



Draft Modular Building Submittal

Performance Specification

Lodging Facility

McMurdo Station, Antarctica

March 2, 2017

Prepared for



Prepared by

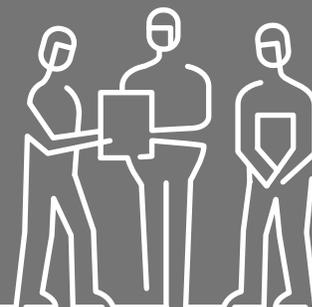


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PART ONE – PROPOSAL FORMS & DOCUMENTS

To be developed by Leidos Antarctica Support Contract (ASC) team when completing the administrative components of the Design-Build Solicitation.

PART TWO – GENERAL REQUIREMENTS

To be developed by ASC when completing the administrative components of the Design-Build Solicitation.

Consider placing “Design After Award” requirements in Part Two.

PART THREE – PROJECT PROGRAM

1.0 PROJECT DESCRIPTION

1.1 General

This project is part of the McMurdo-Palmer Station-South Pole Modernization (MPSM) project. MPSM is planned as a multi-phased reconstruction effort to modernize facilities in Antarctica in order to gain efficiencies and better support the execution of science.

The project includes design development of a prototypical design, and construction of, one new dormitory-type lodging facility, Building 30, to accommodate 280 personnel. The intent is to duplicate Building 30 two more times on the site with only slight modifications to certain components of the floor plan. The three facilities will house a total of 840 occupants. The Revit models and drawings represent a 35-percent design effort. The final constructed design, prepared by the Contractor, will provide personnel with housing that is safe, and with facilities that are energy efficient, durable, and low maintenance. These lodging facilities will be constructed at McMurdo Station in Antarctica, and shall fit into the surrounding architectural environment of the station.

The strategies and solutions presented in this package are intended to be representative of a design that meets the goals, requirements and budgetary constraints of the ASC. Betterments or alternative solutions are allowed, however, the general intent of these documents shall be maintained. The design drawings in Attachment C were developed based on the assumption of a fully site-constructed (i.e., stick-built) facility, however, subsequent analysis has determined that modular construction is the preferred approach. Accordingly, the Contractor shall use the drawings as a reference only to develop the modular design.

The information presented in this document reflects user group feedback garnered during the 21 June 2016 project kickoff meeting, as well as subsequent stakeholder discussions during meetings to review the project's site and building layout options. It contains project performance requirements and prescriptive requirements that supplement the drawings.

Performance and Prescriptive requirements are presented in Part Four. Performance requirements are intended to provide guidance to the designer, allowing some latitude without specifying a particular solution. Prescriptive requirements, on the other hand, are features which have been identified as mandatory.

1.2 Facility Summary

The lodging facility shall be constructed from shop-fabricated modules which are built off site and shipped to McMurdo for assembly. Each facility will contain both single and double occupancy rooms with the ability to add additional bed options for occupant overflow. Each sleeping room will include a bed per occupant (bunkable, if surge capacity is required), 2-drawer freestanding dressers, freestanding wardrobes, mini refrigerators, one TV/flat screen per room, and the option of a small desk with chair or a lounge chair with tablet arm. The net area for single occupancy rooms should be at a minimum 77 square feet and for double occupancy rooms should be at a minimum of 119 square feet. Each building will be three stories high and will be elevated above grade to allow for snow scour underneath. Ancillary spaces include lounges, break rooms, residential laundries, toilet and shower rooms, and building utility rooms.

Building 30 is approximately 184-feet long by 86-feet wide. The total building footprint is approximately 15,870 gross square feet (GSF) and has three floors per building comprising approximately 47,600 GSF per building.

The building design concept includes 95 beds per floor on three floors for a total 285 beds. Note, the five beds in excess of program requirements of 280 are the result of floor plan geometry and structural

layout. ASC opted to slightly exceed requirements rather than be below the minimum requirement of total bed count per building.

This project shall comply with the 2015 version of the International Building Code (IBC) and its related engineering codes. Note, IBC is the governing building code for all United States Antarctic Program (USAP) facilities in Antarctica. NSF has also confirmed that Unified Facilities Criteria (UFCs) are not applicable to this project therefore antiterrorism requirements indicated in UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings do not apply.

Other site features include the following:

- The three lodging facilities, Buildings 30, 31, and 32 are separated by 30-foot fire lanes between them. The fire lane continues around the west side of the site to provide access to all sides of each building. Note, although the intent was to keep Building 208 operational during the construction of all three buildings, the construction of Building 32 will require demolition of the existing Building 208; see the civil site plan provided in Attachment C for building footprint locations.
- There will be an enclosed sky bridge that will connect Building 31 to the new Contingency Operations building across the road to the east. The self-supporting sky bridge, which will be located at the second floor level of each facility, will require a continuous building expansion joint at the junctures of each facility and the bridge. The design of this sky bridge is included in the scope of work for this project. Coordination of the location of this connection affects the prototype design of all three lodging buildings. This framed opening in Buildings 30 and 32 is intended to provide future capability to remove a section of the exterior wall should this need arise. Therefore, the Contractor shall verify the final location, size, and elevation of this framed opening during design development of Building 30. Note, alignment of the bridge must allow a walk surface with a slope that is within building code limits and must allow adequate clearance for NSF vehicles under the bridge.
- Sky bridges between Buildings 30, 31 and 32 are also planned in order to allow lodging facility residents to move between buildings without having to go outside. The design of these sky bridges are included in the scope of work for this project. This connection is shown in the Revit Building Information Modeling (BIM) model (provided electronically) and on the architectural drawings in **Attachment C** at the southeast corner of the building on the second floor. Because Building 30 is the northernmost building of the three, a connection is not shown at the northwest corner, however, if one becomes necessary at subsequent facilities or to connect Building 30 to existing facilities to the north, the sleeping room on the second floor between gridlines 10.3 and 11 could be removed to allow such a connection. Total room counts would still comply with minimum requirements.
- Building 30 will connect to the McMurdo utility distribution system; additional civil details are provided in Part Four, Section 1.

2.0 BUILDING REQUIREMENTS

2.1 Space Tabulation

Space Name	# of spaces	Unit SF (Net)	Total SF (Net)	Total SQM (Net)	Remarks
Single Occupancy Sleeping Room	201 (min)	77	15,477	1,437.86	67 per floor, 3 floors
Double Occupancy Sleeping Room	42 (min)	119	4998	464.33	14 per floor, 3 floors
Quiet Lounge	3	254	762	70.79	1 per floor, 3 floors
Lounge	2	606	1212	112.60	1 on second floor, 1 on third floor
Boiler Room	1	506	506	47.01	first floor
Men's Toilet and Shower Room	3	507	1,521	141.31	1 per floor, 3 floors
Women's Toilet and Shower Room	3	507	1,521	141.31	1 per floor, 3 floors
Men's Toilet Room	3	161	483	44.87	1 per floor, 3 floors
Women's Toilet Room	3	161	483	44.87	1 per floor, 3 floors
Residential Laundry	3	224	672	62.43	1 per floor, 3 floors
Janitor Room	3	48	144	13.38	1 per floor, 3 floors
Janitor & Storage Room	3	29	87	8.08	1 per floor, 3 floors
Fan Room	3	295	885	82.22	1 per floor, 3 floors
Communications Room	3	120	360	33.45	1 per floor, 3 floors
Electrical Room	3	84	252	23.41	1 per floor, 3 floors
Trash/Recycle Room	3	50	150	13.94	1 per floor, 3 floors
Vestibule & Cubbies	3	102	306	28.43	1 per floor, 3 floors
Break Area	3	48	144	13.38	1 per floor, 3 floors
Corridors	3	2,783	8,349	775.65	1 per floor, 3 floors
Stair 1	3	246	738	68.56	quantity = area of footprint on each floor
Stair 2	3	272	816	75.81	quantity = area of footprint on each floor
Subtotal Net Area			39,866	3,703.67	
Net to Gross Factor			1.19	1.19	high gross factor due to thick exterior walls required for this climate
TOTAL GROSS AREA			47,600	4,422.19	

The Contractor shall provide actual area in both square feet and square meters.

2.2 Space Relationships

The floor plan layout of Building 30 has been vetted through a multiple scheme review process with stakeholders. The primary objective was to accommodate the required number of beds within three buildings (Buildings 30, 31, and 32), limited to three stories in height, on the allocated site. Final room sizes have also been vetted. Compliance with stated sleeping room dimensions are critical to allow specified furniture and accessories to fit, to allow the quantity of sleeping rooms required for each building within the designated building footprint, and to provide required fire lane separations between buildings within designated site limits. Spatial adjacencies addressed the following:

- Buildings have been limited to three stories to allow the McMurdo Station fire department to reach all floors and to avoid the need for elevators in the buildings.
- Buildings are separated by required fire lanes.
- Sleeping areas have been separated from communal areas to mitigate noise. Communal areas have been enclosed as much as possible without compromising egress paths.
- Lounges are located at corners to take advantage of views out. Each floor features a smaller quiet lounge and a larger more central lounge.
- The central lounge on the second floor is located near the planned sky bridge connection to the Contingency Operations building.
- Stair 2 landings are intentionally oversized to accommodate the movement of bulky items between floors.
- Both stairs have 13-inch treads to accommodate snow boots.
- Corridor sizes should be designed based on code requirements but should be adequate for occupant equipment to be moved. Corridors designed to be greater than minimum code is preferred.
- Shower areas are separated from toilet areas.
- Secondary toilet rooms have been provided to limit travel distance to toilets.
- Plumbing walls are located back-to-back for efficiency of pipe routing.
- Toiletry cubbies are provided in the toilet room vestibule.
- Additional sinks, toilets and drinking fountains have been provided to address peak use times.
- Kitchen functions in the break area have been intentionally limited to eliminate fire concerns associated with cooking equipment and management of common appliances such as refrigerators and dishwashers.
- Laundry rooms are located at exterior walls to accommodate dryer exhaust.
- Trash rooms are located near communal functions for central collection.
- A janitor room has been provided at each end of each floor to limit mop bucket travel distance.

2.3 Exterior Character

The design mission for McMurdo Station is to create efficient, durable facilities that support the long term U.S. commitment to advancing science in Antarctica. Design solutions, construction sequencing, and building operations must strive to tread lightly upon the earth. Toward these ends, the following criteria have been addressed:

Architectural Character and Programming:

- Building massing and profile are aerodynamically correct for this high wind zone.
- Building enclosure features simple, streamlined corners and junctures of materials to facilitate thermal performance, efficiency, and to convey innovation.
- The building footprint is compact and efficient. This is to reduce reliance on vehicular transport and lengths of utility runs and to provide the required number of sleeping units on a compact site.
- Windows are provided where possible to maximize daylighting and views. Measures to control daylight for sleeping and to control glare have also been provided.

- Exterior finish colors shall be solid hues, vibrant but tasteful, to combat the greyness of the environment. Metal panel textures are intended to be basically smooth with slight striations for rigidity and to avoid the appearance of oil canning. Glazing shall be tinted but shall not be reflective. Final colors and textures shall be proposed by the Contractor. Colors and textures shall be in accordance with those planned for the new Contingency Operations building and other ongoing building development projects at the site.

Technical Performance:

- The building envelope is designed to limit heat, moisture, and air transfer through walls, floors and roofs. This addresses building systems efficiency and occupant comfort.
- Buildings are slightly elevated on columns to allow wind to scour snow from beneath. Columns and wraps must be detailed to block thermal transfer from exterior to interior.
- In general, the technical characteristics of the lodging facility shall conform to the principles discussed in the benchmarking study for composite metal building enclosure systems located in the *McMurdo Station Modernization Study, Building Shell and Fenestration Study*, dated 29 April 2016.
- For specific requirements, see Part Four of this document and Attachment C - Drawings.

3.0 ROOM REQUIREMENTS

This section provides specific space characteristics based off rooms located on drawing floorplan. These characteristics include function of space, minimum dimensions, minimum acoustic requirements, and mechanical, plumbing, and electrical/communication requirements. Room numbers are indicated on the drawings.

Single Occupancy Sleeping Room

Space Characteristics

Function/adjacencies: Provides a bedroom for personnel in residence at McMurdo. Sleeping rooms must be separated from communal spaces

Special Dimensions:

Plan Dimensions (No Less Than): 7'-6" x 10'-4"
Minimum Ceiling Height: 9'-0"

Acoustics: Minimum sound transmission class (STC) 55 at walls; minimum impact insulation class (IIC) 50 at floor to ceilings; minimum noise reduction coefficient (NRC) .17 for wall coverings (for sound absorption).

Access: Secure

Number of Occupants: 1

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, ventilation

Electrical/Communications: Power receptacles, lighting, telecommunications outlets

Other/Special Requirements: As indicated in Part Four

Double Occupancy Sleeping Room

Space Characteristics

Function/adjacencies: Provides a bedroom for personnel in residence at McMurdo. Sleeping rooms must be separated from communal spaces

Special Dimensions:

Plan Dimensions (No Less Than): 11'-6" x 10'-4"
Minimum Ceiling Height: 9'-0"

Acoustics: Minimum STC 55 at walls; minimum IIC 50 at floor to ceilings; minimum NRC .17 for wall coverings (for sound absorption).

Access: Secure

Number of Occupants: 2

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, ventilation

Electrical/Communications: Power receptacles, lighting, telecommunications outlets

Other/Special Requirements: As indicated in Part Four

Quiet Lounge

Space Characteristics

Function/adjacencies: Provides rest and relaxation space for quiet activities such as reading. Must be enclosed (separated from the corridor).

Special Dimensions:

Ideal Plan Dimensions: As programmed
Minimum Ceiling Height: 9'-0"

Acoustics: Minimum STC 55 at walls adjacent to sleeping rooms; minimum IIC 50 at floor to ceilings; minimum NRC .17 for wall coverings (for sound absorption).

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, ventilation

Electrical/Communications: Power receptacles, lighting, telecommunications outlets

Other/Special Requirements: Views out

Lounge

Space Characteristics

Function/adjacencies: Provides rest and relaxation space for communal activities such as cards, television, etc. Must be enclosed (separated from sleeping areas).

Special Dimensions:

Ideal Plan Dimensions: As programmed
Minimum Ceiling Height: 9'-0"

Acoustics: Minimum STC 55 at walls adjacent to sleeping rooms; minimum IIC 50 at floor to ceilings.

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, ventilation

Electrical/Communications: Power receptacles, lighting, telecommunications outlets

Other/Special Requirements: Views out

Boiler Room

Space Characteristics

Function/adjacencies: Houses mechanical equipment to heat the facility.

Special Dimensions:

Ideal Plan Dimensions: 500 SF

Minimum Ceiling Height: Open to structure

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Individual heating zone with thermostat, combustion air, cooling fan, central equipment

Electrical/Communications: Power receptacles, lighting, telecommunications outlet, heating, ventilation, and air conditioning (HVAC) controls

Other/Special Requirements: None

Fan Room

Space Characteristics

Function/adjacencies: Houses mechanical equipment for HVAC system.

Special Dimensions:

Ideal Plan Dimensions: 300 SF

Minimum Ceiling Height: Open to structure

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Individual heating zone with thermostat, central equipment

Electrical/Communications: Power receptacles, lighting, telecommunications outlet, HVAC controls

Other/Special Requirements: None

Electrical Room

Space Characteristics

Function/adjacencies: Houses electrical equipment for building.

Special Dimensions:

Ideal Plan Dimensions: 90 SF

Minimum Ceiling Height: Open to structure

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Individual heating zone with thermostat, cooling fan

Electrical/Communications: Power receptacles, lighting, central equipment

Other/Special Requirements: Door must open out

Communications Room

Space Characteristics

Function/adjacencies: Houses telecommunications equipment for building.

Special Dimensions:

Ideal Plan Dimensions: 120 SF, 10'-0" x 12'-0"

Minimum Ceiling Height: Open to structure

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Cooling fan

Electrical/Communications: Power receptacles, lighting, telecommunications outlets, HVAC controls

Other/Special Requirements: Door must open out

Residential Laundry Room

Space Characteristics

Function/adjacencies: Houses washers, dryers and folding tables for laundering personal clothing and linens.

Special Dimensions:

Ideal Plan Dimensions: 250 SF
Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, ventilation, dryer exhaust

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: Should be located on an exterior wall for dryer exhaust

Men's Toilet and Shower Room

Space Characteristics

Function/adjacencies: Provides toilet, sink, and shower facilities for male building residents. Proximity to sleeping rooms but separated from sleeping zone.

Special Dimensions:

Ideal Plan Dimensions: As programmed
Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: None

Women's Toilet and Shower Room

Space Characteristics

Function/adjacencies: Provides toilet, sink, and shower facilities for female building residents. Proximity to sleeping rooms but separated from sleeping zone.

Special Dimensions:

Ideal Plan Dimensions: As programmed

Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: None

Men's Toilet Room

Space Characteristics

Function/adjacencies: Provides toilet and facilities for male building residents. Proximity to sleeping rooms.

Special Dimensions:

Ideal Plan Dimensions: As programmed

Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: None

Women's Toilet Room

Space Characteristics

Function/adjacencies: Provides toilet and facilities for female building residents. Proximity to sleeping rooms.

Special Dimensions:

Ideal Plan Dimensions: As programmed
Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Individual radiant floor heating zone with thermostat, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: None

Janitor Room

Space Characteristics

Function/adjacencies: Houses mop sink and cleaning equipment.

Special Dimensions:

Ideal Plan Dimensions: 45 SF
Minimum Ceiling Height: Open to structure

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Shared radiant floor heating zone with adjacent corridor, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: Shelves for supplies, mop hook

Janitor and Storage Room

Space Characteristics

Function/adjacencies: Houses mop sink, cleaning equipment and supplies.

Special Dimensions:

Ideal Plan Dimensions: 45 SF

Minimum Ceiling Height: Open to structure

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Shared radiant floor heating zone with adjacent corridor, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: Shelves for supplies, mop hook

Trash/Recycle Room

Space Characteristics

Function/adjacencies: Houses trash collection for the residents. Locate in communal areas.

Special Dimensions:

Ideal Plan Dimensions: As programmed

Minimum Ceiling Height: 8'-0"

Acoustics: None

Access: Secure

Number of Occupants: None

Mechanical/Plumbing: Shared radiant floor heating zone with adjacent corridor, exhaust ventilation

Electrical/Communications: Lighting

Other/Special Requirements: Verify containers for trash, recycle, compost with McMurdo operations personnel.

Vestibule & Cubbies

Space Characteristics

Function/adjacencies: Provides transition space and houses toiletry cubbies for building residents accessing the Toilet and Shower Rooms. Locate adjacent to Toilet and Shower Room communal-side entry.

Special Dimensions:

Ideal Plan Dimensions: As programmed
Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Shared radiant floor heating zone with adjacent corridor, exhaust ventilation, plumbing fixtures as indicated.

Electrical/Communications: Lighting

Other/Special Requirements: Toiletry cubbies

Break Area

Space Characteristics

Function/adjacencies: Provides limited kitchen functions such as a coffee area and sink. Locate within communal area near lounge.

Special Dimensions:

Ideal Plan Dimensions: As programmed
Minimum Ceiling Height: 9'-0"

Acoustics: None

Access: Open

Number of Occupants: Varies

Mechanical/Plumbing: Shared radiant floor heating zone with adjacent corridor, sink.

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: None

Corridors

Space Characteristics

Function/adjacencies: Provides horizontal building circulation and egress.

Special Dimensions:

Ideal Plan Dimensions: As required by life safety code
Minimum Ceiling Height: 9'-0"

Acoustics: Minimum STC 55 at walls adjacent to sleeping rooms; minimum IIC 50 at floor to ceilings; minimum NRC .17 for wall coverings (for sound absorption).

Access: Open

Number of Occupants: 300 per floor, code calculated for R-2 occupancy

Mechanical/Plumbing: Radiant floor heating, transfer air ventilation

Electrical/Communications: Power receptacles, lighting

Other/Special Requirements: None

Stair 1

Space Characteristics

Function/adjacencies: Provides vertical building circulation and egress. Locate in accordance with life safety codes for exit separation between stairways and for travel distances at each floor.

Special Dimensions:

Ideal Plan Dimensions: As required by life safety code
Minimum Ceiling Height: 9'-0" clear at all areas to accommodate bulky items

Acoustics: Minimum STC 55 at walls adjacent to sleeping rooms

Access: Open

Number of Occupants: 150 per floor, which is half of the code calculated R-2 occupancy for each floor.

Mechanical/Plumbing: Individual heating zone with thermostat

Electrical/Communications: Lighting

Other/Special Requirements: Provide area of refuge at each floor landing in size and location as required by life safety code.

Stair 2

Space Characteristics

Function/adjacencies: Provides vertical building circulation and egress. Locate in accordance with life safety codes for exit separation between stairways and for travel distances at each floor.

Special Dimensions:

Ideal Plan Dimensions: As required by life safety code

Minimum Ceiling Height: 9'-0" clear at all areas to accommodate bulky items

Acoustics: Minimum STC 55 at walls adjacent to sleeping rooms

Access: Open

Number of Occupants: 150 per floor, which is half of the code calculated R-2 occupancy for each floor.

Mechanical/Plumbing: Individual heating zone with thermostat

Electrical/Communications: Lighting

Other/Special Requirements: Provide area of refuge at each floor landing in size and location as required by life safety code.

PART FOUR –PERFORMANCE AND PRESCRIPTIVE REQUIREMENTS

1.0 CIVIL AND SITE WORK

A. Performance Requirements

Existing Site Description

The new lodging facility, Building 30, will sit to the southwest of Main Street and west of the new Contingency Operations building in the central section of McMurdo Station. The existing site consists of a well-developed gravel pad. Current project information indicates that the pad is relatively level and graded to provide drainage to the southwest, however, due to the tandem design effort for the Core Facility Building, pad elevations and grading must be verified throughout design development for this project. The project site is bounded by Building 202 immediately adjacent to the north, Building 206 immediately adjacent to the south, a gravel road and ditch to the west, and Building 164 to the east.

Currently, the site is occupied by Building 203, wings A, B and C. These facilities are served by utilities that include domestic water, fire water, sanitary sewer, fuel oil, and electrical. All three wings of Building 203, and the utilities that serve them, will be demolished by others and removed in advance of this project.

Proposed Site Description

A layout line was developed to represent the edge of an expanded gravel pad that will require the demolition of existing utilities, grading, and miscellaneous earthworks to be completed by others. The proposed site has been arranged to be forward compatible with the future improvements identified in the master plan. These improvements include a 30-foot wide roadway located east of Building 30 and two additional lodging facilities, Buildings 31 and 32, south of Building 30. The ultimate site wide drainage, landscaping, parking, site circulation, and utility layout and distribution will be provided under a separate contract. It is anticipated that this work, in the vicinity of Building 30, will be completed prior to construction of the building.

Civil site improvements for this project are limited to siting and finish grading of the facility to be forward compatible with the ultimate improvements. The plan view location was sited so that the construction of Buildings 31 and 32 would require the least amount of demolition at any time. Minimizing the offsets between the buildings, edge of the slope to the west, and Building 202 maximizes the distance between Buildings 30, 31, and 32 and the Contingency Operations building and therefore limits the impacts to the proposed roadway.

The finish floor elevation was determined after reviewing the existing elevations and grades of the site and taking into account a clear flow path to prevent snow drifting on the roadway in between Building 30 and the Contingency Operations building.

Grading

The site will be rough graded after Buildings 203 A/B/C have been demolished. Rough grading will be provided under a separate contract. Finish grading for this project is limited to grading work in the immediate vicinity of Building 30, and will be provided as part of this project. These grades are a function of the existing conditions. The site grading plan has been included and maintains existing flow patterns in a Northeast-Southwest direction at a 2-percent slope.

Temporary construction grading should be maintained so that positive drainage is provided until a final grade can be established.

Documentation will be needed for the "Site Development" credit that the soil is "reused for functions comparable to their original function."

A site assessment must be documented for the Leadership in Energy and Environmental Design (LEED) "Site Assessment" credit: "Document assessment of project design related to topography, hydrology, climate, vegetation, soils, human use, human health effects, proximity of vulnerable populations, adjacent physical activity opportunities, and proximity to major sources of air pollution." See Section 10 for LEED requirements.

Parking

Parking locations are not included in the scope of work for this project. Parking is provided at other locations established in the Master Plan and will be constructed under other projects.

Storm Drainage

No storm drains exist across the lodging site. Roadside ditches and culvert systems are currently being used to route drainage flows.

The proposed drainage system will be developed by others and will include shaping existing drainage ditches and providing check dams or drop structures, concreted trapezoidal channels, and adequately sized culverts.

Hydrology calculations will be completed by others as a part of the overall McMurdo Station drainage plan.

Hydraulic calculations will be completed by others as a part of the overall McMurdo Station drainage plan.

Any head loss calculations will be completed by others as a part of the overall McMurdo Station drainage plan.

Utilities

Utilities to support Building 30 are assumed to consist of: domestic water, fire suppression water, sanitary sewer, heat loop supply and return, power, fuel, and communications. All of these utilities are assumed to be fed to Building 30 via the exterior McMurdo utility distribution systems, which is a separate project.

Landscape Design

There are no Landscape Enhancements for this project.

B. Prescriptive Requirements

A minimum 30-foot clearance between buildings shall be provided for fire truck access.

2.0 ARCHITECTURE

A. Performance Requirements

General

The 35% design describes a building superstructure consisting of a structural steel frame with light gage metal infill. The exterior building enclosure consists of a continuous cavity assembly with an exterior insulated metal wall, roof, and raised floor panel enclosure and an interior insulated framed wall, roof and floor enclosure. This cavity assembly provides a whole building thermal break by enclosing structural components within it. The airspace in the cavity contributes to the minimum R-65 design requirement. Columns passing through the raised floor assembly include structural thermal break components at the points of penetration through the floor assembly; see Section 4, "Structural" for more information. Note, this cavity configuration also corresponds to the benchmark findings for composite metal building enclosure systems discussed in the McMurdo Station Modernization Study, *Building Shell and Fenestration Study*, dated 29 April 2016.

In order to achieve an R-65 design value for the building enclosure, the Revit BIM model and the architectural drawings in **Attachment C** indicate an estimated 9-inch thick insulated metal panel assembly with a 4-inch rigid-insulated framed assembly on the interior side of the enclosure cavity. An R-65 design value is intended to allow R-5 for construction and weather variation tolerances so that a minimum tested R-60 value can be achieved. Wall, roof, and raised floor assemblies are required to achieve a minimum R-60 when tested in accordance with ASTM C518, *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*.

The Contractor must adjust thicknesses of materials and assemblies in accordance with thermal requirements for the particular components selected for the project. Note, most insulated metal panel manufacturers do not offer assemblies thicker than 6-inches therefore a custom solution will most likely be required.

Provide insulated exterior glazing with thermally broken frames that achieve a minimum R-7 (0.14 U-value) when tested in accordance with American Society for Testing and Materials (ASTM) E2190, *Standard Specification for Insulating Glass Unit Performance and Evaluation*.

Provide exterior glazing with the following features:

- Insulated, multi-pane, glazed units (IGUs) with low-E coatings. Vendor data for IGUs indicates that gas filled cavities are only effective for approximately ten years, therefore gas filled cavities may not be counted in thermal resistance calculations. IGUs must rely on the number of glazing panes, types of thermal coatings, thermal breaks, and airspaces to achieve ratings. IGUs must be factory assembled, sealed, and certified.
- Glazing shall include coatings to control glare while allowing appropriate visible light transmittance. Dynamically tintable (photosensitive) glazing may be proposed; however, functionality in this climate must be documented.
- Exterior lites of IGUs must contain laminated layers to withstand high wind projectile conditions for this particular wind zone in accordance with ASTM E1886, *Standard Test Method for Performance of Exterior Windows, Curtainwalls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials*, and ASTM E1996, *Standard Specification for Performance of Exterior Windows, Curtainwalls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes*. Because these standards are not written specifically for the Antarctic, values may have to be extrapolated. Debris in this location is considered to be ice.
- All glazed units must be fixed (non-operable).

Provide insulated exterior doors. Door cores must achieve a minimum R-11 (0.09 U-value) when tested in accordance with ASTM C518 Standard Test Method for Steady-State Thermal Transmission

Properties by Means of the Heat Flow Meter Apparatus. Doors with polyurethane cores appear to meet this requirement.

Door hardware and accessories must be specified for the harsh, high wind environment at McMurdo Station. Specifications must include corrosion-resistant metals suitable for this location. Exterior door hardware must be operable while wearing gloves of thickness and types rated for subzero temperatures.

Additional accommodations for surge occupancy will be accomplished with the addition of stackable (bunk-type) beds. No additional square footage will be allocated for surge occupancy. Bed frames in the Revit BIM model indicate bunk bed frames, however, top bunks have been omitted and are not part of this project.

Wall assemblies in sleeping rooms must be detailed to provide a minimum sound transmission class (STC) rating of 55 when tested in accordance with ASTM E336, *Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings*. Interior wallcoverings at sleeping rooms must provide a minimum NRC rating of 0.17.

Floor assemblies in sleeping rooms must be detailed to provide a minimum IIC rating of 50, without the carpet, when tested in accordance with ASTM E1007, *Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies*. A flexible membrane within the floor assembly may be necessary to achieve this rating.

The Revit BIM model indicates a 0.5-inch layer of American Plywood Association (APA) plywood subfloor on top of the modular in-floor hydronic radiant heat system. This subfloor provides a base for carpet in the sleeping rooms and a protective covering over the radiant heat tubes below it. Alternate products may be used if verified to be compatible with the radiant heat system, with carpet requirements, and with IIC ratings for floor assemblies.

Interior doors must include hardware to mitigate sound from closing doors. Coordinate closer type and balancing, provide rubberized seals, hinges, latches and locks so that sound is mitigated and doors close completely. Provide seals that block corridor light from infiltrating sleeping rooms.

Corridor and stair locations and widths indicated on the drawings comply with life safety requirements for egress components for this R-2 occupancy and construction type (IIB with sprinklers). Should final floor layouts vary from those outlined in these documents, the Contractor must demonstrate life safety code compliance of the final design layout. Contractor must provide updated life safety analysis (LSA) with each design phase.

Two lounges shall be provided on each floor. One small "quiet" lounge and one larger lounge are indicated on the drawings. Designs for a subsequent building may convert the larger lounge into a commercial laundry room, however, a commercial laundry is currently not part of this scope of work (SOW). See Section 3, "Interiors" for additional information about lounges.

Each floor shall include a residential laundry room with four washers and six dryers. Laundry rooms shall be located and furnished as indicated on the drawings. Note, dryers must be stackable units; see Part Five for sample product data.

Kitchens are intended to be partial kitchens, essentially coffee areas, without cooking equipment, refrigerators, or dishwashers. Kitchens shall include a sink, countertop with cabinets, microwave, and convenience outlets at countertop height. The intentional omission of cooking equipment is to eliminate fire concerns associated with such equipment. The intentional omission of shared refrigerators and dishwashers is to eliminate operational issues associated with managing and maintaining these appliances. Each sleeping room includes a small refrigerator for personal use.

Provide gendered toilet rooms on each floor as indicated on the drawings. Note, toilet, urinal, lavatory, drinking fountain, and mop sink quantities are intentionally provided in excess of requirements indicated in the 2015 International Plumbing Code (IPC). Due to space restrictions, shower quantities are deficient by one shower for each gender; however, it is preferred that the code minimum be met, if possible, during modular design.

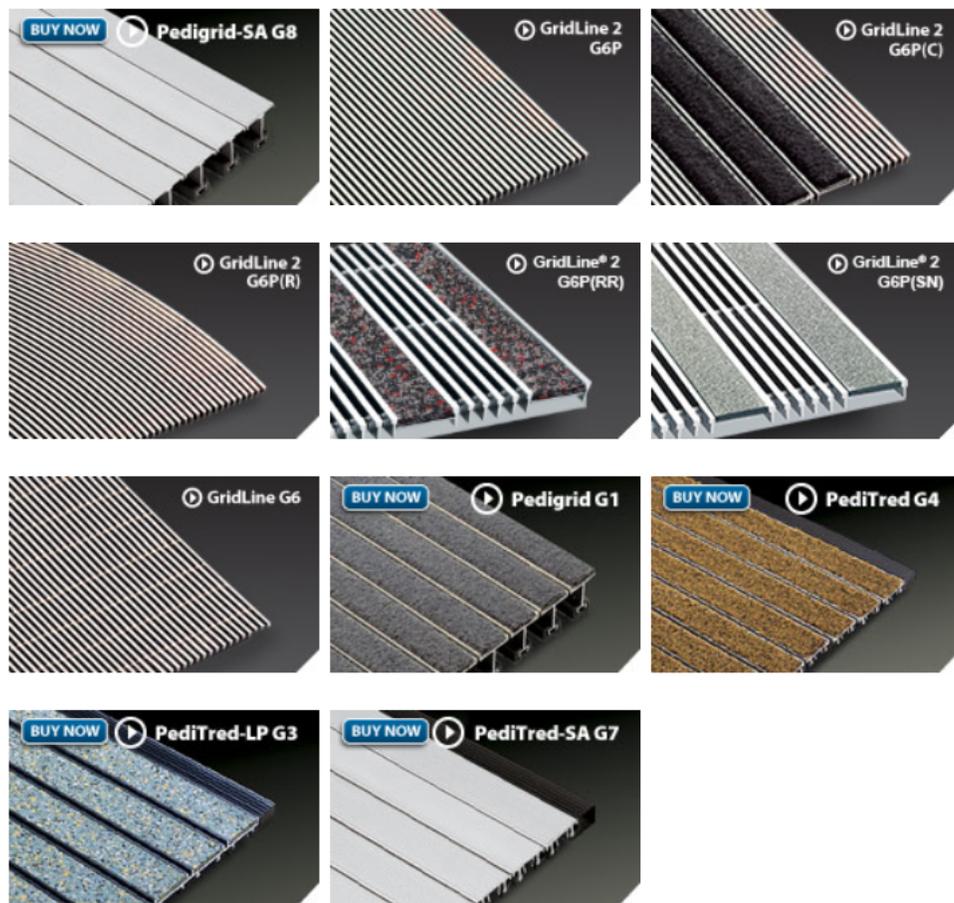
Provide a trash collection room on each floor. Verify separation, recycling, and storage requirements with McMurdo Station refuse handling regulations.

Provide telecommunication, electrical, and mechanical rooms on each floor as indicated on the drawings. Verify sizes of these rooms with equipment and systems selected during design development. Unless requested otherwise, telecommunication rooms require a 10-foot-by-12-foot minimum (inside clear dimension) space on each floor of each building. Verify equipment clearances and door swing requirements per applicable codes and operational requirements.

Provide a minimum quantity of 96, 1-foot-by-1-foot open-faced storage cubbies, stacked in tiers, in the entries to the main toilet rooms on each floor; see **Attachment C** for locations. These cubbies are intended for storage of toiletries and are not intended to be locked or otherwise secured. See product data and Revit BIM model for suggested cubby units. No other lockers or additional storage for building occupants will be provided in Building 30; additional storage is planned to be located in an adjacent building and is, therefore, not part of this SOW.

Provide entry grate systems, extending a minimum of 10-feet into the entry and entirely covering the width of the entry at every grade level entry. Verify that the type of metal will withstand snow and ice abatement measures (i.e. salt, glycol, cinder) without excessive degradation. The following are examples of acceptable entry grate systems:

Entrance Grates



Building Code and Life Safety Analysis

A complete LSA is indicated on the drawings. A summary is also provided herein. The LSA is provided as a recommended path forward for the Contractor, and to demonstrate life safety compliance of the 35-percent design. The Contractor must demonstrate compliance of the final design with all applicable codes and standards. More restrictive types of construction are acceptable provided the increase in construction costs for elements such as spray fireproofing is warranted by project factors and is approved in writing by ASC. Highlights of the LSA include:

- a. Occupancy: Residential Group R-2, dormitory use
- b. Construction Type IIB, non-combustible, with sprinklers
- c. 0-Hour (HR) fire-ratings at structural frame, bearing and non-bearing walls, floors and roof
- d. 1/2-HR fire separation between individual sleeping rooms and between sleeping zones and adjacent uses
- e. 1/2-HR horizontal fire separations between individual sleeping rooms and between sleeping zones and adjacent uses
- f. Automatic sprinkler system required
- g. Allowable height and stories per building: 75 feet / 5 stories
- h. Actual (estimated) height per building: approximately 50-feet (including 4-feet clear below raised first floor)
- i. Allowable area: 130,904 SF
- j. Actual approximate area: 15,870 SF x 3 floors = 47,600 GSF
- k. 30-foot fire separation required between buildings to avoid fire-rating both facades of buildings facing one another
- l. 30-foot fire ring road is required by the NSF

The Americans with Disabilities Act (ADA) does not apply to federal executive agencies, of which the NSF is one. The Architectural Barriers Act (ABA) of 1968 and the Rehabilitation Act of 1973 do apply to federal agencies, however, in the opinion of the NSF Office of General Counsel, they do not apply to Antarctica. Therefore, there are no legal requirements for USAP to design or construct structures in Antarctica in accordance with U.S. accessibility standards. Therefore, accessibility codes indicated herein do not apply to this project. However, accessible egress from each floor of the building has been provided in the form of level egress components; adequate widths and clearances at corridors, stairs, and stair doors; and areas of refuge in both stairwells. See the **Attachment C** for more information.

Construction Description – Building Envelope

Design parameters for the exterior building envelope include:

- a) Onsite construction efficiency: Prefabricate or shop fabricate as many building components as possible to allow minimal site assembly and to provide quality control of assemblies within a shop setting. Prefabrication or shop fabrication must not introduce shipping and handling conflicts. IGUs must be shop fabricated, sealed, and certified.

- b) Energy efficiency: The Contractor shall develop the design of the building envelope in accordance with requirements, including but not limited to, thermal and moisture resistance, air infiltration and exfiltration limits, and energy use limits. Verify compliance at each design phase using building analysis modeling for the complete building envelope. Verify the specific location of the dew point within the building envelope and specify and locate vapor and/or air barriers so as to avoid condensation and trapping of moisture within said envelope. Because the dew point, and therefore the types and locations of air and/or vapor barriers, depends on final building enclosure and HVAC system selections, these barriers have been omitted from architectural assemblies indicated on the drawings. Barrier types, locations, and detailing must be determined during design development by the Contractor. Lighting must be specified for efficient energy use and operation. Effective climate control must facilitate energy conservation.
- c) Resistance to, and resilience in, a harsh and variable Antarctic environment: 170-mile per hour (mph) wind, extreme temperatures, prolonged periods of daylight and darkness. Design building connections for expansion and contraction over a wide range of temperatures and conditions. Design floor-to-wall and wall-to-roof corners for aerodynamic performance; the drawings suggest chamfered corners; however, other such eased edges are acceptable. Specify materials that can withstand scouring, corrosion due to ice and snow abatement measures, and expansion and contraction due to extreme temperature variations. Provide a continuous roof, wall, and raised-floor enclosure without eaves, parapets, rakes, or other protrusions. Omit gutters and rain leaders to avoid ice damming. In this wind zone, snow is typically blown from roof surfaces, and rain is scarce; therefore, the drawings suggest a low slope roof profile which has been found to perform best in this environment.
- d) 50-year lifespan: Specify building materials, detail, and construct to last at least 50 years in this particular environment.
- e) Architectural expression: Reflect the mission and stature of the NSF within the context of the McMurdo Station site. Building forms and scale, textures, colors, and juxtapositions with other buildings are contributing factors.
- f) Welcoming: Because Building 30 will be home away from home to many people, provide a building whose facades, entries, pathways, and lighting are welcoming and simple to navigate.

B. Prescriptive Requirements

Sleeping room sizes must be as indicated on the drawings provided in **Attachment C**. Dimensions on the drawings are to centerlines of framed components, are provided for construction layout purposes, and do not indicate clear dimensions of spaces. Note, compliance with these sleeping room dimensions are critical to allow specified furniture and accessories to fit within each space, to achieve the required quantity of sleeping rooms in each building, and to provide required fire lane separations of 30-feet between buildings.

Sleeping rooms must include single- and double-occupancy rooms as indicated on the drawings. See Part Three herein for more detailed information regarding number of beds provided.

The landing at Stair 2 is intentionally oversized to accommodate moving large items up and down stairs. Provide pairs of doors as indicated, with removable astragals and one pinned leaf. Indicate egress leaf on final life safety drawings. Provide 13-inch-deep stair treads to accommodate snow boots.

3.0 INTERIORS

A. Performance Requirements

General

This project includes the selection and coordination of interior and exterior materials and finishes. Attention to durability, maintenance and function has been exercised to assure the best possible products are proposed herein. Materials and finishes were selected for long term appearance retention and for their low maintenance characteristics. Colors, textures and patterns have been selected to compliment the exterior geographic region of the facility. Product data for interior materials, finishes, and furniture are provided in Part Five.

Wall Finishes

Gypsum wallboard (GWB) shall have a semi-gloss painted finish with a light orange peel texture except at sleeping rooms which shall have acoustical wallcoverings that achieves a minimum 0.17 NRC (for sound absorption). GWB shall be fire-rated type "X". Lighter weight fire-rated GWB is available to meet the ½-hour fire-rating that is required, however, proposed products must demonstrate compliance with required ratings and type "X" GWB composition.

Provide acoustical wallcovering in sleeping rooms and corridors. Provide a wallcovering with a minimum 0.17 NRC when used over GWB. Wallcovering backing shall be fused poly of a minimum 24 ounces/face weight. Products must comply with the requirements of National Fire Protection Association (NFPA) 265, Class A, when tested in accordance with ASTM E-84, *Standard Test Method for Surface Burning Characteristics of Building Materials*. Wallcovering shall contain 90-percent post-consumer, recycled solution dyed, polyester stable fibers, shall be pill-resistant, and easy to clean and maintain.

Solid Surface: Solid surface material when used in a vertical application shall be ¼" thick. Material shall be installed in a "no seam" appearance.

Wall base: Rubber base shall be a permanently impregnated patterned base. The style of the base shall be a traditional cove base no less than 4-inches in height. The rubber base shall contain no less than 15% post-consumer recycled content. Indoor air quality and FloorScore certified product shall be considered. The same color of rubber base shall be used throughout the entire facility to reduce waste and minimize storage of extra product.

Floor Finishes

Entrance Flooring: The entrance flooring shall be a heavy duty removable stainless steel monolithic grid system with slip resistant inserts. The flooring shall run the entire length of the entrance vestibule area. The product shall have a minimum rolling load of 500 pounds (lbs). The product shall be available in 5/8-inch, ¾-inch and 1-1/8-inch depths. The grid system shall contribute to the Material and Resources (MR) Credit 4 and Indoor Environmental Quality (IEQ) Credit 5 for LEED New Construction (NC) v4. See Section 10 for LEED requirements.

Carpet tile: Shall be a modular, multi-level pattern looped carpet. The fiber construction shall be an Eco Solution Q nylon or approved equal. The product shall be a 100% solution dyed fibers. The carpet shall have at a minimum 10.5 stitches per inch and shall have no less than 6/32-inch high pile height. The product size shall be 24-inch by 24-inch per tile. The carpet shall meet the texture appearance retention rating (TARR) traffic class. The carpet shall be bleach resistant and easy to clean. A quarter-turned installation method is preferred. The carpet will be installed over ½-inch thick APA plywood subfloor over an in-floor hydronic radiant heat system. The carpet shall be removable using a tack-tile method to allow the end user to replace carpet tiles as needed.

Rubber flooring: Flooring shall be of a homogeneous, vulcanized rubber compound with environmentally compatible color pigments that are free of toxic heavy metals like lead, cadmium or mercury. The rubber shall have a random scattered design. The overall and wear layer thickness shall not exceed 0.12 inches (3MM). The roll length of the product shall be a minimum of 39-feet and be 4-feet wide. There shall be a wide range of colors available.

Ceiling Finishes

Gypsum wallboard: at sleeping rooms and at other accent areas, as indicated on the drawings. GWB shall have a semi-gloss painted finish with a light orange peel texture. For simplicity and economies of scale, all GWB shall be fire-rated type “X.”

Acoustical Ceiling Tiles (ACT): at corridors and other public spaces shall be 2-foot by 4-foot tiles with a 2-foot by 2-foot false grid. Provide tiles with a minimum NRC rating of 0.90.

Color: Ceilings shall be painted light colors to provide even and ample reflected light to spaces.

Windows

Window sills shall be integral to the window and shall be aluminum. See Section 2, “Architecture” herein for more information about glazing assemblies.

Window coverings in each sleeping room shall contain a dual track shade system with SnapLoc fascia concealment at the head and both jambs of the window. The system must include a blackout shade cloth and a basket weave construction shade within the dual track system. The blackout shade cloth shall be composed of a PVC-free fiberglass material with an opaque acrylic backing. The fabric shall be flame retardant and fade resistant. The basket weave shade shall be composed of a 2-foot by 2-foot woven material in a basket weave pattern. The construction of the material shall provide a uniform scrim effect at the window wall with a 3-percent openness. The color of the shade shall match the overall paint or wallcovering color of the room.

Typical Room Finishes

Toilet and Shower Rooms

Floor	Rubber sheet flooring
Base	Flash cove rubber base
Walls	Solid surface or approved equal. GWB substrates must be moisture resistant.
Ceilings	Painted GWB or moisture resistant ACT
Casework	Quartz solid surface counter with backsplash, apron to conceal plumbing
Toilet Partitions	Phenolic resin floor and ceiling anchored toilet partitions
Toilet Accessories	Stainless steel, verify McMurdo vendor program. Include shelves at lavatories.
Plumbing Fixtures	Wall-mounted lavatories, floor-mounted toilets, prefabricated shower inserts. Shower doors to be polycarbonate, or approved safety equal.

Corridors

Floor	Carpet tile
Base	Rubber
Walls	GWB, acoustical wallcovering
Ceilings	ACT, 2 x 4 tiles with a 2 x 2 false grid. Minimum .90 NRC

Sleeping Rooms

Floor	Carpet tile
Base	Rubber
Walls	Type "X" GWB, with acoustical wallcoverings with a minimum .17 NRC for sound absorption
Ceilings	ACT, 2 x 4 tiles with a 2 x 2 false grid. Minimum .90 NRC
Specialties	Tackboard, heavy duty coat hooks
Windows	Dual track system (blackout and basketweave shade cloths)

Janitor Closet, Trash/Recycle Room

Floor	Rubber sheet flooring
Base	Flash cove rubber base
Walls	Solid surface or approved equal
Ceilings	Painted GWB

Lounges

Floor	Carpet tile, laminate flooring
Base	Wood, rubber
Walls	Wood, wallcovering, paint
Ceilings	ACT, 2 x 4 tiles with a 2 x 2 false grid. Minimum .90 NRC

Laundry Rooms

Floor	Rubber sheet flooring
Base	Flash cove rubber base
Walls	Solid surface or approved equal
Ceilings	ACT

Entry Vestibules and Skyways

Floor	Recessed removable grid system
Base	Rubber
Walls	GWB, painted
Ceilings	ACT

Stairs

Treads/Nosings	Stamped rubber
Base	Rubber
Walls	GWB, painted
Ceilings	GWB, ACT or open as required for sound, fire-ratings and mounting of selected lights

Mechanical/Electrical Rooms

Floor	Sealed concrete
Base	Rubber
Walls	GWB, painted
Ceilings	GWB, ACT or open as required for sound, fire-ratings and mounting of selected lights

Comm Rooms

Floor	Electrostatic dissipative (ESD)
Base	Rubber
Walls	GWB, painted, verify location and extent of plywood backer board
Ceilings	GWB, ACT or open as required for sound, fire-ratings and mounting of selected lights

B. Prescriptive Requirements

Furniture, Fixtures and Equipment (FFE)

All Furniture, Fixtures and Equipment (FFE) are to be provided as part of this project. KI Furniture is the required vendor at McMurdo Station. Verify current model numbers and furniture components at time of order entry. Product information is included in Part Five.

Sleeping Rooms

The furniture described is a flexible furniture system that allows reconfiguration to fit individual needs. The system offers height adjustability, a tool-free assembly and non-handed components. Each room shall contain a bed (bunkable), 2- Drawer freestanding dresser to be located under the bed to maximize space, and freestanding wardrobe. In the single occupancy rooms, 50-percent of them contain a small desk and chair. The other 50-percent have a lounge chair with tablet arm. The double occupancy rooms shall have a small desk and chair or a lounge chair that separates the individual beds. Confirm the percentage of desks / lounge chairs during final design.

BED FRAME, DECK AND ASSEMBLY: The bed frames are fabricated with two heavy 14-gauge steel tubular uprights. A vertical slotted pattern allows the height of the bed to be adjusted on 1" increments. The bed deck assembly is composed of two 11-gauge steel rails with hooks that fasten into the vertical slots of the bed frame ends. The mattress shall be laid upon a bed deck that is composed of three ¾" thick, 45lb density particle board with a melamine top and bottom for stability. The metal finish of the bed is an electrostatically applied epoxy powder-coat finish for durability. The mattress size is 39"x 79" and consists of a 13-gauge contact unit, 7" thick, with boric acid felt on each side, insulator pad, inverted seams, foam corners. The mattress can be wrapped in 4mm plastic film making it waterproof and bed bug resistant. The mattress shall meet Federal Government Flammability Standards DOC FF4-72. The bed assembly shall include a personal shelf that hooks onto a side rail of the bed deck to provide storage at the bed height. The shelf shall be of a laminate surface with indentions to hold phones, drinks and radios. Overall dimensions: 38 7/8"Wx86"Lx39 3/8"H

2-DRAWER FREESTANDING DRESSER: The freestanding dresser shell shall be constructed of a laminated woodgrain front and top and shall be ¾" thick, constructed of particleboard with high-pressure laminate surface. Edges and front shall be banded with matching edge banding for added durability. Heavy-duty steel ball-bearing drawer suspension shall be provided. The dresser shall come with option on locking capability. The grain direction on top shall be left to right and on the drawer fronts

it shall be vertical. The woodgrain laminate shall come in a variety of wood finishes, maple to walnut finish for variety. Overall dimensions: 29-9/32"H x 36"W x 18-7/8"D

FREESTANDING WARDROBE – COMBINATION UNIT: Wardrobe shell shall be constructed of 20-gauge steel. The uprights, top and bottom shall be a reinforced welded construction into a rigid box frame. Lock options shall be available based on the customer's needs. The combination unit shall come with a hanging area above and drawers underneath. Heavy duty steel ball bearing drawer suspensions shall be provided. The wardrobe shall have a laminate front to match the freestanding dresser. The door pulls located at the top of the door shall be the same design as on the drawers. The woodgrain direction shall be vertical. One mirror shall be provided on the right-hand side of the interior door of the cabinet. Overall dimensions: 76"H x 36"W x 24"D

DESK ASSEMBLY: Desk top shall be constructed with ¾" thick M3 particle board with a high-pressure laminate top and phenolic backing sheet. A "Y-22" style leg is preferred and shall be of a welded construction with 1" diameter, 16-gauge steel tubing. The legs shall be powder coat painted. The table shall contain two wheel locking casters. The casters shall be a minimum of 2.44" in diameter. The wheel treads shall be easily mobile on carpet surfaces. Overall Dimensions: 24"D x 30"W x 29"H

DESK CHAIR: The chair shall be of two piece construction. The seat shall be upholstered with fabric placed over foam using a drawstring process. The back shall be made of injection molded polypropylene with cantilever springs. The back shall provide a supportive flex movement with an integral molded handle. The chair shall be provided with double wheel casters that are made of high-impact thermoplastic and shall be easily movable on carpet surfaces.

TABLET ARM LOUNGE CHAIR: The chair shall be constructed of a seat frame and arms that is a minimum ¾" laminated hardwood plastic with 5/4 maple cross rails. All mainframe joints shall be double doweled and glued. The chair shall have a sled base that is constructed of 16-gauge round steel welded tubing that is attached to a steel mounting plate and secured to the frame. The seat and back suspension shall be stretched strap webbing inner woven and stapled into position. The back shall have a density of 1.5 foam and compression of 26-pound (lb) that is 3" thick. The tablet shall be ¾" laminate construction with a medium density fiberboard core with high pressure laminate facing on both sides with a 2mm polyvinyl chloride (PVC) edge banding. Overall Dimensions: 32"W x 33.5"D x 28.25"H

MINI REFRIGERATOR: An Energy Star qualified 1.1 cu.ft single door auto-defrost refrigerator shall be provided. The unit shall maintain a 38-degree Fahrenheit (F) at 75.2-degree F +/- 1.8-degree F ambient temperature. The door swing shall be reversible. The capacity of the refrigerator shall be able to maintain (5) cans in a beverage can dispenser, with a tall bottle door shelf. 2 front adjustable leveling feet shall be provided so that the unit be installed with at least a ¾" to 1" space below the bottom in order to let the air circulate freely around the unit. Overall Dimensions: 20-5/8" H x 15"W x 16-1/8"D

Lounge Areas

The lounge areas shall include a combination of soft seating such as lounge chairs and sofas. Additional furniture shall include bookcases, small tables, and chairs. The intended use of the each lounge area will determine the particular furniture used. Contractor shall verify use and furniture with ASC. Designated quiet lounges have been placed on each floor and are enclosed by interior relites and doors. A more social open lounge area intended for games and various activities for larger groups of people are also located on each floor in the more "public" zone of each floor plan. The following items are proposed for use within the space.

LOUNGE CHAIR AND SOFA: The chair shall be constructed of a seat frame and arms that is a minimum ¾" laminated hardwood plastic with 5/4 maple cross rails. All mainframe joints shall be double doweled and glued. The chair shall have a sled base that is constructed of 16-gauge round steel

welded tubing that is attached to a steel mounting plate and secured to the frame. The seat and back suspension shall be stretched strap webbing inner woven and stapled into position. The back shall have a density of 1.5 foam and compression of 26lb that is 3" thick.

STUDY/GAME TABLE: Table shall have a top that is 1-1/4" thick, particleboard core construction with a .05" high-pressure laminate facer and .026" backer on the underside. A solid oak or maple edge shall be provided around the perimeter of the table. The legs shall be attached to the apron using dovetail joinery and heavy-duty anchoring bolts. Each leg shall have a 2" diameter nylon-based adjustable leveling glide.

WOOD CHAIR: A 4-leg wood chair shall be used and placed around the study/game table. The chair shall come from the same series of the table to maintain consistency of finish, design and style. The chair shall contain a wood seat.

BOOKCASE SHELVING: The shelving shall be a Grade A oak or maple veneer on both faces. The veneer shall cover the bookcase so that it is covered if placed in a freestanding application. Adjustable wood shelves shall be provided, quantity determined by the height of the unit. The shelves shall be placed in a peg and groove design to prevent accidental removal. Bookcase unit shall contain a base and top cornice detail.

Laundry Rooms

Each laundry room shall contain (4) washers and (6) dryers. Two 24-inch by 48-inch folding tables shall be provided and shall be easily accessible.

WASHER: A commercial front load washer shall be provided. The washer shall have an electric powered connection – 120/208/60/1 15-amp requirement. The spin speed shall exert 440 g-force extraction and shall provide no less than 1200 spin speed – revolutions per minute (RPM). A commercial-grade stainless steel washtub shall be provided with no less than 11.7 gallon water consumption. The following cycles shall be provided: Heavy Duty, Normal Eco, Perm Press, Delicate, Rinse and Spin, and Spin Only. The washer shall provide hot, warm and cold water temperatures. An extra wide 15.5" door opening with a 180-degree door swing is desired. The washer shall be U.S. Department of Energy (DOE) complaint for energy and water efficiency. The color shall be white. Overall Dimensions: 26 7/8"W x 27 3/4"D x 40 7/16"H

DRYER: A commercial single load dryer shall be provided. The dryer shall have an electric powered connection – 120/208/60/1 30-amp requirement. The dryer heating shall be 5350-Watt (W), 208-Volt (V). The following cycle temperatures shall be provided: Regular, Perm Press, Delicate, Time Dry, Quick Dry, and Fluff Up. The galvanized cylinder volume shall be no less than 7.0 cu. ft. The door shall be reversible for installation flexibility. The unit shall be 100% serviceable from the front. The lint filter shall be upfront and easy to clean and be secured. The color shall be white. Overall Dimensions: 26 7/8"W x 28"D x 40 7/16"H

FOLDING TABLES: A 24"x48" laminate folding table shall be provided. The table shall have a plastic laminate surface and a vinyl t-mold edge. The table shall have folding legs and shall be easily movable. The table shall be able to lock in place when in use. Overall Dimensions: 48"W x 24"D x 29"H

Toilet Entries

CUBBY STORAGE: (16) 1/2" thick High Density Polyethylene (HDPE) 6-tier, plastic cubby storage units shall be provided in this location. The units shall have a homogeneous color and matte texture finish. The frames provided for structure shall be welded to the box to provide a secure, rigid assembly. A

sloped top shall be provided to prevent accumulation of dust and storage items on top. The units shall be impervious to moisture and shall not rust or delaminate. The units shall be made from 30-percent pre-consumer recycled HDPE plastic. The color shall be as provided on the Finish Schedule. Overall Dimensions (1-Unit / 6-Tiers): 12"W x 12"D x 72"H / Opening Width – 11-1/4"W.

4.0 STRUCTURAL

A. Performance Requirements

Design Codes and Standards

The facility shall be designed and constructed in accordance with the following codes and standards. This is not an exhaustive list and additional standards may apply to the final design:

- 2015 International Building Code (IBC)
- ASCE 7-10, Minimum Design Loads for Buildings and Other Structures
- AISC Steel Construction Manual, Fourteenth Edition
- AISC 360-10, Specification for Structural Steel Buildings
- AWS D1.1/D1.1M: 2015, Structural Welding Code - Steel
- AWS D1.3/D1.3M: 2008, Structural Welding Code – Sheet Steel
- ACI 318-14, Building Code Requirements for Structural Concrete
- PCI, Precast Concrete Institute Design Handbook, Seventh Edition
- SDI ANSI/NC1.0-10, Steel Deck Institute Standard for Noncomposite Steel Floor Deck
- SDI ANSI/RD1.0-10, Steel Deck Institute Standard for Steel Roof Deck

Design Criteria and Loads

The Lodging Facility shall be classified as a Risk Category II building.

Dead Loads: Minimum dead loads shall be in accordance with ASCE 7. Dead loads include the weight of all permanent materials and equipment supported in or on a structure, including the structures own weight.

Live Loads: Minimum live loads shall be accordance with Chapter 16 of IBC 2015 and as follows:

AREA	LOADS
Bedrooms and Corridors Serving Bedrooms	40 psf
Public Areas and Corridors Serving Public Areas	100 psf
Restrooms / Showers	75 psf
Mechanical / Electrical Rooms	125 psf
Laundry Rooms	125 psf

Lounges	100 psf
Roof Live Loads	20 psf
Ground Snow Load	40 psf

Psf = pounds per square foot

Wind Loads: The Basic Wind Speed (3-Second Ultimate Gust Speed) shall be 170 mph and Exposure D.

Seismic Loads: Minimum building seismic requirements are in accordance with ASCE 7. For the McMurdo site, the seismic design category (SDC) will be SDC = B.

Design Temperature: The design temperature range is minimum -39°F, maximum + 36°F.

Lateral Partition Loads: Minimum design pressure on interior stud partition walls is 5 psf.

Deflection Criteria: Roof and floor framing members supporting ceilings have deflections limited to a maximum 1/360 for live load and 1/240 for dead plus live load. Building lateral drift limit shall be limited to H/480 for the 10-year mean reoccurrence interval (MRI) wind speed.

Foundation Design Criteria: The designs of the building foundation system shall be based on recommendations in the *Geotechnical Assessment Report, McMurdo Station, Ross Island, Antarctica, by Golder Associates*, dated May 2016. Additional Geotechnical investigation is not anticipated as part of this project. The maximum allowable bearing capacity for frozen soil is 2090 psf. Ground floors shall be elevated a minimum of 4 feet above finished grade. This elevation is required to allow airflow and keep the permafrost frozen. Foundations shall be precast concrete spread footing bearing a minimum of 24 inches below grade. Refer to Section 9, "Shipping Constraints" for dimensional and weight restrictions.

Basic Materials of Construction

Concrete minimum 28 day compressive strength will vary depending on the structural element. The concrete strengths are $f'c = 4000$ psi for miscellaneous cast-in-place concrete, and $f'c = 5000$ psi for all precast concrete elements. Materials, design and construction shall comply with ACI 318. Detailing of reinforcement shall comply with ACI SP-66 in addition to ACI 318.

Reinforcing Steel shall be ASTM A615, Grade 60, deformed.

Structural steel will be as follows:

Section Type	ASTM Designation	Yield Stress
W- & WT-Shapes	A992	50 ksi
Channels, angles, plates and S-Shapes	A36	36 ksi
Rectangular HSS	A500, Gr. B	46 ksi
Round HSS	A500, Gr. B	42 ksi

Ksi – kilopound per square inch

Anchor bolts shall be ASTM F1554 Grade 55 and high strength bolts shall be ASTM A325 or A490.

Structural Systems

The facility shall be designed based on a rational engineering analysis in accordance with the governing building codes listed in paragraph A. The design shall be executed using well established principles of engineering mechanics and construction techniques to meet listed requirements.

The systems described in the following paragraphs describe the 35% design solution. Subsequent to the 35% design, modular construction was deemed the preferred approach. Accordingly, the Contractor shall consider these paragraphs as a reference only. Structural systems shall be appropriate for modular construction. Product data for selected structural components are provided in Part Five.

Gravity Systems:

The main building framing consists of wide flange structural steel columns supporting steel beams and girders. Bolted connections are utilized to the greatest extent possible to limit field welding. The columns are supported by precast reinforced concrete spread footings. The columns at the first floor level, and any other structural steel that protrudes through the thermal envelope, are spliced with high performance thermal break plates such as Farrat Thermal Breaks to prevent thermal bridging.

The floor systems consist of structural steel beams and girders supporting a 1-1/2"x20-gauge Type B, wide rib metal deck. The metal deck is topped with 3/4" (nominal), noncombustible, fiber reinforced cement board panels screwed to the metal deck. All panel joints occur over the top flutes of the metal deck to prevent cracking. The basis of design cement board is USAP PlyCem CemDeck. The design of the floor framing system shall consider the reduction of vibrational excitation due to both operable equipment and occupant live load.

The roof system consists of structural steel beams and girders supporting 1-1/2" Type B, wide rib metal deck.

Lateral Systems:

A lateral force resisting system consisting of steel ordinary moment frames accommodates the architectural and thermal requirements of the Lodging Facility. The moment frames are laid out and proportioned to limit lateral drift and uplift forces associated with overturning due to wind loads. The use of several wide moment frames minimizes concentrated overturning forces. Moment frames utilizing multiple columns and beams properly proportioned also reduce or eliminate the need for high-demand moment connections requiring web doubler and/or continuity plates.

B. Prescriptive Requirements

None.

5.0 MECHANICAL AND PLUMBING

A. Performance Requirements

Mechanical and Plumbing Systems shall be designed based on the following Design Criteria:

Space Design Conditions

Space Type	Cooling	Heating
Living Areas (Sleeping rooms, Lounge)	75°F	68°F
Service Areas (Laundry, Trash/Recycle, Service Spaces)	75°F	65°F
Communications Rooms	Maximum 75°F	Minimum 60°F
Unoccupied Areas (Electrical/Mechanical Rooms, Storage Rooms)	Maximum 85°F	Minimum 40°F

Outdoor Design Conditions

Summer: 36°F dry-bulb (DB)

Winter: -39°F DB

Energy Sources

The available energy sources are electricity and fuel oil.

Design Calculations

HVAC cooling and heating load calculations and energy analysis calculations for the 35% design were developed using the eQuest Energy Simulation Tool, version 3.65 and a summary is provided in **Attachment A**. The Contractor shall utilize similar software during design development.

General HVAC Zones and Loads

These criteria are established as baseline values for HVAC space loads. During the design development, these values shall be updated to reflect the actual specified equipment, occupant and lighting load.

Space Type	Miscellaneous	Occupants	Lighting (max)
Sleeping Rooms	0.5 W/sq.ft.	100 sq.ft./person	0.4 W/sq. ft.
Restroom/Shower	0.0 W/sq.ft.	1 per fixture	0.9 W/sq. ft.
Lounge Areas	1.0 W/sq.ft.	150 sq.ft./person	0.7 W /sq.ft.
Laundry	1.5 W/sq.ft.	100 sq.ft./person	0.6 W /sq.ft.

W/sq.ft. = Watts per square foot

Minimum Ventilation Quantities

All occupied spaces will be provided with minimum ventilation, per ASHRAE Standard 62.1-2016.

Space Type	Min. CFM/sq. ft.
Sleeping Rooms	5 cfm/person + 0.06 cfm/sf
Restroom/Shower	70 cfm/fixture + 50 cfm/shower
Lounge Areas	5 cfm/person + 0.06 cfm/sf
Laundry	5 cfm/person + 0.12 cfm/sf
Mechanical / Electrical	Based on actual heat loads

CFM= Cubic feet per minute

Sound Criteria

The following NC establishes the maximum permissible ambient noise levels within the buildings:

Space Type	Noise Criteria
All spaces except below	NC-40
Sleeping Rooms	NC-25
Lounge Areas	NC-35
Restrooms, Corridors	NC-45
Mechanical / Electrical Rooms / Service Space	NC-60

Heat Generation / Space Heating

The Lodging Facility will be connected to the “in town” heat recovery loop, fed from central plant jacket heat and excess heat from adjacent distributed plants.

Local “in town” generation will be via four distributed plants located near the corners of the new Core Facility complex (Central Services, Contingency Operations, Field Science Support/Warehouse, and Trades). Each plant will generate heat for input into the hydronic heating loop using one or a combination of the following:

- Combined Heat and Power (CHP) jacket heat (heat recovery)
- Combustion boiler

Central heat generation at the Lodging Facility will be by diesel fuel fired combustion boilers. The heating system for the building shall be designed to utilize all available heat from the hydronic site loop prior to energizing the boilers as a second stage heat source.

Hydronic distribution within each building will be via Schedule 40 steel piping with flanged fittings for piping over 3” in diameter. Piping 3” in diameter or smaller will be Type L copper with wrought fittings or extruded polyethylene (PEX) where practical. Piping insulation will comply with ASHRAE Standard 90.1 recommendations for 180°F heating pipe. Piping will be sized for a maximum velocity of 4 feet per second using a 30°F Delta T based on the design heating load.

System pumps shall be vertical in-line or canned rotor type. Variable speed drives shall be provided where practical. Pumps shall be selected to provide full flow to all connected loads utilizing a 30°F Delta T and within 5% of their peak efficiency.

Pumps and boilers will be provided in a redundant (N+1) configuration. Direct Digital Controls (DDC) will provide automatic switchover to the redundant unit upon failure of the primary unit and provide local and remote operator alarms. Similarly, lead/lag controls will provide equipment sequencing for multiple installations.

The hydronic loop will utilize a 50/50 mixture of reverse-osmosis (RO) water and propylene glycol. Glycol will be Dowfrost HD, no substitutions.

DDC will be provided for all HVAC systems. Redundant equipment will be automatically controlled and alternated in (primary/standby) to extend equipment life and reduce maintenance expenses. Equipment in primary operation will be monitored and, if a failure alarm exists, the standby unit will operate. Temperature setbacks are to be utilized for energy conservation.

All spaces shall be heated by in-floor hydronic radiant heating, except as noted below. Perimeter spaces may also be served by radiant ceiling panels if needed to provide sufficient heating. All sleeping rooms shall be individually zoned. Each heating zone shall include a two-position zone valve and be controlled by the DDC system. Mechanical rooms and electrical rooms shall be heated by unit heaters. Entry vestibules and stair towers shall be heated by cabinet unit heaters. Suggested product data for in-floor hydronic radiant heating is provided in Part Five.

Space Cooling

Perimeter spaces subject to solar gain may require cooling to maintain required temperatures. Provide cooling as required using outside air from the dedicated outdoor air system (DOAS), described below.

Refrigeration equipment is not anticipated as part of the building HVAC systems. Space cooling for electrical and communications rooms will be provided by outside air ventilation.

Dedicated Cooling

Separate air conditioning systems shall provide 24 hours-per-day, 365 days-per-year cooling to Communications Rooms and Electrical Rooms. Each room shall be provided with a cooling fan which provides filtered, tempered outside air to offset cooling load. Relief air from these spaces will be utilized to offset overall building heating load. Communications Rooms space high temperature alarms shall be connected to the McMurdo utility metering and control system (UMCS).

Air Distribution / Ventilation

All occupied spaces will be served by a DOAS, which will provide heated and filtered air to each occupied zone as needed to satisfy occupant ventilation, space makeup air needs, cooling and building pressurization. The DOAS will also provide exhaust for all Class 1 and 2 air and utilize an air-to-air heat exchanger to pre-heat incoming outside air. The DOAS will include a hydronic preheat coil to and a defrost system to control frost buildup in the heat exchanger, and a hydronic heating coil to control supply air temperature. Downstream ductwork includes pressure independent variable air volume (VAV) boxes with zone heating coils to provide simultaneous heating and cooling to different parts of the facility. The DOAS will be variable flow (VFD-driven) and modulate outside air and exhaust as needed for occupancy, cooling and pressurization. A demand controlled ventilation (DCV) sequence will modulate occupant ventilation in each zone based on zone carbon dioxide (CO₂) sensors. Ductwork shall be galvanized steel or aluminum, fabricated to SMACNA standards.

Extreme cold temperature rated dampers along with fixed, drainable blade louvers will be provided at all building air intake and discharge locations to ensure positive shutoff. Hoods will be provided over each louver to reduce entrainment of snow. Intake hoods shall be designed in accordance with McMurdo standards, which includes a drop leg section with a 45 degree back-cut opening on the side nearest the building. Intake ducts, louvers and dampers shall be sized for 300 foot per minute free area

air velocity, and shall be provided with a basin and drain inside the heated space to evacuate any snowmelt within the duct. Outside air intake ductwork will be externally insulated inside the building to prevent frost buildup and protect the building thermal envelope. All building penetrations shall be thermally isolated to mitigate heat transfer.

Sleeping rooms shall be provided with supply air from the DOAS. Relief air shall exit through a ceiling grille with acoustical elbow into the space above the room, then flow through a transfer opening into the space above the adjacent corridor.

Corridors shall be ventilated with air cascaded from the sleeping rooms. This will also serve as makeup air for the exhausted spaces such as restrooms / showers and laundry rooms.

Lounge spaces shall be provided with supply air from the DOAS. Air will be cascaded from these and other areas to provide makeup air for the restrooms, showers and laundry rooms.

Restrooms and shower areas will be provided with cascaded air from adjacent zones. No air will be returned from these spaces, all shall be exhausted to the outside. Air flow shall be balanced to maintain a negative pressure relative to adjacent spaces.

Laundry rooms will be provided with cascaded air from adjacent zones. No air will be returned from these spaces, all shall be exhausted to the outside. Air flow shall be balanced to maintain a negative pressure relative to adjacent spaces. Dryer vent ductwork will be designed to SMACNA Industrial Round Ductwork standards with all laps in the direction of airflow. Dryer vent ductwork will be ganged together and exhausted through a variable flow material handling style utility set fan. Air flow shall be controlled to maintain a constant negative pressure in the dryer vent system.

Mechanical and electrical rooms will be provided with mixed room air and outside air as required for space ventilation and cooling. No air will be returned from these areas.

Required clearances are to be allotted for maintenance and repair of equipment. Access doors are to be provided for concealed equipment that may require maintenance or repair.

Testing, Adjusting and Balancing

Test and balance (TAB) air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

Commissioning

Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning in accordance with ASHRAE 202-2013, ASHRAE Guideline 1, ASHRAE Guideline 0, IECC and LEED NC v4. Do not use the sampling techniques discussed in ASHRAE Guideline 1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and equipment. Hire the Commissioning Authority (CA), certified as a CA by AABC, NEBB, or TABB, as described in Guideline 1. The CA will be an independent subcontractor to the contractor and not an employee or subcontractor of any other subcontractor on this project. The CA will not have business connections with any other party on the project. The CA will not have any other role or responsibilities outside of commissioning activities. The CA will communicate and report directly to the Government in the execution of the commissioning activities.

Metering

All utility services (except sanitary sewer) are to be metered. Each meter shall be capable of providing 5 minute interval demand and energy consumption data (as applicable) and be able to be network interfaced with the station master process automated controller located in the nearest power plant.

Plumbing System

Domestic cold water shall connect to the new site utilidor, which is currently being designed. In the event that the new utilidor is not completed prior to Lodging Facility construction, temporary connection to the existing utilidor, west of the site, will be required. Domestic cold water and fire protection water are to be supplied by a common service.

Domestic hot water is generated at 140°F by storage type indirect domestic water heater(s), using energy from the site heat recovery loop and/or the local boilers. A master mixing valve located downstream of the storage tanks will provide 120°F hot water to all fixtures within the facility. Each lavatory will have a thermostatic mixing valve to temper the water from 120°F to no more than 105°F. A circulating pump will be provided to maintain consistent temperatures in the domestic hot water system. The recirculation system will be designed to limit non-recirculated branches to 10 feet maximum length.

Domestic Water piping shall be Type L hard drawn copper or cross-linked extruded PEX with 1" sectional fiberglass insulation and factory vapor barrier. Provide PEX piping where feasible for increased freeze protection. Water hammer arrestors will be provided at flush valve and solenoid valve assemblies before the last fixture.

All water piping is to be insulated with text and color identification. Plumbing fixtures will be specified as water-saving type. Trap primers will be provided with a service valve for maintenance and repair. Domestic Water Circulation pump shall be controlled by the DDC system and operated based on building occupancy.

Waste from plumbing fixtures, including floor drains, drains directly to the sanitary sewer system. All sanitary vents shall vent to atmosphere through a combined vent system minimizing the number of roof penetrations. Air admittance valves shall not be used. Domestic Waste and Vent (DWV) will be DWV copper pipe and fittings per McMurdo standard. Cast iron no-hub will be considered if shown to be advantageous from a lifecycle cost perspective.

Fixture groups are not required to be ADA-compliant. Water closets will be floor-mounted with elongated bowl and open front seat. Flush valves will be dual-flush water conserving, 1.6 or 1.1 gallons per flush (gpf) type. Urinals will be wall-mounted with concealed carrier. Flush valves will be water conserving, 0.125 gpf type. Janitor's Closets will be provided with a floor-mounted, manufactured, stone-type (Durastone or Terrazzo) sink with wall-mounted faucet with bucket hook, 3/4-inch hose thread, and anti-siphon vacuum breaker. Lavatory sinks will be counter-mounted, vitreous china type with electronic

actuated faucets. Faucet shall have a thermostatic mixing valve set to provide 105°F hot water maximum and a 0.5 gallons per minute (gpm) aerator. Showers will be floor mounted, terrazzo or other approved manufactured stone basin. Shower valves shall be pressure-balanced thermostatic mixing valves set to provide 120°F maximum at 1.5 gpm. Coffee bar sinks will be 18 gauge stainless steel with a single bowl, 1.0 hp garbage disposal and goose neck faucet.

A floor drain with a perforated strainer will be provided for each toilet room and janitor closet. Floor sinks and floor drains are provided in the mechanical rooms to accommodate routine maintenance and drainage of equipment. All floor drains will be provided with a mechanical trap primer and piped from the nearest cold water source where sufficient pressure drop exists to activate the unit.

B. Prescriptive Requirements

Heating System

Pumps shall be Grundfos uninterruptible power supply (UPS) series, where practical.

Ventilation System

Restrooms, laundry rooms, and specific service areas shall be exhausted through exhaust grilles and ducted to the exhaust side of a DOAS heat recovery unit. Make-up air for the facility is provided through the supply side of the DOAS unit. This provides outside air to the building and ensures adequate building pressurization as well as providing energy recovery from exhaust air. All air handlers shall be manufactured by Trane. Product data for the heat recovery unit are provided in Part Five.

All outside air intake and exhaust dampers shall be extreme cold temperature type as manufactured by TAMCO, Series 9000.

All damper actuators shall be manufactured by Belimo.

Fans shall be manufactured by Greenheck.

DDC Systems

A Building Automation System (BAS) consisting of a building control network which is fully integrated with the McMurdo UMCS system shall be provided. The telecommunication protocol shall be BacNet or MODBus.

Equipment with on-board control systems (e.g., air handling units) shall be fully capable of interfacing with the building automation system. This shall include the building automation system being able to monitor on-board sensors and provide control input.

The building control network shall be a single complete DDC system for control of the HVAC systems. The manufacturer shall be Alerton, no substitutions.

6.0 FIRE PROTECTION

A. Performance Requirements

A detailed building code analysis is provided in the Architecture Section. The Life Safety Plan drawings in **Attachment C** provide further information. The building shall be protected by a wet pipe sprinkler system. Sprinkler piping is to be Schedule 40 black steel in conformance with NFPA 13. Sprinkler heads shall be quick response type, concealed. Product data for fire suppression and fire alarm components are provided in Part Five.

Occupancy Hazard Classification

This building has two types of occupancy hazards. For the purposes of determining automatic sprinkler densities the following classifications are used:

- a. Light Hazard – Sleeping Rooms, Lounges, and Restrooms.
- b. Ordinary Hazard, Group 1 - Laundry Rooms, Miscellaneous Storage Rooms, Communications Rooms, Mechanical Rooms, Electrical Rooms.

Water Flow Demand Criteria

1. Light Hazard
 - a. Design Density: 0.10 gpm/square foot
 - b. Design Area: 1500 square feet
 - c. Hose Allowance: 250 gpm
 - d. Duration: 60 minutes
2. Ordinary Hazard, Group 1
 - a. Design Density: 0.15 gpm/square foot
 - b. Design Area: 1500 square feet
 - c. Hose Allowance: 500 gpm
 - d. Duration: 60 minutes

Fire Suppression and Standpipe System

The fire service main enters the building in the Boiler Room. The fire service main is to be a minimum of six inches in diameter. The main riser feeds two combination Class 1, Wet Standpipe/Risers located at two stairwells at opposite ends of the building. A fire department hose valve is provided at each floor landing in each stairwell. Each of the three floors has its own sprinkler zone served from the combination class 1 wet fire standpipe thru a floor control valve assembly that consists of a supervised valve, check valve, flow switch and combination test/drain valve. Combination test/drain valve discharges to a drain riser in the stairwell which then discharges at the ground level to a plumbing system funnel/hub drain capable of draining the discharge at full flow. An existing fire protection booster pump (electric motor driven) is provided that boosts the water pressure for the building.

Fire Alarm and Mass Notification System

A single, addressable, UL listed fire alarm control panel (FACP) shall provide alarm notification and automated monitoring of the sprinkler system in the facility. The FACP shall be field programmable via the FACP keyboard or control panel without the use of proprietary programming software or device. The fire alarm system monitors the manual pull stations at each exit, sprinkler tamper and flow switches, smoke detectors, and duct-mounted smoke detectors on air handling units per NFPA and IBC criteria. The addressable duct-mounted smoke detectors report to the FACP panel as supervisory devices and disable the associated air-handling unit if smoke is detected. Alarm, trouble, supervisory, and water flow signals are transmitted by a wireless transceiver to the base monitoring system for fire department response. Occupant fire notification is provided utilizing a combination of strobes and speaker/strobes with white faceplates marked "ALERT" located throughout the facility in accordance with NFPA 72. All fire strobes employ clear lenses. Occupant notification is activated upon any fire alarm signal initiated by a manual pull station, sprinkler water flow switch, or common area smoke detector. All Signaling Line Circuits (SLCs) are Class A and Notification Appliance Circuits (NACs) are Class A. System wiring shall be by Belden or West Penn and installed in factory painted red ¾" minimum conduit.

Mass notification system (MNS) is provided throughout the building. The MNS consists of a main panel located next to the FACP. Local operator consoles (LOC) are provided at each floor within 200 foot travel distance from any point to broadcast pre-recorded and live emergency messages utilizing speaker/strobes located throughout the building. The speaker/strobes are spaced throughout the facility to ensure intelligibility as required by NFPA 72. Mass notification strobe and speaker/strobe lenses will utilize the fire alarm speaker strobes. Upon activation of the mass notification system, fire alarm audible signals are deactivated. A supervisory signal is displayed at the fire alarm panel during the emergency voice messaging. The fire alarm audible signal continues after the emergency voice message is completed. MNS system will have battery back-up for 24 hours and then a 5 minute alarm period.

B. Prescriptive Requirements

Fire Alarm and Mass Notification System

System shall be Kidde Netlink. Notification appliances shall be Cooper Wheelock manufactured or private labeled by Cooper Wheelock. Wireless transceiver shall be Keltron RF778F. The station MNS system shall be Cooper SAFEPATH 4.

7.0 ELECTRICAL AND COMMUNICATIONS

A. Performance Requirements

Electrical Power Systems – Power Distribution

The Lodging Facility shall be fed from a pad-mounted transformer that serves the facility via 480Y/277V, secondary conductors. The conductors terminate in a service entrance rated 480Y/277V, main switchboard (MSB).

An electrical power monitoring meter, smart meter, is included for the facility. Smart meters shall be provided with local area network (LAN) connectivity to the station energy management systems. The power meter shall provide energy demand and consumption data on 5 minute intervals. The meter shall record the real power (KW), apparent power (kVA), reactive power (kVAR), power factor (phase angle), and energy meter (kWh) into and out of the MSB panel.

The main switchboard (MSB) serves first, second and third floor loads via 480Y/277V feeders and panel boards. Each floor of the lodging facility includes 480Y/277V panel boards for mechanical and lighting loads. Each floor of the Lodging Facility also includes 208Y/120V panel boards for lower voltage loads such as receptacles, HVAC controls, security, and life safety systems.

The Lodging Facility switchboards, distribution boards, and panel boards employ copper busing. Feeders and branch circuits are copper conductor, routed in electrical metallic tubing (EMT) conduit; ground conductors are provided for feeders and branch circuits. The Lodging Facility electrical power system is designed with 20% spare capacity and 20% spare circuit breaker spaces.

Interior transformer shall be general purpose, dry type, high efficiency, copper wound.

Individual motor starters with disconnect switches, or variable speed drives for motor controls shall be provided as required by Mechanical. Circuits and connections for motors shall be provided as required by equipment manufacturer.

Interior conduit shall be rigid metal (RMC), electrical metallic tubing (EMT), liquid tight flexible steel (LFMC), or flexible metal (FMC), as appropriate for location and application and a ¾" minimum trade size.

Interior electrical wiring installed in raceways, shall be high conductivity copper, 600V, type XHHW/XHHW-2 and a #12 American Wire Gauge (AWG) minimum conductor size.

Duplex receptacles shall be heavy duty, specification grade, 2-pole, 3-wire, grounding, 125V, 20A, white color with matching color nylon cover plate.

Wall switches shall be heavy duty, industrial grade, toggle, 120-277V, 20A, white color with matching nylon cover plate.

An appropriately sized equipment ground conductor shall be installed in raceways with all branch circuit wiring runs.

Electrical Power Systems – Power Quality and Grounding

Power quality for the project is preserved by using surge protective devices (SPD) at the service distribution equipment and where sensitive electronic loads exist. SPD's limit the intensity of over voltage transients from external power distribution events and internal power events. SPD's shall be

integrated into the service distribution panel and all panelboards which contain electronic loads, including computers, lighting fixtures, and televisions.

Building service entry feeders shall include a grounding conductor sized equal to the power conductors and terminated on a dedicated copper ground bar (Area Ground Point / AGP) located in proximity to the main service entry equipment. Equipment ground conductors (EGC) accompanying building service feeder runs are to be terminated to ground at the source end only with the load end being left unterminated.

Interior electrical systems shall be grounded in accordance with Article 250 of the 2011 National Electrical Code. Communications ground bus bar shall be connected to the main electrical ground bus bar, per TIA-607B.

Exterior Electrical Distribution and Lighting

The existing exterior power distribution is a 4160 V, three phase, and three wire system. The existing utilidor runs to the west of the proposed Building 30 location. Pending phasing, a new utilidor will be located on the west side of the proposed Building 30.

The primary feed shall originate at the utilidor and be routed along grade to the pad mounted, exterior located transformer. The primary conductor installed in the utilidor shall be will be copper, 5kV, ethylene propylene rubber (EPR) or cross-linked polyethylene (XLPE), shielded, armored Teck 90 cable assembly.

The new facility pad mounted transformer shall be 3 phase, 4 wire, delta-wye, 4160V primary, 480/277V secondary, low loss design, copper wound, nitrogen filled, dead front, loop fed, self-cooled transformer. The transformer shall be sized to handle the calculated facility loading plus 20% spare capacity. Ground secondary wye of transformer. The transformer shall be located at least 30-feet from the building, in order to maintain the required fire truck access. A direct buried rated metal clad (MC) cable with overall PVC jacket shall be extended from the utility transformer to the main electrical room. Building service entry feeders are to include a grounding conductor sized equal to the power conductors and terminated on a dedicated copper ground bar located in the main electrical room.

Exterior building lighting fixtures are building mounted to provide an average of 5 foot-candles at exterior doors. Fixtures shall be building mounted full cut off, "dark sky" qualified, low ambient temperature (-40° Celsius) Light Emitting Diode (LED) fixtures. Fixtures are wired from within the building.

A lighting contactor with Hand-Off-Automatic (HOA) switch, and photocell "on" will be provided in the electrical room. The photocell will be located on north side of the facility.

Exterior conduit will be RMC or Liquid-Tight Flexible Metal Conduit (LFMC), as appropriate for location and application, ¾ inch minimum trade size.

Exterior wiring installed in raceways will be high conductivity copper, 600V, type XHHW/XHHW-2 of #12 AWG minimum conductor size.

Interior Lighting Systems

General interior lighting shall use LED lamps with dimmable drivers. Fixtures shall have a color temperature of 3500K to 4100K, depending on location and type. All fixtures shall have a color rendering index (CRI) of 80 or better.

Lighting control in restrooms, offices, janitor closets, laundry, storage, and similar rooms shall use ceiling or wall mounted dual technology infrared/ultrasonic motion sensors with adjustable timeout control. Coordinate delay times with the ASC representative.

Bedrooms, lounges, corridors, and similar rooms shall use digital networked lighting control. The system shall include integration daylight sensing, time based lighting level presets, dimmer and manual wall switches and enabled lighting fixtures. Occupancy sensors shall be located in the lounges, corridors and similar rooms where allowable. Lighting control panels on each floor shall interface with the BMS to allow for control of the lighting system.

Emergency egress lighting is accommodated by using a battery backed to power illuminated "EXIT" signs and NFPA 101 required egress lighting. The "EXIT" lights employ red LED lamps on a white field. Egress lighting shall provide 90 minutes of illumination at levels as required by NFPA 101.

The utility areas (electrical, mechanical, etc.) having unfinished ceilings use surface mount or pendant mounted LED industrial fixtures with guard cage or acrylic lens. Occupancy sensors and automatic lighting shall not be used in these spaces due to safety concerns.

Lamp types, ballast types, and fixture types are designed to be uniform in order that maintenance and stocking of replacement items is minimized.

The following maintained illumination levels for LEDs are based on Illumination Engineering Society (IES) of North America Lighting Handbook, 10th Edition, recommendations and shall be used during design.

Area	Illumination Level (fc-footcandles)	Illumination Work Plane Above Finished Floor
Bedrooms	20 fc	2'-0"
Corridors	10 fc	Floor
Janitor Space	10 fc	3'-6"
Kitchen	30 fc	3'-6"
Laundry	20 fc	3'-0"
Lobbies	10 fc	Floor
Lounge	30 fc	2'-6"
Mech/Elect Rooms	30 fc	3'-6"
Restrooms	15 fc	3'-6"
Stairs	10 fc	Floor
Storage	10 fc	Floor
Telecommunications	50 fc	3'-0"
Vestibules	10 fc	Floor

Telecommunication Systems

Primary outside plant telecommunication cabling will consist of single mode fiber optic (SM FO) cabling which enters the facility at the telecommunications entrance room (TER) located on the first floor. This cabling shall terminate on rack mounted 24 port optical fiber entrance patch panels with SC/APC connectors. The TER shall be 10'x12' and contain three 2'x3' racks/cabinets. The door shall be 42" wide and fire rated.

Primary outside plant copper cabling shall terminate on a series of backboard mounted 110 blocks with service entrance overvoltage protectors in a 1:1 arrangement.

Telecommunication rooms (TRs), in addition to the TER, will be located on the second and third floors so that the length of horizontal cabling between the rack to each outlet is less than 295' per TIA standards. Each TR shall be 10'x12' and contain up to three 2'x3' racks/cabinets.

CAT3 telephone backbone cables will be routed from wall mounted 110 blocks in the main communications room to wall mounted 110 blocks in the communication rooms on each floor. Cabling will jumper from parallel 110 blocks, then jumper to rack mounted patch panels. All TRs shall have 25 pair CAT3 copper provided from the TER for the user requested emergency backup telephone system.

Data backbone cabling consists of multiple 12-strand single mode fiber optic (SM FO) cables routed from rack mount fiber patch panels in the TER to rack mounted FO patch panels in the telecommunication rooms on each floor. Backbone fiber optic cabling utilizes SC/APC style connectors.

The voice/data telecommunication infrastructure includes pre-wired jacks with a minimum of four jacks per wall plate, which will be a combination of data and voice in the same wall plate. Jacks will be labeled as voice/data once installation occurs depending on the need. Jacks are provided in the sleeping rooms, common lounge areas, etc. Station data wiring use CAT 6A, 4-pair 24AWG Cu RJ-45 jacks and employs TIA 568C wiring topology. All telephone voice jacks are terminated on rack mounted patch panels for Voice Over Internet Protocol (VOIP) implementation. All data jacks are terminated on rack mounted patch panels. Wall jacks are located within 18" of power receptacles and with a minimum of 1 per sleeping room. Telecommunications horizontal cabling is routed in a combination of conduit and cable tray and terminated at the nearest telecommunications room rack mounted patch panels.

Each telecommunication room includes a minimum of one LAN rack with RJ-45 jack, TIA 568C configuration patch panels and 24 port optical fiber patch panels with SC/APC connectors. Each TR will contain two Telco (relay) racks and one cabinet (19"x45"x42RU). This will compartmentalize incoming backbone connections, outgoing backbone connections, and active telecomm equipment. Quad-plex receptacles with dedicated circuits are provided at the lower right corner of telephone backboards and above each communication system rack. A 208V, 1 phase twist lock receptacle shall be provided above each telecomm rack. Rack space will be provided for GFGI LAN switches and network equipment in each rack.

Plywood telephone backboards are located in each telecommunication room and have a dedicated telecommunications grounding busbar (TGB) grounding bus with a ground conductor tied to the telecommunications master grounding busbar (TMGB) in the main TEF. The TMGB is bonded to the facility power system grounding system per J-STD 607-A. The communications grounding between any TGB and the TMGB is designed for no more than 100 milliohms resistance. Quad-plex receptacles with dedicated circuits are provided at the lower right corner of telephone backboards and above each communication system rack.

Special Electrical Systems

Refer to the Fire Protection section in this document for fire alarm special system and for mass notification system information.

Special Telecommunications Systems

Wireless access points (WAP) are located throughout the interior of the building and provide full coverage to all normally occupied spaces. WAP's consist of high speed, dual band, wireless routers linked together from the closest telecommunication rooms via CAT 6A cabling. Each Wi-Fi system will be password protected for access control.

Closed circuit television (CCTV) system is used to monitor all exterior exits and any sensitive areas. The system consists of IP addressable, fixed, color, cameras that will be linked back to the nearest telecommunication room. Monitoring of the camera signals is performed at a variety of areas around the station and will be assigned as needed.

An access control system (ACS) is provided for all exterior entrances and exits and each individual sleeping room. The ACS consists of a card key and/or PIN keypad for maximum user flexibility and security. Monitoring and control of all access points is maintained in the mission operation center area.

Collaborative communications includes public area displays (PAD), CATV stations, and radio station communications. PAD's are located at each entry/exit and common area. They consist of interactive touch screen monitors with a standard CAT 6A network connection. Each sleeping room and common lounge area will have wired Internet capability and a flat screen TV.

Station notification includes combination mass notification/public address speaker array system that will be provided with the fire protection system. The system of speakers will be mounted throughout the facility to provide the ability to communicate prerecorded and live messages. Mounting locations of the speakers will be coordinated to maximize intelligibility requirements. Control signals for the system will originate in the mission operations center area and fire alarm panel. In addition to the speaker array system, station and weather notifications will be shown throughout the facility in public area displays.

The public address (PA) function will consist of a primary control rack located in a centrally located telecommunication room. The primary control rack will control all the signal distribution between the secondary racks and the public address console which will be located in the mission operations center. The secondary control racks will contain various components that will allow public announcements to be played and controlled in user specified zones. Various wall controllers will be mounted for each zone that will allow source/volume control in that zone. The PA console unit will have the ability to access specific rooms or groups of rooms. The PA system will utilize the speaker array system provided by the fire protection mass notification system.

A new industrial controls system is provided for the facility. It will network interface, via CAT 6A cabling, from the various HVAC, utility metering, and lighting controls panels to the process automated controller in the nearest power plant and then to the master industrial control monitoring station in the mission operations center. This will allow local and remote monitoring and control of the various lighting and environmental controls throughout the facility. Specific environmental zones are established and programmed into the system based on the specific occupants needs.

Lightning Protection

A lightning protection system is not required for the Lodging Facility.

Basic Materials of Construction

Communications cabling with open cable tray routing in air plenum spaces shall be plenum rated. Data and telephone cabling shall be Cat-6A copper. Optical fiber cabling shall meet McMurdo standards.

Communications jacks and wall plates shall use modular assemblies.

Product data for electrical components are provided in Part Five.

B. Prescriptive Requirements

Standardization of equipment is critical to increase maintenance effectiveness and to minimize spare part storage requirements.

Electrical Power Systems – Power Distribution

All electrical distribution equipment shall be manufactured by Schneider Electric, Square D, no substitutions. Provide Schneider Electrical, Square D Watchdog or Premium 30 type interior transformers, no substitutions. Wall switches and receptacles shall be manufactured by Hubbell, no substitutions.

Electrical Equipment

Motors under 3/4 horsepower shall be 120 volt, single phase and motors 3/4 horsepower and greater shall be 480 volt, 3 phase, premium efficiency inverter duty-rated.

Interior Lighting Systems

For ease of maintenance and to reduce spare parts on site provide Sensor Switch nLIGHT system. Interior lighting equipment shall be as manufactured by Lithonia Lighting, Acuity Brands.

8.0 ENVIRONMENTAL COMPLIANCE

A. Performance Requirements

Compliance with all provisions of the Antarctic Treaty is required.

B. Prescriptive Requirements

None.

9.0 SHIPPING CONSTRAINTS

A. Performance Requirements

The constraints indicated herein are provided for Contractor planning purposes. All values must be verified by the Contractor prior to commencement of procurement or work.

The capacity of the Bailey Bridge in its current configuration is 100,000 lbs maximum.

Typically there is no weight restriction on healthy ice piers, however, soundness must be verified and rolling and point loads must be planned and managed to avoid uneven loading and spillage of materials.

The weight of truck trailers when empty is estimated to be 28,000 lbs.

The bridge deck is 12'-6" wide, however, the upper limit for loads on trucks is approximately 11'-9" unless items are cribbed up to transport over the top of the side panels of the bridge. The side panels of the bridge are approximately 5-feet tall.

The cranes on the Ocean Giant are estimated to have a 30-meter reach at 200 tons however this is dependent on the boat coming south.

The cranes on ice can pick up approximately 70,000 lbs in certain limited configurations.

B. Prescriptive Requirements

None.

10.0 SUSTAINABILITY DESIGN

A. Performance Requirements

General

The design of the McMurdo Lodging Facility will represent best practices in sustainable design and optimize those practices within a reasonable investment, both in terms of first cost and life-cycle cost.

Agencies such as the US Green Building Council (USGBC) and the Department of Energy's Federal Energy Management Program (FEMP), have established sustainable design principles and practices. The project will satisfy FEMP guidelines and utilize ENERGY STAR and FEMP-designated products to facilitate the Federal Government's energy management practices.

Established LEED v4 for New Construction and Major Renovation developed by the USGBC was created to establish a means of verifying sustainable design. A LEED "Gold" rating (a minimum of 60 points) is achievable as shown in the credit analysis for the 35% design, see Attachment B. This project is required to meet a LEED "Silver" level of certification, at a minimum. The Contractor is required to register the facility with USGBC, pay the registration fee, and provide all required documentation to achieve certification.

Guiding Principles

Employ Integrated Design Principles. The McMurdo Lodging Facility will employ a building management plan to ensure that operating decisions and tenant education are carried out with regard to integrated, sustainable building operations and maintenance.

Use total building commissioning practices to verify performance of building components and systems and help ensure that design requirements are met. Fundamental building commissioning and proper documentation must be provided as a prerequisite to achieve LEED certification. Provide commissioning to meet ASHRAE 90.1 2016 requirements that testing shall ensure all control elements are calibrated, adjusted, and in proper working condition. Per ASHRAE 90.1 2010, since Building 30 is less than 50,000 square feet, detailed instructions for commissioning HVAC systems is not required in design specifications.

Optimize Energy Performance. Energy efficiency must be in accordance with 2015 International Energy Conservation Code (IECC) as per ASC requirements and ASHRAE Standard 90.1 2010, Design of High-Performance Green Buildings as per project requirements to achieve LEED certification.

The McMurdo Lodging Facility will employ the following strategies and metrics:

- Normal operational energy of no more than 100 Kbtu/sf/year
- Building envelope with an average thermal resistance of R-60 for walls, roofs and floors
- Heating hot water boilers with an minimum thermal efficiency of 83%
- Optimize the recovery of power plant generated waste-heat
- Renewable energy source optimization, where existing wind power or building solar-generated power is employed
- The eQuest energy model used for assessment of energy systems is summarized in Attachment A.

Protect and Conserve Water. The McMurdo Lodging Facility shall require, under normal operating circumstances no more than an average 13 gal/person/day. This can be achieved through the following:

- The use of low-flow fixtures
- Energy Star appliances
- No outdoor water will be used in this design

Enhance Indoor Environmental Quality. This can be achieved through the following:

- Include daylighting in common spaces with dimmable controls
- Mitigation of both the absence and 24-hour presence of daylighting
- Promotion of collaboration through a variety of social spaces
- Products with low pollutant emissions
- No smoking inside or outside except in designated outdoor smoking areas, at least 25-ft from air intakes.

Reduce Environmental Impact of Materials. Materials shall be the following where practical and in support of LEED v4 certification:

- Sustainably sourced
- Built from recycled content
- Built from recyclable content

Certification

The McMurdo Lodging Facility will achieve LEED Silver Certification.

The USGBC is willing to provide LEED credit interpretations adjusted to the special circumstances of Antarctic and McMurdo operations.

A preliminary summary of attainable credits is presented in the LEED Checklist provided in **Attachment B**. It is recommended that the project team attempts these specific credits to achieve certification through LEED Online, however, it is the contractor's responsibility to document the credit requirements through construction.

B. Prescriptive Requirements

None.

PART FIVE – SELECTED MANUFACTURER’S PRODUCT DATA

Basis-of-Design equipment and furnishings selected during the schematic design effort are presented in this section to aid the Contractor during design development. Prescriptive requirements for specific manufacturers are noted in Part Four.

INTERIORS PRODUCT DATA

QUOTATION

CREATED 4/30/2013 | REVISED 6/8/2016 | Valid Through 7/29/2013

Lockheed Martin: New Dorms, USAP/McMurdo Quote Number: 13RJC-161168/C

KI is pleased to present the enclosed quotation. The following items are included:

- Detailed PO requirements
- Quote Summary
- Itemized Quote
- Product Options



Sales Team:

Tim Provost | Sales Rep | tprovost@ccanter.com | (720) 932-7474

Deb Price | Project & Service Coordinator | deb.price@ki.com | 920-406-3442



QUOTATION

Final Considerations:

To ensure your Purchase Order (PO) is processed quickly and efficiently, please adhere to the following requirements:

1. All purchase orders must be issued to KI or KI c/o the dealer with this address:
KI
1330 Bellevue Street
Green Bay, WI 54302
2. The following items must be included on all purchase orders:
 - o Sold To/Bill To Information: complete legal name, address, telephone number and fax number
 - o Ship To Information: complete legal name, address, contact name, contact phone number
 - o Purchase Order Number: a customer-specific identifier, typically a sequential purchase order number or requisition number
 - o Issue Date: date the purchase order was issued
 - o Sales Tax: applicable sales tax will be added upon KI invoicing. If tax exempt, customer must provide or have the tax exempt certificate on file at KI
 - o Purchase Order Total: total of all items and services included on the purchase order
 - o Authorization: signature of authorized purchasing agent or buying entity
 - o Order Details: reference a fully optioned KI quote (ex: 11KGGH-85432) or include all the information listed below
 - Quantity of each item
 - Complete model number, including all finish and option information (by line item)
 - Net purchase price (by line item)
 - Extended net purchase price (all line items)
 - Any additional applicable charges (ex: installation and/or delivery charges)
 - Contract name and/or number if pricing is based on a contract reference
 - Federal purchase order made out to KI. Please reference KI's GSA contract number (GS-28F-0033P).
 - Identify dealer of record (if applicable)
 - Please reference the KIQuote number on your PO
3. Signatures on a quote or a worksheet cannot be accepted as a purchase order.
4. In the event that you do not have a formal Purchase Order process, please contact your KI Sales Representative or call 1-800-424-2432, and we will assist you with creating a PO.

We appreciate your cooperation in providing us with all the required information listed above on your Purchase Order. Complete information helps us serve you better. Thank you for your order.

Purchase Orders that do not meet these requirements will be placed on hold until complete information is received by KI. Purchase orders on hold are not released to manufacturing or assigned a delivery date. KI order lead times begin once the order is released to manufacturing.

KI GSA Reference Information

- KI Office Furniture Contract #GS-28F-0033P. Expiration date 6/9/2019. Pricing is net delivered within the 48 contiguous states unless otherwise noted.
- KI Federal ID Number: 39-1375589
- KI Cage Code: 9J388
- KI Data Universal Number System (DUNS): 032672651

Customer represents that the product information contained within this quote is complete and accurate. Changes to quantities and/or options/finishes will affect this quote. If applicable, other charges such as freight, tax, installation and/or delivery fees may be added at time of order.

Sales resulting from PO's issued by the customer to KI (Whether related to this quotation or otherwise) are governed and controlled by the Terms and Conditions found at www.KI.com/terms and the GSA Customer Information located at www.kigovernment.com

Prepared by Tim Provost

"Reference Only"

Market Code: 4=4=Federal Government

Opportunity #: 307002

Quote Filename: Lockheed Martin: New Dorms,
USAP/McMurdo - 13RJC-161168

Proj Num - 13RJC-161168/C
Model Opt: Y GSA: Y
Proj Totals: Y
Pricing Selection: Net Only

Tim Provost

Sales Rep

tprovost@ccanter.com

(720) 932-7474

Deb Price

Project & Service Coordinator

deb.price@ki.com

920-406-3442



QUOTATION

Lockheed Martin: New Dorms, USAP/McMurdo
Quote Number: 13RJC-161168/C

Customer represents that the product information contained within this quote is complete and accurate. Changes to quantities and/or options/finishes will affect this quote. If applicable, other charges such as freight, tax, installation and/or delivery fees may be added at time of order.

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Proj Num - 13RJC-161168/C
Model Opt: Y GSA: Y
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920-406-3442

CREATED 4/30/2013
REVISED 6/8/2016
Valid Through 7/29/2013

PRODUCT TOTALS	\$427,002.60
Other- See Quote Details	\$0.00
GRAND TOTAL	\$427,002.60

**KI Offers A Lease Finance Option For All of Your Furniture Needs.
Contact Us For A Quote.**

Contract Info
GS28F0033P GSA CONTRACT

Requested Delivery Date To be Determined

Sold To
To be Determined

End User
To be Determined

Ship To
To be Determined

Installation
To be Determined

Client Notes:

QUOTATION

2 drawer with low fridge

CREATED 4/30/2013
VALID THROUGH 7/29/2013
Prepared By Tim Provost
Quote Filename Lockheed Martin: New Dorms, USAP/McMurdo - 13RJC-161168/C

Line	Model	Qty.	Sell Price	Extended Total	TBD Options	
Tag 1						
ROOMSCAPE ONLY						
1.1	RMWFD363C 	Roomscape Freestanding Dresser, 3 Drawer, Lam Front, Comb 6".9", 10-1/2" LOCK OPTION FINISH COLOR LAMINATE COLOR	120	\$609.00	\$73,080.00	
		Top drawer only lock /TL Champagne Metallic /CM Kensington Maple /LKM				
Price Description: GSA/Contract						
1.3	S16125513 No Image Available	RMSBA-PLY Roomscape Single Bed Assembly, 38 7/8"Wx86"Lx39 3/8"H, Plywood Finish Color Laminate Color	120	\$656.10	\$79,332.00	
		Champagne Metallic /CM Kensington Maple /LKM Accommodates a 79" x 39" mattress S16125513 One Time Net Non-Tooling Charge Custom Option Fee 1 Per Order Net Set-up Charge Custom Option Fee 3				
1.4	RMPS 	Roomscape Personal Shelf FINISH COLOR LAMINATE COLOR	120	\$62.00	\$7,440.00	
		Champagne Metallic /CM Kensington Maple /LKM				
Price Description: GSA/Contract						
1.7	S16123268 No Image Available	RMWCW3676/24 Roomscape Combo Wardrobe, Lam Front, 36Wx24Dx76"H Lock Option Finish Color Laminate Color Mirror Option	120	\$1,244.70	\$149,364.00	
		Top drawer only lock /TL Champagne Metallic /CM Kensington Maple /LKM One mirror (RH door) /1M Special size 65 9/32 H x 30" W x 24"D S16123268 Non-standard items are not returnable and not cancelable Note: Custom Product Additional 3 business days lead-time is required Note: Lead-time Change				
Tag 1				WorkGroup Product Subtotal	\$309,216.00	
ROOMSCAPE ONLY						
Tag 1						
Screen						
2.1	S16124891 No Image Available	SZ7005 Simple Screen Frame /CM Champagne Metallic Kit #15 SZ7005-S4868-15 frame	60	\$646.00	\$38,760.00	
		Paint S16124891				
2.1	S16124894 No Image Available	SZ7006 Simple Screen Tile Kensington Maple SZ7006-T2448-L-LKM (Tile B, Kit #15)	60	\$83.73	\$5,023.80	
		/LKM /S16124894				
2.1	S16124896 No Image Available	SZ7006 Simple Screen Tile SZ7006-T4124-MB (Tile D, Kit 15)	60	\$98.18	\$5,890.80	
		S16124896				
2.1	S16124899	SZ7006 Simple Screen Tile	60	\$78.20	\$4,692.00	

QUOTATION

CREATED 4/30/2013
VALID THROUGH 7/29/2013
Prepared By Tim Provost
Quote Filename Lockheed Martin: New Dorms, USAP/McMurdo - 13RJC-161168/C

Line	Model		Qty.		Sell Price	Extended Total	TBD Options
	No Image Available	SZ7006-T4124F (Tile D, Kit #15)			S16124899		
		Sensa (color TBD)			/Fabric		
Tag 1						WorkGroup Product Subtotal	\$54,366.60
Screen							
Tag 1							
Sela							
5.1	1333/NC	Sela Loveseat,Non-Contrast	60		\$1,057.00	\$63,420.00	
		Non-Contrast Fabric		Compliance to TB 117-2013	/NFR		
		Sela Fabric NFR		Fabric Grade G	G		
		Fabric		HOLY COW	HOLY COW		
		HOLY COW		CHOCOLATE TRUFFLE	/27.144.081.P		
		Moisture Barrier		No Moisture Barrier	/NMB		
		Base Finish		Chrome	/CH		
		Glides		Nylon glides (cream color)	/GNY		
		Armcap Option		No armcap	/NAC		
		Price Description: GSA/Contract					
Tag 1						WorkGroup Product Subtotal	\$63,420.00
Sela							

Product SubTotal:	\$427,002.60
Estimated Sales Tax:	See Note Below
Quote Total:	\$427,002.60

Images shown above are intended for approximate visual reference only and may not represent the exact models, numbers, descriptions or options selected. Refer to the model number/description/options shown for full product specifications.

Sales Tax (For Shipment within the United States Only): Estimated sales/use tax will be calculated when order is entered. It is the customer's responsibility to pay any applicable sales/use tax due upon invoicing. A customer will not be charged sales tax if (1) a Resale Certificate, (2) an Exempt Organization Certificate, or (3) a Direct Pay permit is on file with KI's Finance Department. If no certificate is on file, the appropriate sales/use tax rate in effect at shipment will be applied and tax will be added to the customer's invoice.

RoomScape[®]

Residence Hall Furniture

adaptable | student-preferred | durable



Furnishing Knowledge[®]



RoomScape® Residence Hall Furniture

Adaptable. Durable. Attractive. RoomScape is the solution for student-preferred living areas.

Reconfigurable

Simple. Quick. Safe. RoomScape can be assembled without tools. A minimum number of hang-on or stackable components makes it easy for students to arrange their rooms to suit their needs. Free up floor space with lofted beds, bedside shelves, drop-leaf worksurfaces, stack-on wardrobes and ladder frames.

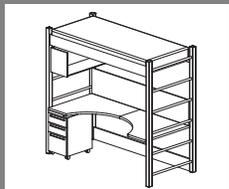
Personal

Adapt limited space to individual preferences with height adjustability and a variety of options. Components and beds adjust to accommodate varying body types or wheelchairs. Mobile storage pedestals with cushions pull out for additional seating or stow away when not in use.

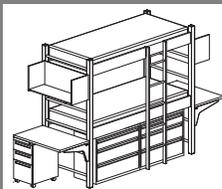
Durable, Attractive, and Responsible.

RoomScape is the smart choice with heavy-duty construction, color flexibility and a small environmental footprint. Steel and laminate design provides better structural integrity. Powder coat paint finishes and wood grain laminates cater to design sensibilities. Recyclable materials and no off-gassing make it eco-friendly.

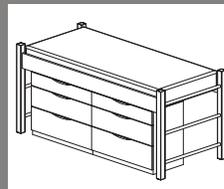
TYPICAL CONFIGURATIONS



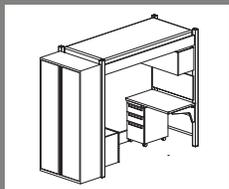
Loft Bed with Megasurface



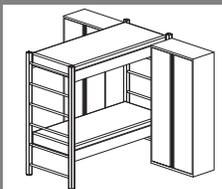
Bunk Beds with Drawers



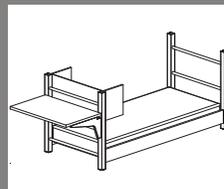
Single Bed with Drawers



Loft Bed with Standard Desk



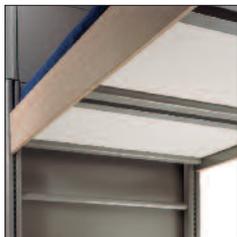
Bunk Beds



Single Bed



Spring bed deck delivers higher comfort and lower cost.



Platform bed deck reflects light to the space below, resists stains and doesn't sag.



Install or rearrange components quickly and easily using slotted channels in the system frame (no tools needed).



Drop-leaf surfaces flip up for greater work space and fold down to optimize room space.

Learn more about RoomScape Residence Hall Furniture



Printed on FSC® certified paper using only vegetable-based inks, including metallics. Please recycle.



KI is a trusted expert for furniture and wall systems around the globe.

USA | CANADA | MEXICO | UK | EUROPE | ASIA | MIDDLE EAST | AUSTRALIA

1330 Bellevue Street • P. O. Box 8100 • Green Bay, WI 54308-8100 • 1-800-424-2432 • www.ki.com

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Furnishing Knowledge®

Sela®

Lounge Collection

Comfortable Design | Casual Function | Contemporary Style



Furnishing Knowledge®



lounge redefined



People settle into lounge spaces naturally by perching on chair arms, spreading out across furnishings, and rearranging furniture pieces. Sela's unconventional design is highly adaptive to support the many ways people like to sit. The comfortable collection is extremely durable and mobile, and responds to how individuals relax, relate, congregate and learn.



Lounge Chair

Lounge Chair and a Half

casual appeal



Sela responds to the realities of lounging and the rigors of use. The collection offers an oversized scale with an increased degree of recline. Less dense materials provide durability with the added appeal of a lifetime warranty. Individuals are made to feel more comfortable, encouraging interaction and supporting spontaneous learning.



Tablet Arm

- Supports laptops, books, note-taking, or snacking.



Sled Base

- Maneuvers easily across any floor. Chrome accents reflect mid-century modern design.



Markerboard Tabletop

- Provides a ready canvas for sharing ideas.

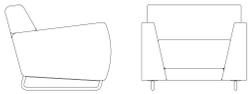


Wood Armcap and Wood Leg

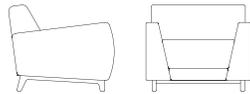
- Reflects sophisticated style to complement any environment.

contemporary^{style}

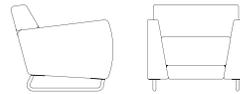
The Sela collection captures the less formal, casual lifestyle of today's students and workers while complementing a variety of interiors. The pieces are residentially influenced with popular mid-century modern elements. Highly functional and well-built, the furnishings ensure both ease and comfort—precisely what a lounge space is intended to provide.



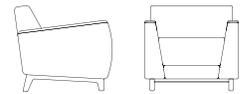
1223 Sela Chair and a Half
Width: 38 Depth: 38.25 Height: 31
COM: 6 yards Weight: 75 lbs



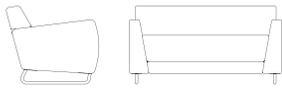
1223WAB/WA/B Sela Wood Arm Chair and a Half
Width: 38 Depth: 38.25 Height: 31
COM: 6 yards Weight: 75 lbs



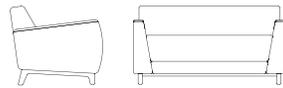
1323 Sela Lounge Chair
Width: 32 Depth: 33.5 Height: 28.25
COM: 4.5 yards Weight: 65 lbs



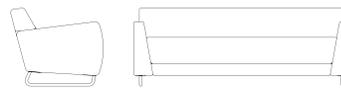
1323WAB/WA/B Sela Lounge Wood Arm Chair
Width: 32 Depth: 33.5 Height: 28.25
COM: 4.5 yards Weight: 65 lbs



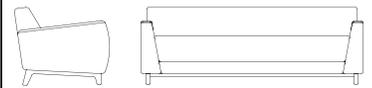
1333 Sela Loveseat
Width: 55 Depth: 33.5 Height: 28.25
COM: 6.5 yards Weight: 90 lbs



1333WAB/WA/B Sela Wood Arm Loveseat
Width: 55 Depth: 33.5 Height: 28.25
COM: 6.5 yards Weight: 90 lbs



1343 Sela Sofa
Width: 78 Depth: 33.5 Height: 28.25
COM: 8.5 yards Weight: 110 lbs



1343W Sela Wood Arm Sofa
Width: 78 Depth: 33.5 Height: 28.25
COM: 8.5 yards Weight: 110 lbs



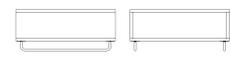
1313-T Sela Lounge Chair with Tablet Arm
Width: 32 Depth: 33.5 Height: 28.25
COM: 4.5 yards Weight: 65 lbs



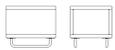
1220 Sela Ottoman
Width: 18 Depth: 26 Height: 18
COM: 1 yard Weight: 50 lbs



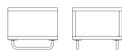
1350 Sela Rectangular Coffee Table
Width: 48 Depth: 20 Height: 15
Weight: 150 lbs



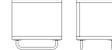
1360 Sela Square Coffee Table
Width: 36 Depth: 36 Height: 15
Weight: 150 lbs



1351 Sela Rectangular End Table
Width: 15 Depth: 18 Height: 18
Weight: 60 lbs



1361 Sela Square End Table
Width: 18 Depth: 18 Height: 18
Weight: 60 lbs



1352 Sela Rectangular Lamp Table
Width: 15 Depth: 18 Height: 15
Weight: 60 lbs



1362 Sela Square Lamp Table
Width: 18 Depth: 18 Height: 15
Weight: 60 lbs

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Furnishing Knowledge®



Absocold® ENERGY STAR® Qualified
Hospitality Refrigerator
1.1 cu. ft. Single-Door - Auto-Defrost



SUITE FRIDGE®
ARD104A

■ **Black**
Model: ARD104AB14R/L



Suite Fridge® hospitality refrigerators are specifically designed for commercial hotel applications only and are *not intended for medical or consumer residential applications.*

KEY BENEFITS

- Fits most existing absorption-type unit cabinetry
- More energy and cooling efficient than absorption refrigerators
- Maintains 38°F at 75.2°F ±1.8°F ambient temperature
- Special QUICK CHILL 'N SNOOZE® Functions
- Environmentally safe - Non-Flammable R134A refrigerant & Non-Flammable foaming agent 245F
- Quiet Operation

FEATURES

Energy	ENERGY STAR® Qualified - Tier I 242 KWH/Yr Energy Consumption 10% less energy than Federal Standard
QUICK CHILL 'N SNOOZE®	Snooze® Function (8 hours) Quick Chill® Function (2 hours)
Defrost Type	Automatic Defrost
Door Type	Easy-Clean Euro-Round Door
Door Handle	Integrated Handle
Door-Swing	Reversible (Factory Standard, Right-Hand Hinge)
Interior Shelves	1 Full-Width Removable Shelf
Door Storage	Beverage Can Dispenser (5 cans) Tall Bottle Door Shelf
Cabinet Design	Fits Most Existing Absorption Unit Cabinetry Clean-Back Design
Leveling	2 Front Adjustable Leveling Feet
Capacity	1.1 cu. ft. Total Capacity

INSTALLATION REQUIREMENTS

Remove all packing material and tape. Install on a level floor or well-supported counter. Avoid any direct sunlight, heat source, or moisture. This product is designed to be *freestanding* and must be installed at least 2" from the wall, and the cabinet bottom is at least 3/4" to 1" above the floor or carpet, in order to let the air circulate freely around the unit.

Product specifications subject to change without notice

DIMENSIONS

Height	20 5/8 in.
Width	15 in.
Depth	16 1/8 in.
Weight	33 lbs.
Carton Height	21 1/2 in.
Carton Width	16 1/2 in.
Carton Depth	18 3/4 in.
Shipping Weight	36 lbs.
Shipping Cube	3.9 cu. ft.

ELECTRICAL

A minimum 15 AMP electrical supply is required (20 AMP electrical supply preferred). A time-delay fuse or circuit breaker and separate circuit is recommended. 115V., 60 Hz.

Running Amperage: 0.9 AMPS



ARD104AB



Commercial UL® listing (File# SA11117)

Patent, Copyright and Trademark Information
This product is covered by US Patent #7,634,918.
Other US Patents Pending.

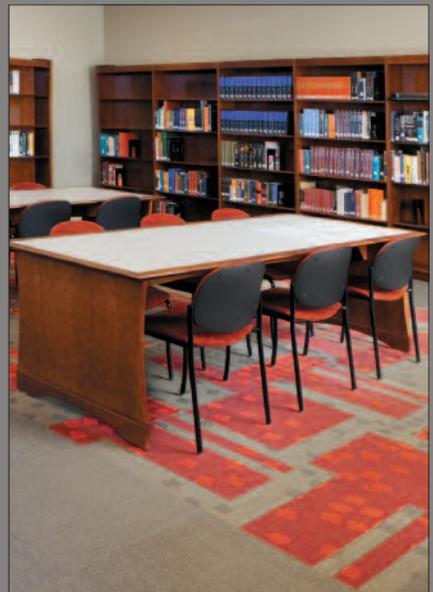
Absocold Corporation, P.O. Box 1545, Richmond, IN 47375
Toll-Free: 800-843-3714 • Fax: 765-935-3450
www.absocold.com • absocold@absocold.com



Integrating aesthetics, technology, and craftsmanship.

- Traditional design
- Versatile function
- Exceptional durability







Study Tables - panel leg, rectangular, square, and round shapes in various sizes. PowerUp option or grommets available.



Carrels - stand-up computer station, ADA height, single face and double face units in 36" and 48" widths - PowerUp option or grommets available.



Chairs - wood chairs with upholstered or wood seats, armless chairs available in three heights, chair with arms available in 18" height only.



Shelving - wood or steel shelves in several heights, single face and double face units.



Display Shelving - media display steel shelving, periodical shelving and newspaper display units in various heights, single face and double face units.



Accessory Units - dictionary and atlas stands, 29" x 36" x 45".



Accessory Units - descending platform book truck, rolling book cart with flat or slanted shelves.

CrossRoads® Library Furniture

Transitional design

Timeless CrossRoads furniture enhances any setting with its clean, transitional style and understated details.

Select either curved or straight table aprons and end panels. Tables and carrels feature a tapered knife-edge design and mitered corners. Available in maple or oak in five standard finishes.

Versatile function

CrossRoads furniture meets the varied demands of today's libraries/resource centers... private or group study, research, storage, display and circulation.

Tables and carrels offer wire-access grommets or KI's patented PowerUp modules that snap open to provide ready access to power/data ports.

Exceptional durability

Attention to detail adds up. Exclusive UV finish, mortise and tenon with screw joinery and a leading 10-year warranty result in library furniture that withstands the test of time.



Circulation Desk - modular circulation desks are created by combining various CrossRoads desking, transaction, corner, and storage units to meet your needs.



LENOXCUBBY Lenox Cubby Locker

- Tough, attractive, solid plastic never needs painting, resists dents and scratches
- Impervious to moisture — cubby will not rust or delaminate
- Made from 30% pre-consumer recycled HDPE plastic
- Durable, vandal resistant all-welded construction
- Wide range of sizes, tiers, colors and options
- 20-year warranty against rust, delamination or breakage under normal use*
- Lockers ship assembled; optional top, end panel and base assembled at the job site
- US Patent Numbers 6,793,299 – 7,223,317
- Other Patents Pending

Construction - Standard Features

Sizes Available:

A=Wide	B=Deep	C=Opening Width	D=Tall
12"	12"	8-1/4"	24***
15"	15"	11-1/4"	36***
18"	18"	14-1/4"	48***
	21"		60"
	24"		72"

** Nominal

Tiers	Actual Locker Height				
	24 ¹¹ / ₁₆ "	36 ¹ / ₂ "	48 ¹ / ₃₂ "	60"	72"
2	X	X	X	X	X
3		X	X	X	X
4			X	X	X
5				X	X
6					X

Frames

Constructed of 1/2" thick High Density Polyethylene (HDPE) with homogeneous color and a matte finish texture. Dirt or graffiti are easily removed with standard industrial cleaners. Frames are welded to cubby box to provide a secure, rigid assembly. Frame width is 1 1/8" on each side. Frame divider height is 1".

Sides, Tops, Bottoms and Dividers

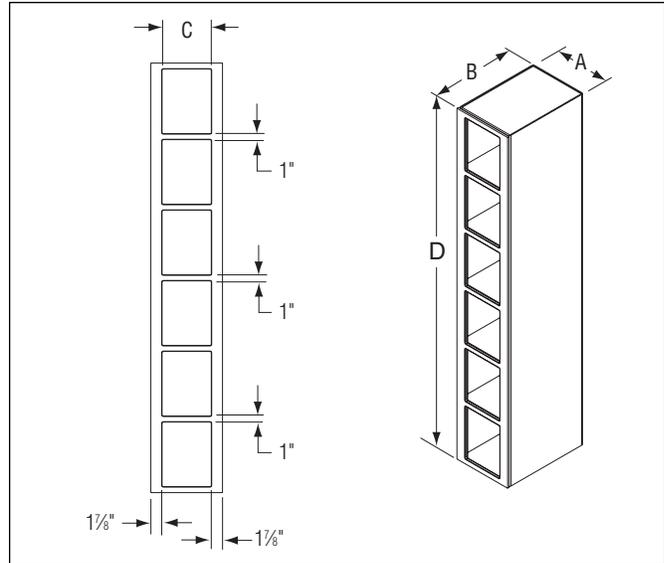
Constructed of 3/8" thick white HDPE with a smooth finish. Sides and back of box are formed from a single sheet of HDPE with fused corners. Tops, bottoms and dividers are welded to box to form a complete unit without metal fasteners or dovetail joints.

Construction - Optional Features

Slope Top – Model LENOXSLOPETOP

Constructed of a 1" thick HDPE backplate (color may vary) and a 1/2" thick colored HDPE slope top panel. Provides a finished look and prevents accumulation of dust and storage of items on top of cubby lockers. Back plate secures to wall first, then panel is secured through the cubby locker top from the inside — no exposed fasteners. Standard slope is 10°. Available in single cubby locker size or in 24", 30", 36", 45" and 72" lengths. All necessary hardware included.

* Normal use further defined as lockers installed in a climate-controlled environment, away from direct sunlight.



Flat Top – Model LENOXFLATTOP

Constructed of 3/8" or 1/2" thick HDPE with homogeneous color and a matte finish texture. Provides a finished look on top of cubbies. Available in single cubby size or in 24", 30", 36", 45" and 72" lengths. Hardware not included.

Base – Model LENOXBASE

Constructed of 1" thick HDPE with homogeneous color and a matte finish texture. Base can be between 3" and 8" tall and set back 3" from cubby locker front to provide toe clearance. Notched end caps provide ease of installation. Installation hardware, including screws, anchors, L-brackets and mending plates are included.

End Panels – Model LENOXENDPANEL

Constructed of 3/8" thick HDPE with homogeneous color and a matte finish texture. End panels cover white cubby sides on exposed ends and are available in flat or slope top styles and in single or double (back-to-back) configurations. When properly installed, the top edge of the end panel is exposed, sitting flush with the finished locker top. All necessary hardware included.

Fillers - Model LENOXFILLER

Constructed of 1/2" thick HDPE secured to 3/8" thick HDPE angle bracket. Filler is attached through the inside of an end or corner cubby to fill gaps between cubbies and a wall or another cubby in a corner. Available in colors to match cubbies 24", 36", 48", 60" or 72" tall, 6", 12", 15" and 18" wide. All necessary hardware included.

Coat Hook

Double hook constructed of black polycarbonate. Furnished in 60" and 72" two-tier cubbies only. Hook hangs under cubby tops. Secured to tops with stainless steel screws.

Wall Hook

Constructed of black powder-coated cast zinc. 1-3 hooks can be secured to each tier with this option. Please specify location.

Wood bases are not recommended.



LENOXCUBBY Lenox Cubby Locker

Please see Optional Selections Tech Data for additional ordering information.

Model	Description
<input type="checkbox"/> LENOXCUBBY	Solid Plastic Cubby Locker

Required Selections (Must select one from each category)

Locker Width (select one):

<input type="checkbox"/> 12-WIDTH	12" Wide Cubby
<input type="checkbox"/> 15-WIDTH	15" Wide Cubby
<input type="checkbox"/> 18-WIDTH	18" Wide Cubby

Locker Depth (select one):

<input type="checkbox"/> 12-DEPTH	12" Deep Cubby
<input type="checkbox"/> 15-DEPTH	15" Deep Cubby
<input type="checkbox"/> 18-DEPTH	18" Deep Cubby
<input type="checkbox"/> 21-DEPTH	21" Deep Cubby
<input type="checkbox"/> 24-DEPTH	24" Deep Cubby

Locker Height (select one):

<input type="checkbox"/> 24-HGT	24" High Cubby (Nom. Height)
<input type="checkbox"/> 36-HGT	36" High Cubby (Nom. Height)
<input type="checkbox"/> 48-HGT	48" High Cubby (Nom. Height)
<input type="checkbox"/> 60-HGT	60" High Cubby
<input type="checkbox"/> 72-HGT	72" High Cubby

Locker Tiers (select one):

<input type="checkbox"/> 2TIER	Two-Tier Cubby
<input type="checkbox"/> 3TIER	Three-Tier Cubby
<input type="checkbox"/> 4TIER	Four-Tier Cubby
<input type="checkbox"/> 5TIER	Five-Tier Cubby
<input type="checkbox"/> 6TIER	Six-Tier Cubby

Locker Color (select one):

<input type="checkbox"/> BEIGE	<input type="checkbox"/> MOSS
<input type="checkbox"/> BURGUNDY	<input type="checkbox"/> RED
<input type="checkbox"/> BUTTERMILK	<input type="checkbox"/> STARRY-NIGHT [†]
<input type="checkbox"/> CANYON-GRANITE	<input type="checkbox"/> TOFFEE
<input type="checkbox"/> CHARCOAL-GRAY	<input type="checkbox"/> WHITE
<input type="checkbox"/> DEEP-BLUE	<input type="checkbox"/> PC-CHARCOALGRAY 100% Post-Consumer Recycled Charcoal Gray**
<input type="checkbox"/> DESERT-STONE	<input type="checkbox"/> PC-TOFFEE 100% Post-Consumer Recycled Toffee**
<input type="checkbox"/> DONE-STONE [†]	<input type="checkbox"/> RECYCLED-BLACK 100% Pre-Consumer Black
<input type="checkbox"/> GRAY	
<input type="checkbox"/> LINEN	

Optional Selections

Locker Wall Hooks

<input type="checkbox"/> NO-HOOKS	No Wall Hooks
<input type="checkbox"/> ONE-HOOK	1 Wall Hook per Tier
<input type="checkbox"/> TWO-HOOKS	2 Wall Hooks per Tier
<input type="checkbox"/> THREE-HOOKS	3 Wall Hooks per Tier

** 100% Post-Consumer HDPE may have some minor flaws and the color may be inconsistent.

Lockers are non-cancelable and non-returnable.

Speed Queen® Multi-Housing

Electronic Commercial Front Load Washer

Front Control



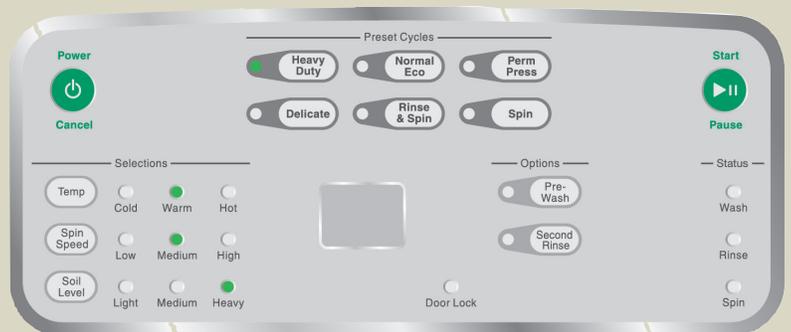
ENERGY STAR® Certified

BUILT FOR RELIABLE PERFORMANCE

- Suspension with out-of-balance logic
- Industry leading 1200 spin speed exerts 440 g-force extraction
- U.S. DOE compliance for energy and water efficiencies
- ADA compliant
- Commercial-grade stainless steel washtub
- Extra-wide 15.5" door opening and 180° door swing
- Four compartment supply dispenser

ELECTRONIC CONTROL

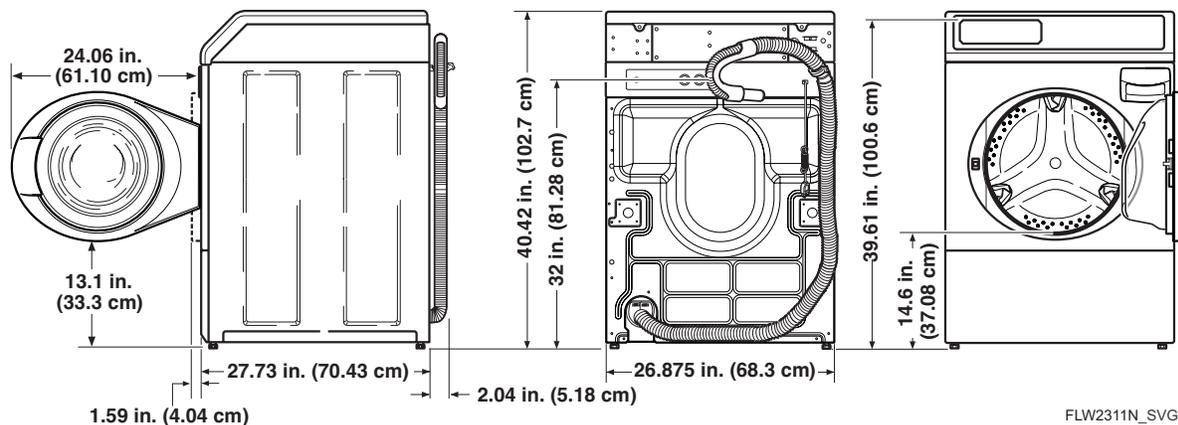
- Cycle indicator lights
- Three wash temperatures
Hot, warm, cold
- Three soil levels
Light, medium, heavy
- Digital display



ELECTRONIC COMMERCIAL FRONT LOAD WASHER SPECIFICATIONS

MODELS	LFNE5BSP113TW01	LFNE5BJP113TW01
		
Appearance		
Color	White	White
Control Panel Selection	Front	Front
Water and Energy Info		
Modified Energy Factor "MEF" ft ³ /kWh/cycle (Liters/kWh/cycle)	2.38 (82.29)	2.38 (82.29)
Water Factor "WF" - gal/ft ³ (Liters/Liter/cycle)	3.7 (0.50)	3.7 (0.50)
Water Consumption - gal (Liter)	11.7 (44.3)	11.7 (44.3)
Technical Info		
Stainless Steel Cylinder Volume - cu. ft. (liters)	3.42 (96.8)	3.42 (96.8)
Weight - lb (kg)	250 (113)	250 (113)
Shipping Weight - lb (kg)	270 (122)	270 (122)
Electrical Requirements	120/60/1-15 amp	120/60/1-15 amp
Overall Dimensions WxDxH - in (mm): 26 7/8 (683) x 27 3/4 (704) x 40 7/16 (1027)		
Cycle - Heavy Duty, Normal Eco, Perm Press, Delicate, Rinse and Spin, Spin Only		
Temperature - Hot, Warm, Cold	Yes	Yes
Motor	0.9 HP 671 W	0.9 HP 671 W
Water Pressure PSI (Bar) - 20-120	1.4-8.3	(1.4-8.3)
Supply Injection	--	Yes
Spin Speeds - RPM	1200	1200
Performance/Features		
Safe Door Lock Release at Cycle Completion	Yes	Yes
Agency Approval	cULus	cULus

For the most accurate information, the installation guide should be used for all design and construction purposes. Due to continuous product improvements, design and specifications subject to change without notice. The quality management system of Alliance Laundry Systems' Ripon facility has been registered to ISO9001:2008.



FLW2311N_SVG

Speed Queen® Multi-Housing

Electronic Commercial Homestyle Stack Dryer (Overall height of 78 3/16") Front Control

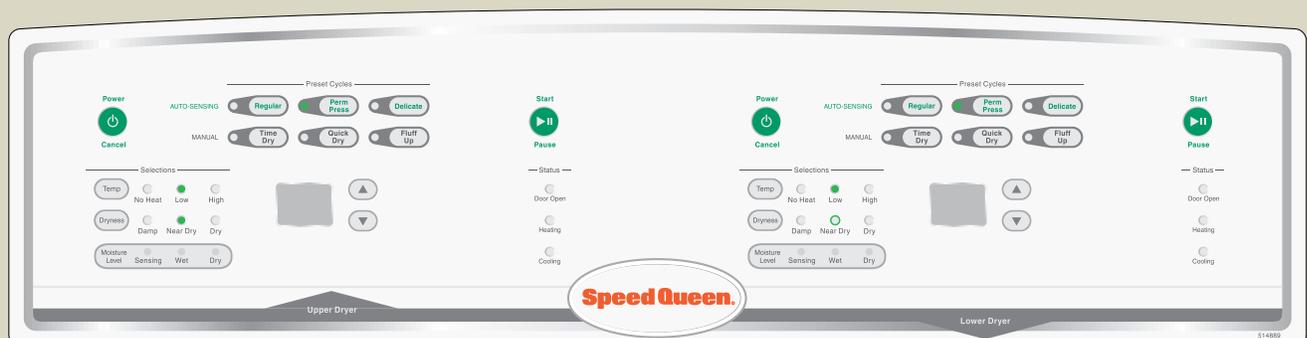


BUILT FOR RELIABLE PERFORMANCE

- Industry's largest door opening 2.06 sq. ft. (1914 cm²)
- Quiet, efficient blower system
- ADA compliant (bottom dryer only)
- High efficiency exhaust blower with superior airflow 220 cfm (105 liters/sec)
- 100% serviceable from the front
- Space-saving narrow cabinet 26-7/8" (683 mm)
- Upfront lint filter easy to clean and secured
- Durable galvanized steel cylinder

ELECTRONIC CONTROL

- Easy-to-use touchpad control
- Equipped with moisture sensing
- Three temperature settings
- Three moisture settings



ELECTRONIC HOMESTYLE COMMERCIAL STACK DRYER SPECIFICATIONS



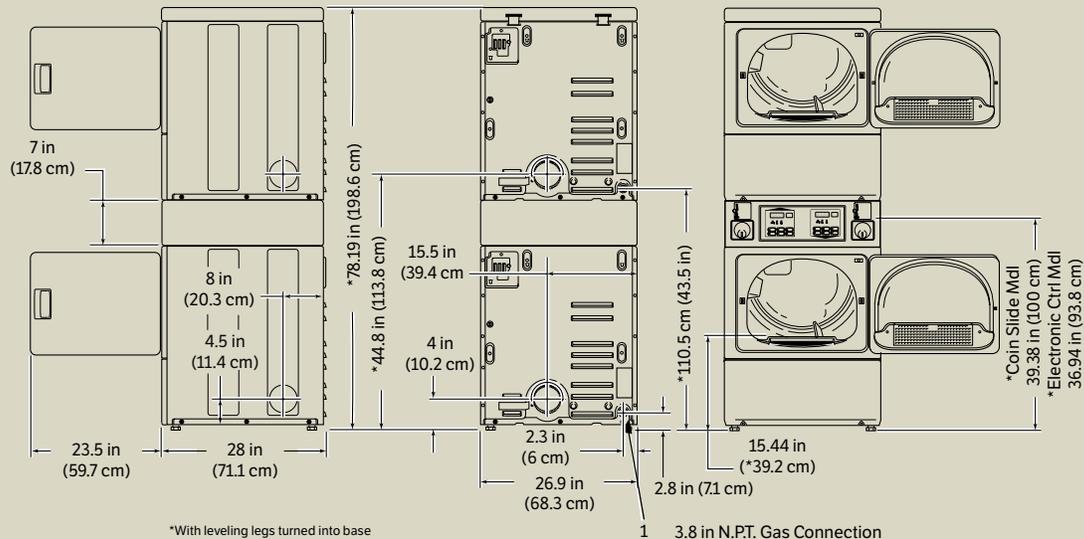
MODELS
LSEE5AGS173TW01
LSEE5AGS153TW01
LSGE5AGS113TW01

Available Control Location	Front
Activation Type	Electronic
Capacity - lb (kg)	18 (8.2) (ea)
Cylinder Volume - cu. Ft. (liters)	7.0 (198) (ea)
Width - in (mm)	26 7/8 (683) (ea)
Depth - in (mm)	28 (711) (ea)
Height - in (mm)	78 3/16 (1986)
Motor Size (Variable Speed Induction) - HP (kw)	1/3 (0.25) (ea)
Available Heat Sources	Electric Gas
Available Heating Element - (Electric)	5350W, 240V 4750W, 208V
Gas Inlet Connection - in (mm)	3/8 (9.5)
Gas Consumption - BTU/Hr	25,000
Exhaust Outlet Dia. - in (mm)	4 (102)
Exhaust Airflow - cfm (liters/sec)	220 (105)
Available Cycles	Regular, Perm Press, Delicate, Time Dry, Quick Dry, Fluff Up
Cylinder Finish	Galvanized
Available Colors	White
Available Electrical Requirements (v/Hz/Ph-Amp)	Elec 240/60/1 30 amp* 208/60/1 Gas 120/60/1 15 amp
Net Weight - lb (kg)	Elec 240 (109) Gas 250 (113)
Shipping Weight - lb (kg)	Elec 255 (115) Gas 265 (120)
Shipping Width - in (mm)	29 (737)
Shipping Depth - in (mm)	32 3/4 (832)
Shipping Height - in (mm)	80 (2032)
Available Agency Approvals	Elec cULus Gas cCSAus

NOTE: Each stack dryer pocket requires its own separate power cord.

* Electric dryers come equipped for 240/60/1 operation. They can be field converted to operate on 208/60/1 with optional 61928 conversion kit. (Gas dryers can be field converted for operation on LP gas with optional 458P3 conversion kit.)

For the most accurate information, the installation guide should be used for all design and construction purposes. Due to continuous product improvements, design and specifications are subject to change without notice. The quality management system of Alliance Laundry Systems' Ripon facility has been registered to ISO 9001:2008. Printed in the USA.





ECO-ART. TRULLO

ACOUSTIC RECYCLED TEXTILE Wallcoverings • Panels • Exhibits • Partitions

A dimensional fabric produced with post-consumer recycled fiber offering exceptional performance, unmatched fade resistance, and a fire/smoke retardant Class A rating. It is lightweight and easy to install and maintain. **eco-A.R.T.** is moisture resistant, mildew, rot, and bacteria resistant and is nonallergenic.

- **eco-fi® Polyester staple fiber.** High strength fibers which are resistant to shrinking and stretching. Highly durable. 100% recycled content from water & soda bottles. Averages 90% post-consumer content.
- Easy to clean and maintain.
- Fiber does not absorb moisture.
- Acoustical qualities: NRC ratings .17 (ASTM C423)
- Velcro compatible, pill resistant.
- **UL classification:** Only Hytex needlepunch acoustical fabrics carry the UL label.
- Passes NFPA 265 Corner Burn Test. It is the standard test method for evaluating room fire growth contribution of Textile Wallcovering.
- Solution dyed. Resists sun, fading - colors are fast to most destructive agents.

USAGE AREAS

DESIGNERS	HEALTH CARE	HOSPITALITY	CORPORATE	INSTITUTIONAL	ENTERTAINMENT
•Commercial Interiors Market	•Retirement Facilities •Nursing Homes •Hospitals •Nursing Stations	•Ball Rooms •Conference Rooms •Meeting Rooms	•Executive Conference Rooms •General Offices	•Schools(Auditorium) •Government & Mass Trans. Buildings •Day Care Centers	•Theatres •Recreational Centers

Acoustical Panels • Tack Boards • Elevators • Ceiling Tiles • Office Partitions • Chair Rails

SPECIFICATIONS

CONTENT eco-fi® Post-Consumer Recycled Solution Dyed Polyester Staple Fiber	BACKING Fused Poly	WEIGHT 24 ounces / face weight	WIDTH 54"	ROLL SIZE 33 yards	FLAMMABILITY Passes NFPA 265 Class A/ASTM E-84
NRC (ASTM C-423) .17 over gypsum board	MOISTURE REGAIN (ASTM D-2654) .5%	COLORFASTNESS TO LIGHT (AATCC-16A) Class 5 - 100 hours	ABRASION RESISTANCE (ASTM D-4158) Voluntary Prod. TS198 Full Commercial Serviceability		

Fosshield® Antimicrobial Technology – silver & copper ions are incorporated into the polyester fiber and naturally attack microbes. Fosshield® inhibits the growth of bacteria, mold and fungus, providing permanent protection. Ions bind to any microbes that may be present on the fiber and disable their critical functions (metabolism, respirations, and reproduction). Typical examples of microbes of common concern are Methicillin-resistant Staphylococcus aureus (MRSA), the Human rhinovirus (common cold), Steptococcus pyogenes (strep), Legionella pneumophilia (Legionaires disease), Human Coronavirus (SARS surrogate), and Feline Calicivirus (Norwalk virus). Fosshield® is the technology incorporated into the FDA cleared SpectraShield® 9500 N95 surgical respirator mask. In the FDA testing, Fosshield® began microbe prevention immediately and eliminated 99.99% of certain odor-causing bacteria after one hour of contact with the respirator surface.

UNDERWRITERS LABORATORIES INC.
CLASSIFIED WALLCOVERING SURFACE BURNING CHARACTERISTICS
 Applied to inorganic reinforced cement board with Sairmix-7 super duty high temperature mortar at an application rate of 55 square feet per gallon

Flame Spread 15	Smoke Developed 85	
--------------------	-----------------------	---------------------------------------------------------------------------------------

NOTE: The numerical flame spread rating and other test results referenced herein are not intended to reflect hazards presented by this or any other material under actual fire conditions.

Installation and maintenance instructions are enclosed with every **eco-A.R.T.** shipment and should be carefully read prior to installation. For best results, it is recommended that a qualified textile wallcovering installer be employed.

Hytex Industries, Inc. – 58 York Ave. – Randolph, MA 02368 – (781) 963-4400 – www.hytex.com



Pinnacle Rubber Wall Base

MADE IN THE USA

PRODUCT QUICK SPEC



ROPPE.

Proven. Flooring. Experiences.

1. MANUFACTURER

Roppe Corporation

1602 N. Union Street
P.O. Box 1158
Fostoria, Ohio USA 44830-1158
t: (419) 435.8546 | tf: (800) 537.9527
f: (419) 435.1056
E-mail: sales@roppe.com | Internet: www.roppe.com



Profile: Sanitary Toe

Gauge: 1/8" (3.2 mm)

Heights: 4" (101.6 mm)

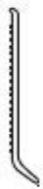
Lengths: 48" (1.22 m) Pieces

Factory Corners: Outside Corners in 4" (101.6 mm) height with 3 3/4" (95.25 mm) returns

2. PRODUCT DESCRIPTION

Roppe Pinnacle Rubber Base is designed for use in commercial and residential wall base applications. PVC free Pinnacle Base is the professional's choice, because 100% Type TS Pinnacle rubber base is highly durable and extremely flexible, allowing for easy installations around columns, corners and architectural curves without product acclimation.

Available Styles (All Dimensions Nominal)



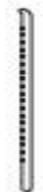
Profile: Standard Cove

Gauge: 1/8" (3.2 mm)

Heights: 2 1/2" (63.5 mm), 3" (76.2 mm), 3 1/2" (88.9 mm), 4" (101.6 mm), 4 1/2" (114.3 mm), 5" (127 mm), 5 1/2" (139.7 mm), 6" (152.4 mm)

Lengths: 48" (1.22 m) Pieces & 120' (36.58 m) Coils

Factory Corners: Inside & Outside Corners in 2 1/2" (63.5 mm), 4" (101.6 mm), 6" (152.4 mm) heights with 2 1/4" (57.15 mm) returns



Profile: Standard No Toe

Gauge: 1/8" (3.2 mm)

Heights: 2 1/2" (63.5 mm), 3" (76.2 mm), 3 1/2" (88.9 mm), 4" (101.6 mm), 4 1/2" (114.3 mm), 5" (127 mm), 5 1/2" (139.7 mm), 6" (152.4 mm)

Lengths: 48" (1.22 m) Pieces & 120' (36.58 m) Coils

Factory Corners: Outside Corners in 2 1/2" (63.5 mm), 4" (101.6 mm) heights with 2 1/4" (57.15 mm) returns



Profile: Butt Toe

Gauge: 1/8" (3.2 mm)

Heights: 4" (101.6 mm)

Lengths: 48" (1.22 m) Pieces

Factory Corners: No Corners Available



Profile: Long Toe

Gauge: 1/8" (3.2 mm)

Heights: 4" (101.6 mm)

Lengths: 48" (1.22 m) Pieces

Factory Corners: Outside Corners in 4" (101.6 mm) height with 2 1/4" (57.15 mm) returns

Inside & Outside Corner Blocks



Gauge: 1/2" (12.77 mm)

Width: 1" (25.4 mm)

Heights: Available in all heights matching Pinnacle wall base heights.

Custom order height as needed and

Roppe recommends that corner blocks

are ordered at least 1/4" taller than the finished height of the wall base being installed with. Any necessary corner height reductions can be achieved by simply trimming the bottom end of the corner blocks.

Inside & Outside Micro Corner Blocks



Gauge: 0.060" – 0.080" (1.5 mm – 2 mm)

Width: 1/4" (6 mm)

Heights: Available in all heights matching Pinnacle wall base heights. Custom order

height as needed and Roppe recommends that corner blocks are ordered at least 1/4"

taller than the finished height of the wall base being installed with. Any necessary corner height reductions can be achieved by simply trimming the bottom end of the corner blocks.

3. TECHNICAL DATA

PRODUCT CLASSIFICATION

- **ASTM F 1861, Resilient Wall Base** - Type TS, Group 1, Styles A, B & C

FIRE TESTING INFORMATION

- **ASTM E 84 (NFPA 255), Surface Burning Characteristics** - Class B, FSI 45, SDI 95
- **ASTM E 648 (NFPA 253), Critical Radiant Flux** - Class 1, > .45 W/cm²
- **ASTM E 662 (NFPA 258), Smoke Generation** - Passes, < 450
- **CAN/ULC-S102.2, Surface Burning** – FSR 50, SDC 175

4. LIMITATIONS

Roppe Pinnacle Rubber Wall Base is for indoor use only. Do not install on any surface exposed to moisture or extreme temperature changes. Do not install in areas subject to vegetable or petroleum based oils & greases. Fading can

Tred-MOR[®]

CARPET CUSHION

Tred-MOR[®] 2568 SPECIFICATIONS

SPECIFICATION DATA

Product Code:	BV0338
Product Name:	Tred-MOR [®] 2568
Traffic Classification:	Heavy
Material Weight:	68 oz./sq. yd.
Density:	22 lbs./cu. ft.
Thickness:	0.250"
Product Dimensions:	54" x 60' (30 sy.)
Mfg. Tolerances:	Width: +/-1% Thickness: +0.040/-0.030
Approx. Shipping Wt.:	138 lbs. per roll
Color:	Black
Material Content:	Made with SBR Rubber
Design Configuration:	Flat/Flat
Backing Top:	Spunbonded
Backing Bottom:	Poly-Tek
Antimicrobial:	Guardian [™]
Moisture Resistant:	98%
StainSTOP [™] :	Yes
Indoor Air Quality:	CRI Green Label Plus-certified

COMFORT AND DURABILITY

CLD PSI @ 25% Deflec. Min.:	3 (Method 601/12151)
CLD PSI @ 65% Deflec. Min.:	20 (Method 601/12151)
Breaking Strength PSI Length:	45 (Min. ASTM-D2646)
Breaking Strength PSI Width:	41 (Min. ASTM-D2646)
Compression Set:	17.5%

FLAME CERTIFICATION

Pill Test:	Pass (DOC-FF 1-70)
Smoke chamber:	Pass
Flooring Radiant Panel:	*

*Not applicable to separate carpet cushion. Carpet must be tested in composition with cushion.



ACOUSTICAL PERFORMANCE

Impact Insulation Class (IIC):	75 (ASTM-492)
Sound Absorption (NRC):	0.35 (ASTM C423-81)

THERMAL INSULATION

R-Value:	0.460
K-Value:	0.534

OTHER

Meets Federal Spec.:	Class II (ZZ-00811B, Type I)
Toxicity:	No more toxic than wood – an accepted industry standard

PRODUCT FEATURES

Tred-MOR is the nation's premium commercial carpet cushion. It is synonymous with Dubl-Stik[®], and is the benchmark by which all others are measured. Tred-MOR can also be used in conventional stretch-in installation, and is available with QuikLIFT[®] backing.





INTERIOR FINISHES PALETTE

STRUCTURAL PRODUCT DATA

Structural Thermal Break Connections



Introduction

Thermal break plates are high performance thermal insulators used between both horizontal and vertical connections of internal and external elements to prevent thermal / cold bridging. They provide a simple, economical and extremely effective solution to meeting Part L of the Building Requirements by way of reducing both heat loss and the risk of internal condensation. Farrat thermal breaks can also be used in hot climate conditions to insulate the cool, air conditioned interior, from the hot outside conditions.

In 2007, responding to a request from a designer who was concerned with cold bridging on a project, Farrat Isolevel began manufacturing thermal breaks for buildings. Changing legislation in response to climate change and energy saving has meant that Farrat now supply tens of thousands of thermal break plates for the UK and overseas market each year. Constantly driven by engineering excellence, Farrat continue to lead the way in the development of the thermal break plate market.

Farrat thermal breaks are accredited by the **Steel Construction Institute (SCI)** under the Assessed Product Quality Mark Scheme and manufactured under our ISO 9001:2008 Quality Assurance system. Farrat thermal breaks also meet the **NHBC's** technical requirements.

We take pride in providing our customers with a high level of service from technical support through to manufacturing accuracy and timely deliveries to site.

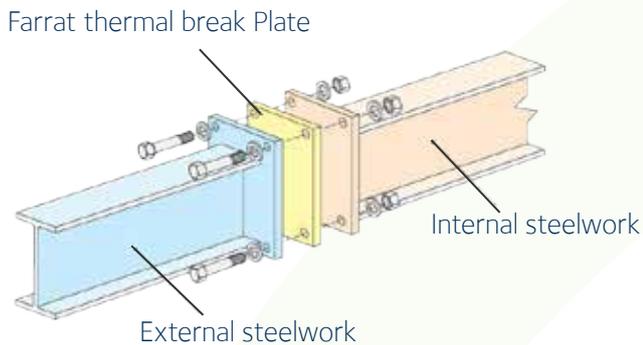


Fig 2.1 steel to steel connection

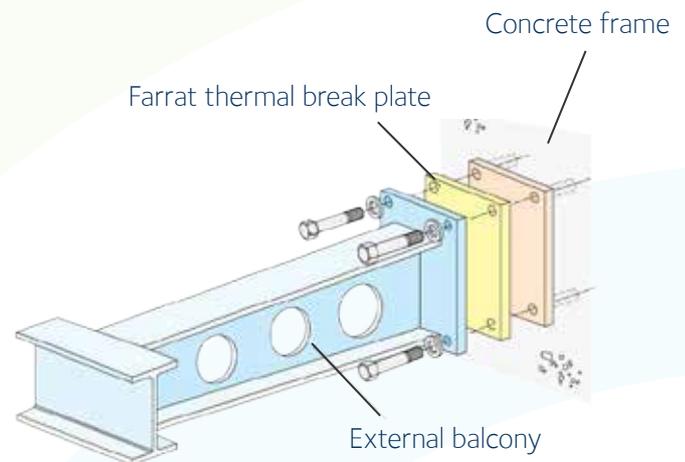


Fig 2.2 steel to concrete connection

Typical Applications

The four primary connections where Farrat thermal breaks are used are as follows:

- › Steel to Steel
- › Steel to Concrete / Masonary
- › Steel to Timber
- › Concrete to Concrete



Thermal Breaks are used in new build and refurbishment projects in the following building elements:



Why choose Farrat Structural thermal breaks?



Steel Construction Institute (SCI) – Assessed Product

"SCI Assessed" is an established quality mark that has been awarded to testify that the technical data and structural design methodology for Farrat thermal breaks has been independently verified by SCI.

All material properties were verified by SCI following testing to an appropriate European building product standard and by an approved Nando Accreditation Body.

<http://ec.europa.eu/enterprise/newapproach/nando/>

NHBC

Farrat thermal breaks meet the NHBC's Technical requirements. NHBC accepts the use of Farrat TBK and TBL thermal break materials for use in structural applications as set out in the SCI report.

Quality Assurance

Farrat Isolevel Limited operates an ISO 9001:2008 quality assurance system. All thermal breaks are manufactured under this system.



Fig 3.1 Farrat research & development laboratory



Fig 3.2 connection with thermal break (Farrat research & development laboratory)

Our in-house testing capabilities include:

-) Dynamic Testing
-) Static Compression Testing
-) Transmissibility Testing
-) Isolated Foundation Testing
-) Shock Testing
-) Creep Testing
-) Cantilever Beam Testing
-) Thermal Break Heat Transfer Testing

-) Façade system connections to the primary frame
-) Brise-Soleil and Canopies
-) Roof plant room columns
-) Balustrading



-) Connections of external to internal primary building elements
-) Isolation of sub-structure and basement structure elements
-) External balconies



-) External staircases
-) Man-safe/cleaning systems
-) Connections to existing structures

Farrat Thermal Breaks – Material Properties

Farrat thermal breaks are manufactured from high performance materials. We offer two grades, Farrat TBK and Farrat TBL. The materials have been independently tested and accredited by the Steel Construction Institute (SCI) under the “Assessed Product” Quality Mark Scheme. In the majority of applications Part L is satisfied by using plates between 5 & 25mm in thickness.

PROPERTIES	FARRAT TBK	FARRAT TBL
Characteristic Compressive Strength, fck (N/mm ² , MPa)	312	89
Design value for compressive strength, fcd (N/mm ² , MPa)	250	70
Elastic Modulus (N/mm ² , MPa)	5178	2586
Density (Kg/m ³)	1465	1137
Water Absorption (%)	0.14	0.48
Thermal Conductivity (W/mK)	0.187	0.292
Colour (may vary)	Amber	Black
Thicknesses available (mm) ++	5, 10, 15, 20 & 25	5, 10, 15, 20 & 25
Temperature Resistance (°Celsius)*	+250 short term (Max) +210 long term (Max) -180 (Min)	

++ Multiple plates can be provided for applications where thicknesses greater than 25mm are required.

* Fire performance of connections – please refer to page 11.

Specifications

-) **Construction drawings** should show a fully detailed connection or one communicating the design intent with a supporting specification (NBS or similar).
-) **The Architect** is normally responsible for ensuring that the connection meets the requirements of the Building Regulations Part L (SAP).

Design Output – Thermal performance/ Thickness (Farrat TBK or Farrat TBL)
-) **The Structural Engineer** is normally responsible for designing the connection or providing a performance specification for the steelwork fabricator.

Design Output – Strength (Farrat TBK or Farrat TBL)

Sample Specification for a project using Farrat TBK – National Building Specification (NBS)

NBS Clause:

G10/ 350 Thermal Break Connection Plate

-) **Manufacturer** Farrat Isolevel Ltd, Balmoral Road, Altrincham, Cheshire, WA15 8HJ, Tel: +44 (0)161 924 1600, Fax: +44 (0)161 924 1616 www.farrat.com
-) **Product Reference** Farrat TBK
-) **Thickness** 25 mm
-) **Plate Size** As Drawing number – or to be determined by the connection designer
-) **Hole Size & Positions** As Drawing number – or to be determined by the connection designer
-) **Accreditation** SCI Assessed Product/ NHBC

Procurement

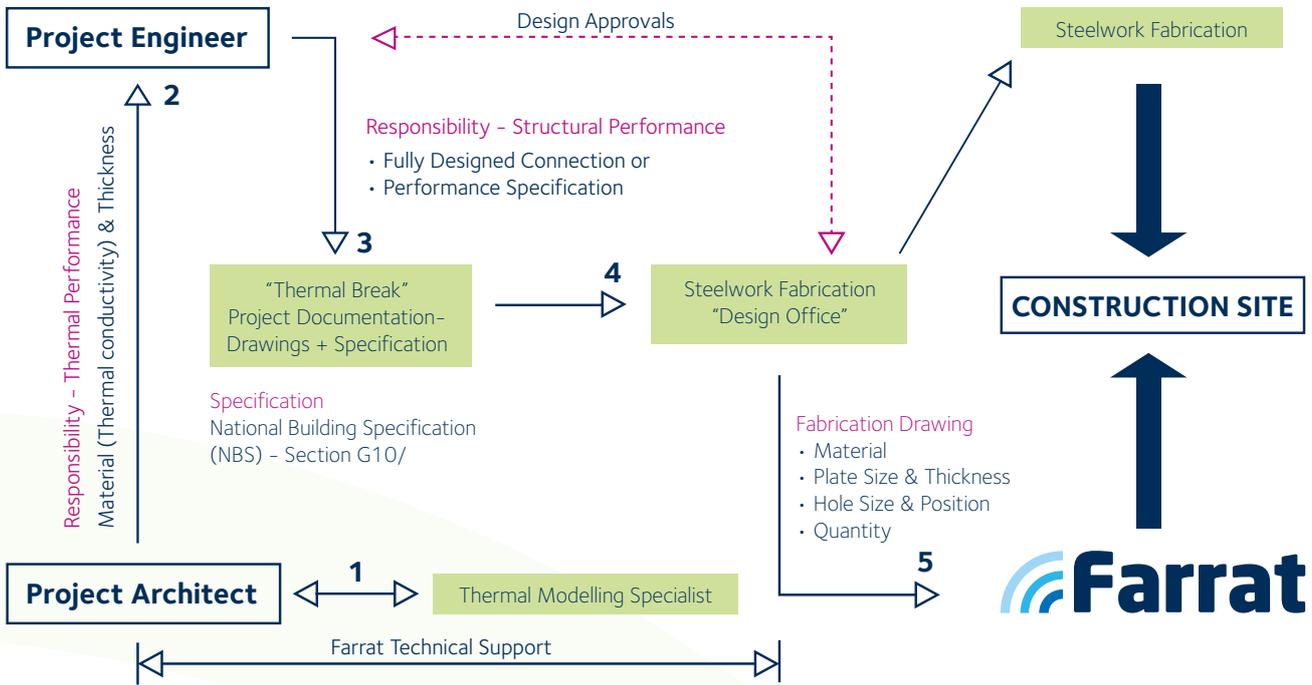


Fig 5.1 The normal procurement process for thermal breaks in a steel framed structure

Enquiries

Quotations:

The following information is required:

- › Material Type – Farrat TBK or Farrat TBL
- › Plate dimensions
- › Plate thickness
- › Size and number of holes
- › Quantity
- › Delivery location

Orders

A fully dimensioned drawing is normally required for each type of plate with a unique project and plate reference prior to fabrication. Fabrication is undertaken in accordance with our ISO 9001 Accreditation. Prior to delivery all thermal breaks are labelled with the fabricator's unique reference. Farrat Thermal Breaks are bespoke products and early procurement is recommended. Where very large orders are envisaged we are happy to work with the customer to plan phased deliveries.

We aim to start manufacturing within 3 days of customers placing an order, The despatch date will be advised at point of order.

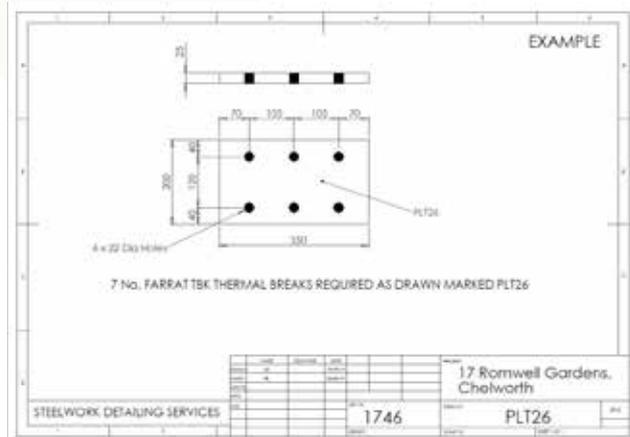


Fig 5.2 Typical thermal break fabrication drawing

Design Consideration – Thermal Performance

Thermal Performance of the Building Envelope

There are very few standard construction details between projects and consequently the detailing of the building envelope and penetrations through the envelope can vary significantly. The calculation of thermal performance and compliance with codified requirements can be complex.

There are two aspects to thermal performance of the building envelope, heat loss and condensation risk. Both of these issues are covered by Building Regulations, and guidance on meeting the Building Regulations is given in various Approved Documents (England and Wales), Technical Handbooks (Scotland) or Technical Booklets (Northern Ireland).

These documents currently all require heat loss and condensation risk to be assessed in accordance with the same British Standards, European Standards and BRE Publications.

Heat Loss

Heat loss is quantified using three parameters, depending upon the nature of the element causing the heat loss.

- ▶ For plane elements such as floors, walls and windows, the designer determines a U-value, which is the heat loss per unit projected area per unit temperature difference, expressed in Watts per square metre per Kelvin (W/m^2K)
- ▶ For linear elements, such as the interface between a window and a wall opening, or a corner where two walls meet, the designer determines a linear thermal transmittance, or Psi-value (ψ -value), which is the additional heat loss per unit length per unit temperature difference, expressed in Watts per metre per Kelvin (W/mK)
- ▶ For localised elements, such as a structural member penetration through a wall, the additional heat loss due to the penetration is expressed as a point thermal transmittance or Chi-value (χ -value), which is the additional heat loss due to the element per unit temperature difference, expressed in Watts per Kelvin (W/K)

Connections that penetrate or bridge the insulation layer normally require a χ -value to be determined. The designer must analyse or measure the heat loss through the construction both with and without the penetration. The difference between these values is the χ -value which is the residual heat loss due to the penetration.

It is impractical to measure the heat loss through most real penetrations due to their size and complexity. A more practical and cost-effective approach is for the designer to use computer modelling software based on techniques such as Finite Element Analysis (FEA).

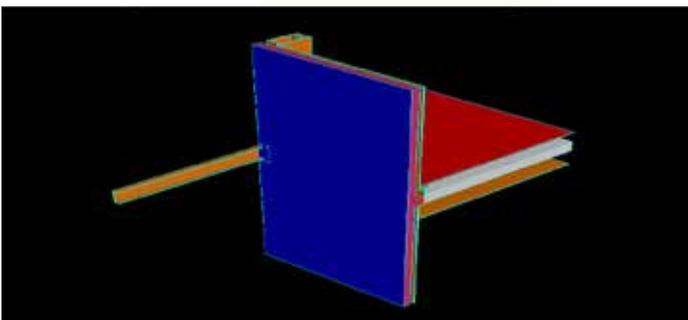


Fig 6.1 Half-detail of penetration as analysed

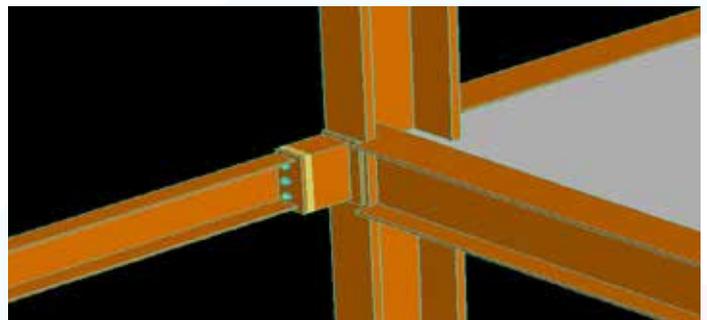


Fig 6.2 Close-up of penetration detail

Figures 6.1 and 6.2 show an FEA model of a penetration utilising a 25 mm Farrat TBK thermal break, combined with thermal isolating washers to maximise the effectiveness of the thermal break (only one-half of the detail is modelled – the detail is symmetrical). For the purposes of analysis the FEA model must include the entire wall construction from the inside to outside, including all dry linings, external finishes and the penetration detail, as has been done for the analyses described here.

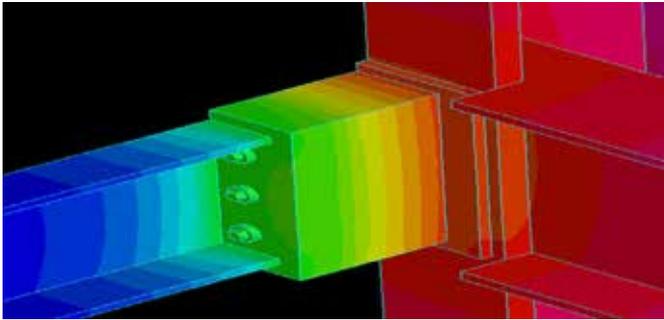


Fig 7.3 Predicted temperature distribution with no thermal break

Figure 7.3 shows the predicted temperature distribution through the penetration without a thermal break. The temperature on the steelwork on the warm side of the cladding system is 9.8°C and the heat loss (χ -value) is 1.31 W/K.

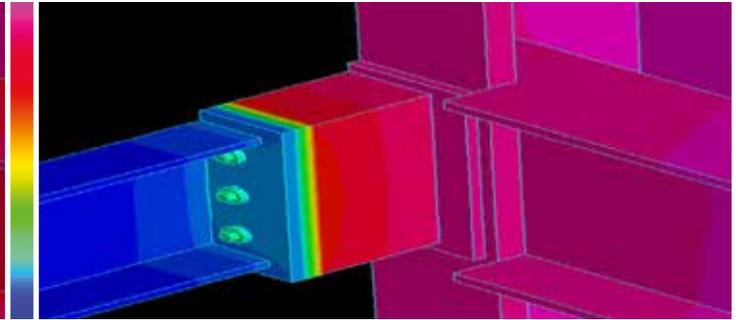


Fig 7.4 Predicted temperature distribution with Farrat TBK thermal pad and thermal isolating washers

Figure 7.4 shows the predicted temperature distribution with a Farrat TBK thermal pad and thermal isolating washers. The temperature on the steelwork on the warm side of the cladding system is increased to 16.5°C and the heat loss (χ -value) is reduced to 0.35 W/K, a 73% decrease in the heat loss.

Condensation Risk

The Specifier will usually identify indoor and outdoor temperatures and relative humidity conditions under which condensation must not occur. Guidance on suitable conditions is given in BS 5250 Code of Practice for the Control of Condensation in Buildings. From these conditions it is possible to determine the allowable minimum temperature on the construction detail below which there would be a risk of condensation. FEA and similar analysis methods allow the temperature distribution to be predicted, as shown in the previous example.

Recommendations

The Specifier must identify temperature and relative humidity conditions under which condensation is not permitted. The Specifier must also state the limiting χ -value for a single penetration.

The size of the connection is then determined by reference to structural requirements and the connection can then be analysed to determine its thermal performance.

The best thermal performance will always be obtained with the least net cross-sectional area of bolt connections through the thermal break, the smallest area of thermal break and the use of the thickest possible thermal break.

Good practice is to locate the Farrat thermal break in the primary insulation layer of the wall or roof, and to fill the space around the connection with insulation.

Dr. Richard Harris

Senior Associate, Consultancy Department
www.sandberg.co.uk

SANDBERG

Design Consideration – Structural Performance

Thermal breaks are normally used in protected façades or roof systems. In general, steelwork connections should be designed in accordance with the latest SCI guidance publications as listed below:

Simple Connections

SCI-P212: Joints in steel construction. Simple connections (BS 5950-1).

SCI-P358: Joints in steel construction. Simple joints to Eurocode 3.

Moment Connections

SCI-P207: Joints in steel construction. Moment connections (BS 5950-1).

SCI-P398: Joints in steel construction. Moment joints to Eurocode 3.

However, additional design checks should be carried out for connections that include Farrat thermal break plates between the steel elements as follows:

1. Check that the thermal break plate can resist the applied compression forces
2. Check that any additional rotation due to the compression of the thermal break plate (including allowance for long term creep) is acceptable
3. Check that the shear resistance of the bolts is acceptable given that there may be a reduction in resistance due to:
 - › Packs
 - › Large grip lengths

Nominally pinned connections

Nominally pinned connections (also referred to as simple connections) are generally designed to only transmit shear forces and tying forces. Therefore, the thermal break plate is not required to resist compression forces. Hence, for nominally pinned connections there is no requirement for the designer to check the compression resistance of the thermal break plate within the connection.

However, there may be situations where beams are also subject to axial load, in these situations the thermal break plate is required to resist compression forces and should be designed accordingly. The design procedure presented later can be adapted to suit thermal break plates subject to compression or alternatively the Farrat thermal break plates can be treated as a column base plate (see Section 7 of SCI Publication P358).

Moment connections

In moment resisting connections (fig 8.1) one part of the connection is in tension and the other part of the connection is in compression, as shown below. Therefore, a thermal break plate within the connection is required to resist compression forces. Hence, for moment connections there is a requirement for the designer to check the compression resistance of the thermal break plate within the connection.

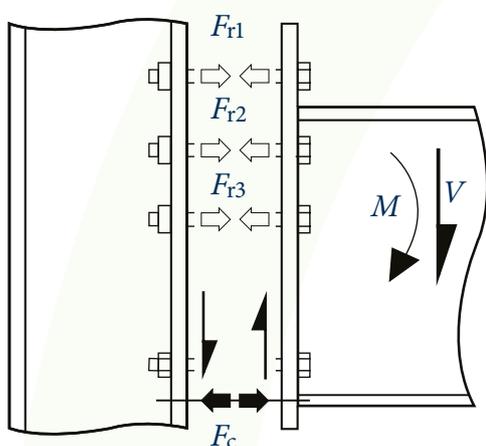


Fig 8.1 Moment connection

M = Applied moment
 V = Applied shear
 $F_{r1,2,3}$ = Bolt row tension forces
 F_c = Compression force



Fig 8.2 Cantilever test frame (Farrat research & development laboratory)



1. Applied compressive stress to thermal break

The designer must check that the compressive stress applied to the thermal break plate is less than the design compression strength of the thermal break material. This is achieved by satisfying the expression given below.

$$F_c \leq B \times L \times f_{cd}$$

F_c is the applied compression force (ULS)

f_{cd} is the design value for compressive strength (thermal break)

B is the depth of the compression zone on the thermal break

L is the width of the compression zone on the thermal break

The compression force F_c can be obtained from published data for standard moment connections (see SCI-P207 and SCI-P398). Alternatively, F_c can be calculated as part of the normal connection design process if standard moment connections are not used.

The dimensions B and L are calculated based on a dispersal of the compression force from the beam flange as shown in Fig 9.1 and Fig 9.2. However, it should be noted that B and L must be reduced if the beam end plate projection is insufficient for full dispersal of the force or if the column flange width is insufficient for full dispersal of the force.

B and L are defined in the following expressions:

$$B = t_{f,b} + 2(s + t_p)$$

Where:

$t_{f,b}$ is the beam flange thickness

s is the weld leg length

t_p is the end plate thickness

$$L = b_b + 2 \times t_p$$

Where:

b_b is the beam flange width

t_p is the end plate thickness

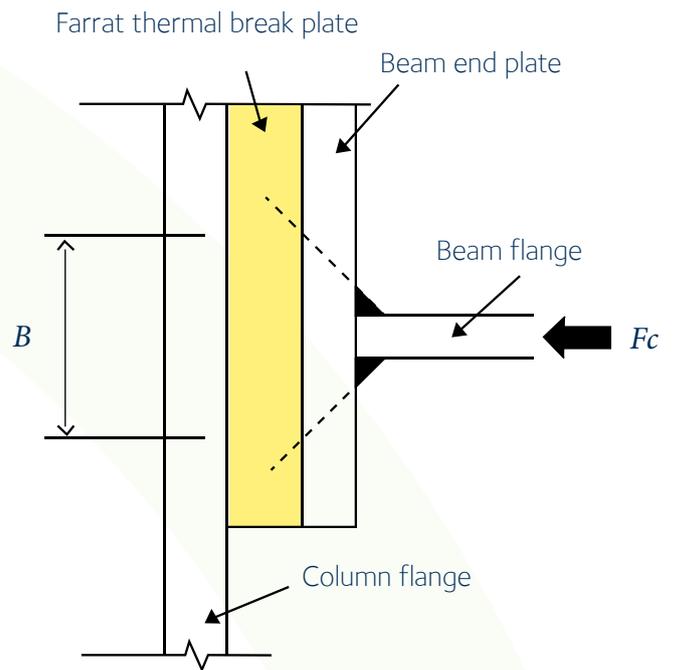


Fig 9.1 Dispersion of force through connection compression zone - dimension B

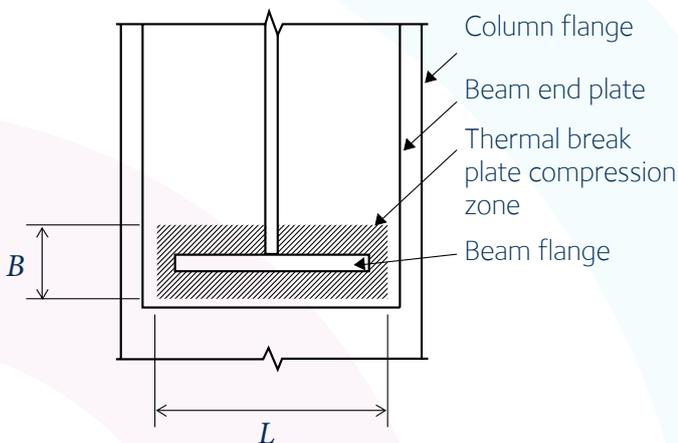


Fig 9.2 Dispersion of force through connection compression zone - dimension L

2. Additional rotation due to compression of thermal break

For moment connections, such as those supporting balconies, the rotation of the connection under load is an important design consideration, typically for aesthetic and serviceability requirements.

The amount of compression of the thermal break plate ΔT is calculated as given in expression:

$$\Delta T = \frac{t_{tb} \times \sigma_{tb}}{E_{tb}}$$

where:

t_{tb} is the thickness of the thermal break plate

σ_{tb} is the stress in the compression zone of the thermal break plate (SLS)

E_{tb} is the elastic modulus of the thermal break plate

The additional rotation of the connection (θ) due to the presence of a thermal break plate within the connection can be calculated using the expression:

$$\theta = \text{Arcsin} \left(\frac{\Delta T}{h_b} \right)$$

where:

h_b is the depth of the beam

Farrat thermal break materials exhibit low levels of creep behaviour. Therefore, in the consideration of additional rotation due to compression of the thermal break plates the designer should include an allowance for long term creep. Based on testing the following allowance should be made:

- › For TBK, increase deformation by 20% to allow for long term creep
- › For TBL, increase deformation by 30% to allow for long term creep

All connections (with or without a thermal break plate) will rotate when loaded. In most typical cases the additional connection rotation due to the presence of a thermal break plate will be small. A typical example is presented below:

Example

Long term creep

CONNECTION PROPERTY	FARRAT TBK	FARRAT TBL
Depth of beam (mm)	150	150
Thickness of thermal break plate (mm)	25	25
Stress in compression zone of thermal break plate at serviceability limit state (SLS), (N/mm ² , MPa)	85	35
Elastic modulus of thermal break plate (N/mm ² , MPa)	5178	2586
Compression of thermal break plate (mm)	0.410	0.338
Additional compression of thermal break plate due to creep [TBK +20% : TBL +30%]	0.492	0.439
Additional rotation of connection (Degrees)	0.188	0.168

3. Bolt shear resistance

A thermal break plate in a connection must be considered as a pack in terms of the connection design. Where packs are used in connections there are detailing rules that should be followed and depending on the thickness of packs it may be necessary to reduce the shear resistance of the bolts within the connection.

- › The number of packs should be kept to a minimum (less than 4)
- › The total thickness of packs t_{pa} should not exceed $4d/3$, where d is the nominal diameter of the bolt
- › If t_{pa} exceeds $d/3$ then, the shear resistance of the bolts should be reduced by the factor β_p given in the expression

$$\beta_p = \frac{9d}{8d + 3t_{pa}}$$

Where:

d is nominal bolt diameter

t_{pa} is the total thickness of packs

4. Large grip lengths

A thermal break plate in a connection will increase the total grip length (T_g) of the bolts. The total grip length is the combined thickness of all the elements that the bolt is connecting together (e.g. end plate, thermal break plate, column flange, additional packs etc). Depending on the size of the grip length it may be necessary to reduce the shear resistance of the bolts within the connection.

If T_g exceeds $5d$ then, the shear resistance of bolts with large grip lengths should be reduced by the factor β_g given in expression.

$$\beta_g = \frac{8d}{3d + T_g}$$

where:

d is nominal bolt diameter

T_g is the total grip length of the bolt

5. Frictional resistance

a) Non-preloaded bolts

The coefficient of friction of the thermal break plate is not a relevant property for the structural design of connections with non-preloaded bolts.

b) Pre-loaded bolts

For the structural design of connections with preloaded bolts the coefficient of friction of the thermal break plate will be required. The slip resistance of the bolted connection is calculated in accordance with Section 3.9 of BS EN 1993-1-8. The number of friction surfaces is required for this calculation.

In addition, the local compression force around the bolt holes on the thermal break plate must be checked to ensure the compressive strength of the thermal break plate is not exceeded.

Preloaded bolts are also known as HSF bolts.

6. Fire

Generally, thermal breaks are used in locations that do not require fire protection. Where the connection requires a fire rating then the following options are available:

- › A board fire protection system can be applied
- › Sprayed fire protection can be applied. The compatibility of the applied fire protection material should be checked with the thermal break material
- › The connection may be designed on the assumption of complete loss of the thermal break material in the accidental condition. For accidental conditions excessive deformations are acceptable provided that the stability of the structure is maintained

Note: Although all care has been taken to ensure that all the information contained herein is accurate, Farrat Isolevel Limited assumes no responsibility for any errors or misinterpretations or any loss or damage arising therefrom.

Other areas of expertise

Vibration & acoustic control for buildings and structures

We have developed a comprehensive range of solutions to the problem of controlling and isolating noise, vibration, shock and movement in both new and existing buildings. Our diverse range of products includes floating floor systems, isolated foundations, structural bearings, anti vibration washers, resilient seatings and coil spring and damper systems for a variety of different building types.

Anti-vibration and precision levelling products for industrial machinery and equipment

Having manufactured high quality anti vibration and precision levelling mountings for more than 50 years, Farrat has developed a rich expertise in this field. These products include a complete range of anti vibration materials, anti vibration washers and anti vibration and levelling mounts. Our products are used in a wide variety of applications, from power presses to roll grinders and printing presses.

Global experts in Vibration Control, Thermal Isolation & Precision Levelling Solutions for Construction, Industry & Power Generation

Plycem CemDeck Cement Board Floor Panels

----- Architectural Specifications -----

Division 3- 03500 Cementitious Decks and Underlayment Last Update: 05/09/2016

I. General:

The work under this Section is subject to the provisions of the Contract and the Contract Documents, which in any way affect the work herein specified.

II. Scope of Work:

- A. Furnish and install all fiber reinforced cement board roof or floor panels as shown on the drawings and as herein specified.
- B. Coordinate this Section with interfacing and adjoining work for proper sequencing of installation.

III. Work in Other Sections:

- A. Roof framing and floor framing.
- B. Metal roof and floor decking.
- C. Insulation.
- D. Roof surfacing and floor finishes.

IV. Materials:

A. General: All cement board floor panels shall comply with ASTM C-1186-91 Norm, standard specification for flat non-asbestos fiber-cement sheets, Grade 1; and shall be installed according to the manufacturer's most current instructions published on the internet web site at <https://architecturalproducts.com>. Materials shall be Plycem CemDeck Fiber Reinforced Cement Board as supplied by U.S. Architectural Products, Inc., Princeton, New Jersey (800-243-6677), or equal.

B. Floor Panels:

1. Panels to be of metric thickness: 20mm (13/16") minimum for floor applications or 22mm (7/8"), 25mm (1"), or 30mm (1-3/16") thickness, in 4' x 8' or 4' x 10' sizes as shown on drawings. Cement board panels shall be factory sealed against moisture penetration.
2. Plycem CemDeck floor panels are to be installed over minimum 2 inch flange width supporting framing members not exceeding 24 inches on centers while limiting deflection to a maximum of 1/240 except when ceramic tile is installed maximum deflection must be limited to 1/360. If roof sheathing is to receive nailed on shingles, use CemSteel roof sheathing in proper thickness chosen from CemSteel load tables to carry the live load design for the roof. Do not nail roof shingles onto Plycem CemDeck – use CemSteel roof sheathing for nailed on shingle applications. See URL link at end of section for CemSteel applications.
3. Panels shall have the following minimum mechanical properties (in dry condition):
 - 3.a. Modulus of Elasticity perpendicular to fibers (per ASTM C120) 775,000 psi
 - 3.b. Modulus of Rupture perpendicular to fiber (per ASTM C120) 1,820 psi
 - 3.c. Shear Strength (per ASTM D732) 1,180 psi
 - 3.d. Tensile Strength perpendicular to fibers (per ASTM D209) 690 psi
 - 3.e. Compressive Strength perpendicular to surface (per ASTM C170) 3,860 psi

V. Samples and Submittals:

- A. Submit two 4" x 6" pieces of panel in thickness selected.
- B. Submit two copies of specifications, installation instructions and general recommendations of the manufacturer.

VI. Fire Resistance Properties:

- A. Cement board roof or floor panels shall be noncombustible in accordance with ASTM E136. Panels shall be rated zero flame spread and zero smoke development per ASTM E84.

VII. Delivery and Storage:

- A. Panels are normally delivered to site in factory crates that are bound with plastic sheet protection, wooden edge protection and wooden dunnage to facilitate forklift handling. When transporting loose panels by truck, they must be laid flat and fully protected against edge damage and protected from weather with waterproof

covering. When hand carrying single panels, they must be carried on edge with the short side held vertically.

- B. Deliver, store and handle materials to prevent breakage, warping or damage by water.
- C. Acclimatize materials by storing on site not less than three days before installation.
- D. Materials to be stored indoors on leveled dunnage not exceeding 32" on centers. If temporarily stored outdoors, boards must be elevated above ground, and protected from the weather with waterproof covering.
- E. Panels to be stored flat and not on edges.

VIII. Installation:

A. Tools: Use standard carpentry tools to cut and install panels.

B. Installation:

1. Use minimum 20mm (13/16") minimum thickness panels for floors, stagger panel joints in long direction. Plycem CemDeck panels are to be installed over minimum 2 inch flange width supporting framing members not exceeding 24 inches on centers while limiting deflection to a maximum of 1/240. When ceramic tile is to be installed, limit maximum deflection to 1/360.
2. When roof sheathing is to receive nailed on shingles, use CemSteel roof sheathing in proper thickness chosen from CemSteel load tables to carry the live load design for the roof. Do not nail roof shingles onto Plycem CemDeck – use CemSteel for nailed on shingle applications. See URL link at end of section for CemSteel applications.
3. Install panels with long dimension perpendicular to direction of supporting joists.
4. Prior to screw fastening boards to joists, apply Sikaflex-11 FC (or equal) construction adhesive in the modified T&G joints and at the square edge joints which occur over joists supports. After applying the adhesive, ensure board joints are tight prior to screw fastening the boards to joists.
5. Comply with applicable building codes for wind, seismic and other load requirements.
6. All floor panels are to receive a wear surfacing finish. Cement board floor panels are to be installed as a sub-floor, not as a finished wear floor surface. Use trowel applied, acrylic based floor-leveling compound for correcting minor unevenness of the cement board floor joints prior to the application of the finish flooring materials. Ceramic tile and vinyl (VCT) tile or other tile type products should be installed onto ProFlex Maxxim SIM-40 Underlayment* (or equal) which must be installed over the Plycem CemDeck. Do not install any tile like finishes directly onto Plycem CemDeck Cement Board. Floor finishing materials must not be applied until after the building is completely closed to the weather and the Plycem CemDeck installation has acclimatized to the closed building's environment for a minimum of 48 hours.
7. Deflection of panels must be limited to 1/240 under maximum live load design except where ceramic tile is to be installed maximum deflection must be limited to 1/360.
8. All field cut edges or penetration edges of the Plycem CemDeck boards must be re-sealed with Sherwin-Williams HC acrylic emulsion concrete sealer. Do not use any oil based sealers on Plycem CemDeck.

C. Fasteners

Use corrosion resistant self-countersinking head screws such as HILTI PWH SD Cement Board Fasteners, part #00372760, or equal. Fasteners to be minimum #8 diameter with S-12 self-drilling 'TEK' points. Length = 2 to 3 times the board thickness. Fasteners to maintain minimum 3/4" distance from all board edges. Screw fasteners to maintain minimum of 2" distance from board corners and offset fasteners to avoid 45 degree fastener placement at board corners. Do not overdrive screw heads. Seat screw heads flush with board surface.

* PROFLEX MAXXIM SIM-40 UNDERLAYMENT

<http://proflex.us/pdf/products/Membranes/Elastomeric/40mil%20SIM/SIM40-PDS.pdf>

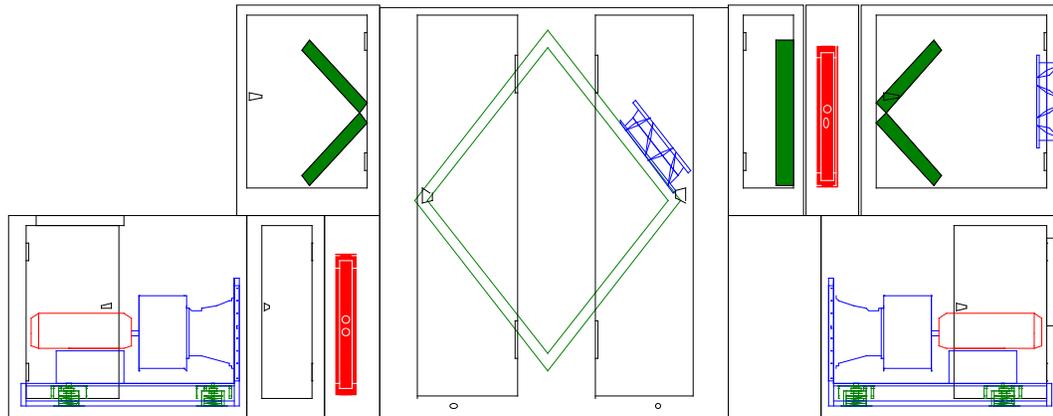
--- END OF SECTION ---

MECHANICAL PRODUCT DATA



Performance Climate Changer

Job Information			
Name	McMurdo Station Dormitory	Tag	HRV-1
Address	Alaska	Quantity	1
Sales Team		Model Number	CSAA008UA
Comments			



Unit level options			
Fuse size circuit 2	15.00 A	Fuse size circuit 1	15.00 A
Number of marine LED lights	0 Lights	Total Estimated Unit Air Leakage	0.94 %
Total Estimated Unit Air Leakage	38 cfm	Total Estimated Unit Air Leakage (%)	0.94 %
Total Estimated Unit Air Leakage (cfm)	38 cfm	ASHRAE 111 Leakage Class	6
Comp #1 circuit number	1	Circuit number 2	Exhaust fan motor(s)
Circuit number 1	Supply fan motor(s)	Component #2	Exhaust fan motor(s)
Component #1	Supply fan motor(s)	Casing - 250 Hz	74 dB
Casing - 125 Hz	72 dB	Casing - 63 Hz	81 dB
Integral base frame	2.5in. integral base frame	Return - 8K Hz	51 dB
Return - 4K Hz	64 dB	Return - 2K Hz	70 dB
Return - 1K Hz	67 dB	Return - 500 Hz	70 dB
Return - 250 Hz	70 dB	Return - 125 Hz	68 dB
Return - 63 Hz	72 dB	Casing - 8K Hz	46 dB
Casing - 4K Hz	56 dB	Casing - 2K Hz	59 dB
Casing - 1K Hz	68 dB	Casing - 500 Hz	77 dB
Comp #2 reference VFD HP	3 hp	Comp #1 reference VFD HP	5 hp
Comp #2	460/3/60	Comp #1	460/3/60
voltage/phase/hertz		voltage/phase/hertz	
Supply top - 8K Hz	56 dB	Supply top - 4K Hz	66 dB
Supply top - 2K Hz	72 dB	Supply top - 1K Hz	73 dB
Supply top - 500 Hz	78 dB	Supply top - 250 Hz	70 dB
Supply top - 125 Hz	72 dB	Supply top - 63 Hz	73 dB
Roof curb weight	0.0 lb	Comp #2 FLA	4.73 A
Comp #1 FLA	5.83 A	Exhaust - 4K Hz	66 dB
Exhaust - 2K Hz	71 dB	Exhaust - 1K Hz	71 dB
Exhaust - 500 Hz	78 dB	Exhaust - 250 Hz	66 dB
Exhaust - 125 Hz	67 dB	Exhaust - 63 Hz	67 dB
Outdoor - 8K Hz	49 dB	Outdoor - 4K Hz	62 dB
Outdoor - 2K Hz	68 dB	Outdoor - 1K Hz	65 dB
Outdoor - 500 Hz	67 dB	Outdoor - 250 Hz	67 dB
Outdoor - 125 Hz	66 dB	Outdoor - 63 Hz	71 dB
Exhaust - 8K Hz	56 dB	Comp #2 circuit number	2



Leakage level	ASHRAE leakage class	SPA required	No
	6		
MCA circuit 1	7.29 A	Rigging weight	3289.6 lb
Width	50.500 in	Length	190.250 in
MCA circuit 2	5.91 A	Installed weight	3322.1 lb
FLA (CV) circuit 2	4.73 A	FLA (CV) circuit 1	5.83 A

Controls and VFD/starter

Factory programmed PPS	No	EW/CDQ - HV harness fit	Will fit
Raceway - HV harness fit	Will fit	2" Conduit - HV harness fit	Will fit
Factory controls package	No factory controls	Outside air sensor	None
Controller mounting	No mount	LCD screen	No LCD
Controller type	No controller	Prepackaged solution option used	PPS common configuration not used

Fan section

Exhaust - 8K Hz	56 dB	Exhaust - 4K Hz	66 dB
Exhaust - 2K Hz	71 dB	AMCA FEG	FEG75
Part load motor efficiency	82.82 %	Motor class	NEMA premium compliant TEFC
Return - 63 Hz	72 dB	Casing - 8K Hz	41 dB
Casing - 4K Hz	51 dB	Casing - 2K Hz	55 dB
Casing - 1K Hz	64 dB	Casing - 500 Hz	73 dB
Casing - 250 Hz	70 dB	Casing - 125 Hz	68 dB
Casing - 63 Hz	77 dB	Elevation	0.00 ft
Direct drive fan blades	Improved sound quality	Return - 8K Hz	51 dB
Return - 4K Hz	64 dB	Return - 2K Hz	70 dB
Return - 1K Hz	67 dB	Return - 500 Hz	70 dB
Return - 250 Hz	70 dB	Return - 125 Hz	68 dB
Unit static efficiency	55.99 %	Total brake horsepower at min temp	2.963 hp
Total brake horsepower	2.796 hp	Speed	2036 rpm
Design temperature	70.00 F	Fan module pressure drop	1.351 in H2O
Total static pressure	2.482 in H2O	Full load motor efficiency	89.57 %
Fan quantity	1.00 Each	Precision motor	Yes
Total number of actuators	0.00 Each	Number of small actuators	No small actuators
Number of large actuators	No large actuators	Motor hertz	69.00 Hz
Fan size and type	18.25in. dd plenum, 80% width, M press	Motor interface options	Field provided VFD
Section weight	655.0 lb	Section height	37.750 in
Section width	50.500 in	Section length	43.000 in
Maximum TSP @ 60 Hz	2.482 in H2O	Discharge 1 back - face velocity	1500 ft/min
Fan airflow	4000 cfm	Discharge 1 back - area	2.67 sq ft
Discharge 1 back - pressure drop	0.351 in H2O	Starter/VFD	No NEMA or fan mounted NEMA
Controls section	No controls and VFD/starter	Motor voltage	460/3
Motor horsepower per fan	3.5 hp	Fan wheel balance	Inverter balance with SGR
Motor RPM	1800	Exhaust - 1K Hz	71 dB
Exhaust - 500 Hz	78 dB	Exhaust - 250 Hz	66 dB
Exhaust - 125 Hz	67 dB	Exhaust - 63 Hz	67 dB
Footnote 4	Refer to mechanical specifications	Bare fan peak total efficiency	70.70 %

Custom length section



Section weight	88.3 lb	Section height	37.750 in
Section width	50.500 in	Section length	17.000 in

Filter section			
Filter face velocity	360 ft/min	Filter section pressure drop	0.595 in H2O
Filter pressure drop	0.595 in H2O	Filter area	11.11 sq ft
Section weight	197.0 lb	Section height	37.750 in
Section width	50.500 in	Section length	26.500 in

Air mixing section			
Opening 1 front - airflow	4000 cfm	Opening 1 back - airflow	4000 cfm
Opening 1 back - pressure drop	0.309 in H2O	Opening 1 back - face velocity	1201 ft/min
Opening 1 front - area	10.09 sq ft	Opening 1 back - area	3.33 sq ft
Actuator	No	Opening 1 back total pressure drop	0.309 in H2O
Filter pressure drop	0.000 in H2O	Filter ASP	0.000 in H2O
Filter area	11.11 sq ft	Filter airflow	4000 cfm
Greatest entry PD	0.309 in H2O	Total mixing section pressure drop	0.309 in H2O
Dirty filter status	Pressure gage		

Coil section			
UV protectant	No UV protectant	Limit switch UV	No limit switch
L trap dimension	5.795 in	Corrosion resistant coating	None
Turbulators	Yes	AHRI 410 classification	NOT Certified by AHRI
Tube diameter	1/2in. tube diameter (12.7 mm)	Tube matl/wall thickness	.016" (0.406 mm) copper tubes
Coil height	Unit coil height	Coil face velocity	501 ft/min
Coil face area	7.99 sq ft	Unit airflow	4000 cfm
Coil performance airflow	4000 cfm	Side access door location	None
Coil installed weight	80.8 lb	Coil rigging weight	60.4 lb
Coil section pressure drop	0.138 in H2O	Air pressure drop	0.138 in H2O
Section weight	166.8 lb	Section height	37.750 in
Section width	50.500 in	Section length	10.000 in
Rows	2	Coil type	UW
System type	Hot water	Entering dry bulb	-30.00 F
Leaving dry bulb	40.00 F	Nominal height top or single coil	28 in. (711 mm)
Fin type	Delta flo E (energy efficient)	Fin material	Aluminum fins
Nominal fin spacing	74 Per Foot	J trap dimension	1.598 in
H trap dimension	3.197 in	Fluid pressure drop	1.81 ft H2O
Standard fluid flow rate	22.52 gpm	Fluid temperature drop	30.00 F
Leaving fluid temperature	150.00 F	Entering fluid temperature	180.00 F
Coil fluid percentage	50.00 %	Fluid type	Propylene glycol
Finned length	40" (1016 mm) finned length	Total cap top or single coil	303.66 MBh
Total capacity	303.66 MBh	Coil fouling factor	0.00025 hr-sq ft-deg F/Btu
Fluid volume	2.45 gal	Fluid velocity	1.76 ft/s

Filter section			
Filter face velocity	546 ft/min	Filter section pressure drop	0.668 in H2O
Filter pressure drop	0.668 in H2O	Filter area	7.33 sq ft
Section weight	100.7 lb	Section height	37.750 in
Section width	50.500 in	Section length	14.000 in



Air to air section			
Supply economizing pressure drop	0.535 in H2O	Exhaust economizing pressure drop	0.535 in H2O
Economizing supply airflow	4000 cfm	Economizing exhaust airflow	4000 cfm
Plate exchanger size	Full exchanger, high eff. without bypass	Unit type	Dual path
Section type	Air to air plate frame heat exchanger	Frost damper	Yes
Face & bypass location	None	Plate type	Dimple aluminum
Plate spacing	Medium spacing	Series total pressure drop	0.000 in H2O
Section weight	982.0 lb	Section width	50.500 in
Section length	63.000 in	Section height	75.750 in
Winter 100% Bypass pressure drop	0.000 in H2O	Design winter supply pressure drop	0.476 in H2O
Design winter exhaust pressure drop	0.536 in H2O	Leaving summer supply airflow	4000 cfm
Leaving winter supply airflow	4000 cfm	Entering summer exhaust airflow	4000 cfm
Entering summer supply airflow	4000 cfm	Entering winter exhaust airflow	4000 cfm
Entering winter supply airflow	4000 cfm	Elevation	0.00 ft
Replication run	1920	Summer 100% Bypass pressure drop	0.000 in H2O
Design summer supply pressure drop	0.476 in H2O	Design summer exhaust pressure drop	0.536 in H2O
Entering winter exhaust RH	40.00 %	Entering winter exhaust DB	68.00 F
Entering winter supply RH	35.00 %	Entering winter supply DB	36.00 F
Summer design sensible effectiveness	64.43 %	Summer dry sensible effectiveness	64.43 %
Winter design sensible effectiveness	64.43 %	Winter dry sensible effectiveness	64.43 %
Greatest supply PD	0.535 in H2O	Greatest exhaust PD	0.536 in H2O
Entering summer supply RH	40.00 %	Entering summer supply DB	36.00 F
Leaving winter exhaust HR	40.63 gr/lb	Leaving winter exhaust RH	83.79 %
Leaving winter exhaust WB	45.09 F	Leaving winter exhaust DB	47.46 F
Leaving winter supply HR	11.03 gr/lb	Leaving winter supply RH	16.34 %
Leaving winter supply WB	40.25 F	Leaving winter supply DB	56.62 F
Summer exhaust condensate	0.00 lb/hr	Winter energy recovered	89.19 MBh
Summer energy recovered	-89.21 MBh	Leaving summer exhaust HR	40.63 gr/lb
Leaving summer exhaust RH	83.80 %	Leaving summer exhaust WB	45.09 F
Leaving summer exhaust DB	47.45 F	Leaving summer supply HR	12.52 gr/lb
Leaving summer supply RH	18.53 %	Leaving summer supply WB	40.75 F
Leaving summer supply DB	56.62 F	Entering summer exhaust RH	40.00 %
Entering summer exhaust DB	68.00 F	Winter exhaust condensate	0.00 lb/hr
Summer supply condensate	0.00 lb/hr		

Coil section			
UV protectant	No UV protectant	Limit switch UV	No limit switch



L trap dimension	8.248 in	Corrosion resistant coating	None
AHRI 410 classification	NOT Certified by AHRI	Tube diameter	3/8in. tube diameter (9.5 mm)
Tube matl/wall thickness	.012" (0.305 mm) copper tubes	Coil height	Unit coil height
Coil face velocity	527 ft/min	Coil face area	7.58 sq ft
Unit airflow	4000 cfm	Coil performance airflow	4000 cfm
Side access door location	None	Coil installed weight	49.3 lb
Coil rigging weight	37.2 lb	Coil section pressure drop	0.100 in H2O
Air pressure drop	0.100 in H2O	Section weight	135.3 lb
Section height	37.750 in	Section width	50.500 in
Section length	10.000 in	Rows	1
Coil type	3W	System type	Hot water
Entering dry bulb	40.00 F	Leaving dry bulb	55.00 F
Nominal height top or single coil	28 in. (711 mm)	Fin type	Omega flo H (Hi efficient)
Fin material	Aluminum fins	Nominal fin spacing	105 Per Foot
J trap dimension	2.416 in	H trap dimension	4.832 in
Fluid pressure drop	0.38 ft H2O	Standard fluid flow rate	4.83 gpm
Fluid temperature drop	30.00 F	Leaving fluid temperature	150.00 F
Entering fluid temperature	180.00 F	Coil fluid percentage	50.00 %
Fluid type	Propylene glycol	Finned length	39" (991 mm) finned length
Total cap top or single coil	65.07 MBh	Total capacity	65.07 MBh
Coil fouling factor	0.00025 hr-sq ft-deg F/Btu	Fluid volume	1.45 gal
Fluid velocity	1.11 ft/s		

Access section

Section width	50.500 in	Section length	14.000 in
Section weight	83.0 lb	Section height	37.750 in

Fan section

AMCA FEG	FEG75	Part load motor efficiency	85.64 %
Motor class	NEMA premium compliant TEFC	Casing - 8K Hz	44 dB
Casing - 4K Hz	54 dB	Casing - 2K Hz	57 dB
Casing - 1K Hz	66 dB	Casing - 500 Hz	74 dB
Casing - 250 Hz	71 dB	Casing - 125 Hz	70 dB
Casing - 63 Hz	79 dB	Elevation	0.00 ft
Direct drive fan blades	Improved sound quality	Unit static efficiency	60.34 %
Total brake horsepower at min temp	3.911 hp	Total brake horsepower	3.690 hp
Speed	2209 rpm	Design temperature	70.00 F
Fan module pressure drop	1.781 in H2O	Total static pressure	3.531 in H2O
Full load motor efficiency	88.95 %	Fan quantity	1.00 Each
Precision motor	Yes	Total number of actuators	0.00 Each
Number of small actuators	No small actuators	Number of large actuators	No large actuators
Motor hertz	75.00 Hz	Fan size and type	18.25in. dd plenum, 80% width, M press
Motor interface options	Field provided VFD	Section weight	655.0 lb
Section height	37.750 in	Section width	50.500 in
Section length	43.000 in	Maximum TSP @ 60 Hz	3.531 in H2O
Discharge 1 top - face	1500 ft/min	Fan airflow	4000 cfm



velocity			
Supply top - 8K Hz	56 dB	Supply top - 4K Hz	66 dB
Supply top - 2K Hz	72 dB	Supply top - 1K Hz	73 dB
Supply top - 500 Hz	78 dB	Supply top - 250 Hz	70 dB
Supply top - 125 Hz	72 dB	Supply top - 63 Hz	73 dB
Discharge 1 top - area	2.67 sq ft	Discharge 1 top - pressure drop	0.281 in H2O
Starter/VFD	No NEMA or fan mounted NEMA	Controls section	No controls and VFD/starter
Motor voltage	460/3	Motor horsepower per fan	4.5 hp
Fan wheel balance	Inverter balance with SGR	Motor RPM	1800
Outdoor - 8K Hz	49 dB	Outdoor - 4K Hz	62 dB
Outdoor - 2K Hz	68 dB	Outdoor - 1K Hz	65 dB
Outdoor - 500 Hz	67 dB	Outdoor - 250 Hz	67 dB
Outdoor - 125 Hz	66 dB	Outdoor - 63 Hz	71 dB
Footnote 4	Refer to mechanical specifications	Bare fan peak total efficiency	70.70 %

BUDERUS

G315 | G515 | G615

Cast Iron Commercial Boilers



- High Efficiency—Combustion Efficiencies Up to 88.2%
- 350 to 3,982 MBH Output
- Thermostream Design Eliminates Thermal Shock

Superior Equipment by Design

Comfortable. Efficient. Intelligent Heating.

Buderus



G315 | G515 | G615

A Better Way to Heat

The Buderus commercial Thermostream boilers are designed with many physical attributes setting them above the competition and increasing their longevity and efficiency. The burner doors are field adjustable to swing fully open from either side, to enable the boilers to fit in any location. These boilers are shipped knocked down for easy transport, the G315 and the G515 can also be shipped as an assembled block. Due to the unique chamber design, no refractory materials are used. This reduces the number of service calls and maximizes heat transfer. Buderus precision castings eliminate the need for manual grinding. Precision beveled steel push nipples join cast iron sections and high temperature flue sealants are used to sustain pressurized operation.

The G315 and G515 come with a full 3½" of thermal insulation, and the G615 comes with a full 4" of thermal insulation to reduce standby heat loss. All Buderus cast iron commercial boilers are manufactured with the Buderus GL-180M cast iron with a silicone "barrier skin." To streamline the appearance of the boilers, the supply and return connections for the G315 are located at the rear of the boiler, while the G515/G615 have top supply and a rear return. These boilers are for use with hot water and can be installed with gas, oil or dual fuel burners.

Intelligent Heating—by Design

Buderus, the world leader in heating technology, manufactures the highest quality boilers based on centuries of experience. With its innovative design and quality manufacturing, a Buderus boiler will outlast and out-perform virtually any other commercial hot water boiler system in the world.

The G315, G515 and G615 are designed to maximize the heating value of every ounce of fuel and are built with the highest quality materials. Established in 1731, Buderus uses state-of-the-art techniques in the design and manufacturing of its boilers.

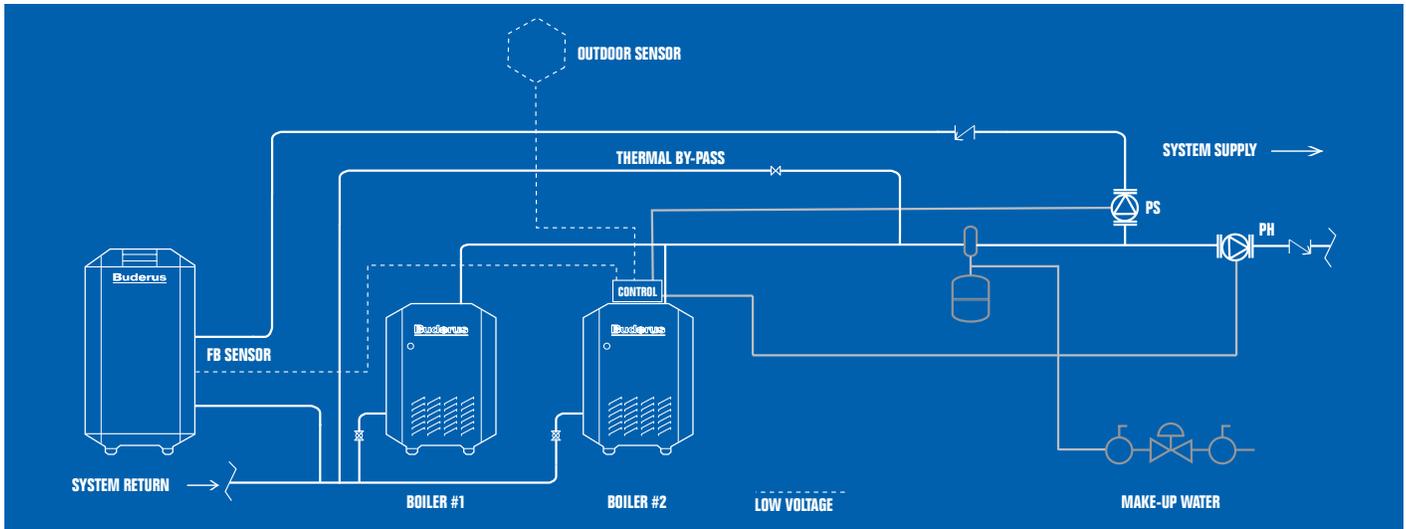
Thermostream Design

The Buderus developed Thermostream principle is proven for higher efficiency and improved system reliability in high volume heating systems. Condensation and thermal shock are made impossible by design, as cool return water mixes internally and is preheated with supply water before exposure to directly heated surfaces. This process eliminates hot and cold spots in the boiler and balances water flow throughout all boiler sections. The Thermostream design permits continuous low temperature operation under normal return water without requiring a minimum boiler return temperature. Internal water circulation and injection into each boiler section combined with deflection plates ensure condensate free boiler operation—even under no flow conditions.



Design Benefits

- Eliminates the need for bypass loop or shunt pump
- Eliminates hot and cold spots in the boiler
- Allows operation at low return water temperatures without thermal shock concerns
- Minimum supply temperature of 122°F with standard control
- Ensures balanced water flow through all boiler sections



NOTE: This drawing is conceptual in nature and does not purport to address all design, installation or safety considerations.

Boiler Construction

The boiler sections are assembled with beveled, surface-profiled push nipples for long, trouble-free watertight operation. Boiler flueways are manufactured to be gas tight with tongue and groove section design and elastic, high temperature resistant sealing rope. A permanent dry door gasket ensures repeated positive sealing of the full swing burner door. Because flue gases cannot escape through the seams between boiler sections, the boilers are able to retain heat more efficiently.

GL-180M Gray Cast Iron

Buderus GL-180M silicone injected, gray cast iron obtains its superior material characteristics primarily from a high carbon (graphite) and silicone content.

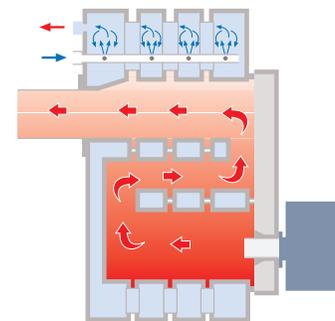
Buderus GL-180M gray cast iron has excellent corrosion resistance, exceptional casting characteristics, 40% greater flexibility and elasticity as well as high thermal conductivity. Buderus developed the special substances that are impregnated during the casting process to improve the mechanical properties of cast iron. The graphite precipitates into smaller, modified flakes which produce GL-180M cast iron with 40% greater elasticity and a high silicone barrier for corrosion protection. All sections are heat treated to relieve thermal stresses. Additional elements further enhance the properties of the GL-180M. The graphite appears in two different forms in the microstructure: nodular form producing excellent tensile strength and great elasticity and graphite flakes producing excellent corrosion resistance against acidic combustion products.

Full Three Pass Design—for High Efficiency

Buderus developed the full three pass system to increase the heat transfer and efficiency of boilers. This design allows more heat to be transferred during all three passes, unlike conventional boilers that only use one pass to transfer heat. This system maximizes the total possible heat available with the lowest fuel consumption possible. To greatly decrease standby loss Buderus has manufactured a 3½" and 4" thick thermal insulation.

The Three-Pass Boiler is Designed for:

- Optimized combustion with positive pressure-fired boilers and tailored chamber geometry—no need for a heat-consuming refractory or target wall eliminating the need for costly repairs
- Minimal stack losses with the modified three-pass flue design's large heat transfer areas
- Low standby losses with a full 3½" to 4" jacket of thermal insulation around the entire block—even underneath the boiler



How it Works

The flame fires into the first chamber. Then the flue products flow through the second pass to the front of the boiler. From there they reverse direction again—moving through the third pass to the back, and finally exiting via the flue connection into the chimney. Because the gases are held in the boiler longer this allows the cast iron to absorb the maximum amount of heat, resulting in a lower stack temperature and a higher efficiency.

Complete Your System



Complete Your System

Once you have a Buderus boiler, you can add a Buderus indirect fired hot water tank, an optional Buderus Logamatic Control or both. The Logamatic Control maximizes your comfort and fuel savings. It will also accommodate specialized heating applications such as radiant flooring. Combined, this premium heating system will provide years of exceptional comfort and economy.

Convenient Logamatic Control

Logamatic Controls can be used to adjust the firing rates of burners in multi-boiler systems. Controls can be pre-programmed with automatic night and day functions and set to trigger automatic adjustments based on shifts in outdoor or indoor temperatures. An optional module is available for direct communication with building management systems.

4000 Logamatic Control Series

The intelligent regulation of energy is the heart of any heating system. A Logamatic Control provides the ability to make finer adjustments than are possible by manually turning the boiler off and on or relying on traditional thermostats. Multiple design innovations increase the versatility of Buderus Logamatic Controls including the automatic adjustment between various modes of operation. A change in modes can be set to correspond with time, date or temperature. Modes can also be changed manually. All Logamatic Controls now include summer, winter and vacation modes which effectively regulates energy consumption. This regulation is effective in single or multi-boiler systems, with any heat source and with one or multiple heating zones.

Heatronic 4000 Control Series

The Heatronic 4000 is pre-loaded with the parameters for Bosch and Buderus commercial boilers. Pre-programmed options include fuel type, boiler type, high and low fire outputs, motor speed, pump purge time, maximum temperature output, and min/max modulation parameters. The Heatronic 4000 works with up to four condensing and non-condensing boilers that are either modulating, single stage or two stage. Designed to accurately maintain target water temperature based on outdoor temperature reset or a fixed setpoint for space or process heating applications. Optional features to increase efficiency and boiler plant reliability include domestic hot water and setpoint heating, boiler run-time balancing, stand-by primary pump operation, and pump exercising.

4000 Logamatic Control Series

Integrated multi-boiler system controller with the following features and optional control modules:

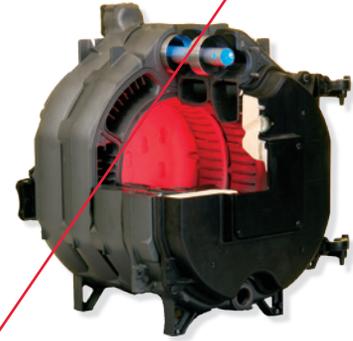
- Outdoor reset, staged burner operation
- Control of single, two-stage and modulating burners (Up to 8 boilers)
- Automatic and load/switch dependent boiler rotation
- Operation of boiler pumps, 2-way valves, 3 or 4-way valves and system pumps
- BMS interface capability
- External load capability: DHW and other on-demand loads
- Self diagnostics and system parameter display

G315 Series

Model	G315/5	G315/6	G315/7	G315/8	G315/9
Performance Data					
Gross Output MBH	350	454	559	663	768
Number of Sections	5	6	7	8	9
Max. Input Gas MBH	433	556	678	801	924
Max. Input Oil	3.0	3.85	4.7	5.6	6.4
Net IBR MBH	304	395	486	577	668
Boiler HP	10.4	13.6	16.6	19.8	22.9
Max. Operating Pressure (psi)	87	87	87	87	87
Combustion Efficiency Oil	86.8%	86.9%	87%	87.1%	87.1%
Combustion Efficiency Gas	84.2%	84.3%	84.4%	84.4%	84.4%
Thermal Efficiency Oil	83.3%	84.3%	84.9%	85.4%	85.7%
Thermal Efficiency Gas	80.0%	81.8%	82.4%	82.8%	83.1%
Piping Connections					
Vent Connection Size, in.	7	7	7	7	7
Supply, in.	3	3	3	3	3
Return, in.	3	3	3	3	3
Physical Dimensions					
Overall Boiler Length, in. (LG)	44¼	50½	56¾	63⅞	69½
Boiler Block Length, in. (LK)	38¼	44½	50¾	57	63½
Boiler Door Thickness, in.	5	5	5	5	5
Minimum Boiler Width, in. (BE)	28	28	28	28	28
Height, in.	40¾	40¾	40¾	40¾	40¾
Fire Box Depth, in. (LF)	31	37½	43¾	50	56¼
Fire Box Diameter, in.	15¾	15¾	15¾	15¾	15¾
Fire Box Volume (cu. ft.)	5.19	6.39	7.59	8.79	9.99
Dry Weight (lbs.)	1,197	1,391	1,585	1,779	1,973
Water Content (gal.)	37.8	45.2	52.6	60.0	67.4
Operating Weight (lbs.)	1,512	1,768	2,024	2,280	2,545

Boiler Model	315/5	315/6	315/7	315/8	315/9
Foundation Length L1, in.	36	42¼	48½	54¼	61
Flat Plate Length L2, in.	28¾	35	41¼	47¼	54

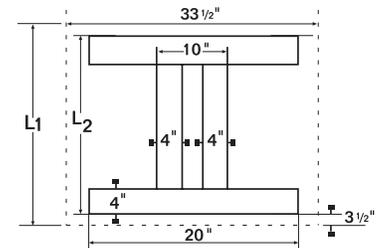
The boiler must be placed on a smooth, level concrete base, 33½" wide. Cement in the base or place on its top either 4"x ¼" flat steel plates or 4" x 2" x ¼" angle irons for boiler support. Dimensions L1 and L2 are specified in the table above. Buderus recommends the use of Beckett, Gordon Platt, Power Flame and Riello burners for oil/gas firing (Buderus stocks Riello and Beckett burners).



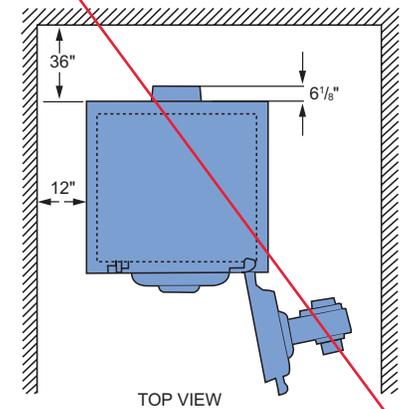
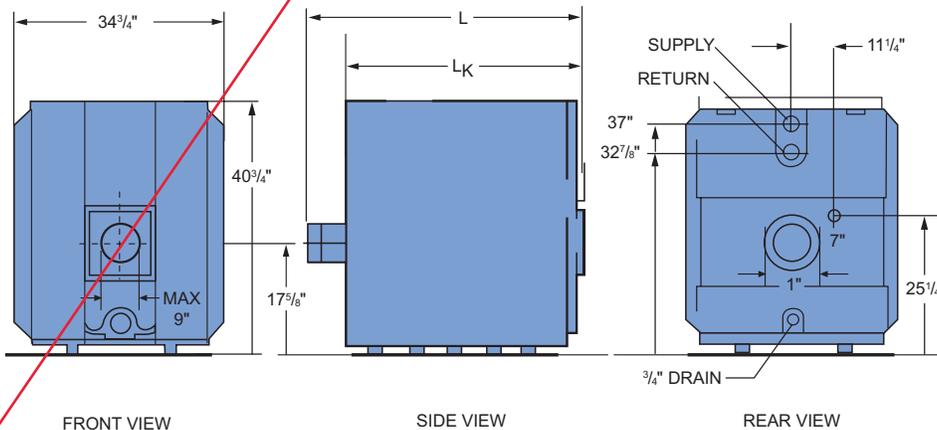
MEA Approved
 CRN Approved
 MA Approved

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G315 Foundation Dimensions



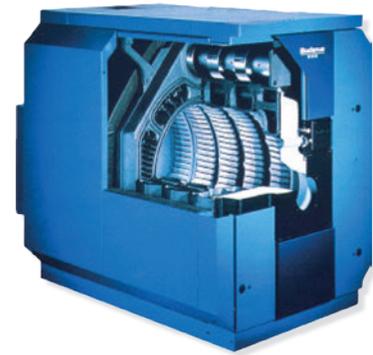
315 Section Weights in lbs		
Front	Intermediate	Rear
199	199	199



G515 Series



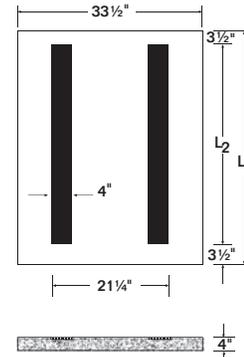
Model	G515/7	G515/8	G515/9	G515/10	G515/11	G515/12
Performance Data						
Gross Output MBH	818	1,009	1,201	1,392	1,583	1,775
# of Sections	7	8	9	10	11	12
Max Input Gas MBH	995	1,216	1,438	1,660	1,881	2,103
Max Input Oil GPH	6.9	8.4	10.0	11.6	13.0	14.6
Net IBR MBH	711	877	1,044	1,210	1,377	1,543
Boiler HP	24.5	30.2	35.9	41.6	47.3	53
Max Operating Pressure (psi)	87	87	87	87	87	87
Combustion Efficiency Oil	88.2%	88.2%	88.1%	88.1%	88.1%	88.1%
Combustion Efficiency Gas	85.6%	85.5%	85.5%	85.5%	85.4%	85.4%
Thermal Efficiency Oil	84.8%	85.5%	86.1%	86.4%	86.8%	87.0%
Thermal Efficiency Gas	82.2%	83.0%	83.5%	83.9%	84.2%	84.4%
Piping Connections						
Vent Connection Size, in.	10	10	10	10	10	10
Supply, in.	4	4	4	4	4	4
Return, in.	4	4	4	4	4	4
Physical Dimensions						
Overall Boiler Length, in. (LG)	62¼	69	75¼	82½	89¼	95¼
Boiler Block Length, in. (LK)	54½	61	67½	74¼	81	87½
Boiler Door Thickness, in.	5	5	5	5	5	5
Minimum Boiler Width, in. (BE)	33	33	33	33	33	33
Height, in.	52¼	52¼	52¼	52¼	52¼	52¼
Fire Box Depth, in. (LF)	45¼	52½	59¼	66	72½	79¼
Fire Box Diameter, in.	20¼	20¼	20¼	20¼	20¼	20¼
Fire Box Volume (cu. ft.)	14.87	17.16	19.46	21.75	24.05	26.31
Dry Weight (lbs.)	2,731	3,059	3,505	3,864	4,188	4,541
Water Content (gal.)	68.2	77.7	87.2	96.7	106.2	115.7
Operating Weight (lbs.)	3,300	3,707	4,233	4,671	5,074	5,506



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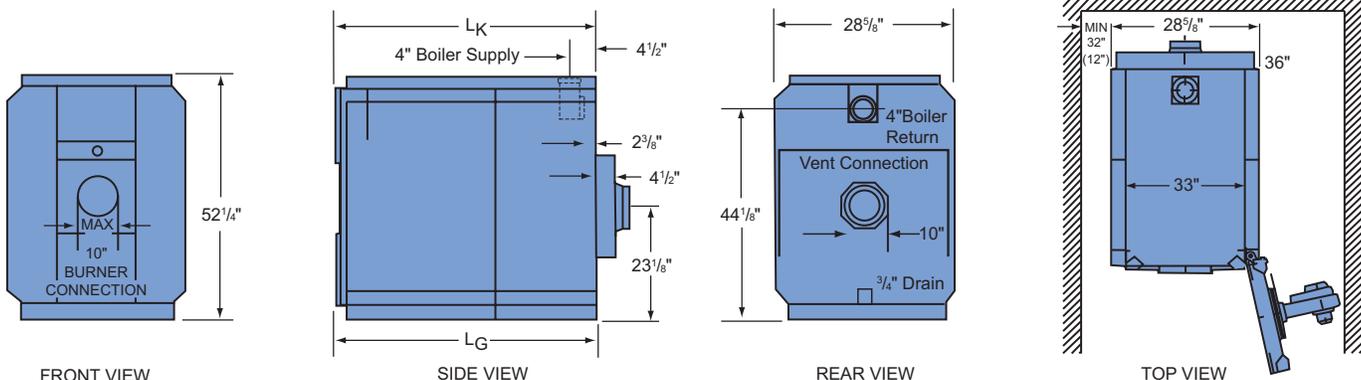
G515 Foundation Dimensions



Boiler Model	515/7	515/8	515/9	515/10	515/11	515/12
Foundation Length L1, in.	53½	60¼	67	73½	80¼	87
Flat Plate Length L2, in.	46¾	53½	60¼	67	73½	80¼

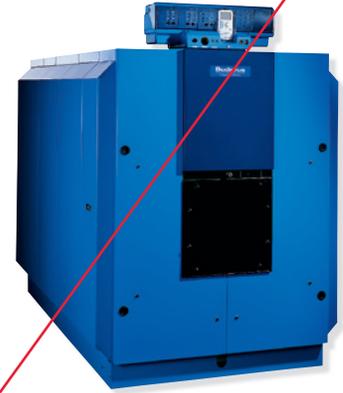
515 Section Weights in lbs		
Front	Intermediate	Rear
326	331	357

The boiler must be placed on a smooth, level concrete base, 33½" wide. Cement in the base or place on its top either 4" x ¼" flat steel plates or 4" x 2" x ¼" angle irons for boiler support. Dimensions L1 and L2 are specified in the table above. Buderus recommends the use of Beckett, Gordon Piatt, Power Flame and Riello burners for oil/gas firing (Buderus stocks Riello and Beckett burners).



G615 Series

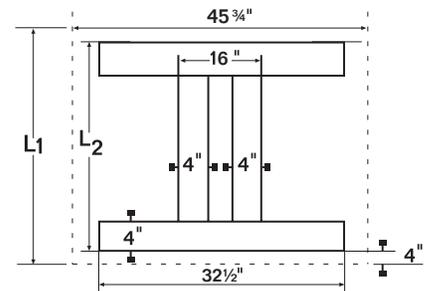
Model	G615/9	G615/10	G615/11	G615/12	G615/13	G615/14	G615/15	G615/16
Performance Data								
Gross Output MBH	1,201	2,242	2,532	2,822	3,112	3,402	3,692	3,982
Number of Sections	9	10	11	12	13	14	15	16
Max. Input Gas MBH	1,438	2,670	3,031	3,392	3,753	4,113	4,474	4,835
Max. Input Oil	16.0	18.5	21.0	23.5	26.0	28.5	31.0	33.5
Net IBR MBH	1,697	1,950	2,202	2,454	2,706	2,958	3,210	3,463
Boiler HP	58.3	66.9	75.6	84.3	92.9	101.6	110.3	118.9
Max. Operating Pressure (psi)	87	87	87	87	87	87	87	87
Combustion Efficiency Oil	88.1%	86.7%	86.6%	86.6%	86.5%	86.5%	86.5%	86.5%
Combustion Efficiency Gas	85.5%	84.1%	84%	84%	83.9%	83.9%	83.9%	83.9%
Thermal Efficiency Oil	86.1%	86.5%	86.1%	85.8%	85.5%	85.3%	85.1%	84.9%
Thermal Efficiency Gas	83.5%	83.9%	83.5%	83.2%	82.9%	82.7%	82.5%	82.4%
Piping Connections								
Vent Connection Size, in.	14	14	14	14	14	14	14	14
Supply, in.	6	6	6	6	6	6	6	6
Return, in.	6	6	6	6	6	6	6	6
Physical Dimensions								
Overall Boiler Length, in. (LG)	75¾	82½	89¼	96	102½	109¼	116	122¾
Boiler Block Length, in. (LK)	71	77¾	84½	92	97¾	104¼	111¼	117¾
Boiler Door Thickness, in.	5	5	5	5	5	5	5	5
Minimum Boiler Width, in. (BE)	50½	50½	50½	50½	50½	50½	50½	50½
Height, in.	62¾	62¾	62¾	62¾	62¾	62¾	62¾	62¾
Fire Box Depth, in. (LF)	60	66¾	73½	80	86¾	93½	100¼	106¾
Fire Box Diameter, in.	26¾	26¾	26¾	26¾	26¾	26¾	26¾	26¾
Fire Box Volume (cu. ft.)	23.56	26.21	29.07	31.46	34.08	36.72	39.34	41.97
Dry Weight (lbs.)	5,510	6,045	6,580	7,110	7,645	8,160	8,799	9,125
Water Content (gal.)	144	160	176	192	208	224	240	256
Operating Weight (lbs.)	6,740	7,390	8,050	8,720	9,390	10,040	10,720	11,280



MEA Approved
 CRN Approved
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G615 Foundation Dimensions

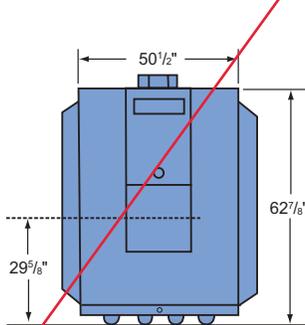


Boiler Model	615/9	615/10	615/11	615/12	615/13	615/14	615/15	615/16
Foundation Length L1, in.	65¾	72½	79¼	86	92¾	99¼	106	112½
Flat Plate Length L2, in.	58	64¾	71¼	78	84½	91¼	98	104¾

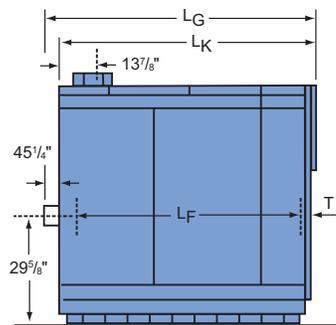
615 Section Weights in lbs		
Front	Intermediate	Rear
565	545	657

The boiler must be placed on a smooth, level concrete base, 33½" wide. Cement in the base or place on its top either 4" x ¼" flat steel plates or 4" x 2" x ¼" angle irons for boiler support. Dimensions L1 and L2 are specified in the table above.

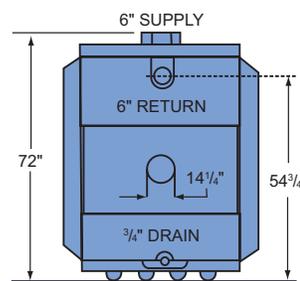
Buderus recommends the use of Beckett, Gordon Platt, Power Flame and Riello burners for oil/gas firing (Buderus stocks Riello and Beckett burners).



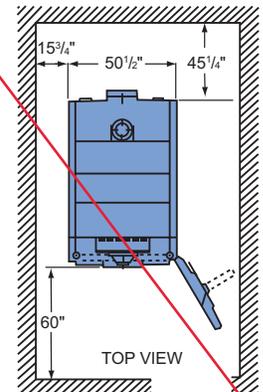
FRONT VIEW



SIDE VIEW



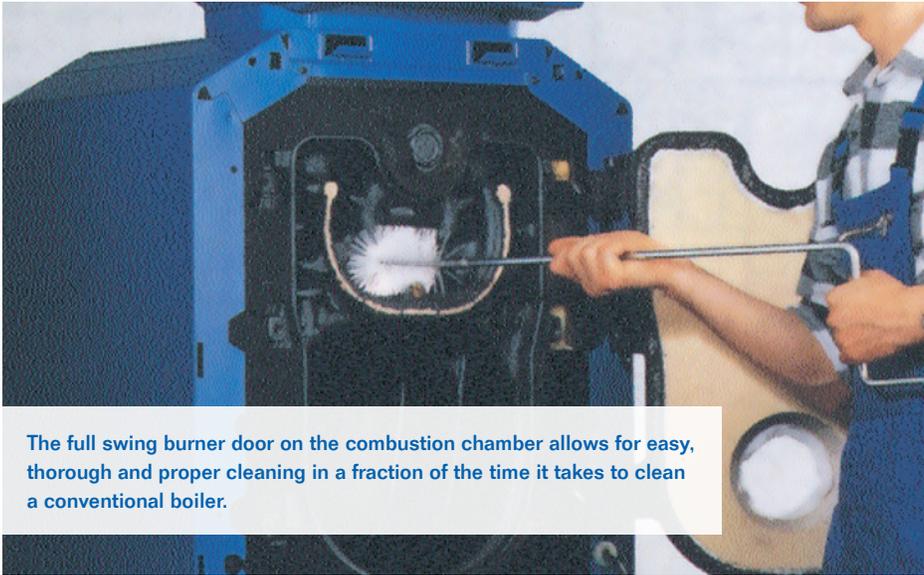
REAR VIEW



TOP VIEW

G315 | G515 | G615

Cast Iron Commercial Boilers



The full swing burner door on the combustion chamber allows for easy, thorough and proper cleaning in a fraction of the time it takes to clean a conventional boiler.

Superior Design

- Designed to operate at any return water temperature
- Full swing burner door for easy and quick, thorough cleaning
- No refractory parts for reduced maintenance
- Boiler fully serviced and cleaned from the front
- Cast iron breaching for long life
- Thermostream design increases efficiency and system reliability
- High efficiency through full three-pass boiler design
- No thermal shock as result of unique Thermostream boiler design
- No minimum water temperature
- Savings in overall equipment costs, installations and annual operating costs
- High combustion and thermal efficiencies

Commercial Boiler Specifications

- 1 There shall be provided and installed a quantity of ___ G315, G515 or G615 Buderus sectional cast iron hot water boiler(s) with a total gross output rating of ___ MBH, suitable for forced draft firing with No. 2 fuel oil, natural gas, or propane. Maximum operating pressure of the boiler(s) shall be 87 psi. They shall bear the ASME stamp and IBR rating.
- 2 Boiler(s) shall be fabricated with GL-180M high silicone cast iron. They shall be of wet base, double wall, sectional construction with precision machined steel push nipples. Boiler(s) shall have a 5 year warranty against defects in the heat exchanger.
- 3 Boiler(s) shall be of full three pass design, capable of achieving combustion efficiencies up to 87.1% on oil and up to 84.5% on gas at full firing rate. Boiler(s) shall contain no refractory material or combustion target wall.
- 4 Boiler(s) shall be capable of sustained operation at any return water temperature without any means external to the boiler to temper or preheat return water. When operating with standard high temperature controls a water temperature of 122°F must be reached within ten minutes at the boiler supply during burner operation.
- 5 Access to boiler firesides for inspection and service shall be through a fully insulation and jacketed door, field adjustable for left or right hinging. The seal between door and boiler casing shall be a permanent dry gasket for repeated positive sealing. All flue passages shall be accessible only through the front door and removable rear clean-out covers.
- 6 Boiler(s) shall be furnished with a heavy-gauge baked enamel jacket with a full 3½" or 4" insulation on top and on all sides, flanged water connections and a cast iron flue collector for long life.

Operational Requirements for the G315, G515 and the G615

- Maintain minimum 122°F supply temperature with standard high temperature controls during burner operation within 10 minutes after burner starts up.
- No additional requirements for firing with 2-stage or full modulation burners (gas or oil).
- No minimum return water temperature and no minimum flow requirement.
- Boiler(s) shall not require return water temperature control or minimum flow condition.

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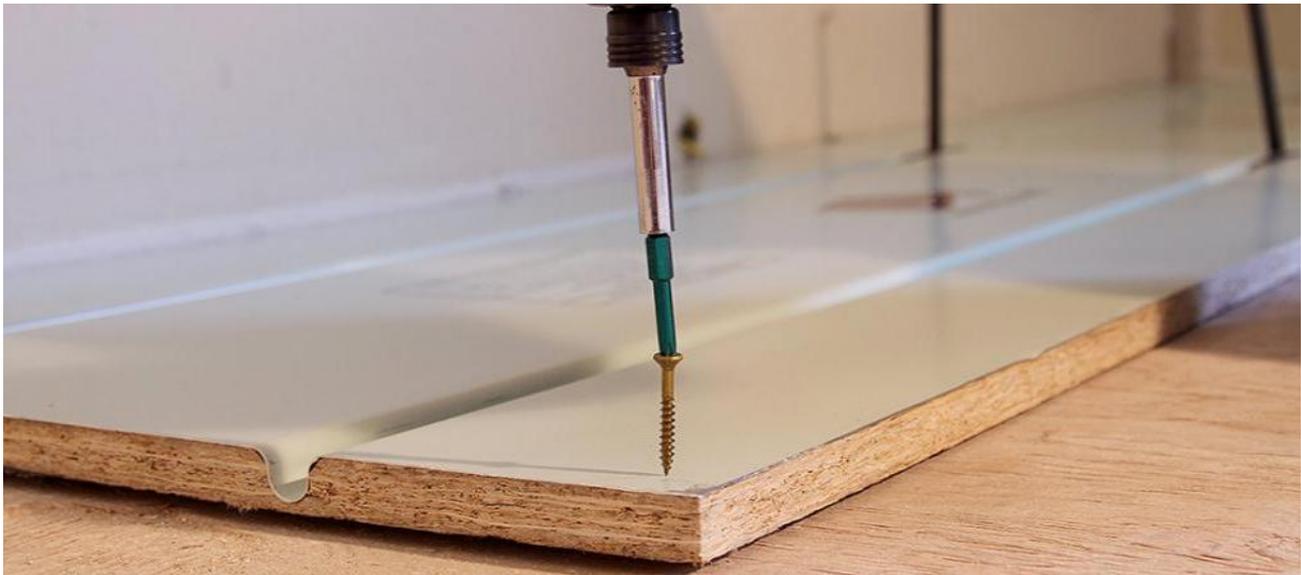
A Tradition of Excellence

The world leader in heating technologies since 1825, Buderus produced the first low-temperature hydronic heating systems. Today, Buderus products are acknowledged as the global standard in high-efficiency, low emissions hydronic heating. All Buderus products are designed to meet strict safety and environmental regulations.

Buderus boilers are quick and easy to install and will outlast and outperform virtually any other hot water heating system. They are designed for easy access and service. With appropriate maintenance, Buderus boilers deliver the highest efficiencies throughout the lifespan of operation. Buderus is a member of Bosch Thermotechnology.

Warmboard-R

This smaller, thinner panel is ideal for installing over existing subfloor or slab, or walls or ceiling



Warmboard-R is our radiant heat panel designed specifically for retrofits and remodels. It is a 13/16" thick radiant panel that provides unmatched response, energy efficiency and comfort. Warmboard-R panels measure 2'x4', and are ideal for installing over existing subfloor or slab. They are also used regularly in wall and ceiling installations. As the panels are installed, the modular channel pattern automatically produces the tubing layout, a process that takes much more time with other radiant systems. Roll out the 1/2" PEX (Aluminum PEX) tubing into the stamped pattern and attach to the hydronic circuit. This smooth process saves you money throughout your construction process.

The entire panel, including the tubing channel, is bonded to thick aluminum, creating a highly conductive surface which pulls the heat from the tube rapidly and spreads evenly throughout your home. Warmboard-R delivers a sturdier floor for your clients as well, and virtually any type of flooring can be installed over these panels.

Warmboard-S (/warmboard-s)

Panel Thickness: 13/16"

Panel Size: 2' x 4', high-grade OSB

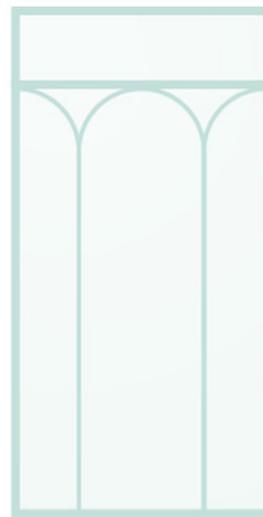
Tubing Spacing: 12"

Tubing Size: 1/2"

Panel Types: Straight, Turn

Conductive Material: 0.025" thick 1060 Aluminum

Warmboard-R (/warmboard-r)



Turn Warmboard-R



Straight Warmboard-R



Our **design team** will work with you (or architect or builder) to design the optimal panel layout for your project, including your zone preferences. Color-coded plans are provided showing where each panel installs, and includes tubing layouts and manifold locations well. Each project includes tools to ensure a smooth installation, including alignment pins and router templates. While installation is generally done by professionals, many DIY'ers have successfully installed their own Warmboard-R panels, and then hire a plumber for other parts of the project.

Click [here \(/sites/default/files/downloads/fullplanset_0809.pdf#page=2\)](/sites/default/files/downloads/fullplanset_0809.pdf#page=2) to see sample Panel and Tubing layout plans for a Warmboard project.

Installation Information

Warmboard-R Install Manual
(/sites/default/files/downloads/Warmboard-R_InstallManual.pdf)

AXIOM

INDUSTRIES LTD.

MODEL SF100 PACKAGED HYDRONIC SYSTEM FEEDER

The SF100 contains everything required to feed and pressurize closed hydronic heating or cooling systems in a neat, simple package that is easy to install and operate. It is compatible with both water and water/glycol solutions.



5-55 psi

FEATURES and BENEFITS

- 208 litre (55 US gallon) tank for storage and mixing
- Plugs into any standard 115 VAC outlet
- Fluid level switch shuts the pump off if the storage tank level gets low
- Accumulator tank prevents excessive pump cycling
- No direct connection to potable water supply eliminates need for backflow prevention
- Make-up fluid stored in the feeder tank can be pre-treated
- Diverter valve for purging of air on initial start-up and manual agitation of solution
- Prevents major floods - in the event of system rupture, only the contents of the tank can be pumped into the system
- Provides leak detection - dropping fluid level provides immediate notice that the system has developed a leak
- Fluid drained for service can easily be put back into the system
- Flexible connection hose with system check valve makes installation easy

Represented By:

AXIOM INDUSTRIES LIMITED 2615 WENTZ AVENUE SASKATOON, SK S7K 5J1
TOLL FREE : (877) 651-1815 PHONE : (306) 651-1815 FAX : (306) 242-3373

www.axiomind.com



INDUSTRIES LIMITED

SF100 HYDRONIC SYSTEM FEEDER TECHNICAL INFORMATION

WEIGHT - 16 kg, 35 lbs.

ELECTRICAL

115/60/1, 0.7 amps
3-prong plug and cord

PUMP PERFORMANCE

0.09 l/s (1.4 gpm) @ free flow
0.06 l/s (1.0 gpm) @ 345KPa (50 psig)
Self-priming up to 2.1 m (7 feet)
Maximum liquid temp. 77 C (170 F)



Certified to CAN/CSA
C22.2 No. 68



9901055
Conforms to UL73

SPECIFICATION

Hydronic system feeder shall be AXIOM INDUSTRIES LTD. Model SF100. System shall include 208 litre (55 US gallon) storage/mixing tank with cover; pump suction hose with inlet strainer; pressure pump with thermal cut-out; integral pressure switch; integral check valve; cord and plug; pre-charged accumulator tank with EPDM diaphragm; manual diverter valve for purging air and agitating contents of storage tank; pressure regulating valve adjustable (35 – 380 KPa; 5 – 55 psig) complete with pressure gauge; built-in check valve; union connection; 12 mm (1/2”) x 900 mm (36”) long flexible connection hose with check valve; low level pump cut-out. Pressure pump shall be capable of running dry without damage. Power supply 115/60/1 0.7 A. Unit shall be completely pre-assembled and certified by a recognized testing agency to CSA standard C22.2 No 68.

ACCESSORIES

- 2PRV** – Second Pressure Reducing Valve, Pressure Gauge, System Connector Hose and Check Valve to allow for independent pressure supply to a second system.
- RIA10-1-SAA** – Low Level Alarm Panel c/w Remote Monitoring Dry Contacts and Selectable Audible Alarm

LIMITED WARRANTY

The SF100 is warranted against defects in materials and workmanship for one year.

Project _____ Location _____
 Consultant _____ Contractor _____
 Unit Tag _____ Sales Agent _____

HEAVY-DUTY LARGE VOLUME STORAGE TANKS MODEL HD CUSTOM BUILT

Large volume tanks are designed for storing potable water. Fitting locations of these custom-line tanks match the needs of normal installations plus those for the A. O. Smith Cer-Temp 80® and Shure-Temp™ systems.

FEATURES

SIZES FROM 80 TO 12,500 GALLONS

All tanks are constructed to the requirements of the ASME Code. These ASME Code tanks are available at 125, 150 & 160 PSI working pressure. Consult factory for ASME Code tanks that have greater or lesser working pressures with special configurations or materials.

LINING AND COATINGS

Each lining and coating has particular capabilities and limitations. Thorough investigation on the service life of steel tanks with protective coatings or linings has led to the recommendation of the following linings:

- Glass Lined — All internal surfaces exposed to water are glass lined per ASME HLW Code procedures.
- Cement Lined — Cement lining consists of a specially formulated cement applied over the interior of the vessel. Cement lined tanks are recommended when storing water at 180°F or higher.
- Epoxy Lined — The application of specially formulated epoxy makes this lining suitable for cold or hot water storage.

Please consult the factory for recommendations on the uses of linings for specific applications. All tanks receive one prime coat of paint on external surface. Contact your local A. O. Smith representative for severe or unusual applications that may require other materials.

CATHODIC PROTECTION

Glass lined, cement and epoxy tanks are furnished with anodes designed for maximum protection.

CUSTOM TANK OPENINGS

All tanks will be supplied with the fittings located as indicated on the drawings unless specified otherwise. Custom tank opening sizes and locations can be provided as per your specification.

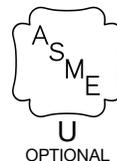
INSPECTION OPENINGS

- 11"x15" manhole or 4"x 6" handhole are available as options on diameters 36" and below.
- 2 each 2" ASME inspection openings are standard on tanks 36" diameter and below.
- 12"x16" ASME inspection openings are standard on tanks with 42" diameters and above.

TANK OPTIONS

- Manholes • Handholes
- Additional/Custom Tank Openings
- Lifting Lugs
- Angle Legs
- Ring Base
- Horizontal Tank Saddles
- Factory Jacketing and Insulation
- Tank Heaters - Cement and Epoxy Linings

**MODELS
HD-20-80
THROUGH
HD-96-12,500**





Commercial Storage Tanks

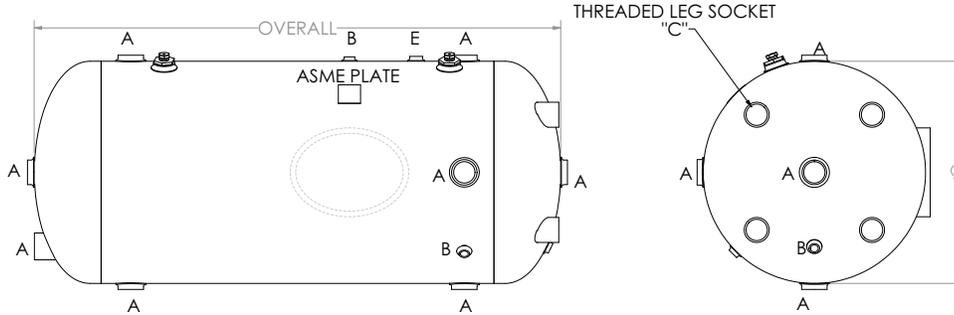
STORAGE TANK SELECTION

Model Number	Diameter	Nominal Approximate O. A. Length	Gallon Capacity	Model Number	Diameter	Nominal Approximate O. A. Length	Gallon Capacity
HD20-80	20"	60"	80	HD54-650	54"	71"	650
HD20-100	20"	72"	100	HD54-750	54"	81"	750
HD24-125	24"	66"	125	HD54-900	54"	95"	900
HD24-140	24"	75"	150	HD54-1,000	54"	105"	1,000
*HD24-175	24"	90"	175	*HD54-1,250	54"	129"	1,250
HD30-175	30"	60"	175	*HD54-1,500	54"	153"	1,500
HD30-200	30"	71"	200	*HD54-1,800	54"	181"	1,800
HD30-250	30"	84"	250	*HD60-800	60"	72"	800
*HD30-300	30"	99"	300	*HD60-1,000	60"	88"	1,000
HD36-250	36"	60"	250	*HD60-1,250	60"	107"	1,250
HD36-300	36"	71"	300	*HD60-1,500	60"	126"	1,500
HD36-350	36"	86"	350	*HD60-1,750	60"	146"	1,750
HD36-400	36"	93"	400	*HD60-2,000	60"	165"	2,000
*HD36-500	36"	122"	500	HD66-1,000	66"	75"	1,000
HD42-375	42"	67"	375	*HD66-1,500	66"	107"	1,500
HD42-450	42"	79"	450	*HD66-2,000	66"	139"	2,000
HD42-500	42"	88"	500	*HD66-2,500	66"	171"	2,500
HD42-600	42"	103"	600	*HD72-2,500	72"	147"	2,500
HD42-700	42"	119"	700	*HD72-3,000	72"	174"	3,000
HD42-800	42"	134"	800	*HD72-3,500	72"	201"	3,500
HD48-500	48"	73"	500	*HD72-4,000	72"	228"	4,500
HD48-600	48"	81"	600	*HD84-4,000	84"	173"	4,000
HD48-700	48"	93"	700	*HD84-5,000	84"	212"	5,000
HD48-750	48"	105"	750	*HD84-6,000	84"	252"	6,000
HD48-900	48"	117"	900	*HD84-8,000	84"	330"	8,000
HD48-1,000	48"	137"	1,000	*HD96-7,500	96"	244"	7,500
*HD48-1250	48"	159"	1,250	*HD96-10,000	96"	319"	10,000
*HD48-1,500	48"	190"	1,500	*HD96-12,500	96"	395"	12,500

NOTE: Above listed tanks are standard sizes only. Other capacity tanks are available. Custom tanks built to your specifications are also available. Consult factory representative.

* Vertical installation requires addition of angle iron legs or ring base.

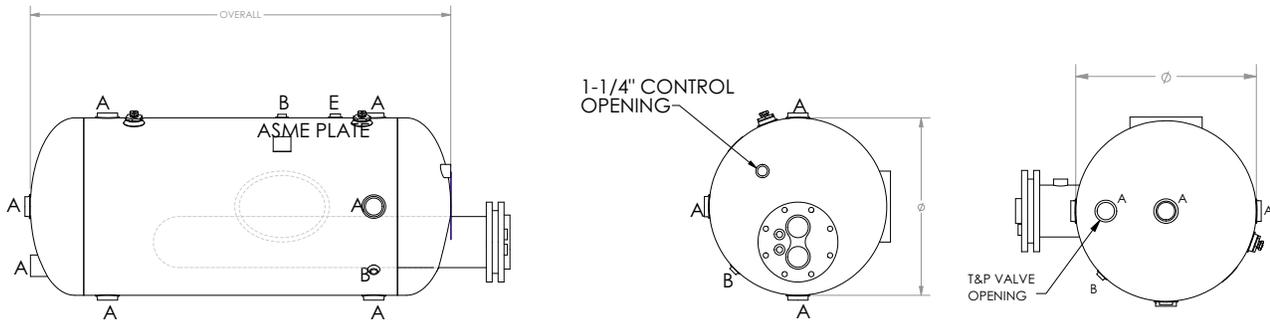
CUSTOM-LINE STORAGE TANKS (20" THRU 96" DIA. TANKS)



NOTE:

- 1) 54" DIAMETER AND LARGER TANKS MUST BE ORDERED WITH ANGLE LEGS RATHER THAN THREADED LEG SOCKETS FOR VERTICAL INSTALLATIONS.
 - 2) SPECIFY FOR HORIZONTAL OR VERTICAL INSTALLATION.
 - 3) NO LEG SOCKETS PROVIDED ON HORIZONTAL TANKS.
- 2 each 2" ASME inspection openings are standard on tanks 36" diameter and below.
 12"x16" ASME inspection openings are standard on tanks with 42" diameters and above.

CUSTOM-LINE STORAGE TANKS (20" THRU 96" DIA. TANKS)

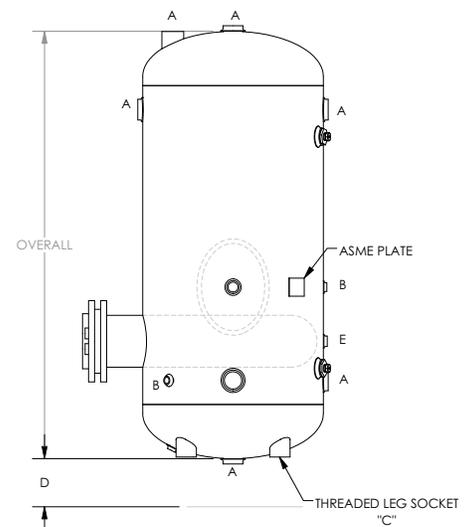


NOTE:

- 1) ADD SUFFIX "ES" FOR SINGLE - WALL OR "ED" FOR DOUBLE - WALL TO MODEL NUMBER WHEN EQUIPPED WITH A TUBE TANK HEATER (i.e.: HD-36-350ES).
- 2) SPECIFY FOR HORIZONTAL OR VERTICAL INSTALLATION.
- 3) NO LEG SOCKETS PROVIDED ON HORIZONTAL TANKS.

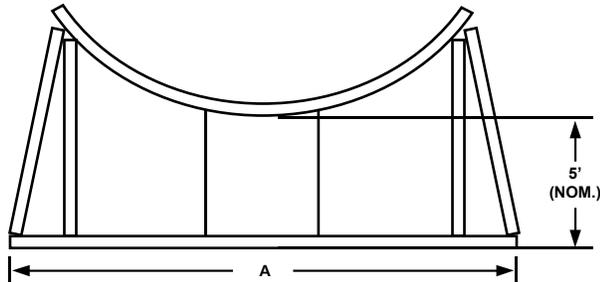
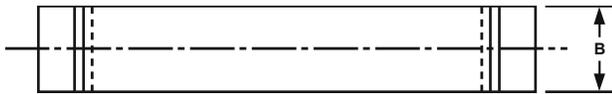
ALL DIMENSIONS IN INCHES

DIMENSION CHART					
DIMENSION	A	B	C	D	E
20	2	3/4	1 1/2	6	3/4
24 THRU 36	2 1/2	3/4	2 1/2	8	1
42 AND 48	3	3/4	3	10	1
54 THRU 96	3	3/4	3	10	1





Commercial Storage Tanks



TANK SADDLES

A.O. SMITH PART NO.	TANK DIA.	A	B
P2-2600-20	20	22	6
P2-2600-24	24	26	6
P2-2600-30	30	32	6
P2-2600-36	36	38	6
P2-2600-42	42	44	6
P2-2600-48	48	50	6
P2-2600-54	54	56	8
P2-2600-60	60	62	8
P2-2600-66	66	58	8
P2-2600-72	72	74	10
P2-2600-84	84	86	10
P2-2600-96	96	98	10

FACTORY INSULATION OPTIONS

Factory Jacketed and Insulation

- **INSULATION** — Entire tank is surrounded with high-density fiberglass insulation to reduce costly heat loss; non-sagging and vermin-proof. To meet or exceed the thermal efficiency and/or standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IESNA 90.1, depth of insulation cavity requires use of remote bulb-type tank temperature control and thermometer.
- **CABINET** — Heavy gauge steel with high quality powder coat paint provides additional insulating qualities for greater energy savings.
- Adds 6" to the diameter of the tank.



OUTDOOR FOAM INSULATION

- **INSULATION** — Entire tank is sprayed with minimum of 2" high-density polyurethane foam insulation that forms a watertight jacket that is approved for outdoor use. Meets or exceeds the thermal efficiency and standby loss requirements of the U.S. Department of Energy and Current Edition of the ASHRAE/IESNA 90.1.
- Adds 6" to the diameter of the tank.

Note: Minimum foam insulation thickness is 2"; however, since tank is hand sprayed, insulation thicknesses may be greater in some areas giving the finished tank an uneven but watertight surface.

HIGH EFFICIENCY (R-16) FACTORY JACKET AND INSULATION

- **INSULATION** — Meets or exceeds the thermal efficiency and/or standby loss requirements of the U.S. Department of Energy and Current Edition of the ASHRAE/IESNA 90.1. For Green building jobs where maximum energy efficiency is required. Entire tank is surrounded with high-density fiberglass insulation to reduce costly heat loss and save additional energy; non-sagging and vermin-proof. The increased depth of the insulation cavity requires use of remote bulb-type tank temperature control and thermometer.
- **CABINET** — Heavy gauge steel with high quality powder coat paint provides additional insulating qualities for greater energy savings.
- Adds 10" to the diameter of the tank.

SUGGESTED SPECIFICATION

SAMPLE SPECIFICATION FOR CUSTOM-LINE STORAGE TANKS

When jacketed or insulated these models meet or exceed the thermal efficiency and standby loss requirements of ASHRAE 90.1b (current standard).

ASME storage tank to be A. O. Smith Custom-Line model _____. Capacity to be _____ gallons with a diameter of _____ inches. Tank(s) shall be constructed and stamped according to ASME specifications for _____ psi working pressure. Manhole (12"x16"), handhole (4x6) or inspection openings (2-2") shall be installed in accordance with ASME code requirements and manufacturer(s) standard practice. Tank to be constructed of (carbon steel) _____. Lining shall be (glass, epoxy, cement) _____. Tank(s) lined with (glass, cement, epoxy) _____ lining shall be equipped with the number and size of magnesium anode rod(s) sufficient to provide adequate protection for the tank lining. Tank shall be (vertical, horizontal) _____ design and provided with (four) _____ (angle iron legs, threaded leg socket(s)) _____ ring base, _____ saddles.

SAMPLE SPECIFICATION FOR TANK HEATERS

Tank heaters shall be Model No. _____ 3/4" OD 20 gauge copper "U" tubes. Heater to have _____ square feet of heating surface to heat _____ gallons per hour from _____ degrees F to _____ degrees F with heating media of _____ psi steam (or _____ degrees F boiler water). The element shall be constructed so that the entire section can be removed from the tank for cleaning and inspection.

For Technical Information and Automated Fax Service, call 800-527-1953. A.O. Smith Corporation reserves the right to make product changes or improvements without prior notice.

FIRE PROTECTION PRODUCT DATA



Series 2000SS

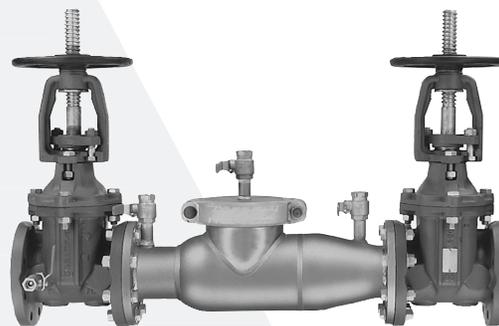
Double Check Valve Assemblies

Sizes: 2½" – 12" (65 – 300mm)

LEAD FREE*

Features

- Patented Cam-Check Assembly provides low head loss
- Short lay length is ideally suited for retrofit installations
- Stainless Steel body is half the weight of competitive designs reducing installation and shipping cost
- Stainless steel construction provides long term corrosion protection and maximum strength
- Single top access cover with two-bolt grooved style coupling for ease of maintenance
- No special tools required for servicing
- Compact construction allows for smaller vaults and enclosures
- May be installed in horizontal or vertical "flow up" position



2000SS

Series 2000SS Double Check Valve Assemblies are designed to prevent the reverse flow of polluted water from entering into the potable water system. This series can be applied, where approved by the local authority having jurisdiction, on non-health hazard installations. Features short end-to-end dimensions, lightweight stainless steel body, and low head loss.

Specifications

A Double Check Valve Assembly shall be installed at each noted location to prevent the unwanted reversal of polluted water into the potable water supply. The main valve body shall be manufactured from 300 series stainless steel to provide corrosion resistance, 100% lead free through the waterway. The double check shall consist of two independently operated spring loaded cam-check valves, required test cocks, and optional inlet and outlet resilient seated shutoff valves. Each cam-check shall be internally loaded and provide a positive drip tight closure against the reverse flow of liquid caused by backsiphonage or backpressure. The modular cam-check includes a stainless steel spring and cam-arm, rubber faced disc and a replaceable seat. There shall be no brass or bronze parts used within the cam-check valve assembly. The valve cover shall be held in place through the use of a single grooved style two-bolt coupling. The main assembly shall consist of two independently operating torsion spring check assemblies, two resilient seated isolation valves, and four ball valve type test cocks. The assembly shall be an Ames Company Series 2000SS.

Available Models

Suffix:

- NRS – non-rising stem resilient seated gate valves
- OSY – UL/FM outside stem and yoke resilient seated gate valves

**OSY FxG – flanged inlet gate connection and grooved outlet gate connection

**OSY GxF – grooved inlet gate connection and flanged outlet gate connection

**OSY GxG – grooved inlet gate connection and grooved outlet gate connection

LG – less gates

Available with grooved NRS gate valves - consult factory**

Post indicator plate and operating nut available – consult factory**

**Consult factory for dimensions

*The wetted surface of this product contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight.

Materials

All internal metal parts: 300 Series stainless steel

Main valve body: 300 Series stainless steel

Check assembly: Noryl®

Flange dimension in accordance with AWWA Class D

Noryl® is a registered trademark of General Electric Company.

Pressure — Temperature

Temperature Range: 33°F – 110°F (5°C – 43°C)

Maximum Working Pressure: 175psi (12.06 bar)

Standards

AWWA C510-92, CSA B64.5

Approvals



1015

(OSY ONLY)

For 12" approvals consult factory

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

Ames product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Ames Technical Service. Ames reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Ames products previously or subsequently sold.



FLUSH FIRE PUMP TEST CONNECTIONS AND VARIATIONS

REGULARLY FURNISHED: Cast brass body with end inlet, size and number of outlets as selected by figure number. Brass plate lettered "PUMP TEST CONNECTION," Brass NRS hose gate valves with loose bonnets, 3" female, NPT inlet x 2 1/2" Male hose thread outlet, with caps and chains.

OPTIONAL FINISHES:

- B Polished Brass on Exposed Parts
- C Rough Chrome Plated on Exposed Parts
- D Polished Chrome Plated on Exposed Parts

THREADS:

- NST
- Other

✓	Fig. No.	Pump Size G.P.M.	Inlet Size	Number Outlets	A	B	C	D
	5862	500	4"	2	15 1/4"	5 1/4"	6"	16"
	5863	750	6"	3	22 1/4"	6 1/4"	6 3/4"	23"
	5864	1000	6"	4	28 3/4"	7 3/4"	7 3/4"	30"
	5865	2000	8"	6	43"	7 3/4"	9 3/4"	44"

BODY MATERIAL

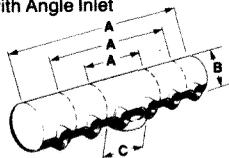
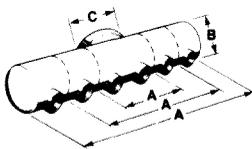
REGULARLY FURNISHED: Ductile iron body with red glossy polyester coating. Inlet size, location and number of outlets as selected by figure number and as indicated on Variation Selection chart.

- 1 with Ductile Iron Body

BODY INLET LOCATIONS

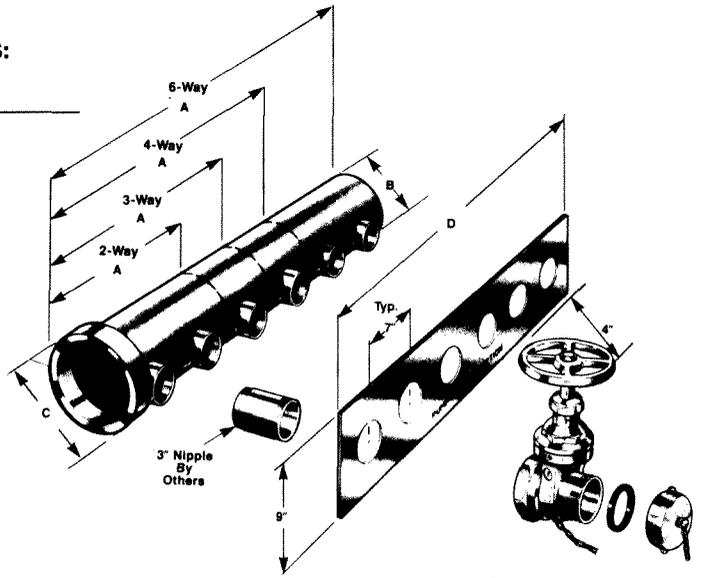
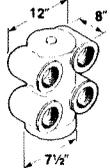
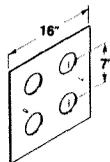
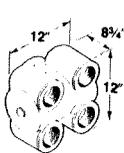
REGULARLY FURNISHED: Brass or ductile iron body. Inlet size, location and number of outlets as selected by figure number and as indicated on Variation Selection chart.

- 2 with Back Inlet
- 3 with Angle Inlet



REGULARLY FURNISHED: Square four way brass or ductile iron body. Back or angle inlet as selected by suffix number as indicated on Variation Selection chart.

- 4 with Square Body Back Inlet
- 5 with Square Body Angle Inlet



OUTLETS

REGULARLY FURNISHED:

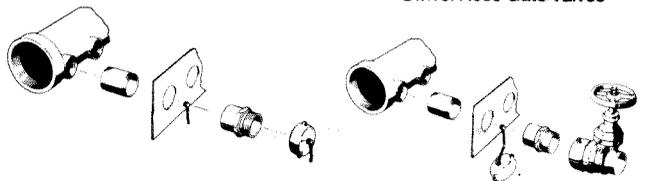
Male 2 1/2" hose thread snoots with cap and chain instead of affixed valves. Number of outlets as selected by figure number and as indicated on Variation Selection chart.

- 6 with Male Snoots, Caps and Chains

REGULARLY FURNISHED:

Male 2 1/2" hose thread snoots with cap and chain, swivel inlet hose gate valve with male hose thread outlet. Number of outlets as selected by figure number and as indicated on Variation Selection chart.

- 7 with Male Snoots, Caps and Chains, and Removable Swivel Hose Gate Valves



VARIATION SELECTION CHART

✓	Suffix No.	Figure No.			
		5862	5863	5864	5865
	Body Material				
	- 1 Ductile Iron	✓	-	✓	-
	Body Inlet				
	- 2 Back	✓	-	✓	✓
	- 3 Angle	✓	-	✓	✓
	- 4 Sq. Back, Brass or Ductile	-	-	✓	-
	- 5 Sq. Angle, Brass or Ductile	-	-	✓	-
	Outlets				
	- 6 Male Snoots, Caps, and Chains	✓	✓	✓	✓
	- 7 Male Snoots, Caps and Chains, and Removable Swivel Hose Gate Valves	✓	✓	✓	✓

DIMENSIONS ARE SUBJECT TO MANUFACTURERS TOLERANCE AND CHANGE WITHOUT NOTICE. WE ASSUME NO RESPONSIBILITY FOR USE OF SUPERSEDED OR VOID DATA.

Reliable®

Model G

2½" (65mm), 3" (80mm),
4" (100mm) & 6" (150mm)

Right-Check™ Riser Valves

Features

1. Grooved end connections.
2. Compact, lightweight design.
3. Non-slamming, spring loaded clapper to minimize water hammer.
4. Approved for horizontal and vertical installation.
5. Stream-lined body design provides very low friction loss.
6. Elastomer faced clapper provides leak-free, non-sticking sealing.

Reliable Model G Riser Right-Check™ Valves are intended for installation in wet pipe fire protection system risers and preaction systems using supervisory air as low as 1 psi (0,07 bar). The Riser Valve and Trim Kit (Figure 1) with a water flow detector can provide an electric alarm, and is a cost effective alternative to an alarm valve in installations not requiring a mechanical alarm.

Riser Valves are factory tapped for 1¼" (or 2") NPT and ½" NPT system connections and for ¼" NPT supply connection (Ref. Figure 2).

Grooved end connections provide fast and easy installation using listed or approved mechanical grooved couplings. Rigid style grooved couplings can be used for positive clamping to resist flexural and torsional loads.

Riser Right-Check™ Valves and associated riser equipment should periodically be given a thorough inspection and test. NFPA 25 provides minimum maintenance requirements. Check valves should be inspected and operated at least annually. Parts should be replaced as required.

When Model G Riser Valves are installed vertically, the direction of the flow arrow must point upward. For horizontal installations, the hinge pin must be located at the top. In preaction systems, the valves must be installed vertically.

Valve Description

1. Rated working pressure - 250 psi (17,2 bar).
2. Factory hydrostatic test pressure - 500 psi (34,5 bar).
3. Friction loss, expressed in equivalent length of Sch. 40 pipe with C = 120 (based on Hazen-Williams formula) and a flowing velocity of 15 ft/s (4.6 m/s), is:
2½" (65mm) - 7 ft. (2.1m) 4" (100mm) - 10 ft. (3.0m)
3" (80mm) - 7 ft. (2.1m) 6" (150mm) - 16 ft. (4.9m)
See Bulletin 807 for Pressure Drop (psi) vs. Flow Rate (gpm) data chart.



Figure 1

4. Standard grooved end dimensions per ANSI/ AWWA C606.
5. Dimensions A/B/C/D (Fig. 3) in inches (mm).
2½" (65mm) - 7.12 (181)/ 4.81(122)/ 3.88 (98)/ 11.38 (289)
3" (80mm) - 7.62 (194)/ 5.06 (129)/ 4.00 (102)/ 11.62 (295)
4" (100mm) - 8.44 (214)/ 6.19 (157)/ 4.00 (152)/ 13.56 (344)
6" (150mm) - 10.25 (260)/ 7.06 (179)/ 5.12 (130)/ 14.44 (367)
6. Shipping weight (including Trim Kit):
2½" (65mm) - 14 lbs. (6.4 kg)
3" (80mm) - 15 lbs. (6.8 kg)
4" (100mm) - 24 lbs. (11.0 kg)
6" (150mm) - 45 lbs. (20.4 kg)

Trim Kit Description

Main Drain:

- 1¼" (32mm) angle valve and close nipple, 2½" and 3" (65mm and 80mm) sizes.
- 2" (50mm) angle valve and close nipple, 4" and 6" (100mm and 150mm) sizes.

Upstream and Downstream Side (all sizes):

- 300 psi (20,7 bar) water pressure gauge (2 req'd).
- ¼" (6mm) 3-way globe valve (2 req'd).
- ¼" x 5" (6mm x 127mm) nipple (upstream only).
- ¼" x 1½" (6mm x 38mm) nipple (downstream only).
- ¼" (6mm) plug (2 req'd).

Approvals

1. Listed by Underwriters Laboratories, Inc.
2. Listed by Underwriters Laboratories of Canada.
3. Approved by Factory Mutual Research Corp.
4. NYC MEA 258-93E.

Model 513 (13) Riser Manifold 1-1/2 thru 6 Inch (DN40 thru DN150) For NFPA 13 Sprinkler Systems

General Description

The Figure 513 (13) Riser Manifolds described in this technical data sheet provide the necessary waterflow alarm, pressure gauge, alarm test orifice, drain, and sight glass equipment in a single assembly for use in NFPA 13 sprinkler systems as follows:

NFPA 13*

- 1-1/2 Inch (DN40)
Male Thread x Female Thread
- 1-1/2 thru 6 Inch (DN40 thru DN150)
Groove x Groove

*Although the Riser Manifold described in this data sheet is intended for NFPA 13 sprinkler systems, it may be used for NFPA 13D or 13R residential sprinkler systems, where a test orifice of 5.6K (80K) is acceptable.

The variety of sizes and grooved end connections allow cost effective and easy transition to check valves, control valves, and system piping. The Riser Manifolds may be installed in either the horizontal (flow switch on top) or vertical (flow going up) for both single sprinkler rises and floor control in high rises.

WARNING

The Riser Manifolds 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. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Technical Data

Approvals

The Figure 513 (13) Riser Manifolds with a cover tamper switch for the waterflow alarm switch are UL Listed, ULC Listed, and FM Approved.

The Figure 513 (13) Riser Manifolds without a cover tamper switch for the waterflow alarm switch are UL Listed and FM Approved.

Maximum Working Pressure

175 psi (12,1 bar)

Test Orifice

5.6K (80K)

Assembly

The manifold body of the Figure 513 is ductile iron, whereas the manifold body of the Figure 13 is cast iron. The two assemblies are completely interchangeable in function, application, and end-to-end laying length.

Finish

Red painted.

Installation

The Riser Manifolds may be installed in either the horizontal (flow switch on top) or vertical (flow going up). The inlet of the Riser Manifold may be directly connected to a shut-off control valve.

NOTES

Where applicable pipe thread sealant is to be applied sparingly. Use of a non-hardening pipe thread sealant is recommended.

Never remove any piping component nor correct or modify any piping deficiencies without first depressurizing and draining the system.

Step 1. Install the manifold body with the flow arrow pointing in the downstream position using threaded con-



nections and/or listed mechanical grooved connections, as applicable

Step 2. Connect the drain line, and then close the drain valve.

Step 3. Refer to Figure 3 for wiring guidance. All wiring must be performed in accordance with the Authority Having Jurisdiction and/or the National Electrical Code.

Step 4. Refer to Figure 4 for optional relief valve.

Step 5. Place the system in service by filling the system with water. When filling the system, partially open the control valve to slowly fill the system. *Filling the system slowly will help avoid damaging the waterflow alarm switch.*

After the system is fully pressurized, completely open the control valve.

Step 6. Secure all supply valves open.



⚠ WARNING

- Installation must be performed by qualified personnel and in accordance with all national and local codes and ordinances.
- Shock hazard. Disconnect power source before servicing. Serious injury or death could result.
- Risk of explosion. Not for use in hazardous locations. Serious injury or death could result.

UL, CUL and CSFM Listed, FM Approved, LPCB Approved, For CE Marked (EN12259-5)/VdS Approved model use VSR-EU

Service Pressure: 450 PSI (31 BAR) - UL

Flow Sensitivity Range for Signal:

4-10 GPM (15-38 LPM) - UL

Maximum Surge: 18 FPS (5.5 m/s)

Contact Ratings: Two sets of SPDT (Form C)

10.0 Amps at 125/250VAC

2.0 Amps at 30VDC Resistive

10 mAmps min. at 24VDC

Conduit Entrances: Two knockouts provided for 1/2" conduit.

Individual switch compartments suitable for dissimilar voltages.

Environmental Specifications:

- NEMA 4/IP54 Rated Enclosure suitable for indoor or outdoor use with factory installed gasket and die-cast housing when used with appropriate conduit fitting.
- Temperature Range: 40°F - 120°F, (4.5°C - 49°C) - UL
- Non-corrosive sleeve factory installed in saddle.

Service Use:

Automatic Sprinkler	NFPA-13
One or two family dwelling	NFPA-13D
Residential occupancy up to four stories	NFPA-13R
National Fire Alarm Code	NFPA-72

Optional: Cover Tamper Switch Kit, stock no. 0090148

Replaceable Components: Retard/Switch Assembly, stock no. 1029030

General Information

The Model VSR is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50 mm thru 200 mm). LPC approved sizes are 2" thru 8" (50 mm thru 200 mm). See Ordering Information chart.

The VSR may also be used as a sectional waterflow detector on large systems.

The VSR contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 GPM (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

Enclosure

The VSR switches and retard device are enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin number 5401103 for installation instructions of this switch.

Installation (See Fig. 1)

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The device should not be installed within 6" (15 cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

Note: Do not leave cover off for an extended period of time.

Drain the system and drill a hole in the pipe using a hole saw in a slow speed drill. (see Fig. 1)

Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole.

Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Install the saddle strap and tighten nuts alternately to required torque. (see Fig. 1). The vane must not rub the inside of the pipe or bind in any way.

Specifications subject to change without notice.

Ordering Information			
Nominal Pipe Size		Model	Part Number
2"	DN50	VSR-2	1144402
2 1/2"	DN65	VSR-2 1/2	1144425
3"	DN80	VSR-3	1144403
3 1/2"	-	VSR-3 1/2	1144435
4"	DN100	VSR-4	1144404
5"	-	VSR-5	1144405
6"	DN150	VSR-6	1144406
8"	DN200	VSR-8	1144408



UL, ULC, and CSFM Listed, FM Approved, NYMEA Accepted, CE Marked

Dimensions: 6.19" L X 2.25" W X 5.88" H
15,7cm L X 5,7cm W X 14,6cm H

Weight: 2 lbs. (0,9 kg.)

Enclosure: Cover - Die-Cast
Finish - Red Spatter Enamel
Base - Die Cast Zinc

All parts have corrosion resistant finishes.

Cover Tamper: Tamper resistant screws,
Optional cover tamper kit available.

Contact Ratings:

OSYSU-1: One set of SPDT (Form C)
OSYSU-2: Two sets of SPDT (Form C)
15.00 Amps at 125/250VAC
2.50 Amps at 30VDC resistive

Environmental Limitations:

- **NEMA 4 and NEMA 6P Enclosure (IP67) when used with appropriate watertight conduit fittings.**
- Indoor or Outdoor use (Not for use in hazardous locations. See bulletin no. 5400705 OSYS-U-EX for hazardous locations.)
- Temperature Range: -40°F to 140°F (-40°C to 60°C)

Conduit Entrances:

2 knockouts for 1/2" conduit provided

Service Use:

Automatic Sprinkler	NFPA-13
One or two family dwelling	NFPA-13D
Residential occupancy up to four stories	NFPA-13R
National Fire Alarm Code	NFPA-72

General Information

The OSYSU is used to monitor the open position of an OS&Y (outside screw and yoke) type gate valve. This device is available in two models; the OSYSU-1, containing one set of SPDT (Form C) contacts and the OSYSU-2, containing two sets of SPDT (Form C) contacts. These switches mount conveniently to most OS&Y valves ranging in size from 2" to 12" (50mm to 300mm). They will mount on some valves as small as 1/2" (12,5mm).

The cover is held in place by two tamper resistant screws that require a special tool to remove. The tool is furnished with each device and should be left with the building owner or responsible party. Replacement or additional cover screws and hex keys are available. See Ordering Information.

Optional Cover Tamper Switch

A field installable cover tamper switch is available as an option which may be used to indicate removal of the cover. See Ordering Information.

Testing

The OSYSU and its associated protective monitoring system should be inspected and tested in accordance with applicable NFPA codes and standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently).

Ordering Information

Model	Description	Stock No.
OSYSU-1	Outside Screw & Yoke-Supervisory Switch (Single switch)	1010106
OSYSU-2	Outside Screw & Yoke-Supervisory Switch (Double switch)	1010206
--	Cover Screw	5490424
--	Hex Key for Cover Screws and Installation Adjustments	5250062
--	Optional Cover Tamper Switch Kit	0090131

For pressure reducer type valve installation kits (if required) contact valve manufacturer.

Series RFI — 5.6 K-factor “Royal Flush II” Concealed Pendent Sprinklers Quick & Standard Response, Standard Coverage

General Description

The TYCO Series RFI 5.6 K-factor, “Royal Flush II” Concealed Pendent Sprinklers Quick Response (3-mm bulb) and Standard Response (5-mm bulb), are decorative sprinklers featuring a flat cover plate designed to conceal the sprinkler. These sprinklers are optimal for architecturally sensitive areas such as hotel lobbies, office buildings, churches, and restaurants.

Each sprinkler includes a Cover Plate/Retainer Assembly and a Sprinkler/Support Cup Assembly. The separable, two-piece assembly design provides the following benefits:

- Allows installation of the sprinklers and pressure testing of the fire protection system prior to installation of a suspended ceiling or application of the finish coating to a fixed ceiling.
- Permits the removal of suspended ceiling panels for access to building service equipment without having to first shut down the fire protection system and remove sprinklers.
- Provides for 1/2 inch (12,7 mm) of vertical adjustment to allow a measure of flexibility in determining the length of fixed piping to cut for the sprinkler drops.

The Series RFI Sprinklers are shipped with a Disposable Protective Cap. The Protective Cap is temporarily removed during installation and replaced to help protect the sprinkler during ceiling installation or finish. The tip of the Pro-

ductive Cap can be used to mark the center of the ceiling hole into plaster board or ceiling tiles by gently pushing the ceiling product against the Protective Cap. When ceiling installation is complete, the Protective Cap is removed and the Cover Plate/Retainer Assembly is installed.

As an option, the Series RFI Standard Response (5-mm bulb) “Royal Flush II” Concealed Pendent Sprinklers can be fitted with a silicone Air and Dust Seal. (Refer to Figure 5.) The Air and Dust Seal is intended for sensitive areas where it is desirable to prevent air and dust from the area above the ceiling to pass through the cover plate.

NOTICE

The Series RFI Concealed Pendent Sprinklers described herein must be installed and maintained in compliance with this document and with the applicable standards of the National Fire Protection Association, in addition to the standards of any 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. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Sprinkler Identification Number (SIN)

TY3531 — 3 mm bulb
TY3551 — 5 mm bulb



Technical Data

Sprinkler Approvals

Approvals apply only to the service conditions indicated in the Design Criteria section.

- TY3531 (3 mm Bulb) is UL Listed, C-UL Listed and NYC Approved (MEA 353-01-E) as Quick Response.
- TY3531 (3 mm Bulb) is VdS Approved (Certificate No. G4090007).
- TY3531 (3 mm Bulb) is FM and LPCB Approved (Ref. No. 094a/10) as Standard Response.

Note: FM and LPCB do not approve concealed sprinklers for quick response.

- TY3551 (5 mm Bulb) is UL Listed, C-UL Listed, FM Approved, LPCB Approved (Ref. No. 094a/9), and NYC Approved (MEA 353-01-E) as Standard Response.

Approvals for Air and Dust Seal

UL and C-UL Listed for use with the RFI Standard Response Concealed Sprinkler (TY3551)

Maximum Working Pressure

Maximum 250 psi (17,3 bar) by UL, C-UL, and NYC

Maximum 175 psi (12,1 bar) by FM, VdS, and LPCB

Temperature Rating

155°F (68°C) Sprinkler with
139°F (59°C) Plate

200°F (93°C) Sprinkler with
165°F (74°C) Plate

Discharge Coefficient

K= 5.6 GPM/psi^{1/2} (80,6 LPM/bar^{1/2})

IMPORTANT

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.

Model G1, G4 Sprinkler Guards and Model G1/S1, G4/S3 Guards with Shields for Series TY-B, TY-FRB, TY-L, and TY-FRL Sprinklers

General Description

TYCO Model G1 and G4 Sprinkler Guards are designed for use with specific types of Series TY-B, TY-FRB, TY-L, and TY-FRL Sprinklers that may be located in areas that make them susceptible to mechanical or physical damage. Table A provides compatibility details.

Model G1/S1 and G4/S3 Sprinkler Guards with Shields (Figure 2), in addition to providing protection from mechanical or physical damage, protects the sprinkler from water spray of higher elevation sprinklers (for example, rack storage sprinkler installations). When the Model G1/S1 and G4/S3 are used with the Series TY-B, TY-FRB, TY-L, and TY-FRL Sprinklers shown in Table A, the assemblies form Upright Intermediate Level Sprinklers intended for use in fire sprinkler systems designed in accordance with the standard installation rules recognized by the applicable Listing agency (that is, UL Listing is based on NFPA requirements).

- Model G1 and G4 Guards are a re-designation for the Gem F938 and F937 respectively.
- Model G1/S1 and G4/S3 Guards are a re-designation for the Gem F938/Q-76 and F937/Q-75 respectively.

NOTICE

Model G1 and G4 Sprinkler Guards and Model G1/S1 and G4/S3 Sprinkler Guards with Shields described herein must be installed and maintained in compliance with this document and with the applicable standards of the National Fire Protection Association, in addition to the standards of any Authorities Having Jurisdiction. Failure to do so may impair the performance of these devices.

Owners are responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Technical Data

Approvals

UL and C-UL Listed
FM Approved
Refer to Table A.

Finishes

Red Painted and Zinc Chromate

Physical Characteristics

Welded assembly fabricated from carbon steel

Design Criteria

In accordance with the requirements of the NFPA, sprinkler guards shall be listed. Guards are only listed for use with specified sprinklers; therefore, the Model G1, G4, G1/S1, and G4/S3 must only be used with the Series TY-B, TY-FRB, TY-L, and TY-FRL Sprinklers shown in Table A.





Model 1011T

TEST AND DRAIN®

Sectional Floor Control Test and Drain Valve for Systems Requiring Pressure Relief Valve and Pressure Gauge Assembly



3/4" 1" 1 1/4" 1 1/2" 2"

- The AGF Manufacturing Inc. **Model 1011T TEST AND DRAIN®** matches all the features and benefits of our **Model 1000** by providing both the test function and the express drain function in a multistory installation for a wet fire sprinkler system, with the added features of an integral **Model 7000 Pressure Relief Valve** with drainage piping, **Model 7500 300 PSI 3 1/2" Pressure Gauge**, and **Model 7600 1/4" 3-Way Globe Valve**.

- The **Model 1011T** complies with the requirements of NFPA-13 that stipulate a pressure relief valve be installed on all gridded systems and downstream of all pressure reducing valves (see reverse).

- The **Model 1011T TEST AND DRAIN®** is a compact single handle ball valve which includes a tamper resistant test orifice and integral tamper resistant sight glasses, and is 300 PSI rated.

- Available in a full range of sizes from 3/4" to 2" NPT and BSPT, with all specifiable orifice sizes 3/8" (2.8K), 7/16" (4.2K), 1/2" (5.6K), 17/32" (8.0K), 5/8" (11.2K, ELO), 3/4" (14.0K, ESFR), and K25 as required by NFPA 13, 2007 (see reverse).

- The included UL/FM **Model 7000 Pressure Relief Valve** features a flushing handle and is factory rated for 175 PSI. Other pressure settings are available and may be substituted.

- Designed to relieve excess system pressure caused by surges or temperature changes as well as solve the difficult problem of providing the relief valve with a convenient drainage-piping outlet.

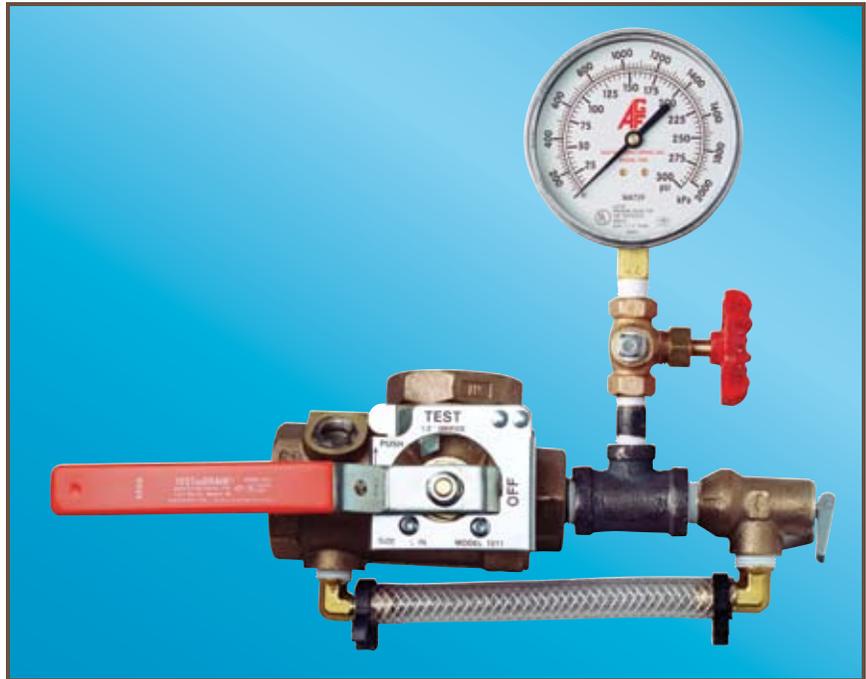
- The **Model 1011T** is shipped complete with all necessary components including the UL/FM **Model 7500 Pressure Gauge** and UL/FM **Model 7600 Globe Valve**.

- Shipped with relief valve and bypass drain ports plugged to expedite pressure testing the system.

- A locking kit is available and can be ordered with the valve to provide vandal resistance or prevent unintentional alarm activation.

- Repair kits including (1) adapter gasket, (1) ball, (2) valve seats, (1) stem packing, and (1) stem washer are available for all **TEST AND DRAIN®** valves. Valve and orifice size must be specified when ordering.

NOTE: It is important to note that the pressure rating of the relief valve indicates an operating range of pressure for both opening and closing of the valve. Standard relief valves are required to OPEN in a range of pressure between 90% and 105% of their rating. The valves are required to CLOSE at a pressure above 80% of that rating. The relief valve should be installed where it is easily accessible for maintenance. Care should be taken that the relief valve CANNOT be isolated from the system when the system is operational. A relief valve should NEVER have a shutoff valve or a plug downstream of its outlet.



Reliability, Versatility, Code Compatibility

ARIES NETLink™

Multi-Loop Intelligent Fire Alarm-Suppression Control Unit



Effective: July 2014
K-76-800

FEATURES

- Intelligent addressable multi-loop, suppression-focused control unit
- Triple R redundancy provides maximum protection against inadvertent release
- Out-of-the-box features:
 - 2 SLCs with 255 unrestricted addresses each (510 total)
 - 4 x 40 Display-Keypad
 - 4 Programmable soft-switches
 - 2 NACs and 2 R-NACs
 - 3 Programmable and 1 Trouble Form-C Relays
 - 2 Auxiliary Power Outputs, 2 amps each
 - USB ports for PC and printer
 - RS-232 ports for graphics
 - 120/240V, 50/60 Hz AC input
 - 5.4 A Power Supply Unit
 - Charging Capacity of 165 AH (UL) and 132 AH (ULC)
 - RS-485 Annunciator bus
 - 2-Tier or 3-Tier NEMA 1 Enclosure – fits between 16" studs
- Suppression systems include:
 - FM-200, FE-13, 3M Novec 1230 Fire Protection Fluid, Carbon Dioxide, Argonite & Halon Clean Agents
 - Dry Chemical, Wet Chemical
 - Water-Mist
 - Sprinkler Supervisory Service
 - Deluge, Pre-Action, Foam, Foam-Water Systems
- Modular and expandable
 - From 3 to 8 SLCs (2,040 addresses)
 - Up to 96 relays
 - Up to 72 release/NAC circuits
 - Combinations of the above and/or functional modules
- Networkable up to 64 nodes (130,560 addresses)
- Flexible programming
- High level serviceability and diagnostics
 - Ground fault detection by circuit
 - 10,000 event log capacity
 - Internet connectivity with e-mail notification feature
- Modbus RTU, Modbus TCP/IP, BACnet MS/TP and BACnet IP compatibility
- Backwards compatible with installed investment
 - SmartOne SLC devices & protocol
 - Kidde Control Heads
 - Actuators
 - Legacy PEGAsys panels via simple retrofit kit
- Seamlessly integrated HSSD, ASD and LHD
- Pluggable terminal blocks
- User Interface 4 x 40 display supports 4 languages: English, French Canadian, Spanish and Portuguese
- French Canadian, Spanish and Portuguese Language kit
- Approvals/Listings*:
 - FM Approved to ANSI/UL864
 - UL Listed No. S2422
 - cUL Listed No. S2422
 - CSFM Approved: No. 7165-1076:0195
 - California OSHPD Special Seismic Certification Pre-Approval, No. OSP-0286-10
 - NYC Fire Department Certificate of Approval: No. 6092
 - City of Chicago Acceptable for Class 1 Applications
- RoHS compliant



DESCRIPTION - CONTROL UNIT

The ARIES NETLink™ is one of the most technologically advanced intelligent fire alarm suppression-focused control units available to the industry today. It combines the high quality, system reliability, and flexibility required by modern commercial, high-tech and industrial applications in an aesthetically-pleasing and physically-robust package. Its modular architecture enables easy field expansion from the base 2-SLC unit that supports 510 addressable devices (255 per circuit) to an 8-SLC system that supports 2,040 addressable devices; 130,560 addresses available for a 64-node network.

The ARIES NETLink is compact, fits between wall stud dimensions, and is designed to be quick and easy to install. Cutting edge technologies incorporated in the electronics design enable diagnostics for time-efficient commissioning.

Main Controller Board - MCB

The ARIES NETLink's main printed circuit board contains the system's central processing unit (CPU) and all of the primary circuits. The MCB is the heart of the system, controlling the operation and supervision of all the system modules and software. It receives loop device data, processes the data based on pre-programmed instructions, and transmits output commands to the output modules, field devices, and display(s). The MCB is mounted to the enclosure using special design hinged standoffs which permit the board to swing left and enable easy access to the PMU/PSU assembly behind.

User Interface

The user interface consists of a built-in keypad and display which provide physical means by which an operator and/or installer performs system functions, enters the security password, operates soft keys, navigates the system menus, configures and tests the entire ARIES NETLink system. The LCD display supports four languages: English, French, Spanish, and Portuguese (selected from the top-level menu).

SAFEPATH®4

Facility Communications

SP40S

Description

The **SP40S** is a Multi-Function Supervised Paging, Messaging, Background Music delivery and Emergency Voice Evacuation System with 24 VDC battery backup. The SP40S integrates with fire alarm systems and provides full control of building audible and visual notification appliances. This single channel system is capable of delivering 40 watts of supervised **high fidelity** audio power and 2 amps of supervised 24 VDC synchronized strobe power. It comes standard with an on-board digital voice messaging system with 8 standard messages, a hand-held microphone, power supply/battery charger and numerous additional features. The SAFEPATH4 system is expandable to 5280 watts utilizing the SPB-80/4 (80 watts and 4 amps of strobe power), the SPB-160 (160 watts) or SPB-320 (320 watts) supervised audio power boosters. All models available in 115 VAC or 220 VAC.

Applications for the SP40S

- Multi-use applications—The system can function as an evacuation system, an emergency messaging system, a paging system, an employee notification system and a background music system per NFPA 72 (2002), section 6.8.4 Combination Systems
- Fire code applications—The system is listed under UL Standard 864, 9th edition delivering supervised audio and voice messaging with strobes and notification appliance circuits (NAC) for visual alerting
- Economic OSHA applications—The system is OSHA 1910.165 compliant; this means that it does not require reliability inspections every two months, or the required spare parts inventory
- Wide ranging applications—from small to large facilities
- Can connect to pagers for private alerting of emergency/trouble conditions

System Activation

- Contact closure message activation



Features

Approvals & Compliance

- Approvals: UL Standard 864, 9th edition, UL Standard 1711, California State Fire Marshal (CSFM), New York City (MEA), FCC Part 15
- OSHA 1910.165 and ADA Compliant
- 1 Year Warranty

Background Music

- Capable of broadcasting from a supplied BGM source
- Unique supervision method allows for full system supervision even during background music (BGM)
- Line Level input for music source
- Frequency Response 100 - 15KHz

General Paging

- Easily interfaces with most existing phone system page port, CO port and line level signals
- Automatically mutes BGM
- Frequency Response 275 - 6.5kHz
- Night ringer or security alert connection

Voice Evacuation

- Complies to NFPA-72 requirements
- Supervised NAC speaker and strobe circuits
- Live microphone override
- 8 digitally pre-recorded voice messages
- Uses selectable pre-tones for messages

Strobe Inputs and Activation

- 2 Amps of 24 VDC supervised strobe power with built-in Wheelock sync protocol. Power limited.
- Strobe output is selectable for control of Wheelock sync protocol or non-sync operation
- Strobe terminals have pass thru capability for Wheelock sync or non-sync operation
- Any of the 8 messages can be dip switch selected to activate strobes
- Microphone activation can be dip switch selected to activate strobes
- Auxiliary activation (Remote MIC) can be dip switch selected to activate strobes
- 24 VDC supervised and synchronized strobe power can be expanded to meet the requirements of the installation via connecting to optional Wheelock power boosters

Speaker Output

- 40 watts of supervised audio power
- Speaker outputs: 25V or 70.7V power limited

Audio Processing

- Volume and tone controls for general paging and BGM
- Connectivity of optional speaker splitter modules
- Dual-tone tone generator with: Code 3 Tone and Slow Whoop for alerting of system trouble
- Night ringer/security alerting capability
- Audio power can be expanded by connecting to optional audio power boosters
 - SPB-80/4 80 Watt Supervised Audio Power Booster with 4 Amp of Synchronized Strobe Power
 - SPB-160 160 Watt Supervised Audio Power Booster
 - SPB-320 320 Watt Supervised Audio Power Booster

Live & Pre-recorded Message Announcement

- Supplied with 8 pre-recorded emergency messages
- Capable of in-field recording of all messages via 1/8" line level audio input jack
- Preset audio levels for emergency messaging (prerecorded and live mic) - system reverts back to a pre set level regardless of the volume set for BGM or general paging
- On board Push-to-Talk Microphone
- Telephone paging input, disconnects BGM when in use
- Auxiliary input for Remote Microphone connection

Benefits and Advantages of the Multi-Function SAFEPATH4

- One System Multi-Function Facility Communications System
- Background Music (BGM) system, with patent pending supervision during BGM operation
- Supervised Emergency/Fire Voice Evacuation System
- Interfaces with telephone system for general paging requirements
- Built in power for visual notification appliances e.g., Strobes
- Expandable for larger system requirements (with optional equipment)

Power Supply & Batteries

- 24 VDC, 33AH Max rechargeable battery back-up power circuitry built-in
- Batteries can be housed in the enclosure (Up to two (BAT-1212), 12 volt, 12 ampere hour batteries can fit in the enclosure. Actual battery size required will depend on speaker and/or strobe load. Batteries are sold separately).

Installation/Maintenance

- Multiple trouble LED indicators for quick system diagnostics
- Fully supervised circuitry always in effect – even during BGM and general paging (via patent pending technology)
- Removable quick connect/disconnect terminals for ease of wiring, accepts #12 to #22 AWG
- Power limited circuitry with Class "B" or Class "A" wiring. Class "A" only with use of Audio Splitter
- Surge protected circuitry
- Audio and strobe power limiter reset button

Compatible Wheelock Products

All Wheelock Speaker/Strobes
 All Wheelock Strobes
 All Wheelock Speakers
 All Cluster Speakers
 Wheelock Strobe Power Supply

Inputs – Audio and Activation		
Priority Ordered Inputs	Priority Level	Type of Input
On Board Microphone	1	Push to Talk (PTT) Microphone
Auxiliary	2	Remote Microphone or Remote Microphone Expander
Digital Message Input 1	3	Contact Closure activation
Digital Message Input 2	4	
Digital Message Input 3	5	
Digital Message Input 4	6	
Digital Message Input 5	7	
Digital Message Input 6	8	
Digital Message Input 7	9	
Digital Message Input 8	10	
Night Ringer Input	11	Contact Closure input
Telephone Paging Input	12	Page port input
Background Music Input	13	Line Level Input, 600 ohm, input voltage must be less than 2.5 V peak to peak, or .3 volts RMS

Audio/Technical Specifications	
Switch mode, Class D amplifier (40 Watts)	
Speaker Outputs	25V or 70.7V power limited
Frequency Response	Voice: 275 Hz – 6.5 kHz BGM: 100 Hz - 15 kHz Meets UL Voice Evacuation Requirements of 800 - 2800 Hz
Signal to Noise Ratio	better than 65 dB
Dynamic Range	better than 65 dB
Total Harmonic Distortion	less than 2%
Stand by Current Draw	130 mA
Alarm Current Draw	4.7 amps

Mechanical	
Dimensions	21" H x 16" W x 6" D (wall mount)
Weight	36 lbs. (without batteries)
Finish	Red or black exterior enclosure
Door Lock	Wheelock Key-lock



SAFEPATH® 4 Audio Boosters

- SPB-320** 320 Watt Supervised Audio Power
Booster (Four 80 watt circuits)

- SPB-160** 160 Watt Supervised Audio
Power Booster (Two 80 watt circuits)

- SPB-80/4** 80 Watt Supervised Audio
Power Booster with 4 Amps of
Supervised and Synchronizable
Strobe Power (Two 2 Amp circuits)



Description

Supervised Facility Communication and Emergency Voice Evacuation Audio and Audio/Strobe Power Boosters, UL Standard 1711 and UL Standard 864, 9th edition with 24VDC battery backup capabilities. Designed to provide for additional supervised audio power for live voice, pre-recorded messages or background music (BGM). Fully supervised patent pending circuitry is always in effect even during BGM. The SPB-80/4 also provides 4 Amps of 24 VDC Supervised and Synchronized Strobe Power.

The SPB-320, SPB-160 and the SPB-80/4 easily connects to the Wheelock SP40S or SP40/2. Multiple SPB-320, SPB-160 and SPB-80/4 Audio Boosters can be inter-connected to accommodate large installations with supervised audio power and also supervised and synchronized strobe power requirements.

The SPB-320 draws 2.4 watts of audio input power to properly operate and provide additional supervised audio output power. The SPB-160 and the SPB-80/4 draws 1.2 watts of audio input power to properly operate and provide additional supervised audio output power. A maximum of 5,280 watts of supervised audio power can be achieved. Additional strobe power can be obtained via a combination of SPB-80/4 or Wheelock Power Supplies/Chargers.

Applications

- Provides for additional supervised audio power for large installations
- Provides for additional supervised and synchronizable strobe power for large installations
- Can be used in new construction as well as in retrofit construction

Features

Approvals & Compliance

- Approvals: UL Standard 864, 9th edition, UL Standard 1711, California State Fire Marshal (CSFM), New York City (MEA)
- OSHA 1910.165, ADA and UFC 04-021-01 2002 Compliant, including October 2007 Draft
- 1 Year Warranty

System Activation: Audio

- 70V or 25V input from the SP40S or SP40/2
- 1 Volt input from SP4-RMX

System Activation: Strobe (SPB-80/4)

- 8 - 33VDC NAC input connected to the strobe input

Power Supply & Batteries

- Fully supervised patent pending circuitry always in effect even during BGM
- Power limited circuitry
- Class D amplifiers
- Internal battery charger and power supply
- Required batteries fit inside the enclosure (sold separately)
- SPB-320 requires four 12 VDC, 12 AH batteries
- SPB-160 and SPB-80/4 require two 12 VDC, 12 AH batteries

Outputs:

- SPB-320 has four 80 watt speaker output circuits
- SPB-160 has two 80 watt speaker output circuits
- SPB-80/4 has one 80 watt speaker output circuit and two 2 amp strobe circuits (4 amps total)
- Supervised Audio Speaker outputs: 70V or 25V field selectable (all boosters must be either 70 V or 25 V)
- Expansion output (supervised, 24VDC at .5A in alarm condition) used for connecting multiple boosters
- DC output (unsupervised for optional splitter power). Each speaker circuit (four for the SPB-320, two for the SPB-160, one for the SPB-80/4) can connect to speaker splitters

SAFEPATH® 4

Addressable Paging Splitter and Telephone Zone Controller

SP4-APS Addressable Paging Splitter

SP4-TZC Telephone Zone Controller

Applications:

- Connects to the SP40S or SP40/2 to control selectable paging and background music (BGM)
- Ability to access individual or multiple speaker zones throughout the SP40S or SP40/2 system via the telephone

Features:

- Allows selections of speaker zones via a telephone keypad (DTMF tones)
- UFC 04-021-01 2002 Compliant, including October 2007 Draft
- One SP4-TZC (controller) can control up to 17 SP4-APS (splitters)
- Telephone page input connects to stand alone telephone, unused CO port, page port
- USB connection for logical zone grouping and BGM programming (supports Windows 2000 and Windows XP)
- Up to 9 logical zones, (a logical zone is a user selected group of up to 5 zones, individual or fixed)
- RS-485 digital control to the SP4-APS speaker splitters
- Connects to the SP40S or SP40/2 via the BGM input
- The combination of 1 SP4-TZC (controller) and up to 17 SP4-APS (splitters) can provide:

Class B

- 4 zones per splitter
- Up to 68 individual zones (17 splitters)
- 17 fixed zones (groups of 4)
- 9 logical zones

Class A

- 2 zones per splitter
- Up to 34 individual zones (17 splitters)
- 17 fixed zones (groups of 2)
- 9 logical zones

Ordering Information:

Model	Order Code	Description
SP4Z-APS	9920	Addressable Paging Splitter
SP4-TZC	9921	Telephone Zone Controller
TZC-USB	9923	SP4-TZC Programming Cable



SP4-TZC Telephone Zone Controller:

- Connects to the SP40S or SP40/2
- Auto programmable
- Custom user programmable (for logical zones)
- All call or selected zone(s) telephone paging
- Background music (BGM) zone(s) selectable
- Telephone input and background music (BGM) input
- Enclosure for the SP4-TZC (controller):
 - Dimensions: 13”H x 7.6”W x 2.15”D
 - Color: Black
 - Wall mountable
- Requires 24 VDC, model RPS-2406

SP4-APS Addressable Paging Splitter:

- Addressable speaker zone splitter
- Mounts inside the SP40S, SP40/2, SPB-80/4, SPB-160 or SPB-320
- Operates on 24 VDC, supplied by the SP40S, SP40/2, SPB-80/4, SPB-160, SPB-320
- Handles 40 watts of supervised audio per zone
- UL Standard 864, 9th edition listed

SAFEPATH®4

Supervised Volume Control

SP-SVC

Supervised Volume Control



Applications:

- Allows manual volume setting for telephone paging and background music for a specific speaker or speaker zone
- The selected adjustment will not affect the volume setting of emergency prerecorded messages or live microphone usage

Features:

- Supervised volume control for use with UL Listed Life Safety Applications
- UFC 04-021-01 2002 Compliant, including October 2007 Draft
- Can handle up to 35 watts of 70.7 volt audio power input
- Adjustment settings: 0 – 10, in 3dB increments
- Operates in Class B or Class A wiring (for Class A, the SP4-APS is required)
- Requires a double gang, 3½” deep back box or 4” square and 1-1/2” deep box with a 1-1/2” extension ring
- Stainless steel mounting plate with a black knob
- UL Standard 864 and California State Fire Marshal (CSFM) listed for use with the SP40S, SP40/2 or SPB Audio Boosters
- OSHA 1910.165 and ADA compliant
- Maximum RMS current 10.0mA

Ordering Information:

Model	Order Code	Description
SP-SVC	9926	Supervised Volume Control for use with the SAFEPATH®4 system

SAFEPATH®4

Remote Microphone



Description:

Remote Microphone for use with the SAFEPATH®4 Facility Communications System - SP40S, SP40/2 or SP4-RMX

Applications:

- Provides for an additional microphone in a remote location
- Can be mounted up to 2,000 feet away from the SP40S or SP40/2

Features:

- Approvals: UL Standard 864, 9th edition and California State Fire Marshal (CSFM)
- UFC 04-021-01 2002 Compliant, including October 2007 Draft
- Supervised hand held push to talk microphone
- Key required to enable remote microphone use
- Individual front panel LED indication for; System Normal, System Trouble and Alarm
- When used with the SP40S or SP40/2, the priority level is 2, the SP40S or SP40/2 on board microphone is always priority 1
- Remote microphone usage disengages background music and general paging
- Voice frequency response: 275 Hz - 6.5 kHz
- Requires 24VDC, supplied by the SP40S, Audio Boosters, or SP4-RMX
- Input current: Standby: 23mA
Alarm: 30mA
- Audio output level: 1.05V RMS
- 6 wire connection to the SP40S, SP40/2 or SP4-RMX
- Mounting plate is red and measures, 8 3/4” x 5 1/4”, fits into a 4 gang back box
- All output circuitry is Power Limited

Ordering Information:

Model	Order Code	Description
SPRM	8996	Remote Microphone for use with the SP40S, SP40/2, SPB-320, SPB-160, SPB-80/4 or SP4-RMX, red plate
SPRM-GP	9927	General Paging Microphone for use with the SPB-320, SPB-160, or SPB-80/4, black plate

SP4-RMX

Remote Microphone Expansion Module

SAFEPATH[®]4 Remote Microphone Expansion Module

Applications:

- Expands one remote microphone (SPRM) from the SP40S or SP40/2 to three remote microphones
- Two SP4-RMX modules can be cascaded together to provide up to six remote microphones from the SP40S or SP40/2
- Provides for an auxiliary input for connection of an external VoiceLink message repeater for additional messages



Ordering Information:

Model	Order Code	Description
SP4-RMX	9919	Remote Microphone Expansion Module

Microphone and message priority levels when the SP4-RMX is used with the SP40S or SP40/2:

Priority Level	Device
	<i>Microphones</i>
1	SP40 on board microphone
2	SP4-RMX, remote microphones #1, 2, 3 (set priority or First In First Out)
3	SP4-RMX, auxiliary input <i>only</i>
	<i>SP40S Standard Messages</i>
4	SP40S message 1
5	SP40S message 2
6	SP40S message 3
7	SP40S message 4
8	SP40S message 5
9	SP40S message 6
10	SP40S message 7
11	SP40S message 8

Color: Black
Wall mountable

Features:

- The SP4-RMX will provide the capability of connecting up to (3) three Remote Microphone Stations (SPRM)
- When connected to the SP40S or SP40/2, two SP4-RMX units can be cascaded together to provide up to six remote microphones
- Provides for an auxiliary input for connection of an external message repeater, for additional messages
- Can accept a line level input for broadcasting of other information
- When the SP4-RMX is connected to the SP40S or SP40/2, the entire system benefits from the additional microphone capability
- Can be connected to Audio Boosters for general (non-alarm) paging with use of SPRM-GP
- UL Standard 864 listed
- OSHA 1910.165, ADA and UFC 04-021-01 2002 Compliant, including October 2007 Draft
- Multiple on board diagnostics with 3 status conditions: standby, alarm, and trouble
- Operates on 24 VDC, supplied by the SP40S, SP40/2, SPB-80/4, SPB-160, SPB-320
- The SP4-RMX is an external module
Enclosure dimensions: 13"H x 7.6"W x 2.15"D

15:36:09 15:36:09 15:36:09
05/06/10 05/06/10 05/06/10

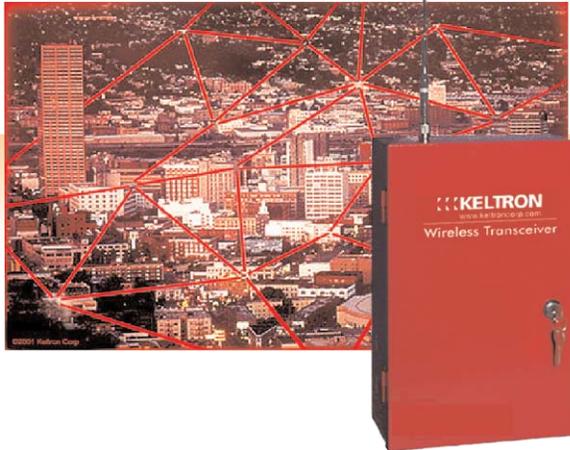
Dashboard

15:36:09 15:36:09 15:36:09
05/18/14 05/18/14 05/18/14

20:36:09 20:36:09 20:36:09

KELTRON®

Keltron RF778F Wireless Transceiver



- High performance
- Cost effective
- Scalable
- UL-Listed Primary Signaling

Keltron RF778F wireless transceivers provide two-way alarm transmission from monitored locations to the supervising receiver. Replacing expensive and unreliable telephone lines, active network radio is a self-routing and self-healing solution that ensures instant life safety event monitoring over a wide geographic area.

Designed for use in campus facilities, industrial complexes or municipal environments, each Keltron RF778F wireless transceiver serves as both a transceiver and a repeater to improve the strength and range of the entire network. The two-way transceiver provides high integrity communications that ensure every signal is authenticated and acknowledged.

Keltron RF778F wireless transceivers feature 8 discrete programmable end-of-line (EOL) inputs.

Keltron RF778F benefits

High performance - delivers messages in less than two seconds

Cost effective - case-mount antenna - easy installation reduces expense - eliminates monthly telephone charges

Scalable - multiple routing enables long range mesh network with high capacity growth potential

Reliable - unique store-and-forward technology eliminates signal loss

Keltron RF778F features

The Keltron active network radio system is UL-listed as a Primary Signaling System. This means that it may be used as the sole method of transmitting fire alarm signals to the receiving location. Other key features include:

- Built-in power supply and battery charger
- Digital dialer input using the IntelliTap receiver to tap the alarm panel dialer output and transfer full alarm data by radio
- 8 programmable end-of-line fire/security inputs (EOL)
- Alternate input module, DataTap™ RS232 interface to addressable FACP
- Ground fault detection for direct device monitoring
- Charger failure reporting
- Synthesized radios increase stability and accuracy

Programmable features include:

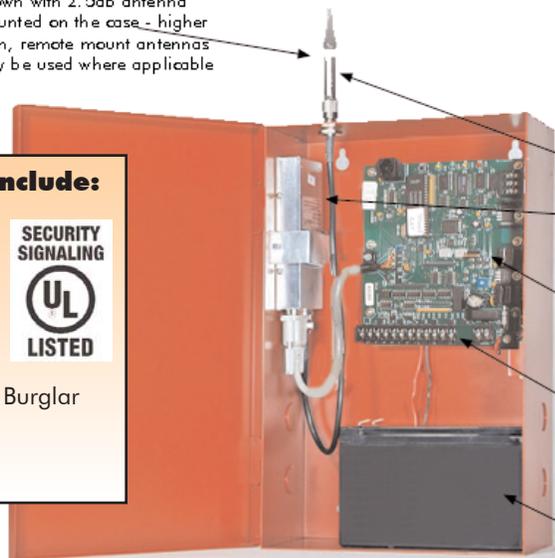
- Check-in time
- Time-to-live (TTL)
- AC fail delay reporting
- Second alarm delay
- Antenna cut delay
- Network/cipher code/account

UL Fire & Safety Listings Include:

- ▶ UL1610 (standard)
Central Station Alarm Units
- ▶ UL864 (standard)
Control Unit Accessories, System
- ▶ UL681 (standard)
Installation and Classification of Burglar and Holdup Alarm Systems



Shown with 2.5db antenna mounted on the case - higher gain, remote mount antennas may be used where applicable



Typical Configuration:

- Antenna: omnidirectional, choose from 2.5 db to 7 db
- Transceiver: 2-5 watts typical, UHF and VHF available
- Smart controller for transceiver and repeater reports alarms, trouble, respinals, low battery, AC status and more dynamically adapts to maximize performance
- 8 - EOL fire/burglary inputs
- Built-in power supply/battery charger

Specifications

8 Zones	8 programmable EOL fire/ burglary inputs
Ack delay/ Antenna cut	Form C fail security relay contact (local reporting) provides a signal at the transceiver if transmissions are blocked, low battery or charger fail
Radio	Standard frequency range is 440-470 MHz, others available
Standard output power	2 watts, others available. All radio systems require FCC licensing
Power input	16.5VAC, 40VA, UL-listed class II transformer required
Handheld programmer	1 per network (order separately) - used primarily during installation of the transceiver to set transceiver parameters (10R7041)
Voltage	12VDC nominal
Current	150 mA standby, 1.2 A transmit (2 W transmitter)
Back-up battery (order separately)	12V, 7.5AH (24h), lead acid gel type
Low battery reporting	2 minute test cycle (approx.)
AC status reporting	Reports to supervising station after approximately 100-160 minutes without AC power, reports AC power restoral after approximately 100-160 minutes of restored power

Colors	Available in standard colors: burglary beige or fire red. Please specify when ordering
Operating temperature range	0 to 49° C
Storage temperature range	-10 to 60° C
Relative humidity range	0 to 85% RHC, Non-condensing
Box dimensions (approx.) (excluding antenna)	13.25" H x 8.5" W x 4.3" D (34cm x 21.5cm x 11cm)
Box weight (approx.) (excluding battery)	5.6 lbs / 2.6 kg

Options

IntelliTap	Satellite/remote dialer data receiver
DataTap™	RS232 serial interface to addressable FACP data receiver*

***Note: any fire panel that is monitored by a Keltron transceiver must provide a serial data output or compatible hardware outputs that are active and can be monitored. Review the compatibility charts on the Keltron Web site for more details.**

Keltron develops and manufactures universally-compatible, UL listed life safety event management systems for the municipal and proprietary markets. Solutions include Ethernet signaling systems, active network radio systems, distributed multiplex systems, digital communicator/receiver systems, and direct wire systems. This document is not intended for installation or maintenance purposes. All specifications are subject to changes without notice. For more information visit www.keltronicorp.com or contact us at 781-894-8710.



Series E70 Speakers and Speaker Strobes



**SERIES E70
STROBE**



**SERIES E90
STROBE**



**SERIES E90
SPEAKER**



**SERIES E70
SPEAKER**

Description

The Wheelock Series E Low Profile Speakers and Speaker Strobes are designed for high efficiency sound output, with dual voltage (25/70 VRMS) capability and field selectable taps from 1/8 to 2 watts. The low profile design incorporates a speaker mounting plate for faster and easier installation. Each model has a built-in level adjustment feature and an aesthetic two (2) screw grille cover.

The Series E Speaker Strobe models incorporate the Low Current draw Series RSS Strobes.

Strobe options for wall mount models include 1575 or 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.

Series E Speakers and Speaker Strobes provide high audio output with clear audibility and are designed to meet the critical needs of the life safety industry for effective emergency voice communications, tone signaling and visible signaling to alert the hearing impaired.

The strobe portion of all Series 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.

Series E Speaker Strobes are UL Listed for indoor use under Standard 1971 (Signaling Devices for the Hearing-Impaired) and Standard 1480 (Speaker Appliances), and use a Xenon flashtube with solid state circuitry enclosed in a rugged Lexan® lens to provide maximum reliability for effective visual signaling. All inputs are supervised and employ IN/OUT wiring terminals for fast installation using #12 to #18 AWG wiring.

Color options for the Series E Speakers and Speaker Strobes are red, white and nickel plated.

Features

- Approvals include: UL Standard 1971, UL Standard 1480, New York City (MEA), California State Fire Marshal (CSFM), Factory Mutual (FM) and Chicago (BFP) See approvals by model in Specifications and Ordering Information
- ADA/NFPA/ANSI compliant
- Complies with OSHA 29 Part 1910.165
- **Wall mount models are available with Field Selectable Candela Settings of 15/30/75/110cd or 135/185cd (Multi-Candela models), or 1575cd (Single Candela model)**
- **Ceiling mount models are available with field selectable candela settings of 15/30/75/95cd or 115/177cd (Multi-candela models)**
- Strobes produce 1 flash per second over the regulated voltage range
- 24 VDC with wide UL "Regulated Voltage" using filtered DC or unfiltered VRMS input voltage
- Synchronize using the Wheelock Sync Modules or panels with built-in Wheelock Patented Sync Protocol
- Field selectable taps for 25 or 70 VRMS operation from 1/8 watt up to 2 watts
- High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ
- Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires



Series MPS Manual Pull Stations



MPS-100
MPS-200



MPS-400X

Description:

Wheelock Series MPS non-coded Manual Pull Stations are constructed of high quality, die-cast metal for long lasting performance and may be mounted on a single gang backbox.

Available in either single or dual action configurations for indoor or outdoor use with SPST contacts and terminal strip connections. The normally open contact will close when the pull station is activated and is rated for 30 VDC @ 1 amp and/ or 120 VAC @ 1 amp. The contacts are gold plated to avoid the risk of corrosion.

The single action explosion-proof model Series MPS-400X is UL Listed and Factory Mutual approved for use in Class I, Division I, Groups B, C and D; Class II, Groups E, F and G; and Class III hazardous environments. It also has a marine rating and is approved for NEMA-4X applications. MPS Pull Stations are NEMA-3R listed when mounted to the MPS-WP weatherproof back box.

All models are painted red with raised white lettering and a locking mechanism to prevent unauthorized reset.

Features:

- Approvals Include: UL Standard, Factory Mutual (FM), California State Fire Marshal (CSFM) and New York City (MEA)
- Single or Dual Action
- Key Reset
- Terminal Strip Connections
- Corrosion resistant, gold plated SPST contacts
- Mounts on single gang backbox
- Surface and Weatherproof backboxes available
- Plastic breakrod
- High-gloss red enamel finish with raised white lettering

Operation:

The Series MPS is operated by pulling the handle on the front of the station as far down as it will go, at which point the handle locks into place and is easily visible from up to 50 feet. The handle is reset by opening the station with a key, placing the handle in the normal upright position and relocking the station. On dual action models (not shown), the push bar rotates inward allowing the Pull handle to be grasped in a one handed motion.

Specification and Ordering Information:

Model Number	Order Code	Description	Mounting Options
MPS-100	8400	SPST, Single Action, Terminals, Key Reset	MPS-ISB, MPS-WP
MPS-200*	8401	SPST, Double Action, Terminals, Key Reset	MPS-ISB, MPS-WP
MPS-400X	8403	Explosion Proof, Single Action, Key Reset	(Backbox provided)
MPS-ISB	8404	Interior Surface Backbox, Red	
MPS-WP	8405	Weatherproof Backbox with Gasket Assembly	
MPS-RODS	8406	Scored Acrylic Breakrods (dozen)	

* Consult Customer Service for Availability

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Architects and Engineers Specifications

The non-coded Manual Pull Stations shall be Wheelock Series MPS Single Action, Double Action or approved equals. They shall be constructed of a rugged die-cast metal housing with key reset and corrosion resistant, gold plated single or double pole, single or double throw contacts. The wiring connections shall be made via a terminal strip and the unit shall mount to a single gang backbox and when Weatherproof Manual Pull Stations are required, the backbox shall be the Wheelock Series MPS-WP Backbox with Gasket Assembly. MPS Pull Stations shall be NEMA-3R listed when mounted to the MPS-WP weatherproof back box.

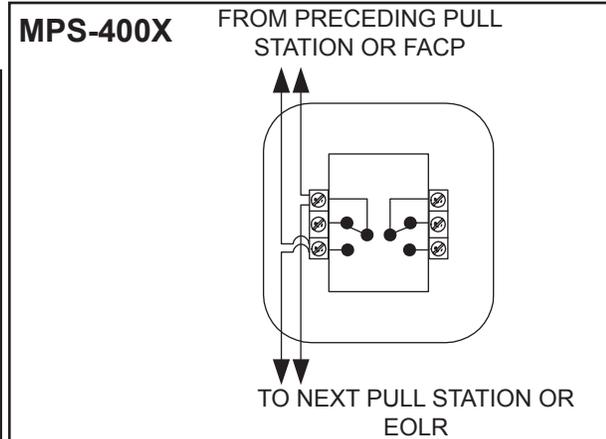
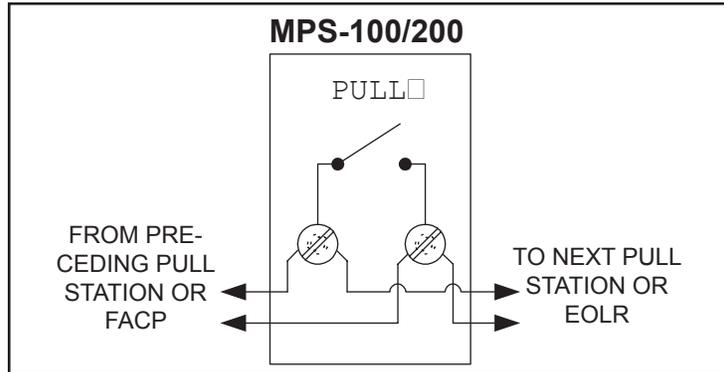
The Series MPS-400X shall be installed in installations that require Explosion Proof, Marine or NEMA 4X rated initiating devices. Temperature rating -40°F to 150°F.

MPS-ISB dimensions shall be 4-3/4"H x 3-1/4" W x 2-1/4"D.

NOTE: All CAUTIONS and WARNINGS are identified by the symbol ▲ . All warnings are printed in bold capital letters.

▲ WARNING: PLEASE READ THESE SPECIFICATIONS AND ASSOCIATED INSTALLATION INSTRUCTIONS (P84044 and P84045) CAREFULLY BEFORE USING, SPECIFYING OR APPLYING THIS PRODUCT. FAILURE TO COMPLY WITH ANY OF THESE INSTRUCTIONS, CAUTIONS OR WARNINGS COULD RESULT IN IMPROPER APPLICATION, INSTALLATION AND/OR OPERATION OF THESE PRODUCTS IN AN EMERGENCY SITUATION, WHICH COULD RESULT IN PROPERTY DAMAGE, AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.

Wiring Diagrams



Wheelock products must be used within their published specifications and must be PROPERLY specified, applied, installed, operated, maintained and operationally tested in accordance with their installation instructions at the time of installation and at least twice a year or more often and in accordance with local, state and federal codes, regulations and laws. Specification, application, installation, operation, maintenance and testing must be performed by qualified personnel for proper operation in accordance with all of the latest National Fire Protection Association (NFPA), Underwriters' Laboratories (UL), National Electrical Code (NEC), Occupational Safety and Health Administration (OSHA), local, state, county, province, district, federal and other applicable building and fire standards, guidelines, regulations, laws and codes including, but not limited to, all appendices and amendments and the requirements of the local authority having jurisdiction (AHJ).

NOTE: Due to continuous development of our products, specifications and offerings are subject to change without notice in accordance with Wheelock, Inc. standard terms and conditions



WE ENCOURAGE AND SUPPORT NICET CERTIFICATION
3 YEAR WARRANTY

S5008 MPS 06/11

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P: 800-631-2148
F: 732-222-8707
www.coopernotification.com

Cooper Notification is

Wheelock®



SAFEPATH®

WAVES



COOPERNotification

POWERPATH NAC Power Supply



Description

The Wheelock POWERPATH (PS-8-LP) by Eaton is a supervised remote power supply/battery charger in a low profile cabinet that is used for supervision and expanded power driving capability of fire alarm Notification Appliance Circuits (NAC). The PS-8-LP is filtered and regulated and provides 8 amps of power distributed across 4 outputs.

The power supplies may be connected to any 12V or 24V (FWR or DC) Fire Alarm Control Panel (FACP) by using a NAC or a "Dry Contact." Primary applications include NAC expansion (supports ADA requirements) and auxiliary power to support system accessories. This unit provides filtered and regulated 24VDC, up to four (4) Class "B" two (2) Class "A" or two (2) Class "B" and one (1) Class "A" Notification Appliance Circuits. With the optional plug-in PS-EXP module the unit supports (8) Class "B" or (4) Class "A" Notification Appliance Circuits. Additionally, an auxiliary power output of 2.5 Amps (disconnected upon AC power loss or an alarm condition) or up to 0.240 A of constant power on the PS-8-LP.

The Wheelock power supplies can accommodate 7 AH batteries inside its lockable chassis. Using an external battery cabinet it can charge up to 33 AH batteries (pending UL testing). Two FACP NAC circuits or two "Dry" contact initiating circuits can be connected to the inputs. These inputs can then be directed to control supervision and power delivery to any combination of the four (4) outputs. Each output is rated at 3.0 Amps (Class "B") or (Class "A") and can be programmed to generate a steady or Code 3 temporal horn sound and a strobe output under alarm condition. Total load for PS-8-LP NAC circuits must not exceed the power supplies rated output.

The power supplies under non-alarm condition provide independent supervision for Class "A" and Class "B" FACP NAC circuits. In the event of circuit trouble, the FACP will be notified via the POWERPATH steered input (IN1 or IN2). In addition there are two sets of trouble reporting terminals, one used for AC power loss reporting and the other for all troubles. The AC power loss reporting, on the common trouble terminals and on IN1 or IN2, can be delayed for either 30 seconds or 170 minutes. The AC power loss terminals will always report the trouble within 1 second after loss of AC power.

The PS-8-LP power supplies are UL listed under UL Standard 864, 9th Edition to be used with any 24 volt listed regulated notification appliances. They include the capability to synchronize Wheelock strobes and horns and to silence the horn signal when horn/strobes are operating on two wires.

EATON

Powering Business Worldwide

Features

- Low Profile
- Inputs
 - 120VAC, 50/60Hz, 4.25 Amps and 5.32 Amps Operating Power in Alarm
 - 240VAC, 60Hz, 3.22 Amps Operating Power in Alarm
 - 24VDC Battery Backup Connection
 - Two (2), 12V or 24V NAC Initiating Circuits (8-33V at 5mA)
 - FWR or DC
 - Two (2) "Dry" Contact initiating Circuits
 - Accepts two (2) Class "A" or two (2) Class "B" circuit inputs
 - Built in battery charger for sealed lead acid or gel type batteries
- Outputs
 - NAC outputs are 24VDC, 3.0 Amps each, power limited
 - 8 Amps on PS-8-LP total alarm current
 - Capable of four (4), Class "B" circuits
 - Capable of two (2) Class "A" circuits
 - Capable of one (1) Class "A" circuit and two (2) Class "B" circuits
 - Capable of (8) Class "B" or four (4) Class "A" circuits with optional PS-EXP module
 - Temporal (Code 3), constant voltage output, Wheelock Sync output or True input to output follower mode
 - Built-in Wheelock synchronization mode that can be fed to any or all of the output circuits
 - Input and output can be synchronized with "IN>OUT SYNC" mode (DSM, 2nd POWERPATH or FACP with synchronization protocol is required)
 - Audible silence capability
 - Filtered and electronically regulated output
 - 2.5 Amp auxiliary power limited output with reset capability. (Removed upon AC loss or alarm. Automatic reset 30 seconds after AC power returns or the alarm condition is over) or 0.240 Amps PS-8-LP of auxiliary power limited output which remains on during AC loss or an alarm condition when configured for 24 hour battery backup
- Supervision
 - Compatible with 12V or 24V (FWR or DC) FACP
 - Signaling appliance circuits are supervised and steered to either IN1 or IN2
 - 10K Ohm, 1 Watt (Wheelock Model #MPEOL) End of Line Resistor (EOLR) for supervision of all outputs
 - 37 distinguishable trouble diagnostics
 - AC loss trouble reported over a separate set of contacts (delay of 1 second)
 - All troubles are reported over the common trouble contacts (AC loss can have a delay of 30 seconds or 170 minutes)
 - Automatic switchover to standby battery when AC fails
 - Thermal and short circuit protection with auto reset
 - Input and output status LED indicators
 - AC fail supervision
 - Battery presence and low battery supervision
 - Ground Fault Detection, with diagnostics to indicate which circuit fault is on
 - Latching LEDs for NAC trouble annunciation and Diagnostic trouble LEDs (latching can be disabled)
- Power
 - Not battery dependent
 - Automatic switch over to standby batteries when AC fails
 - Supports sealed lead acid or gel type batteries
 - Fused battery protection
 - Thermal and short circuit protection with auto reset
 - Supports 7AH batteries
- Compliance
 - Approvals Include: UL Standard 864, UL 1481
 - Compliant with NFPA 72
 - Factory Mutual (FM)
- Operating Modes (refer to Installation Manual):
 - Normal Mode: Provides constant 24 VDC output upon initiation by a voltage to input IN1 or IN2 or by a contact opening on DRY1 or DRY2. The unit returns to standby mode when the input is deactivated.
 - Wheelock Sync Mode: Provides signals for synchronization of patented Wheelock audible and strobe notification appliances. Audibles can also be silenced in this mode while the strobes continue to flash.
 - In>Out Sync Mode: Accepts a synchronization signal on the input to provide a coded output or synchronized output. This signal may come from a FACP, another POWERPATH or a Wheelock DSM synchronization module. Caution: Do not use strobes on coded output circuits.
 - True Input Follower Mode: Accepts a coded signal on the input to provide a coded output with the same timing as the input. The signal may come from a FACP, another POWERPATH or other coded source. Caution: Do not use strobes on coded output circuits.
 - Temporal Mode: Codes the output voltage in a code-3 temporal pattern to drive audible appliances such as horns, bells or chimes. Caution: Do not use strobes on coded output circuits.

Note: All CAUTIONS and WARNINGS are identified by the symbol ▲. All warnings are printed in bold capital letters.

▲ WARNING

PLEASE READ THESE SPECIFICATIONS AND ASSOCIATED INSTALLATION INSTRUCTIONS CAREFULLY BEFORE USING, SPECIFYING OR APPLYING THIS PRODUCT. VISIT WWW.COOPERNOTIFICATION.COM OR CONTACT EATON FOR THE CURRENT INSTALLATION INSTRUCTIONS. FAILURE TO COMPLY WITH ANY OF THESE INSTRUCTIONS, CAUTIONS OR WARNINGS COULD RESULT IN IMPROPER APPLICATION, INSTALLATION AND/OR OPERATION OF THESE PRODUCTS IN AN EMERGENCY SITUATION, WHICH COULD RESULT IN PROPERTY DAMAGE, AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.

Table 1. Specification & Ordering Information

Model	Description
PS-8-LP	8 amp power supply, red enclosure, 120V
PS-8E-LP	8 amp power supply, red enclosure, 220V
PS-8-B-LP	8 amp power supply, black enclosure, 120V
PS-8E-B-LP	8 amp power supply, black enclosure, 240V
PS-8-EXP-LP	8 amp power supply with preinstalled expansion module, red enclosure, 120V
PS-8E-EXP-LP	8 amp power supply with preinstalled expansion module, red enclosure, 240V
PS-EXP	4 class B or 2 class A expansion module

Table 2. Specifications

Physical	
Weight	PS-8-LP: 11.5lbs. (Ship) 9.4lbs (Unit); PS-EXP: 1lb. (Ship & Unit)
Dimensions	PS-8-LP: 17"H x 13"W x 3.5"D; PS-EXP: 4.3"H x 3.7"W x 1"D
Enclosure can house up to two 7 AH batteries	
Input Circuit	
Input voltage range	8 to 33 VDC
Input Current @ 12 VDC	0.005 amps
Input Current @ 24 VDC	0.005 amps
Output Circuit	
Four (4) Class B or Two (2) Class A or\ One (1) Class A and Two (2) Class "B" or 8 Class B or 4 Class A (optional PS-EXP module necessary)	24 VDC @ up to 3 amps per circuit
Continuous duty up to 3 Amps per circuit, up to 4 Amps maximum per panel	
Standby Current	0.129 Amps
Alarm Current	0.129 Amps
Primary PS-8-LP (120VAC models)	105 to 130 VAC 50/60 Hz @ 5.32 Amps
Primary PS-8-EXP-LP (240 VAC models)	210 to 260 VAC 50/60 Hz @ 3.22 Amps
Secondary Power Charging Capacity	32 Amp hours @ 0.750 Amps per hour
Aux Output	
CP Mode	PS-8-LP up to 250 mA
MP Mode	2.5A during non alarm

Architects and Engineers Specifications

The power supply shall be Wheelock POWERPATH PS-8-LP, or equivalent. The unit shall be stand alone power supply intended for powering fire alarm notification appliances via its own Notification Appliance Circuit(s) (NAC). The unit shall be UL 864 Listed for power limited operation of outputs and comply with NFPA 70 (NEC), article 760.

The power supply shall support a full 8A of notification power even if the battery is in a degraded mode and only AC power is connected.

The power supply shall be activated by a standard Notification Appliance Circuit (NAC) from any Fire Alarm Control Panel (FACP) or a "Dry contact" opening. The units shall be 8 ampere, 24 VDC, regulated and filtered, supervised remote power supply/charger. It shall operate over the voltage range of 8 to 33 VDC or FWR. The primary application of the unit shall be able to expand fire alarm system capabilities for additional NAC circuits to support ADA requirements and to provide auxiliary power to support system accessories or functions. The power supply shall provide four Class "B"; two Class "A"; or two Class "B" and one Class "A" NAC circuit(s). Eight Class "B" or Four Class "A" circuits shall be available with an optional PS-EXP module. The PS-8-LP unit shall supply up to 240 mA of auxiliary power that is available during both non-alarm and alarm or auxiliary power of not less than 2.5A at 24 VDC during non-alarm. The power supply shall be capable of charging batteries of up to 33 ampere hours per NFPA 72 at maximum rate of 0.750 Amps per hour.

Input activation options shall be from not less than two NAC circuits or Dry Contact closures. These inputs shall have the capability of being directed to any combination of the four NAC circuit outputs. Each NAC circuit output shall be rated at 3 amperes for Class "B" applications or 3 amperes each for Class "A". The outputs shall be programmable to generate a steady or Temporal (Code 3) output and or a synchronized strobe or horn output. The power supply shall provide independent loop supervision for either Class "A" or Class "B" FACP NAC circuits and shall have the capability to "steer" all alarm or trouble conditions to either incoming NAC circuit. The units shall have common trouble terminals. The power supply shall be powered from a 120 VAC source with a current consumption of 5.32 amperes max. The unit shall incorporate short circuit protection with auto reset. The power supply shall incorporate a built in battery charger for lead acid or gel type batteries with automatic switchover to battery back up in the event of AC power failure. The charger shall incorporate fused protection for the batteries and have the ability to report low battery and/or no battery condition(s). Standby current for battery back up shall be 0.129 Amps max. The power supply shall have the ability to latch trouble LEDs so the circuit in trouble can be identified. The cabinet dimensions shall be 17" H x 13" W x 3.5" D. UL 864, UL 1481, FM

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.



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ELECTRICAL PRODUCT DATA

I-Line™ Combo Panelboard

Distribution Panelboards

Catalog

2110CT1301R03/15

2015

Class 2110



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by Schneider Electric

Product Description

The I-Line™ Combo single phase and three phase panelboard, combines NQ for single phase and NQ or NF for three phase lighting section with an I-Line distribution section in a single panelboard. This is an industry-exclusive addition to the Schneider Electric Square D™ brand I-Line Power Distribution Panelboard offer, designed for use in both AC and DC systems. It is available in single or duplex configurations, which determine the number of included lighting sections. All main circuit breaker panelboards rated 800 A or less are suitable for use as service entrance.

I-Line Combo panelboards are available as 225–800 A main lugs only and 70–1200 A main circuit breakers. The I-Line Combo panelboards are designed to accept the following circuit breakers: FA, FH, FI, FY, HD, HG, HJ, HL, HR, JD, JG, JJ, JL, JR, LA, LD, LG, LH, LI, LJ, LL, LR, MG, MJ, PG, PJ, PK, PL, Q4, QB, QG, QJ, EDB, EGB, EJB, QO and QOB.



**Single I-Line
Combo Panelboard**



**Duplex I-Line
Combo Panelboard**

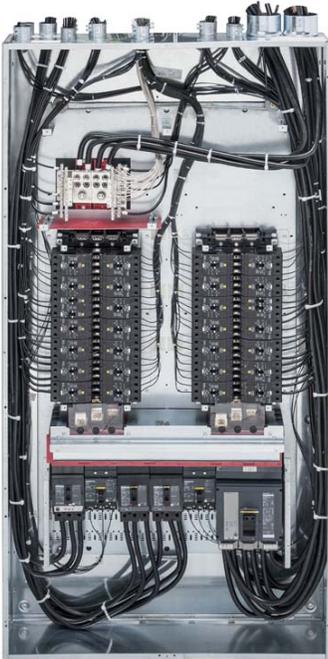
Standards

I-Line Combo panelboards are designed, manufactured, and tested to comply with the following standards:

Standard	Description
UL 50	Standard for electrical equipment enclosures
UL 67	Standard for panelboards
CSA C22.2, Nos. 29 and 94-1989	Standard for panelboards, including enclosed panelboards
NFPA 70	National Electrical Code (NEC)
CSA C22.1	Canadian Electrical Code (CEC)
NEMA PB 1	Standard for panelboards
W-P 115C Type 1 Class 1	Specification for circuit breaker panelboards
2000 IBC	US standard for seismic requirements
1995 NBCC	Canadian standard for seismic requirements

I-Line™ Combo Panelboard

Product Description



Service

The I-Line Combo distribution panelboards can be used on the following system voltages:

Vac	Phase	Wire
120/240 ¹	1	3
208Y/120	3	4
480Y/277	3	4
240/120	3	4
600Y/347	3	4
220/110	3	4
230/115	3	4
380/115	3	4
400/230	3	4
415/240	3	4
240	3	3

Vdc	Phase	Wire
48(NQ) ²	—	2

¹ NQ only.

² The DC rating of the entire panelboard is limited due to the 48 Vdc rating of QO circuit breakers used in the NQ section of the I-Line Combo panelboard.

Panelboard Configuration	I-Line Mounting Space	Maximum Amperage		Lighting Section Circuit Count		NEMA 1 Dimension in Inches (millimeters)			
				Section 1	Section 2	Height	Width	Depth	
Single	18 in. (457 mm)	600		30	—	86 (2184)	26 (660)	9.5 (241)	
				42	—	86 (2184)	26 (660)	9.5 (241)	
Single	22.5 in. (572 mm)	600		30	—	73 (1854)	32 (813)	9.5 (241)	
				42	—	91 (2311)	32 (813)	9.5 (241)	
Duplex ¹	22.5 in. (572 mm)	600		42	42	91 (2311)	32 (813)	9.5 (241)	
				54	30	91 (2311)	32 (813)	9.5 (241)	
Duplex	31.5 in. (800 mm)	800	1200 ²	MLO	42	42	86 (2184)	44 (1118)	9.5 (241)
				MCB	54	30	86 (2184)	44 (1118)	9.5 (241)
			30	Optional Mounting Space ³	86 (2184)	44 (1118)	9.5 (241)		
			42	Optional Mounting Space ³	86 (2184)	44 (1118)	9.5 (241)		
			54 ⁴	Optional Mounting Space ³	86 (2184)	44 (1118)	9.5 (241)		

¹ Only available in the NQ lighting panelboard.

² 1200 A is available as 42–42 only.

³ Optional mounting space is only available on 800 A interiors, not 1200 A.

⁴ The 54 circuit with an optional mounting space is available for 800 A, but can only be used with 1, 2, or 3 lighting contactors.

I-Line™ Combo Panelboard

Product Description



NEMA Type 1 Enclosure



NEMA Type 3R Enclosure

Enclosure Protection

Enclosure	Protects From These Environments:
Type 1	Indoor contact with the enclosed equipment
Type 3R ¹	Outdoor falling rain, sleet, and ice
Type 4/4X Stainless ¹	Corrosion, hose-directed water, dust
Type 5 ¹	Indoor settling dust, falling dirt, dripping liquids
Type 12 ¹	Indoor circulating dust, falling dirt, dripping liquids

Type 1 Enclosures	Fronts	Surface and flush trims available as four-piece construction. Standard does not include door. An optional four-piece trim with door is also available. Finished with gray-baked enamel electrodeposited over cleaned phosphatized steel (ANSI 49).
	Boxes	Galvanized steel in 26, 32, and 44-inch (660, 813, and 1118 mm) widths. Removable endwalls without knockouts.
Type 3R, 5, and 12 Enclosures		Gasketed door with vault handle and directory card holder
		Three-point latching
		End and side gutter trim
		No knockouts
		Removable drain screw for Type 3R Finished with gray-baked enamel electrodeposited over cleaned phosphatized steel (ANSI 49)

¹ Only available in 26 in. (660 mm) and 44 in. (1118 mm) width configurations.



Powerpact P-Frame 1200 A Main
(the maximum size circuit breaker for the I-Line Combo panelboard)



Powerpact L-Frame 250 A Main



Main Circuit Breaker Panelboards

- Accepts up to 1200 A main circuit breaker ²
- Available factory-assembled up to 1200 A or ready-to-install up to 800 A ²
- Cable entry can be top or bottom feed ³
- Suitable for use as service entrance equipment up to 800 A in the US
- Accepts plug-on I-Line main circuit breakers: LA/LH-frame, PowerPact™ L-, M-, and P-frame
- Available with a short circuit current rating (SCCR) up to 200 kA maximum
- Available with tin plated copper bus, silver plated copper bus, or tin plated aluminum bus ⁴
- Solid neutral is mounted at the top of the panelboard, as standard
- Available with compression lugs for I-Line circuit breakers; consult online *Digest* for details about compression lugs available for each circuit breaker type.

Main Lugs-Only Panelboards

- Available factory-assembled or ready-to-install up to 800 A
- Accepts plug-on I-Line main lug kits ⁵
- Available with a short circuit current rating (SCCR) up to 200 kA maximum
- Available with tin-plated copper bus, silver-plated copper bus, or tin-plated aluminum bus ⁴
- Cable entry can be top or bottom feed ³
- Solid neutral is mounted at the top of the panelboard, as standard
- Available with compression lugs for I-Line circuit breakers; consult online *Digest* for details about compression lugs available for each circuit breaker type.

Solid Neutral

- Mounts in main compartment above the lighting sections
- Does not take up interior circuit breaker mounting space
- UL/CSA Listed for use with aluminum or copper conductors
- Copper or aluminum neutral available
- 200% rated neutral available as a factory-assembled option up to 800 A

Branch Circuit Breakers

- NQ lighting sections accept QO and QOB circuit breakers, which are available from 10–150 A
- NF lighting sections accept E-frame circuit breakers, which are available from 15–110 A
- I-Line sections with 18 in. (457 mm), 22.5 in. (572 mm), or 31.5 in. (800 mm) of mounting space will accept thermal magnetic/basic electronic or electronic with ammeter or energy trip unit I-Line circuit breakers ⁶

² 1200 A main circuit breaker is allowed in US and Mexico only.

³ I-Line section is required to reside at the bottom of the panelboard.

⁴ Tin-plated aluminum bussing is only available on 225 A and 250 A configurations.

⁵ Plug-on Kits include catalog numbers SL400, SL800, S33931, and SL800M5. Please refer to the most current *Digest* to determine which one is required.

⁶ Available with compression lugs for I-Line circuit breakers. Consult online *Digest* for details about compression lugs available for each circuit breaker type.

480/277 V PANELBOARDS

NF Circuit Breaker Panelboards

Catalog
1670CT0701

2008
Class 1670

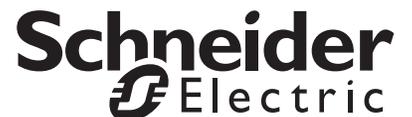


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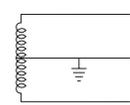
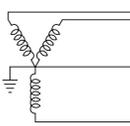
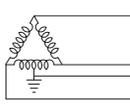
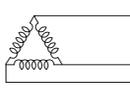
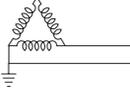
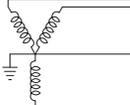
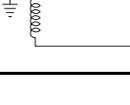
by Schneider Electric



NF Circuit Breaker Panelboards Standards and Ratings

Standards and Ratings

NF circuit breaker panelboards are for use on ac systems. They are UL[®] Listed under File E33139 and marked cULus. NF circuit breaker panelboards accept EDB, EGB, and EJB branch circuit breakers.

Voltage	System	System Diagram
120/240 Vac	1 ϕ 3W	
208Y/120 Vac	3 ϕ 4W	
240/120 Vac	3 ϕ 4W Delta	
240 Vac	3 ϕ 3W Delta	
240 Vac	3 ϕ 3W Grounded B ϕ Delta	
480Y/277 Vac	3 ϕ 4W	
600Y/347 Vac	3 ϕ 4W	

Standards

NF circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

- UL 67—Standard for Panelboards
- UL 50—Enclosures for Electrical Equipment
- UL Listed Class CTL panelboard
- CSA C22.2, No. 29-M1989—Panelboards and Enclosed Panelboards
- CSA C22.2, No. 94-M91—Special Purpose Enclosures
- NEMA PB 1—Panelboards
- NFPA 70—National Electrical Code[®] (NEC[®])
- Federal Specification W-P-115C Type I Class 1—Circuit Breaker Panelboards
- 2003 IBC, NFPA 5000, ASCE/SE17—Seismic Qualification

Ratings

- Main lugs: 125–800 A
- Main circuit breaker: 125–600 A

NF Circuit Breaker Panelboards

Main Circuit Breakers

Main Circuit Breakers



HDL

- 125 A maximum field-installable EDB, EGB, or EJB (110 A max at 600Y/347 Vac)
- 100 A maximum field-installable FI
- 125 A maximum field-installable HDL, HGL, HJL, or HLL
- 250 A maximum field-installable JDL, JGL, JJL, or JLL
- 400 A maximum field-installable LAL or LHL
- 400 A or 600 A maximum factory-installed LCL or LIL (LCL is 480Y/277 Vac maximum)

Factory-Installed Circuit Breaker Accessories

FIL, HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL, and KIL circuit breakers are available with shunt trip, ground fault shunt trip, undervoltage trip, time delay, auxiliary switches, and alarm switches.



JDL

Table 1: Main Circuit Breaker Adapter Kits (Circuit Breaker Not Included)

Adapter Kit Catalog Number	Ampere Rating	Main Circuit Breaker ¹
N100MFI	20–100 A	FIL
N150MH ²	15–125 A ³	HDL, HGL, HJL, HLL
N250MJ	150–250 A	JDL, JGL, JJL, JLL
N250MKC	110–250 A	KIL
N400M	125–400 A	LAL, LHL

¹ Main circuit breakers are not included in the adapter kits. Order them separately.

² For single phase applications of HDL and HGL, select a 3-pole main circuit breaker. For single-phase applications of HJL and HLL, select a 2-pole main circuit breaker.

³ RTI kit accepts maximum 125 A H-frame circuit breaker.

NOTE: See “Main Circuit Breaker Terminal Data” on page 18.

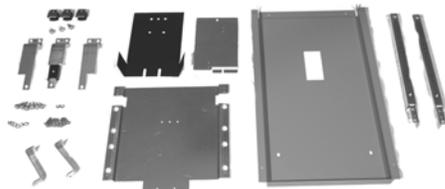
Field-Installable Circuit Breaker Accessories

Field-installable undervoltage release, alarm switch, shunt trip, and auxiliary contacts are available for LAL, LHL, LCL, and LIL 400 A main circuit breaker interiors.

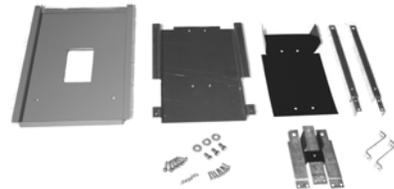
NOTE: See Supplemental Digest for additional accessories.



LAL



N250MJ Main Circuit Breaker Kit



N400M Main Circuit Breaker Kit

Branch Circuit Breakers (Bolt-on)



Table 2: Standard Branches, 600Y/347 Vac Maximum

Branch Prefix	Availability			Short Circuit Current Rating ¹	
	1-Pole	2-Pole	3-Pole	at 480Y/277 Vac	at 600Y/347 Vac
EDB	15-70 A	15-125 A ²	15-125 A ²	18,000 A	14,000 A
EGB	15-70 A	15-125 A ²	15-125 A ²	35,000 A	18,000 A
EJB	15-70 A	15-125 A ²	15-125 A ²	65,000 A	25,000 A

¹ Series ratings are also available.
In **Canada**: See Series Rating Guide (Data Bulletin #S1600PD0302EP).
In **USA**: See Switchboard/Panelboard Short Circuit Current Ratings (Data Bulletin #2700DB9901) or the Digest.
² 600Y/347 Vac is 110 A maximum.



Table 3: EPD Branches – 30 mA Ground Fault Equipment Protection Devices, 277 Vac Maximum

Branch Prefix	Availability 1-Pole ¹	Short Circuit Current Rating ² at 277 Vac
EGB-EPD	15-70A	18,000 A
EGB-EPD	15-70A	35,000 A
EJB-EPD	15-70A	65,000 A

¹ EPD branches are single-pole only, and require two pole spaces in the panelboard.
² Also available with series ratings.



Table 4: Standard and EPD Branches – Terminal Lug Data

Branch Circuit Breaker Prefix	Ampere Rating	Wire Size	
		Aluminum	Copper
EDB, EGB, EJB, EDB-EPD, EGB-EPD, EJB-EPD	15-30 A	#12 - #6	#14 - #6
	35-125 A	#12 - 2/0	#14 - 2/0

EDB Branch Circuit Breakers

208/120V PANELBOARDS

NQ Circuit Breaker Panelboards

Catalog
1640CT0801

2008

Class 1640



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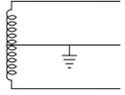
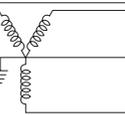
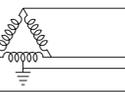
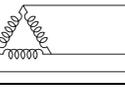
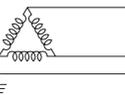


by Schneider Electric

NQ Circuit Breaker Panelboards Standards and Ratings

Standards and Ratings

NQ circuit breaker panelboards meet US and Canadian standards, and are marked cULus. NQ circuit breaker panelboards accept QO[®] and QOB branch circuit breakers.

Voltage	System	System Diagram
120/240 Vac	1 ϕ 3W	
208Y/120 Vac	3 ϕ 4W	
240/120 Vac	3 ϕ 4W Delta	
240 Vac	3 ϕ 3W Delta	
240 Vac	3 ϕ 3W Grd. B ϕ Delta	

Standards

NQ circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

- UL 67—Standard for Panelboards
- UL 50—Enclosures for Electrical Equipment
- CSA C22.2, No. 29-M1989—Panelboards and Enclosed Panelboards
- CSA C22.2, No. 94-M91—Special Purpose Enclosures
- NEMA PB 1—Panelboards
- NFPA 70—National Electrical Code[®] (NEC[®])
- Federal Specification W-P-115C Type I Class 1—Circuit Breaker Panelboards
- 2003 IBC, NFPA 5000, ASCE/SE17 Seismic Qualification

Ratings

- Main Lugs 100–600 A
- Main Circuit Breaker 100–600 A

Product Selection

General Purpose Transformers

480 V Delta Primary to 208Y/120 Secondary—Aluminum Windings; 150 °C Rise

kVA	Catalog Number	Enclosure ¹ (see pages 6–17)	Wiring Diagram	Weight (lbs)	Primary Current (A)			Secondary Current (A)	
					Nameplate	NEC Max Rating 125%	NEC Max Rating 250%	Nameplate	NEC Max Rating 125%
15	EP15T3H	17D	See page 22	240	18.0	25	45	41.7	60
30	EP30T3H	17D		305	36.1	45	90	83.4	110
45	EP45T3H	18H		405	54.2	70	125	125.1	175
75	EP75T3H	20D		610	90.3	125	225	208.4	275
112.5	EP112T3H	21D		810	135.5	175	300	312.6	400
150	EP150T3H	22D		1060	180.6	225	450	416.9	500
225	EP225T3H	24D		1385	271.0	350	600	625.3	800
300	EP300T3H	25D		1790	361.3	450	900	833.7	1000

¹ NEMA Type 2 drip-proof enclosure. Weather shields are available to upgrade the enclosures to NEMA Type 3R (suitable for outdoor use). Standard transformers up through 75 kVA three-phase and 75 kVA single-phase can be mounted directly on wall via mounting brackets.

480 V Delta Primary to 208Y/120 Secondary—Copper Windings; 150 °C Rise

kVA	Catalog Number	Enclosure ¹ (see pages 6–17)	Wiring Diagram	Weight (lbs)	Primary Current (A)			Secondary Current (A)	
					Nameplate	NEC Max Rating 125%	NEC Max Rating 250%	Nameplate	NEC Max Rating 125%
15	EP15T3HCU	17D	See page 22	265	18.0	25	45	41.7	60
30	EP30T3HCU	17D		350	36.1	45	90	83.4	110
45	EP45T3HCU	18H		450	54.2	70	125	125.1	175
75	EP75T3HCU	20D		680	90.3	125	225	208.4	275
112.5	EP112T3HCU	21D		870	135.5	175	300	312.6	400
150	EP150T3HCU	22D		1175	180.6	225	450	416.9	500
225	EP225T3HCU	24D		1615	271.0	350	600	625.3	800
300	EP300T3HCU	25D		2045	361.3	450	900	833.7	1000

¹ NEMA Type 2 drip-proof enclosure. Weather shields are available to upgrade the enclosures to NEMA Type 3R (suitable for outdoor use). Standard transformers up through 75 kVA three-phase and 75 kVA single-phase can be mounted directly on wall via mounting brackets.

480 V Delta Primary to 208Y/120 Secondary—Aluminum Windings; 115 °C Rise

kVA	Catalog Number	Enclosure ¹ (see pages 6–17)	Wiring Diagram	Weight (lbs)	Primary Current (A)			Secondary Current (A)	
					Nameplate	NEC Max Rating 125%	NEC Max Rating 250%	Nameplate	NEC Max Rating 125%
15	EP15T3HF	17D	See page 22	245	18.0	25	45	41.7	60
30	EP30T3HF	17D		305	36.1	45	90	83.4	110
45	EP45T3HF	18H		410	54.2	70	125	125.1	175
75	EP75T3HF	20D		615	90.3	125	225	208.4	275
112.5	EP112T3HF	21D		810	135.5	175	300	312.6	400
150	EP150T3HF	22D		1060	180.6	225	450	416.9	500
225	EP225T3HF	24D		1425	271.0	350	600	625.3	800
300	EP300T3HF	25D		1810	361.3	450	900	833.7	1000

¹ NEMA Type 2 drip-proof enclosure. Weather shields are available to upgrade the enclosures to NEMA Type 3R (suitable for outdoor use). Standard transformers up through 75 kVA three-phase and 75 kVA single-phase can be mounted directly on wall via mounting brackets.

Premium 30 Energy Efficient Transformers Product Selection

480 V Delta Primary to 208Y/120 Secondary—Copper Windings; 115 °C Rise

kVA	Catalog Number	Enclosure ¹ (see pages 6–17)	Wiring Diagram	Weight (lbs)	Primary Current (A)			Secondary Current (A)	
					Nameplate	NEC Max Rating 125%	NEC Max Rating 250%	Nameplate	NEC Max Rating 125%
15	EP15T3HFUCU	17D	See page 22	270	18.0	25	45	41.7	60
30	EP30T3HFUCU	17D		350	36.1	45	90	83.4	110
45	EP45T3HFUCU	18H		450	54.2	70	125	125.1	175
75	EP75T3HFUCU	20D		660	90.3	125	225	208.4	275
112.5	EP112T3HFUCU	21D		915	135.5	175	300	312.6	400
150	EP150T3HFUCU	22D		1175	180.6	225	450	416.9	500
225	EP225T3HFUCU	24D		1630	271.0	350	600	625.3	800
300	EP300T3HFUCU	25D		2065	361.3	450	900	833.7	1000

¹ NEMA Type 2 drip-proof enclosure. Weather shields are available to upgrade the enclosures to NEMA Type 3R (suitable for outdoor use). Standard transformers up through 75 kVA three-phase and 75 kVA single-phase can be mounted directly on wall via mounting brackets.

Single-Phase, General Purpose

General purpose standard transformers are intended for power, heating, lighting, and light-duty control applications.

NOTE: These products are obsolete and can no longer be ordered. The information in this table is for reference only.

Table 6.3: Single-Phase, General Purpose Transformer Selection

kVA	Catalog Number	Full Capacity Taps	°C Temp. Rise	Weight▲ (lbs)	Enclosure ▲■
240 X 480 V Primary, 120/240 V Secondary, 60 Hz CULUS Listed through 167 kVA					
15	15S1H	6-2.5%2+4-◆	150	200	17D
25	25S3H	6-2.5%2+4-◆	150	245	17D
37.5	37S3H	6-2.5%2+4-◆	150	325	18D
50	50S3H	6-2.5%2+4-◆	150	350	18D
75	75S3H	6-2.5%2+4-◆	150	450	21D
100	100S3H	6-2.5%2+4-◆	150	640	22D
167	167S3H	6-2.5%2+4-◆	150	975	24D
250	200S3H	6-2.5%2+4-◆	150	1220	25D
333	250S3H	6-2.5%2+4-◆	150	1535	25D
600 V Primary, 120/240 V Secondary, 60 Hz CULUS Listed through 167 kVA					
15	15S5H	6-2.5%2+4-◆	150	200	17D
25	25S5H	6-2.5%2+4-◆	150	245	17D
37.5	37S5H	6-2.5%2+4-◆	150	325	18D
50	50S5H	6-2.5%2+4-◆	150	350	18D
75	75S5H	6-2.5%2+4-◆	150	450	21D
100	100S5H	6-2.5%2+4-◆	150	640	22D
167	167S5H	6-2.5%2+4-◆	150	975	24D
250	250S5H	6-2.5%2+4-◆	150	1220	25D
333	333S5H	6-2.5%2+4-◆	150	1535	25D
208 V Primary, 120/240 V Secondary, 60 Hz CULUS Listed through 167 kVA					
15	15S60H	2-5%FCBN★	150	205	17D
25	25S60H	2-5%FCBN★	150	240	17D
37.5	37S60H	2-5%FCBN★	150	325	18D
50	50S60H	2-5%FCBN★	150	350	18D
75	75S60H	2-5%FCBN★	150	450	21D
100	100S60H	2-5%FCBN★	150	640	22D
167	167S60H	2-5%FCBN★	150	975	24D
277 V Primary, 120/240 V Secondary, 60 Hz CULUS Listed through 167 kVA					
15	15S61H	2-5%FCBN★	150	205	17D
25	25S61H	2-5%FCBN★	150	240	17D
37.5	37S61H	2-5%FCBN★	150	325	18D
50	50S61H	2-5%FCBN★	150	350	18D
75	75S61H	2-5%FCBN★	150	450	21D
100	100S61H	2-5%FCBN★	150	640	22D
167	167S61H	2-5%FCBN★	150	975	24D

- ▲ Not for construction. Contact your nearest Schneider Electric sales office for certified prints.
- For enclosure styles, see Dimensions Table, page 6.
- ◆ When 240 volt connection is used, there will be 3-5% taps, 1 above and 2 below 240 volts.
- ★ FCBN = full capacity below normal

NOTE: Lugs are furnished by customer.

Watchdog® Low Temperature Rise

- Designed for low energy losses at loads greater than 50% of nameplate rating.
- Extra long life expectancy using 220 °C insulation system designed for full load operation at a maximum temperature rise of 115 °C or 80 °C instead of 150 °C.
- Continuous emergency overload capability of 15% on 115 °C rise and 30% on 80 °C rise.

NOTE: These products are obsolete and can no longer be ordered. The information in this table is for reference only.

Table 6.4: Watchdog Low Temperature Rise Transformer Selection

kVA	Catalog Number	Full Capacity Taps	Weight▲ (lbs)	Enclosure ▲■
115 °C Rise Single Phase – 240x480 V Primary 120/240 V Secondary 60 Hz CULUS Listed				
15	15S3HF	6-2.5%2 + 4-◆	230	17D
25	25S3HF	6-2.5%2 + 4-◆	325	18D
37.5	37S3HF	6-2.5%2 + 4-◆	350	18D
50	50S3HF	6-2.5%2 + 4-◆	450	21D
75	75S3HF	6-2.5%2 + 4-◆	650	22D
100	100S3HF	6-2.5%2 + 4-◆	1050	24D
80 °C Rise Single Phase – 240x480 V Primary 120/240 V Secondary 60 Hz CULUS Listed				
15	15S3HB	6-2.5%2 + 4-◆	230	17D
25	25S3HB	6-2.5%2 + 4-◆	325	18D
37.5	37S3HB	6-2.5%2 + 4-◆	350	18D
50	50S3HB	6-2.5%2 + 4-◆	450	21D
75	75S3HB	6-2.5%2 + 4-◆	675	22D
100	100S3HB	6-2.5%2 + 4-◆	1100	24D
115 °C Rise Three Phase – 480 V Delta Primary 208Y/120 V Secondary 60 Hz CULUS Listed				
15	15T3HF	6-2.5%2 + 4-	250	17D
30	30T3HF	6-2.5%2 + 4-	340	18D
45	45T3HF	6-2.5%2 + 4-	500	19D
75	75T3HF	6-2.5%2 + 4-	620	21D
112.5	112T3HF	6-2.5%2 + 4-	800	22D
150	150T3HF	6-2.5%2 + 4-	1025	24D
225	225T3HF	6-2.5%2 + 4-	1450	25D
300	300T3HF	6-2.5%2 + 4-	2460	30D
500	500T68HF	6-2.5%2 + 4-	3950	31D
115 °C Rise Three Phase – 480 V Delta Primary 208Y/120 V Secondary 60 Hz CULUS Listed, Copper Windings				
15	15T3HFUCU	6-2.5%2 + 4-	250	17D
30	30T3HFUCU	6-2.5%2 + 4-	340	18D
45	45T3HFUCU	6-2.5%2 + 4-	500	19D
75	75T3HFUCU	6-2.5%2 + 4-	620	21D
112.5	112T3HFUCU	6-2.5%2 + 4-	800	22D
150	150T3HFUCU	6-2.5%2 + 4-	1025	24D
225	225T3HFUCU	6-2.5%2 + 4-	1450	25D
300	300T3HFUCU	6-2.5%2 + 4-	2460	30D
500	500T68HFUCU	6-2.5%2 + 4-	3950	31D
80 °C Rise Three Phase – 480 V Delta Primary 208Y/120 V Secondary 60 Hz CULUS Listed				
15	15T3HB	6-2.5%2 + 4-	250	17D
30	30T3HB	6-2.5%2 + 4-	340	18D
45	45T3HB	6-2.5%2 + 4-	500	19D
75	75T3HB	6-2.5%2 + 4-	750	21D
112.5	112T3HB	6-2.5%2 + 4-	850	22D
150	150T3HB	6-2.5%2 + 4-	1075	24D
225	225T3HB	6-2.5%2 + 4-	1450	25D
300	300T3HB	6-2.5%2 + 4-	2460	30D
500	500T68HB	6-2.5%2 + 4-	3950	31D
80 °C Rise Three Phase – 480 V Delta Primary 208Y/120 V Secondary 60 Hz CULUS Listed, Copper Windings				
15	15T3HBUCU	6-2.5%2 + 4-	250	17D
30	30T3HBUCU	6-2.5%2 + 4-	340	18D
45	45T3HBUCU	6-2.5%2 + 4-	500	19D
75	75T3HBUCU	6-2.5%2 + 4-	750	21D
112.5	112T3HBUCU	6-2.5%2 + 4-	850	22D
150	150T3HBUCU	6-2.5%2 + 4-	1075	24D
225	225T3HBUCU	6-2.5%2 + 4-	1450	25D
300	300T3HBUCU	6-2.5%2 + 4-	2460	30D
500	500T68HBUCU	6-2.5%2 + 4-	3950	31D

FEATURES & SPECIFICATIONS

INTENDED USE — Ideal for use in applications where smart, energy-efficient fixtures are desired. Typical applications include parking garages, canopies, transportation, schools, hospitals, cold storage and exterior retail environments where moisture or dust is a concern. Polycarbonate enclosure protects fixture while remaining easy to service and clean.

CONSTRUCTION — UV-stabilized, injection-molded, impact-resistant, frosted polycarbonate housing with continuous poured-in-place, closed-cell gasket. 20-gauge steel channel and channel cover. Aluminum sheet metal board plate for thermal conduction and support. Captive, tamper-resistant, polycarbonate latches standard (8 Torx T-20 tamper-resistant screws included). Stainless steel latches also available. Fixture design allows for approximately 4% up-light.

OPTICS — UV-stabilized, injection-molded, impact-resistant, clear transparent and frosted, polycarbonate lens with aesthetic rib detail (.080" thick). Miro 5 aluminum reflector used to achieve wide distribution.

ELECTRICAL — Utilizes high-output LEDs integrated on a two-layer circuit board, ensuring cool-running operation. Electronic LED driver rated for 44 input watts and is standard 0-10V dimming. Integral 6kV/3kA surge protection, tested in accordance to IEEE/ANSI standards. L85 at 60,000 hours.

INSTALLATION — Stainless steel surface spring-mounting brackets standard (2 included) allows for ceiling or suspended mount. A variety of stainless steel mounting options also available: J-box mounting and mounting brackets for suspension with aircraft cable (cable not included). Optional stainless steel V-hooks available for chain hanging (chain not included). Surface conduit entry on each end and on top. For horizontal and vertical mounting on a wall, application must be under a covered ceiling and QMB option recommended. 1/2" - 3/4" KO. When wall mounted the product will be rated for damp location only.

LISTINGS — CSA Certified to UL and C-UL standards. For use in ambient temperatures ranging from -20°F (-29°C) to 104°F (40°C). VAP LED is wet location listed for covered ceiling applications. IP65 and IP66 rated. VAP LED is NSF Splash Zone rated when suspended or ceiling mounted. When wall mounted the product will be rated for damp location only. 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 to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

For installed Rough Service Product(s), Acuity warrants that, for the lifetime of the product(s), the polycarbonate lens and/or polycarbonate housing will withstand breakage resulting from occasional physical abuse and rough handling (the "Rough Service Warranty"), notwithstanding the vandalism exclusion set forth at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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.

Catalog Number	
Notes	BOILER AND MECH ROOMS
Type	

ARCHWAY™
PASSAGE™

Rough Service Fixture

VAP LED



CEILING/
SUSPEND MOUNT



Specifications

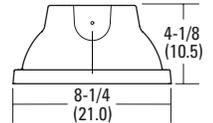
Length: 54-3/4 (139.1)

Width: 8-1/4 (21.0)

Depth: 4-1/8 (10.5)

Weight: 13.5 lbs. (5.9 kg)

All dimensions are shown in inches (centimeters) unless otherwise noted.



ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: VAP 4000LM FST MD MVOLT GZ10 40K 80CRI

VAP Series	Nominal lumens	Diffuser	Distribution	Voltage	Driver	Color temperature	CRI
VAP	4000LM 4,000 lumens	FST Frosted polycarbonate lens	MD Medium	MVOLT MVOLT	GZ10 0-10V dimming	30K 3000K	80CRI 80 CRI
	6000LM 6,000 lumens	PCL Clear polycarbonate lens	WD Wide	120 120V		35K 3500K	90CRI 90 CRI
	12000LM 12,000 lumens ¹			277 277V		40K 4000K	
				347 347V ²		50K 5000K	
				480 480V ²			

Options³

SF	Single fuse ⁴	STSL	Stainless steel tamper resistant latches	MSI10XAWL10M DSCXAWL	Xpoint wireless integral motion sensor, On/Off operation for motion sensing, override Off due to daylight ⁴
BSL722	Bodine® emergency LED battery pack for 0°C and up ^{4,5,6}	QMB	Quick-mount ceiling bracket		
BSL722C	Bodine® emergency LED battery pack for -20°C and up ^{4,5,6}	CMB	Chain-mount suspension bracket	MSI10NWL	Low mount 360 integral motion sensor, wet location, On/Off operation ⁴
WLF	Wet location fitting (two outboard, top) ⁷	JSB	Junction box snap-bracket	MSI102L3VWL	Low mount 360 integral motion sensor, wet location, High/Low operation (bi-level) ⁴
WLFIN	Wet location fitting (two inboard, top) ⁷	LSC	Lens safety clip	MSI10NWL DSCNWL	Low mount 360 integral motion sensor, wet location, On/Off operation for motion sensing, override Off due to daylight ⁴
WLFEND	Wet location fitting (one end) ⁷	DL	Damp location ⁹		
WLFEND2	Wet location fitting (both ends) ^{7,8}	L/SP	Less surge protection device	XAD	XPoint™ wireless controller ,0-10V dimming ¹⁰
CS89	6' white cord, 16/3, no plug, wet location				
CS88	6' Brad Harrison 16/3 cord and straight blade plug set ⁴				
CS88L12	12' Brad Harrison 16/3 cord and straight blade plug set ⁴				

Accessories: Order as separate catalog number. (Ships separately)

VAPSMB	Surface spring-mount bracket	RK1 T20BIT	Hex base driver bit, Torx T20.
VAPQMB	Quick-mount ceiling bracket		Tamper resistant screws with center reject pin
VAPCMB	Chain-mount bracket	RK1 T20DRV	Torx T20 screwdriver for use with tamper resistant screws with center reject pin
VAPJSB	Junction box snap bracket		
HC36	Wire hook and 36" chain set ^{11,12}		

Notes

- Not available with BSL722 or BSL722C options.
- 347V and 480V utilize a step-down transformer. Available 60HZ only.
- For additional options, consult factory.
- Must specify voltage.
- Not available with 12000LM lumen package. Maximum ambient temperature 30 C.
- Available in 120-277V only.
- 5/8" long NPT threaded hub.
- Not available with cord, sensor, or photocell options.
- Required when using battery packs or cord sets that are not rated for wet locations.
- Not available with BSL722 and BSL722C option.
- Requires CMB (chain mount bracket) option.
- For stainless steel, specify STS (example: HC36 STS).

FEATURES & SPECIFICATIONS

INTENDED USE —The T Series LED combines digital lighting and control technologies with a high-performance optical system to deliver general ambient lighting for many applications such as schools, offices and hospitals.

High-efficacy light engine delivers long life and excellent color, ensuring a superior quality lighting installation that is highly efficient and sustainable. **Certain airborne contaminants can diminish integrity of acrylic.** [Click here for Acrylic Environmental Compatibility table for suitable uses.](#)

CONSTRUCTION — Housing formed from cold-rolled steel. Housing is painted after fabrication for superior finish.

Smooth hemmed sides and smooth inward-formed end flanges, for easy handling.

Standard extruded aluminum door frame has superior structural integrity with premium appearance and mitered corners. Door frame is painted after fabrication, standard. Powder-painted rotary cam latches provide easy, secure door closure. Integral T-bar clips are standard. Acrylic shielding material is 100% UV stabilized.

OPTICS — Standard pattern #19 lens, 0.156" thick with highly transmissive overlay, is standard for superior brightness control. Overlay is 0.040" thick. Other lenses are available.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior level and quality of illumination for extended service life. 90% LED lumen maintenance at 60,000 hours (L90/60,000).

eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI. Optional nLight™ embedded controls continuously monitor system performance, allow for constant lumen management/compensation function, facilitate simple "plug-and-play" network and controls upgrading via Cat-5 cable.

Driver disconnect is provided where required to comply with U.S. and Canadian codes.

INSTALLATION — Drivers and internal components are accessible from floor. LED boards include plug-in connectors for easy replacement or servicing. Suitable for direct insulation contact. Suitable for damp location.

LISTINGS — CSA certified to U.S. and Canadian 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.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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.

Catalog Number
Notes CORRIDORS AND LOUNGES
Type

T SERIES LED

2TL

2' x 2' LED



ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2TL2 33L RW A19 EZ1 LP835 N80

Series	Lumens ¹	Door	Lens	Voltage
2TL2 Recessed LED 2x2	20L 2000 lumens 33L 3300 lumens 40L 4000 lumens	FW Flush aluminum, white RW Recessed aluminum, white	A12 #12 pattern acrylic A19 #19 pattern acrylic, 0.156" thick MWS Matte white .040" thick MPL Micro prism SWL Satin white	(blank) MVOLT (120-277V) 347 347V ²

Driver	Color temperature	Control	Options
EZ1 eldoLED dims to 1% (0-10 volt dimming)	LP830 3000 K	(blank) No controls	EL7L 700 nominal lumen battery pack
EZB eldoLED dims to dark (0-10 volt dimming)	LP835 3500 K	N80 nLight with 80% (L80) lumen management	EL14L 1400 nominal lumen battery pack
EDB eldoLED DALI ³	LP840 4000 K	N80EMG nLight with 80% (L80) lumen management for use with generator supply EM power	CP Chicago plenum
EXB eldoLED DMX/RDM ³	LP850 5000 K	N100 nLight without lumen management	
EXA1 Dims to 1%, XPoint wireless enabled ^{3,4}		N100EMG nLight without lumen management for use with generator supply EM power	
EXAB Dims to dark, XPoint wireless enabled ^{3,4}			
SLD Step-level dimming ³			

Accessories: Order as separate catalog number.	
DGA22	Drywall grid adapter for 2x2 recessed fixture.

Notes

- 1 Approximate lumen output.
- 2 Not available with EL7L or EL14L 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.

FEATURES & SPECIFICATIONS

INTENDED USE — The STL combines digital LED lighting and controls technologies with high-performance optical design to offer the most advanced surface-mount 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 — Housing is roll formed from code-gauge steel.

Impact modified linear-faceted refractor with light diffusing film. Refractor attaches to die cast ends by simple hook and pin design with controlled tension provided by sonically welded end plate, providing secure installation and easy maintenance.

Decorative die-cast end caps provide added durability.

Finish: All metal parts are post-painted in white polyester powder coat for smooth, finished edges and uniform light distribution. Natural aluminum finish available on end caps (see Options).

Injection-molded plastic light traps prevent light leaks between shielding and end plates and centers diffuser on channel.

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to vertical and horizontal work surfaces, rendering interior space, objects and occupants in a more balanced luminous environment. Light distribution is carefully controlled at high angles, providing just enough luminous flux to create the volumetric effect.

Angled mounting surface combined with crescent-shape linear faceted refractor system obscures and integrates individual LED images and uniformly washes fixture surface with light.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. STL is rated to deliver L80 performance for 50,000 hours.

Optional nLight® embedded controls continuously monitor system performance, allow for constant lumen management / compensation function, facilitate simple “plug-and-play” network and controls upgrading via Cat-5 cable. LED AccuDrive™ driver delivers full-range dimming from 0-10V control signal. Ballast disconnect provided where required to comply with US and Canadian codes.

LISTINGS — CSA certified to meet U.S. and Canadian standards.

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.

Patents pending. Damp listed.

WARRANTY — 5-year limited warranty. Complete warranty terms located at

www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

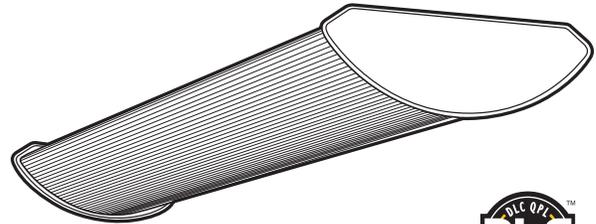
Catalog Number
Notes DORM ROOMS
Type



Surface Volumetric

STL

2' and 4'
LED



INDUSTRY RECOGNITION/AWARDS



ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: STL2 22L D26 LP835 NX

Series	Lumens ¹	Voltage	Wattage ⁶	Color temperature	Control	Options	Finish ¹⁴
STL2 2' surface volumetric LED	22L ^{2,4} 40L ^{3,4}	(blank) MVOLT (120-277)	D26 26W ^{2,7} D40 40W ^{3,7,8}	LP830 82 CRI, 3000 kelvin ^{10,11}	NX Less controls BLD Bi-level dimming ^{3,12}	EL14L LED Emergency battery pack (nominal 1400 lumens); see Life Safety section ^{3,13}	(blank) White DNA Natural aluminum
STL4 4' surface volumetric LED	48L ^{3,4}	347 347V ⁵	D50 50W ^{3,7,9}	LP835 82 CRI, 3500 kelvin LP840 82 CRI, 4000 kelvin LP850 82 CRI, 5000 kelvin ^{10,11}	N80 nLight with 80% (L80) lumen management N80EMG nLight with 80% (L80) 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		

Accessories: Order as separate catalog number.	
STCR	Continuous row connector (see mounting data)
STACG___	ST adjustable aircraft cable gripper suspension kit (specify length as 36 or 72 inches) (specify ceiling type F1 or F2 - see mounting data)
STACGF___	ST adjustable aircraft cable gripper with power feed (specify length as 36 or 72 inches) (specify ceiling type F1 or F2 - see mounting data)
STACGE___	ST adjustable aircraft cable gripper with emergency power feed (specify length as 36 or 72 inches) (specify ceiling type F1 or F2 - see mounting data)

Notes

- 1 Approximate lumen output.
- 2 For use with STL2 only.
- 3 For use with STL4 only.
- 4 Actual performance may differ as a result of end-user environment and application.
- 5 Not for use with EL14L.
- 6 Approximate input power.
- 7 Actual wattage may differ by -3% to +6% when operating between 120-277V +/-10%.
- 8 For use with 40L only.
- 9 For use with 48L only.
- 10 Extended lead time.
- 11 Not available with 40L.
- 12 Not for use with EL14L on 48L system.
- 13 For use with NX control option only.
- 14 For additional paint finishes refer to: [Architectural Colors](#).

FEATURES & SPECIFICATIONS

INTENDED USE — Sharing many popular Z Series elements, this solid-state strip offers long maintenance-free life, several color temperatures, lumen outputs and lengths. Ideal for new construction and retrofit applications in T5 and T8 lengths. Ideal for uplight and downlight in commercial, retail, manufacturing, warehouse, cove and display applications.

CONSTRUCTION — Compact-design channel and cover are formed from code-gauge, cold-rolled steel. Improved easy "snap 'n' lock" end plates allow for quick attachment.

Finish: Paint options include high-gloss, baked white enamel (WH), galvanized (GALV), matte black (MB) and smoke gray (SKGY). Five-stage iron phosphate pre-treatment ensures superior paint adhesion and rust resistance.

OPTICS — Replaceable medium diffuse lens (up to 10%) offer ingress protection from debris.

ELECTRICAL — Utilizes high-output LEDs integrated on a two-layer circuit board, ensuring cool-running operation. Internal pluggable wiring harness prevents wiring errors. Electronic LED driver is rated for 75 input watts maximum (see Operational Data on page two for actual wattage consumption), **multi-volt input and 0-10V dimming standard**. This fixture is designed to withstand a maximum line surge of 1.5kV at 0.75kA combination wave for indoor locations, for applications requiring higher level of protection additional surge protection must be provided.

LEDs provide 83 CRI at 3000 K, 3500 K, 4000 K or 5000 K.

Lumen output ranges from 2100 to 6000 lumens. Beam angle is 110 FWHM (full width at half maximum).

Lumen output up to 1,300 lumens per foot. In 86°F (30°C) ambient environments, L70 is predicted to be 100,000+ hours, L85 at 44,000 hours. Luminaire should be installed in applications where ambient temperatures do not exceed 86°F (30°C). Ambient temperatures that exceed 86°F (30°C) will result in reduced life and will void warranty.

INSTALLATION — Tool-less channel cover for easy installation.

Fixture may be surface, pendant or stem mounted. Three-point aligner locks in place for easy continuous row mounting.

LISTINGS — UL Listed. CSA certified to US and Canadian safety standards. For use in damp locations between -4°F (-20°C) and 86°F (30°C).

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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.

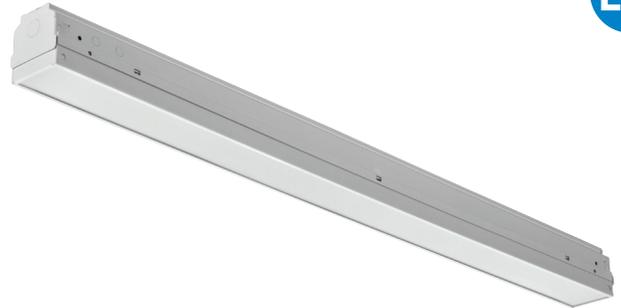
Catalog Number
Notes ELECTRICAL AND COMM ROOMS
Type



Lensed LED Striplight

ZL2N

24" and 48" Lengths



ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: ZL2N L48 3000LM MDD MVOLT 40K 80CRI WH

ZL2N				MDD											
Series	Length	Nominal lumens ¹		Diffuser	Voltage	Color temperature		Color rendering index		Options		Paint finish			
ZL2N Lensed LED striplight	L24 24"	2000LM	2,000 lumens	MDD Medium diffuse	MVOLT 120-277V HVOLT 347-480V ²	40K 4000 K	80CRI 80 CRI	PLR Plug-in wiring ³ PLR1LVG Plug-in wiring low voltage ⁴ BSL722 Emergency battery pack ^{5,6}	WH White GALV Galvanized MB Matte black SKGY Smoke gray						
	L46 46"	2000LM	2,000 lumens			30K 3000 K	90CRI 90 CRI								
	L48 48"	3000LM 3,000 lumens 5000LM 5,000 lumens	ZSD Zebra striped lens	35K 3500 K 50K 5000 K											

Accessories: Order as separate catalog number.	
ZACVH	Aircraft cable with hook
HC36	Hanger chain, 36"
ZSPRG	For 15/16" T-grid only
LSXR	Sensor Switch® LSXR occupancy sensor ³

Replacement Lens	
LZL2 XX MDIF	Medium-diffuse lens. Specify length 24 or 48 (example: LZL2 24 MDIF) ⁷

Notes

- See Operational Data on page 2 for actual lumens.
- Not available with L24, 24" fixture.
- See ordering information on page 3.
- Use ZSPRG for surface mounting when order this option.
- Specify voltage, 120 or 277.
- Output is 1400 lumens.
- XX denotes length.

PRODUCT INFORMATION

Advanced plug-in system with three-circuit capability. Available on industrial and strip products and a variety of architectural products mounted in continuous rows. 1, 2, 3 and 4-lamp fixtures. PLR22 (2-circuit) and PLR33 (3-circuit) crossover harness switches hot circuit serving next fixture in row. Reduces fixture types on job for alternating circuit applications (see example below.)

Easy one-step installation, saves up to 35% on labor costs. Expanded switching flexibility helps save energy.

Rows can be 50% longer with two-circuit systems. Polarized, lock-together nylon connectors prevent miswiring in the field. #12 THHN conductor, rated 600V, 90°C. White neutral wire included. Grounding accomplished by fixture in-row connectors.

CSA certified systems available with up to 2 circuits. G ground required.

Note: Specifications subject to change without notice.



PLR

Advanced 3-Circuit Plug-In

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Series	Number of hot wires	Branch circuits	Dimming	Ground
PLR	(blank) Not required for 22 or 33	<u>Circuits to which ballast is connected</u>	LV Low-voltage dimming	(blank) No ground in PLR
PLR22	1 Black	(blank) Not required for 22 or 33		G Ground. Maximum 2 circuits
PLR33	2 Black and red	A Black wire		
	3 Black, red and blue			

Typical Applications

- Multiple-circuit and single-circuit for longer continuous rows
- Multiple-circuit with alternating fixtures on separate circuits, 2-circuit (PLR 22) and 3-circuit (PLR 33)
- Multiple circuit with night-lights located along row as desired

TYPICAL APPLICATIONS										
PLR 3 C	PLR 3 C	PLR 3 C	PLR 3 C	PLR 2 B	PLR 2 B	PLR 2 B	PLR 2 B	PLR 1	PLR 1	PLR 1
(All PLR22)										
Circuit A	Circuit B	Circuit A	Circuit B	Circuit A	Circuit B	Circuit A	Circuit B	Circuit A	Circuit B	Circuit A
(All PLR33)										
Circuit A	Circuit B	Circuit C	Circuit A	Circuit B	Circuit C	Circuit A	Circuit B	Circuit C	Circuit A	Circuit B
PLR 3 A	PLR 3 A	PLR 3 A	PLR 3 C	PLR 3 B	PLR 3 B	PLR 3 B	PLR 3 C	PLR 3 A	PLR 3 A	PLR 3 A

PRODUCT INFORMATION

A standard occupancy time delay is also present to ensure lights turn off (once minimum on timer has also elapsed) if no occupancy is detected.

This timer is factory set at 10 minutes to promote energy savings, but is adjustable between 30 seconds and 30 minutes. These adjustments may be done through the unit's push-button.

FEATURES

- Four interchangeable lenses - high mount 360°, low mount 360°, high mount aisleway, and small motion 360°.
- Integrated mounting bracket drops lens down 3" from chase nipple - no bracket accessory required.
- 100% digital PIR detection - provides excellent RF immunity

Note: Specifications subject to change without notice.



LSXR

Single Relay

sensorswitch

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: LSXR 10 ADC HVOLT 30M

LSXR		Lens option				Dimming/photocell	
Series	Passive Infrared Indoor Occupancy Sensor	(blank)	No lens	610	High and low mount 360°	(blank)	None
		6	High mount, 360°	650	High mount 360° and aisleway	HL	High/low occupancy operation
		10	Low mount, 360°	3PK	High and low mount 360° and aisleway	P	Switching photocell (on/off)
		50	High mount aisleway	4PK	All lenses	ADC	Dimming and switching photocell
		9	Small motion, 360°			ANL	Dimming and switching photocell with high/low occupancy operation

Voltage	Max dim level	Min dim level	Lead length	Temp humidity	Default time delay
(blank) 120-277 VAC (MVOLT)	(blank) 10 VDC	(blank) Minimum dimming level of ballast	(blank) 14"	(blank) None	(blank) 10 minutes (with minimum 15 minutes on time)
HVOLT 347-480 VAC	9H 9 VDC	1V 1 VDC	42L 42"	LT Low temperature	5M 5 minutes (LED only)
	8H 8 VDC	2V 2 VDC			15M 15 minutes
	7H 7 VDC	3V 3 VDC			20M 20 minutes
		4V 4 VDC			30M 30 minutes
		5V 5 VDC			
		6V 6 VDC			

For additional information see www.lithonia.com

Contemporary Thermoplastic Exits

Quantum®

LED Quick-Mount®



Intended Use

Ideal for applications requiring attractive, quick installation exit signs and low energy consumption.

Features

Precision-molded thermoplastic housing is impact and scratch resistant, corrosion proof and UV-stabilized to resist discoloration.

Innovative snap-together design allows installation in less than three minutes.

Long-life LEDs feature very low energy consumption and rated life up to 25 years. Consumes less than one watt of energy.

Fully assembled single-face exit with optional extra faceplate for easy field conversion to double face.

EXIT SIGNS

Replaceable chevron directional indicator knockouts for choice of direction.

Universal mounting capability – top, back or end (canopy provided).

Automatic recharge after discharge.

Conveniently located test switch and status indicator provide visual and manual means of monitoring system operation.

The self diagnostic emergency signs comply with NFPA Life Safety Code and automatically test the battery once a month for five minutes and once every six months for 30 minutes.

U.S. Patent No. 5,526,251, 5,611,163, 5,739,639 and 5,954,423. Other patents pending.

Listings

UL Listed (standard). CSA or NOM Certified (see Options).

Ordering Information

Example: **LQM S W 3 R 120/277 EL N**

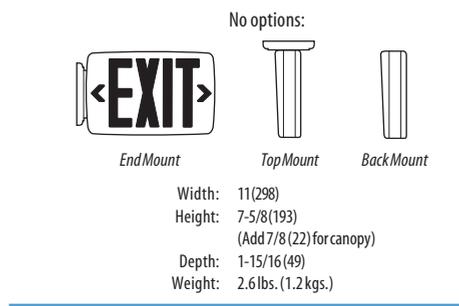
Family LQM LED	Housing color (blank) Black ² W White	Number of faces 1 Single ^{2,3} 3 Single with extra faceplate and color panel for field conversion to double-face	Panel color R Red G Green ³	Input voltage⁴ 120/277 Dual voltage ³ 120/347 Dual voltage ⁵	Operation (blank) Standard non-emergency Nickel-cadmium battery ³ EL N Nickel-cadmium battery with self-diagnostics ^{3,6} LDC6 6V DC input for LED lamp ⁵ LDC12/48 12-48V DC input for LED lamps ⁵	Options² For options and fixture compatibility, see page 431.
Face type S Stencil P Panel ^{1,2,3}						Certification (blank) UL Listed CSA CSA Certified NOM NOM Certified

lightquick[®] XD
Express delivery products.
See page 11 for details about LightQuick XD.

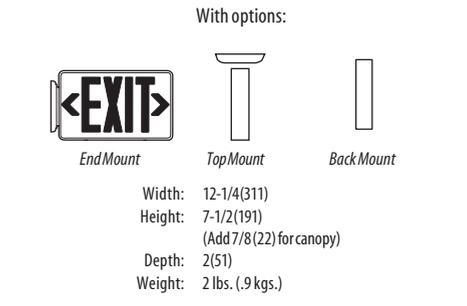
<i>Description</i>
LQM S W 3 G 120/277 EL N
LQM S W 3 R 120/277 EL N
LQM S W 3 R 120/277

- Quick-Mount® Installation:
- 1) Connect jumper leads (provided) to AC input leads in J-box. Fasten bracket and canopy to J-box.
 - 2) Remove faceplate from housing and snap housing onto canopy.
 - 3) Connect input leads to leads at corner of housing wire channel. Connect battery.
 - 4) Snap out directional chevron indicators (if necessary) and snap faceplate onto canopy.

Dimensions are shown in inches (millimeters) unless otherwise noted.



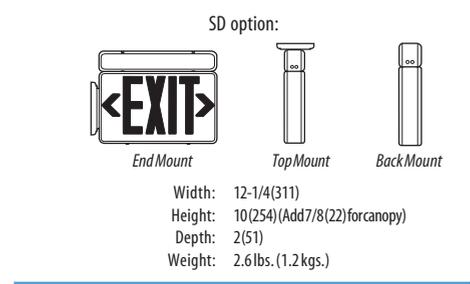
Electrical Application Data			
Type	Volts	Amps	Watts
<i>Primary Circuit</i>			
Standard	120	.04	.57
LED Red	277	.05	.68
Standard	120	.05	.62
LED Green	277	.05	.72
Emergency	120	.04	.72
LED Red	277	.92	.92
Emergency	120	.04	.72
LED Green	277	.05	.92
<i>Emergency Circuit</i>			
LDC6	6	.16	.96
LDC12/48	12	.10	1.20
LDC12/48	24	.05	1.24
LDC12/48	32	.04	1.28
LDC12/48	48	.03	1.36



Exit signage	(blank) Exit
SALIDA	Salida ^{2,7}

Accessories⁸	(Order separately)
ELA W US12	12" stem kit with white canopy ⁹
ELA WGEX	Back-mount wireguard
ELA WGEXT	Top-mount wireguard
ELA WGEKE	End-mount wireguard

- NOTES:
- 1 For custom signage only. Special wording available on panel face, white housing only, see page 430.
 - 2 See "With options" below for special housing dimensions.
 - 3 Not available with CSA.
 - 4 Some special voltages available. Consult factory.
 - 5 Only available with CSA.
 - 6 See "SD option" below for special housing dimensions.
 - 7 Letters 6" high with 7/16" stroke.
 - 8 For additional options, accessories and fixture compatibility, see page 431.
 - 9 Replace W with B for black canopy.



FEATURES & SPECIFICATIONS

INTENDED USE — The T Series LED surface mount combines digital lighting and control technologies with a high-performance optical system to deliver general ambient lighting for many applications such as schools, offices and hospitals. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality light installation that is highly efficient and sustainable. **Certain airborne contaminants can diminish integrity of acrylic.** [Click here for Acrylic Environmental Compatibility table for suitable uses.](#)

CONSTRUCTION — Designed exclusively for use with LED Smooth hemmed sides and smooth, inward formed end flanges for safe handling. Lighter weight fixture allows safe, easy installation. Standard steel door frame has superior structural integrity with premium extruded appearance and precision flush mitered corners. Powder painted, steel latches provide easy, secure door closure. Superior mechanical light seal requires no foam gasketing. Integral T-bar clips secure fixture to T-bar system. Housing formed from cold-rolled steel. Acrylic shielding material 100% UV stabilized. No asbestos is used in this product. Finish: Five-stage iron-phosphate pretreatment ensures superior paint adhesion and rust resistance. Painted parts finished with high-gloss, baked white enamel.

OPTICS — Standard pattern #19 lens, 0.156" thick with highly transmissive overlay, is standard for superior brightness control. Overlay is 0.040" thick. Other lenses are available.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior level and quality of illumination for extended service life. 90% LED lumen maintenance at 60,000 hours (L90/60,000).

Standard nLight® embedded controls continuously monitor system performance, allow for constant lumen management/compensation function, facilitate simple "plug-and-play" network and controls upgrading via CAT5 cable. LED driver delivers full-range dimming from 0-10V control signal. Ballast disconnect is provided where required to comply with US and Canadian codes.

INSTALLATION — Surface mount. Drivers and internal components are accessible from floor. LED boards include plug-in connectors for easy replacement or servicing. Suitable for damp location.

LISTINGS — CSA certified to US and Canadian standards. 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.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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.

Catalog Number
Notes LAUNDRY ROOMS
Type

T SERIES SURFACE MOUNT

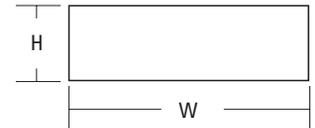
TLX4

1' x 4' LED



Specifications

Length: 48 (121.9)
Width: 12-1/4 (31.1)
Depth: 4-3/4 (12.1)



All dimensions are inches (centimeters) unless otherwise indicated.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: TLX4 40L FW A12 EZ1 LP835 N80

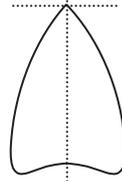
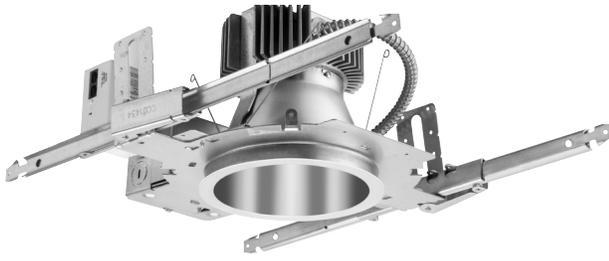
TLX4		Lumens ¹		Door		Lens		Voltage		Driver		
TLX4	Surface LED 1x4	20L	2000 lumens	FW	Flush aluminum, white	A12	#12 pattern acrylic	(blank)	MVOLT (120-277)	EZ1	eldoLED dims to 1% (0-10 volt dimming)	
		30L	3000 lumens			A19	#19 pattern acrylic, 0.156" thick	347	347 ²	EZB	eldoLED dims to dark (0-10 volt dimming)	
		40L	4000 lumens	RW	Regressed aluminum, white	MWS	Matte white .040" thick			EDB	eldoLED DALI ³	
		48L	4800 lumens			MPL	Micro prism			EXB	eldoLED DMX/RDM ³	
		60L	6000 lumens			SWL	Satin white			EXA1	Dims to 1%, XPoint wireless enabled ^{3,4}	
										EXAB	Dims to dark, XPoint wireless enabled ^{3,4}	
										SLD	Step-level dimming ³	
Color temperature		Control						Options				
LP830	3000 K	(blank)	No controls						EL7L	700 nominal lumen battery pack ⁵		
LP835	3500 K	N80	nLight with 80% (L80) lumen management						EL14L	1400 nominal lumen battery pack ⁵		
LP840	4000 K	N80EMG	nLight with 80% (L80) lumen management for use with generator supply EM power									
LP850	5000 K	N100	nLight without lumen management									
		N100EMG	nLight without lumen management for use with generator supply EM power									

Notes

- 1 Approximate lumen output.
- 2 Not available with EL7L or EL14L 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 Not available for 48L or 60L options.



Luminaire Type:
Catalog Number
(autopopulated):



Gotham Architectural Downlighting
LED Downlights

**6" Evo®
Downlight**

Solid-State Lighting



FEATURES

OPTICAL SYSTEM

- Self-flanged or flangeless semi-specular, matte-diffuse or specular finishing trim
- Patented Bounding Ray™ optical design (U.S. Patent No. 5,800,050)
- 45° cutoff to source and source image
- Top-down flash characteristic
- Polycarbonate lens integral to light engine

MECHANICAL SYSTEM

- 16-gauge galvanized steel construction; maximum 1-1/2" ceiling thickness
- Telescopic mounting bars maximum of 32" and minimum of 15", preinstalled, 4" vertical adjustment
- Toolless adjustments post installation
- Junction box capacity: 8 (4 in, 4 out) 12AWG rated for 90°C
- Light engine and driver accessible through aperture
- Injection molded mud ring included with flangeless trims. Ships separately. Installs independently of the mounting frame to reduce cracks in plaster due to vibration.

ELECTRICAL SYSTEM

- Fully serviceable and upgradeable lensed LED light engine
- 70% lumen maintenance at 60,000 hours
- Tested according to LM-79 and LM-80 standards
- Overload and short circuit protected
- 2.5 SDCM; 85 CRI typical, 90+ CRI optional

LISTINGS

- Fixtures are CSA certified to meet US and Canadian standards; wet location, covered ceiling

WARRANTY

- 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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.

ORDERING INFORMATION

EXAMPLE: EVO 35/10 6AR MWD LSS MVOLT EZ1

Series	Color temperature	Nominal lumen values	Aperture/Trim color	Trim Style	Distribution	Finish	Voltage
EVO	27/ 2700 K	10 1000 lumens	6AR Clear	(blank) Self-flanged	MD Medium (0.9 s/mh)	LSS Semi-specular	MVOLT 120 277 347²
	30/ 3000 K	15 1500 lumens	6PR Pewter	FL Flangeless			
	35/ 3500 K	20 2000 lumens	6WTR Wheat	MWD Medium wide (1.0 s/mh)			
	40/ 4000 K	25 2500 lumens	6GR Gold				
		30 3000 lumens	6WR¹ White	WD Wide (1.2 s/mh)			
		35 3500 lumens	6BR¹ Black				
		40 4000 lumens	6WRAMF¹ White anti-microbial				
		45 4500 lumens					

Driver ³	Options
EZ10 eldoLED ECOdrive 0-10v dimming driver. Minimum dimming level 10%	SF Single fuse. Specify 120V or 277V.
EZ1 eldoLED ECOdrive 0-10V dimming driver. Minimum dimming level 1%	TRW⁶ White painted flange
EZB eldoLED SOLOdrive 0-10V dimming driver. Minimum dimming level <1%.	TRBL⁷ Black painted flange
EDAB eldoLED SOLOdrive DALI dimming driver. Minimum dimming level <1%.	EL⁸ Emergency battery pack with integral test switch
EDXB eldoLED POWERdrive DMX with RDM (remote device management). Minimum dimming level <1%. Includes termination resistor. Refer to DMXR Manual .	ELR⁸ Emergency battery pack with remote test switch
EXA1 XPoint Wireless, eldoLED ECOdrive 1% dimming, 0-10V. Refer to XPoint tech sheet.	NPS80EZ⁵ nLight® dimming pack controls 0-10V eldoLED drivers.
EXAB XPoint Wireless, eldoLED SOLOdrive <1% dimming, 0-10V. Refer to XPoint tech sheet.	NPS80EZER^{5,9} nLight® dimming pack controls 0-10V eldoLED drivers. ER controls fixtures on emergency circuit.
ECOS2^{4,5} Lutron® Hi-Lume® 2-wire forward-phase dimming driver. Minimum dimming level 1%. Minimum lumen 1000/Maximum lumen 3000.	
ECOS3^{4,5} Lutron® Hi-Lume® 3-wire or EcoSystem® dimming driver. Minimum dimming level 1%. Minimum lumen 1000/Maximum lumen 4500.	



FEATURES & SPECIFICATIONS

INTENDED USE — For wall or ceiling mounting, vertical or horizontal. The WL combines digital LED lighting and controls technologies with high-performance optical design to offer the most advanced wall-mount 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 — Housing is roll formed from code-gauge steel.

Reflector is retained in die cast ends providing secure installation and easy maintenance.

Decorative die-cast end caps provide added durability.

Finish: All metal parts are post-painted in white polyester powder coat for smooth, finished edges and uniform light distribution.

OPTICS — Impact modified linear faceted refractor. Optically engineered for superior light distribution and maximum efficacy.

Crescent-shape linear faceted refractor system obscures and integrates individual LED images and uniformly washes fixture surface with light.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. 90% LED lumen maintenance at 60,000 hours (L90/60,000). The LEDs have a CRI of 82.

eldoLED driver options deliver choice of dimming range and choices for 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.

CONTROLS — Optional nLight™ embedded controls continuously monitor system performance and allow for constant lumen management function.

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 energy waste created by the traditional practice of over-lighting.

Integral occupancy control: Integrated occupancy sensors allow luminaire to power off or dim to 10% or 50% output when space is unoccupied. Fixture designed to fail on.

The nES 7 is ideal for small rooms without obstructions or areas with primarily walking motion (e.g. corridors, stairwells). Additionally, the NES7ADCX includes an integrated photocell, which enables daylight harvesting.

For rooms like restrooms and private offices or any space with obstructions, the nES PDT 7 dual technology sensor is recommended. The nES PDT 7 utilizes both PIR (passive infrared) and Microphonics™ technologies to detect occupancy.

Wireless networking: XPoint™ Wireless technology creates a mesh network to ensure communication between fixtures, sensors and wall stations facility-wide. This option provides superior lighting management capabilities including granular control, configuration and custom grouping. This option enables sensors that detect motion to wirelessly communicate to neighboring fixtures — whether

Catalog Number	
Notes	STAIRWELLS
Type	

W SERIES

Wall bracket & Surface Mount LED



WL4

4'

LED



eldoLED

on different floors in a stairwell, to a corridor or hallway — illuminating the desired path.

LISTINGS — CSA certified to meet U.S. and Canadian standards. Suitable for damp location.

Patents pending. 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.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: WL4 30L EZ1 LP840

Series	Lumens ¹	Voltage	Driver	Color temperature	Lumen management
WL4 4' wall-mount LED	20L 2000 lumens 30L 3000 lumens 40L 4000 lumens	(blank) MVOLT (120 - 277V) 347 347V	EZ1 eldoLED dims to 1%, 0-10V EZB eldoLED dims to dark, 0-10V SLD Step-level dimming ²	LP830 3000 K LP835 3500 K LP840 4000 K LP850 5000 K	(blank) No nLight N80 nLight with 80% lumen management N100 nLight without lumen management N80EMG nLight with 80% lumen management for use with generator supply emergency power ³ N100EMG nLight without lumen management for use with generator supply emergency power ³

Occupancy control ⁴	Standby mode ¹⁰	Options	Finish ¹²
NES7 Sensor Switch® nES 7 PIR integral occupancy sensor ^{5,6}	(blank) Fixture turns off when unoccupied	EL7L LED Emergency battery pack (nominal 700 lumens); see Life Safety section ¹¹	(blank) White
NESPD7 Sensor Switch® nES PDT 7 dual technology integral occupancy control ^{5,6}	DIM10 Fixture dims to approximately 10% light output when unoccupied	EL14L LED Emergency battery pack (nominal 1400 lumens); see Life Safety section ¹¹	
NES7ADCX Sensor Switch® nES 7 ADCX PIR integral occupancy sensor with automatic dimming control photocell ^{5,6}	DIM50 Fixture dims to approximately 50% light output when unoccupied ⁹	SC Surface conduit end cap provisions	
XADS7 XPoint™ wireless controller and micro 360° PIR occupancy and photocell sensor ^{7,8}			
XADNS7 XPoint™ wireless controller and micro 360° PIR occupancy and photocell sensor (egress lighting) ^{7,8}			
MSD7 Sensor Switch® MSD 7 PIR integral occupancy sensor ⁹			

Notes

- 1 Approximate lumen output.
- 2 Not available with XPoint™ Wireless or nLight options.
- 3 nLight EMG option requires a connection to existing nLight network. Power is provided from a separate N80 or N100 enabled fixture.
- 4 See integral occupancy control section in header.
- 5 Requires N80 or N100.
- 6 Not suitable for damp locations.
- 7 Select (blank) under "Lumen management" for this option.
- 8 Gateway not included. Requires on-site commissioning. Visit www.lightingcontrols.com/XPointWireless for more information.
- 9 Not available with EZB or SLD.
- 10 Requires occupancy control. For XPoint™ Wireless select (blank). Standby mode is programmed at time of commissioning.
- 11 Not available with 347V.
- 12 For additional paint finishes refer to Architectural Colors.



WST LED

Architectural Wall Sconce



Catalog Number

Notes

EXTERIOR LIGHTS

Type

Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

Luminaire

Height: 8-1/2"
(21.59 cm)

Width: 17"
(43.18 cm)

Depth: 10-3/16"
(25.9 cm)

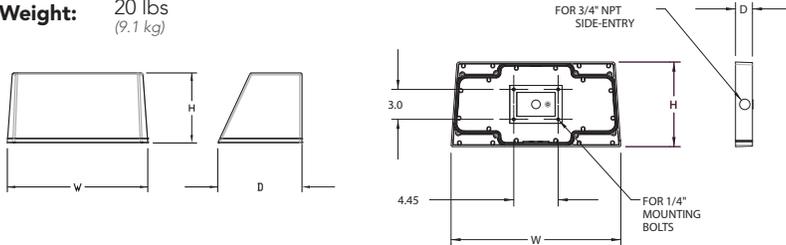
Weight: 20 lbs
(9.1 kg)

Optional Back Box (BBW)

Height: 4"
(10.2 cm)

Width: 5-1/2"
(14.0 cm)

Depth: 1-1/2"
(3.8 cm)



Introduction

The WST LED is designed with the specifier in mind. The traditional, trapezoidal shape offers a soft, non-pixelated light source for end-user visual comfort. For emergency egress lighting, the WST LED offers six battery options, including remote. For additional code compliance and energy savings, there is also a Bi-level motion sensor option. With so many standard and optional features, three lumen packages, and high LPW, the WST LED is your "go to" luminaire for most any application.

Ordering Information

EXAMPLE: WST LED P1 40K VF MVOLT DBBTXD

WST LED	Performance Package	Color temperature	Distribution	Voltage	Mounting	Options	Finish (required)
WST LED	P1 1,500 Lumen package	27K 2700 K 30K 3000 K	VF Visual comfort forward throw VV Visual comfort wide	MVOLT ¹ 120 ¹ 208 ¹ 240 ¹ 277 ¹ 347 480	Shipped included (blank) Surface mounting bracket Shipped separately BBW Surface-mounted back box PBBW Premium surface-mounted back box ² LCE Left side conduit entry ³ RCE Right side conduit entry ³	PE Photoelectric cell, button type PER NEMA twist-lock receptacle only PER5 Five-wire receptacle only PER7 Seven-wire receptacle only PIR Motion/Ambient Light Sensor, 8-15' mounting height ⁴ PIR1FC3V Motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc ⁴ PIRH 180° motion/ambient light sensor, 15-30' mounting height ⁴ PIRH1FC3V Motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc ⁴ SF Single fuse (120, 277, 347V) ⁵ DF Double fuse (208, 240, 480V) ⁵ DS Dual switching ⁶ E7WH Emergency battery backup (7W) ⁷ E7WC Emergency battery backup (cold, 7W) ^{7,8} E7WHR Remote emergency battery backup (remote 7W) ⁹ E20WH Emergency battery backup (20W) ^{7,10} E20WC Emergency battery backup (cold, 20W) ^{7,8,10} E23WHR Remote emergency battery backup (remote 20W) ⁹ Shipped separately RBPW Retrofit back plate VG Vandal guard WG Wire guard	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DSSXD Sandstone DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white DSSTXD Textured sandstone
	P2 3,000 Lumen package	40K 4000 K 50K 5000 K					
	P3 6,000 Lumen package						

NOTES

- MVOLT driver operates on any line voltage from 120-277V (50/60 Hz). Specify 120, 208, 240 or 277 options only when ordering with photocell (PE), fusing (SF, DF), or dual switching (DS).
- Top conduit entry standard.
- Not available with BBW.
- Not available with PE, PER, PER5, PER7, VG or WG.

- Not available with MVOLT option. Button photocell (PE) can be ordered with a dedicated voltage option. Single fuse (SF) requires 120, 277 or 347 voltage option. Double fuse (DF) requires 208, 240 or 480 voltage option.
- Not available with E7WH, E7WC, E7WHR, E20WC, E20WH, or E23WHR. Used with inverter system. Not available with 347/480V. Not available with PE, PER, PER5 & PER7.

- Not available with 347/480V.
- Battery pack rated for -20° to 40°C.
- Comes with PBBW.
- Warranty period is 3-years.



PART SIX - ATTACHMENTS

Attachment A – Energy Model Summary

Attachment B – Proposed LEED Checklist

Attachment C – Drawings and BIM Model (Model is provided electronically)