
Miscellaneous Loads	218	146	0	364	6.4
Internal Subtotal	438	435	142	1,014	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-949	0	-949	-16.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-90	0	-90	-1.6
Grand Total	2,020	3,350	142	5,513	100.0
RA Sensible (Lights)	167	0	0	167	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.3	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,796	0	0	-1,796	98.9
Door	0	0	0	0	0.0
Wall	0	-160	0	-160	8.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	86	0	86	-4.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	109	0	109	-6.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,796	36	0	-1,760	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	15	0	15	-0.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-70	0	-70	3.9
Grand Total	-1,796	-20	0	-1,815	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	266
Cooling ACH	10.22
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	31
Calculated Ventilation ACH	1.19
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	266
Heating ACH	10.22
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	31
Calculated Ventilation ACH	1.19
Infiltration cfm	0
Min Stop/RH (%)	100

Areas	ft²
Roof	0
Other Roof	0
Ceiling	155
Window	65
Door	0
Wall	109
Below-Grade Wall	0
Other Wall	109
Partition	453
Exterior Floor	0
Internal Floor	155
Slab	0
Other Floor	155

Engineering Checks For Cooling

Cooling tons	0.46	No People(max)	0.71
%OA	12	People per 1000 ft²	5
cfm/ft²	1.87	Volume (ft³)	1,562.0
cfm/ton	579.40		
ft²/ton	309.09		
Btu/h-ft²	38.82		

Engineering Checks For Heating

Heating Mbh	-1.82	No People(max)	0.71
%OA	12	People per 1000 ft²	5
cfm/ft²	1.87	Volume (ft³)	1,562.0
cfm/Mbh	-146.64		
ft²/Mbh	-78.21		
Btu/h-ft²	-12.79		

ROOM_4016E - Flex

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 17:00:00					
Outside	DB / WB / HR	92.2	°F /	75.2	°F /	104.3	gr/lb
Room	DB / RH / HR	75.0	°F /	50.1	% /	64.8	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	380	0	380	12.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	81	0	81	2.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	461	0	461	-
People	294	376	464	1,134	36.6
Lights	177	242	0	419	13.5
Miscellaneous Loads	460	287	0	748	24.1
Internal Subtotal	930	906	464	2,301	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	140	0	140	4.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-5	0	-5	-0.2
Grand Total	930	1,502	464	2,897	100.0
RA Sensible (Lights)	203	0	0	203	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-23	0	-23	8.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-53	0	-53	18.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-76	0	-76	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-211	0	-211	73.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-287	0	-287	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	121
Cooling ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	33
Calculated Ventilation cfm	14
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	121
Heating ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	33
Calculated Ventilation cfm	14
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	319
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	859
Exterior Floor	0
Internal Floor	319
Slab	0
Other Floor	319

Engineering Checks For Cooling

Cooling tons	0.24	No People(max)	3.00
%OA	12	People per 1000 ft²	10
cfm/ft²	0.40	Volume (ft³)	3,296.3
cfm/ton	499.48		
ft²/ton	1,241.33		
Btu/h-ft²	9.67		

Engineering Checks For Heating

Heating Mbh	-0.29	No People(max)	3.00
%OA	12	People per 1000 ft²	10
cfm/ft²	0.18	Volume (ft³)	3,296.3
cfm/Mbh	-420.79		
ft²/Mbh	-1,045.57		
Btu/h-ft²	-0.96		

ROOM_4017E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00					
Outside	DB / WB / HR	67.4	°F /	60.0	°F /	65.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.0	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,654	4,685	0	6,339	107.4
Door	0	0	0	0	0.0
Wall	0	112	0	112	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-78	0	-78	-1.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-609	0	-609	-10.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,654	4,109	0	5,763	-
People	78	92	148	318	5.4
Lights	152	208	0	360	6.1
Miscellaneous Loads	228	153	0	380	6.4
Internal Subtotal	457	453	148	1,058	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,000	0	-1,000	-16.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-94	0	-94	-1.6
Grand Total	2,111	3,468	148	5,727	100.0
RA Sensible (Lights)	174	0	0	174	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.3	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,864	0	0	-1,864	99.2
Door	0	0	0	0	0.0
Wall	0	-166	0	-166	8.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	91	0	91	-4.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	116	0	116	-6.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,864	41	0	-1,823	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	17	0	17	-0.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-72	0	-72	3.9
Grand Total	-1,864	-15	0	-1,879	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	277
Cooling ACH	10.19
Sec Fan cfm	0
Input Ventilation cfm	13
Calculated Ventilation cfm	32
Calculated Ventilation ACH	1.18
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	277
Heating ACH	10.19
Sec Fan cfm	0
Input Ventilation cfm	13
Calculated Ventilation cfm	32
Calculated Ventilation ACH	1.18
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	161
Window	68
Door	0
Wall	113
Below-Grade Wall	0
Other Wall	113
Partition	457
Exterior Floor	0
Internal Floor	161
Slab	0
Other Floor	161

Engineering Checks For Cooling

Cooling tons	0.48	No People(max)	0.74
%OA	12	People per 1000 ft²	5
cfm/ft²	1.87	Volume (ft³)	1,630.5
cfm/ton	579.33		
ft²/ton	310.60		
Btu/h-ft²	38.63		

Engineering Checks For Heating

Heating Mbh	-1.88	No People(max)	0.74
%OA	12	People per 1000 ft²	5
cfm/ft²	1.87	Volume (ft³)	1,630.5
cfm/Mbh	-147.16		
ft²/Mbh	-78.88		
Btu/h-ft²	-12.68		

ROOM_4018E - Pantry

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		9/21 17:00:00					
Outside	DB / WB / HR	84.6	°F /	71.1	°F /	92.4	gr/lb
Room	DB / RH / HR	74.9	°F /	60.0	% /	77.7	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	332	0	332	2.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-107	0	-107	-0.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	226	0	226	-
People	189	149	359	697	4.2
Lights	401	357	0	757	4.5
Miscellaneous Loads	2,300	5,804	5,980	14,085	84.5
Internal Subtotal	2,890	6,309	6,340	15,539	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	495	0	495	3.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-48	0	-48	-0.3
Grand Total	2,890	6,982	6,340	16,212	100.0
RA Sensible (Lights)	460	0	0	460	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-134	0	-134	32.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-47	0	-47	11.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-181	0	-181	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-237	0	-237	56.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-418	0	-418	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	491
Cooling ACH	7.45
Sec Fan cfm	0
Input Ventilation cfm	57
Calculated Ventilation cfm	57
Calculated Ventilation ACH	0.86
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	491
Heating ACH	7.45
Sec Fan cfm	0
Input Ventilation cfm	57
Calculated Ventilation cfm	57
Calculated Ventilation ACH	0.86
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	380
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	929
Exterior Floor	0
Internal Floor	380
Slab	0
Other Floor	380

Engineering Checks For Cooling

Cooling tons	1.35	No People(max)	1.80
%OA	12	People per 1000 ft²	5
cfm/ft²	1.37	Volume (ft³)	3,955.2
cfm/ton	363.27		
ft²/ton	266.21		
Btu/h-ft²	45.08		

Engineering Checks For Heating

Heating Mbh	-0.42	No People(max)	1.80
%OA	12	People per 1000 ft²	5
cfm/ft²	0.21	Volume (ft³)	3,955.2
cfm/Mbh	-1,173.90		
ft²/Mbh	-860.11		
Btu/h-ft²	-1.16		

ROOM_4018EA - Break / Pantry

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00					
Outside	DB / WB / HR	67.4	°F /	60.0	°F /	65.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	3,487	8,568	0	12,056	110.4
Door	0	0	0	0	0.0
Wall	0	237	0	237	2.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-594	0	-594	-5.4
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-690	0	-690	-6.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	3,487	7,522	0	11,009	-
People	160	174	305	640	5.9
Lights	276	347	0	622	5.7
Miscellaneous Loads	469	292	0	761	7.0
Internal Subtotal	905	813	305	2,023	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-2,231	0	-2,231	-20.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-200	0	-200	-1.8
Grand Total	4,392	5,904	305	10,601	100.0
RA Sensible (Lights)	316	0	0	316	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.1	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-3,573	0	0	-3,573	105.9
Door	0	0	0	0	0.0
Wall	0	-332	0	-332	9.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	326	0	326	-9.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	270	0	270	-8.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-3,573	264	0	-3,309	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	66	0	66	-2.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-131	0	-131	3.9
Grand Total	-3,573	199	0	-3,374	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	510
Cooling ACH	9.11
Sec Fan cfm	0
Input Ventilation cfm	26
Calculated Ventilation cfm	59
Calculated Ventilation ACH	1.05
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	510
Heating ACH	9.11
Sec Fan cfm	0
Input Ventilation cfm	26
Calculated Ventilation cfm	59
Calculated Ventilation ACH	1.05
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	323
Window	136
Door	0
Wall	227
Below-Grade Wall	0
Other Wall	227
Partition	571
Exterior Floor	0
Internal Floor	323
Slab	0
Other Floor	323

Engineering Checks For Cooling

Cooling tons	0.88	No People(max)	1.53
%OA	12	People per 1000 ft²	5
cfm/ft²	1.67	Volume (ft³)	3,357.7
cfm/ton	577.62		
ft²/ton	345.60		
Btu/h-ft²	34.72		

Engineering Checks For Heating

Heating Mbh	-3.37	No People(max)	1.53
%OA	12	People per 1000 ft²	5
cfm/ft²	1.67	Volume (ft³)	3,357.7
cfm/Mbh	-151.28		
ft²/Mbh	-90.50		
Btu/h-ft²	-11.05		

ROOM_4020E - Open Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		10/21 13:00:00					
Outside	DB / WB / HR	77.5	°F /	67.2	°F /	83.4	gr/lb
Room	DB / RH / HR	75.0	°F /	47.6	% /	61.5	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	8,394	13,946	0	22,341	64.5
Door	0	0	0	0	0.0
Wall	0	678	0	678	2.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	975	0	975	2.8
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	1,802	0	1,802	5.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	8,394	17,400	0	25,795	-
People	1,183	991	2,254	4,428	12.8
Lights	2,036	2,010	0	4,046	11.7
Miscellaneous Loads	3,462	1,732	0	5,193	15.0
Internal Subtotal	6,681	4,733	2,254	13,668	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-6,708	0	-6,708	-19.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-445	0	-445	-1.3
Grand Total	15,075	14,980	2,254	32,309	100.0
RA Sensible (Lights)	2,337	0	0	2,337	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.1	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-9,720	0	0	-9,720	98.3
Door	0	0	0	0	0.0
Wall	0	-807	0	-807	8.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	193	0	193	-1.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	1,103	0	1,103	-11.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-9,720	489	0	-9,231	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-236	0	-236	2.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-423	0	-423	4.3
Grand Total	-9,720	-171	0	-9,891	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	1,490
Cooling ACH	3.60
Sec Fan cfm	0
Input Ventilation cfm	192
Calculated Ventilation cfm	172
Calculated Ventilation ACH	0.42
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	1,490
Heating ACH	3.60
Sec Fan cfm	0
Input Ventilation cfm	192
Calculated Ventilation cfm	172
Calculated Ventilation ACH	0.42
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	2,304
Window	325
Door	0
Wall	542
Below-Grade Wall	0
Other Wall	542
Partition	1,650
Exterior Floor	0
Internal Floor	2,304
Slab	0
Other Floor	2,304

Engineering Checks For Cooling

Cooling tons	2.69	No People(max)	11.27
%OA	12	People per 1000 ft²	5
cfm/ft²	0.66	Volume (ft³)	24,800.8
cfm/ton	553.31		
ft²/ton	837.47		
Btu/h-ft²	14.33		

Engineering Checks For Heating

Heating Mbh	-9.89	No People(max)	11.27
%OA	12	People per 1000 ft²	5
cfm/ft²	0.66	Volume (ft³)	24,800.8
cfm/Mbh	-150.65		
ft²/Mbh	-227.97		
Btu/h-ft²	-4.39		

ROOM_4031E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		11/21 13:00:00					
Outside	DB / WB / HR	67.4	°F /	60.0	°F /	65.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,580	4,798	0	6,378	113.0
Door	0	0	0	0	0.0
Wall	0	103	0	103	1.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-288	0	-288	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-762	0	-762	-13.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,580	3,851	0	5,431	-
People	75	98	143	316	5.6
Lights	147	221	0	368	6.5
Miscellaneous Loads	220	163	0	383	6.8
Internal Subtotal	442	481	143	1,067	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-934	0	-934	-16.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-90	0	-90	-1.6
Grand Total	2,022	3,309	143	5,474	100.0
RA Sensible (Lights)	168	0	0	168	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		76.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,793	0	0	-1,793	95.2
Door	0	0	0	0	0.0
Wall	0	-159	0	-159	8.5
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	6	0	6	-0.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	115	0	115	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,793	-38	0	-1,831	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	18	0	18	-1.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-69	0	-69	3.7
Grand Total	-1,793	-90	0	-1,883	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	264
Cooling ACH	10.04
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	31
Calculated Ventilation ACH	1.18
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	264
Heating ACH	10.04
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	31
Calculated Ventilation ACH	1.18
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	156
Window	65
Door	0
Wall	108
Below-Grade Wall	0
Other Wall	108
Partition	457
Exterior Floor	0
Internal Floor	156
Slab	0
Other Floor	156

Engineering Checks For Cooling

Cooling tons	0.46	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	1.84	Volume (ft³)	1,577.5
cfm/ton	579.14		
ft²/ton	314.32		
Btu/h-ft²	38.18		

Engineering Checks For Heating

Heating Mbh	-1.88	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	1.84	Volume (ft³)	1,577.5
cfm/Mbh	-140.37		
ft²/Mbh	-76.17		
Btu/h-ft²	-13.13		

ROOM_4033E - Director's Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		10/21 13:00:00					
Outside	DB / WB / HR	77.5	°F /	67.2	°F /	83.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.7	% /	60.4	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	3,020	6,197	0	9,216	92.8
Door	0	0	0	0	0.0
Wall	0	555	0	555	5.6
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-64	0	-64	-0.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-645	0	-645	-6.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	3,020	6,042	0	9,062	-
People	184	182	351	717	7.2
Lights	359	408	0	767	7.7
Miscellaneous Loads	538	307	0	845	8.5
Internal Subtotal	1,081	898	351	2,329	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,718	0	-1,718	-17.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-159	0	-159	-1.6
Grand Total	4,101	5,064	351	9,515	100.0
RA Sensible (Lights)	412	0	0	412	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		81.2	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-5,316	0	0	-5,316	96.1
Door	0	0	0	0	0.0
Wall	0	-916	0	-916	16.6
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	197	0	197	-3.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	479	0	479	-8.7
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-5,316	-240	0	-5,556	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	220	0	220	-4.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-193	0	-193	3.5
Grand Total	-5,316	-213	0	-5,529	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	454
Cooling ACH	7.06
Sec Fan cfm	0
Input Ventilation cfm	30
Calculated Ventilation cfm	52
Calculated Ventilation ACH	0.81
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	454
Heating ACH	7.06
Sec Fan cfm	0
Input Ventilation cfm	30
Calculated Ventilation cfm	52
Calculated Ventilation ACH	0.81
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	369
Window	194
Door	0
Wall	451
Below-Grade Wall	0
Other Wall	451
Partition	365
Exterior Floor	0
Internal Floor	369
Slab	0
Other Floor	369

Engineering Checks For Cooling

Cooling tons	0.79	No People(max)	1.75
%OA	12	People per 1000 ft²	5
cfm/ft²	1.30	Volume (ft³)	3,857.1
cfm/ton	572.81		
ft²/ton	442.20		
Btu/h-ft²	27.14		

Engineering Checks For Heating

Heating Mbh	-5.53	No People(max)	1.75
%OA	12	People per 1000 ft²	5
cfm/ft²	1.30	Volume (ft³)	3,857.1
cfm/Mbh	-82.16		
ft²/Mbh	-63.42		
Btu/h-ft²	-15.77		

ROOM_4035E - Waiting Area

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00					
Outside	DB / WB / HR	85.6	°F /	73.4	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	47.1	% /	60.8	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,993	3,211	0	5,203	96.3
Door	0	0	0	0	0.0
Wall	0	111	0	111	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-63	0	-63	-1.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-133	0	-133	-2.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,993	3,126	0	5,119	-
People	148	149	235	532	9.9
Lights	89	101	0	190	3.5
Miscellaneous Loads	232	142	0	374	6.9
Internal Subtotal	470	392	235	1,097	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-822	0	-822	-15.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-95	0	-95	-1.8
Grand Total	2,463	2,602	235	5,299	100.0
RA Sensible (Lights)	102	0	0	102	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		77.5	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,908	0	0	-1,908	93.9
Door	0	0	0	0	0.0
Wall	0	-171	0	-171	8.4
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-34	0	-34	1.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	128	0	128	-6.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,908	-77	0	-1,985	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	26	0	26	-1.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-73	0	-73	3.6
Grand Total	-1,908	-124	0	-2,032	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	251
Cooling ACH	9.04
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	29
Calculated Ventilation ACH	1.04
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	251
Heating ACH	9.04
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	29
Calculated Ventilation ACH	1.04
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	164
Window	70
Door	0
Wall	117
Below-Grade Wall	0
Other Wall	117
Partition	457
Exterior Floor	0
Internal Floor	164
Slab	0
Other Floor	164

Engineering Checks For Cooling

Cooling tons	0.44	No People(max)	1.51
%OA	12	People per 1000 ft²	10
cfm/ft²	1.66	Volume (ft³)	1,665.4
cfm/ton	568.38		
ft²/ton	342.76		
Btu/h-ft²	35.01		

Engineering Checks For Heating

Heating Mbh	-2.03	No People(max)	1.51
%OA	12	People per 1000 ft²	10
cfm/ft²	1.66	Volume (ft³)	1,665.4
cfm/Mbh	-123.56		
ft²/Mbh	-74.50		
Btu/h-ft²	-13.42		

ROOM_4037E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00					
Outside	DB / WB / HR	85.6	°F /	73.4	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	46.6	% /	60.3	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	2,056	3,270	0	5,326	95.5
Door	0	0	0	0	0.0
Wall	0	115	0	115	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-9	0	-9	-0.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-117	0	-117	-2.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	2,056	3,259	0	5,315	-
People	82	75	157	315	5.6
Lights	161	179	0	340	6.1
Miscellaneous Loads	241	145	0	386	6.9
Internal Subtotal	485	399	157	1,041	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-869	0	-869	-15.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-95	0	-95	-1.7
Grand Total	2,541	2,694	157	5,392	100.0
RA Sensible (Lights)	185	0	0	185	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		77.2	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,968	0	0	-1,968	96.9
Door	0	0	0	0	0.0
Wall	0	-176	0	-176	8.7
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	35	0	35	-1.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	129	0	129	-6.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,968	-12	0	-1,980	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	24	0	24	-1.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-75	0	-75	3.7
Grand Total	-1,968	-64	0	-2,032	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	259
Cooling ACH	8.99
Sec Fan cfm	0
Input Ventilation cfm	13
Calculated Ventilation cfm	30
Calculated Ventilation ACH	1.04
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	259
Heating ACH	8.99
Sec Fan cfm	0
Input Ventilation cfm	13
Calculated Ventilation cfm	30
Calculated Ventilation ACH	1.04
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	170
Window	72
Door	0
Wall	120
Below-Grade Wall	0
Other Wall	120
Partition	463
Exterior Floor	0
Internal Floor	170
Slab	0
Other Floor	170

Engineering Checks For Cooling

Cooling tons	0.45	No People(max)	0.79
%OA	12	People per 1000 ft²	5
cfm/ft²	1.65	Volume (ft³)	1,729.0
cfm/ton	577.34		
ft²/ton	349.80		
Btu/h-ft²	34.31		

Engineering Checks For Heating

Heating Mbh	-2.03	No People(max)	0.79
%OA	12	People per 1000 ft²	5
cfm/ft²	1.65	Volume (ft³)	1,729.0
cfm/Mbh	-127.70		
ft²/Mbh	-77.36		
Btu/h-ft²	-12.93		

ROOM_4039E - 3P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00					
Outside	DB / WB / HR	85.6	°F /	73.4	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	46.7	% /	60.3	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	2,889	4,185	0	7,074	95.8
Door	0	0	0	0	0.0
Wall	0	164	0	164	2.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-114	0	-114	-1.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	1	0	1	0.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	2,889	4,236	0	7,125	-
People	115	97	219	432	5.8
Lights	224	230	0	454	6.1
Miscellaneous Loads	337	188	0	525	7.1
Internal Subtotal	677	515	219	1,411	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,271	0	-1,271	-17.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-136	0	-136	-1.8
Grand Total	3,566	3,343	219	7,128	100.0
RA Sensible (Lights)	258	0	0	258	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		77.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,635	0	0	-2,635	101.1
Door	0	0	0	0	0.0
Wall	0	-241	0	-241	9.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	134	0	134	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	190	0	190	-7.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,635	83	0	-2,552	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	43	0	43	-1.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-98	0	-98	3.8
Grand Total	-2,635	27	0	-2,608	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	342
Cooling ACH	8.50
Sec Fan cfm	0
Input Ventilation cfm	19
Calculated Ventilation cfm	40
Calculated Ventilation ACH	0.99
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	342
Heating ACH	8.50
Sec Fan cfm	0
Input Ventilation cfm	19
Calculated Ventilation cfm	40
Calculated Ventilation ACH	0.99
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	235
Window	99
Door	0
Wall	165
Below-Grade Wall	0
Other Wall	165
Partition	509
Exterior Floor	0
Internal Floor	235
Slab	0
Other Floor	235

Engineering Checks For Cooling

Cooling tons	0.59	No People(max)	1.10
%OA	12	People per 1000 ft²	5
cfm/ft²	1.56	Volume (ft³)	2,414.1
cfm/ton	576.37		
ft²/ton	369.50		
Btu/h-ft²	32.48		

Engineering Checks For Heating

Heating Mbh	-2.61	No People(max)	1.10
%OA	12	People per 1000 ft²	5
cfm/ft²	1.56	Volume (ft³)	2,414.1
cfm/Mbh	-131.32		
ft²/Mbh	-84.17		
Btu/h-ft²	-11.88		

ROOM_4040E - Conference

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00				
Outside	DB / WB / HR	88.2 °F	/	74.1 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	60.2 %	/	78.0 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-619	0	-619	-3.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-295	0	-295	-1.7
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-914	0	-914	-
People	3,435	3,961	6,542	13,938	80.2
Lights	742	1,009	0	1,751	10.1
Miscellaneous Loads	1,005	597	0	1,602	9.2
Internal Subtotal	5,181	5,567	6,542	17,290	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	194	0	194	1.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-49	0	-49	-0.3
Grand Total	5,181	4,797	6,542	16,520	100.0
RA Sensible (Lights)	851	0	0	851	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		75.0 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-233	0	-233	32.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-67	0	-67	9.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-300	0	-300	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-413	0	-413	57.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-713	0	-713	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	496
Cooling ACH	4.13
Sec Fan cfm	0
Input Ventilation cfm	203
Calculated Ventilation cfm	57
Calculated Ventilation ACH	0.48
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	496
Heating ACH	4.13
Sec Fan cfm	0
Input Ventilation cfm	203
Calculated Ventilation cfm	57
Calculated Ventilation ACH	0.48
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	682
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	1,207
Exterior Floor	0
Internal Floor	682
Slab	0
Other Floor	682

Engineering Checks For Cooling

Cooling tons	1.38	No People(max)	32.69
%OA	12	People per 1000 ft²	50
cfm/ft²	0.76	Volume (ft³)	7,198.5
cfm/ton	360.04		
ft²/ton	475.42		
Btu/h-ft²	25.24		

Engineering Checks For Heating

Heating Mbh	-0.71	No People(max)	32.69
%OA	12	People per 1000 ft²	50
cfm/ft²	0.20	Volume (ft³)	7,198.5
cfm/Mbh	-695.59		
ft²/Mbh	-918.32		
Btu/h-ft²	-1.09		

ROOM_4041E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00				
Outside	DB / WB / HR	85.6 °F	/	73.4 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	46.7 %	/	60.3 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,856	2,946	0	4,802	94.7
Door	0	0	0	0	0.0
Wall	0	105	0	105	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-6	0	-6	-0.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-91	0	-91	-1.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,856	2,955	0	4,810	-
People	75	68	144	287	5.7
Lights	147	161	0	308	6.1
Miscellaneous Loads	221	130	0	351	6.9
Internal Subtotal	443	359	144	946	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-770	0	-770	-15.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-86	0	-86	-1.7
Grand Total	2,299	2,458	144	4,901	100.0
RA Sensible (Lights)	169	0	0	169	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		77.2 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,809	0	0	-1,809	98.7
Door	0	0	0	0	0.0
Wall	0	-161	0	-161	8.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	81	0	81	-4.4
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	111	0	111	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,809	31	0	-1,777	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	15	0	15	-0.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-70	0	-70	3.8
Grand Total	-1,809	-24	0	-1,833	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	236
Cooling ACH	8.95
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	27
Calculated Ventilation ACH	1.02
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	236
Heating ACH	8.95
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	27
Calculated Ventilation ACH	1.02
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	156
Window	66
Door	0
Wall	109
Below-Grade Wall	0
Other Wall	109
Partition	455
Exterior Floor	0
Internal Floor	156
Slab	0
Other Floor	156

Engineering Checks For Cooling

Cooling tons	0.41	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	1.64	Volume (ft³)	1,581.7
cfm/ton	577.22		
ft²/ton	352.17		
Btu/h-ft²	34.07		

Engineering Checks For Heating

Heating Mbh	-1.83	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	1.64	Volume (ft³)	1,581.7
cfm/Mbh	-128.63		
ft²/Mbh	-78.47		
Btu/h-ft²	-12.74		

ROOM_4043E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00					
Outside	DB / WB / HR	85.6	°F /	73.4	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	46.7	% /	60.3	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,857	2,923	0	4,780	94.8
Door	0	0	0	0	0.0
Wall	0	106	0	106	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-34	0	-34	-0.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-76	0	-76	-1.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,857	2,918	0	4,775	-
People	76	67	144	287	5.7
Lights	148	160	0	308	6.1
Miscellaneous Loads	222	129	0	351	7.0
Internal Subtotal	445	357	144	946	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-765	0	-765	-15.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-86	0	-86	-1.7
Grand Total	2,302	2,423	144	4,870	100.0
RA Sensible (Lights)	170	0	0	170	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		77.2	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,811	0	0	-1,811	99.3
Door	0	0	0	0	0.0
Wall	0	-161	0	-161	8.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	94	0	94	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	110	0	110	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,811	43	0	-1,768	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	14	0	14	-0.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-71	0	-71	3.9
Grand Total	-1,811	-13	0	-1,825	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	234
Cooling ACH	8.83
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	27
Calculated Ventilation ACH	1.02
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	234
Heating ACH	8.83
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	27
Calculated Ventilation ACH	1.02
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	157
Window	66
Door	0
Wall	109
Below-Grade Wall	0
Other Wall	109
Partition	457
Exterior Floor	0
Internal Floor	157
Slab	0
Other Floor	157

Engineering Checks For Cooling

Cooling tons	0.41	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	1.62	Volume (ft³)	1,589.2
cfm/ton	577.04		
ft²/ton	355.98		
Btu/h-ft²	33.71		

Engineering Checks For Heating

Heating Mbh	-1.82	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	1.62	Volume (ft³)	1,589.2
cfm/Mbh	-128.37		
ft²/Mbh	-79.18		
Btu/h-ft²	-12.63		

ROOM_4044E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00				
Outside	DB / WB / HR	88.2 °F	/	74.1 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	48.5 %	/	62.7 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	149	0	149	9.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	51	0	51	3.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	200	0	200	-
People	81	107	154	343	21.4
Lights	158	241	0	399	24.8
Miscellaneous Loads	237	158	0	395	24.6
Internal Subtotal	476	506	154	1,136	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	89	0	89	5.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	476	794	154	1,424	100.0
RA Sensible (Lights)	181	0	0	181	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		75.0 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-29	0	-29	17.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-29	0	-29	17.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-58	0	-58	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-112	0	-112	65.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-170	0	-170	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	63
Cooling ACH	2.23
Sec Fan cfm	0
Input Ventilation cfm	13
Calculated Ventilation cfm	7
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	63
Heating ACH	2.23
Sec Fan cfm	0
Input Ventilation cfm	13
Calculated Ventilation cfm	7
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	168
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	594
Exterior Floor	0
Internal Floor	168
Slab	0
Other Floor	168

Engineering Checks For Cooling

Cooling tons	0.12	No People(max)	0.77
%OA	12	People per 1000 ft²	5
cfm/ft²	0.41	Volume (ft³)	1,698.3
cfm/ton	530.25		
ft²/ton	1,300.92		
Btu/h-ft²	9.22		

Engineering Checks For Heating

Heating Mbh	-0.17	No People(max)	0.77
%OA	12	People per 1000 ft²	5
cfm/ft²	0.20	Volume (ft³)	1,698.3
cfm/Mbh	-370.47		
ft²/Mbh	-908.74		
Btu/h-ft²	-1.10		

ROOM_4045E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00				
Outside	DB / WB / HR	85.6 °F	/	73.4 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	46.7 %	/	60.3 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,752	2,796	0	4,548	94.6
Door	0	0	0	0	0.0
Wall	0	100	0	100	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-21	0	-21	-0.4
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-85	0	-85	-1.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,752	2,790	0	4,542	-
People	72	64	137	274	5.7
Lights	140	153	0	294	6.1
Miscellaneous Loads	211	124	0	335	7.0
Internal Subtotal	423	342	137	902	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-716	0	-716	-14.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-81	0	-81	-1.7
Grand Total	2,175	2,334	137	4,646	100.0
RA Sensible (Lights)	161	0	0	161	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		77.2 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,725	0	0	-1,725	98.5
Door	0	0	0	0	0.0
Wall	0	-153	0	-153	8.7
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	78	0	78	-4.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	103	0	103	-5.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,725	29	0	-1,697	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	12	0	12	-0.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-68	0	-68	3.9
Grand Total	-1,725	-27	0	-1,752	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	223
Cooling ACH	8.87
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	26
Calculated Ventilation ACH	1.03
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	223
Heating ACH	8.87
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	26
Calculated Ventilation ACH	1.03
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	150
Window	62
Door	0
Wall	104
Below-Grade Wall	0
Other Wall	104
Partition	452
Exterior Floor	0
Internal Floor	150
Slab	0
Other Floor	150

Engineering Checks For Cooling

Cooling tons	0.39	No People(max)	0.69
%OA	12	People per 1000 ft²	5
cfm/ft²	1.63	Volume (ft³)	1,508.3
cfm/ton	577.12		
ft²/ton	354.26		
Btu/h-ft²	33.87		

Engineering Checks For Heating

Heating Mbh	-1.75	No People(max)	0.69
%OA	12	People per 1000 ft²	5
cfm/ft²	1.63	Volume (ft³)	1,508.3
cfm/Mbh	-127.52		
ft²/Mbh	-78.26		
Btu/h-ft²	-12.78		

ROOM_4046E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 21:00:00						
Outside	DB / WB / HR	84.9	°F /	73.2	°F /	104.2	gr/lb	
Room	DB / RH / HR	75.0	°F /	48.8	% /	63.0	gr/lb	
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	8	0	8	0.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	58	0	58	4.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	66	0	66	-
People	73	97	138	308	23.0
Lights	142	213	0	355	26.4
Miscellaneous Loads	213	137	0	350	26.0
Internal Subtotal	427	447	138	1,013	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	103	0	103	7.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	427	615	138	1,180	100.0
RA Sensible (Lights)	163	0	0	163	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb	
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb	
Supply Air Dry Bulb Temp		75.0	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-28	0	-28	18.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-26	0	-26	16.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-55	0	-55	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-100	0	-100	64.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-155	0	-155	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	52
Cooling ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	6
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	52
Heating ACH	2.05
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	6
Calculated Ventilation ACH	0.24
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	151
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	549
Exterior Floor	0
Internal Floor	151
Slab	0
Other Floor	151

Engineering Checks For Cooling

Cooling tons	0.10	No People(max)	0.69
%OA	12	People per 1000 ft²	5
cfm/ft²	0.37	Volume (ft³)	1,523.5
cfm/ton	524.96		
ft²/ton	1,408.60		
Btu/h-ft²	8.52		

Engineering Checks For Heating

Heating Mbh	-0.16	No People(max)	0.69
%OA	12	People per 1000 ft²	5
cfm/ft²	0.21	Volume (ft³)	1,523.5
cfm/Mbh	-333.05		
ft²/Mbh	-893.49		
Btu/h-ft²	-1.12		

ROOM_4047E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00				
Outside	DB / WB / HR	85.6 °F	/	73.4 °F	/	104.2 gr/lb
Room	DB / RH / HR	75.0 °F	/	46.6 %	/	60.3 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,700	2,762	0	4,462	93.6
Door	0	0	0	0	0.0
Wall	0	96	0	96	2.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	47	0	47	1.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-104	0	-104	-2.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,700	2,801	0	4,501	-
People	70	64	134	268	5.6
Lights	137	152	0	289	6.1
Miscellaneous Loads	206	123	0	329	6.9
Internal Subtotal	413	340	134	887	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-701	0	-701	-14.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-78	0	-78	-1.6
Grand Total	2,113	2,361	134	4,609	100.0
RA Sensible (Lights)	157	0	0	157	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		77.5 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,682	0	0	-1,682	93.6
Door	0	0	0	0	0.0
Wall	0	-148	0	-148	8.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-23	0	-23	1.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	106	0	106	-5.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,682	-65	0	-1,747	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	16	0	16	-0.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-66	0	-66	3.7
Grand Total	-1,682	-115	0	-1,797	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	222
Cooling ACH	9.04
Sec Fan cfm	0
Input Ventilation cfm	11
Calculated Ventilation cfm	26
Calculated Ventilation ACH	1.06
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	222
Heating ACH	9.04
Sec Fan cfm	0
Input Ventilation cfm	11
Calculated Ventilation cfm	26
Calculated Ventilation ACH	1.06
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	146
Window	61
Door	0
Wall	101
Below-Grade Wall	0
Other Wall	101
Partition	451
Exterior Floor	0
Internal Floor	146
Slab	0
Other Floor	146

Engineering Checks For Cooling

Cooling tons	0.38	No People(max)	0.67
%OA	12	People per 1000 ft²	5
cfm/ft²	1.66	Volume (ft³)	1,473.7
cfm/ton	577.39		
ft²/ton	348.97		
Btu/h-ft²	34.39		

Engineering Checks For Heating

Heating Mbh	-1.80	No People(max)	0.67
%OA	12	People per 1000 ft²	5
cfm/ft²	1.66	Volume (ft³)	1,473.7
cfm/Mbh	-123.42		
ft²/Mbh	-74.58		
Btu/h-ft²	-13.41		

ROOM_4048E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 21:00:00						
Outside	DB / WB / HR	84.9	°F	/	73.2	°F	/ 104.2	gr/lb
Room	DB / RH / HR	75.0	°F	/	48.7	%	/ 63.0	gr/lb
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	7	0	7	0.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	52	0	52	4.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	59	0	59	-
People	64	87	123	274	22.9
Lights	126	192	0	317	26.5
Miscellaneous Loads	188	123	0	312	26.0
Internal Subtotal	378	402	123	903	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	92	0	92	7.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	378	552	123	1,053	100.0
RA Sensible (Lights)	144	0	0	144	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F	/	0.0	°F	/ 5.5	gr/lb
Room	DB / RH / HR	70.0	°F	/	4.6	%	/ 5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-29	0	-29	20.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-23	0	-23	16.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-52	0	-52	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-89	0	-89	63.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-142	0	-142	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	46
Cooling ACH	2.04
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.22
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	46
Heating ACH	2.04
Sec Fan cfm	0
Input Ventilation cfm	10
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.22
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	134
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	511
Exterior Floor	0
Internal Floor	134
Slab	0
Other Floor	134

Engineering Checks For Cooling

Cooling tons	0.09	No People(max)	0.61
%OA	12	People per 1000 ft²	5
cfm/ft²	0.38	Volume (ft³)	1,350.4
cfm/ton	525.43		
ft²/ton	1,398.32		
Btu/h-ft²	8.58		

Engineering Checks For Heating

Heating Mbh	-0.14	No People(max)	0.61
%OA	12	People per 1000 ft²	5
cfm/ft²	0.21	Volume (ft³)	1,350.4
cfm/Mbh	-325.86		
ft²/Mbh	-867.06		
Btu/h-ft²	-1.15		

ROOM_4049E - 3P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 09:00:00					
Outside	DB / WB / HR	85.6	°F /	73.4	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	46.7	% /	60.3	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	3,637	4,603	0	8,240	95.5
Door	0	0	0	0	0.0
Wall	0	239	0	239	2.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-218	0	-218	-2.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	72	0	72	0.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	3,637	4,696	0	8,333	-
People	135	106	257	497	5.8
Lights	263	247	0	509	5.9
Miscellaneous Loads	394	207	0	601	7.0
Internal Subtotal	792	559	257	1,608	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-1,455	0	-1,455	-16.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-162	0	-162	-1.9
Grand Total	4,429	3,638	257	8,324	100.0
RA Sensible (Lights)	302	0	0	302	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		81.1	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-5,043	0	0	-5,043	105.0
Door	0	0	0	0	0.0
Wall	0	-439	0	-439	9.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	305	0	305	-6.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	375	0	375	-7.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-5,043	242	0	-4,801	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	180	0	180	-3.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-180	0	-180	3.7
Grand Total	-5,043	241	0	-4,801	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	400
Cooling ACH	8.49
Sec Fan cfm	0
Input Ventilation cfm	22
Calculated Ventilation cfm	46
Calculated Ventilation ACH	0.98
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	400
Heating ACH	8.49
Sec Fan cfm	0
Input Ventilation cfm	22
Calculated Ventilation cfm	46
Calculated Ventilation ACH	0.98
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	273
Window	186
Door	0
Wall	310
Below-Grade Wall	0
Other Wall	310
Partition	409
Exterior Floor	0
Internal Floor	273
Slab	0
Other Floor	273

Engineering Checks For Cooling

Cooling tons	0.69	No People(max)	1.28
%OA	12	People per 1000 ft²	5
cfm/ft²	1.56	Volume (ft³)	2,825.2
cfm/ton	576.33		
ft²/ton	370.28		
Btu/h-ft²	32.41		

Engineering Checks For Heating

Heating Mbh	-4.80	No People(max)	1.28
%OA	12	People per 1000 ft²	5
cfm/ft²	1.56	Volume (ft³)	2,825.2
cfm/Mbh	-83.28		
ft²/Mbh	-53.50		
Btu/h-ft²	-18.69		

ROOM_4050E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00					
Outside	DB / WB / HR	88.2	°F /	74.1	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	48.6	% /	62.8	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	105	0	105	7.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	45	0	45	3.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	150	0	150	-
People	68	90	129	287	21.6
Lights	132	202	0	334	25.1
Miscellaneous Loads	198	133	0	330	24.8
Internal Subtotal	397	425	129	951	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	79	0	79	5.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	397	653	129	1,178	100.0
RA Sensible (Lights)	151	0	0	151	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-26	0	-26	17.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-25	0	-25	17.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-51	0	-51	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-94	0	-94	64.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-144	0	-144	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	52
Cooling ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	11
Calculated Ventilation cfm	6
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	52
Heating ACH	2.20
Sec Fan cfm	0
Input Ventilation cfm	11
Calculated Ventilation cfm	6
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	140
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	522
Exterior Floor	0
Internal Floor	140
Slab	0
Other Floor	140

Engineering Checks For Cooling

Cooling tons	0.10	No People(max)	0.64
%OA	12	People per 1000 ft²	5
cfm/ft²	0.40	Volume (ft³)	1,416.1
cfm/ton	529.77		
ft²/ton	1,310.99		
Btu/h-ft²	9.15		

Engineering Checks For Heating

Heating Mbh	-0.14	No People(max)	0.64
%OA	12	People per 1000 ft²	5
cfm/ft²	0.21	Volume (ft³)	1,416.1
cfm/Mbh	-360.74		
ft²/Mbh	-892.52		
Btu/h-ft²	-1.12		

ROOM_4051E - 3P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 15:00:00					
Outside	DB / WB / HR	94.5	°F /	75.8	°F /	104.3	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,424	819	0	2,243	60.5
Door	0	0	0	0	0.0
Wall	0	79	0	79	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	14	0	14	0.4
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-120	0	-120	-3.2
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,424	792	0	2,216	-
People	109	122	208	440	11.8
Lights	213	272	0	485	13.1
Miscellaneous Loads	320	198	0	518	14.0
Internal Subtotal	643	592	208	1,443	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-140	0	-140	-3.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-54	0	-54	-1.5
Grand Total	2,067	1,190	208	3,466	100.0
RA Sensible (Lights)	245	0	0	245	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.2	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,645	0	0	-2,645	99.4
Door	0	0	0	0	0.0
Wall	0	-226	0	-226	8.5
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	77	0	77	-2.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	190	0	190	-7.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,645	41	0	-2,604	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	48	0	48	-1.8
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-104	0	-104	3.9
Grand Total	-2,645	-15	0	-2,660	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	161
Cooling ACH	4.21
Sec Fan cfm	0
Input Ventilation cfm	18
Calculated Ventilation cfm	19
Calculated Ventilation ACH	0.50
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	161
Heating ACH	4.21
Sec Fan cfm	0
Input Ventilation cfm	18
Calculated Ventilation cfm	19
Calculated Ventilation ACH	0.50
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	223
Window	93
Door	0
Wall	155
Below-Grade Wall	0
Other Wall	155
Partition	503
Exterior Floor	0
Internal Floor	223
Slab	0
Other Floor	223

Engineering Checks For Cooling

Cooling tons	0.29	No People(max)	1.04
%OA	12	People per 1000 ft²	5
cfm/ft²	0.77	Volume (ft³)	2,293.7
cfm/ton	558.95		
ft²/ton	721.99		
Btu/h-ft²	16.62		

Engineering Checks For Heating

Heating Mbh	-2.66	No People(max)	1.04
%OA	12	People per 1000 ft²	5
cfm/ft²	0.77	Volume (ft³)	2,293.7
cfm/Mbh	-60.70		
ft²/Mbh	-78.39		
Btu/h-ft²	-12.76		

ROOM_4053E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 15:00:00					
Outside	DB / WB / HR	94.5	°F /	75.8	°F /	104.3	gr/lb
Room	DB / RH / HR	75.0	°F /	47.2	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	906	594	0	1,500	60.5
Door	0	0	0	0	0.0
Wall	0	52	0	52	2.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-24	0	-24	-1.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-70	0	-70	-2.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	906	552	0	1,457	-
People	72	86	137	296	11.9
Lights	140	193	0	333	13.4
Miscellaneous Loads	211	140	0	351	14.1
Internal Subtotal	424	418	137	979	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-85	0	-85	-3.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-33	0	-33	-1.3
Grand Total	1,329	852	137	2,318	100.0
RA Sensible (Lights)	161	0	0	161	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.8	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,828	0	0	-1,828	98.6
Door	0	0	0	0	0.0
Wall	0	-152	0	-152	8.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	75	0	75	-4.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	110	0	110	-5.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,828	32	0	-1,796	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	17	0	17	-0.9
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-75	0	-75	4.1
Grand Total	-1,828	-25	0	-1,854	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	108
Cooling ACH	4.29
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	12
Calculated Ventilation ACH	0.48
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	108
Heating ACH	4.29
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	12
Calculated Ventilation ACH	0.48
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	150
Window	63
Door	0
Wall	104
Below-Grade Wall	0
Other Wall	104
Partition	452
Exterior Floor	0
Internal Floor	150
Slab	0
Other Floor	150

Engineering Checks For Cooling

Cooling tons	0.19	No People(max)	0.69
%OA	12	People per 1000 ft²	5
cfm/ft²	0.79	Volume (ft³)	1,511.1
cfm/ton	559.47		
ft²/ton	711.03		
Btu/h-ft²	16.88		

Engineering Checks For Heating

Heating Mbh	-1.85	No People(max)	0.69
%OA	12	People per 1000 ft²	5
cfm/ft²	0.79	Volume (ft³)	1,511.1
cfm/Mbh	-58.32		
ft²/Mbh	-74.11		
Btu/h-ft²	-13.49		

ROOM_4057E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00				
Outside	DB / WB / HR	84.2 °F	/	72.1 °F	/	98.7 gr/lb
Room	DB / RH / HR	75.0 °F	/	47.3 %	/	61.1 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	793	746	0	1,540	60.2
Door	0	0	0	0	0.0
Wall	0	48	0	48	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-141	0	-141	-5.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-14	0	-14	-0.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	793	640	0	1,433	-
People	75	98	144	317	12.4
Lights	147	215	0	362	14.2
Miscellaneous Loads	220	143	0	364	14.2
Internal Subtotal	443	456	144	1,042	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-56	0	-56	-2.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-30	0	-30	-1.2
Grand Total	1,236	1,009	144	2,389	100.0
RA Sensible (Lights)	169	0	0	169	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		85.8 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,900	0	0	-1,900	99.7
Door	0	0	0	0	0.0
Wall	0	-159	0	-159	8.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	97	0	97	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	115	0	115	-6.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,900	53	0	-1,847	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	19	0	19	-1.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-78	0	-78	4.1
Grand Total	-1,900	-6	0	-1,906	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	111
Cooling ACH	4.22
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	111
Heating ACH	4.22
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	156
Window	65
Door	0
Wall	109
Below-Grade Wall	0
Other Wall	109
Partition	456
Exterior Floor	0
Internal Floor	156
Slab	0
Other Floor	156

Engineering Checks For Cooling

Cooling tons	0.20	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	0.78	Volume (ft³)	1,579.3
cfm/ton	558.97		
ft²/ton	721.32		
Btu/h-ft²	16.64		

Engineering Checks For Heating

Heating Mbh	-1.91	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	0.78	Volume (ft³)	1,579.3
cfm/Mbh	-58.38		
ft²/Mbh	-75.33		
Btu/h-ft²	-13.27		

ROOM_4059E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00					
Outside	DB / WB / HR	84.2	°F /	72.1	°F /	98.7	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	805	754	0	1,559	60.3
Door	0	0	0	0	0.0
Wall	0	49	0	49	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-143	0	-143	-5.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-15	0	-15	-0.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	805	645	0	1,450	-
People	76	99	145	321	12.4
Lights	149	218	0	366	14.2
Miscellaneous Loads	223	145	0	368	14.2
Internal Subtotal	449	461	145	1,055	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-57	0	-57	-2.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-31	0	-31	-1.2
Grand Total	1,254	1,018	145	2,417	100.0
RA Sensible (Lights)	171	0	0	171	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.8	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,922	0	0	-1,922	99.8
Door	0	0	0	0	0.0
Wall	0	-161	0	-161	8.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	99	0	99	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	117	0	117	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,922	56	0	-1,867	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	19	0	19	-1.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-79	0	-79	4.1
Grand Total	-1,922	-4	0	-1,926	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	113
Cooling ACH	4.24
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	113
Heating ACH	4.24
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	158
Window	66
Door	0
Wall	110
Below-Grade Wall	0
Other Wall	110
Partition	458
Exterior Floor	0
Internal Floor	158
Slab	0
Other Floor	158

Engineering Checks For Cooling

Cooling tons	0.20	No People(max)	0.73
%OA	12	People per 1000 ft²	5
cfm/ft²	0.77	Volume (ft³)	1,600.5
cfm/ton	558.92		
ft²/ton	722.50		
Btu/h-ft²	16.61		

Engineering Checks For Heating

Heating Mbh	-1.93	No People(max)	0.73
%OA	12	People per 1000 ft²	5
cfm/ft²	0.77	Volume (ft³)	1,600.5
cfm/Mbh	-58.47		
ft²/Mbh	-75.56		
Btu/h-ft²	-13.23		

ROOM_4060E - Focus

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 21:00:00						
Outside	DB / WB / HR	84.9	°F /	73.2	°F /	104.2	gr/lb	
Room	DB / RH / HR	75.0	°F /	48.6	% /	62.8	gr/lb	
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	13	0	13	1.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	36	0	36	4.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	49	0	49	-
People	44	65	83	192	22.6
Lights	85	143	0	228	26.9
Miscellaneous Loads	128	92	0	220	25.9
Internal Subtotal	257	301	83	641	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	63	0	63	7.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	257	411	83	751	100.0
RA Sensible (Lights)	98	0	0	98	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb	
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb	
Supply Air Dry Bulb Temp		75.0	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-29	0	-29	26.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-17	0	-17	15.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-46	0	-46	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-62	0	-62	57.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-108	0	-108	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	33
Cooling ACH	2.16
Sec Fan cfm	0
Input Ventilation cfm	7
Calculated Ventilation cfm	4
Calculated Ventilation ACH	0.26
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	33
Heating ACH	2.16
Sec Fan cfm	0
Input Ventilation cfm	7
Calculated Ventilation cfm	4
Calculated Ventilation ACH	0.26
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	93
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	434
Exterior Floor	0
Internal Floor	93
Slab	0
Other Floor	93

Engineering Checks For Cooling

Cooling tons	0.06	No People(max)	0.42
%OA	12	People per 1000 ft²	5
cfm/ft²	0.40	Volume (ft³)	915.7
cfm/ton	528.82		
ft²/ton	1,329.31		
Btu/h-ft²	9.03		

Engineering Checks For Heating

Heating Mbh	-0.11	No People(max)	0.42
%OA	12	People per 1000 ft²	5
cfm/ft²	0.24	Volume (ft³)	915.7
cfm/Mbh	-306.71		
ft²/Mbh	-770.85		
Btu/h-ft²	-1.30		

ROOM_4061E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00					
Outside	DB / WB / HR	84.2	°F /	72.1	°F /	98.7	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	794	747	0	1,541	60.2
Door	0	0	0	0	0.0
Wall	0	48	0	48	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-140	0	-140	-5.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-15	0	-15	-0.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	794	641	0	1,434	-
People	75	98	144	317	12.4
Lights	147	216	0	363	14.2
Miscellaneous Loads	221	143	0	364	14.2
Internal Subtotal	443	457	144	1,044	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-56	0	-56	-2.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-30	0	-30	-1.2
Grand Total	1,237	1,011	144	2,391	100.0
RA Sensible (Lights)	169	0	0	169	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.8	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,901	0	0	-1,901	99.7
Door	0	0	0	0	0.0
Wall	0	-159	0	-159	8.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	96	0	96	-5.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	115	0	115	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,901	53	0	-1,848	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	19	0	19	-1.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-78	0	-78	4.1
Grand Total	-1,901	-6	0	-1,908	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	111
Cooling ACH	4.21
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	111
Heating ACH	4.21
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	156
Window	65
Door	0
Wall	109
Below-Grade Wall	0
Other Wall	109
Partition	457
Exterior Floor	0
Internal Floor	156
Slab	0
Other Floor	156

Engineering Checks For Cooling

Cooling tons	0.20	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	0.78	Volume (ft³)	1,580.3
cfm/ton	558.98		
ft²/ton	721.20		
Btu/h-ft²	16.64		

Engineering Checks For Heating

Heating Mbh	-1.91	No People(max)	0.72
%OA	12	People per 1000 ft²	5
cfm/ft²	0.78	Volume (ft³)	1,580.3
cfm/Mbh	-58.40		
ft²/Mbh	-75.34		
Btu/h-ft²	-13.27		

ROOM_4062E - Focus

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 22:00:00						
Outside	DB / WB / HR	83.5	°F /	72.8	°F /	104.2	gr/lb	
Room	DB / RH / HR	75.0	°F /	48.5	% /	62.7	gr/lb	
Supply Air Dry Bulb Temp		56.6	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	13	0	13	2.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	27	0	27	4.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	40	0	40	-
People	31	49	58	137	22.4
Lights	60	107	0	166	27.1
Miscellaneous Loads	89	69	0	158	25.7
Internal Subtotal	180	224	58	462	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	45	0	45	7.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	-0.1
Grand Total	180	308	58	546	100.0
RA Sensible (Lights)	68	0	0	68	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00						
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb	
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb	
Supply Air Dry Bulb Temp		75.0	°F					

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-19	0	-19	24.9
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-13	0	-13	16.7
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-32	0	-32	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-45	0	-45	58.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-77	0	-77	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	24
Cooling ACH	2.25
Sec Fan cfm	0
Input Ventilation cfm	5
Calculated Ventilation cfm	3
Calculated Ventilation ACH	0.28
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	24
Heating ACH	2.25
Sec Fan cfm	0
Input Ventilation cfm	5
Calculated Ventilation cfm	3
Calculated Ventilation ACH	0.28
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	66
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	358
Exterior Floor	0
Internal Floor	66
Slab	0
Other Floor	66

Engineering Checks For Cooling

Cooling tons	0.05	No People(max)	0.29
%OA	12	People per 1000 ft²	5
cfm/ft²	0.41	Volume (ft³)	641.0
cfm/ton	531.20		
ft²/ton	1,280.30		
Btu/h-ft²	9.37		

Engineering Checks For Heating

Heating Mbh	-0.08	No People(max)	0.29
%OA	12	People per 1000 ft²	5
cfm/ft²	0.24	Volume (ft³)	641.0
cfm/Mbh	-312.89		
ft²/Mbh	-753.99		
Btu/h-ft²	-1.33		

ROOM_4063E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00					
Outside	DB / WB / HR	84.2	°F /	72.1	°F /	98.7	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	803	754	0	1,557	60.2
Door	0	0	0	0	0.0
Wall	0	49	0	49	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-142	0	-142	-5.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-15	0	-15	-0.6
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	803	646	0	1,449	-
People	76	99	145	320	12.4
Lights	149	218	0	366	14.2
Miscellaneous Loads	223	145	0	368	14.2
Internal Subtotal	448	461	145	1,054	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-57	0	-57	-2.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-31	0	-31	-1.2
Grand Total	1,251	1,019	145	2,415	100.0
RA Sensible (Lights)	171	0	0	171	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.8	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,919	0	0	-1,919	99.7
Door	0	0	0	0	0.0
Wall	0	-160	0	-160	8.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	98	0	98	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	117	0	117	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,919	54	0	-1,864	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	19	0	19	-1.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-79	0	-79	4.1
Grand Total	-1,919	-5	0	-1,924	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	112
Cooling ACH	4.21
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	112
Heating ACH	4.21
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	158
Window	66
Door	0
Wall	110
Below-Grade Wall	0
Other Wall	110
Partition	458
Exterior Floor	0
Internal Floor	158
Slab	0
Other Floor	158

Engineering Checks For Cooling

Cooling tons	0.20	No People(max)	0.73
%OA	12	People per 1000 ft²	5
cfm/ft²	0.77	Volume (ft³)	1,597.3
cfm/ton	558.94		
ft²/ton	721.70		
Btu/h-ft²	16.63		

Engineering Checks For Heating

Heating Mbh	-1.92	No People(max)	0.73
%OA	12	People per 1000 ft²	5
cfm/ft²	0.77	Volume (ft³)	1,597.3
cfm/Mbh	-58.47		
ft²/Mbh	-75.49		
Btu/h-ft²	-13.25		

ROOM_4064E - Focus

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 21:00:00					
Outside	DB / WB / HR	84.9	°F /	73.2	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	48.5	% /	62.8	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	40	0	40	3.8
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	41	0	41	3.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	81	0	81	-
People	53	78	101	232	22.2
Lights	103	170	0	274	26.3
Miscellaneous Loads	155	110	0	265	25.4
Internal Subtotal	311	357	101	770	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	73	0	73	7.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	311	511	101	923	100.0
RA Sensible (Lights)	119	0	0	119	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-25	0	-25	20.5
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-21	0	-21	17.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-45	0	-45	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-75	0	-75	62.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-121	0	-121	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	41
Cooling ACH	2.22
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.27
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	41
Heating ACH	2.22
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	5
Calculated Ventilation ACH	0.27
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	112
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	487
Exterior Floor	0
Internal Floor	112
Slab	0
Other Floor	112

Engineering Checks For Cooling

Cooling tons	0.08	No People(max)	0.50
%OA	12	People per 1000 ft²	5
cfm/ft²	0.40	Volume (ft³)	1,110.6
cfm/ton	529.65		
ft²/ton	1,312.94		
Btu/h-ft²	9.14		

Engineering Checks For Heating

Heating Mbh	-0.12	No People(max)	0.50
%OA	12	People per 1000 ft²	5
cfm/ft²	0.22	Volume (ft³)	1,110.6
cfm/Mbh	-337.36		
ft²/Mbh	-836.13		
Btu/h-ft²	-1.20		

ROOM_4065E - 1P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00					
Outside	DB / WB / HR	84.2	°F /	72.1	°F /	98.7	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	806	762	0	1,568	60.1
Door	0	0	0	0	0.0
Wall	0	49	0	49	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-133	0	-133	-5.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-18	0	-18	-0.7
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	806	660	0	1,466	-
People	77	100	146	322	12.4
Lights	149	220	0	369	14.1
Miscellaneous Loads	224	146	0	370	14.2
Internal Subtotal	450	466	146	1,062	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-59	0	-59	-2.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-31	0	-31	-1.2
Grand Total	1,256	1,036	146	2,438	100.0
RA Sensible (Lights)	171	0	0	171	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.7	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-1,926	0	0	-1,926	99.4
Door	0	0	0	0	0.0
Wall	0	-161	0	-161	8.3
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	91	0	91	-4.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	118	0	118	-6.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-1,926	48	0	-1,878	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	20	0	20	-1.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-79	0	-79	4.1
Grand Total	-1,926	-11	0	-1,937	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	114
Cooling ACH	4.26
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	114
Heating ACH	4.26
Sec Fan cfm	0
Input Ventilation cfm	12
Calculated Ventilation cfm	13
Calculated Ventilation ACH	0.49
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	159
Window	66
Door	0
Wall	110
Below-Grade Wall	0
Other Wall	110
Partition	458
Exterior Floor	0
Internal Floor	159
Slab	0
Other Floor	159

Engineering Checks For Cooling

Cooling tons	0.20	No People(max)	0.73
%OA	12	People per 1000 ft²	5
cfm/ft²	0.78	Volume (ft³)	1,605.1
cfm/ton	559.13		
ft²/ton	718.40		
Btu/h-ft²	16.70		

Engineering Checks For Heating

Heating Mbh	-1.94	No People(max)	0.73
%OA	12	People per 1000 ft²	5
cfm/ft²	0.78	Volume (ft³)	1,605.1
cfm/Mbh	-58.65		
ft²/Mbh	-75.34		
Btu/h-ft²	-13.27		

ROOM_4066E - Copy/Print/Mail

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00					
Outside	DB / WB / HR	88.2	°F /	74.1	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	46.1	% /	59.5	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-178	0	-178	-4.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-37	0	-37	-1.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-215	0	-215	-
People	16	22	39	78	2.0
Lights	96	148	0	244	6.4
Miscellaneous Loads	2,415	1,110	0	3,524	92.0
Internal Subtotal	2,527	1,280	39	3,846	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	89	0	89	2.3
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	0.0
Grand Total	2,527	1,154	39	3,719	100.0
RA Sensible (Lights)	110	0	0	110	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-20	0	-20	12.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-30	0	-30	18.3
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-50	0	-50	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-114	0	-114	69.4
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.1
Grand Total	0	-164	0	-164	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	182
Cooling ACH	6.32
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	21
Calculated Ventilation ACH	0.73
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	182
Heating ACH	6.32
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	21
Calculated Ventilation ACH	0.73
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	170
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	576
Exterior Floor	0
Internal Floor	170
Slab	0
Other Floor	170

Engineering Checks For Cooling

Cooling tons	0.31	No People(max)	0.16
%OA	12	People per 1000 ft²	1
cfm/ft²	1.16	Volume (ft³)	1,727.6
cfm/ton	588.35		
ft²/ton	506.72		
Btu/h-ft²	23.68		

Engineering Checks For Heating

Heating Mbh	-0.16	No People(max)	0.16
%OA	12	People per 1000 ft²	1
cfm/ft²	0.19	Volume (ft³)	1,727.6
cfm/Mbh	-1,115.38		
ft²/Mbh	-960.44		
Btu/h-ft²	-1.04		

ROOM_4067E - 3P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00					
Outside	DB / WB / HR	84.2	°F /	72.1	°F /	98.7	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.2	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,133	974	0	2,107	61.0
Door	0	0	0	0	0.0
Wall	0	65	0	65	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-196	0	-196	-5.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-32	0	-32	-0.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,133	812	0	1,945	-
People	104	129	198	431	12.5
Lights	203	284	0	486	14.1
Miscellaneous Loads	304	189	0	494	14.3
Internal Subtotal	611	602	198	1,411	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-91	0	-91	-2.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-45	0	-45	-1.3
Grand Total	1,744	1,278	198	3,220	100.0
RA Sensible (Lights)	233	0	0	233	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.3	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,528	0	0	-2,528	101.9
Door	0	0	0	0	0.0
Wall	0	-215	0	-215	8.7
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	152	0	152	-6.1
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	173	0	173	-7.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,528	110	0	-2,418	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	39	0	39	-1.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-101	0	-101	4.1
Grand Total	-2,528	48	0	-2,480	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	150
Cooling ACH	4.13
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	17
Calculated Ventilation ACH	0.47
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	150
Heating ACH	4.13
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	17
Calculated Ventilation ACH	0.47
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	213
Window	89
Door	0
Wall	148
Below-Grade Wall	0
Other Wall	148
Partition	496
Exterior Floor	0
Internal Floor	213
Slab	0
Other Floor	213

Engineering Checks For Cooling

Cooling tons	0.27	No People(max)	0.99
%OA	12	People per 1000 ft²	5
cfm/ft²	0.76	Volume (ft³)	2,179.3
cfm/ton	558.12		
ft²/ton	738.65		
Btu/h-ft²	16.25		

Engineering Checks For Heating

Heating Mbh	-2.48	No People(max)	0.99
%OA	12	People per 1000 ft²	5
cfm/ft²	0.76	Volume (ft³)	2,179.3
cfm/Mbh	-60.40		
ft²/Mbh	-79.93		
Btu/h-ft²	-12.51		

ROOM_4068E - Focus

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		7/21 19:00:00					
Outside	DB / WB / HR	88.2	°F /	74.1	°F /	104.2	gr/lb
Room	DB / RH / HR	75.0	°F /	48.3	% /	62.5	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	160	0	160	13.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	35	0	35	2.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	195	0	195	-
People	58	81	111	250	20.5
Lights	113	181	0	295	24.1
Miscellaneous Loads	170	119	0	289	23.7
Internal Subtotal	341	381	111	833	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	63	0	63	5.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-1	0	-1	-0.1
Grand Total	341	638	111	1,090	100.0
RA Sensible (Lights)	130	0	0	130	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-26	0	-26	20.2
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-22	0	-22	16.8
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-48	0	-48	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-81	0	-81	63.0
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	0	0	0	0.0
Grand Total	0	-129	0	-129	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	49
Cooling ACH	2.42
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	6
Calculated Ventilation ACH	0.30
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	49
Heating ACH	2.42
Sec Fan cfm	0
Input Ventilation cfm	9
Calculated Ventilation cfm	6
Calculated Ventilation ACH	0.30
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	121
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	486
Exterior Floor	0
Internal Floor	121
Slab	0
Other Floor	121

Engineering Checks For Cooling

Cooling tons	0.09	No People(max)	0.55
%OA	12	People per 1000 ft²	5
cfm/ft²	0.44	Volume (ft³)	1,217.3
cfm/ton	534.35		
ft²/ton	1,218.22		
Btu/h-ft²	9.85		

Engineering Checks For Heating

Heating Mbh	-0.13	No People(max)	0.55
%OA	12	People per 1000 ft²	5
cfm/ft²	0.22	Volume (ft³)	1,217.3
cfm/Mbh	-376.23		
ft²/Mbh	-857.57		
Btu/h-ft²	-1.17		

ROOM_4069E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00					
Outside	DB / WB / HR	84.2	°F /	72.1	°F /	98.7	gr/lb
Room	DB / RH / HR	75.0	°F /	47.3	% /	61.1	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,112	968	0	2,081	60.9
Door	0	0	0	0	0.0
Wall	0	64	0	64	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-185	0	-185	-5.4
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-34	0	-34	-1.0
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,112	814	0	1,926	-
People	102	128	195	426	12.5
Lights	199	282	0	482	14.1
Miscellaneous Loads	299	188	0	488	14.3
Internal Subtotal	601	599	195	1,395	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-91	0	-91	-2.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-44	0	-44	-1.3
Grand Total	1,713	1,277	195	3,185	100.0
RA Sensible (Lights)	229	0	0	229	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		85.3	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,491	0	0	-2,491	101.6
Door	0	0	0	0	0.0
Wall	0	-212	0	-212	8.6
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	143	0	143	-5.8
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	170	0	170	-6.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,491	101	0	-2,390	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	38	0	38	-1.6
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-99	0	-99	4.1
Grand Total	-2,491	40	0	-2,451	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	148
Cooling ACH	4.14
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	17
Calculated Ventilation ACH	0.48
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	148
Heating ACH	4.14
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	17
Calculated Ventilation ACH	0.48
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	209
Window	87
Door	0
Wall	145
Below-Grade Wall	0
Other Wall	145
Partition	494
Exterior Floor	0
Internal Floor	209
Slab	0
Other Floor	209

Engineering Checks For Cooling

Cooling tons	0.27	No People(max)	0.98
%OA	12	People per 1000 ft²	5
cfm/ft²	0.76	Volume (ft³)	2,145.0
cfm/ton	558.32		
ft²/ton	734.89		
Btu/h-ft²	16.33		

Engineering Checks For Heating

Heating Mbh	-2.45	No People(max)	0.98
%OA	12	People per 1000 ft²	5
cfm/ft²	0.76	Volume (ft³)	2,145.0
cfm/Mbh	-60.47		
ft²/Mbh	-79.57		
Btu/h-ft²	-12.57		

ROOM_4071E - 2P Office

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		6/21 19:00:00				
Outside	DB / WB / HR	84.2 °F	/	72.1 °F	/	98.7 gr/lb
Room	DB / RH / HR	75.0 °F	/	47.3 %	/	61.2 gr/lb
Supply Air Dry Bulb Temp		56.6 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	1,133	1,021	0	2,155	62.5
Door	0	0	0	0	0.0
Wall	0	64	0	64	1.9
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-263	0	-263	-7.6
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-47	0	-47	-1.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	1,133	775	0	1,908	-
People	104	136	198	438	12.7
Lights	203	299	0	502	14.6
Miscellaneous Loads	304	200	0	504	14.6
Internal Subtotal	611	635	198	1,444	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-94	0	-94	-2.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-46	0	-46	-1.3
Grand Total	1,745	1,270	198	3,213	100.0
RA Sensible (Lights)	233	0	0	233	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Room	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		85.1 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-2,530	0	0	-2,530	103.5
Door	0	0	0	0	0.0
Wall	0	-215	0	-215	8.8
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	196	0	196	-8.0
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	170	0	170	-6.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-2,530	151	0	-2,379	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	36	0	36	-1.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-101	0	-101	4.1
Grand Total	-2,530	86	0	-2,444	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	149
Cooling ACH	4.10
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	17
Calculated Ventilation ACH	0.47
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	149
Heating ACH	4.10
Sec Fan cfm	0
Input Ventilation cfm	17
Calculated Ventilation cfm	17
Calculated Ventilation ACH	0.47
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	213
Window	89
Door	0
Wall	148
Below-Grade Wall	0
Other Wall	148
Partition	496
Exterior Floor	0
Internal Floor	213
Slab	0
Other Floor	213

Engineering Checks For Cooling

Cooling tons	0.27	No People(max)	0.99
%OA	12	People per 1000 ft²	5
cfm/ft²	0.75	Volume (ft³)	2,180.3
cfm/ton	558.03		
ft²/ton	740.25		
Btu/h-ft²	16.21		

Engineering Checks For Heating

Heating Mbh	-2.44	No People(max)	0.99
%OA	12	People per 1000 ft²	5
cfm/ft²	0.75	Volume (ft³)	2,180.3
cfm/Mbh	-61.14		
ft²/Mbh	-81.08		
Btu/h-ft²	-12.33		

ROOM_4CR01E - Corridor

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		10/21 15:00:00					
Outside	DB / WB / HR	78.3	°F /	67.5	°F /	83.4	gr/lb
Room	DB / RH / HR	75.0	°F /	46.5	% /	60.2	gr/lb
Supply Air Dry Bulb Temp		56.6	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	3,126	0	3,126	35.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	340	0	340	3.9
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	3,466	0	3,466	-
People	104	130	248	482	5.5
Lights	603	885	0	1,488	17.0
Miscellaneous Loads	1,523	1,070	0	2,592	29.6
Internal Subtotal	2,230	2,085	248	4,563	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	42	0	42	0.5
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-9	0	-9	-0.1
Grand Total	2,230	5,584	248	8,062	100.0
RA Sensible (Lights)	692	0	0	692	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00					
Outside	DB / WB / HR	0.0	°F /	0.0	°F /	5.5	gr/lb
Room	DB / RH / HR	70.0	°F /	4.6	% /	5.0	gr/lb
Supply Air Dry Bulb Temp		75.0	°F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	0	0	0	0	0.0
Door	0	0	0	0	0.0
Wall	0	0	0	0	0.0
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	-917	0	-917	53.3
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-129	0	-129	7.5
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	0	-1,046	0	-1,046	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Room	0	0	0	0	0.0
Ceiling	0	-674	0	-674	39.2
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	0	0	0	0	0.0
Time Delay Correction	0	-2	0	-2	0.1
Grand Total	0	-1,721	0	-1,721	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	387
Cooling ACH	2.13
Sec Fan cfm	0
Input Ventilation cfm	59
Calculated Ventilation cfm	45
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	387
Heating ACH	2.13
Sec Fan cfm	0
Input Ventilation cfm	59
Calculated Ventilation cfm	45
Calculated Ventilation ACH	0.25
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	1,091
Window	0
Door	0
Wall	0
Below-Grade Wall	0
Other Wall	0
Partition	4,381
Exterior Floor	0
Internal Floor	1,091
Slab	0
Other Floor	1,091

Engineering Checks For Cooling

Cooling tons	0.67	No People(max)	0.99
%OA	12	People per 1000 ft²	1
cfm/ft²	0.39	Volume (ft³)	10,907.6
cfm/ton	576.35		
ft²/ton	1,476.12		
Btu/h-ft²	8.13		

Engineering Checks For Heating

Heating Mbh	-1.72	No People(max)	0.99
%OA	12	People per 1000 ft²	1
cfm/ft²	0.32	Volume (ft³)	10,907.6
cfm/Mbh	-225.01		
ft²/Mbh	-576.17		
Btu/h-ft²	-1.74		

Zone Cooling and Heating Loads by Component

ZONE_Zone 01-00

Conditions at Time of Space Cooling Peak

Peak Time (Mo/D/H:M)		9/21 14:00:00				
Outside	DB / WB / HR	86.8 °F	/	71.7 °F	/	92.4 gr/lb
Zone	DB / RH / HR	75.0 °F	/	49.2 %	/	63.6 gr/lb
Supply Air Dry Bulb Temp		56.7 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	34,121	59,845	0	93,966	34.5
Door	0	0	0	0	0.0
Wall	0	3,373	0	3,373	1.2
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	4,521	0	4,521	1.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	-8,542	0	-8,542	-3.1
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	34,121	59,198	0	93,319	-
People	10,161	11,036	19,325	40,523	14.9
Lights	11,968	15,315	0	27,284	10.0
Miscellaneous Loads	27,578	23,557	7,521	58,656	21.5
Internal Subtotal	49,708	49,908	26,846	126,463	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Zone	0	0	0	0	0.0
Ceiling	0	-9,959	0	-9,959	-3.7
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	50,691	0	0	50,691	18.6
Time Delay Correction	0	-2,057	0	-2,057	-0.8
Grand Total	134,521	97,091	26,846	258,458	100.0
RA Sensible (Lights)	13,741	0	0	13,741	-

Conditions at Time of Space Heating Peak

Peak Time (Mo/D/H:M)		1/21 24:00:00				
Outside	DB / WB / HR	0.0 °F	/	0.0 °F	/	5.5 gr/lb
Zone	DB / RH / HR	70.0 °F	/	4.6 %	/	5.0 gr/lb
Supply Air Dry Bulb Temp		77.7 °F				

	Instant Sensible (Btu/h)	Time Delay Sensible (Btu/h)	Latent (Btu/h)	Total (Btu/h)	Percent of Total (%)
Roof	0	0	0	0	0.0
Other Roof	0	0	0	0	0.0
Glass	-82,432	0	0	-82,432	86.0
Door	0	0	0	0	0.0
Wall	0	-6,816	0	-6,816	7.1
Below-Grade Wall	0	0	0	0	0.0
Other Wall	0	0	0	0	0.0
Partition	0	666	0	666	-0.7
Exterior Floor	0	0	0	0	0.0
Interior Floor	0	3,292	0	3,292	-3.4
Slab	0	0	0	0	0.0
Other Floor	0	0	0	0	0.0
Infiltration	0	0	0	0	0.0
Envelope Subtotal	-82,432	-2,858	0	-85,290	-
People	0	0	0	0	0.0
Lights	0	0	0	0	0.0
Miscellaneous Loads	0	0	0	0	0.0
Internal Subtotal	0	0	0	0	-
RA (All Other)	0	0	0	0	0.0
DOA Direct to Zone	0	0	0	0	0.0
Ceiling	0	1,087	0	1,087	-1.1
Refrigeration	0	0	0	0	0.0
Service Water	0	0	0	0	0.0
HVAC Equipment Losses	0	0	0	0	0.0
Adj Air Transfer Heat	0	0	0	0	0.0
Sizing Factor Correction	-7,657	0	0	-7,657	8.0
Time Delay Correction	0	-3,945	0	-3,945	4.1
Grand Total	-90,089	-5,716	0	-95,805	100.0
RA Sensible (Lights)	0	0	0	0	-

Cooling Airflows	
Main Fan cfm	11,534
Cooling ACH	4.71
Sec Fan cfm	0
Input Ventilation cfm	1,332
Calculated Ventilation cfm	1,332
Calculated Ventilation ACH	0.54
Infiltration cfm	0
Min Stop/RH (%)	100

Heating Airflows	
Main Fan cfm	11,534
Heating ACH	4.71
Sec Fan cfm	0
Input Ventilation cfm	1,332
Calculated Ventilation cfm	1,332
Calculated Ventilation ACH	0.54
Infiltration cfm	0
Min Stop/RH (%)	100

Areas ft²	
Roof	0
Other Roof	0
Ceiling	14,271
Window	2,548
Door	0
Wall	4,375
Below-Grade Wall	0
Other Wall	4,375
Partition	36,187
Exterior Floor	0
Internal Floor	14,271
Slab	0
Other Floor	14,271

Engineering Checks For Cooling

Cooling tons	21.54	No People(max)	97.13
%OA	12	People per 1000 ft²	7
cfm/ft²	0.67	Volume (ft³)	146,977.5
cfm/ton	535.41		
ft²/ton	620.43		
Btu/h-ft²	19.34		

Engineering Checks For Heating

Heating Mbh	-95.80	No People(max)	97.13
%OA	12	People per 1000 ft²	7
cfm/ft²	0.79	Volume (ft³)	146,977.5
cfm/Mbh	-120.39		
ft²/Mbh	-139.48		
Btu/h-ft²	-7.17		