

ATLANTA VA HEALTHCARE SYSTEM Trinka Davis 12 Bed CLC

VA Contract: 36C77622R0059 Project #: 508-349

For the Department of Veterans Affairs Atlanta, GA

BASIS OF DESIGN NARRATIVE

Bid Documents Submission

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EXECUTIVE SUMMARY

The project intent is to add 12 beds to the Trinka Davis Veteran's Village. These 12 private rooms will have private bathrooms and will have room for co-sleeper space. The rooms will consist of 10 "standard" CLC style rooms and 2 Bariatric rooms capable of patients up to 1000 lbs. This new CLC shall be integrated into the existing facility such that staff, patients, and visitors will be able to share spaces; this will be achieved through proximity to the existing facility, physical connection, and maintaining the unique style and aesthetics of the existing facility.

This addition to the Trinka Davis Veteran's Village was also identified as an "end of life" or hospice unit. As such, the spaces will be slightly different than a typical CLC. There will be a commercial kitchen that is not intended to be used by patients; Meals will be prepared by staff and eaten in the Dining Room or a private room. The den is intended to be used for consultation and is to be accessed off the connector to the main facility. There is also a separate ambulance entrance to the addition.

Finally, the building is to be designed to follow the VA guidelines for sustainability/LEED Silver rating level, although the actual certification is not intended to be pursued.





NARRATIVES

II.1 Civil/Site

1. Existing Conditions:

- a. There is a concrete drive, lined with parking stalls, routed from Martin Drive to the canopy drop off area on the north side of the main building. Two turnarounds are along the drive, located near the northwest and northeast corners of the building. The proposed location for the new building is in the northwest corner of the Trinka Davis VAMC campus, where the western turnaround is currently located.
- b. Currently, the north side of the existing building is primarily used by staff. Patients utilize the surface lot and garage on the south side of the building and use the main entrance on the south face of the building as well.
- c. The existing site has a concrete drive with parking stalls and a turnaround. The turnaround is bordered with a concrete sidewalk and curb gutter, as well as a dozen small to mid-sized trees. The turnaround has mulched, landscaped island. Site lighting aligns the turnaround and parking area. A dumpster pad surrounded by bollards is located on the west side of the concrete drive.
- d. The drive and turnaround slope slightly to the west. To the west of the turnaround, there is a grass hill that drops down in elevation 7-feet at approximately 25% slope. There is a 3-foot hill to the north of the parking stalls as well. The base of the hill has dense brush, trees, and a decorative metal fence along the property limits. The property limits on the north and west side of the site are screened with dense vegetation, consisting of shrubs and trees.
- e. The stormwater on site is collected by storm inlets on the west side of the project site. The storm sewer is routed off the project site in sewers ranging from 26-inch to 36-inch diameter, discharging to a detention pond on the north side of campus. This detention pond discharges the overflow north off campus into a culvert underneath Almon Rd.
- f. The soils on site are primarily fill soils that are silty sand and sandy silt.
- g. The existing site is not in compliance with the VA Security Manual, as vehicular movement can get within the Live Safety 25-feet offset required for the existing building. The turnaround, parking stalls and drive, as well as the covered drop off area to the west of the project area currently allows for cars to travel, load, as well a park within this required offset.
- h. A topographic survey was conducted by TerraMark Land Surveying, Inc. in May 2023. Asbuilts of the main building were also utilized.
 - Site lighting poles and decorative bollards with lighting are within the project area. Electrical conduits for lighting are routed from the east and loop the turnaround. There is an electrical box on the north side of the drive, near the existing canopy.
 - ii. A stormwater curb inlet is on the west side of the turnaround. A 36-inch diameter corrugated metal storm sewer, conveying collected runoff from the south of the building, runs along the west and north side of the site. The sewer





- is routed to a retention pond on the north side of campus. The topographic survey was unable to located this sewer, however, the sewer is identified in the as-builts of the main building's construction.
- iii. There is a water line running through the middle of the project area, routed to a fire hydrant on the north side of the drive, near the existing canopy.
- i. The site is not within the floodplain, per FIRM Flood Insurance Rate Map 13045C0258D (Drainage Narrative Appendix Y, FIRM Map). There are no known wetlands, invasive species, or endangered species within the project area.
- j. A Geotechnical Engineering Report by Terracon Consultants, Inc. in June 2023 indicates that the soils on site are primarily fill soils that are silty sand and sandy silt. Groundwater was observed 14 to 16-feet below grade.
- k. An Infiltration Testing Report by Terracon Consultants, Inc. in August 2023 indicates that the soils at the project site have a saturated hydraulic conductivity (Ksat) value ranging from 0.43 to 1.07 inches/hour and soils in the detention pond have a saturated hydraulic conductivity (Ksat) value of 0.84 inches/hour.
- I. The project will follow the requirements and guidelines of the following documents:
 - Manual for Erosion and Sediment Control in Georgia 2916 Edition by Georgia Soil and Water Conservation Commission (GSWCC)
 - ii. Georgia Stormwater Management Manual 2016 Edition Volumes 1 and 2
- m. Per these documents, the design is required to meet one of two requirements: retain the first 1.0 inch of rainfall on site; or, treat the first 1.2-inches of rainfall with BMPs to remove at least 80% of the calculated average annual post-development TSS loading from the site.
- n. The site is within Lake Carroll Village and zoned as C-2 General Commercial (Narrative Appendix X, Zoning Map).
 - Per the City of Carrollton Unified Development Ordinances Section 4.02.01, the required minimum setback from the property line to the wall of the building is to be a minimum of 15-feet for side yards and rear yards
 - ii. The adjacent properties to the north and west of the project site include residential properties. Per the City of Carrollton Unified Development Ordinances Section 4.07.05, a buffer is required. An acceptable buffer is a minimum 20-feet wide landscaped buffer. Another acceptable buffer is a minimum 10-feet wide landscaped buffer and an opaque fence or barrier at least 6-feet in height.

2. Demolition:

- a. Full-depth asphalt, present in the parking lot and the roundabout, will be completely removed after saw cutting the existing pavement section.
- b. Concrete curb and gutter sections within the parking lot and the roundabout will undergo saw cutting and subsequent removal.





- c. The demolition will involve the complete removal of a concrete sidewalk located on the south-east side of the roundabout. The sidewalk will be sawcut and cleared.
- d. The removal of vegetation, including the root ball, is planned for areas outside the roundabout and the parking lot. Additionally, a 6-foot-tall decorative metal fence on the north side of the parking lot and the building will be taken down.
- e. All five site lighting fixtures positioned around the parking lot and the roundabout will be removed as part of the demolition process.
- f. Electrical conduit, originating from the north-east corner of the parking lot, encircling the roundabout, and extending into the building, will be entirely removed.
- g. A concrete post barricade with lighting situated on the south-east side of the roundabout, along with another concrete post barricade west of the Dumpster Pad, are both scheduled for demolition.
- h. The demolition plan includes the removal of the concrete pad located within the dumpster pad area.
- i. The fire hydrant situated on the north-east side of the parking lot will be removed.
- j. The water line, running from the north-east to the south-west of the parking lot and roundabout, will be dismantled and taken away.
- k. Signs located at the start and end of the roundabout, as well as above the sidewalk on the east side of the roundabout, will be taken down.
- I. The detectable warning strip, located just before the sidewalk on the south side of the parking lot, will be removed.
- m. The demolition process involves the removal of a storm structure situated south of the dumpster pad, just before the roundabout starts. Additionally, the attached storm sewer will be removed. The existing storm structure on the west side will also be dismantled.

3. New Site Work:

- a. The proposed site work includes a new concrete drive and turnaround on the east side of the building. The turn around will have one accessible parking stall and one standard parking stall. To the west of the drive, there is an access drive that is routed to the building's ambulance dock. This access drive will have gate arms at the entrance and the exit of the drive.
- b. Concrete sidewalk is to be installed along the east and south side of the new building, as well as along the western side of the existing main building, tying into the sidewalk by the existing loading dock.
- c. A new dumpster pad will be installed to the northeast of the turnaround. The dumpster pad will be surrounded by an opaque fence.
- d. The City of Carrollton's setback requirements will be met by 20-foot vegetation buffers or 10-foot vegetation buffers in addition to an opaque fence. An opaque fence will be installed on the north side of the site along the property limits, replacing the metal decorative fence. A 10-foot vegetation buffer will be installed north of the turnaround





- and dumpster pad. The northwest and west side of the building will have a 20-foot vegetation buffer. Existing vegetation in addition to new trees and shrubs will be utilized to meet this requirement.
- e. A 6-foot tall decorative metal fence will be installed on the north and southwest sides of the building, restricting access to the back side of the building. A gate will be installed on both of these fences.
- f. A retaining wall will be installed on the north side of the turnaround and dumpster pad. The retaining wall will be up to 4.5 feet tall. A decorative metal fence will be installed along the retaining wall perimeter.
- g. The existing drive and curb and gutter location on the north side of the existing building allows vehicles to drive within the 25-foot offset of the existing main building. The proposed work will tie back into this curb and gutter location. However, the proposed work will maintain the 25-foot offset for the new building per the Life Safety requirements. The proposed site work will reduce the extents of where vehicles can drive within this offset of the existing building.
- h. Turnaround with an island is navigable to single unit passenger vehicles. Larger vehicles will not be able to navigate the turnaround without making multiple maneuvers. The dumpster pad can be accessed by a single unit 30-ft long truck to back up to the pad. However, 30-ft long trucks or larger cannot navigate the turnaround or ambulance access; these vehicles have to reverse the concrete drive.
- i. The new building and relocated fire hydrant are accessible by firetruck. Due to space limitations, the turnaround is not sufficiently sized for the fire truck to turnaround; the truck will have to reverse 234-feet before utilizing the existing turnaround on the northeast side of the existing building. This reverse exceeds that allowable 150-feet reverse distance per the 2018 IFC. A discussion with the Carrollton County Fire Department Fire Marshal determined that this is acceptable due to space constraints.

4. Water Supply

a. An existing hydrant is located on the north side of the access drive. This hydrant will be removed and replaced by a fire hydrant to the northwest, in order to accommodate the new turnaround and dumpster pad location. The fire water line is to be rerouted along the north and west side of the new building, tying back into the existing water line on the southwest side of the new building. A water main is routed to this hydrant around the west side of the existing building. This water line will be relocated around the new building. The fire and domestic water service for the new building will be tapped off of this line. Fire Protection and domestic water testing indicate that there is sufficient capacity for this new service.

5. Sanitary Sewer:

a. No existing sanitary sewers were identified on the northwest side of the building. The existing sanitary sewers on the south and west side of the existing building are too shallow for the new service to be ties into by gravity flow. The building will have a new sanitary lateral routed to Almon Rd. A manhole will be installed to intercept the new service and existing 8" VCP line. The invert elevation for this sewer is available at the





downstream manhole. It is required to field verify the existing sanitary sewer's invert at the location of the new manhole.

6. Storm Drainage System / Management:

- a. The existing stormwater on site is collected by curb inlets and routed to a storm sewer that discharges into a detention pond located on the north side of the campus. The detention basin has a control structure that discharges a controlled flow into the Carrollton municipal stormwater system.
- b. Stormwater calculations are required to determine the impact of the project on the stormwater system and to determine the impact of the project to the downstream basin. The existing detention system is sufficiently sized to address quality and quantity performance of the stormwater discharging from the project area. Infiltration testing within the basin allows for infiltration and storage to meet the following requirements listed below.
- c. The project is a redevelopment of an existing site, as the land disturbing activity is approximately 1.2 acres. There are 12 Stormwater Management Standards that are required, per the Georgia Stormwater Management Manual 2016 Edition Volumes 1 and 2. A summary of the stormwater management performance requirements include:
 - i. Retain the first 1.0 inch of rainfall on the site, or; the remaining runoff from the 1.2-inch rainfall event must be treated by BMPs to remove at least 80% of the calculated average annual post-development TSS loading from the site. The design accomplished the first requirement of capturing and retaining the first 1.0 inch of rainfall on site.
 - ii. The post-development discharge rate is to be controlled to the predevelopment rate for the 2-year through the 25-year return frequency storm events. ICPR was utilized to calculate the discharge rates. An underground stormwater storage and infiltration system is proposed to accomplish these discharge rate requirements.
 - iii. The 100-year, 24-hour storm event must be controlled and/or safely conveyed by maintaining existing 100-year floodplain or ensuring floodplain is adequately sized.
 - iv. A downstream peak flow analysis of the watershed downstream of the site where the area of the site comprises 10% of the total drainage area. The 25year, 24-hour storm flows cannot increase at the outlet. Due to limitations of available downstream capacity information, the design ensures that the downstream peak flow is reduced.

d. Phasing Plan

- i. The site is only accessible from the east, so the work will be constructed from west to east.
- ii. The sidewalk along the west side of the existing building is to be constructed first, as once the building is constructed this side of the building will have limited access.





iii. Site demolition and utility relocation is required prior to the construction of the building. Utilities routed along the west side of the building shall be installed before the building is constructed to ensure access. Staging will be located on the turnaround and parking aisles along the north side of the existing building, east of the project site.

e. Erosion & Sediment Control:

i. The disturbed area is approximately 0.67 acres. The hills on the west and north side of the site are vulnerable to erosion due to their steep grade. Protecting these hills with erosion control methods is important. Erosion control blankets, inlet protection, and silt fences will be utilized to protect the site from erosion. A construction entrance located on the east side of the site will be utilized to prevent vehicles from transporting soil offsite.

II.2 Architectural/Interior Design

The architectural design approach is to relate to the existing architectural vocabulary at the village. The proximity to the Main CLC building requires exterior architectural detailing that respects and references the original structure.

The design approach to the exterior building envelope, structure, and roof assembly stems from three premises – the height of the new building, selection of materials, and exterior architectural elements and details used in order to achieve a design that is sympathetic to the existing campus. The design team has prepared an outline of materials, roof system and structure comprising the main components of the building design. They are as follows:

- Steel frame structure with composite metal decking and concrete slab floors, see structural narrative for alternates.
- Exterior wall to be brick and stone veneer with closed cell spray foam insulation and sheathing on cold formed metal stud framing.
- Pitched roof assembly will be comprised of pre-engineered light gage trusses with synthetic clay tile roofing to match those used for existing roof. Roof to have in R-30 insulation.
- Low slope roof assembly will be comprised of R-30 minimum continuous insulation, vapor barrier and EPDM roof membrane. The structure will not slope. Drainage will be achieved by use of tapered insulation to roof drains connected to internal drain leaders.
- Exterior doors to be aluminum frame entrance doors and storefront to match the existing building.
- Windows to be aluminum frame windows with in between glass muntin grids to match existing building.
- Cold formed metal stud framing (3-5/8", 6" and furring sizes) interior partitions and exterior wall furring as needed.
- Prefinished metal gutters and downspouts to match existing building.
- Interior wall finish of painted GWB.
- Interior ceiling to be approximately 60% drop-in ACT ceiling and 40% painted GWB.
- Interior doors to be hollow metal frames with stained flush wood doors.
- The 10 standard rooms shall be provided with a "H" style patient lift system with a 600lb capacity. The lift system will provide coverage of as much area as practical including the patient bathrooms. The bariatric rooms will have lift systems capable of 1000lb.





See Interior Narrative for additional finishes.

INTERIOR DESIGN

The new CLC Building at VA Trinka Davis will be a single-story building with a mechanical basement. The building will be designed to be a space that supports personalized care for veterans administered with integrity, respect, and commitment. The building design will consist of 12 patient rooms, with two out of the twelve rooms designed to serve bariatric patient population. The building will be connected to the existing CLC via a covered, temperature-controlled walkway. A common living and dining space, with elevated ceilings and large windows, shall provide space for patients to socialize, have a meal together, or meet with visitors. With a full-service commercial kitchen on the premises, the staff offices and restricted areas are intended to be "back of house" in the core of the building. The patient rooms will be located at the periphery to capture daylight and views, critical to patient healing and wellbeing. Each patient room will have an attached restroom and a closet for storage. Enclosed patio spaces around the building will allow patients to be close to nature and enjoy the outdoors.

The finishes for the new building shall align with the finishes used in the existing CLC building at Trinka Davis. Paint colors to be matched with the existing colors and other finishes to align with color palette currently in place. Finishes shall include high performance latex paint; LVT shall be used for flooring in most of the dining, corridor, and patient room areas. Carpet is proposed to be used in common living area spaces, whereas restrooms shall have ceramic tile flooring. All casework to be plastic laminate. Charting stations and millwork to have solid surface countertops and backsplashes. Fixed furniture shall be provided by the contractor. All corridors and high traffic areas shall have high impact resistant wall covering. Locally manufactured, natural stone tile veneer, set in mortar bed will be used both indoors and outdoors to match the aesthetic of the existing CLC building.

II.3 Fire Protection/ Code Compliance/ Life Safety

PG 18-3 Design and Construction Procedures

VA Directives, Design Manuals, Master Specifications, VA National Cad Standard Application Guide, and other Guidance on the Technical Information Library (TIL) (http://www.cfm.va.gov/TIL/).

VA Design Manuals PG-18-10

ARCHITECTURAL, AUGUST 1, 2014

ASBESTOS ABATEMENT, JULY 2011

AUTOMATED TRANSPORT SYSTEMS, May 2023

CPM SCHEDULE AND RISK MANAGEMENT, VOL. 1 & 2, DECEMBER 2012

ELECTRICAL, DECEMBER 2019

ESTIMATING, MARCH 8, 2011

FIRE PROTECTION, NINTH EDITION, NOVEMBER 2023

HVAC DESIGN MANUAL - NOVEMBER 1, 2017, REV NOVEMBER 2023

INTERIOR DESIGN, NOVEMBER 1, 2020

LIGHTING, JANUARY 2022





PHYSICAL SECURITY DESIGN MANUAL, OCTOBER 1, 2020, REV JUNE 2023 PLUMBING, JANUARY 2023

SIGNAGE, MAY 2023

SITE PARKING, APRIL 2023, REV NOVEMBER 2016

SITE DESIGN, FEBRUARY 2013, REV APRIL 2021

STEAM BOILERS, VOL 1 OCTOBER 2022

WATER BOILERS, VOL 2 DECEMBER 2023

OUTSIDE STEAM AND HEATING HOT WATER DISTRIB. SYSTEMS, VOL 3 SEPTEMBER 2022

STRUCTURAL, OCTOBER 2022, REV JULY 2023

SUSTAINABLE DESIGN, MAY 2014, REV AUGUST 2017

TELECOMMUNICATIONS, FEBRUARY 2016

VA Design Guides PG-18-12

INPATIENT MENTAL HEALTH AND RESIDENTIAL REHAB FACILITIES, JANUARY 2021

MENTAL HEALTH OUTPATIENT SERVICES, JULY 2018

Other Criteria

ARCHITECTURAL BARRIERS ACT ACCESSIBILITY STANDARDS (ABAAS) INCLUDING VA SUPPLEMENT, BARRIER FREE DESIGN STANDARD PG-18-13, JANUARY 2017, REV OCTOBER 2023

NEPA INTERIM GUIDANCE FOR PROJECTS PG-18-17, SEPTEMBER 2010

SEISMIC DESIGN REQUIREMENTS, H-18-8, JULY 2023

ENERGY POLICY ACT OF 2005 (EPACT)

OCCUPATIONAL, SAFETY, AND HEALTH ADMINISTRATION (OSHA) STANDARDS

EXECUTIVE ORDER 13423: STRENGTHENING FEDERAL ENVIRONMENTAL, ENERGY, AND TRANSPORTATION MANAGEMENT.

Governing Building Codes

NFPA 101 LIFE SAFETY CODE, 2024 EDITION

NFPA NATIONAL FIRE CODES WITH THE EXCEPTION OF NFPA 5000 AND NFPA 900, INCLUDING BUT NOT LIMITED TO:

NFPA 10, STANDARD FOR PORTABLE FIRE EXTINGUISHERS, 2022 EDITION

NFPA 13, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS, 2022 EDITION

NFPA 70, NATIONAL ELECTRIC CODE, 2023 EDITION

NFPA 72, NATIONAL FIRE ALARM AND SIGNALING CODE, 2022 EDITION

NFPA 80, STANDARD FOR FIRE DOORS AND OTHER OPENING PROTECTIVES, 2022 EDITION

NFPA 99, HEALTH CARE FACILITIES CODE, 2024 EDITION





NFPA 220, STANDARD ON TYPES OF BUILDING CONSTRUCTION, 2024 EDITION

NFPA 241, STANDARD FOR SAFEGUARDING CONSTRUCTION, ALTERATION, AND DEMOLITION OPERATIONS, 2022 EDITION

ICC INTERNATIONAL CODE COUNCIL CODES, INCLUDING BUT NOT LIMITED TO:

INTERNATIONAL BUILDING CODE, 2021 EDITION

INTERNATIONAL PLUMBING CODE, 2021 EDITION

INTERNATIONAL MECHANICAL CODE, 2021 EDITION

INTERNATIONAL ENERGY AND CONSERVATION CODE, 2021 EDITION

ASHRAE STANDARDS, AS REFERENCED WITHIN OTHER CODES INCLUDING, BUT NOT LIMITED TO:

90.1 ENERGY STANDARDS FOR BUILDINGS EXCEPT LOW-RISE RESIDENTIAL BUILDINGS, 2016 EDITION

170 VENTILATION OF HEALTHCARE FACILTIES, 2017 EDITION

188 LEGIONELLOSIS: RISK MANAGEMENT FOR BUILDING WATER SYSTEMS, 2018 EDITION FACILITY GUIDELINES INSTITUTE (FGI)

GUIDELINES FOR DESIGN AND CONSTRUCTION OF HOSPITALS, 2018 EDITION

GUIDELINES FOR DESIGN AND CONSTRUCTION OF OUPATIENT FACILITIES, 2018 EDITION

BEHAVIORAL HEALTH DESIGN GUIDE, 2019 EDITION

ASCE-07-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES

ACI 318-11 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

ACI 530-11 BUILDING CODE REQUIREMENTS AND SPECIFICATION FOR MASONRY STRUCTURES

AISC 341-10 SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS

AISC 360-10 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS

Code Criteria

General: This summary of code requirements is based primarily on NFPA 101 (LSC). Design features not addressed by NFPA 101 or documents referenced therein shall comply with the requirements of the latest edition of the IBC or as otherwise identified. For design features that are addressed by both the IBC as well as NFPA 101 or a document referenced by NFPA 101, the requirements of NFPA 101 or the document referenced by NFPA 101 shall be used exclusively (this applies even if the IBC requirements are different).

Local codes: as an agency of the federal government, VA is not subject to local imposition of code enforcement procedures (drawing reviews, building permits, inspections, fees, etc.). VA must function as the authority having jurisdiction (AHJ) and thus has the responsibility to guard public health and safety through enforcing its adopted codes.





Notes: Should a conflict exist between VA requirements and VA adopted nationally recognized codes and standards, the conflict shall be brought to the attention of VA. The resolution of the conflict shall be made by the authority having jurisdiction for VA to ensure a consistency system wide.

Code review

The 2024 edition of the Life Safety Code, NFPA 101, has been used to review this project for compliance with the fire and life safety requirements. For features not addressed by NFPA 101 and the referenced national fire codes, the 2021 edition of the International Building Code has been used.

Project scope

The CLC will be a 12-bed unit. The construction type is determined based upon the allowable area and height requirements of Chapter 5 of the 2021 IBC. Construction type and materials shall be per Chapter 6 of the IBC.

Occupancy type: Existing B, I-1. New I-2 Healthcare, IBC Chapter 3/LSC Chapter 18

Construction type: Existing IIB, IIIA. New IBC II-B, NFPA II(000)

3. Fire resistive ratings type construction, Chapter 6 IBC/NFPA 101:

Structural frame: noncombustible, 0-hour fire resistive

Bearing walls noncombustible, 0-hour fire resistive

Interior: noncombustible, 0-hour fire resistive

Non-bearing walls and partitions

Exterior:

Exterior: noncombustible, 0-hour fire-resistive

Interior: noncombustible, 0-hour fire-resistive

Floor: noncombustible, 0-hour fire resistive

Roof: noncombustible, 0-hour fire resistive

Shaft enclosures 1-hour fire resistive <4 stories (IBC 713.4, LSC 12.3.6)

noncombustible, 0 -hour fire resistive

- 4. Structural design shall comply with Chapter 16 of the IBC.
- 5. Allowable height: 55'. (IBC, table 504.3)
- 6. Allowable number of stories above grade plan: 1. (IBC, table 504.4)
- 7. Allowable area: 44,000 SF. (IBC, table 506.2)
- 8. Building separation: >30': 0-hour fire rating
- 9. Occupancy separation: 2-hour fire rating
- 10. Means of egress
 - Clear width of corridors shall be clear 96 inches.
 - Clear width of doors shall be clear 36 inches





- Not less than 2 exits shall be provided per floor.
- Occupancy load: <500 therefore 2 exits required (NFPA 101 7.4.1.1)
- Maximum travel distance, fully sprinkled: 200 feet (NFPA 101 18.2.5.7.2.4)
- Common path of travel shall not exceed 100 feet (NFPA 101 18.2.5.2)
- Dead end corridors shall not exceed 30 feet. (NFPA 101 18.2.5.3)
- Means of egress shall be illuminated. (LSC 18.2.8)
- Exit signage shall be provided. (LSC 18.2.10)
- 11. Protection from any area having a degree of hazard greater than that normal to the general occupancy of the building or structure shall be provided by protecting the area with automatic extinguishing systems in accordance with section 9.7(3). Where hazard is severe per LSC Chapter 18, soiled holding, protection is provided with an automatic extinguishing system the space shall also be enclosed with smoke partitions in accordance with section 8.4.
 - 1-hour fire resistance rating and automatic sprinkler system is required for the following: soiled holding and high hazard content areas per LSC 18.2.2.

12. Interior finish

- Walls and ceilings: interior finish flame spread shall be limited per Chapter 8 of the NFPA 101 to Class A, B and C materials. Interior wall and ceiling finish shall be Class A or Class B in exits, corridors and lobbies, and Class A, Class B, or Class C in all other areas. (LSC 18.3.3)
 - Class A: flame spread 0-25; smoke developed 0-450.
 - Class B: flame spread 26-75; smoke developed 0-450.
- Floors: interior floor finish shall be Class I or Class II in corridors and exits.
- Fabric draperies, curtains (excluding shower curtains, but including cubicle curtains), and
 other loosely hanging fabrics and films serving as furnishings or decorations in health care
 occupancies must meet the flame resistance requirements of NFPA 701, standard methods
 of fire tests for flame-resistant textiles and films.
- Upholstered furniture and mattresses. Upholstered furniture and mattresses must also meet specified requirements, based on NFPA 260, NFPA 261, NFPA 266, 16 CRF 1632, ASTME E1537, and ASTME E1590.
- New finishes shall be as follows:

As shown on drawings (60% submission and later)

- 13. Extinguishments requirements, portable fire extinguishers shall be provided per NFPA 10. (18.3.5)
- 14. Detection, alarm, and communications systems See Fire Protection Section of this narrative.
- 15. Fire suppression See Fire Protection section of this narrative.





II.4 Structural Design

DESIGN CODES:

- IBC 2021 "International Building Code"
- ACI Standard 318-19, "Building Code Requirements for Structural Concrete", American Concrete Institute
- AISC Steel Construction manual, 15th edition
- Significant variations from the above in local building codes shall be brought to the attention of the structural engineer, for approved substitution prior to their use in the structural design.

ROOF FRAMING:

The main elevated portion of the structure for the CLC building will consist of concrete composite steel wide flange beams supported by a mix of wide flange and HSS tube shaped columns. The steel structural elements and composite deck are all designed to resist load defined by governing codes in addition to blast loading for a VA Essential facility per the requirements set forth by the VA Physical Security Resiliency Design Manual. The composite deck is designed to act as a "lid" to protect the structural elements in the event of a blast, however in order to achieve the hipped roof design for the clear story additional structural supports are to be provided in the form of cold form steel trusses and metal roof deck spanning across the top chord. As these trusses are purely to support the aesthetic of the architectural roof design, in the event of a blast event they are considered sacrificial.

In addition to the main CLC building, Guidon has also designed a structurally isolated connecting corridor between the existing main building and the new CLC building. This corridor structure consists of metal roof deck supported by steel wide flange beams and HSS tube columns.

LATERAL BRACING SYSTEM FOR SEISMIC & WIND LOADS:

Seismic and wind loading will be transferred to the structure by use of moment frames located at all clear story framing locations.

FOUNDATIONS:

Individual walls will be supported by a foundation wall that will sit on a continuous footing underneath. Due to grade changes and the addition of a basement, some of the foundation will serve as retaining walls supporting backfill for the slab on grade. Retaining walls on the exterior supporting backfill and the brick façade have been designed as a cantilever style wall resisting the active earth pressures. Walls specifically supporting the basement steel framing have been designed as restrained and to resist the At-Rest earth pressures. Structural steel columns will be supported on concrete piers that will transfer the load to a typical shallow footing. All foundations will sit at a minimum of 2 feet below grade to ensure the structure will not be subjected to heave from the soil freeze-thaw cycles. All footings have been designed with an assumed allowable bearing pressure of 3,000 psf per the referenced geotechnical report.

STRUCTURAL LOADING CRITERIA:

Roof live loads shall be based on geographical location and local governing building code requirements; however, they shall not be less than 20 psf. Where the roof elevations of the structures vary, snow drift loads will be considered.

The snow, wind and seismic loads will be based on the following criteria:

Snow Load Design Data:





- Ground Snow Load, pg = 5 psf
- Low-slope Roof Snow Load, p_f = 4 psf
- Snow Exposure Factor, C_e = 1.0
- Thermal Factor, C_t = 1.0
- Wind Load Design Data
 - Basic Wind Speed (3-second gust), V = 115 mph
 - Wind Exposure = B
- Seismic Load Design Data (assumed values will be verified with geotechnical report):
 - Short Period Spectral Response, S_s = 0.187g
 - 1-Second Spectral Response, S₁ = 0.085g
 - Seismic Importance Factor, I = 1.25
 - Risk Category = III
 - Seismic Design Category = C
 - Site Classification = D per Geotech report
 - Short Period Spectral Response Coefficient, S_{ds} = 0.199
 - 1-second Spectral Response Coefficient, S_{d1} = 0.135
 - Basic Structural System / Seismic Resisting System: Steel Systems not specifically detailed for seismic resistance, excluding cantilever column systems.
 - Analysis Procedure Utilized = Equivalent Lateral Force Procedure
 - Response Modification Coefficient, R = 3

II.5 Program

Summary: The units shall be built according to the Small Homes Design Guidelines. In March of 2019, a new version of The Small Homes Design Guide, replaced the previous CLC or Community Living Centers Design Guide. In accordance with the new guidelines, all the room and attached bathrooms in the short stay unit will be universal in size.

II.6 Fire Protection

<u>Fire Protection System Description</u>

- For the design features that are addressed by NFPA 101 or a document referenced by NFPA 101, the requirements of NFPA 101 or the documents referenced by NFPA 101 must exclusively be used this applies even if other code requirements are different.
- 2. Local Codes, as an agency of the federal government, VA is not subject to local imposition of code enforcement procedures (drawing reviews, building permits, inspection fees, etc.). VA must function as the authority having jurisdiction (AHJ) and thus has the responsibility to





- guard public health and safety through enforcing its adopted codes. At this time no conflicts are identified.
- 3. In areas of scope of work where twelve (12) bed building addition shall occur for this area of work. The new fire suppression system, sprinkler piping, sprinkler heads, sprinkler branch piping, fitting, hangers, and other miscellaneous items shall be provided for a complete fire suppression system.
- 4. The fire sprinkler system will be designed and installed per latest editions of the National Fire Protection Association (NFPA) standards, Technical Information Library (TIL) Division 21 Specifications, and per the requirements of VA Fire Protection Design Manual.
- 5. Sprinkler Discharge Densities will follow the requirements stated in the Technical Information Library (TIL), Specification 21 13 13, "Wet-Pipe Sprinkler System."
- 6. The size of the distribution main within the building will use the fire hydrant flow tests provided by ATCO Fire Protection as a design input where the results of the test are 1,130 gpm flow capacity with 80 psi static pressure and 52 psi residual pressure and the distribution piping shall be fed at the closest tie in point.
- 7. Sprinkler piping shall be routed to accommodate the architectural configuration. All new sprinkler heads shall be ceiling mounted, semi-recessed to match existing conditions in the Trinka Davis adjoining building and meeting the VA Fire Protection Design Manual. The sprinkler heads shall be mounted on a smooth ceiling for typically light hazards and if any rooms meet the requirements for Ordinary Hazard Group 1 and Ordinary Hazard Group 2 stated in Specification 21 13 13, Wet-Pipe Sprinkler System then semi-recessed sprinkler heads with ordinary hazard design criteria shall be provided in the affected room/area.
- 8. A wet pipe, automatic sprinkler system utilizing quick-response type sprinkler heads will be furnished/installed in all locations within this scope of work. Sprinkler head finishes will be bronze upright in areas without ceilings and, semi-recessed pendent sprinkler head with two-piece escutcheon plate in all finished areas meeting existing conditions.
- 9. Electric Rooms shall be provided with sprinkler protection meeting the requirements of the VA Fire Protection Design Manual and NFPA 13.
- 10. <u>Fire Alarm and Sprinkler Zones share the same boundaries meeting the VA Fire Protection Design Manual.</u>
- 11. The kitchen hood suppression system shall meet the requirements of NFPA 17A and NFPA 96.
- 12. Hydraulic calculations shall be prepared by the installing contractor and the calculations shall meet NFPA 13, Section 28.1.1.1(2) and provide a minimum of 10 percent safety factor using water flow velocities not exceeding 20 feet per second meeting the VA Technical Information Library (TIL) requirements. Hydraulic placard plates will be provided on each riser assembly meeting NFPA Standards.
- 13. All wet-pipe sprinkler systems will be hydrostatically tested per NFPA 13 and the VA Fire Marshal by the fire protection installation subcontractor. The fire suppression contractor shall test the system at 225 psi or 50 psi above operating pressure (whichever is greater) for 2 hours and copies of the Material Test Certificates will be provided for the VA Fire Marshal's records.
- 14. All sprinkler piping 3 inch and larger shall be seismically braced. Seismic design and installation will be based on the requirements of NFPA 13 and meet the requirements of the VA the Seismic Design Requirements Manual.





- 15. The fire sprinkler system will be designed and installed per the latest editions of the National Fire Protection Association (NFPA) standards, Technical Information Library (TIL) Division 21 Specifications, and per the requirements of VA Fire Protection Design Manual.
- 16. Sprinkler Discharge Densities will follow the requirements stated in the Technical Information Library (TIL), Specification 21 13 13, "Wet-Pipe Sprinkler System."
- 17. Lower duration values specified in NFPA 13, Table 19.2.2.1 shall be used as a basis of design since the sprinkler water flow alarm device(s) and supervisory device(s) are electronically supervised and such supervision is monitored at an approved, constantly attended location.

Fire Protection During Construction

- 1. Fire protection during construction of the new building shall follow the requirements of Specification 010000, General Requirements and NFPA 241 to include but not limited to:
 - a. Separation distance between the new building construction and construction-related structures for temporary offices, trailers, sheets, lay-down yards, etc., shall be maintained and in compliance with NFPA 241.
 - b. Hot Work Permits, Fire Watch, Temporary Heating Equipment, Smoking, Waste Disposal, and Handling & Storage of Combustible and Flammable Liquids Requirements shall be compliant with NFPA 241.
 - c. Temporary wiring & lighting and extension cords shall follow the requirements of NFPA 70, National Electric Code.
 - d. Contractor fire safety program shall comply with the requirements of NFPA 241, Section 7.1.2.
 - e. Owner's Responsibility for Fire Protection where a VA shall designate an owner's representative where a person shall have the responsibility for the fire prevention program and who shall ensure that it is carried out to its completion shall be an owner responsibility item.
 - f. Fire Protection installations shall comply with the requirements of NFPA 13, 25 & 72.
 - g. Fire Hydrants shall be free access from the street to the fire hydrants and outside connection for sprinklers and other fire extinguishing equipment whether permanent or temporary and it shall be provided and always maintained.
 - h. First-Aid Fire-Fighting Equipment shall comply with NFPA 241.
 - i. Adherence to NFPA 241, Section 8.2, "Scaffolding, Shoring and Forms."
 - j. Fire protection during construction where a water supply for fire protection, either temporary or permanent shall be made available as soon as combustible material accumulates on the project site.
 - k. Wet-pipe sprinkler system shall be provided, installed and in service as soon as practicable.
 - I. The requirements of Chapter 9, "Safeguarding Roofing Operation" of NFPA 241 shall apply concerning the means and methods of roof installation.
 - m. A written fire prevention, fire suppression and emergency evacuation plan shall be developed, maintained and kept up to date at the project site.
 - n. All fire protection extinguishing equipment applicable to the hazard shall be provided, e.g., ABC Fire Extinguishers
 - p) All hot work shall comply with NFPA 51B.

Fire Alarm System Description





- 1. The fire alarm system will be a Class B, fully addressable, multiplexed fire alarm system complying with the requirements of NFPA 72. The system will comply with the NFPA, and VA Fire Protection Design Manual. Fire alarm pull stations will be located at each exit door and at other strategic points as required by the National Fire Alarm Code and the VA Fire Protection Design Manual for detection and audio/visual annunciation. Smoke Detection shall be provided where, the fire alarm transmitting equipment is located. Duct smoke detectors shall be used to control HVAC equipment shutdown where required by Code.
- 2. For the design features that are addressed by NFPA 101 or a document referenced by NFPA 101, the requirements of NFPA 101 or the documents referenced by NFPA 101 must exclusively be used this applies even other code requirements are different.
- 3. VA is not subject to local imposition of code enforcement procedures (drawing reviews, building permits, inspection fees, etc.). VA must function as the authority having jurisdiction (AHJ) and thus has the responsibility to guard public health and safety through enforcing its adopted codes. At this time no conflicts are identified.
- 4. The fire alarm system additions will be a class-B fully addressable monitoring points that shall be added to the existing fire alarm control panel.
- 5. The fire alarm system additions shall be installed as required by NFPA 101 and shall be designed to meet the requirements contained in NFPA 72 and the VA Fire Protection Design Manual.
- 6. The fire alarm system shall meet the requirements where the system shall have a "Pathway Designation" of a Class B system, fully addressable, multiplexed fire alarm system complying with NFPA 72 and the VA Fire Protection Manual.
- 7. The fire alarm system additions shall be fully addressable fire alarm system designed to the standards of a Class B Circuit and Pathway (e.g., NFPA 72, Chapter 12). The signaling line circuit connecting annunciators shall be Class B (Style 4). The signaling line circuit connecting to addressable/digital devices including detectors, and notification circuit modules shall be Class B. All notification appliance circuits shall be Class B.
- 8. Wiring will be installed in metal raceways within the building to meet the requirements of Pathway Survivability Level 2 in compliance with NFPA 72, Section 12.4.3. The wiring for the local building fire alarm system within new building construction shall be as defined by NFPA 72 as follows:
 - a. Initiating Device Circuits (IDC): Class B
 - b. Notification Appliance Circuits (NAC): Class B
 - c. Signaling Line Circuits (SLC): Class B
- 9. All notification devices shall be individually addressed and connected to a signaling line circuit.
- 10. Visual alarm devices will be installed in all public and patient toilet areas. Combination audio and visual devices will be installed within corridors, at exits, and within large assembly areas in accordance with the requirements of the National Fire Alarm Code and the VA Fire Protection Design Manual. Manual fire alarm boxes shall be installed within 60 inches of exit doors for compliance with NFPA 101, Section 9.6.2.3; and additional manual fire alarm boxes shall be provided so that the travel distance does not exceed 200 feet, measured horizontally (e.g., Refer to NFPA 72, Section 17.14.8.5).





- 11. Corridor smoke detection shall be provided in all smoke compartments containing patient rooms meeting NFPA 101, Section 18.3.4.5.3 at 30 feet on center for advance notification of a potential fire incident.
- 12. The commercial kitchen area shall be provided with smoke detection meeting the requirements of NFPA 101, Section 18.3.2.5.3(13).
- 13. The new Fire Alarm Control Panel for the new Trinka Davis Building addition shall be interfaced with the existing main fire alarm control panel located in room E048.
- 14. The fire alarm control panel shall have secondary power supply using batteries and the batteries shall have sufficient capacity to operate the system under quiescent load for a minimum of 24 hours and at the end of that period shall be capable of operating all alarm notification appliances used for evacuation or direct aid to the location of an emergency for 5 minutes (Refer to NFPA 72, Section 10.6.7.2.1). The installing contractor shall prepare battery calculations and the calculations shall include a minimum 20 percent safety margin above the calculated amp-hour capacity required (Refer to NFPA 72, Section 10.6.7.2.1.1.
- 15. Visual alarm notification devices shall flash in synchronization where multiple appliances are in the same field of view, as defined by NFPA 72 and the VA Fire Protection Design Manual.
- 16. The fire alarm system will conform to NFPA, VA Fire Protection Design Manual and ABA (Architectural Barriers Act), Accessibility Standard for Federal Facilities regulations.
- 17. There are door holders, smoke detectors, and notification devices within the area of the scope of work.
- 18. Visual alarm devices will be installed in all public and patient toilet areas. Combination audio and visual devices will be installed within corridors, at exits, and within large assembly areas in accordance with the requirements of NFPA 72 and the VA Fire Protection Design Manual.
- 19. Combination audio and visual devices will be installed within corridors, at exits of the single-story building addition and Smoke Detectors shall be provided in accordance with the requirements of NFPA 72 and the VA Fire Protection Design Manual.
- 20. VA Fire Protection Design Manual, Section 7.4.D only allows smoke detectors to be installed only where required by National Fire Codes and the VA Fire Protection Design Manual, such as elevator lobbies for elevator recall, locations where a fire alarm control panel are located or Telecommunication spaces where smoke detectors provide early warning of a fire in accordance with NFPA 75 throughout the space and installed in accordance with NFPA 72.
- 21. All fire alarm wiring must be installed in raceway separate from all other system in compliance with the VA Fire Protection Design Manual, Section 7.2.D.
- 22. The scope of work areas will have requirement of employing relocation or partial evacuation, wiring shall be installed in a metal raceway within the areas that a protected throughout by sprinkler protection are considered to meet the NFPA 72 requirements for Pathway Survivability as a 2-hour performance alternative that has been approved by the VA Fire Official and is permitted for voice communication systems in the VA Facilities per the VA Fire Protection Design Manual, Section 7.2.F.
- 23. The electrical contractor will provide back boxes with empty conduit and pull wire to above nearest accessible ceiling. The fire alarm vendor will furnish, install, and wire all new fire alarm devices.
- 24. Fire Alarm Monitoring of the new fire alarm control panel and the existing fire alarm control panels shall be fully tested, confirmed, and accepted by the VA Medical Center designated Fire Protection Engineer for compliance with NFPA 72 relative to 24/7 monitoring of the fire alarm system protecting this space.





I.6 Mechanical - HVAC

The purpose of this narrative is to explain the engineering criteria and rationale used for selecting the type of HVAC system and thermal zoning of the tentative system being proposed for the new Trinka Davis Community Living Center (CLC) in Atlanta, GA. The CLC will be a single-story approximately 12,000 square-foot facility that will accommodate the space program and interior functional requirements of the VA Small House Model.

The HVAC system selection shall comply will also comply with the VA Sustainability Design Manual Guiding Principles. During every design phase, completed 2016 Guiding Principles Checklist and supporting documents will be submitted to the VA.

Mechanical HVAC – System Selection

One of the goals of the project team will be to achieve building substantial reduction of energy consumption based on the VA Sustainability Design Manual Requirements. One of the mandatory requirements for the team is to submit a Life Cycle Cost Analysis (LCCA) for considered HVAC systems for the project. The second requirement is to comply with the VA 2016 Guiding Principles for Sustainable Federal Buildings of Energy Conservation for New Construction. The Baseline Energy Conservation for the selected HVAC system is to reduce building energy consumption by approximately 25% based on PERFORMANCE RATING METHOD of ASHRAE 90.1-2013. Appendix G.

Air Handling Systems

1. Based on the LCCA performed at the 35% design phase, a VRF system is the basis of design system for the project. The proposed VRF system includes a variable refrigerant volume 3-pipe system allowing simultaneous heating and cooling to multiple rooms with precise control. Outdoor heat recovery condensing units will convert heat of rejection and deliver heating to heat required spaces. Fully integrated system controls of the system (heat recovery) allows achieving Energy Efficiency Ratio (IEER) up to 27-28, considerably exceeding energy standards. A variety of selected choices of indoor units allows flexibility for air distribution. The 100% outside air DOAS unit will have DX cooling and heating. The Energy Efficiency will be at least EER = 11.

HVAC System Zoning and Controls

Thermostatic individual zones control was used for this project. This type of control is defined as a space or group of spaces whose load characteristics are sufficiently similar that the desired space conditions could be maintained with a singular controlling device. For example, spaces with exterior wall and glass exposure shall not be zoned with interior spaces. Each zone with be provided with air control devices for all zones. All new supply and return air ductwork and air terminals shall be provided. Return air will be ducted system.





Kitchen System – This will be the primary location of food preparation in this building. Commercial appliances will be selected and provided by others. A dedicated exhaust fan and DOAS unit shall be provided for exhaust and makeup supply air to the new kitchen hoods.

Outdoor Design Conditions

The summer design cooling and winter design heating temperatures that will be used to calculate heating and cooling loads are values for Atlanta Hartsfield International Airport, Georgia that were listed in the VA HVAC Design Reference Page 7-5.

• Summer 1%: 93.9°F DB/74.2°F WB

Winter 99%: 21.5°FExtremes: 96.7°F/14.1°F

Indoor Design Conditions

1. Health Care Functions – Patient spaces will follow the Home Room Data Sheets (Page 6-34 through 6-37 of HVAC Design Manual).

Summer: 75.0°F DB/55% RHWinter: 70°F DB/20% RH

2. Support Functions – Design conditions for all applicable support function spaces listed in the HVAC Design Manual for New, Replacement, Addition and Renovation of Existing VA Facilities (Section 6) shall be as follows:

Summer: 75.0°F DB/55% RH

• Winter: 70°F DB

3. Hours of Operation

• Continuous Operation

Building Automation System

A new building DDC controls will be fully integrated with existing facility controls on the site. The new system will be interfaced for use in BACnet.

<u>Additional Energy Conservation Measures</u>

The following energy conservation measures were proposed based on Sustainable Design Manual of US Department of Veterans Affairs, Published on May 6th, 2014, and Revised on August 18th, 2017. Items 2 and 6 to be discussed with the VA at the 65% review meeting.

1. NEMA Premium efficiency motors – Premium efficient motors that reduce electrical power consumption and costs.

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- 2. Energy meters (BTU meters) BTU meters measure the energy content (temperature sensor and flow meter) of liquid flow and shall be used in both the heating water and chilled water systems.
- 3. Independent setback set points for unoccupied periods of time (for room units).
- 4. Automatic off by occupancy sensors.
- 5. System control strategies:
- 6. Advanced Energy and Water Metering this project will require installation of Advanced utility meters electrical, hot water, domestic water and gas meters, capable of measuring and recording aggregated usage data for evaluating by building personnel for energy, water and gas consumption and management. Meters shall have built-in capabilities to communicate to onsite automated metering infrastructure.

Indoor Environment Air Quality

- 1. Thermal control of the building complies with VA Design HVAC Guide, November 1, 2017.
- 2. Mechanical ventilation requirements for the spaces are determined according to ASHRAE Standard 170-2008, Section 7 and 2010 FGI Guidelines for Design and Construction of Health Care Facilities and ASHRAE 62.1-2010.
- 3. Monitoring ventilated spaces by providing direct outdoor airflow measuring stations capable of measuring the minimum outdoor air intake with display and alarm.
- 4. During the construction phase the Contractor shall comply with SMACNA Indoor Quality Guidelines

Enhanced Indoor Air Quality

- 1. Each ventilation system outdoor air will have filters with a minimum value MERV of 13
- Refrigerant leakage devices will be utilized, monitored and supervised according to ASHRAE 15.

Ozone-Depleting Substances

- 1. Project will not use CFC type refrigerants and will minimize the use of ozone-depleting substances (ODP) to comply with EPA's Significant New Alternatives Policy program.
- 2. Refrigerant leakage devices will be utilized and supervised.

Acoustics

1. HVAC system will comply with PG 18-3 Topic 11, Noise Transmission Control.

I.7 Plumbing

Plumbing Fixtures

All plumbing fixtures in the building shall be designed and selected with institutional use in mind and be of first quality in accordance with VA Standards.





The new plumbing systems that support these spaces will be designed per the latest accepted versions of the International Plumbing Code, the Georgia State Plumbing Code and the Veterans Affairs (VA) plumbing design manual.

New plumbing fixtures will include but are not limited to: vitreous china water closets, vitreous china lavatories, stainless steel drop in sinks, bowls integral to solid surface counter tops, and one-piece molded stone mop receptor. Emergency eye wash stations will be located as necessary throughout the facility.

Water closets shall be floor mounted with manual flush valve. The flush valve will initiate 1.6gpf.

Faucets shall be manual operated with laminar flow type gooseneck spouts. Laminar flow devices will have a flow range of a maximum of 2.2 gpm. Wall mounted lavatories shall be used in all staff and public toilet rooms. Wall mounted lavatories shall be installed with concealed arm carriers and floor mounted type stands concealed in the wall. Also, wall mounted lavatories shall include an ADA compliant safety shield. All hand sinks shall be wall mounted vitreous china or integral solid surface bowl as coordinated with the architectural interior design.

Floor drains shall be provided where called out for in plans.. Floor drains shall be cast-iron body with Nickel-brass floor strainer. Mechanical room shall haveboiler room style floor drains with 4 inch diameter outlet and heavy duty cast-iron floor strainer. Trap primers to be included on all floor drains. Drain grates shall be painted to match floor finish.

All fixtures shall fully conform and be installed per the requirements of the VA Standards, current local plumbing code, Lead-Free Act Annex G of NSF/ANSI Standard 61 and the American Disabilities Act.

Domestic Water Distribution (Potable)

The potable water supply for this building shall be supplied from the existing campus distribution through a reduced pressure backflow preventer located in below ground outside where domestic water piping will enter the building. No secondary potable water entry into the building is to be provided. All underground water service piping supplying the building to be cement lined ductile iron.

Potable hot water shall be generated for domestic use by two natural gas water heaters. The water heater system will include internal water storage. The system will be set at 160°F maximum with a main hi-lo thermostatic (master mixer) mixing valve used to temper the water for distribution. A lockable by-pass will be included for use in allowing thermal eradication in efforts to combat Legionella.

The master mixer with bypass lines will be utilized at the hot water source to regulate the water temperature from 160 degrees Fahrenheit to 115 degrees Fahrenheit. Hot water return loop will be piped back to the Mechanical Room B100 with a communicative electric recirculation pump.

The potable hot water system will have the capability of supplying 160 degree water to the system for a flush (Thermal Eradication) period as needed. This process will include the ability to flush the outlets Page 125





for a period of 30 minutes by opening the bypass valves under the sinks/lavatories to allow the 160 degree water to flow directly through the faucet. System design will eliminate all dead ends (legs) of the piping system. Also, ball valves will be incorporated at the end of each piping section allowing a means to drain heated hot water (160 degrees Fahrenheit), flushing that will be used for disinfections procedures. These drain valves will be located within the allowable maximum distance, (50'-0") of plumbing drainage fixtures.

Note: These listed forms of Legionella prevention are options at this time. Facility management will determine the direction for Legionella prevention as the project design moves forward.

Isolation valves shall be installed such that bathroom fixture groupings will allow maintenance without affecting service to other fixtures groups.

All potable water mains and branches to the individual fixture shall be of ASTM B88 Type L rigid copper pipe with soldered joint (fittings) construction.

No form of PEX piping will be used in the potable water distribution systems as The Thermal Eradication ("Super Heat process") process presents issues with the use of polyethylene piping which may fail over time, therefore Type L copper pipe and fittings are being used.

All potable water piping shall be insulated with 1" fiberglass insulation. Labeling shall be per the VA standards.

Potable (domestic) water will provide makeup water to any HVAC systems as required. Backflow protection will be included with valved isolation. The domestic water piping shall be sized per the International Plumbing Code. (VA Standard.)

The potable water system shall be provided with an advanced utility meter. Meter to relay information every 15 minutes. Metering system to comply with VA specifications.

A backflow preventer shall be provided to protect the water supply from contamination where potable water connections to equipment are required.

All potable water piping shall be provided with labeling as per the VA standard.

Sanitary Waste and Vent

Sanitary waste shall discharge to the existing campus sanitary sewer system (reference civil engineering info for location and additional requirements). All sanitary waste and vent piping shall be sloped a minimum of 1/8" per foot. Sanitary waste and vent piping installed within the outline of the building foundation walls and to a point, five feet outside the building shall be standard weight castiron soil pipe, combined with 4-band heavy duty, stainless steel fittings capable of maintaining a torque of 80-inch pounds.

Two sinks located in kitchen shall have point of use grease interceptors. These interceptors will dispose of any potential grease that may be introduced to the sanitary waste system via the kitchen Page 126





sinks. Once sinks waste goes to point of use grease interceptors, normal waste shall be discharged to floor sink.

Basement shall have a duplex sump pump system. This system shall be responsible for pumping waste from floor drains in basement up and into regular sanitary system. Pump discharge from duplex system shall discharge to regular sanitary sewer with an air gap.

Joints underground shall be hub and spigot installed with compression gaskets. All other waste and vent piping shall be standard weight cast-iron soil pipe with no-hub joints utilizing the same 4-band, heavy duty pipe clamp.

All cleanouts shall be installed where accessible above the finished floor. No cleanouts will be located above (within) the ceiling. Two-way directional grade cleanouts will be provided at the building exterior to accommodate cleaning the sanitary pipe.

Note: PVC sanitary sewer and vent piping will not be allowed for installation, as a drainage collector due to the potential of using the Thermal Eradication process. (Hot water drainage in excess of 140 degrees Fahrenheit (F) is not allowed by the International Plumbing Code.)

Storm Drain

Primary storm drainage system shall discharge below ground to existing campus storm drainage system (reference civil engineering info for location and additional requirements). All storm drain piping shall be sloped a minimum of 1/8" per foot. Storm drain piping installed within the outline of the building foundation walls and to a point, five feet outside the building shall be standard weight cast-iron pipe, combined with 4-band heavy duty, stainless steel fittings capable of maintaining a torque of 80-inch pounds.

Secondary (overflow) roof drainage system shall be installed per the plans. Overflow piping shall discharge to daylight via downspout nozzle located on the plans.

Natural Gas

Natural gas shall connect to existing campus natural gas line (reference civil engineering info). Natural gas shall be brought to the building to provide gas for the gas water heaters located in mechanical room B100.. Exact pressure and size of natural gas line to develop as design phase continues.

Medical Gas Systems

There will be no piped medical gas systems in this facility. Facility to utilize portable oxygen tanks (or any other medical gas as required).





I.8 Electrical

Summary

The new addition will be powered by two utility transformers. The existing transformer that currently feeds the facility and a new redundant feed. The existing transformer can add a new feed that will be routed underground to the new electrical room. The new redundant underground electrical service will be provided from the serving electric utility company to the new building from the existing power distribution lines located in the easement plan east of the new building. The electrical service will be 800 amp, 480Y/277V, 3 phase, 4 wire and solidly grounded system. A 225kVA, utility provided, pad mounted transformer is expected but the final size is to be determined by the power company.

Each service will terminate in a service-rated circuit breaker-type open transition transfer switch in the main electrical room and feed an 800A main distribution panelboard via a 225KVA transformer. Ground fault protection is not required for 480Y/277V systems less than 1000 amp, per 2023 NEC 230.95. The main distribution panel and associated transfer switches will be housed in a 2-hour fire rated room with one exit and outward swinging door.

Concrete-encased duct bank systems shall be provided for all underground raceways from each source (primary, secondary and emergency) to the main electrical room.

Dry type transformers shall be copper wound and used for voltage step-down.

Electrical systems and equipment for this project are not of significant size to create a marked difference in cost savings when evaluated for Life Cycle. No life cycle estimate will be included.

Emergency Generator Power

A standby electrical system will be provided for this facility, which will be powered by a fully enclosed standby diesel engine generator sized to power the entire facility load. An open-transition automatic transfer switch will be provided to power the facilities' normal load, per 2023 NEC Article 702 for Optional Standby systems.

Refer to the drawings for proposed location of the new generator. The generator is designed to also serve the Essential Electrical system and automatically transfer within 10 seconds of power interruption for those loads as required by NFPA 70, NFPA 99 and NFPA 110.

Automatic transfer switches (ATS) will be provided to facility the transfer of power from normal to standby upon loss of power. Switches shall be open transition. Three branches of power will be provided for the essential electrical system and one normal branch of power which is considered optional standby.

- Life Safety 100A ATS
- Critical 150A ATS
- Equipment 400A ATS
- Normal 200A ATS





A manual transfer switch with a temporary docking station and an emergency power off switch shall be provided with the generator to serve as a connection point for a temporary mobile generator in the instance that the primary generator is inoperable.

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Load Calculation

		Units:	Notes:
Existing Peak			
Demand:	0	kW	
New Building			
Demand:	217.0	kW	Calculated after all loads are connected
Recommended			
Transformer size:	225	kVA	
Totalized Peak			Normal branch loads will also be backed up by the generator.
Demand:	22.0	kW	So, 100% of estimated load will be used for generator selection.
Approx. Size for 1			
Generator:	220	kW	
Standard Gen Size:	250*	kW	*This does not consider load-stepping of large equipment.

Sustainable Design

Initial project planning studies determined that the installation of renewable energy sources is either not technically feasible, economically feasible, or Life Cycle Cost Effective and will not be considered part of the scope of this work. Therefore, as directed by the VA sustainable design manual, infrastructure necessary to support the future installation of renewable energy equipment will be provided.

All products, materials and equipment provided in this scope of work, shall be categorically labeled under the following programs as appropriate:

- a. Energy Star
- b. Federal Energy Management Program (FEMP)
- c. Electronic Product Environmental Assessment Tool (EPEAT)

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Power Distribution and Grounding

Electrical distribution components shall be solidly grounded. Each panelboard shall contain 20% spare breakers, per VA Electrical Design Manual 5.3.5.

Distribution and branch circuit panelboards will be provided to serve all loads. The distribution system will comply with VA Facilities guidelines and the latest edition National Electric Code.

Wet or damp location receptacles shall be GFCI type. Devices located on the exterior of the building or on the roof shall be protected by weather proof covers.





A short circuit, coordination and arc flash study will be performed, as part of the construction contract, to ensure safety and reliability.

Short circuit calculations for all new panelboards will be performed using the MVA method.

Voltage drop will be calculated using applicable information derived from the tables in Chapter 9 of the National Electric Code. All feeders and branch circuit conductors will be sized for a combined voltage drop not to exceed 5%, according to NEC recommendations regarding maximum voltage drop.

A counterpoise system will be installed, terminating 60 feet on center (to every other column) by exothermic weld. Secondary grounding will be accomplished by termination to the water service. Patient areas will comply with article 517 of the National Electric Code. Electrical rooms will contain a copper ground bar interconnected by a #2/0, minimum, grounding conductor.

Electrical Room(s)

There are two electrical rooms in the addition, one for normal branch and service entrance-rated equipment and one for EES systems.

The normal branch electrical infrastructure (where the service entrance is located) consists of an 800A main circuit breaker, 3-phase 208Y/120V distribution panelboard, labeled 'MDP'. Panelboard 'MDP' shall be fed by a service-rated 400A ATS via a 225KVA transformer, that will feed a pair of 225A main lugs only, 3-phase 208Y/120V panelboards ('NLP sec 1' and 'NLP sec 2') via a 200A ATS. Panelboards 'NLP sec 1' and 'NLP sec 2' will serve the entire addition power requirements.

The EES branch electrical infrastructure consists of an 800A main circuit breaker, 3-phase 208Y/120V distribution panelboard, labeled 'GDP'. Panelboard 'GDP' shall be fed by a 400A MTS via a 225KVA transformer, that will feed the equipment, critical and life safety branches of power. The equipment branch consists of two 400A main lugs only, 3-phase 208Y/120V panelboards ('EQLP sec 1' and 'EQLP sec 2') via a 400A ATS. Panelboards 'EQLP sec 1' and 'EQLP sec 2' feeds all the mechanical, plumbing and kitchen equipment. The critical branch consists of one 225A main lugs only, 3-phase 208Y/120V panelboard ('CRLP') via a 150A ATS. Panelboards 'CRLP' feeds patient care areas, telecommunications rooms, luminaires, and essential equipment for the facility. The life safety branch consists of one 225A main lugs only, 3-phase 208Y/120V panelboard ('LSLP') via a 100A ATS. Panelboards 'LSLP' feeds egress luminaires and generator equipment.

No plumbing piping and no telecommunications equipment, other than telecommunications outlets, shall be placed within electrical rooms. Appropriate construction will be provided for the type of transformer(s) installed. No water lines or drainage lines shall be fed into or through the closet except for sprinkler feed stubbed into closet. Walls shall go to deck with one hour rating. The electrical room will be placed greater than 15 feet away from the main telecommunications room to reduce the effects of electromagnetic interference producing devices on telecommunications equipment.

Branch circuit panelboards shall be spaced to limit horizontal branch circuit length to no more than 75 feet.

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Raceway and Wiring

All wire shall be copper and installed in raceway. All circuits shall have a separate equipment grounding conductor of appropriate size in the NEC. No more than 3 branch circuits are allowed to run in one homerun. A minimum conduit size of 3/4 inch shall be utilized. Data wiring shall not be mixed with other systems. All junction boxes (J-boxes) shall be color-coded as directed by SRE. All J-boxes shall be labeled on cover as to circuit and contents if applicable. Exposed branch circuits will all be run in conduit. Electrical wire and cable to have lead content less than 300 parts per million.

Power Monitoring and Metering

Power monitoring and metering shall be installed in accordance with the Energy Conservation goals of the project. The monitoring system shall report data to the building automation system and be capable of storing data for at least 36 Months.

Meters will be provided to report all whole-building energy sources and such that individual energy end uses that represent 10% or more of the total annual consumption can be reported separately. Each meter shall:

- Be permanently installed
- Transmit data to a remote location
- Report consumption and demand,
- Report hourly, daily, monthly and annually

In addition, the whole building meter shall be able to report power factor.

Electrical loads will be segregated as much as reasonably achievable to reduce the number of meters required. Where physical segregation is not feasible, then either each diverse branch circuit will be measured separately, or subtractive metering will be used, where appropriate, to electrically segregate the data.

Pending results of the final energy model report, it is expected that advanced meters will be placed to monitor the following:

- 1. Inputs and outputs of each generator
- 2. Panelboard mains and branch circuits as required to collect data for
 - a. Interior lighting
 - b. Interior Receptacles
 - c. Heating
 - d. Cooling

Indoor Lighting

Lighting fixtures shall be LED type with Color Rendering Index (CRI) of 90 minimum in all spaces. Fixtures to have a rated lifespan of 50,000 hours. Lighting fixtures shall be in accordance with Illuminating Engineering Society of North America (IESNA) recommendations.





Light fixtures shall have long operating lives, which utilize controlling elements (lenses, louver, reflectors, etc.) designed to provide the best utilization of emitted light at the task location; that are appropriate for the ambient temperature; and that are not prone to dirt accumulation. In high ceiling areas, locate fixtures for maintenance access or provide access for maintenance equipment.

Public restrooms shall be provided with at least one lighting fixture connected to the emergency electrical system. Occupancy sensors for lighting shall be used in each toilet stall and for over-all coverage.

Utility areas will utilize suspended, LED type strip fixtures with wire guards. Interior emergency exit and emergency lighting will be connected to the emergency electrical system and will be industrial grade. Occupancy sensors and lighting controls will be utilized to control lighting per VA Lighting design guide requirements. Self-contained emergency battery lights will be utilized where required for uninterrupted lighting service.

The lighting system will consist typically of 2'X4', 2'X2', and recessed downlight LED fixtures. LED illuminated sources will be utilized to reduce lighting power densities. Additional decorative pendant and sconce light fixtures will be provided but will not provide a major source of illumination.

All luminaires for indoor use shall be equipped with 0-10V dimming drivers capable of dimming to 1%.

Exit signs will be edge-lit, LED source with red letters and applicable chevron arrows.

Lighting Control

Lighting controls shall be designed to comply with the VA Lighting Design Manual and IES recommendations. A central, networked lighting control system will be provided that is capable of interfacing with the building automation system. Daylight harvesting will be provided where practical.

Shared and multi-occupant areas will be provided with individual and/or multi-zone switching and dimming control to provide reduced light levels and customizable controls. Automatic controls will be provided in spaces where applicable.

Patient care areas shall be provided with individualized controls that are readily accessible from the patient bed location. Where practical, controls will be integrated with automatic shade, blind or curtain controls. Automatic daylight controls will be provided in private patient rooms and exterior rooms as practical.

Corridor general lighting shall be controlled so that all lights turn off or dim to 50% automatically. Manual dimming controls will be provided for all lighting in corridors. Automatic daylight controls will be provided in corridors as practical.

Exterior Lighting

Exterior lighting shall be designed to comply with the project Energy Conservation goals and VA lighting design guidelines. Dark Sky principles required by the VA shall be met for Light Pollution Page 132





Reduction. Exterior lighting shall meet requirements of local outdoor lighting codes. Efforts will be made in the design to avoid adding any unnecessary light pollution to surrounding residential areas. Criteria recommend in the IESNA Guideline for Security Lighting for People, Property, and Public Spaces (latest edition) shall govern the lighting design. Exterior lighting shall be coordinated with physical security, SSTV, and landscaping requirements.

The exterior illumination will, in general, consist of wall mounted LED fixtures with distribution to maximize the lighting source and light pollution control. Pole mounted fixtures will be provided if additional parking is provided under this project. Poles will be mounted to a three to five feet deep concrete base, depending upon height of the pole.

Additional exterior illumination will be determined during user group meetings. If included, sidewalk illumination will consist of bollards or pole mounted LED fixtures. Minimal build facade will be provided to limit the amount of light pollution.

Exterior lighting will be controlled by combination of photocells. Site lighting energy usage and control shall comply with ASHRAE 90.1.

Lightning Protection

A risk analysis per NFPA 780, Annex L shall be provided to determine to appropriate elements of a lightning protection system, where Nd>Nc. Calculations will be completed, including assumptions to be submitted. The following factors shall follow the fixed factors in the calculations: C3 = 2.0, C4 = 1.0, C5 = 5.0. All other factors shall be project-specific. All cables, Air terminals, rods, and components shall be copper, and use exothermic weld joints. Master label shall be required for lightning protection system.

Receptacle Circuits

No more than 6 receptacles shall be installed on a single circuit. Receptacles shall be Hospital Grade.

Telecommunications and All Schedule "B" Low Voltage Systems

Conduits from wall outlet boxes will be stubbed into cable tray above accessible corridor ceilings with grommets. Cables will be installed in complete raceway systems as required by VA telecommunications design guidelines.

Nurse Call System

A complete nurse call system will be provided. System shall include but not be limited to emergency call toilet stations, patient stations, corridor mounted dome lighting, nurse master station and all associated head end equipment. Head end equipment shall be installed in the telecommunications room. New system needs to be compatible with existing facility system.

Public Address and Mass Notification System





Public address/white noise speakers will be provided in all common areas and corridors. The speaker system will be tied into the fire alarm system so that in the event of a fire event, the fire alarm system can override any other noise or announcements. The system shall consist of head-end and distribution cabinets, audio mixer, power amplifiers, UPS, telephone interface equipment connected via supervised wiring to speakers and amber colored, synchronized strobes. Necessary traps, filters, and volume controls will be installed to mitigate distortion and provide intelligibility for audio messages. New system needs to be compatible with existing facility system.

Arc Flash

A fault current, coordination, arc flash study will be performed after final equipment selections, at the expense of the electrical contractor. Labels will be installed on all devices, indicating the arc flash hazard for each application in compliance with current edition of NEC, NFPA 70E and IEEE 1584.

I.9 Telecommunications

Overview

The telecommunications and low voltage systems will conform to current ANSI/TIA/EIA standards and the latest edition of the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM. In addition, the following references and compliances to the latest editions, as related to the design, manufacture, test, and install telecommunications cabling networks per manufacture's requirements and in accordance with NFPA-70 (National Electric Code), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following specific standards:

- ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
- ANSI/TIA/EIA-568-B.2 -- Commercial Building Telecommunications Cabling Standard,
 Part 2: Balanced Twisted Pair Cabling Components
- ANSI/J-STD-607-A: Commercial Building Grounding and Bonding Requirements for Telecommunications
- ANSI/TIA/EIA 569-A: Commercial Building Standard for Telecommunication Pathways and Spaces
- ANSI/TIA/EIA 606 -A: The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- ANSI/TIA/EIA 607A: Commercial Building Grounding and Bonding Requirements for Telecommunications
- ANSI/TIA/EIA 758: Customer-Owned Outside Plant Telecommunications Cabling Standard
- IEEE 802.3 (series): Local Area Network Ethernet Standard, including the IEEE 802.3z Gigabit Ethernet Standard
- ISO/IEC IS 11801: Generic Cabling for Customer Premises
- BICSI: BICSI Telecommunications Cabling Installation Manual
- BICSI: BICSI Telecommunications Distribution Methods Manual (TDMM)
- National Electric Code (NEC).







- National Fire Protection Agency (NFPA).
- American National Standards Institute (ANSI).
- Telecommunications Industry Association (TIA).
- Electronic Industries Alliance (EIA).
- National Electrical Safety Code (NESC).
- Americans with Disabilities Act (ADA).
- VA Telecommunications and Special Telecommunications Systems Design Manual
- VA Design Guide Office of Information and Technology

<u>General</u>

The building will be provided with a communications wiring system for voice, data and video distribution systems. Cable will be installed within conduit, duct box, wireway, cabinet or rack. Where pathways demand, the cable shall use an independent support structure suspended from the building steel in accordance with the above listed specifications. All required cables will be provided, placed, terminated and tested as noted on the drawings and as specified herein. All passive components including termination equipment, support hardware, lubricants, tools, fittings, plywood backboard and labor required to install a complete and working telecommunications system in accordance with the design specifications are to be included within this work.

Site

Service for telecommunications will be established by the addition of conduit from the existing campus services infrastructure into the new building. New fiber optic cables will be planned as part of this design with additional services from the local telephone or cable television company, as applicable for lessor-provided services.

The new 4-inch telecommunications conduits will enter the building above ceiling and continue to the Telecommunications Room (TR). An additional conduit path will be provided from the Main Computer Room for redundant fiber pathway. Inbound fiber optic cables will be routed to the TR and will be interconnected via overhead conduit to all other locations in the building.

Riser & Telecommunication Room (TR)

The new TR will be provisioned with a new riser conduit system consisting of four (4) 4-inch sleeves. The TR will be provisioned in accordance with the design guidelines and will include: Floor-mounted open equipment racks, vertical and horizontal wire management, overhead ladder rack to support the distribution of cables and a building ground system. The TR room provisioning will include the required power circuits, grounding, convenience outlets, plywood, and lighting as specified.

Riser Backbone





The building riser backbone will be duplicated between systems. Each system shall be comprised of a 24-strand single-mode fiber optic cable within the provided innerduct. All fibers will be terminated using "LC-style" anaerobic cure connectors and placed in a rack-mounted enclosure.

Horizontal Pathways

Cables shall be run and supported in a contractor-provided support system. This system of cable tray and hangers shall provide proper support every 4-5' and shall not be overloaded as to deform the cable geometry. A multi-hook system shall be used to separate low voltage cabling infrastructures. Sag shall not exceed 8 inches between hook systems. The cable system shall be plenum-rated and re-enterable. All vertical conduits for horizontal cables from each workstation outlet shall be 1-1/4"" in trade size and shall be installed in 4-inch by 4-inch boxes. All penetrations shall be fire-stopped using an approved UL system.

Horizontal Cabling

From the Telecommunications Room, (TR), horizontal telecommunications cables shall be run to each station. Each outlet shall be provisioned with a six-port faceplate with two (2) 4-pair Category 6A, plenum-rated cables terminated on four RJ45 Category 6A jacks. Provide blanks at other port locations matching the faceplate color. Three data cables and one voice cable shall be provided for each typical outlet location. Cables shall use the following color codes:

Voice Cable - White Data 1 - Yellow Data 2 - Green Data 3 - Gray Wireless - Orange SURVEILLANCE - Violet Bas/DAS – Black

All cables and all jacks shall be color-coded to identify the service. All outlets shall provide for the addition of two jacks to be mounted in the faceplate. Faceplates shall match the electrical faceplates in color and material. All labeling shall be done in accordance with the design specifications.

All horizontal cables shall be terminated on rack-mounted Category 6A modular patch panels. Coaxial cable for the use of distributing cable television video will be provided to all areas defined by the Owner.

Testing

The horizontal cabling system will be tested for compliance with ANSI/TIA/EIA 568 B.1 category 6 performance requirements. Testing shall be accomplished using level III+ or higher field tester. The contractor shall submit test results (both CD-ROM and hard copy with program to review results) no later than five days after the cables are tested. The contractor shall provide permanent link test results, while providing a full channel warranty.

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All cables shall be tested for DC continuity of each conductor, shorts between conductors and shields and operation of shorting bars in connectors. Test shall be performed after connectors have been installed and cable terminated on outlet ports at both ends. The Contractor shall provide CD-ROM verification of cable testing results indicating date of test performed and results, signed by job foreman.

All fiber optic cables shall be tested using an OTDR and utilize a bi-directional testing method. The 50um multi-mode fiber optic cable shall have a maximum attenuation of 3.0 dB/km @ 850nm and 1.0 dB/km @ 1300nm. Acceptable loss budget calculations shall be made in accordance with ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant.

The single mode fiber optic cable shall have a maximum attenuation of 1.0 dB/km for inside plant cable and 0.75 dB/km for outside plant. Acceptable loss budget calculations shall be made in accordance with ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-mode Fiber Cable Plant.

Security, Access Control and Surveillance

The following guidelines will be applied as appropriate in the development of the security plan for systems design:

- NFPA 730: Guide for Premises Security 2008
- NFPA 731: Standard for the Installation of Electronic Premises Security Systems
- VA Physical Security and Resiliency Design Manual

An integrated access control, intrusion detection, and closed-circuit television (SURVEILLANCE) surveillance system will be provided, as outlined below. The access control and intrusion detection system shall be open architecture and network-based. The SURVEILLANCE system shall be IP- based and shall integrate directly with the existing access control and intrusion detection platform.

Card reader access control shall be provided at the building entrances and exterior doors.

Card reader access control shall be provided at the interior doors to telecom rooms, electrical rooms, mechanical rooms, TR, offices and other spaces with high- value equipment, secured files and other owner-specified doors.

Roam alert system shall be provided in the facility to monitor patient activity. The new system shall be integrated with the access control system to override the door.

Intrusion detection system shall be provided in the facility. The new system shall be integrated with the access control system to monitor all doors that have access to the exterior.





The use of perimeter intrusion detection will be determined in user group meetings. Should perimeter intrusion detection be installed, it shall include concealed balanced magnetic door contact switches and door magnets on every exterior door, concealed balanced magnetic contact switches and magnets on every sliding glass window and surface contact switches and magnets on roof hatches. These will be supplemented with limited motion detector coverage to protect main and lower level spaces with exterior glass, hallways, stair towers and rooms with critical assets.

The use of exterior Surveillance camera coverage will be determined in user group meetings in the next phase of design. If exterior SURVEILLANCE camera coverage is to be installed, it shall include the building entrances, parking areas, rear parking and chiller area and sidewalks surrounding the building. Interior SURVEILLANCE camera coverage shall include the lobby, stairwells, corridors, IT Rooms, public gathering areas, spaces with high value equipment, and other Owner specified areas.

All cameras will be a minimum of 1080HD and support H.264 and MPEG compression. All interior housings shall be vandal resistant and shall be available in a form factor that provides an unobtrusive look.

The security system shall comply with the Americans with Disabilities Act (ADA). The systems shall be coordinated with other aspects of the building design such as fire alarm and life safety, door hardware, electrical systems, etc. The systems designed shall have all required head-end equipment, including access control system panels and power supply, digital communicator and intercom controllers. The systems shall be capable of being managed from any workstation in the Police Control and Operations Room. The systems shall be configured, programmed and fully tested to operate according to defined sequences of operation.

Security Intercom

The following guidelines will be applied as appropriate in the development of the intercom plan for systems design:

- NFPA 730: Guide for Premises Security 2008
- NFPA 731: Standard for the Installation of Electronic Premises Security Systems
- VA Physical Security and Resiliency Design Manual

The use of an integrated intercom system will be determined in user group meetings prior to the next phase of design. If an integrated intercom system is to be installed, it shall be located on exterior door locations and be integrated into the security system. The system shall be open architecture and network-based. The intercom system shall be IP- based and shall integrate directly with the existing access control and intrusion detection platform with the VA location.





II.11 Sustainability

During the schematic design phase, the VA and design team worked to identify whether the Trinka Davis CLC project would pursue LEED certification or compliance with the VA Sustainable Design Manual and Guiding Principles. A sustainability charrette was held in July of 2023, during which the sustainability team presented the requirements of the different options and initial thoughts on eligibility and compliance. After the 35% submission, the VA determined that designing to the VA Sustainable Design Manual and Guiding Principles checklist is the most practical route of sustainability moving forward.

The sustainability charrette included team members from the VA, Charlotte Engineers, and Guidon. Major goals for the project were highlighted including functionality, greater use of space, and a seamless design that matches the aesthetics of the current buildings on site. Determinations that came out of this charrette included using the dry detention pond for stormwater management due to the cistern being deemed unusable, an additional option for the site location approved by the VA, and the geothermal wells on the southside of the site being deemed infeasible for use of this project due to tie-in issues and the requirements for backup power by the VA. Weekly team meetings have been held virtually with members from Charlotte Engineers and Guidon from the start of the project to ensure all design elements and requirements are being met.

Key design elements that were carefully considered to reduce irrigation of the site include the selection of native shrubbery and a small garden on site for residential use that includes native flowering plants. All landscaping will be irrigated using non-permanent sources of irrigation that include a nearby watering hose attached to the side of the building.

The energy model analysis performed by Charlotte Engineers on 4 different HVAC systems determined that the Variable Refrigerant Flow (VRF) system was the most cost-effective and energy efficient option. The VRF system provided a 39% reduction in building energy consumption and is in compliance with ASHRAE 90.1-2013. Commissioning is understood to be contracted by the owner but has not been solidified in this phase.. R410A will be the refrigerant used, which has a low GWP and no CFCs.

All fixtures selected will be water-efficient and, where applicable, WaterSense labeled. The design team has eliminated single pass cooling. The design team will discuss including building-level water and energy meters with the owner at the 65% design review.

The thermal comfort and ventilation of the project has been designed to comply with ASHRAE 55 and 62.1. A daylighting analysis of the schematic design was conducted by Guidon in the 35% submission. The close proximity of the dense vegetation to the north and west, and to a lesser degree, the adjacent building to the east, limit the amount of diffuse light available to the project. Given these constraints, the design team has maximized daylighting potential by providing generous windows in each patient room, along with manual shades. Public and social spaces have larger and numerous windows including clerestory windows, which allow a great deal of natural light in these spaces.

Materials have been selected consciously with efforts to prioritize products with EPDS, HPDs, no to low VOC content, and other environmental attributes. Biophilic design elements have also been included throughout the project with various material selections included in this submission. The recycling space for the project has been sized appropriately to provide for the collection and storage of recyclable materials.

The Guiding Principles checklist has been updated for this 65% submission. Currently, there are ten criteria that have been verified as compliant. The remaining twelve marked as "in progress" are still being investigated and most should achieve compliance by the next submission – some of these items will be





tracked until the completion of construction. Next steps include the continued investigation and work with the design team towards gaining compliance in the remaining criteria to meet the 20 out of 21 required metrics by the VA.







APPENDIX B: Soil Investigation







Trinka Davis VA - Community Living Centers Carrollton, Georgia

June 16, 2023 Terracon Project No. 49235016

Prepared for:

Guidon Design, Inc. Indianapolis, IN

Prepared by:

Terracon Consultants, Inc. Atlanta, Georgia

Environmental Facilities Geotechnical Materials

June 16, 2023

Terracon

GeoReport

Guidon Design, Inc. 1221 N. Pennsylvania Street Indianapolis, IN 30328

Attn: Mr. Mark Jones – Senior Project Manager + Director

E: mjones@guidondesign.com

Re: Geotechnical Engineering Report

Trinka Davis VA - Community Living Centers

108 Martin Drive Carrollton, Georgia

Terracon Project No. 49235016

Dear Mr. Jones:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P49225016, dated January 26, 2023. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

Kevin L. Privette, P.E. Senior Engineer

William J. Sheffield, P.E. Manager | Geotechnical Services

REPORT TOPICS

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Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at <u>client.terracon.com</u>.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES SITE LOCATION AND EXPLORATION PLANS EXPLORATION RESULTS SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

Trinka Davis VA - Community Living Centers 108 Martin Drive Carrollton, Georgia Terracon Project No. 49235016 June 16, 2023

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed small home addition to be located at 108 Martin Drive in Carrollton, Georgia. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Demolition considerations
- Excavation considerations

- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Lateral earth pressures

The geotechnical engineering Scope of Services for this project included the advancement of 5 supplemental test borings to a depth of 25 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of readily available geologic and topographic maps as well as provided documents, plans, etc.

Item	Description
Deve al Information	The project is located on a 0.34-acre area at 108 Martin Drive in Carrollton, Georgia.
Parcel Information	Approximate Coordinates: 33.590351°N / -85.058860°W
	See Site Location

Trinka Davis VA - Community Living Centers ■ Carrollton, Georgia June 16, 2023 ■ Terracon Project No. 49235016



Item	Description
Existing Improvements	The area currently consists of a concrete paved access drive with some parking stalls along the north side of the site. An existing building is to the south and east of the southern end of the site. Based on historical aerial photographs the site was developed between 2010 and 2012.
Current Ground Cover	Concrete pavements with grassed perimeters and some trees.
Existing Topography	The site is relatively flat, with a slight downward slope to the west and in the northwest corner of the area.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. Our current understanding of the project conditions is as follows:

Item	Description	
Information Provided	Our understanding of the project is based upon email correspondence and a telephone conversation with you. The following files were provided via email: 16.1043 – 16.10.11 – Subagreement Terracon – executed.pdf Attachment 1 – 508 – 349 A E SOW.pdf P.1795 – Trinka Davis VA Clinic – Survey area.pdf Terracon is familiar with the site having performed a geotechnical exploration for the existing parking deck in 2016 - Terracon Project No. 49165249.	
Project Description	We understand that the project consists of a 15-bed small home addition.	
Proposed Structure	The project includes a one story (approximately 14,500 SF) building. A covered walkway will connect the southeast corner of the new structure with the existing adjacent building.	
Building Construction	The structure will have either a reinforced concrete or steel frame with a concrete slab-on-grade	
Finished Floor Elevation	Will match that of the existing building.	
Maximum Loads (assumed)	 Columns: 150 kips Walls: 4 kips per linear foot (klf) Slabs: 100 pounds per square foot (psf) 	
Grading/Slopes	For the purposes of this report, we have assumed maximum cuts and fills on the order of 5 feet will be needed to establish finished grades.	
Below-Grade Structures	None anticipated (basements, underground detention, etc.)	
Free-Standing Retaining Walls	None anticipated but may become necessary as design progresses.	
Pavements	No new pavements are anticipated. The site plan indicates the existing access drive will be converted to a circular turn around to the east of the new structure. If needed, we have provided our standard pavement design recommendations assuming 50 automobiles per day and 2 times per week delivery truck.	

Trinka Davis VA - Community Living Centers Carrollton, Georgia June 16, 2023 Terracon Project No. 49235016



GEOTECHNICAL CHARACTERIZATION

Site Geology

The project site is located in the Piedmont Physiographic Province of Georgia which is characterized by medium to high grade metamorphic rocks and scattered igneous intrusions. The term metamorphic describes rocks that have been subjected to high temperatures and/or pressures, usually deep within the earth's crust. These high temperatures and pressures cause the textural and mineralogical characteristics of the original rock to be altered and can also cause certain rock types to fully melt, becoming what is known as magma. Magma is less dense than the surrounding solidified rock and tends to move upward through fractures and joints, displacing the surrounding rock. This rock type is known as an igneous intrusion. Metamorphic rocks are predominant in this region but, due to erosion and uplift, both of these rocks will eventually become exposed at the land surface.

The subsurface bedrock in this region has undergone differing rates of weathering, which often produces a considerable variation in depth to competent rock over short horizontal distances. It is also not unusual for lenses and boulders of hard rock and zones of partially weathered rock to be present within the soil mantle above the general bedrock level. The typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands, which often consist of saprolites (native soils which maintain the original fabric of the parent rock). Generally, the soil becomes harder with depth to the top of parent crystalline rock or "massive bedrock" which occurs at depth.

The boundary between soil and rock is typically not sharply defined. A transitional zone termed "partially weathered rock" is normally found overlying bedrock. Partially weathered rock (PWR) is defined for engineering purposes as residual material with a standard penetration resistance exceeding 100 blows per foot (bpf).

Based on published geologic mapping the, the site is underlain by Piedmont Province soils derived from granitic gneiss.

Fill soils are those soils that have been placed or reworked by man in conjunction with past construction grading, underground utility installation, farming or other previous activity at the site. Fill can be composed of different soil types from various sources and can contain debris from building demolition, organics, topsoil, trash, etc. The engineering properties of the fill depend primarily on its composition, density, and moisture content. Some materials, where it is difficult to determine if they are fill, are deemed as possible fill.

Trinka Davis VA - Community Living Centers ■ Carrollton, Georgia June 16, 2023 ■ Terracon Project No. 49235016



Typical Subsurface Profile

The borings drilled at the site generally encountered topsoil, existing fill materials, and residual soils.

All borings encountered existing fill to depths ranging from about 3 to 6 feet. The fill appears to have been placed in a controlled manner, but we have no records to indicate the degree of compaction achieved during placement. If records are available, they should be provided to Terracon for use in our evaluation and development of geotechnical recommendations.

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 1	1/2 to 1 inches	Topsoil	
Stratum 2	3 to 6 feet	Fill – Silty SAND	Loose to Medium Dense
Stratum 3	To boring termination of 25 feet	Residuum – Sandy Silt (MH) Silty Sand (SM)	Soft to Medium Stiff Loose to Medium Dense

As part of the laboratory tests, 11 moisture content, 2 Atterberg limits, and 2 grain size analysis were conducted on selected soil samples. The test results are presented in the **Exploration Results** section of this report.

Briefly, the moisture content of representative soil samples ranged from 14% to 36%. The results of the Atterberg limits and grain size analysis are summarized in the following tables.

Atterberg Limits					
Boring	Boring Depth (feet) Liquid Limit Plastic Limit Plasticity Index				
B-1	3.5-5	66	40	26	
B-4	6-7.5	52	33	19	

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Grain Size Analysis				
Boring Depth (feet) Sand (Percentage) Fines (Percentage)				
B-1	1-2.5	58.4	41.6	
B-4	1-2.5	50.1	49.9	

Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. Details for each of the borings are presented on the boring logs included in the **Exploration Results** section of this report.

Groundwater

The boreholes were observed while drilling and shortly after completion for the presence and level of groundwater. The water levels observed in the boreholes are noted on the attached boring logs, and are summarized below:

Boring Number	Depth to groundwater while drilling (Feet/inches)
B-1	14/3
B-2	14/9
B-3	15/6
B-4	16/7
B-5	16/3

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. In addition, perched water can develop over low permeability soil or rock strata. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

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GEOTECHNICAL OVERVIEW

Based on the geotechnical engineering analyses, subsurface exploration and laboratory test results, we recommend that the proposed structure be supported on a spread footing foundation system as discussed herein.

Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The **Shallow Foundations** section addresses support of the building bearing on native stiff to hard lean/fat clay or engineered fill. The **Floor Slabs** section addresses slab-on-grade support of the building.

Support of foundations, floor slabs and pavements on or above existing fill materials is discussed in this report. However, even with the recommended construction procedures, there is inherent risk for the owner that compressible fill or unsuitable material, within or buried by the fill, will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by following the recommendations contained in this report. To take advantage of the cost benefit of not removing the entire amount of undocumented fill, the owner must be willing to accept the risk associated with building over the undocumented fills following the recommended reworking of the material. Should this be the case, development can be supported on a shallow foundation system.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of data presented herein, engineering analyses, and our current understanding of the proposed project.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include demolition of the existing asphalt pavements, clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in preparation of specifications. Recommendations include quality criteria necessary, to appropriately prepare the site.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project and identified in this report.

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Site Preparation

We anticipate construction will be initiated by stripping vegetation, and loose, soft or otherwise unsuitable material. Stripped materials consisting of vegetation and organic materials should be wasted off site or used to vegetate landscaped areas or exposed slopes after completion of grading operations. Stripping depths between our boring locations and across the site could vary considerably; as such we recommend actual stripping depths be evaluated by Terracon during construction to aid in preventing removal of excess material. Existing pavements, and / or underground utilities should be removed and replaced with engineered fill.

The fine-grained soils encountered in the borings will be sensitive to disturbance from construction activity and water seepage. If precipitation occurs prior to or during construction, the near-surface soils could increase in moisture content and become more susceptible to disturbance. Construction activity should be monitored and curtailed if the construction activity is causing subgrade disturbance. Terracon can help with monitoring and developing recommendations to aid in limiting subgrade disturbance.

After stripping, proofrolling should be performed with heavy rubber tire construction equipment such as a fully loaded tandem-axle dump truck. A Terracon geotechnical engineer or his representative should observe proofrolling to aid in locating unstable subgrade materials. Proofrolling should be performed after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade and to reduce the amount of undercutting / remedial work required. Unstable materials identified should be stabilized as directed by the engineer based on conditions observed during construction. Undercut and replacement and densification in-place are typical remediation methods.

Existing Fill

As noted in **Geotechnical Characterization**, all borings encountered existing fill to depths ranging from about 3 to 6 feet. The fill appears to have been placed in a controlled manner, but we have no records to indicate the degree of compaction achieved during placement. If such records (density test, etc.) exist, they should be provided to us for evaluation.

Support of footings, floor slabs, and pavements, on or above existing fill soils, is discussed in this report. However, even with the recommended construction procedures, there is inherent risk for the owner that compressible fill or unsuitable material, within or buried by the fill, will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by following the recommendations contained in this report.

If the owner elects to construct the footings and floor slabs on the existing fill, the following protocol should be followed. All foundation bearing soils should be evaluated prior to concrete placement. Once the planned grading has been completed, the entire area should be proofrolled with heavy, rubber tire construction equipment, to aid in delineating areas of soft or otherwise unsuitable soil.

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Once unsuitable materials have been remediated, and the subgrade has passed a proofroll, the existing and undocumented fill that was removed can be evaluated for reuse as structural fill.

Excavation Conditions

After comparison of the boring data and the anticipated finished grade elevations, we do not anticipate that materials requiring difficult excavation techniques for removal will be encountered during mass grading operations or utility trench installation. The existing fill and residual soils found above finished floor levels should be excavatable with conventional earthmoving equipment.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures, pavements or slopes. General fill is material used to achieve grade outside of these areas. Soils used for structural and general fill should meet the following material property requirements:

Soil Type 1,3,4	USCS Classification	Acceptable Parameters (for Structural Fill)
Fine Grain	CL and ML LL < 45 / PI < 25	All Locations and Elevations
Granular	SP, SM, SC, and SW	All Locations and Elevations
On-Site Soils ²	SM, MH	All Locations and Elevations

- 1. Structural and general fill should consist of materials relatively free of organic matter, debris, and particles larger than about 4 inches. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.
- 2. A large portion of the existing fill is expected to be suitable for reuse as new fill provided it is free of organics, debris, and unsuitable materials. It appears the fill is wet and will require drying prior to use. Terracon should field evaluate existing fill materials for use.
- 3. All fill should have a maximum dry density of at least 95 pounds per cubic foot (pcf) as determined by the standard Proctor test (ASTM D 698).
- 4. Any materials proposed as fill from off-site sources should be tested for compliance with these criteria before being hauled to the site.

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Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	 8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used 	Same as Structural fill
Minimum Compaction Requirements ^{1,2}	 98% of max. dry density within 1 foot of floor slabs or finished pavement subgrade 95% of max. dry density below foundations and more than 1 foot below floor slabs or finished pavement subgrade 	92% of max.
Moisture Content Range ^{1,2,3}	Fine Grain Soils: -2% to +3% of optimum Granular: -2% to +3% of optimum	As required to achieve min. compaction requirements

- 1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
- Fill should be tested for compaction and moisture content during placement. Should the results of the inplace density tests indicate that the specified moisture or compaction requirements have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
- Moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved
 without pumping when proofrolled. Based on laboratory testing portions of the soils were wet of their
 optimum moisture content. Therefore, some moisture conditioning should be expected prior to or during fill
 placement.

Grading and Drainage

Adequate positive drainage should be provided during construction and maintained throughout the life of the development to prevent an increase in moisture content of the foundation, pavement and backfill materials. Surface water drainage should be controlled to prevent undermining of fill slopes and structures during and after construction.

Gutters and downspouts that drain water a minimum of 10 feet beyond the footprint of the proposed structures are recommended.

It is recommended that all exposed earth slopes be seeded to provide protection against erosion as soon as possible after completion. Seeded slopes should be protected until the vegetation is established. Sprinkler systems should not be installed behind or in front of walls or near slopes.

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Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building and pavement areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

Groundwater was encountered in all of the borings during our exploration. Based on our understanding of the proposed development, we do not expect groundwater to affect construction. If groundwater is encountered during construction, some form of temporary or permanent dewatering may be required. Conventional dewatering methods, such as pumping from sumps, should likely be adequate for temporary removal of any groundwater encountered during excavation at the site. Well points would likely be required for significant groundwater flow, or where excavations penetrate groundwater.

All excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

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Construction Observation and Testing

The earthwork operations should be observed by the Geotechnical Engineer or his representative. Monitoring should include documentation of adequate removal of vegetation and topsoil, proofrolling, and mitigation of unstable areas delineated by the proofroll. Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer or his representative prior to placement of additional lifts. Any areas that do not meet the compaction specifications should be reworked to achieve compliance.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer or his representative. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in the **Earthwork** section, the proposed structure can be supported by a shallow, spread footing foundation system bearing on residual soils or structural fill extending to residual soils. Design recommendations for shallow foundations for the proposed structure are presented in the following paragraphs.

Shallow foundations may be supported on existing fill soils provided the site has been prepared in accordance with the requirements noted in the **Earthwork** section. However, even with the recommended construction procedures, there is inherent risk for the owner that compressible fill or unsuitable material, within or buried by the fill, will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by following the recommendations contained in this report. Design recommendations for shallow foundations for the proposed structure are presented in the following paragraphs.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing pressure 1, 2	3,000 psf
Required Bearing Stratum ³	Structural fill or residual soils.
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 16 inches
Ultimate Passive Resistance ⁴ (equivalent fluid pressures)	160 psf
Ultimate Coefficient of Sliding Friction ⁵	0.35

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Item	Description	
Minimum Embedment below	Exterior footings in unheated areas:	18 inches
Fluid and One de 6	Exterior footings in heated areas:	18 inches
Finished Grade ⁶	Interior footings in heated areas:	12 inches
Estimated Total Settlement from Structural Loads ²	Less than about 1 inch	
Estimated Differential Settlement ^{2, 7}	About ½ of total settlement	

- 1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 5% within 10 feet of structure.
- 2. Values provided are for maximum loads noted in **Project Description**.
- 3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in Farthwork
- 4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. For passive earth pressure to develop, the footing must move horizontally to mobilize resistance. Therefore, the total calculated passive pressure should be reduced by one-half to two-thirds for design purposes.
- 5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
- 6. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
- 7. Differential settlements are as measured over a span of 40 feet.

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. The weight of the foundation concrete below grade may be neglected in dead load computations. Interior footings should bear a minimum of 12 inches below finished grade. Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

Footings, foundations, and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ from those presented in this report, supplemental recommendations will be required.

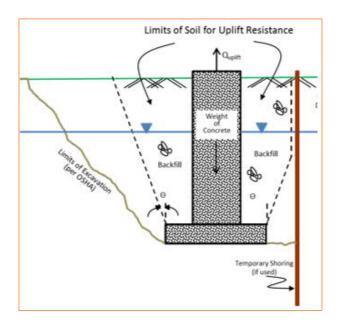
Design Parameters - Uplift Loads

We understand a covered walkway will connect the southeastern corner of the new structure to the existing structure. Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated in the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of

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the foundation to the ground surface at an angle, θ , of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 120 pcf should be used for the backfill. This unit weight should be reduced to 50 pcf for portions of the backfill or natural soils below the groundwater elevation.



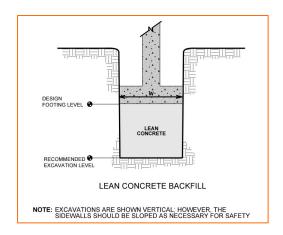
Foundation Construction Considerations

As noted in the **Earthwork** section, soils exposed in footing excavations should be evaluated by the Geotechnical Engineer or his representative. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

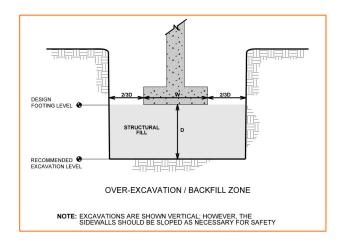
If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.

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Over-excavation for structural fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with well-graded granular material placed in lifts of 8 inches or less in loose thickness and compacted to at least 95 percent of the material's maximum standard Proctor dry density (ASTM D-698). The overexcavation and backfill procedure is described in the figure below.



For foundations adjacent to slopes, a minimum horizontal setback of 10 feet should be maintained between the foundation base and slope face. In addition, the setback should be at a location where an imaginary line extending downward at 45 degrees from the nearest edge of the foundation does not intersect the slope face.

Areas of loose soils may be encountered at foundation bearing depth after excavation is completed for footings. When such conditions exist beneath planned footing areas, the subgrade soils should be surficially compacted prior to placement of the foundation system. If sufficient compaction cannot be achieved in-place, the loose soils should be removed and replaced with

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engineered fill. For placement of engineered fill below footings, the excavation should be widened laterally, at least eight inches for each foot of fill placed below footing base elevations.

SEISMIC CONSIDERATIONS

Seismic Site Classification

Code Used	Site Classification
2018 International Building Code (IBC) 1	D^2

- 1. In general accordance with the 2018 International Building Code.
- 2. The 2018 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100-foot soil profile determination. Borings for the building extended to a maximum depth of approximately 20 feet and this seismic site class definition considers that medium dense silty sand continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths could be performed to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a higher seismic site class.

FLOOR SLABS

Depending upon the finished floor elevation, unsuitable, weak, soft to medium stiff soils may be encountered at the floor slab subgrade level. These soils should be replaced with structural fill so the floor slab is supported on at least 2 feet of compacted suitable natural soils or structural fill.

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

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Floor Slab Design Parameters

Item	Description
Interior floor system	Slab-on-grade concrete.
Floor Slab Support ¹	Minimum 12 inches of approved on-site or imported soils placed and compacted in accordance with the Earthwork section of this report. ^{2,3}
Subbase ³	4-inch compacted layer of free draining, granular subbase material

- 1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
- 2. We recommend subgrades be maintained at the proper moisture condition until floor slabs are constructed. If the subgrade should become desiccated prior to construction, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slabs.
- 3. The floor slab design should include a capillary break, comprised of free-draining, compacted, granular material, at least 4 inches thick.

A subgrade prepared and tested as recommended in this report should provide adequate support for lightly loaded floor slabs.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder/barrier.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Settlement of floor slabs supported on existing fill materials cannot be accurately predicted but could be larger than normal and result in some cracking. Mitigation measures, as noted in **Existing Fill** within **Earthwork**, are critical to the performance of floor slabs. In addition to the mitigation measures, the floor slab can be stiffened by adding steel reinforcement, grade beams and/or post-tensioned elements.

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Floor Slab Construction Considerations

On most project sites, the site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of base rock and concrete and corrective action may be required.

We recommend the area underlying the floor slab be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and placement of base rock. Attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the base rock and concrete.

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

LATERAL EARTH PRESSURES

Design Parameters

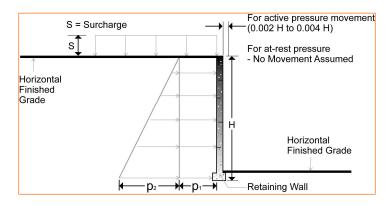
The lateral earth pressure recommendations herein are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls. Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop recommendations for the design of such wall systems upon request.

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint

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conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters			
Earth Pressure Condition	Coefficient for Backfill Type ⁴	Surcharge Pressure ^{5,6,7} p ₁ (psf)	Effective Fluid Pressure ^{4,6,7,8,9} p ₂ (psf)
Active (K _a) ¹	Sandy Silt/Silty Sand- 0.36	(0.36)S	(45)H
At-Rest (K₀)	Sandy Silt/Silty Sand - 0.53	(0.53)S	(65)H
Passive $(K_p)^{2,3}$	Sandy Silt/Silty Sand – 2.8		

- For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height.
- 2. For passive earth pressure to develop, wall must move horizontally to mobilize resistance. Therefore, the total calculated passive pressure should be reduced by one-half to two-thirds for design purposes.
- 3. Ignore passive pressure in frost zone
- Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf.
- 5. Uniform surcharge, where S is surcharge pressure.
- 6. Loading from heavy compaction equipment and dynamic loading are not included.
- 7. No safety factor is included in these values.
- 8. To achieve "Unsaturated" conditions, follow guidelines in Subsurface Drainage for Below-Grade Walls below.
- 9. No hydrostatic pressure acting on wall.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. To calculate the resistance to sliding, a value of 0.35 should be used as the ultimate coefficient of friction between the footing and the underlying soil.

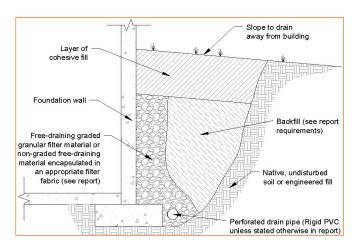
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Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a prefabricated drainage structure may be used. A prefabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

PAVEMENTS

Subgrade Preparation

On most project sites, the site grading is accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

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We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proofrolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

After proofrolling and repairing subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in the **Earthwork** section of this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning.

Pavement Design Considerations

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery and trash removal trucks. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

Pavement thickness can be determined using AASHTO, Asphalt Institute and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Terracon can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to parking lots and drives should slope down from pavement edges at a minimum 2%;
- The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote proper surface drainage;
- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g., garden centers, wash racks);
- Install joint sealant and seal cracks immediately;

Trinka Davis VA - Community Living Centers ■ Carrollton, Georgia June 16, 2023 ■ Terracon Project No. 49235016



- Seal all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter;
 and,
- Place curb, gutter and/or sidewalk directly on low permeability subgrade soils rather than on unbound granular base course materials.

Estimates of Minimum Pavement Thickness

As a minimum, we recommend the following typical pavement sections be considered. We have assumed 50 automobiles per day and a delivery truck 2 times per week.

Asphalt (AC) Pavement			
Material	Light Duty ¹ Thickness (inches)	Heavy Duty ² Thickness (inches)	GDOT
Subgrade	Upper 12 inches of existing soil or engineered fill	Upper 12 inches of existing soil or engineered fill	98% of Standard Proctor MMD, -2 to +3% OMC
Aggregate Base	6	8	GAB, Section 815 and 310
Asphalt Binder Course	-	1¾	SP19 - Section 400, 424, 824 and 828
Asphalt Surface Course	2	11/4	SP9.5 - Section 400, 424, 824 and 828

- 1. Automobiles only.
- 2. Combined automobiles and trucks.

The graded aggregate base should be compacted to a minimum of 98 percent of the material's modified Proctor (ASTM D-1557, Method C) maximum dry density. Where base course thickness exceeds 6 inches, the material should be placed and compacted in two or more lifts of equal thickness.

The listed pavement component thicknesses should be used as a guide for pavement systems at the site for the traffic classifications stated herein. These recommendations assume a 20-year pavement design life. If pavement frequencies or loads will be different than that specified Terracon should be contacted and allowed to review these pavement sections.

Asphalt concrete aggregates and base course materials should conform to the Georgia Department of Transportation (GDOT) "Standard Specifications for Construction of Transportation System".

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Portland Cement Concrete (PCC) Pavement			
Material	Light Duty ¹ Thickness (inches)	Heavy Duty ² Thickness (inches)	Reference
Subgrade	Upper 12 inches of existing soil or engineered fill	Upper 12 inches of existing soil or engineered fill	GDOT: 98% of Standard Proctor MMD, -2 to +3% OMC
Aggregate Base	4	4	GDOT: GAB, Section 815 and 310
PCC	5	6 ½	ACI

- 1. Automobiles only.
- 2. Combined automobiles and trucks.

We recommend a Portland cement concrete (PCC) pavement be utilized in entrance and exit sections, dumpster pads, loading dock areas, or other areas where extensive wheel maneuvering are expected. The dumpster pad should be large enough to support the wheels of the truck which will bear the load of the dumpster.

Although not required for structural support, the base course layer is recommended to help reduce potentials for slab curl, shrinkage cracking, and subgrade "pumping" through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Portland cement concrete should be designed with proper air-entrainment and have a minimum compressive strength of 4,000 psi after 28 days of laboratory curing. Adequate reinforcement and number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI requirements. The joints should be sealed as soon as possible (in accordance with sealant manufacturer's instructions and ACI requirements) to minimize infiltration of water into the soil.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section.

We recommend drainage be included at the bottom of the GAB layer at the storm structures to aid in removing water that may enter this layer. Drainage could consist of small diameter weep holes excavated around the perimeter of the storm structures. The weep holes should be

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excavated at the elevation of the GAB and soil interface. The excavation should be covered with No. 57 stone which is encompassed in Mirafi 140 NL or approve equivalent which will aid in reducing fines from entering the storm system.

Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria, etc.) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for

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third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either substantiate or modify our conclusions in writing.

ATTACHMENTS

Trinka Davis VA - Community Living Centers ■ Carrollton, Georgia June 16, 2023 ■ Terracon Project No. 49235016



EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
5	25	building / utilities

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit. No existing ground surface elevations were provided, and none are shown on the boring logs. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with an ATV-mounted rotary drill rig using continuous flight hollow stem augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

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Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to further evaluate the engineering properties of the various soil strata, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture)
 Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Trinka Davis VA - Community Living Centers - Carrollton, Georgia June 16, 2023 - Terracon Project No. 49235016

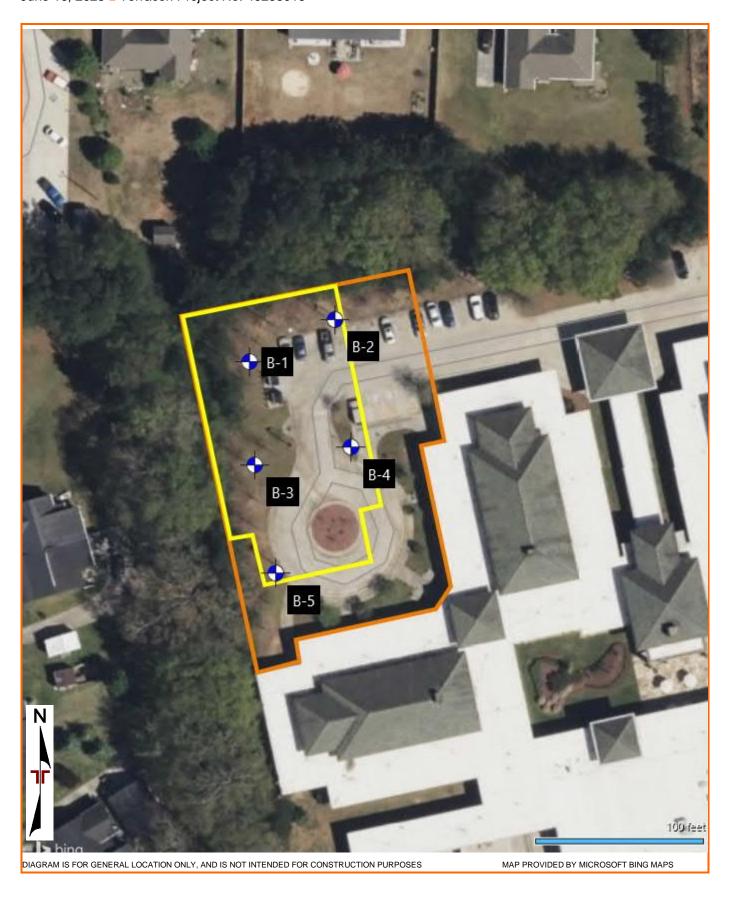




EXPLORATION PLAN

Trinka Davis VA - Community Living Centers Carrollton, Georgia June 16, 2023 Terracon Project No. 49235016





EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-5)

Atterberg Limits
Grain Size Distribution

Note: All attachments are one page unless noted above.

		BORING L	LOG NO. B-1				Page 1	of 1
	ROJECT: Trinka Davis VA - Commun Centers	ity Living	CLIENT: Guido Indian	n Design, Inc. apolis, IN				
Sï	TE: 180 Main Street Carrollton, GA							
GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.5905° Longitude: -85.0589°			DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
×××	DEPTH 0.0 \TOPSOIL, 1/2 Inch				> 0	S)		
	FILL - SANDY SILT (SM), with rock fragmen	nts, orange-brown, loo	se	-			4-4-4 N=8	13.8
	X3.0 RESIDUUM - SANDY SILT (MH), orange, st	iff		-			3-5-7 N=12	36.5
				5 -			4-4-6 N=10	
1	- soft			10-	-		1-1-2 N=3	
Advana Bar	- medium stiff			-			2-3-2	
				15-			N=5	
	18.0 SILTY SAND (SM), fine to medium grained,	orange-black, medium	dense				6-8-9	
				20-			N=17	
				-				
	25.0 Boring Terminated at 25 Feet			25-				
	Stratification lines are approximate. In-situ, the transition ma	y be gradual.		Hammer Type: Automatic				
Advar Ho	ncement Method: Illow Stem Auger			Notes:				
Abano Bao	donment Method: ckfilled with soil cuttings	See Supporting Informations symbols and abbreviation						
	WATER LEVEL OBSERVATIONS	75		Boring Started: 06-02-2023		Boring (Completed: 06-0	2-2023
	14 Feet 3 Inches While Drilling	- lieu	מחאבי	Drill Rig: CME 550		_	MDS Midway - C	
	. Cave In At 17 Feet 6 Inches		point PI, Ste 600 nceville, GA	Project No.: 49235016				

-4-3 N=7 21.4 -5-5 = 10 15.7 -6-7 = 13
-4-3 N=7 21.4 -5-5 =10 15.7
-4-3 N=7 21.4 -5-5 =10 15.7
-4-3 N=7 21.4 -5-5 =10 15.7
N=7 21.4 -5-5 15.7 -6-7
-6-7
-2-4 N=6
-2-1 N=3
-4-6 =10
9-10
=19
ted: 06-02-2023
idway - Casey

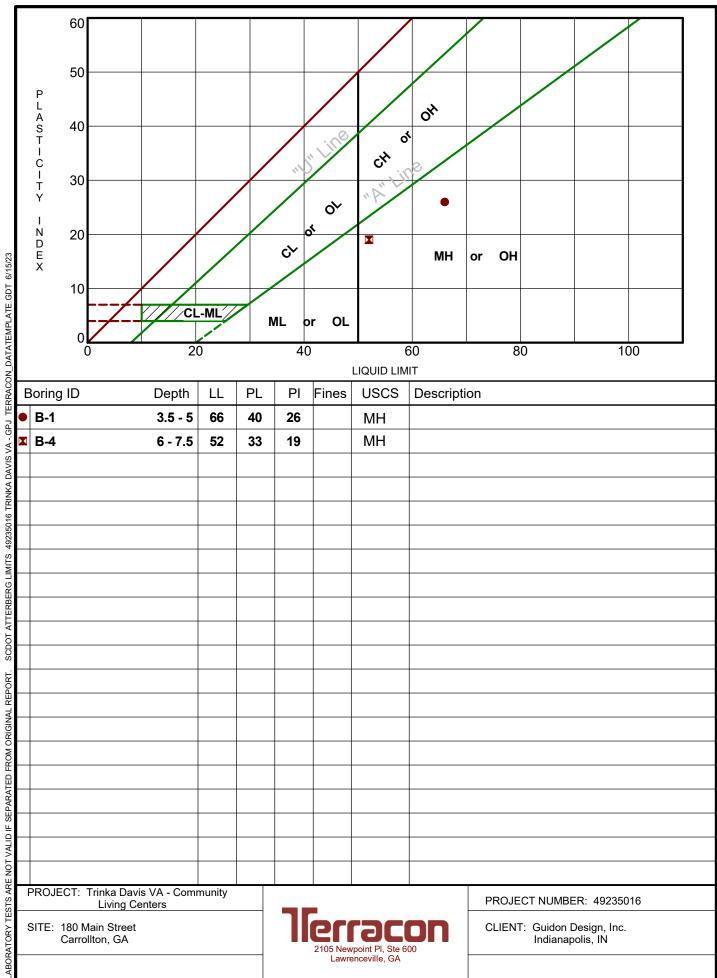
			BORING L	OG NO. B-3			Page 1	of 1
P	PR	OJECT: Trinka Davis VA - Community Centers	/ Living	CLIENT: Guidon Indianap	Design, Inc. polis, IN			
S	SIT	E: 180 Main Street Carrollton, GA						
90		LOCATION See Exploration Plan			(t.)	TYPE	- L.O.	(%)
GRAPHICLOG		Latitude: 33.5904° Longitude: -85.0589°			DEPTH (Ft.)	OBSERVATIONS	FIELD TEST RESULTS	WATER CONTENT (%)
GRAF	;				DEP	OBSERVA SAMDI E		NOS
-		DEPTH 0.1 \TOPSOIL, 1 Inch			/ >	ō u	Ď	
\otimes	\otimes	FILL - SANDY SILT (ML), with rock, red-black,	stiff		/		3-6-5	
	\otimes					\geq	N=11	18.2
\otimes	\otimes							
$\stackrel{\circ}{\otimes}$	\otimes						4-4-5 N=9	25.7
	\otimes	6.0			5 —			
5	Ĭ	RESIDUUM - SANDY SILT (MH), trace mica, re	ed, stiff				5-7-8	
Y L L						\vdash	N=15	
<u> </u>							3-5-6	
Ž Z					10-	\mathbb{Z}	N=11	
2								
_ 								
<u> </u>		13.0 SILTY SAND (SM), with mica, trace clay, fine to	o medium grained, ta	n. loose				
<u>0</u>		,, ,, ,, ,, ,,	, G	,	-		3-3-4 N=7	
AA DAVIS					15	zĽ	11-7	
0100								
49230		- orange-black, very loose					1-1-2	
WELL					20-	36	N=3	
Y I								
GEO SMARI LOG-		- loose					2-3-5	
يات ا	<mark></mark>	25.0 Boring Terminated at 25 Feet			25	\dashv	N=8	
		-						
JIVAI 2 IIVAI								
A LED FROM ORIGINAL REPOR		Stratification lines are approximate. In-situ, the transition may be	e gradual.	H	ammer Type: Automatic			
K						_		
		ement Method: w Stem Auger		No	ites:			
A A L			See Supporting Information	ion for explanation of				
		onment Method: filled with soil cuttings	See Supporting Informati symbols and abbreviation	ns.				
	7	WATER LEVEL OBSERVATIONS 15 Feet 6 Inches While Drilling	160	acon Bori	ng Started: 06-02-2023	Во	ring Completed: 06-	02-2023
200				Dilli	Rig: CME 550	Dr	iller: MDS Midway -	Casey
E 18854	21	Cave In At 19 Feet 6 Inches		oint PI, Ste 600 ceville, GA Proi	ect No.: 49235016	1		

		1	BORING L	OG NO. B-4				Page 1 c	of 1
	PR	OJECT: Trinka Davis VA - Community Centers	Living	CLIENT: Guidon Design, Indianapolis, IN	Inc.				
	SIT	E: 180 Main Street Carrollton, GA							
	GRAPHICLOG	LOCATION See Exploration Plan Latitude: 33.5903° Longitude: -85.0587°			DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
\overline{x}		DEPTH 0.0 \TOPSOIL, 1/2 Inch				> ö	S)		
×××××××××××××××××××××××××××××××××××××××		FILL - SILTY SAND (SM), trace organics, red, I	oose		<u> </u>		X	3-3-4 N=7	16.4
0/15/25 XXXXXX		- with rock fragments, medium dense			5-			3-4-6 N=10	25.0
LAIE.GU		RESIDUUM - SANDY SILT (MH), red, very stiff			_	-		8-11-8 N=19	21.1
LDA I AI EIVIE		- with mica, stiff			10-			6-7-7 N=14	
IERRACO					-				
		13.0 SILTY SAND (SM), with mica, fine to medium g	grained, tan, loose		_ -				
5016 I KINKA DAVIS VA					15-			2-4-5 N=9	
NO WELL 4923		- trace rock fragments, orange-black			20-			2-3-3 N=6	
					- - - 25-	-		4-4-5 N=9	
A I ED FROM ORIGINAL REPOR		Boring Terminated at 25 Feet							
¥		Stratification lines are approximate. In-situ, the transition may be	e gradual.	Hammer Type:	Automatic				
ALID IF SEF		ement Method: ow Stem Auger		Notes:					
AI AI		onment Method: cfilled with soil cuttings	See Supporting Informati symbols and abbreviation	on for explanation of ns.					
<u> </u>	Z	WATER LEVEL OBSERVATIONS 16 Feet 7 Inches While Drilling	75	Boring Started: 0	6-02-2023		Boring (Completed: 06-02	2-2023
200		· •		Drill Rig: CME 55	0		Driller:	MDS Midway - Ca	asey
	£364	Cave In At 21 Feet 6 Inches		int PI, Ste 600 ceville. GA Project No.: 4923	5016				

		BORING	LOG NO. B-				Page 1 o	of 1
PR	ROJECT: Trinka Davis VA - Communi Centers	ty Living	CLIENT: Guido Indiar	on Design, Inc. Japolis, IN				
SIT	TE: 180 Main Street Carrollton, GA			• /				
-06	LOCATION See Exploration Plan			t)	VEL ONS	YPE	L S	(%)
GRAPHICLOG	Latitude: 33.5901° Longitude: -85.0588°			 DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
GRA					WATE	SAME	핊묎	S NO
\otimes	0.0 \TOPSOIL, 1/2 Inch							
\bigotimes	FILL - SILTY SAND (SM), trace mica, rock fr	agments and organi	cs, red-black, loose	_		M	3-4-5 N=0	19.6
\otimes							N=9	
\otimes				_			2-3-5	26.0
$\stackrel{>}{\otimes}$				5 -		<u> </u>	N=8	20.0
$\stackrel{\times}{\mathbb{I}}$	X6.0 RESIDUUM - SANDY SILT (MH), trace mica,	red, very stiff					6-8-9	
		- -		-		A	N=17	
	- stiff			_			4-6-7	_
	S.III			10-		X	N=13	
				-				
				-	-			
				-				
	- orange-black, medium stiff			-		M	2-2-2 N=4	
				15-	 			
				_				
L	18.0							
	SILTY SAND (SM), trace mica, fine to mediui	m grained, white, vei	ry loose	_			2-1-2	
	<mark>4.</mark>			20-	_		N=3	_
	<mark>:</mark>			-	ļ			
				-	123			
	- orange-black, medium dense			_		\vdash	2.5.7	
	25.0			25-		X	3-5-7 N=12	
	Boring Terminated at 25 Feet			25				
	Charlie at an incompanion to be site. At a transition of	. h. a manada ad						
	Stratification lines are approximate. In-situ, the transition may	/ be gradual.		Hammer Type: Automatic				
	ncement Method: Ilow Stem Auger			Notes:				
		Con Comments of Lat	action for overlanding of					
	donment Method: ckfilled with soil cuttings	See Supporting Information symbols and abbrevia	nation for explanation of titions.					
	-							
_	WATER LEVEL OBSERVATIONS 16 Feet 3 Inches While Drilling			Boring Started: 06-02-2023		Boring (Completed: 06-02	2-2023
				Drill Rig: CME 550		Driller: I	MDS Midway - C	asey
A	Cave In At 22 Feet 1 Inch		vpoint PI, Ste 600 enceville, GA	Project No.: 49235016				

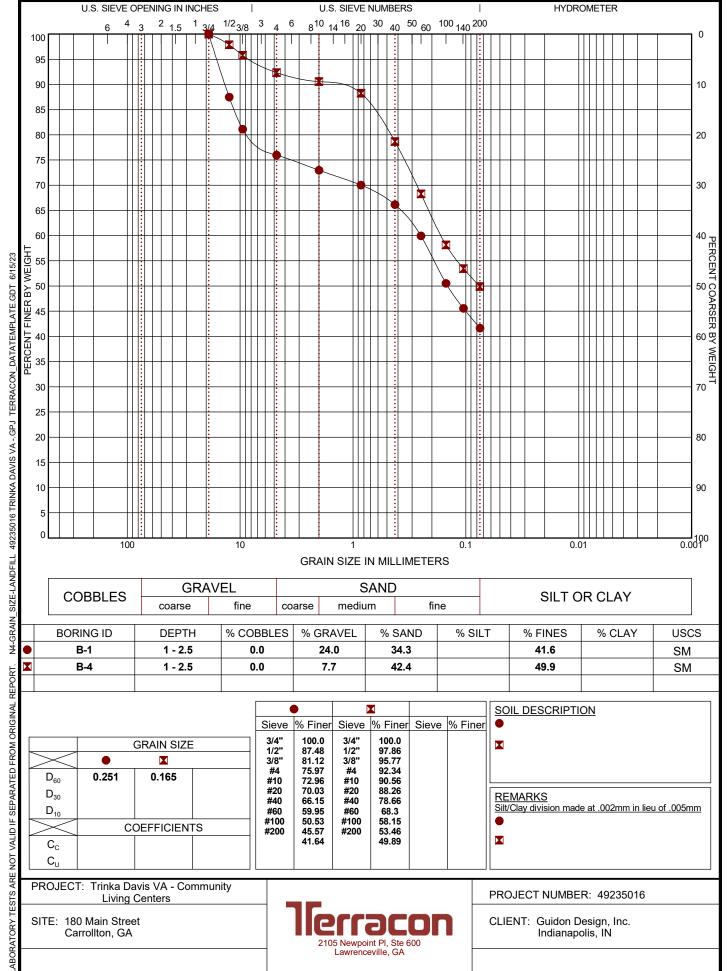
ATTERBERG LIMITS RESULTS

ASTM D4318



GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



SUPPORTING INFORMATION

Contents:

General Notes Unified Soil Classification System

Note: All attachments are one page unless noted above.



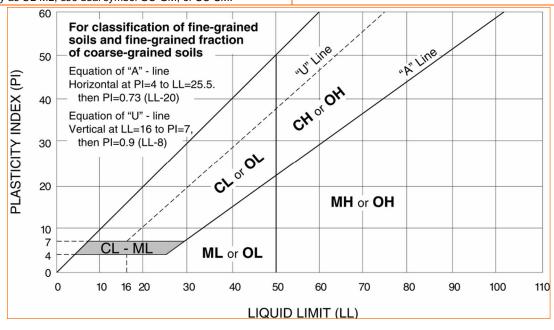
					S	Soil Classification	
Criteria for Assign	ing Group Symbols	and Group Names	Using Laboratory	Tests A	Group Symbol	Group Name ^B	
		Clean Gravels:	$Cu \ge 4$ and $1 \le Cc \le 3$ E		GW	Well-graded gravel F	
	Gravels: More than 50% of	Less than 5% fines ^C	Cu < 4 and/or [Cc<1 or 0	Cc>3.0] ^E	GP	Poorly graded gravel F	
	coarse fraction retained on No. 4 sieve	Gravels with Fines:	Fines classify as ML or N	ИΗ	GM	Silty gravel F, G, H	
Coarse-Grained Soils:	retained on No. 4 sieve	More than 12% fines ^C	Fines classify as CL or C	Н	GC	Clayey gravel F, G, H Well-graded sand	
More than 50% retained on No. 200 sieve		Clean Sands:	$Cu \ge 6$ and $1 \le Cc \le 3$ E		SW	Well-graded sand	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Less than 5% fines D	Cu < 6 and/or [Cc<1 or Cc>3.0] E		SP	Poorly graded sand	
		Sands with Fines: More than 12% fines D	Fines classify as ML or MH		SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH		sc	Clayey sand ^{G, H, I}	
		Ingrapio	PI > 7 and plots on or ab	ove "A"	CL	Lean clay ^{K, L, M}	
	Silts and Clays:	Inorganic:	PI < 4 or plots below "A"	line ^J	ML	Silt K, L, M	
	Liquid limit less than 50	Organic:	Liquid limit - oven dried	< 0.75	75 OL	Organic clay K, L, M, N	
Fine-Grained Soils: 50% or more passes the		Organic.	Liquid limit - not dried	< 0.73	OL	Organic silt K, L, M, O	
No. 200 sieve		Inorganic:	PI plots on or above "A" line		CH	Fat clay ^{K, L, M}	
	Silts and Clays:	morganio.	PI plots below "A" line		MH	Elastic Silt K, L, M	
	Liquid limit 50 or more	Organic:	Liquid limit - oven dried	< 0.75	ОН	Organic clay K, L, M, P	
		Organio.	Liquid limit - not dried	₹ 0.73	011	Organic silt K, L, M, Q	
Highly organic soils:	Primarily	organic matter, dark in co	olor, and organic odor		PT	Peat	

- A Based on the material passing the 3-inch (75-mm) sieve.
- If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

E
$$Cu = D_{60}/D_{10}$$
 $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

- $^{\mbox{\scriptsize F}}$ If soil contains \geq 15% sand, add "with sand" to group name.
- ^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

- $\ensuremath{^{\textbf{H}}}\xspace$ If fines are organic, add "with organic fines" to group name.
- If soil contains ≥ 15% gravel, add "with gravel" to group name.
- J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay. J
- K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
- L If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
- MIf soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
- N PI \geq 4 and plots on or above "A" line.
- OPI < 4 or plots below "A" line.
- P PI plots on or above "A" line.
- ^QPI plots below "A" line.



APPENDIX C: QA/QC plan & VA Checklists





ARCHITECTURAL DESIGN REVIEW CHECKLIST

TITLE _Construct TVDD CLC 12 Beds	PROJECT NO. 508-349
LOCATIONCarrollton GA	DATE 8/16/2024
REVIEWED BY Tyler Sanders	
ORGANIZATION Guidon	

LIFE SAFETY ISSUES

NO.	ARCHITECTURAL - LIFE SAFETY ITEM	COMMENTS/ YES/NO/NA
1	The design of all fire safety features in new construction and renovation at VA facilities shall comply with the latest edition (the edition in effect at the bid date) of the National Fire codes (a compilation of National Fire Protection Association Codes, Standards, Recommended Practices, and Manuals). Fire protection features not included in the National Fire Codes shall be designed in accordance with the requirements of the latest edition of the International Building Code (IBC).	YES
2	For existing buildings, the Fire Protection Engineering consultant may propose equivalent fire safety protection. The consultant shall document equivalency requests with sufficient rationale in the fire protection report for the project. VA's Authority Having Jurisdiction shall approve all equivalency requests prior to the equivalent method being incorporated into the design.	YES
3	Every project should have a comprehensive fire protection design plan which includes protection throughout the building by an approved automatic sprinkler system. A fire protection report, including fire protection drawings that are developed during the design development stage of the project, shall support the fire protection plan. The fire protection report shall include related design considerations and criteria that have been coordinated among all the affected disciplines, and shall serve as the basis for the design, construction, and future operation of the building.	YES

ARCHITECTURAL DESIGN REVIEW CHECKLIST

TITLE _Construct TVDD CLC 12 Beds	PROJECT NO. 508-349
LOCATIONCarrollton GA	DATE 8/16/2024
REVIEWED BY Tyler Sanders	
ORGANIZATION Guidon	

CONSTRUCTION DOCUMENTS / FINAL BID DOCUMENT

NO.	ARCHITECTURAL – CONSTRUCTION DOCUMENTS /	COMMENTS/
NO.	FINAL BID DOCUMENT ITEM	YES/NO/NA
1	Compliance with DESIGN REVIEW Submission Instructions (PG-18-15)	YES
2	Incorporate all of the revisions required from DD2 Review	YES
3	Floor Plans/Drawings;	
	a. Room names and numbers	YES
	b. Interior dimensions	YES
	c. Exterior dimensions and match lines	YES
	d. Column grid lines	YES
	e. Expansion joints between new and existing	YES
	f. Floor drains and pitch (all accessible Bathroom & Bathing room floors slope to drain)	YES
	g. Corner guards, handrails, bumper guards, and grab bars	YES
	h. Water coolers (near waiting rooms and along corridors)	YES
	i. Air-lock vestibules at main entrance	YES
	j. Elevator lobbies (min 12 feet deep)	N/A
	k. Ducts and utility shafts that pass-through floors	YES
	1. Transformer rooms with curbs and no overhead pipes or ducts	YES
	m. Roof slope is minimum 1/4" per foot	YES
	n. Roof-top equipment with screens	YES
	o. Access doors to roof	YES
	p. Walkways on roof	YES
	q. Lightning protection	YES
	r. Door symbols	YES
	s. Lead-lines partitions and "universal floor T's"	YES
	t. Location and details of Dedication Plaque	
	u. Floor slab depressions identified and coordinated with structural drawings	YES

	ARCHITECTURAL – CONSTRUCTION DOCUMENTS /	COMMENTS/
NO.	FINAL BID DOCUMENT ITEM	YES/NO/NA
	v. Areaways with rails or gratings	YES
4	Demolition Plans with existing finish schedule and notes	N/A
5	Reflected Ceiling Plan	YES
6	Equipment Plans with elevations and details	YES
7	Building sections, wall sections, and exterior elevations showing:	
	a. Finish floor elevations	YES
	b. All building systems	YES
	c. Materials	YES
	d. Future expansion	YES
8	Fire Protection Plan:	
	a. Details of stairwell sign	N/A
	b. Door and window schedule with fire rating and fire rated glazing	YES
	c. Location of main annunciator panel	N/A
	d. Height and configuration of storage racks and shelving	N/A
	e. Exit calculations	YES
9	Graphics and Signage Plan	YES
10	Interior details, elevations, and sections	YES
11	Finish schedule	YES
12	Architectural specifications edited and marked in pencil	YES
13	Drafting symbols, abbreviations, general notes, and schedules	YES
14	Coordinate all drawings with other technical disciplines	YES
15	Compliance with VA NCS Application Guide and applicable NCS	YES
	modules.	
16	Compliance with applicable requirements of any Record of Decision or	YES
	Finding of No Significant Impact under NEPA, and/or any	
	commitment or agreement under Section 106 of NHPA.	

ELECTRICAL DESIGN REVIEW CHECKLIST

TITLE Construct TDVV CLC 12 Beds LOCATION Carrollton, GA REVIEWED BY Nick Esposito, PE ORGANIZATION Charlotte Engineers, LLP **PROJECT NO.** 508-349 **DATE** August 19, 2024

NO.	ELECTRICAL – CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
1	Requirements for Essential and Standby Electrical System distribution - follow Electrical Design Manual.	YES
2	Requirements for primary and secondary transformation and distribution equipment (see Electrical Design Manual).	YES
3	Receptacles, mounting heights as required in different areas (see Electrical Design Manual).	YES
4	Raceways required in Fluoroscopic, Radiographic and Deep Therapy rooms (see Electrical Design Manual).	NA, not in the scope of work.
5	Raceway systems (see Electrical Design Manual):	
	a. Install all wiring in raceways.	YES
	b. Encase underground raceways in concrete.	YES
6	Alarms: Nonflammable medical gas and medical- surgical vacuum systems (see Electrical Design Manual) and NFPA 99:	
	a. Master alarm panels required at the Telephone Console Room and Engineering Control Center.	NA, not in the scope of work.
	 Area alarms provided at nurses' stations where medical gas systems are installed. 	NA, not in the scope of work.
7	Miscellaneous Alarm Systems (see Electrical Design Manual): Blood Bank refrigeration, Medical Gas System Alarm and others.	NA, not in the scope of work.
8	Lightning Protection System: (see Electrical Design Manual).	YES
9	Fire Alarm Systems: See Fire Protection Design Manual	YES
10	Coordinate drawings with other technical disciplines	YES
11	Compliance with VA National CAD Standard Application Guide and applicable National CAD Standard modules	YES

FIRE PROTECTION DESIGN REVIEW CHECKLIST

TITLE Construct TDVV CLC 12 Beds LOCATION Carrollton, GA REVIEWED BY John Callahan, CFPS, FP PE ORGANIZATION Charlotte Engineers, LLP **PROJECT NO.** 508-349 **DATE** August 19, 2024

NO.	FIRE PROTECTION – CONSTRUCTION DOCUMENT ITEM	COMMENTS/
	(Related to Plumbing/Sanitary Engineering)	YES/NO/NA
1	Have DESIGN REVIEW Submission Requirements (PG-18-15) for	Yes
	this review been met? If not, list omissions.	
2	Were previous VA comments satisfied?	Yes
3	Have drawings been prepared in compliance with VA Design &	Yes
	Construction Procedures and Design Manuals?	
4	Have smoke and fire partitions been indicated on drawings?	Yes
5	Have fire densities been indicated on drawings	Yes
6	Have fire supply lines and fire standpipes been indicated?	Yes
7	Are shut-off valves and drains provided at base of fire standpipes?	Yes
8	Are all fire protection items provided in specifications?	Yes
9	Coordinate drawings with other disciplines	Yes

HEATING, VENTILATING, AND AIR CONDITIONING DESIGN REVIEW CHECKLIST

TITLE Construct TDVV CLC 12 Beds LOCATION Carrollton, GA REVIEWED BY Avery Stanley, MSME, PE ORGANIZATION Charlotte Engineers, LLP **PROJECT NO.** 508-349 **DATE** August 19, 2024

FINAL BID DOCUMENTS

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – FINAL BID DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
1	Check if the A/E submission is in compliance with PG-18-15.	YES
2	Summary of PG-18-15 A/E submission requirements for the designers:	
	a. Place the seal of the professional engineer responsible for the design on the drawings.	YES
	b. Submit revised draft specifications to incorporate all changes, resolution of conflicts and modifications noted at CD1 review. Revisions shall also include results of any drawing changes not shown on CD1 documents that affect the specifications.	YES
	c. Type specifications in final format and submit a complete set for review. Include a set of full-size final drawings fully coordinated.	YES
	d. Return all draft specifications reviewed at CD 1 review to aid the final bid documents review.	N/A – will submit upon request.
3	Compliance with VA National CAD & BIM Standards Application Guide	YES

PLUMBING/SANITARY DESIGN REVIEW CHECKLIST

TITLE Construct TDVV CLC 12 Beds LOCATION Carrollton, GA REVIEWED BY Devin Strickland, CPDT ORGANIZATION Charlotte Engineers, LLP **PROJECT NO.** 508-349 **DATE** August 19, 2024

NO.	PLUMBING - CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
1	Have DESIGN REVIEW Submission Requirements (PG-18-15) for this review been met? If not, list omissions.	YES
2	Were previous VA comments satisfied?	YES
3	Have drawings been prepared in compliance with VA Design & Construction Procedures?	YES
4	Have design calculations been submitted for the following systems:	
	a. Soil, waste, & vent	YES
	b. Roof drainage	YES
	c. Domestic cold water	YES
	d. Domestic hot water & return	YES
	e. Hot water generation	YES
	f. Reagent grade water	NA
	g. Fuel gas	NA
	h. Oxygen	NA
	i. Vacuum	NA
	j. Medical air	NA
	k. Nitrous Oxide	NA
	1. Nitrogen	NA
	m. Laboratory air	NA
	n. Laboratory vacuum	NA
	o. Dental air	NA
	p. Oral Evacuation	NA
	q. Shop air	NA
	r. Therapeutic pool	NA
5	Do drawings indicate locations, sizes, & capacities of:	
	a. Medical air compressors & receivers	NA
	b. Laboratory air compressors & receivers	NA
	c. Dental air compressors & receivers	NA

NO.	PLUMBING - CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
	d. Vacuum pumps & receivers	NA
	e. Hot water heaters, accumulator, & circulating pump	YES
	f. Sumps & pumps	YES
	g. Water treatment equipment	NA
6	Do plumbing fixture numbers agree with those provided in contract	YES
Ü	specifications?	120
7	Have correct plumbing fixtures been located where required?	YES
8	Has adequate wall space been provided for piping to serve wall-hung	YES
Ü	fixtures and back-to-back fixtures?	
9	Has location, size, and invert or centerline elevations of sanitary and	YES
	storm sewers, water and fuel gas lines been coordinated with	
	civil/sanitary engineer?	
10	Do "P" numbers provided for plumbing fixtures on drawings match	YES
	those indicated in specifications?	
11	Have piping and fixture locations been coordinated with architectural	YES
	and structural drawings?	
12	Has freeze protection been considered for water piping?	YES
13	Are floor drains correctly located and sized?	YES
14	Are roof drains correctly located and sized?	YES
15	Has location and number of cylinders of nitrous oxide manifold been	NA
	indicated?	
16	Has location and number of cylinders of inside oxygen manifold been	NA
	indicated?	
17	Has exterior oxygen storage pad been indicated?	NA
18	Has location of medical gas alarm panels been shown?	NA
19	Have pressure failure switches for oxygen, nitrous oxide, vacuum, and	NA
	compressed air systems been indicated and coordinated with electrical?	
20	Are fuel oil tanks for emergency generators provided?	NA
21	Have balancing valves been provided in the domestic hot water	YES
	system?	
22	Are emergency eye wash/showers provided where chemicals and other	YES
	hazardous materials are handled?	
23	Have room names and numbers been provided for floor plans?	YES
24	Have floor numbers, floor heights, and plumbing fixture numbers been	YES
	shown on all riser diagrams?	
25	Have adequate number of isolation shut-off valves been provided for	
	the following piping systems?	
	a. Water	YES
	b. Fuel Gas	NA
	c. Medical Gases	NA
26	Have backflow prevention valves been installed in potable and non-	YES
	potable water distribution systems	

NO.	PLUMBING - CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
27	Are acid waste and vent piping and neutralization/dilution tanks	NA
	necessary?	
28	Are all plumbing items provided in specifications?	YES
29	Has type, speed, horsepower, and capacity of pumps and compressors	YES
	been provided on drawings?	
30	Have necessary details been provided?	YES
31	Have riser diagrams been provided for the following systems?	
	a. Soil, waste, & vent	YES
	b. Cold water	YES
1	c. Hot water & return	YES
	d. Reagent grade water	NA
1	e. Oxygen	NA
	f. Medical air	NA
	g. Vacuum	NA
	h. Dental air	NA
	i. Oral evacuation	NA
	j. Shop air	NA
	k. Fuel gas	NA
	1. Nitrous oxide	NA
	m. Nitrogen	NA
ļ	n. Roof drainage	YES
32	Coordinate drawings with other disciplines	YES

NO.	SANITARY – CONSTRUCTION DOCUMENT ITEM	COMMENTS/ YES/NO/NA
1	Have DESIGN REVIEW Submission Requirements (PG-18-15) for	YES
	this review been met? If not, list omissions at bottom of this sheet.	
2	Were previous VA comments satisfied?	YES
3	Have drawings been prepared in compliance with VA Design &	YES
	Construction Procedures & Design Manuals?	
4	Have design calculations been submitted for the following systems:	
	a. Sanitary sewerage	YES
	b. Sewage treatment	NA
5	Are sanitary drawings coordinated with plumbing, electrical site, steam	YES
	site, and landscape drawings?	
6	Coordinate drawings with other disciplines	YES

DESIGN REVIEW CHECKLIST

SITE AND LANDSCAPE

- ☑Reviewers should Use Checklists when reviewing any type of VA construction project for the following disciplines:
 - Architectural,
 - Boiler Safety Devices Operation Checklist,
 - Electrical,
 - Heating, Ventilating, and Air Conditioning (HVAC),
 - Incineration/Solid Waste,
 - Plumbing, Fire Protection, and Sanitary,
 - Site and Landscape,
 - Steam Distribution,
 - Steam Generation, and
 - Structural.
- ☑Reviewers should Ensure that DESIGN REVIEW Submission Instructions (PG-18-15) for Schematic, Design Development, and Construction Documents are followed for various types of VA construction projects.
- ☑Reviewers should Ensure that every VA construction project is in compliance with all life safety issues.
- ☑Reviewers should Be aware that these checklists are not all-inclusive but only provide minimum review items.

SITE AND LANDSCAPE DESIGN REVIEW CHECKLIST

TITLETrinka Davis Construct TDV	V CLC 12 Beds	
PROJECT NO. 508-349		
LOCATIONTrinka Davis Veteran		
Village	DATE 2/12/2024	
REVIEWED BY TJ Schmid		
ORGANIZATION Guidon Design		

GENERAL INFORMATION FOR REVIEWERS

The reviewer should be thoroughly familiar with the following VA standards before conducting a design review. These are available on the CFM Internet Web site: https://www.cfm.va.gov/til

ITEM	DESCRIPTION
1.	MASTER CONSTRUCTION SPECIFICATIONS (PG-18-1)
2.	DESIGN AND CONSTRUCTION PROCEDURES (PG-18-3)
3.	STANDARD DETAILS (PG-18-4) AND CAD STANDARDS
4.	DESIGN MANUALS (PG-18-10)
5.	DESIGN GUIDES (PG-18-12)
6.	BARRIER FREE DESIGN STANDARD (PG-18-13)
7.	MINIMUM REQUIREMENTS FOR DESIGN REVIEW SUBMISSIONS (PG-18-15)
8.	ENVIRONMENTAL PLANNING GUIDANCE (PG-18-17)
9.	CULTURAL RESOURCE MANAGEMENT DIRECTIVE (D-7545)
10.	CULTURAL RESOURCE MANAGEMENT PROCEDURES (H-7545)
11.	DESIGN ALERTS

SITE AND LANDSCAPE REVIEW DESIGN REVIEW CHECKLIST

TITLETrinka Davis Construct TDVV	CLC 12 Beds	
PROJECT NO. 508-349		
LOCATIONTrinka Davis Veteran		
Village	DATE 2/12/2024	
REVIEWED BY TJ Schmid		
ORGANIZATION Guidon Design		

SCHEMATIC 1

NO.	SCHEMATIC 1 – SITE AND LANDSCAPE ITEM	COMMENTS/ YES/NO/NA
1	COMPLIANCE WITH DESIGN REVIEW SUBMISSION	
	INSTRUCTIONS	
	(PG-18-15)	
2	ANALYSIS OF THE SITE (Narrative and graphic format) - Does	
	analysis show relation to:	
	a. Adjacent facilities and surrounding community	Yes
	b. Mass transit routes	Yes
	c. Utilities (water, sewer, gas, telephone, electric, fire alarm)	Yes
	d. On and off site restrictions	Yes
	e. Zoning ordinances	Yes
	f. Easements	Yes
	g. Aircraft flight patterns	NA
	h. Fire access	Yes
	i. Flood plains and wetlands	Yes
	j. Soil conditions	Yes
	k. Access roads and surrounding roadway improvements	Yes
	1. Any historic, architectural, archaeological, and/or cultural aspects	Yes
	of the site and its surroundings identified in environmental or historic	
	preservation studies, documents, or agreements	
	m. Accessibility for existing structures	Yes
	n. Hazardous waste data	NA
3	CIRCULATION STUDY - Do drawings show:	
	Ingress/egress by pedestrians, cars, trucks, emergency vehicles, and mass transit traffic	Yes
4	PHASING ANALYSIS/PLAN - Do drawing show impacts of project	
	construction on:	
	a. Hospital routine	Yes
	b. Ingress/egress of pedestrian and traffic flows	Yes

NO.	SCHEMATIC 1 – SITE AND LANDSCAPE ITEM	COMMENTS/ YES/NO/NA
	c. Transportation and storage of construction material	Yes
	d. Mitigation of air and noise pollution	Yes
	e. Sequencing of new conflicts	Yes
	f. Areas of future construction	Yes
5	CONTACT WITH LOCAL AND OTHER JURISDICTIONS	
	a. Off-site roads	Yes
	b. Off-site utilities	Yes
	c. Design reflects any commitments made per the National Environmental Policy Act (NEPA) or agreements reached per Section 106 of the National Historic Preservation Act (NHPA).	Yes
	d. Design reflects resolution of any identified local planning, historic preservation, neighborhood, traffic or community issues	Yes
6	DEVELOPMENT CONCEPT - Do drawings show:	
	a. Proposed buildings and structures (coordinate with Architectural)	Yes
	b. Equipment at grade (coordinate with other disciplines)	Yes
	c. Site preparation	Yes
	d. Demolition	Yes
	e. Future expansion (coordinate with Architectural)	Yes
	f. First floor elevations of proposed structures (coordinate with Architectural)	Yes
	g. Critical spot elevations	Yes
	h. Any structures, spaces, areas, or landscape elements identified for preservation or special treatment per NEPA or NHPA	Yes
7	ACQUIRE TOPOGRAPHIC, UTILITY, AND LANDSCAPE SURVEY	Yes
8	SOILS INVESTIGATION	Yes
9	Compliance with VA CAD and BIM Standards	Yes

SITE AND LANDSCAPE REVIEW DESIGN REVIEW CHECKLIST

TITLETrinka Davis Construct TDV	/V CLC 12 Beds	
PROJECT NO. 508-349		
LOCATIONTrinka Davis Veteran		
Village	DATE 2/12/2024	
REVIEWED BY TJ Schmid		
ORGANIZATION Guidon Design		

SCHEMATIC 2

NO.	SCHEMATIC 2 – SITE AND LANDSCAPE ITEM	COMMENTS/ YES/NO/NA
1	COMPLIANCE WITH DESIGN REVIEW SUBMISSION	Yes
	INSTRUCTIONS (PG-18-15) - Have the comments from the previous	
	review been addressed and corrected?	
2	UPDATE NARRATIVE CONCERNING PROJECT DEVELOPMENT	Yes
3	UPDATE PHASING PLAN	Yes
4	TOPOGRAPHIC, UTILITY, AND LANDSCAPE SURVEY - Include	Yes
	Benchmark, Datum Reference, Property lines, Adjoining Streets	
5	STAKING/LAYOUT PLAN - Do drawings show:	
	a. Proposed building and structures (coordinate with Architectural)	Yes
	b. Proposed roads and parking	Yes
	c. Entrances and exits (coordinate with other disciplines)	Yes
	d. Mechanical and electrical equipment on grade (coordinate with	Yes
	other disciplines)	
	e. Demolition	Yes
	f. Boundary line, if required	Yes
6	GRADING PLAN - Do drawings show:	
	a. First floor elevations for buildings and on grade equipment	Yes
	(coordinate with other disciplines)	
	b. Spot elevations at structure corners, entrances, exits, intersections	Yes
	(coordinate with other disciplines)	
	c. Proposed grading	Yes
7	EROSION CONTROL AND DRAINAGE	Yes
8	STAGING AREA - Do drawings show:	
	a. Construction access and parking	Yes
	b. Stockpile areas for earth and materials	Yes
9	LANDSCAPE PLAN - Do drawings show:	
	a. Plant groupings	Yes
	b. List of proposed plant material	Yes
10	Compliance with VA CAD and BIM Standards	

SITE DESIGN REVIEW CHECKLIST

TITLETrinka Davis Construct TDV	V CLC 12 Beds	
PROJECT NO. 508-349		
LOCATIONTrinka Davis Veteran		
Village	DATE 8/19/2024	
REVIEWED BY TJ Schmid		
ORGANIZATION Guidon Design		

DESIGN DEVELOPMENT

NO.	SITE – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
1	COMPLIANCE WITH DESIGN REVIEW SUBMISSION	Yes
	INSTRUCTIONS	
	(PG-18-15) - Have the comments from the previous review been	
_	addressed and corrected?	
2	TITLE BLOCK, SCALE, NORTH ARROW, LEGEND	Yes
3	TOPOGRAPHIC, UTILITY, AND LANDSCAPE SURVEY - Update	Yes
	and expand if necessary	
4	DEMOLITION PLAN - Do drawings show:	
	a. Buildings to be removed	NA
	b. Paving to be removed	Yes
	c. Trees & shrubs to be removed	Yes
	d. Utilities to be removed	Yes
k	STAGING AREA AND CONSTRUCTION FENCE - Do drawings	
	show:	
	a. Construction fence	Yes
	b. Stockpile areas	Yes
	c. Construction sign	No
	d. Safety sign	No
6	STAKING/LAYOUT PLAN - Do drawings show:	
	a. Location of buildings and structures (coordinate with Architectural)	Yes
	b. Location of:	
	(1) Roads	Yes
	(2) Curb and gutters	Yes
	(3) Parking areas	Yes
	(4) Service areas	Yes
	(5) Walks	Yes
	(6) Courtyards, plazas, entryways, etc.	Yes
	(7) Brick paving	NA
	c. Location of inlets (coordinate with Sanitary)	Yes

NO.	SITE – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
	d. Fencing for security	Yes
	e. Accessibility requirements	
	(1) Accessible parking and van spaces	Yes
	(2) Accessible curb ramps	Yes
	(3) Accessible ramps (exterior)	Yes
	f. Mechanical equipment pads (coordinate with Mechanical)	Yes
	g. Electrical equipment pads (coordinate with Electrical)	Yes
	h. Expansion, contraction, and construction joint locations	No
	i. Construction limits	Yes
	j. Underground utilities (coordinate with other disciplines)	
	(1) Power	Yes
	(2) Telephone	Yes
	(3) Water	Yes
	(4) Gas	Yes
	(5) Sewer	Yes
	(6) Storm Drainage	Yes
	(7) Fuel tanks/O ₂ tanks	Yes
	k. Light poles and fire hydrants (coordinate with other disciplines)	Yes
7	GRADING PLAN - Do drawings show:	1 65
	a. First floor building elevations (coordinate with Architectural)	Yes
	b. Spot elevations at structure corners, entrances, exits, platforms and	Yes
	other critical areas (coordinate with Architectural)	103
	c. Elevations of equipment at grade (coordinate with other	Yes
	disciplines)	103
	d. Contour lines	Yes
	(1) Existing	Yes
	(2) New	Yes
	e. Storm drainage inlet elevations (coordinate with Sanitary)	Yes
	f. Existing grades	Yes
	g. Grading limits	Yes
8	ROCK EXCAVATION (Quantity)	NA
9	Compliance with VA National CAD Standard Application Guide and	Yes
,	applicable National CAD Standard modules.	103
10	ROAD PROFILES AND ALIGNMENT - Do drawings show:	
10	a. Horizontal alignment	NA
	b. Vertical alignment	NA
	c. All traversed utilities	NA
11	SIGNAGE PLAN	Yes
12	SIGNAGE DETAILS	Yes
13	CONSTRUCTION DETAILS NOTES	Yes
14		Yes
15	ROCK EXCAVATION (Quantity)	NA
16	EROSION CONTROL AND SEDIMENT CONTROL, POLLUTION PREVENTION PLAN	Yes

NO.	SITE – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
17	COMPLIANCE WITH ENVIRONMENTAL ASSESSMENT	Yes
18	Compliance with terms of any Record of Decision (ROD) or Finding of	Yes
	No Significant Impact (FONSI) under NEPA	
19	Compliance with terms of any historic preservation commitments or	Yes
	agreements	
20	SAMPLE SPECIFICATIONS	Yes

LANDSCAPE DESIGN REVIEW CHECKLIST

TITLETrinka Davis Construct TDV	V CLC 12 Beds	
PROJECT NO. 508-349		
LOCATIONTrinka Davis Veteran		
Village	DATE 8/19/2024	
REVIEWED BY TJ Schmid		
ORGANIZATION Guidon Design		

DESIGN DEVELOPMENT

NO.	LANDSCAPE – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
1	EROSION CONTROL AND SEDIMENT CONTROL, POLLUTION PREVENTION PLAN	Yes
2	COMPLIANCE WITH ENVIRONMENTAL ASSESSMENT	
	 a. Compliance with terms of any Record of Decision (ROD) or Finding of No Significant Impact (FONSI) under NEPA. 	Yes
	b. Compliance with terms of any historic preservation commitments or agreements.	Yes
3	PLANTING PLAN - Do drawings show:	
	a. Composition of:	
	(1) Trees	Yes
	(2) Shrubs	Yes
	(3) Ground cover	Yes
	(4) Lawns	Yes
	b. Quantities	Yes
	c. Spacing	Yes
	d. Plant list	Yes
	e. Keying	Yes
	f. Edging	No
	g. Seeding and sprinkling limits (coordinate with Sanitary)	Yes
4	TITLE BLOCK, SCALE, NORTH ARROW, LEGEND	Yes
5	PLANTING DETAILS	Yes
6	LARGE SCALE PLANS OF SPECIALTY AREAS	
	a. Courtyards, patios, etc.	No
	b. Entrances areas	No
	c. Paving joint patterns	No
7	LANDSCAPE DETAILS	
	a. Brick paving	NA
	b. Benches	No
	c. Planters	NA

NO.	LANDSCAPE – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
	d. Water features	NA
8	PLANTING LIST	
	a. Common name	Yes
	b. Genus and species	Yes
	c. Size/caliper	Yes
	d. Special comments	NA
9	NOTES	No
10	SAMPLE SPECIFICATIONS	Yes
11	Compliance with VA CAD and BIM Standards	Yes

SITE AND LANDSCAPE DESIGN REVIEW CHECKLIST

TITLETrinka Davis Construct TDV	V CLC 12 Beds	
PROJECT NO. 508-349		
LOCATIONTrinka Davis Veteran		
Village	DATE 8/19/2024	
REVIEWED BY TJ Schmid		
ORGANIZATION Guidon Design		

		T
NO.	SITE AND LANDSCAPE –	COMMENTS/
NO.	CONSTRUCTION DOCUMENTS ITEM	YES/NO/NA
1	COMPLIANCE WITH DESIGN REVIEW SUBMISSION	
	INSTRUCTIONS (PG-18-15)	
	a. Have the comments from the previous review been addressed and	Yes
	corrected?	
	b. Have the approved DD2 drawing been expanded to the level of	Yes
	detail necessary for construction?	
	c. Have all the documents been coordinated with other disciplines?	Yes
2	SITE DEVELOPMENT SPECIFICATIONS	Yes
3	LANDSCAPE SPECIFICATIONS	Yes
4	ENVIRONMENTAL AND/OR HISTORIC PRESERVATION	Yes
	SPECIFICATIONS	
5	Compliance with VA CAD and BIM Standards	Yes

STRUCTURAL DESIGN REVIEW CHECKLIST

TITLE: VA Trinka Davis, Construct TVDD CLC 12 Bed

PROJECT NO.: 508-349

LOCATION: VA Trinka Davis, Carrollton GA DATE: August 19, 2024

REVIEWED BY: Andrew Kennedy ORGANIZATION: Guidon Design

NO.	STRUCTURAL – CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
1	Percent Complete	100%
	a. Drawings	Yes
	b. Specifications	Yes
	c. Calculations	Yes
2	Drawings (Spot Check) Comply with VA Appl Guide	
	a. Dimensions	Yes
	b. Size of Beams	Yes
	c. Size of Columns & Base Plates	Yes
	d. Size of Steel Decking (Type & Properties)	Yes
	e. Size of Floor Slab	Yes
	f. Floor Depressions	NA
	g. Floor & Roof Openings	Yes
	h. Elevation of Top of Beams	Yes
	i. Beam reactions shown (or addressed otherwise) for steel	Yes
	framing and Transfer/Frame forces necessary for connection design	
	as well (delegated design)	
	j. Concept of connection details and member reinforcement (steel-	Yes
	delegated design)	
	k. Lateral force- Resisting system Elements, Locations and Details	Yes
	1. Expansion Joint Detail (Special attention in seismic areas)	Yes
	m. Construction Joints & Control Joints	Yes
	n. Orientation of Columns	Yes
	o. Foundations	Yes
	p. Shallow & Deep Foundations-Typical Footing (Size & details	Yes
	including Elevation)	
	q. Pile Cap (Detail including Cut-off Elevation)	NA
	r. Grade beam Details (if applicable)	NA
	s. Total Linear Feet of Piles/Caissons	NA

NO.	STRUCTURAL – CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
	t. Caisson (Detail including Elevation, Top & Bottom)	NA
	u. Rock Elevation (Assure classification with Soil Report)	NA
	v. Estimate of Quantity of Rock Excavation	NA
	w. Water Proofing Detail	NA
	x. Design Parameters (Floor Live Load, Wind, Seismic, & Soil	Yes
	Bearing Pressure)	
3	Special Details & Notes (Spot Check)	
	a. Grades of Steel, Types of Concrete	Yes
	b. Schedules (Footing, Grade Beam, Column, etc.) complete	Yes
	c. Reinforcing Details (conform with ACI, including seismic. details)	Yes
	d. Spacing of bars allow vibrating concrete	Yes
	e. Connection Details	Yes
	f. Sleeve Details	Yes
	g. Shelf Angle Detail	Yes
	h. Fireproofing Details	NA
	i. Pre-cast Panel Design & Details	NA
	j. Masonry Wall Anchorage	NA
	k. Boring Logs	Yes
	1. Structural General Notes	Yes
	m. Special Load Areas Identified	Yes
	p. Cumulative Loads on Columns	Yes
4	Calculations (Spot Check manually the computer results).	
	a. Framed Slab	Yes
	b. Beam (Unbraced Length)	Yes
	c. Column (KL/R)	Yes
	d. Base Plate	Yes
	e. Foundation (coordinate with Geotechnical Report)	Yes
	f. Other Design Considerations (L.L. Reduction, Continuity)	Yes
	g. Deflection (Short & Long Term)	Yes
	h. Drift (from lateral load analysis compared with allowable)	Yes
	i. Non-structural Elements Anchorage	Yes
	j. Lateral Load Analysis	Yes
	k. Physical Security/Blast Calculations	Yes
	Progressive Collapse	NA
5	Computer Application	
	a. Computer output summarized for primary load resisting members	Yes
	b. Computer Program Documentation	Yes
6	Ensure that that all review issues have been resolved, and the project	Yes
	files contain information on how each issue was finalized	
7	Ensure that the project files contain a final set of structural calculations for future reference	Yes

NO.	STRUCTURAL – CONSTRUCTION DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
hav	structural drawings and calculations to show evidence that they been done and checked by professional structural engineer listed der key personnel in the A/E contract	Yes

TELECOMMUNICATIONS SYSTEMS DESIGN REVIEW CHECKLIST

TITLE Construct TDVV CLC 12 Beds LOCATION Carrollton, GA REVIEWED BY Nick Esposito, PE ORGANIZATION Charlotte Engineers, LLP **PROJECT NO.** 508-349 **DATE** August 19, 2024

CONSTRUCTION DOCUMENTS

NO.	TELECOMMUNICATIONS SYSTEMS –	COMMENTS/
NO.	CONSTRUCTION DOCUMENTS ITEM	YES/NO/NA
1	Documents contain RCDD stamp.	YES
2	Requirements for primary and secondary surge protection are included	YES
	(see Telecommunications and Special Telecommunications Systems	
	Design Manual).	
3	Telecommunications rooms are sufficiently sized for cabinet, rack and	YES
	equipment sizes using largest and/or heaviest dimensions and weights	
	so that working clearance requirements, space for future installations,	
	and structural requirements are satisfied. (see Telecommunications and	
	Special Telecommunications Systems Design Manual).	
4	Pathways including cable tray and conduits are sized for quantity of	YES
	cables anticipated. (see Telecommunications and Special	
	Telecommunications Systems Design Manual).	
5	Coordinate drawings with other technical disciplines (see	
	Telecommunications and Special Telecommunications Systems Design	
	Manual):	VEC
	a. Equipment cooling and ventilation.	YES
	b. Equipment power locations.	YES
	c. Electrical loads.	YES
	d. UPS sizing and loads are according to the Physical Security	YES
	Design Manual.	*****
6	Physical Security Systems are coordinated with door hardware, and	YES
	Fire Detection and Notification Systems (see Physical Security Design	
	Manual, NFPA 101 and VA Guide 0730).	ATEG
7	Includes functional diagrams (Riser Diagrams) of Essential	YES
	Telecommunications Systems, Controls and Operation such as Data,	
	Voice (Telephone – contact TVE 202-462-5311), Nurse Call,	
	Emergency Call, Duress Alarm, PA, MATV, CCTV, IC, DAS,	
	Intrusion Detection, Access Control (PACS), and Other Signal	
	Systems.	

NO.	TELECOMMUNICATIONS SYSTEMS –	COMMENTS/
NO.	CONSTRUCTION DOCUMENTS ITEM	YES/NO/NA
8	Project documents to procure and install Wireless LAN Controllers and	YES
	wireless access points. Drawings include two data cables terminated at	
	Wireless Access Point locations approved by VA spectrum analysis	
	and SMCS.	
9	Includes large-scale (minimum 1/4"=1') partial plans for areas such as	YES
	Main Computer Room, Telephone Equipment/Operator Room,	
	Telecommunications Rooms, Network Operations Room, DEMARC,	
	Antenna Head End Room, Police Control/Operation Rooms,	
	Emergency Communications Control/Operations Rooms. Contact,	
	Spectrum Management and COMSEC Service (SMCS 005OP2H3) for	
	complete list.	
10	Specifications are VA specifications from TIL and tailored to fit the	YES
	project requirement.	
11	All system Specifications included and refer to VA Section 27 05 11.	YES
12	Compliance with VA CAD and BIM Standards	YES

ARCHITECTURAL QA / QC	REVIEW CHECKI	LIST	
PROJECT NAME: Construct T	DVV CLC 12 Beds	PROJECT MANAGER:	Mark VanderWoude
PROJECT NUMBER:	22.9003	PROJECT ARCHITECT:	Tyler Sanders
EST. % COMPLETE:	100%	DRAWN BY:	Tyler Sanders
REVIEW PHASE: SD	□DD ⊠CD		
BUILDING CODE REVIEWER: _	Kari Allen		
TECHNICAL REVIEWER:	Erin Sikorski	DATE:	8/16/2024
OUTSTANDING ITEMS YES Are all SD Phase Review is YES Are all DD Phase Review is			
<u>SPECIFICATIONS</u>			
YES Are Specifications attached Yes Does the Specification date YES Is the header and footer for Yes Does the Specification head	match the date on the date the current format?		
TITLE SHEET			
YES Is project title correct?			

- YES Is Owner(s) name correct?
- <u>YES</u> Are all names correctly spelled?
- YES Are all dates proper?
- **YES** Are all addresses, including the Architect, correct?
- Cross check index sheet titles and numbers against actual sheets, verified with all disciplines. **YES**
- YES Cross check title against Project Manual title sheet
- <u>YES</u> Are the correct logos used?

GENERAL INFORMATION SHEET

- YES Check for location map.
- <u>YES</u> Check for vicinity map.
- <u>YES</u> Are all dates proper?
- YES Are all addresses, including the Architect, correct?
- Cross check index sheet titles and numbers against actual sheets, verified with all disciplines <u>YES</u>
- YES Cross check title against Project Manual title sheet

ALL SHEETS

- YES On title block, check that project title, date, project numbering, and spelling are correct. Are all "Drawn By" spaces filled in?
- YES Dimensioning: are there missing dimensions? Is method correct (one side of wall)? Are strings left open ended, are they to face of stud or CMU, and are they continuous? NO ARROWHEADS
- Spot check appropriate specification sections to determine appropriateness, coordination with the drawings, and YES coordination with the method of bidding.
- Conduct cursory review of each sheet for specialty items, special relationships, code compliance, vertical YES relationships, and horizontal relationships.
- Do all drawings have scales and all plans have north arrows correct (north arrow up or to the right)? YES
- <u>YE</u>S Check match lines for continuity.

ARCHITECTURAL QA / QC REVIEW CHECKLIST

- YES Are key plans located in lower right corner?
- YES Is only new construction poched or shaded?
- YES Are current drafting standards being implemented?

LIFE-SAFETY SHEET

- YES Check the construction type and occupancy classification per Code, and if sprinkler system is noted
- YES Is Building / Code Data listed? YES Are referenced codes listed?
- YES Are Fire-rated walls / required separations identified?
- <u>NA</u> Are fire-rated ceilings indicated?
- YES Are Direction of Egress arrows shown?
- YES Are Building Occupancy types listed?
- YES Are Fire Extinguisher and/or Cabinets shown?
- YES Exit width calculated, number of expected occupants listed?
- YES Is a Life Safety Legend shown?

DEMOLITION SHEETS

- N/A Review demo notes. Do they correspond to the proper components to be removed?
- N/A Spot check proposed demolition with Civil, Structural, and MEP Drawings.

PLAN SHEETS

- YES Verify all detail call-outs and cross check detail numbering with the actual details.
- YES Verify all section cuts and cross check section cut numbering with the actual sections.
- <u>YES</u> Note any additional conditions that need sections and/or details.
- <u>YES</u> Do all new or renovated doors have a number? Verify door swings and spot check door sizes, door and doorframe continuity for appearance, sound-proofing and security, code compliance, safety, and impediment to circulation.
- YES Check for floor drains, conflicts.
- YES Check for locations of convectors, fan coils, conflicts.
- YES Check for ceiling bulkheads and locations.
- YES Check electrical cabinet requirements and noting for equipment layouts.
- <u>YES</u> Check conflicts between visual display boards and electrical requirements.
- <u>YES</u> Check location of water coolers. Are handicap accessible coolers provided?
- <u>YES</u> Review restroom facilities for sight lines, general ADA access, and recessed toilet accessories for proper locations and wall thickness.
- YES Are floor material changes properly noted?
- <u>YES</u> Spot check wall construction for appropriateness and soundproofing (elevators, toilets, equipment rooms, conference rooms, and offices). Are rated walls provided at shafts, chases, stairs, corridors, electrical and mechanical rooms, elevators, elevator equipment rooms, storage and janitor rooms, etc.)?
- YES Cross check layouts at match lines with adjoining unit layouts.
- YES Verify that plans and elevations correspond to each other.
- YES Spot check plans against structural, mechanical, electrical plans.
- <u>YES</u> Spot check plans against civil for concrete slabs, ramps, railings, etc.
- YES Are expansion joints defined and specified (floor, wall, ceiling)?
- <u>YES</u> Is foundation drainage shown on foundation or civil plans, tied into storm sewer system on mechanical plans, and noted on appropriate sections?
- YES Do all rooms have a name and number?
- YES Are notes and comments grouped down right side of sheet?
- YES Is there a Legend?
- YES Are Wall Type tags shown?

REFLECTED CEILING PLAN

- <u>YES</u> Is there a Reflected Ceiling Plan Legend?
- YES Verify Legend agrees with Room Finish Schedule
- <u>YES</u> Verify rooms hatched agree with Room Finish Schedule.
- YES Are ceiling heights noted at each room?
- YES Are bulkhead / soffit heights indicated?
- YES Are bulkheads / soffits detailed?
- YES Note any condition that needs to be detailed
- YES Are column grids shown?

ROOF PLAN SHEET

- YES Spot-check all details, numbering sequences, scale, symbols, materials, and dimensions.
- <u>YES</u> Cross check against floor plans and elevations, verify mechanical and electrical projections through roof, and check structural for roof slopes.
- YES Check for roof and overflow drains, verify piping on plumbing plans.
- YES Verify all roof slopes and saddles: does roof drain properly?
- YES Verify that all roof details are appropriate and applicable to the roof system.
- YES Flat roofs: show walk-pad / paver locations.
- YES Verify roof access (doors, hatches, ladder locations).
- YES In spaces with exposed structure, are EPDM fasteners cut off or painted?
- $\underline{N/A}$ If combustible construction, check for attic ventilation. Check for draft stops and access.
- YES Are premanufactured items detailed (roof hatches, skylights, etc.)?
- YES Are notes and comments grouped down right side of sheet?
- YES Are column grids shown?
- N/A Is there a Roof Plan Legend?

BUILDING ELEVATION SHEETS

- <u>YES</u> Cross check elevations against wall sections and foundation plans for conflict of grade. Is foundation, waterproofing, etc., exposed?
- <u>YES</u> Determine that all section cuts are shown, oriented in proper direction, and contain correct numbers and sheet references.
- <u>YES</u> Verify all wall louvers for size and height locations, coordinate against architectural and mechanical floor plans for adjacencies and mechanical discharge and proximity to vertical and horizontal items.
- <u>YES</u> Cross check the key plan against the elevations, the elevations against the floor plans and that proper match lines are shown.
- <u>YES</u> Are sufficient material indications shown to properly identify building components?
- YES Are column grid lines shown?
- YES Are control joint locations shown?
- <u>YES</u> Are all elevations drawn including offsets and returns?
- YES Check titles.
- YES Use 0'-0" nomenclature not 0.00'.
- YES Are notes and comments grouped down right side of sheet?

SECTION SHEETS

- YES Is sheet laid out such that letters or numbers start in the upper right, go down the page, then move left continuing the sequence from the top of the page down as successive details/sections get identified across the page?
- YES Are sections numbered non-sequentially from sheet to sheet?
- <u>YES</u> Is one section per sheet noted thoroughly with the remaining sections noted for non-typical items only?
- YES Is a general note to "see section X/AX.X for typical notes" provided?
- YES Does notation nomenclature match specifications?
- YES Are vertical dimensions given via elevation targets and not dimension lines?
- <u>YES</u> If masonry veneer, is a min. 2" air space provided between veneer and back-up?

ARCHITECTURAL QA / QC REVIEW CHECKLIST

- YES Cross check sections elevations against room finish schedules, details and other appropriate detailing. YES Spot check sections against structural, civil, mechanical and electrical drawings. Check clearances. YES Check steel for fireproofing requirements and specifications. YES Cross check sections for equipment bulkheads and against equipment layouts. YES Evaluate sections for constructibility and weather tight construction. YES Check for note continuity between sections, details, and specifications (if included): insure that either notes or symbology are used, not both. YES Spot check wall conditions and thickness versus floor plans and structural drawings. Are wall thicknesses dimensioned as well as noted? YES Verify extent of vapor barrier, points of termination, continuous overlap, and location on warm side of wall. YES Verify air infiltration barrier overlaps, flashing at base of wall. YES Is exterior waterproofing and perimeter foundation drainage shown correctly? YES Check that wall, roof and/or soffit insulation is contiguous and complete, verify that building envelope is complete with insulation. YES If masonry construction, are end dams noted and detailed? N/A If building has a crawl space, is it properly ventilated and insulated? NO Are only vertical dimensions shown on vertical sections? ROOF CANTILEVER DIMENSIONED YES Are specified criteria noted? YES Is wall framing spacing noted? DOOR AND WINDOW SCHEDULE AND DETAIL SHEETS YES Is sheet laid out such that letters or numbers start in the upper right, go down the page, then move left continuing the sequence from the top of the page down as successive details/sections get identified across the page? YES Spot check jamb, head, sill details and door frame elevations for dimensions and relevance. YES Spot Check door detailing against floor plans, sections and elevations. YES Check door schedule against life safety plan for fire rating, verify louver requirements with mechanical plans, and check glass size limits pertaining to fire rating. If electronic hold opens or electric strikes are identified, are they coordinated with electrical drawings? <u>YES</u> **YES** Is glazing type identified? Are tempered glass locations shown? Do rated doors and windows have wire glass? YES Are window and door frames located from column centerline, face of masonry or stud, or other reference point? YES Are custom windows detailed? YES Are window and door sizes shown on schedules as rough opening dimensions? YES Are window and door perimeter joints dimensioned? YES Are window and curtain wall framing member sizes dimensioned? YES Are metal drips/flashing being used at head of exterior doors and windows? **DETAIL SHEETS**
- <u>YES</u> Is sheet laid out such that letters or numbers start in the upper right, go down the page, then move left continuing the sequence from the top of the page down as successive details/sections get identified across the page?
- YES Are details numbered instead of lettered?
- YES Check for note continuity between sections, details, and specifications (if included): insure that either notes or symbology are used, not both. Are notes repeated or are only differences noted?
- YES Check details for constructibility.
- <u>YES</u> Verify that details correspond to room finish schedule. Are applied finishes distinguished from constructed finishes?
- <u>YES</u> Are pre-manufactured items detailed?

CIVIL/STRUCTURAL / MECHANICAL / ELECTRICAL DRAWINGS

YES	Using same titleblock as Architectural.	Civil, Structural	. MEP logo included in titleblock?

- <u>YES</u> Spot check grade elevation around the perimeter. Coordinate with wall sections.
- YES Coordinate location of ADA door operator pedestals.
- YES Verify recessed slabs for tile, brick, terrazzo, and walk off mats.
- YES Verify proper roof drain sump pan supports.
- YES Do any MEP lines run through structural members?
- YES Spot check exterior hose bibs.
- YES Spot check exterior electrical outlets.
- YES For tall structures, is lightning protection provided/shown or noted?
- N/A Verify that no unrelated MEP lines run through stairs.

APPENDIX D: Guiding Principles Checklist and Supporting Documentation



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2016 Guiding Principles Checklist for New Construction and Modernization v2.0

Per Executive Order 13693, the 2016 Guiding Principles were issued on February 26, 2016 by the White House Council on Environmental Quality, Office of Sustainability, in two documents: "Determining Compliance with the Guiding Principles for Sustainable Federal Buildings" (GP Compliance Document), which outlines evaluation criteria on which the Guiding Principles will be scored, and the "Guiding Principles for Sustainable Federal Buildings and Associated Instructions," which provides instructions, guidance and recommended practices. This Checklist was developed by the U.S. Department of Energy, Federal Energy Management Program, as a voluntary tool for evaluating and tracking a building's progress towards meeting the evaluation criteria defined in the GP Compliance Document. Agencies are invited to use this Checklist as is, or to reformat it to suit agency needs. Some cells in this worksheet are protected. For the password, contact the FEMP sustainability

program at the link below. For more information about the Guiding Principles and FEMIX Support: http://energy.gov/eere/temp/guiding-principles-sustainable-rederal-						
huildinge				Department/Region:		Federal Real Property ID:
Building Name: Trinka Davis Veteran Village CLC				Address: 180 Martin Drive		Checklist Manager:
Federal Campi	ıs:			City & State: Carrollton, GA, 30117		Date: 06/20/2024
						applicable" may be used where the building's inherent function, mission, safety, or r sub-element. Metrics marked as "N/A" should be justified and documented.
Select Gui	dina Princin	ele Metrics Type:	New Construction Metrics	20 In Compliance		
	3		(click menu above)			
			(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Compliance	
Guiding Principle	Required or Additional		Metric	Suggested Evidence of Compliance (may need one or more)	(dropdown box) Yes/No/In- Process/Not Applicable	Notes/Comments
I. Employ Int	egrated Ass	essment, Operati	ion, and Management Principle			
Integrated Assessment, Operation, and Management	RQD	and use an integrate and other environm design process; follo principles; evaluate consider design choi performance, suppo occupants and consi	ronmental impact of siting decisions and project team to: establish energy ental performance goals in the w sustainable landscape design electric vehicle charging needs; ices that improve environmental rt health and wellness of building ider climate risks including wildfire; ges of the building's life cycle.	 Integrated Team roster or equivalent Baseline Guiding Principles assessment Site assessment Sustainable design charrette Other 	Yes	95% Submission comments: Integrated team meeting weekly to coordinate analysis and design for project, ongoing throughout design. Ongoing Guiding Principles (GP) coordination has occured between all members of design team. Site Assessment submitted at 35%. Sustainability charrette conducted 7/13/2023 Exhibits: see Trinka Davis Sustainability Charette, Charette Attendence, and Team Meeting Invitee List.
Commissioning	RQD	to optimize building agents who are inde construction or oper be consistent with the Security Act (EISA) so	recommission at least every 4 years performance using commissioning pendent of the design and rating team. Commissioning should he Energy independence and ection 432 ¹ and Federal Energy im (FEMP) commissioning guidance. ²	Commissioning report Other	Yes	95% Submission comments: CXA is understood to be part of project scope VA confirmed 4/23/2024 CXA to be contracted direct to owner.
II. Optimize I	Energy Perfo	ormance				
		30% better than the Heating, Refrigeratir (ASHRAE) 90.1 stand		Document reduction calculation method and results ENERGY STAR Portfolio Manager documentation		
Efficiency	RQD	D. For modernization, ensure: 1) Energy use is 20% below the fiscal year (FY) 2015 energy use baseline, OR 2) Energy use is 38% below the FY 2003 energy use baseline, OR 3) The building has an ENERGY STAR* rating of 75 or higher, OR 4) For building types not in ENERGY STAR Portfolio Manager, where adequate benchmarking data exists, the building is in the top quartile of energy performance for its building type, AND	ENERGY STAR Portfolio Manager documentation Document reduction calculation method and results	Yes	95% Submission comments: MEP engineer has conducted LCCA and Energy Model and analyzed four different system types to present to owner. The owner selected the option that achieves a 30% reduction over 90.1 baseline. Exhibit: see Energy Efficiency Documentation (full report submitted at 35%)	
Energy E1			Agency or site purchasing policy			
		C. Use energy efficie	nt products, as required by statute	Purchasing contracts Purchase orders Affirmative procurement reports Other		
Renewable and Clean Energy	RQD	cycle cost-effective r consider long-term o	olement, where appropriate, life renewable energy projects on-site; off-site renewable sources and certificates (RECs); and utilize clean igy where possible.	Renewable energy contract Utility records Photos of on-site renewable Photos of alternative energy Proof of purchase of RECs Other	Yes	95% Submission comments: Solar study not part of project scope. Geo-thermal was originally considered for project but was determined infeasible due to the limited amount of available space on site.
Metering	RQD		vel meters for electricity, natural gas, dvanced or standard meters as	 Building-level utility bills Design specifications for advanced meters Photos of building-level meters Other 	Yes	95% Submission comments: The gas meter is called out on plan sheet PP100 and the energy meter is shown on plan sheet E007.
Benchmarking	RQD	preferably using ENE regularly monitor bu	ng performance at least annually, ERGY STAR Portfolio Manager; uilding energy performance against e data and peer buildings.4	 ENERGY STAR Portfolio Manager documentation Other 	Yes	95% Submission comments: ENERGY STAR portfolio Manager will be used regularly to benchmark building performance.

Guiding Principle	Required or Additional	Metric	Suggested Evidence of Compliance (may need one or more)	Compliance (dropdown box) Yes/No/In- Process/Not Applicable	Notes/Comments
III. Protect a	nd Conserve	Water			
Indoor Water Use	POD	7. A. Build to ASHRAE standard 189.1-2014 sections 6.3.2, 6.4.2, and 6.4.3, or current comparable ASHRAE standards, AND B. Use water-efficient products; install building level water meters; optimize cooling tower operations; and eliminate single pass cooling.	Photos of building-level meters Building-level utility bills ENERGY STAR Portfolio Manager documentation Agency or site purchasing policy Document efficient products (photos, lists, product specs, etc.) Other	Yes	95% Submission comments: A. The design is compliant with ASHRAE 189.1-2014. B. All Public Lavatory Sinks are 0.5GPM and Toilet Closet fixtures are 1.6GPF. None of the mechanical systems being considered have cooling towers. There is no single-pass cooling. Water meters are shown on plan sheet PP100.
Outdoor Water Use	RQD	8. A. Separately meter water for irrigation systems greater than 25,000 square feet, AND B. Use water efficient landscapes, AND C. Limit potable water use for irrigation to 50% or more below conventional practices using methodologies from (but not the numeric requirements contained in) ASHRAE standard 189.1-2014 section 6.5.1, or current comparable ASHRAE standards, to calculate water use of conventional practices.	Document when no water is used to irrigate	Yes	95% Submission comments: The design will have native plantings and will not require a permanent irrigation system. As there is no irrigation, the design reflects a 100% reduction in potable water use. Refer to sheet LP101 for landscaping, and there is no irrigation sheet as it is not being used.
Alternative Water	RQD	Consider alternative sources of water where cost- effective and permitted by local laws and regulations.	Document consideration of alternative sources Document use of alternative water (photos, narrative, etc.) Other	Yes	95% Submission comments: The Civil team investigated the use of Rain Barrels as a cost effective option for an alternative source of water for the little landscaping on site. The VA Facilities team decided against this option as there is no other rainwater collection onsite.
Stormwater Management	RQD	For new construction meet or exceed EISA section Stormwater management requirements.	Stormwater plan Stormwater permit Document stormwater strategies (photos, narrative, etc.) Other	Yes	95% Submission comments: Refer to Stormwater Management Plan on CU101 - Utility Plan Sheet.
IV. Enhance	Indoor Envi	ronmental Quality			
Ventilation and Thermal Comfort	RQD	11. Meet the current ASHRAE 55 and either 62.1or 62.2 standards for ventilation and thermal comfort.	ENERGY STAR Certification Documentation from licensed architect, engineer or qualified building professional Other	Yes	95% Submission comments: Project is compliant with ASHRAE 55 and 62.1.
Daylighting and Lighting Controls	RQD	12. Maximize opportunities for daylighting in regularly occupied space, automatic dimming controls or accessible manual controls, task lighting, and shade and glare control.	Schematic of floor layout Document (photos, list, narrative, design specifications, etc.) Other	Yes	95% Submission comments: The close proximity of trees on the west and north sides of the building have limited the availability of daylight in the building. Given these constraints, the design team has maximized daylighting potential as much as possible by providing generous windows in each patient room, along with manual shades and lighting controls to allow the patient to adjust their light level. Public and social spaces have larger and numerous windows including clerestory windows, which allow a great deal of natural light in these spaces. See sheet AE102 for layout and AE602 for window details. See sheet EL110 for lighting controls.
Indoor Air Quality	RQD	13. Develop and implement an indoor air quality policy that considers the following: moisture control, use of low emitting materials and products with low pollutant emissions, necessary protocols to protect indoor air quality during construction and in the finished building, prohibition of smoking in any form inside and within 25 feet of all building entrances, operable windows, and building ventilation intakes, and use of integrated pest management techniques.	Indoor air quality policy Compilation of individual policies Other		95% Submission comments: Specification section 01 81 13 requires use of low-emitting materials, and requires contractor to develop and implement construction IAQ plan. The VA has an indoor air quality policy that will apply to this project.
Occupant Health and Wellness	RQD	14. Promote opportunities for voluntary increased physical movement of building occupants such as making stairwells an option for circulation, active workstations, fitness centers, and bicycle commuter facilities; and support convenient access to healthy dining options, potable water, daylight, plants, and exterior views.	Building or site-wide health and fitness programs Fitness centers Healthy dining options Active/ergonomic work stations Other	Yes	95% Submission comments: There are fitness facilities on site. The corners of the building layout feature integrated "porch" spaces for occupants to enjoy the outdoors in a covered, secured space. Regularly occupied spaces are designed to maximize daylighting opportunities and views to nature. Dining options are provided for occupants within the facility. Exhibit: refer to Biophilic Design narrative.

Guiding Principle	Required or Additional	Metric	Suggested Evidence of Compliance (may need one or more)	Compliance (dropdown box) Yes/No/In- Process/Not Applicable	Notes/Comments
V. Reduce t	he Environm	nental Impact of Materials			
and Performance		15. Procure products that meet the following requirements where applicable: A. RCRA section 6002, AND B. FSRIA section 9002, AND C. Federally Recommended Specifications, Standards and Ecolabels or are on the Federal Green Procurement Compilation for other green products, as	Agency or site purchasing policy Other	Vas	95% Submission comments: A. RCRA 6002 - specification section 01 81 13 requires use of recycled content in building materials. B. FSRIA 9002 - specification section 01 81 13 requires use of biobased materials.
Material Content and	ngu	appropriate, AND D. Avoid ozone depleting compounds and high GWP chemicals.	Document no ODC and GWP chemicals Plan to avoid ODC and GWP chemicals Other		C. Products selected comlpy with Federal Green Procurement Compilation. D. ODP chemicals will be avoided in design and low-GWP chemicals are prioritized. R410A does not contain CFCs and will be the refrigerant utilized.
Waste Diversion		16. Where markets exist, provide reuse and recycling services for building occupants and divert at least 50% of non-hazardous non-construction related materials from landfills.	Recycling contract Waste stream report/s Other	Yes	95% Submission comments: Space provided in design for collection and storage of recyclables - see Soiled Utility room on sheet AE102.
Materials Management	RQD	17. Where markets exist, divert at least 50% of construction and demolition materials from landfills.	Construction and Demolition (C&D) contract Construction and demolition policy Other	Yes	95% Submission comments: Specification section 01 81 13 requires 50% diversion of construction waste from landfills. Contractor to provide Construction Waste and Demolition Mgmt. Plan.
VI. Assess a	ınd Consider	r Climate Change Risks			
Mission Criticality	ROD	18. Determine long-term mission criticality of the physical asset and operations to be housed in the facility to inform the design of new construction and modernization to increase climate resilience.	Climate resilience plan Other		95% Submission comments: Project is considered "life safety" with "mission critical utilities."
Floodplain Considerations		19. For new construction, avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and avoid floodplain development whenever there is a practicable alternative.	Site plan Other	Yes	95% Submission comments: Project is not located within the 100-year FEMA floodplain. This is verified on the Stormwater Management Report located on CU101 - Utility Plan Sheet.
Facility Design		20. For new construction, balance options to address predicted climate change impacts against mission criticality, cost, and security to determine design parameters; at a minimum, include low and no cost resilience measures to address predicted climate conditions.	Document building design features Climate resilience plan Other	Yes	95% Submission comments: Robust building envelope designed to buffer extremes of heat/cold. Large overhangs provide solar shading for windows, increasing occupant thermal comfort during high heat events and increasing the passive survivability of the project.
Facility Adaptation		21. For modernization, take action to mitigate identified risks, considering mission criticality, climate impacts, cost, and phased adaptation over time.		Not Applicable	N/A for new construction, applies to modernization.

Version 2.0 released 26 October 2016.

Trinka Davis CLC 95% Sustainability Narrative

During the schematic design phase, the VA and design team worked to identify whether the Trinka Davis CLC project would pursue LEED certification or compliance with the VA Sustainable Design Manual and Guiding Principles. A sustainability charrette was held in July of 2023, during which the sustainability team presented the requirements of the different options and initial thoughts on eligibility and compliance. After the 35% submission, the VA determined that designing to the VA Sustainable Design Manual and Guiding Principles checklist is the most practical route of sustainability moving forward.

The sustainability charrette included team members from the VA, Charlotte Engineers, and Guidon. Major goals for the project were highlighted including functionality, greater use of space, and a seamless design that matches the aesthetics of the current buildings on site. Determinations that came out of this charrette included using the dry detention pond for stormwater management due to the cistern being deemed unusable, an additional option for the site location approved by the VA, and the geothermal wells on the southside of the site being deemed infeasible for use of this project due to tie-in issues and the requirements for backup power by the VA. Weekly team meetings have been held virtually with members from Charlotte Engineers and Guidon from the start of the project to ensure all design elements and requirements are being met.

Key design elements that were carefully considered to reduce irrigation of the site include the selection of native shrubbery and a small garden on site for residential use that includes native flowering plants. As required by Guiding Principles, the design team investigated opportunities to replace potable water use with alternative water. Rain barrels to be used for irrigation were identified as the least costly and least invasive strategy, but was not desired by the owner and facilities team as there are currently no other rain barrels on this campus.

The energy model analysis performed by Charlotte Engineers on 4 different HVAC systems determined that the Variable Refrigerant Flow (VRF) system was the most cost-effective and energy efficient option. The VRF system provided a 39% reduction in building energy consumption and is in compliance with ASHRAE 90.1-2013. R410A will be the refrigerant used in equipment, which has a low GWP and no CFCs. The VA has confirmed the project will be commissioned, but a commissioning agent has not been contracted at this phase.

All fixtures selected are water-efficient with 0.5 GPM for Public Lavatory sinks and 1.6GPF for Toilet Closets. The design team has eliminated single pass cooling. There are building-level energy and water meters included to allow the VA to benchmark this building's utility usage and identify usage patterns and opportunities for further energy and water use reduction.

The thermal comfort and ventilation of the project has been designed to comply with ASHRAE 55 and 62.1. A daylighting analysis of the schematic design was conducted by Guidon in the 35% submission. The close proximity of the dense vegetation to the north and west, and to a lesser degree the adjacent building to the east, limit the amount of natural light available to the project. Given these constraints, the design team has maximized daylighting potential by providing generous windows in each patient room, along with manual shades. Public and social spaces have more numerous, larger windows including clerestory windows, which allow a great deal of natural light in these spaces.



Materials have been selected consciously with efforts to prioritize products with EPDS, HPDs, no to low VOC content, and other environmental attributes. Biophilic design elements have also been included throughout the project with various material selections included in this submission. There is an appropriately sized space to provide for the collection and storage of recyclable materials.

The Guiding Principles checklist has been updated for this 95% submission. Currently, there are 20 out of the 21 criteria that have been verified as compliant. Criteria number 21 is not applicable to this project as it pertains to modernization rather than new construction. The contractor will be responsible for ensuring these goals are carried throughout construction and the project remains compliant with Guiding Principles.





VA Trinka Davis CLC 95% Submission

II. Energy Efficiency
Energy Efficiency Summary Documentation and LCCA Report

CHARLOTTE ENGINEERS, LLP



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Life Cycle Cost Analysis Results

The VAV with Reheat option has the highest cost out of the four options presented at \$4.1 million. The Packaged Rooftop VAV with Reheat option has the second highest cost at \$3.3 million. The Packaged Rooftop Heat Pump Option is the third highest cost presented at \$2.9 million. The VRF option is the most cost-effective option presented at \$2.2 million. The LCCA supports the VRF option as the least expensive option overall

The proposed VRF system option reduces building energy consumption by 39% and complies with the building performance rating per ASHRAE 90.1-2013.

References

The information provided in this report was developed from the cooling and heating loads provided in the Appendices along with the zoning layout in the 35% mechanical drawings. The Energy and Cost Analysis (attached at end of report) and Cost Estimate (Appendices) also provided in this submission have assisted in the analysis of this building's life cycle cost.

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LIFE CYCLE COST ANALYSIS

Trinka Davis Veterans Village Construct 12-Bed CLC Project. No. 508-349

Charlotte Engineers Project: 4792

July 3, 2023

GENERAL DESCRIPTION

The purpose of this narrative is to explain the engineering criteria and rationale used for selecting the type of HVAC system and thermal zoning of the tentative system(s) being proposed for the 12-Bed Community Living Center (CLC) for the Trinka Davis Veterans Village in Carrollton, GA. The CLC will be a single-story facility and approximately 14,500 square ft. The system design will accommodate the space program and interior functional requirements of a VA CLC.

EXECUTIVE SUMMARY

As part of the 35% Schematic Design submittal, a life cycle cost analysis (LCCA) has been provided for the new CLC. Although the VA Trinka Davis campus has requested an air handling unit system with a chilled water cooling coil and a hot water heating coil, a cost analysis considering other systems is being provided. The life cycle cost analysis is based on a 20-year summary including equipment, installation, energy cost, and related maintenance costs. The findings through this analysis show that the variable refrigerant flow (VRF) system is the most cost-effective and energy efficient system.

The systems considered are:

Option 1 (Baseline): Package Rooftop Heat Pump

This option is the ASHRAE 90.1 baseline HVAC system for a building of this type and size. Two constant volume heat pump units would serve the entire building, one for the administrative areas and one for the patient rooms. These units would provide direct expansion (DX) cooling and electric heating capabilities.

Option 2: Packaged Rooftop Variable Air Volume (VAV) with Reheat

A single rooftop unit would serve the entire building. This unit would provide direct expansion (DX) cooling and natural gas heating capabilities. The majority of the areas in the facility shall be provided with airflow utilizing single duct VAV terminal units with electric reheat.

Option 3: VAV with Reheat (Chilled Water & Heating Hot Water)

This is the VA's preferred system. A single air-handling unit (AHU) would serve the entire building. These units would include a chilled water coil and a hot water heating coil. This option requires an air-cooled chiller and chilled water pumping package along with a natural gas boiler and heating hot water pumping package.





Option 4: Variable Refrigerant Flow (VRF)

A condensing unit shall be located on the roof. The respective indoor units and branch selectors shall be located above the ceiling with all new refrigerant piping. A dedicated outdoor air unit is required to provide minimum ventilation requirements. The AE is aware that a VRF system is not a VA preferred system, however is sometimes used at VA facilities.

DETAILED ANALYSIS

Mechanical HVAC - System Selection

One of the goals of the project team will be to achieve reduced building energy consumption. The objective of the mechanical team was to select a system that supports the health care process while being energy efficient. Several system types were considered for the new CLC in pursuit of an energy efficient and cost-effective solution to include:

- Packaged Rooftop Heat Pumps This system utilizes DX cooling and electric heat capabilities.
- Packaged Rooftop VAV with Reheat This system utilizes DX cooling and electric reheat in the VAV terminals. This system would also utilize natural gas from the campus loop for the unit heating coil.
- Multiple Zone, VAV air-handling system with chilled water and hot water coils in the air handler and hot water coils in the VAV terminal units. This system requires new chiller and boiler systems.
- VRF This system utilizes small DX systems that share a common condensing unit. Ventilation is provided via a dedicated outdoor air unit (DOAS).

The VRF system was decided upon being the best for this facility because of the following:

- a. The VRF system is the most energy-efficient system in comparison with the alternative systems based on the energy model for this project.
- b. There is much less ductwork for a VRF system which also increased the energy efficiency of the system.
- c. The upfront costs of the chilled water and heating hot water systems are higher, due to significant amount of equipment, ductwork and piping.
- d. Multiple units serving individual spaces provide for excellent space temperature and humidity control, as the zones don't rely on other zones for heating and cooling.



Outdoor Design Conditions

The summer design cooling and winter design heating temperatures used in calculating the heating and cooling loads were values for Atlanta Hartsfield International Airport, GA, listed in the ASHRAE Fundamentals Handbook, 2021. Per the simulation general requirements in ASHRAE 90.1 weather conditions used in sizing runs to determine equipment capacities were based on the following:

Cooling	ASHRAE (1% Cooling Design Temperature)
Cooling	91.6 °F (dry bulb) / 74.9°F (wet bulb)
Lloating	ASHRAE (99% Heating Design Temperature)
Heating	26.4°F (dry bulb)

Indoor Design Conditions

Health Care Functions

Design relative humidity for all applicable healthcare spaces listed in ASHRAE 170-2021 (Table 7.1) shall be maintained at a maximum relative humidity of 60% and shall have design temperatures as specified therein. Applicable healthcare functions include patient rooms.

Support Functions

Design conditions for all applicable miscellaneous function spaces listed in HVAC Design Manual for New, Replacement, Addition, and Renovation of Existing VA Facilities (Section 6) shall be as follows:

- 68°F at 20% relative humidity (heating mode)
- 80°F at 50% relative humidity (cooling mode)

Applicable support functions include offices, workrooms, entrance vestibules and circulation spaces.

Cooling and Heating Load Calculations - Parameters

The cooling and heating load calculations were performed using Trane TRACE 3D Plus version 5.10.57 and Trane TRACE 700 version 6.3.3.

Occupancy

The design occupancy was based on VA design guides, project program data, building layout and ASHRAE Standard 62.1-2019 *Ventilation for Acceptable Indoor Air Quality*.

Light and Plug Loads

The heat gain due to lighting was assumed to comply with the standards set forth in ASHRAE 90.1-2019. The plug loads were assumed given the furniture layout and recommended heat gains noted in the 2021 ASHRAE Handbook–Fundamentals.

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Building Thermal Envelope

Atlanta Georgia was identified by the U.S. Department of Energy (DOE) as being in climate zone 3A and the building thermal envelope was assumed to be in compliance with the standards set forth in ASHRAE 90.1-2019 for said climate zone.

Outdoor Air for Ventilation

The ventilation rate requirements were based on the highest value of the minimum outdoor air for ventilation using the parameters in:

- ASHRAE Standard 62.1-2019
- 2019 ASHRAE Handbook HVAC Applications
- Exhaust Air: Chapter 6 of HVAC Design Manual for New, Replacement, Addition, and Renovation of Existing VA Facilities

System Zoning

An HVAC thermostatic control zone was used in deriving the single-line schematic plan of HVAC zoning. An HVAC thermostatic control zone is defined as a space or group of spaces whose load characteristics are sufficiently similar that the desired space conditions can be maintained through a single controlling device. For example, spaces with exterior walls and glass exposures shall not be zoned with interior spaces. Similarly, spaces with windows facing different directions shall not share the same zone as another room whose windows don't share the same orientation.

HVAC Utilities

The facility will have 480V/3Ø/60Hz electrical service and natural gas available on the site as power and heating sources for HVAC equipment.

Maintenance Costs

Maintenance Costs were estimated for each equipment type. Estimations were made related to items. The software programs, such as Trane System Analyzer, recommend estimation at 5% of the total cost of installation cost over a 20-year period.

Energy Conservation and Reduction Measures (ECRMs)

The following energy conservation measures were proposed based on Sustainable Design Manual of US Department of Veterans Affairs, Published in May 6th, 2014 and Revised in August 18th, 2017. Where applicable, they have been incorporated in the computer simulations utilized in the life cycle cost analyses.

- 1. Variable frequency drives (VFD)— Motor controller that drives an electric motor by varying the frequency and voltage supplied to the electric motor. The VFD allows the motor to fluctuate with required demand, saving on electrical costs.
- 2. NEMA Premium efficiency motors Premium efficient motors that reduce electrical power consumption and costs.
- 3. Energy meters (BTU meters) BTU meters measure the energy content (temperature sensor and flow meter) of liquid flow and shall be used in both the steam and chilled water systems.
- 4. System control strategies



- a) Airside economizer Control strategy that reduces utility costs by bringing in outdoor air (non-mechanical cooling) when ambient conditions meet certain criteria.
- b) Fan-pressure optimization Control strategy that reduces the energy use of the supply fan at part-load conditions.

Life Cycle Cost Comparison

The table below lists the different costs (in dollars) associated with the three options provided. The values provided are from the associated Energy and Cost Analysis, developed utilizing VA data along with cost estimates of previous projects.

Costs	Option 1 (Baseline) Packaged Rooftop Heat Pump	Option 2 Packaged Rooftop VAV with Reheat	Option 3 VAV with Reheat (CHW/HHW)	Option 4 VRF
Equipment /Materials	\$1,250,000.00	\$1,500,000.00	\$2,000,000.00	\$975,000.00
Installation	\$750,000.00	\$900,000.00	\$1,200,000.00	\$585,000.00
Energy Costs (20 years)	\$906,920.00	\$771,860.00	\$812,440.00	\$581,680.00
Maintenance (20 years)	\$62,500.00	\$75,000.00	\$100,000.00	\$50,000.00
Replacements (10 years)	\$10,000.00	\$15,000.00	\$20,000.00	\$10,000.00
Total Cost over 20 Years	\$2,979,420.00	\$3,261,860.00	\$4,132,440.00	\$2,201,680.00

Figures 1 and 2 on the next page illustrate the differences between the options with each component shown and one with the total life cycle cost.



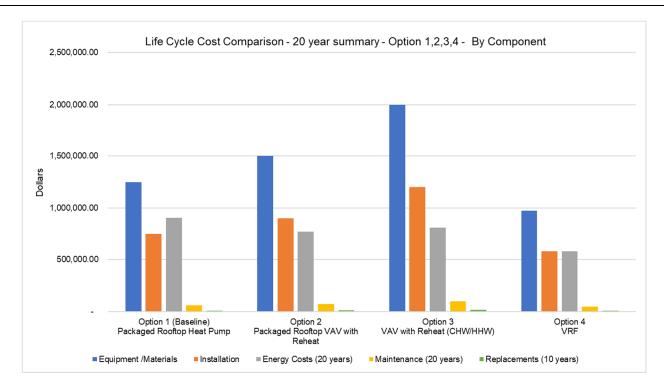


Figure 1



Figure 2

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Life Cycle Cost Analysis Results

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Building Summary	Weather Summary

Building Type	
Conditioned Floor Area	10,361 ft²
Total Building Area	11,034 ft²
Gross Wall Area	7,800 ft ²
Window-Wall Ratio	28.6 %
Gross Roof Area	13,340 ft ²
Skylight-Roof Ratio	0 %
Average Plug Load Density	1.92 W/ft²
Average Lighting Density	0.67 W/ft ²
Peak Occupancy	123
Site Ventilation	6,188 ft³/min
Cooling Specific Air Flow	13,819 ft³/min
Heating Specific Air Flow	5,145 ft³/min
Site Peak Cooling Load	64 tons
Site Peak Heating Load	517 MBh

Location	Atlanta Hartsfield Intl Ap GA USA		
Weather File	Weather File USA_GA_Atlanta-Hartsfield- Jackson.Intl.AP.722190		
Latitude	N 33° 37		
Longitude	W 84° 25		
Time Zone	GMT -5.0 Hours		
Summer Design Dry Bulb Temperature (1%) 91.6			
Winter Design Dry Bulb Temperature (99%) 26.4			
	User Defined		
Summer Desig	Summer Design Day Dry Bulb Temperature 91.7		
Coincident Design Day Wet Bulb Temperature 73.9			
Winter Design Day Dry Bulb Temperature 21.5			

Project Information

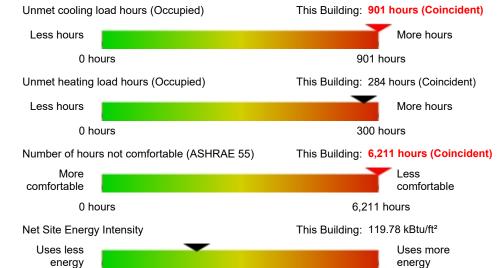
Project Name Construct Trinka Davis 12 Bed CLC Recovery 2023-06-06-111755

Building Owner VAMC Atlanta Location Carrollton, GA

Program User CAC

Company

Building Performance



Site Performance

Net Source Energy Use Intensity (EUI) 370.6 kBtu/ft²

Annual Electrical Consumption 373,939 kWh

Annual Peak Electrical Demand 93 kW

Annual Gas Consumption 46 MMBtu

Annual Water Consumption 0 gal

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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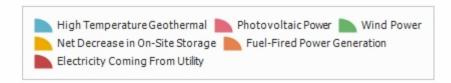
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349.89 kBtu/ft2

TRACE 3D Plus 5.10.57

0 kBtu/ft2





Fuel-Fired Power Generation	0 kWh
High Temperature Geothermal	0 kWh
Photovoltaic Power	0 kWh
Wind Power	0 kWh
Net Decrease in On-Site Storage	0 kWh
Sub-Total On Site Electricity	0 kWh
Electricity Coming From Utility	373,940 kWh
Surplus Electricity To Utility	0 kWh
Net Electricity From Utility	373,940 kWh
Total Electric Sources	373,940 kWh

Water-Side Heat Recovery	0 kWh
Air to Air Heat Recovery Cooling	0 kWh
Air to Air Heat Recover Heating	0 kWh
High-Temperature Geothermal	0 kWh
Solar Water Thermal	0 kWh
Solar Air Thermal	0 kWh
Total On-Site Thermal Sources	0 kWh

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

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Alternative Annual Electricity End Use and Demand Comparison



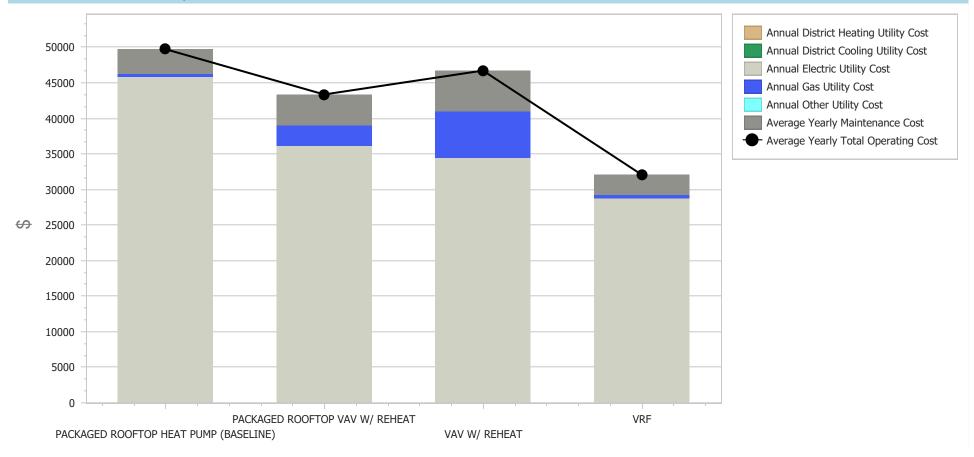
	KAGED ROOFTOP I	HEAT PUMP (BASELI	PACKAGED ROOFTOP VAV W/ REHEAT		VAV W/ REHEAT		VRF	
	Energy (kWh)	Demand (kW)	Energy (kWh)	Demand (kW)	Energy (kWh)	Demand (kW)	Energy (kWh)	Demand (kW)
Cooling	71,163.02	35.53	80,303.88	42.86	134,126.20	79.38	59,744.91	27.71
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Receptacles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fans	180,045.10	26.12	25,027.73	5.50	25,026.03	5.50	21,182.79	4.21
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heating	29,187.15	53.40	87,448.01	49.15	397.91	0.34	53,359.13	56.70
Humidification	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Lighting	30,622.40	6.67	33,521.77	6.67	33,521.77	6.67	30,622.40	6.67
Interior Receptacles	62,925.30	12.03	68,932.32	12.03	68,932.32	12.03	62,925.30	12.03
Pumps	0.00	0.00	0.00	0.00	4,071.95	2.71	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Service Water Heating	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grand Total	373,942.97	133.75	295,233.71	116.21	266,076.18	106.63	227,834.53	107.32

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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Economic Alternative Comparison



	AGED ROOFTOP HEAT PUMP (BASE	ACKAGED ROOFTOP VAV W/ REHEA	VAV W/ REHEAT	VRF
Annual District Cooling Utility Cost	0	0	0	0
Annual District Heating Utility Cost	0	0	0	0
Annual Electric Utility Cost	45,805	36,129	34,469	28,748
Annual Gas Utility Cost	461	2,922	6,503	461
Annual Other Utility Cost	0	0	0	0
Average Yearly Maintenance Cost	3,469	4,313	5,750	2,875
Average Yearly Total Operating Cost	49,735	43,364	46,722	32,085

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

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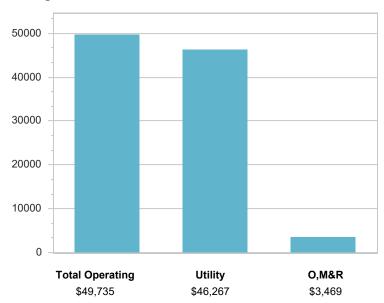
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Economic Summary and Calculation Parameters

Life Cycle and Costing Parameters

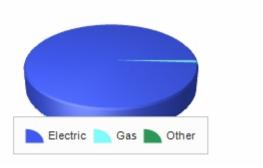
Length of Study	20 years
Inflation Approach	ConstantDollar
Discounting Convention	BeginningOfYear
Real Discount Rate	3.00%
Nominal Discount Rate	N/A
Inflation Rate	N/A
Tax Rate	5.00%
Depreciation Method	None
Base Date	August 2017
Service Date	August 2017
Building Area	11,034 (ft²)
Net Conditioned Building Area	10,361 (ft²)
Initial Capital Investment Cost	\$1,250,000

Average Costs



Energy Cost Summary

Name	Electricity	Gas	Other	Total
Energy Cost (Net)	\$45,805	\$461	\$0	\$46,267
Renewables Offset	\$0	\$0	\$0	\$0
Energy Cost (Total)	\$45,805	\$461	\$0	\$46,267
Cost per Building Area	\$4.15	\$0.04	\$0.00	\$4.19
Cost per Net Cond. Bldg Area	\$4.42	\$0.04	\$0.00	\$4.47



Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

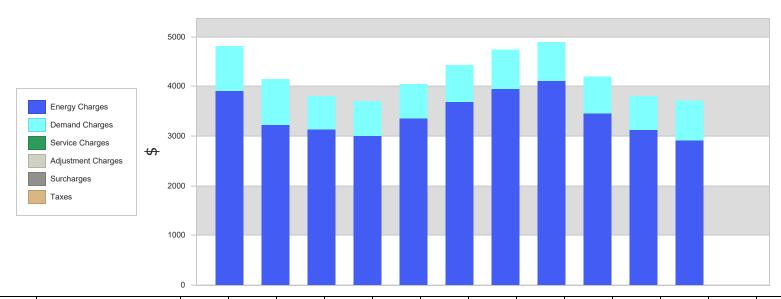
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TRACE 3D Plus 5.10.57 Page 1 of 28

Monthly Utilities Cost Summary



Tariff Catagory	Fuel Type	Jan (\$)	Feb (\$)	Mar (\$)	Apr (\$)	May (\$)	Jun (\$)	Jul (\$)	Aug (\$)	Sep (\$)	Oct (\$)	Nov (\$)	Dec (\$)	Annual Total (\$)	% of Total
Consumption Charges	Natural Gas	43	39	43	42	43	42	43	43	42	43	40	0	461	1.00%
	Electricity	3,864	3,188	3,089	2,967	3,309	3,646	3,904	4,067	3,415	3,077	2,870	0	37,397	80.83%
Demand Charges	Electricity	898	926	671	695	692	738	789	777	744	682	796	0	8,408	18.17%
ServiceCharges	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Basis	All	4,805	4,153	3,803	3,703	4,044	4,426	4,736	4,886	4,201	3,802	3,707	0	46,267	100.00%
Adjustment	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Surcharge	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Subtotal	All	4,805	4,153	3,803	3,703	4,044	4,426	4,736	4,886	4,201	3,802	3,707	0	46,267	100.00%
Taxes	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	Total	4,805	4,153	3,803	3,703	4,044	4,426	4,736	4,886	4,201	3,802	3,707	0	46,267	

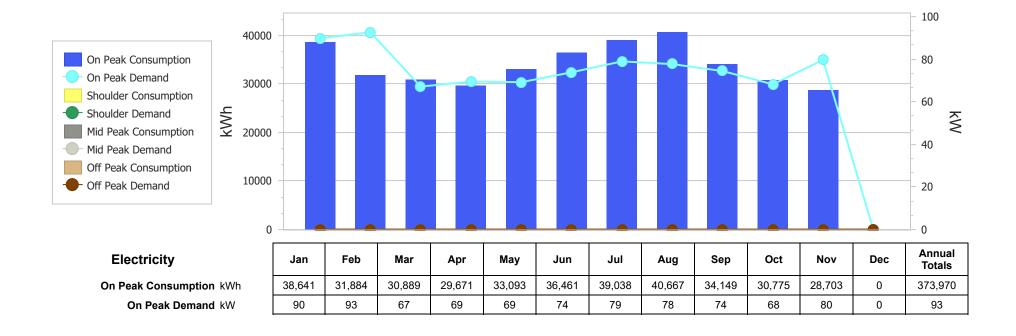
Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

File

Monthly Utility Details

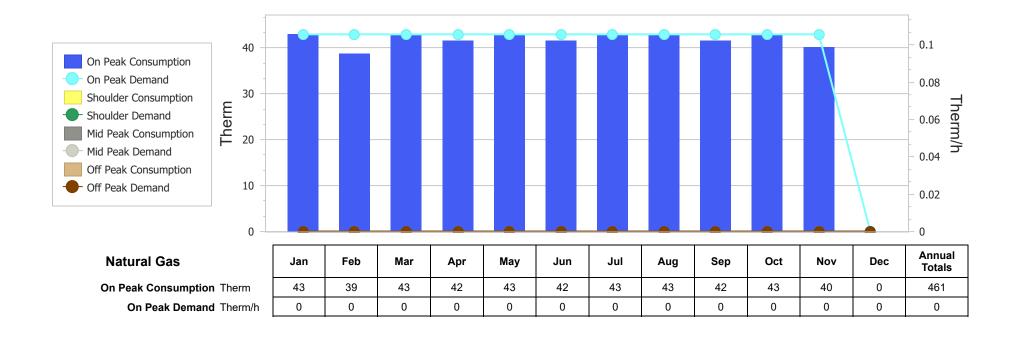


Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

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Monthly Utility Details



Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

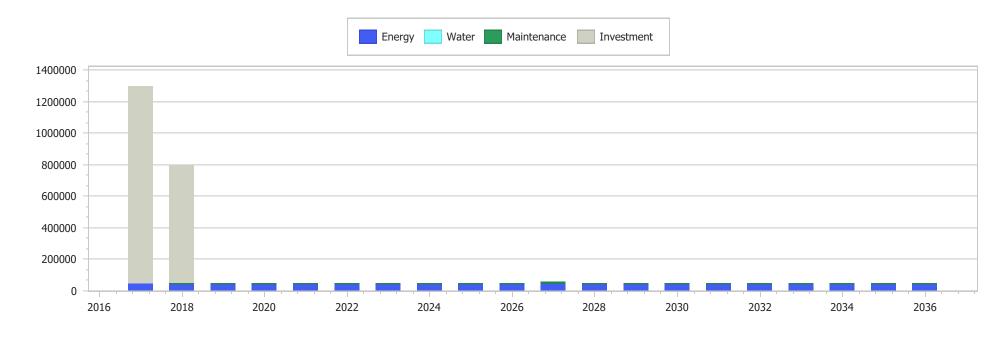
File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

Tariff Details

Tariff Name	Selected	Qualified	Meter Name	Buy or Sell	Group	Total Annual Cost
SAMPLE WITH ALL UTILITIES_NGAS	Yes	Yes	BUILDING NATURAL GAS	Buy	(none)	\$461
SAMPLE WITH ALL UTILITIES_ELEC	Yes	Yes	BUILDING ELECTRICITY	Buy	(none)	\$45,805

Life Cycle Operating Cash Flow (without escalation)



TRACE 3D Plus 5.10.57

Year	Energy	Water	Maintenance	Investment	Total
2017	46,267	0	0	1,250,000	1,296,267
2018	46,267	0	3,125	750,000	799,392
2019	46,267	0	3,125	0	49,392
2020	46,267	0	3,125	0	49,392
2021	46,267	0	3,125	0	49,392
2022	46,267	0	3,125	0	49,392
2023	46,267	0	3,125	0	49,392

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

Calculated at: Jun 08, 2023 - 12:20 PM

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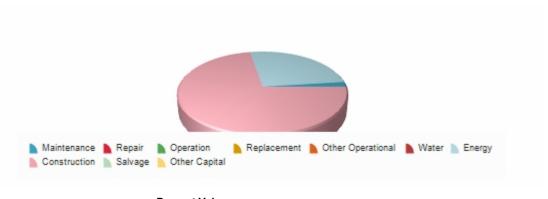
Year	Energy	Water	Maintenance	Investment	Total
2024	46,267	0	3,125	0	49,392
2025	46,267	0	3,125	0	49,392
2026	46,267	0	3,125	0	49,392
2027	46,267	0	13,125	0	59,392
2028	46,267	0	3,125	0	49,392
2029	46,267	0	3,125	0	49,392
2030	46,267	0	3,125	0	49,392
2031	46,267	0	3,125	0	49,392
2032	46,267	0	3,125	0	49,392
2033	46,267	0	3,125	0	49,392
2034	46,267	0	3,125	0	49,392
2035	46,267	0	3,125	0	49,392
2036	46,267	0	3,125	0	49,392

TRACE 3D Plus 5.10.57

Present Value Analysis (Without Escalation)

Present Value By Year

Year	Total Cost	Present Value
2017	1,296,267.00	1,296,267.00
2018	799,391.70	776,108.40
2019	49,391.71	46,556.42
2020	49,391.71	45,200.41
2021	49,391.71	43,883.89
2022	49,391.71	42,605.72
2023	49,391.71	41,364.78
2024	49,391.71	40,159.98
2025	49,391.71	38,990.27
2026	49,391.71	37,854.63
2027	59,391.71	44,193.01
2028	49,391.71	35,681.62
2029	49,391.71	34,642.35
2030	49,391.71	33,633.35
2031	49,391.71	32,653.74
2032	49,391.71	31,702.66
2033	49,391.71	30,779.28
2034	49,391.71	29,882.80
2035	49,391.71	29,012.42
2036	49,391.71	28,167.40
Tota	2,739,340.13	



Category	Present Value	
Maintenance	\$52,202.81	2%
Repair	\$0.00	0%
Operation	\$0.00	0%
Replacement	\$0.00	0%
Other Operational	\$0.00	0%
Water	\$0.00	0%
Energy	\$708,981.80	26%
Total Operation	\$761,184.60	
Construction	\$1,978,155.00	72%
Salvage	\$0.00	0%
Other Capital	\$0.00	0%
Total Capital	\$1,978,155.00	
Total Energy	\$708,981.80	
Grand Total	\$2,739,340.00	

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

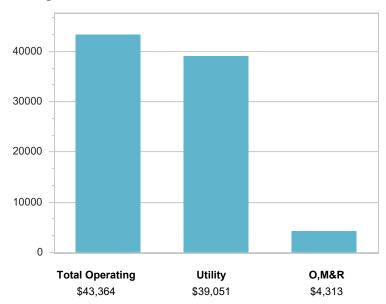
Economic Summary and Calculation Parameters

Life Cycle and Costing Parameters

Length of Study	20 years
Inflation Approach	ConstantDollar
Discounting Convention	BeginningOfYear
Real Discount Rate	3.00%
Nominal Discount Rate	N/A
Inflation Rate	N/A
Tax Rate	5.00%
Depreciation Method	None
Base Date	August 2017
Service Date	August 2017
Building Area	11,034 (ft²)
Net Conditioned Building Area	10,361 (ft²)
Initial Capital Investment Cost	\$1,500,000

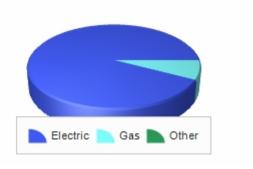
Average Costs

TRACE 3D Plus 5.10.57



Energy Cost Summary

Name	Electricity	Gas	Other	Total
Energy Cost (Net)	\$36,129	\$2,922	\$0	\$39,051
Renewables Offset	\$0	\$0	\$0	\$0
Energy Cost (Total)	\$36,129	\$2,922	\$0	\$39,051
Cost per Building Area	\$3.27	\$0.26	\$0.00	\$3.54
Cost per Net Cond. Bldg Area	\$3.49	\$0.28	\$0.00	\$3.77



Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

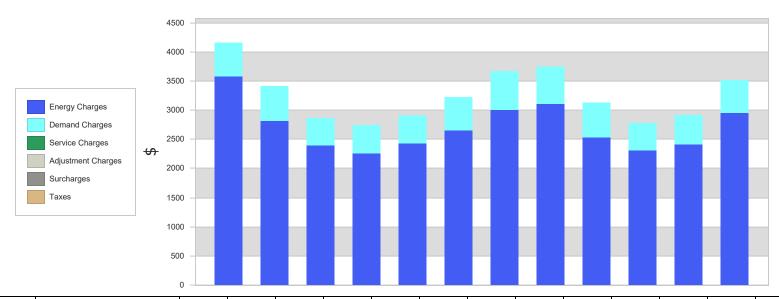
File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

Calculated at: Jun 08, 2023 - 12:22 PM

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Monthly Utilities Cost Summary



Tariff Catagory	Fuel Type	Jan (\$)	Feb (\$)	Mar (\$)	Apr (\$)	May (\$)	Jun (\$)	Jul (\$)	Aug (\$)	Sep (\$)	Oct (\$)	Nov (\$)	Dec (\$)	Annual Total (\$)	% of Total
Consumption Charges	Electricity	2,682	2,266	2,202	2,155	2,384	2,616	2,957	3,063	2,485	2,192	2,124	2,400	29,525	75.61%
	Natural Gas	899	546	195	106	49	42	43	43	42	115	288	554	2,922	7.48%
Demand Charges	Electricity	580	595	468	487	476	567	665	639	600	467	501	558	6,603	16.91%
ServiceCharges	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Basis	All	4,161	3,407	2,866	2,747	2,909	3,224	3,665	3,744	3,126	2,775	2,914	3,512	39,051	100.00%
Adjustment	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Surcharge	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Subtotal	All	4,161	3,407	2,866	2,747	2,909	3,224	3,665	3,744	3,126	2,775	2,914	3,512	39,051	100.00%
Taxes	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	Total	4,161	3,407	2,866	2,747	2,909	3,224	3,665	3,744	3,126	2,775	2,914	3,512	39,051	

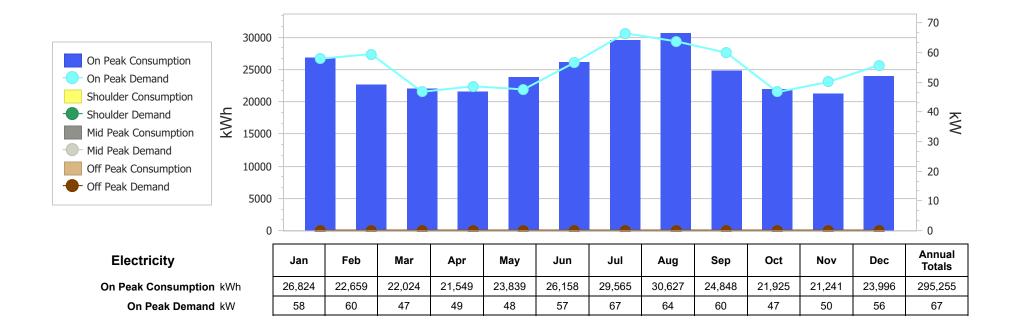
Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

File

Monthly Utility Details

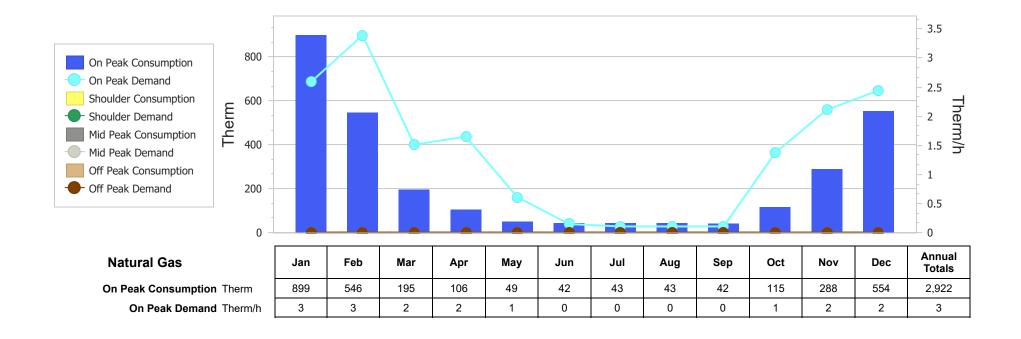


Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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Monthly Utility Details



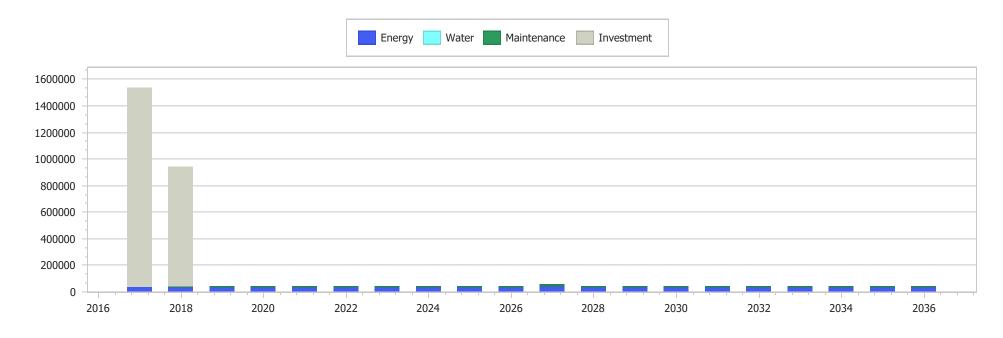
Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Tariff Details

Tariff Name	Selected	Qualified	Meter Name	Buy or Sell	Group	Total Annual Cost
SAMPLE WITH ALL UTILITIES_NGAS	Yes	Yes	BUILDING NATURAL GAS	Buy	(none)	\$2,922
SAMPLE WITH ALL UTILITIES_ELEC	Yes	Yes	BUILDING ELECTRICITY	Buy	(none)	\$36,129

Life Cycle Operating Cash Flow (without escalation)



Year	Energy	Water	Maintenance	Investment	Total
2017	39,051	0	0	1,500,000	1,539,051
2018	39,051	0	3,750	900,000	942,801
2019	39,051	0	3,750	0	42,801
2020	39,051	0	3,750	0	42,801
2021	39,051	0	3,750	0	42,801
2022	39,051	0	3,750	0	42,801
2023	39,051	0	3,750	0	42,801

Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

TRACE 3D Plus 5.10.57

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Year	Energy	Water	Maintenance	Investment	Total
2024	39,051	0	3,750	0	42,801
2025	39,051	0	3,750	0	42,801
2026	39,051	0	3,750	0	42,801
2027	39,051	0	18,750	0	57,801
2028	39,051	0	3,750	0	42,801
2029	39,051	0	3,750	0	42,801
2030	39,051	0	3,750	0	42,801
2031	39,051	0	3,750	0	42,801
2032	39,051	0	3,750	0	42,801
2033	39,051	0	3,750	0	42,801
2034	39,051	0	3,750	0	42,801
2035	39,051	0	3,750	0	42,801
2036	39,051	0	3,750	0	42,801

name:

Present Value Analysis (Without Escalation)

Present Value By Year

Year	Total Cost	Present Value
2017	1,539,051.00	1,539,051.00
2018	942,801.00	915,340.80
2019	42,801.00	40,344.05
2020	42,801.00	39,168.98
2021	42,801.00	38,028.13
2022	42,801.00	36,920.52
2023	42,801.00	35,845.16
2024	42,801.00	34,801.13
2025	42,801.00	33,787.51
2026	42,801.00	32,803.40
2027	57,801.00	43,009.37
2028	42,801.00	30,920.35
2029	42,801.00	30,019.76
2030	42,801.00	29,145.40
2031	42,801.00	28,296.50
2032	42,801.00	27,472.33
2033	42,801.00	26,672.17
2034	42,801.00	25,895.31
2035	42,801.00	25,141.08
2036	42,801.00	24,408.81
	al Life Cuele Coet	2 027 074 76

Total Life Cycle Cost 3,037,071.76



Category	Present Value	
Maintenance	\$64,875.66	2%
Repair	\$0.00	0%
Operation	\$0.00	0%
Replacement	\$0.00	0%
Other Operational	\$0.00	0%
Water	\$0.00	0%
Energy	\$598,409.70	20%
Total Operation	\$663,285.40	
Construction	\$2,373,787.00	78%
Salvage	\$0.00	0%
Other Capital	\$0.00	0%
Total Capital	\$2,373,787.00	
Total Energy	\$598,409.70	
Grand Total	\$3,037,072.00	

Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

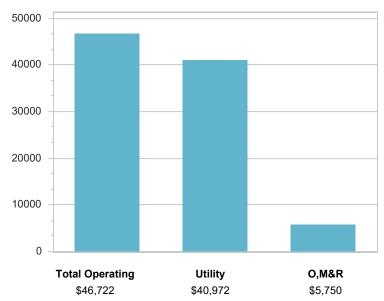
Economic Summary and Calculation Parameters

Life Cycle and Costing Parameters

•	•
Length of Study	20 years
Inflation Approach	ConstantDollar
Discounting Convention	BeginningOfYear
Real Discount Rate	3.00%
Nominal Discount Rate	N/A
Inflation Rate	N/A
Tax Rate	5.00%
Depreciation Method	None
Base Date	August 2017
Service Date	August 2017
Building Area	11,034 (ft²)
Net Conditioned Building Are	a 10,361 (ft²)
Initial Capital Investment Cos	\$2,000,000

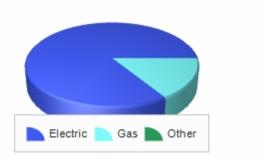
Average Costs

TRACE 3D Plus 5.10.57



Energy Cost Summary

Name	Electricity	Gas	Other	Total
Energy Cost (Net)	\$34,469	\$6,503	\$0	\$40,972
Renewables Offset	\$0	\$0	\$0	\$0
Energy Cost (Total)	\$34,469	\$6,503	\$0	\$40,972
Cost per Building Area	\$3.12	\$0.59	\$0.00	\$3.71
Cost per Net Cond. Bldg Area	\$3.33	\$0.63	\$0.00	\$3.95



Alternative: VAV W/ REHEAT

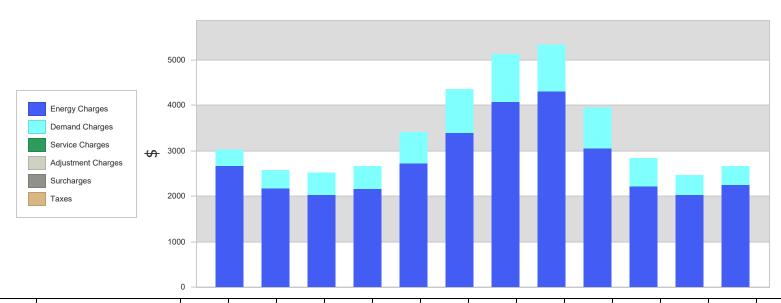
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Calculated at: Jun 08, 2023 - 12:24 PM

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Monthly Utilities Cost Summary

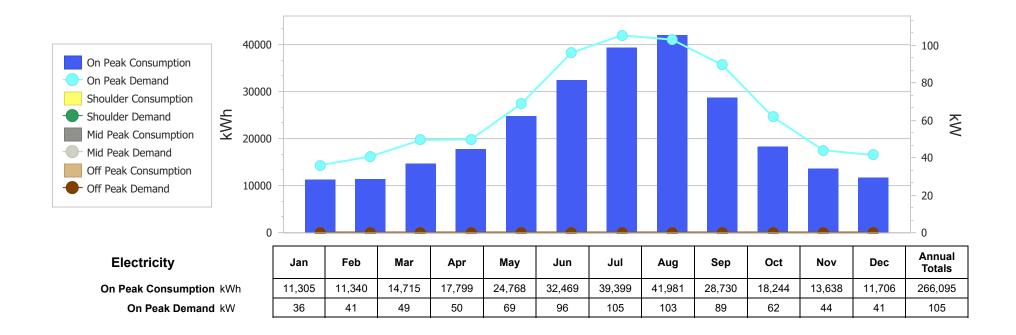


Tariff Catagory	Fuel Type	Jan (\$)	Feb (\$)	Mar (\$)	Apr (\$)	May (\$)	Jun (\$)	Jul (\$)	Aug (\$)	Sep (\$)	Oct (\$)	Nov (\$)	Dec (\$)	Annual Total (\$)	% of Total
Consumption Charges	Electricity	1,131	1,134	1,472	1,780	2,477	3,247	3,940	4,198	2,873	1,824	1,364	1,171	26,610	64.95%
	Natural Gas	1,544	1,035	556	388	246	153	138	120	182	400	664	1,078	6,503	15.87%
Demand Charges	Electricity	360	407	494	498	688	961	1,054	1,031	895	618	440	414	7,860	19.18%
ServiceCharges	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Basis	All	3,034	2,575	2,522	2,665	3,411	4,361	5,132	5,349	3,950	2,843	2,467	2,663	40,972	100.00%
Adjustment	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Surcharge	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Subtotal	All	3,034	2,575	2,522	2,665	3,411	4,361	5,132	5,349	3,950	2,843	2,467	2,663	40,972	100.00%
Taxes	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	Total	3,034	2,575	2,522	2,665	3,411	4,361	5,132	5,349	3,950	2,843	2,467	2,663	40,972	

Alternative: VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Monthly Utility Details



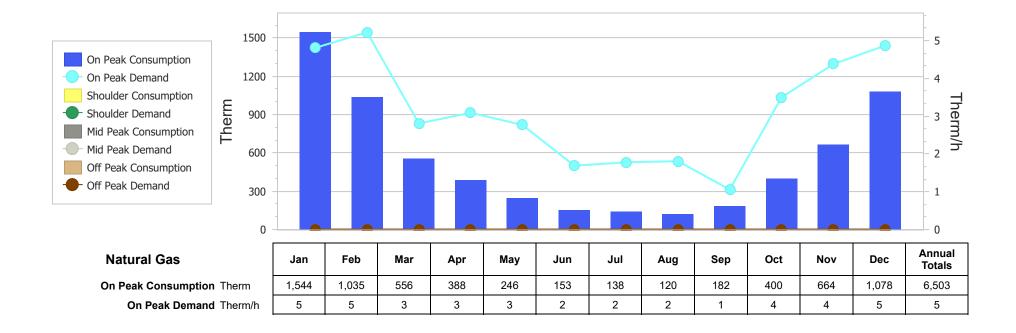
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Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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File

Monthly Utility Details



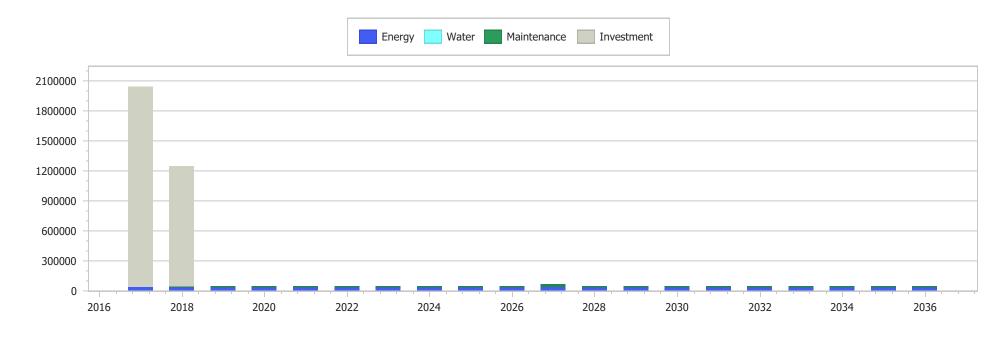
Alternative: VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Tariff Details

Tariff Name	Selected	Qualified	Meter Name	Buy or Sell	Group	Total Annual Cost
SAMPLE WITH ALL UTILITIES_ELEC	Yes	Yes	BUILDING ELECTRICITY	Buy	(none)	\$34,469
SAMPLE WITH ALL UTILITIES_NGAS	Yes	Yes	BUILDING NATURAL GAS	Buy	(none)	\$6,503

Life Cycle Operating Cash Flow (without escalation)



Year	Energy	Water	Maintenance	Investment	Total
2017	40,972	0	0	2,000,000	2,040,972
2018	40,972	0	5,000	1,200,000	1,245,972
2019	40,972	0	5,000	0	45,972
2020	40,972	0	5,000	0	45,972
2021	40,972	0	5,000	0	45,972
2022	40,972	0	5,000	0	45,972
2023	40,972	0	5,000	0	45,972

Alternative: VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

Calculated at: Jun 08, 2023 - 12:24 PM

TRACE 3D Plus 5.10.57 Page 19 of 28

Year	Energy	Water	Maintenance	Investment	Total
2024	40,972	0	5,000	0	45,972
2025	40,972	0	5,000	0	45,972
2026	40,972	0	5,000	0	45,972
2027	40,972	0	25,000	0	65,972
2028	40,972	0	5,000	0	45,972
2029	40,972	0	5,000	0	45,972
2030	40,972	0	5,000	0	45,972
2031	40,972	0	5,000	0	45,972
2032	40,972	0	5,000	0	45,972
2033	40,972	0	5,000	0	45,972
2034	40,972	0	5,000	0	45,972
2035	40,972	0	5,000	0	45,972
2036	40,972	0	5,000	0	45,972

Alternative: VAV W/ REHEAT Calculated at: Jun 08, 2023 - 12:24 PM Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-111755.mdf

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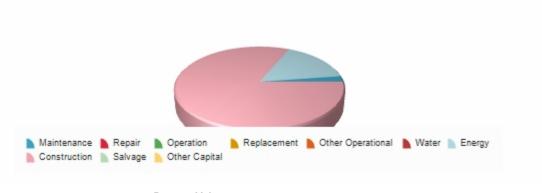
File

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Present Value Analysis (Without Escalation)

Present Value By Year

Year	Total Cost	Present Value	
2017	2,040,972.00	2,040,972.00	
2018	1,245,972.00	1,209,682.00	
2019	45,972.02	43,333.03	
2020	45,972.02	42,070.91	
2021	45,972.02	40,845.54	
2022	45,972.02	39,655.87	
2023	45,972.02	38,500.84	
2024	45,972.02	37,379.46	
2025	45,972.02	36,290.73	
2026	45,972.02	35,233.72	
2027	65,972.02	49,089.38	
2028	45,972.02	33,211.16	
2029	45,972.02	32,243.85	
2030	45,972.02	31,304.71	
2031	45,972.02	30,392.92	
2032	45,972.02	29,507.69	
2033	45,972.02	28,648.24	
2034	45,972.02	27,813.83	
2035	45,972.02	27,003.71	
2036	45,972.02 26,217.20		
Tota	3,879,396.79		



Category	Present Value	
Maintenance	\$86,500.87	2%
Repair	\$0.00	0%
Operation	\$0.00	0%
Replacement	\$0.00	0%
Other Operational	\$0.00	0%
Water	\$0.00	0%
Energy	\$627,846.90	16%
Total Operation	\$714,347.80	
Construction	\$3,165,049.00	82%
Salvage	\$0.00	0%
Other Capital	\$0.00	0%
Total Capital	\$3,165,049.00	
Total Energy	\$627,846.90	
Grand Total	\$3.879.396.00	

Alternative: VAV W/ REHEAT Calculated at: Jun 08, 2023 - 12:24 PM

TRACE 3D Plus 5.10.57

name: 111755.mdf

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

File

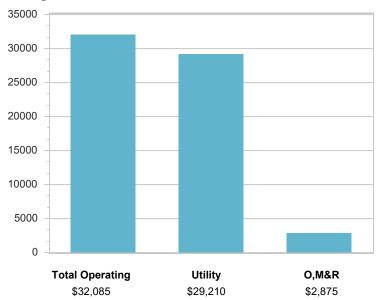
Economic Summary and Calculation Parameters

Life Cycle and Costing Parameters

•	
Length of Study	20 years
Inflation Approach	ConstantDollar
Discounting Convention	BeginningOfYear
Real Discount Rate	3.00%
Nominal Discount Rate	N/A
Inflation Rate	N/A
Tax Rate	5.00%
Depreciation Method	None
Base Date	August 2017
Service Date	August 2017
Building Area	11,034 (ft²)
Net Conditioned Building Area	a 10,361 (ft²)
Initial Capital Investment Cos	t \$975,000

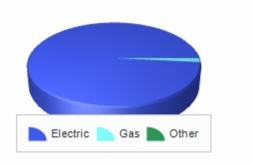
Average Costs

TRACE 3D Plus 5.10.57



Energy Cost Summary

Name	Electricity	Gas	Other	Total
Energy Cost (Net)	\$28,748	\$461	\$0	\$29,210
Renewables Offset	\$0	\$0	\$0	\$0
Energy Cost (Total)	\$28,748	\$461	\$0	\$29,210
Cost per Building Area	\$2.61	\$0.04	\$0.00	\$2.65
Cost per Net Cond. Bldg Area	\$2.77	\$0.04	\$0.00	\$2.82



Alternative: VRF

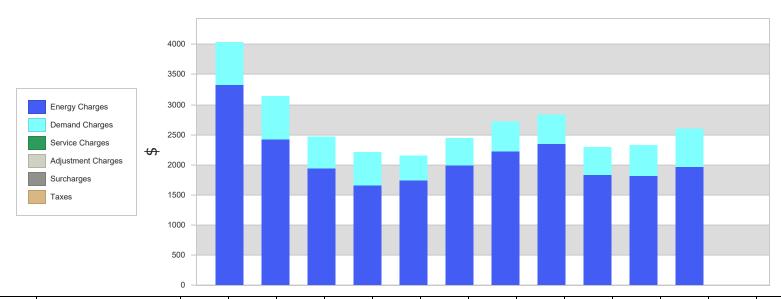
File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

name: 111755.mdf

Calculated at: Jun 08, 2023 - 12:27 PM

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Monthly Utilities Cost Summary



Tariff Catagory	Fuel Type	Jan (\$)	Feb (\$)	Mar (\$)	Apr (\$)	May (\$)	Jun (\$)	Jul (\$)	Aug (\$)	Sep (\$)	Oct (\$)	Nov (\$)	Dec (\$)	Annual Total (\$)	% of Total
Consumption Charges	Natural Gas	43	39	43	42	43	42	43	43	42	43	40	0	461	1.58%
	Electricity	3,283	2,380	1,895	1,615	1,697	1,946	2,177	2,303	1,791	1,774	1,924	0	22,785	78.01%
Demand Charges	Electricity	709	718	526	555	410	456	498	486	463	508	635	0	5,963	20.41%
ServiceCharges	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Basis	All	4,035	3,137	2,464	2,211	2,150	2,444	2,718	2,831	2,296	2,325	2,599	0	29,210	100.00%
Adjustment	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Surcharge	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
Subtotal	All	4,035	3,137	2,464	2,211	2,150	2,444	2,718	2,831	2,296	2,325	2,599	0	29,210	100.00%
Taxes	All	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	Total	4,035	3,137	2,464	2,211	2,150	2,444	2,718	2,831	2,296	2,325	2,599	0	29,210	

Alternative: VRF

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Monthly Utility Details

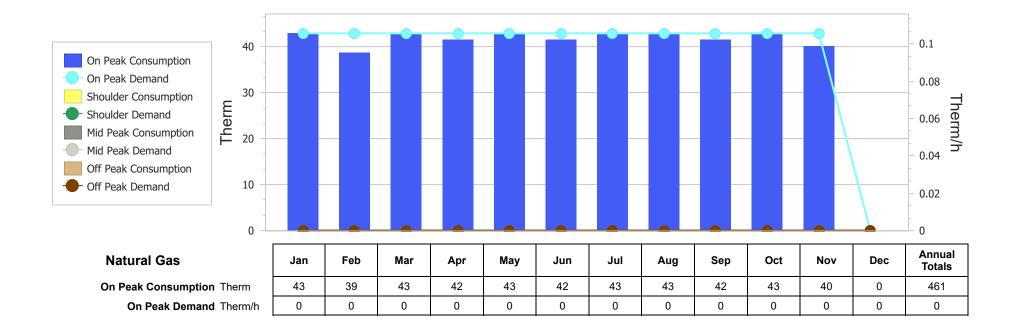


Alternative: VRF

File

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Monthly Utility Details



Alternative: VRF

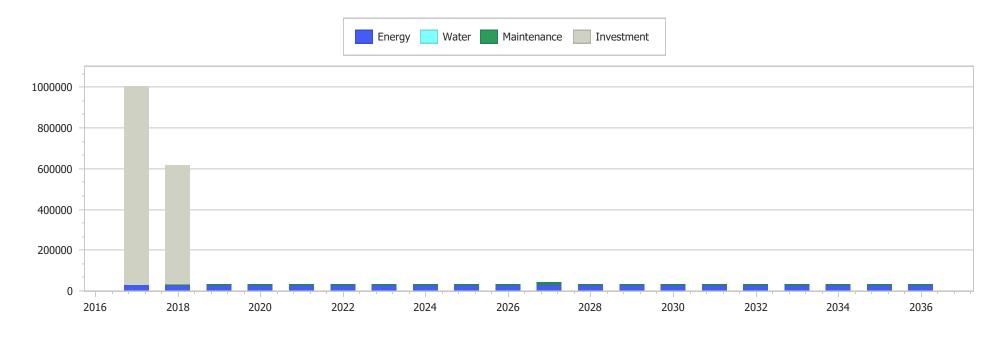
File

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Tariff Details

Tariff Name	Selected	Qualified	Meter Name	Buy or Sell	Group	Total Annual Cost
SAMPLE WITH ALL UTILITIES_NGAS	Yes	Yes	BUILDING NATURAL GAS	Buy	(none)	\$461
SAMPLE WITH ALL UTILITIES_ELEC	Yes	Yes	BUILDING ELECTRICITY	Buy	(none)	\$28,748

Life Cycle Operating Cash Flow (without escalation)



Year	Energy	Water	Water Maintenance		Total
2017	29,210	0	0	975,000	1,004,210
2018	29,210	0	2,500	585,000	616,710
2019	29,210	0	2,500	0	31,710
2020	29,210	0	2,500	0	31,710
2021	29,210	0	2,500	0	31,710
2022	29,210	0	2,500	0	31,710
2023	29,210	0	2,500	0	31,710

Alternative: VRF

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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Year	Energy	Water	Maintenance	Investment	Total
2024	29,210	0	2,500	0	31,710
2025	29,210	0	2,500	0	31,710
2026	29,210	0	2,500	0	31,710
2027	29,210	0	12,500	0	41,710
2028	29,210	0	2,500	0	31,710
2029	29,210	0	2,500	0	31,710
2030	29,210	0	2,500	0	31,710
2031	29,210	0	2,500	0	31,710
2032	29,210	0	2,500	0	31,710
2033	29,210	0	2,500	0	31,710
2034	29,210	0	2,500	0	31,710
2035	29,210	0	2,500	0	31,710
2036	29,210	0	2,500	0	31,710

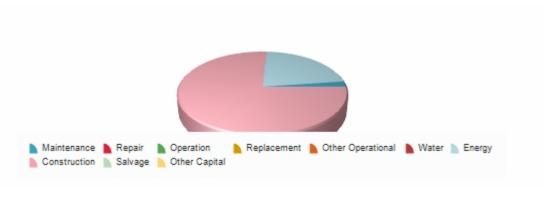
Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-111755.mdf File name:

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Present Value Analysis (Without Escalation)

Present Value By Year

Year	Total Cost	Present Value
2017	1,004,210.00	1,004,210.00
2018	616,709.60	598,747.10
2019	31,709.54	29,889.28
2020	31,709.54	29,018.72
2021	31,709.54	28,173.52
2022	31,709.54	27,352.93
2023	31,709.54	26,556.24
2024	31,709.54	25,782.76
2025	31,709.54	25,031.80
2026	31,709.54	24,302.72
2027	41,709.54	31,035.82
2028	31,709.54	22,907.65
2029	31,709.54	22,240.43
2030	31,709.54	21,592.65
2031	31,709.54	20,963.74
2032	31,709.54	20,353.15
2033	31,709.54	19,760.34
2034	31,709.54	19,184.79
2035	31,709.54	18,626.01
2036	31,709.54	18,083.51
Tota	al Life Cycle Cost	2,033,813.16



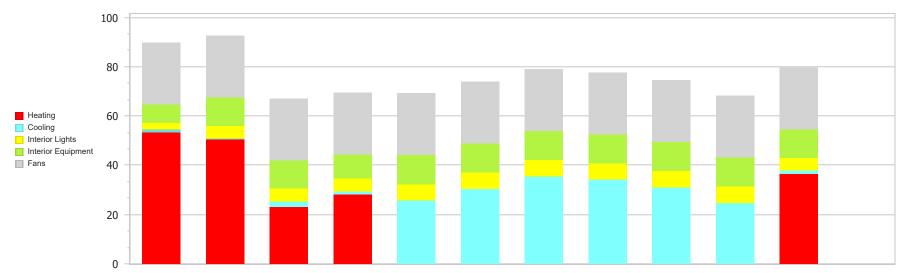
Category	Present Value	
Maintenance	\$43,250.44	2%
Repair	\$0.00	0%
Operation	\$0.00	0%
Replacement	\$0.00	0%
Other Operational	\$0.00	0%
Water	\$0.00	0%
Energy	\$447,601.20	22%
Total Operation	\$490,851.60	
Construction	\$1,542,961.00	76%
Salvage	\$0.00	0%
Other Capital	\$0.00	0%
Total Capital	\$1,542,961.00	
Total Energy	\$447,601.20	
Grand Total	\$2,033,813.00	

Alternative: VRF

File

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Electricity (kW)



Peak Facility Demand Time of Peak (Day/Hour)

Heating

Cooling Interior Lights

Exterior Lights

Interior Equipment

Exterior Equipment

Fans

Pumps

Heat Rejection Humidification

Heat Recovery

Water Systems

Refrigeration Generators

Electricity Produced

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
89.8	92.6	67.1	69.5	69.2	73.8	78.9	77.7	74.4	68.2	79.6	0
07/19:00	03/07:00	06/07:00	06/06:00	30/14:00	27/15:00	07/15:00	01/14:00	07/15:00	10/15:00	22/07:00	0
53.4	50.4	23	28.1	0	0	0	0	0	0	36.5	0
1.1	0.5	2.4	1.4	25.8	30.4	35.5	34.3	31	24.8	1.4	0
2.6	5.1	5.1	5.1	6.4	6.7	6.7	6.4	6.7	6.7	5.1	0
0	0	0	0	0	0	0	0	0	0	0	0
7.6	11.5	11.5	9.7	11.9	11.7	11.7	11.9	11.7	11.7	11.5	0
0	0	0	0	0	0	0	0	0	0	0	0
25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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Gas (therms/hr)

Peak Facility Demand Time of Peak (Day/Hour) Interior Equipment

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0
01/	/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	0
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0

Alternative: PACKAGED ROOFTOP HEAT PUMP (BASELINE)

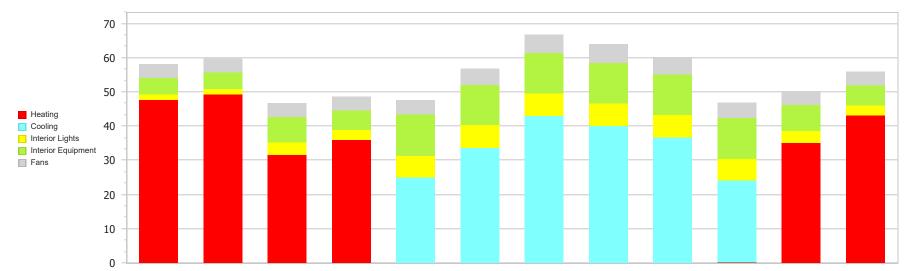
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TRACE 3D Plus 5.10.57 Page 2 of 8

Electricity (kW)



Peak Facility Demand Time of Peak (Day/Hour)

Heating

Cooling Interior Lights

Exterior Lights

Interior Equipment

Exterior Equipment

Fans

Pumps

Heat Rejection Humidification

Heat Recovery

Water Systems

Refrigeration Generators

Electricity Produced

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
58	59.5	46.8	48.7	47.6	56.7	66.5	63.9	60	46.7	50.1	55.8
09/03:00	13/03:00	06/05:00	06/04:00	31/13:00	27/15:00	07/15:00	18/15:00	07/15:00	10/13:00	21/05:00	18/04:00
47.6	49.2	31.6	35.9	0	0	0	0	0	0.1	35	43.1
0	0	0	0	24.9	33.6	42.9	40	36.6	23.9	0	0
1.7	1.7	3.6	2.9	6.4	6.7	6.7	6.7	6.7	6.4	3.6	2.9
0	0	0	0	0	0	0	0	0	0	0	0
4.7	4.7	7.5	5.8	12	11.7	11.7	11.7	11.7	12	7.5	5.8
0	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4.2	4.7	5.4	5.5	5.1	4.4	4	4
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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Gas (therms/hr)

Peak Facility Demand Time of Peak (Day/Hour) Heating Interior Equipment

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.6	3.4	1.5	1.7	0.6	0.1	0.1	0.1	0.1	1.4	2.1	2.4
14/07:00	12/06:00	19/06:00	06/04:00	11/05:00	10/04:00	01/12:00	01/12:00	01/12:00	26/05:00	22/06:00	18/07:00
2.5	3.4	1.5	1.6	0.6	0.1	0	0	0	1.3	2.1	2.4
0.1	0	0	0	0	0	0.1	0.1	0.1	0	0	0.1

TRACE 3D Plus 5.10.57

Alternative: PACKAGED ROOFTOP VAV W/ REHEAT

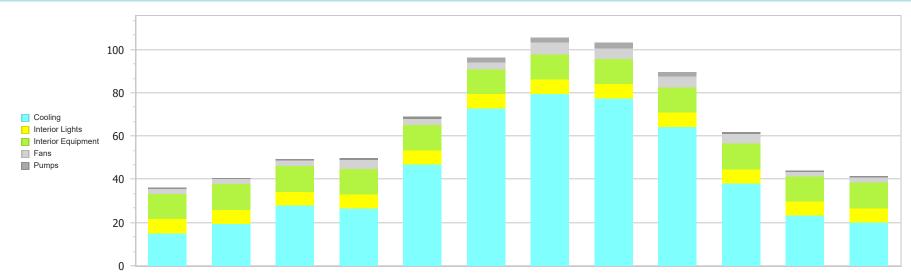
File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

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Electricity (kW)



Peak Facility Demand Time of Peak (Day/Hour)

Heating

Cooling

Interior Lights

Exterior Lights Interior Equipment

Exterior Equipment

Fans

Pumps

Heat Rejection Humidification

Heat Recovery

Water Systems

Refrigeration

Generators

Electricity Produced

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
36	40.7	49.4	49.8	68.8	96.1	105.4	103.1	89.5	61.8	44	41.4
19/15:00	28/13:00	30/13:00	17/14:00	31/12:00	23/11:00	07/15:00	10/15:00	07/15:00	10/13:00	27/17:00	12/13:00
0	0	0	0	0	0	0	0	0	0	0	0
14.9	19.4	27.8	26.6	46.9	72.8	79.4	77.3	64.2	38.2	23.2	20.1
6.7	6.4	6.4	6.4	6.4	6.7	6.7	6.7	6.7	6.4	6.7	6.4
0	0	0	0	0	0	0	0	0	0	0	0
11.7	12	12	11.9	11.9	11.2	11.7	11.7	11.7	12	11.4	12
0	0	0	0	0	0	0	0	0	0	0	0
2.2	2.4	2.6	4.1	2.6	3.2	5.4	4.8	5.1	4.3	2.2	2.4
0.5	0.4	0.6	0.7	1.1	2.3	2.3	2.7	1.9	0.8	0.5	0.5
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Alternative: VAV W/ REHEAT

Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-File

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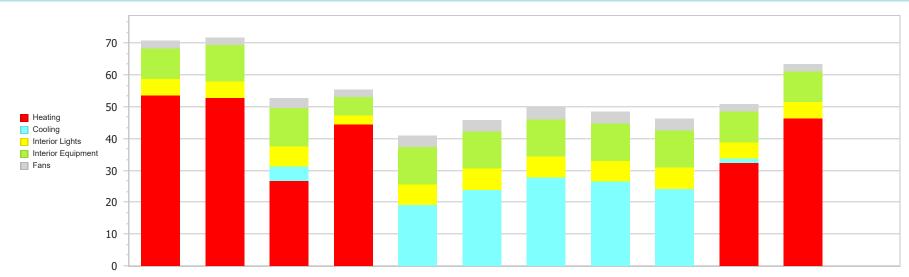
Gas (therms/hr)

Peak Facility Demand Time of Peak (Day/Hour) Heating Interior Equipment

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.8	5.2	2.8	3.1	2.8	1.7	1.8	1.8	1.1	3.5	4.4	4.9
01/20:00	12/06:00	19/06:00	06/04:00	18/04:00	12/04:00	24/04:00	23/04:00	29/03:00	07/05:00	08/06:00	22/05:00
4.7	5.2	2.8	3.1	2.8	1.7	1.8	1.8	1	3.5	4.4	4.8
0.1	0	0	0	0	0	0	0	0	0	0	0

Alternative: VAV W/ REHEAT Calculated at: Jun 08, 2023 - 12:24 PM Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-File

Electricity (kW)



Peak Facility Demand Time of Peak (Day/Hour)

Heating

Cooling Interior Lights

Exterior Lights

Interior Equipment

Exterior Equipment

Fans

Pumps Heat Rejection

Humidification

Heat Recovery

Water Systems Refrigeration

Generators

Electricity Produced

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
70.9	71.8	52.6	55.5	41	45.6	49.8	48.6	46.3	50.8	63.5	0
10/06:00	03/07:00	22/13:00	06/04:00	30/14:00	22/16:00	07/15:00	01/14:00	07/15:00	26/06:00	22/06:00	0
53.6	52.8	26.7	44.4	0	0	0	0	0	32.4	46.4	0
0	0	4.5	0	19.1	23.9	27.7	26.5	24.2	1.3	0	0
5.1	5.1	6.4	2.9	6.4	6.7	6.7	6.4	6.7	5.1	5.1	0
0	0	0	0	0	0	0	0	0	0	0	0
9.7	11.5	12	5.8	11.9	11.6	11.7	11.9	11.7	9.7	9.7	0
0	0	0	0	0	0	0	0	0	0	0	0
2.4	2.3	3	2.3	3.5	3.5	3.8	3.7	3.7	2.3	2.2	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Alternative: VRF

File Construct Trinka Davis 12 Bed CLC_Recovery_2023-06-06-

Gas (therms/hr)

Peak Facility Demand Time of Peak (Day/Hour) Interior Equipment

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0
01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	01/12:00	0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0

Alternative: VRF Calculated at: Jun 08, 2023 - 12:27 PM

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VA Trinka Davis CLC 95% Submission

IV. Daylighting and Lighting Controls
Optimizing Daylighting Narrative and Biophilic Design Narrative



VA Trinka Davis CLC Daylighting and Lighting Controls Narrative

VA Project No: 508-349 GDI Project No: 22.9003

Project Location: Atlanta, GA

The close proximity of trees on the west and north sides of the building have limited the availability of daylight in the building. Given these constraints, the design team has maximized daylighting potential as much as possible by providing generous windows in each patient room, along with manual shades to allow the patient to adjust their light level. Public and social spaces have larger and numerous windows including clerestory windows, which allow a great deal of natural light in these spaces.



VA Trinka Davis CLC Biophilic Design Narrative

VA Project No: 508-349 GDI Project No: 22.9003

Project Location: Atlanta, GA

The 12-bed community living center at Trinka Davis is a brand-new building which is connected to the existing housing units and clinical buildings on campus. The building exterior emulates the design of existing construction which focuses on brick and a lot of locally sourced stone veneer. The building interiors heavily focus on naturistic finishes and creating a sense of serenity and calm for its dwellers. The use of stone and wood paneling in open public areas adds warmth to surroundings. Private spaces like patient rooms and corridors focus on naturistic patterns of vines and stalks on wall coverings and flooring as well as river rock patterns on ceramic tile used in all the restrooms. Access to outdoor patios at three different locations in the building is an active design measure to promote biophilia and access to nature.

APPENDIX E: Calcs and Cutsheets







ELECTRIC UNIT HEATERS FOR STANDARD AND HAZARDOUS (CLASSIFIED) LOCATIONS



MODEL HER



MODEL VE



MODEL PTE



MODEL HEX



Table of Contents	Page
Electric Unit Heater Design Benefits	
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Models HER, PTE, VE	4
Model HEX	5
Performance/Dimensional Data	
Performance Data - All Units	6
Performance Data - Vertical Unit Air Deflectors	7
Dimensional Data - All Units	8
Accessories - Field Installed - All Units	9
Ordering Information	10
Specifications - All Units	11

Selectable using the Modine Breeze™ AccuSpec Selection Software.





As Modine Manufacturing Company has a continuous product improvement program, it reserves the right to change design and specifications without notice.

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ELECTRIC UNIT HEATERS

Wide Range of Sizes and Types

Horizontal air delivery unit heater type (HER series):

32 models, 8 sizes from 3 kW through 25 kW.

Recommended for buildings with low ceilings, they are equipped with horizontal air deflector blades to adjust airflow either up or down. Optional vertical deflector blades are also available to deflect air to the right or left, providing complete directional control over discharge of heated air. Horizontal delivery units are normally placed around the perimeter of the building where heat loss is greatest, so that the air stream from each heater "wipes" the wall to produce a blanket of warm air along the outside walls.

Vertical air delivery unit heater type (VE series):

21 models, 9 sizes from 5 kW through 50 kW.

Recommended for buildings with high ceilings are high and where obstructions do not permit good horizontal movement of air. Various optional air deflectors are available to produce a variety of distribution patterns (see page 12). Vertical unit heaters are usually oriented so that the heat spread from one overlaps the heat spread of another unit heater.

Power-Throw[™] unit heater type (PTE series):

3 models, 3 sizes from 15 kW through 50 kW.

For applications requiring heat throw greater than can be provided by HER units, Power-Throw[™] unit heaters should be considered. For hard-to-heat areas, such as near frequently opened loading dock doors or large warehouses, Power-Throw[™] units are frequently an ideal choice. They are equipped with horizontal air deflector blades to adjust airflow either up or down. Due to the higher velocity of discharge air, their air streams should not be directed at room occupants. A single Power-Throw[™] unit heater can often be used to replace as many as three smaller horizontal delivery units, thereby reducing equipment, installation, and maintenance costs.

Explosion Proof Horizontal Air Delivery Unit Heater Type (HEX series):

A WARNING

Before installing and operating heaters confirm location, classification and properties of flammable vapors, liquids, gases, dusts and fibers which may be present. Each room, section or area should be considered individually.

26 model combinations, 9 sizes from 3 kW through 35 kW.

These horizontal heaters are designed for rugged industrial applications in hazardous locations such as oil refineries, petrochemical plants, pulp and paper mills, coal mines, grain elevators, etc., where the possibility of explosion or fire exists due to the presence of flammable gases, vapors, powdered metals or dusts. Heaters are UL Listed for Class I, Divisions 1 & 2, Groups C and D; Class II, Division 1, Groups E, F and G, and Class II, Division 2, Groups F and G. The UL temperature code shall be T3B 329°F (165°C) for Class I and II, indicating maximum operating surface temperatures. Before selecting any heater for a particular application, refer to Article 500 of the National Electric Code, as well as other applicable Standards. Abbreviated descriptions of UL classes, groups, and divisions are as follows.

Class I: Locations in which flammable gas or vapors may be present, such as, but not limited to:

 Group C: Atmospheres such as ethylene, alcohol, carbon monoxide, or hydrogen sulfide.



 Group D: Atmospheres such as acetone, gasoline, natural gas, propane or other gases or vapors of equivalent hazard.

Class II: Locations in which combustible dusts may be present, such as, but not limited to:

- Group E: Atmospheres containing combustible metal dust regardless of resistivity or other combustible dust of similar hazard characteristics.
- Group F: Atmospheres containing carbon black, charcoal, coal or coke dust or dust of similar hazard characteristics.
- Group G: Atmospheres containing flour, starch, grain dust or dusts of similar hazards.

Division I: Location in which ignitable concentrations of flammable material exist under normal operating conditions.

Division II: Locations in which flammable materials will normally be confined within closed containers and escape only in the case of abnormal conditions. Any equipment approved for Division I is automatically also approved for Division II.

For further information, please consult the National Electric Code (NEC) and National Fire Prevention Association (NFPA) standards.

Low Installation Cost

Transformers, contactors and fuses are factory-furnished and factory-wired when required. Terminal blocks facilitate connection of power supply and control wiring. Modine electric unit heaters are lightweight and require no special reinforcement to suspend them.

Easy to Service

Fan and motor are exposed and can be removed without lowering the unit heater. A hinged bottom panel permits full access to controls on models HER, horizontal units. Vertical delivery and Power-Throw™ models have separate control boxes externally mounted on the units. Motors are totally enclosed, permanently lubricated, and thermally protected. Electrical contactors, fuses, and transformers are all safely enclosed in control compartments.

Application Flexibility

Total Heating

Units can meet the total heating requirement in most industrial plants, commercial and recreational buildings, and in special-purpose structures such as animal shelters. The features that make them the ideal selection for these types of buildings are a long heat throw, uniform heat delivery and low installation and maintenance costs. High up and out-of-the-way, unit heaters provide heat into work areas for clean, safe, economical heating comfort.

Supplemental Heating

They are ideal for spot heating applications during short periods of occupancy in the area to be heated. In out-of-the-way locations, remote from areas served by the building's main heating systems, electric unit heaters can often eliminate the expense of extending gas, steam, or hot water lines.

Stand-by/Back-up Heating

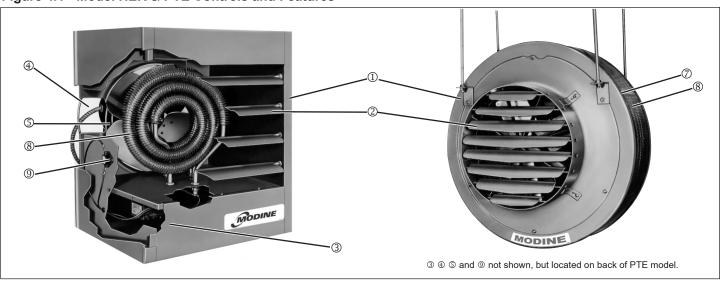
Where fossil fuel supplies are interruptible or undependable, electric unit heaters are recommended as a stand-by or back-up heating system to supply comfort to an entire building or any part of it.

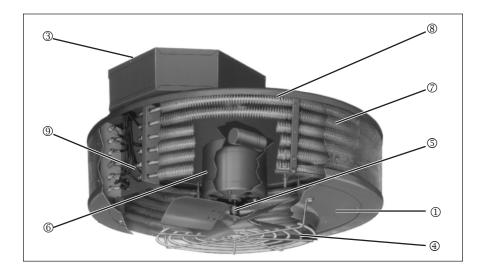
2-116.10 3

DESIGN FEATURES - MODELS HER, PTE, & VE



Figure 4.1 - Model HER & PTE Controls and Features





- ① Casing The casing is cleaned and phosphatized prior to electrostatic application of a baked-on, gray-green polyester powdercoat paint.
- ② Adjustable Air Deflector Blades (HER & PTE units only) -Adjustable up and down, blades provide control over the horizontal air delivery of the unit heater.
- ③ Control Compartment Safely encloses power and control terminal blocks, contactor(s), fuses and transformer. Terminal blocks provide easy access for field wiring. On model HER horizontal units, a hinged bottom panel swings down for full access to the control compartment.
- Safety Fan Guard Formed from heavy gauge steel rod stock, the fan guard is attached to the unit heater casing and provides a rigid support for the motor and protection from the exposed fan.
- Motor/Fan The totally enclosed, thermally protected, continuous-duty motor is mounted to the fan guard utilizing rubber vibration absorbing material. The lightweight aluminum propeller type fan is connected directly to the motor shaft and is statically balanced for peak performance and low sound level.

- Motor Heat Shield (VE units only) Protects the motor from heated air passing through the unit heater.
- Protective Screen (VE & PTE units only) The aluminum screen protects heating elements from accidental damage and further enhances the appearance of the unit heater.
- ® Heating Element Nickel-chromium wire elements are enclosed in powder-filled aluminum coated steel tubes to which spiraled fins are permanently fused for maximum heat transfer. Elements are resistant to thermal shock and vibration.
- Automatic Reset Overheat Control In the event of overheating, this control interrupts the power supply to the heating elements. The control automatically resets itself once the heater cools to a safe temperature. Control includes a switch located in terminal box with a capillary tube around bottom heating element.

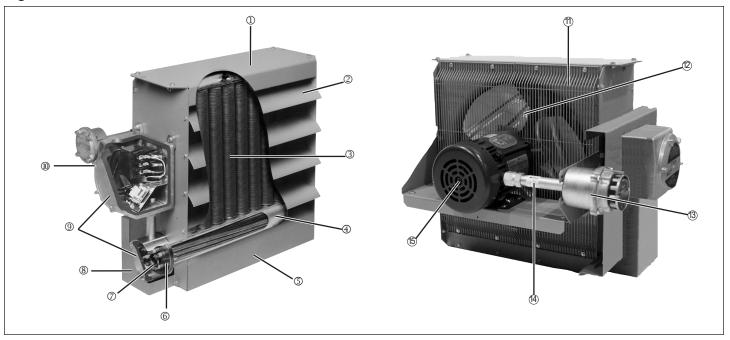
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DESIGN FEATURES - EXPLOSION-PROOF MODEL HEX



Features

Figure 5.1 - Model HEX Controls and Features



- ① Epoxy coated 14 gauge steel cabinet contains heater core, motor, and fan assembly. All fasteners are plated for corrosion protection.
- ② Adjustable extruded aluminum louvers allow directional control of airflow.
- ③ Liquid to air finned tube heat exchanger core. An Ethylene Glycol and water solution is used as the heat transfer fluid, providing freeze protection to -49°F (-45°C). A pressure relief valve protects the core from overpressure damage. Heaters are UL Listed for Class I, Divisions 1 & 2, Groups C and D, and Class II, Division 1, Groups E, F and G, and Class II, Division 2, Groups F and G. UL temperature code shall be T3B 329°F (165°C) for Class I and II, indicating maximum operating surface temperatures. Refer to page 3 for additional details.
- Low watt density metal sheathed immersion type heating elements in the liquid filled lower tank feature a Teflon® liner to keep elements away from outer surfaces. (Teflon® is a registered trademark of E.I du Pont de Nemours & Co.).
- The core is easily removable through the bottom of the heater for ease of service.
- Automatic reset, bimetal, high-limit provides over temperature protection and is rated for 100,000 cycles of service.

- Factory wiring to tin plated copper bus bars for effective handling of high current flow.
- ® Outer protective cover protects against high surface temperatures.
- Threaded explosion proof covers on junction boxes.
- ® NEMA Type 7 & 9 enclosures with large, heavy-duty aluminum data plate houses the built-in control transformer, convenient terminals for 120V room thermostat wiring connection, load carrying contactor with severe duty coil, and fuse protection for contactor coil, including a spare fuse in a convenient holder.
- Marrow gap two-piece safety fan guard shields all moving parts.
- ② Heavy gauge embossed fan blades.
- Optional factory installed explosion proof thermostat.
- Factory wired motor connections with copper conductor wires enclosed in steel conduit. Conduit is reverse threaded for easy motor removal.
- ⑤ Thermally protected, automatic reset explosion-proof motor

Teflon® is a registered trademark of E.I du Pont de Nemours & Co. $\,$

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PERFORMANCE DATA - ALL MODELS



					Heating (Capacity	У			ir Data ①					
Location		Model		High	n Stage	Low	Stage		A	ir Data U					
Delivery Type				kW	Btu/hr	kW	Btu/hr	Airflow (CFM) ②	Temp Rise (°F)	Heat Throw (ft.)	Maximum Mounting Height (ft.)				
		HER 30		HER 30		HER 30		3	10,200	n/a	n/a	380	25	12	8
		HER 50		5	17,100	n/a	n/a	380	42	<mark>12</mark>	8				
	Ž	HER	75	7.5	25,600	n/a	n/a	530	45	14	8				
	Delivery	HER	100	10	34,100	n/a	n/a	830	38	20	9				
	De	HER	125	12.5	42,700	n/a	n/a	830	48	20	10				
	E	HER	150	15	51,200	n/a	n/a	830	57	20	10				
ω l	Horizontal	HER	200	20	68,200	n/a	n/a	1300	49	25	11				
Ö	ŗ	HER	250	25	85,300	n/a	n/a	1300	61	25	12				
ati	ĭ	PTE:	300	30	102,400	15	51,200	2575	40	75	17				
١٥		PTE4	400	40	136,500	20	68,200	2575	54	60	15				
臣		PTE:	500	50	170,600	25	85,300	2575	70	45	14				
Standard Locations		VE	50	5	17,100	n/a	n/a	800	21						
tan	_	VE	75	7.5	25,600	n/a	n/a	800	31						
Ó	er)	VE 100		VE 100		10	34,100	n/a	n/a	940	36				
	Vertical Delivery	VE 1	VE 150		51,200	n/a	n/a	1340	38	0 T.11. 7.	4 C Tl /N 4 /				
		VE 200 VE 250		19	64,800	n/a	n/a	1600	41		1 for Throw/Mounting eight Data.				
	is			25	85,300	n/a	n/a	1600	55		ayiii Dala.				
	ert	VE 3	300	30	102,400	15	51,200	2575	40						
	_	VE 4	100	40	136,500	20	68,200	2575	54						
		VE 5	500	50	170,600	25	85,300	2575	70						
		HEX	-3	3	10,250	n/a	n/a	500	19	15	7				
ons ⊚	2	HEX	-5	5	17,050	n/a	n/a	500	31.6	15	7				
atic of)	Ne Ne	HEX	-7.5	7.5	25,600	n/a	n/a	850	27.9	30	10				
Locations Proof) ③	Delivery	HEX	-10	10	34,100	n/a	n/a	850	37.2	30	10				
s L	all	HEX	-15	15	51,200	n/a	n/a	1750	27.1	40	10				
lou Sic	Horizontal	HEX	-20	20	68,250	n/a	n/a	1750	36.1	40	10				
ard	riz	HEX	-25	25	85,300	n/a	n/a	3600	21.9	70	20				
Hazardous Locatio (Explosion Proof)	운	HEX	-30	30	102,350	n/a	n/a	3600	26.3	70	20				
		HEX	-35	35	119,450	n/a	n/a	3950	28	70	20				

① Airflow shown is at 70°F ambient and heating at full rated capacity

Table 6.2 - Unit Motor Data - All Models

	1	Motor Inform	ation		
Model	Motor HP	Motor Type	Motor Bearing Type		
HER 30					
HER 50	1/40				
HER 75					
HER 100		Totally Enclosed,	Sleeve		
HER 125		Shaded Pole	Oleeve		
HER 150	1/15				
HER 200	1				
HER 250					
PTE300		Totally Enclosed,			
PTE400	1/6	Permanent Split	Ball		
PTE500		Capacitor			
VE 50					
VE 75	1/15	Totally Enclosed, Shaded Pole	Sleeve		
VE 100		Shaded Fole			
VE 150					
VE 200	1/8				
VE 250		Totally Enclosed, Permanent Split	Ball		
VE 300		Capacitor	Dall		
VE 400	1/6				
VE 500					
HEX5_60-3.0					
HEX5_60-5.0					
HEX5_60-7.5					
HEX5_60-10.0					
HEX5_60-15.0	1/2	Explosion Proof	Ball		
HEX5_60-20.0					
HEX5_60-25.0					
HEX5_60-30.0	-				
HEX5_60-35.0					

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full rated capacity.

© For HER, airflow CFM is for inlet. For PTE and VE, airflow CFM is outlet.

For HEX units above 6000 feet above sea level, altitude limits may exist. Refer to the latest revision of Installation & Service Manual 2-519.

HEAT SPREAD AND MOUNTING HEIGHT-MODEL VE

Performance Data

Heat Spread and Mounting Height

Refer to Table 7.1 and Figures 7.2 through 7.5 for the recommended mounting heights and accompanying heat spread of vertical units without an air deflector and with the three air deflectors offered.

Table 7.1 - Heat Spread and Mounting Height (Ft.) ⁽¹⁾

	Wit	h No				With D	eflecto	r		
		ector	Trun	cone	Con	Cone-Jet		Louv	ers	
Model	May	Coreed			Vert	Vertical®		cal3	45° ③	
No.	Max. Height	Spread (S)	Н	S	Н	S	Н	S	Н	S
VE 50	13	20	9	24	18	23	15	13	8	23
VE 75	11	17	8	20	15	20	13	11	8	20
VE100	12	18	8	22	17	22	14	12	8	22
VE150	17	26	11	30	23	30	20	17	10	30
VE200	20	30	13	36	27	35	23	20	12	35
VE250	17	26	11	31	23	31	20	18	10	31
VE300	20	31	15	36	28	36	24	21	12	36
VE400	18	27	13	32	24	32	21	18	11	32
VE500	16	24	12	29	22	29	19	16	10	29

① With 70°F ambient air and heating at full capacity

Figure 7.1 - Vertical Air Outlet Accessories

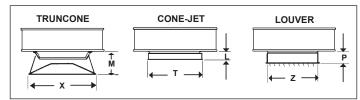


Table 7.2 - Vertical Air Outlet Accessories

Model	Trun	cone	Con	e-Jet	Louvers		
No.	M	Х	L	T	Р	Z	
VE50-VE250	12 1/2	22	6 1/2	18 7/8	6 1/2	16 7/8	
VE300-VE-500	12 1/2	27	7 1/2	24 3/4	7 1/2	19 3/4	

Figure 7.2 - Without Deflector

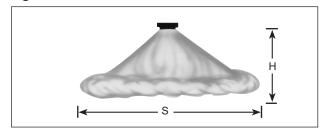


Figure 7.3 - With Truncone

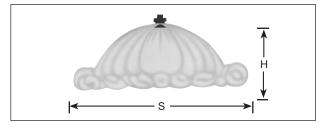


Figure 7.4 - With Cone-Jet

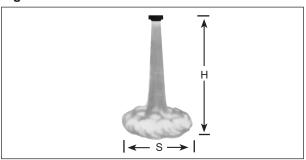


Figure 7.5 - With One- or Two-Way Louvers

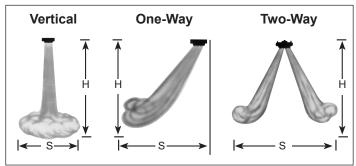
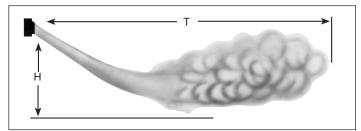


Figure 7.6 - Mounting Height & Heat Throw - Models HER, PTE, & HEX (refer to Table 6.1)



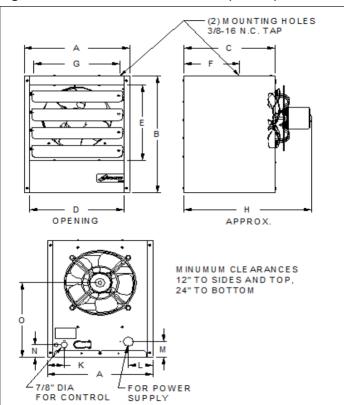
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Indicates pitch of adjustable louvers. 45° louvers are available for one- or two-way deflection

MODINE

Dimensional Data

Figure 8.1 - Model HER Dimensions (inches)



				МО	DEL			
Dim.	HER 30	HER 50	HER 75	HER 100	HER 125	HER 150	HER 200	HER 250
Α	14-1/4	14-1/4	16-7/8	16-7/8	16-7/8	16-7/8	18-7/8	18-7/8
В	17-1/2	17-1/2	20-7/8	20-7/8	20-7/8	20-7/8	24	24
С	12-1/4	12-1/4	14-3/4	14-3/4	14-3/4	14-3/4	20	20
D	12-7/8	12-7/8	14-1/2	14-1/2	14-1/2	14-1/2	16-1/2	16-1/2
E	11-3/8	11-3/8	13	13	13	13	16	16
F	7-1/2	7-1/2	8-7/8	9-5/8	9-5/8	9-5/8	12-5/8	12-5/8
G	11-5/8	11-5/8	13-1/2	13-1/2	13-1/2	13-1/2	15-1/2	15-1/2
Н	17-1/4	17-1/4	20-1/4	21-1/4	21-1/4	21-1/4	26-1/2	26-1/2
K	2-1/4	2-1/4	2-1/4	2-1/4	2-1/4	2-1/4	3-1/4	3-1/4
L	3-3/8	3-3/8	3-1/4	3-1/4	3-1/4	3-1/4	4-1/4	4-1/4
M	2-3/8	2-3/8	2-1/4	2-1/4	2-1/4	2-1/4	2-1/2	2-1/2
N	1-7/8	1-7/8	2-1/4	2-1/4	2-1/4	2-1/4	2-1/2	2-1/2
0	11-1/8	11-1/8	12-3/4	12-3/4	12-3/4	12-3/4	⁹ 4-1/2	14-1/2
Fan Dia.	9	9	12	12	12	12	14	14
Wt. Lbs.①	34 ①	34 ①	52 ①	67 ①	65 ①	74 ①	97 ①	98 ①

Approximate Shipping Weight Add 7 lbs. for 480 Volt Models.

Figure 8.2 - Model PTE Dimensions (inches)

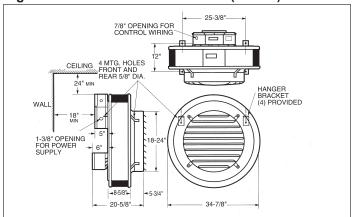
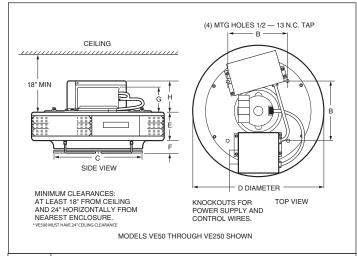
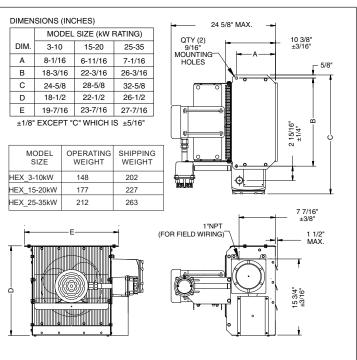


Figure 8.3 - Model VE Dimensions (inches)



		Model									
Dim.	VE50	VE75	VE100	VE150	VE200	VE250	VE300	VE400	VE500		
В	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	18 3/8	18 3/8	18 3/8		
С	14 1/2	14 1/2	14 1/2	14 1/2	14 1/2	14 1/2	19 1/2	19 1/2	19 1/2		
D	24 7/8	24 7/8	24 7/8	24 7/8	24 7/8	24 7/8	34 7/8	34 7/8	34 7/8		
E	4 1/4	4 1/4	5	5	5	5	8 5/8	8 5/8	8 5/8		
F	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	2 1/8	2 1/8	2 1/8		
G	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4		
Н	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4		
Fan Dia.	14	14	14	14	14	14	19	19	19		
Approx. Wt. Lbs.	62	64	66	70	72	73	122	125	129		

Figure 8.4 - Model HEX Dimensions (inches)



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Thermostats

The unit-mounted thermostat in Figure 9.1 is provided as a field installed kit for a model HER series only. Temperature range of the dial setting is from 40°F to 90°F.

Other thermostats offered (not unit-mounted) are:

- Line-voltage single stage
- Line-voltage, 2-stage (available on PTE and VE models 300, 400 and 500)
- Low-voltage single stage (requires Low-Voltage Control kit.)

Figure 9.1 - Unit-Mounted Thermostat



Low-Voltage Control

This control permits use of a low-voltage thermostat control of electric unit heaters. High capacity models VE300, VE400, VE500 and all PTE series heaters cannot operate in two stages with a low-voltage thermostat; however, they will respond in one stage with full operation of all elements. On model HER series, this control cannot be combined with the unit-mounted thermostat.

Summer-Winter Switch

In the winter position, the thermostat will cycle the fan and heating elements. In the summer position, the switch will permit the fan to run continuously while the heating elements are controlled by the thermostat. Maximum switch rating is 10A at 250 volts. Kit includes switch, conduit box, wire nuts, and installation instructions.

Figure 9.2 **Low-Voltage Control**

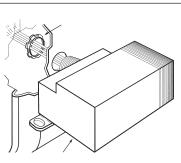


Figure 9.3 **Summer-Winter Switch**



Vertical Unit Air Deflector Blades

Blades used to deflect airflow in directions left or right of unit heater. Used in addition to standard horizontal deflector blades. Not available for Power-Throw[™] models.

Vertical Unit Air Deflectors (refer to page 7 for more info)

- The cone-jet allows the discharge air stream to be adjusted from a concentrated high velocity jet to a broadened air stream to cover a larger area.
- The truncone causes a broad discharge air stream covering a larger area than possible with the cone-jet.
- The one-way louver allows the discharge air stream to be adjusted in one direction.
- The two-way louver allows the discharge air stream to be adjusted in two directions.

Pipe Suspension Adapter Kit

To facilitate threaded-pipe suspension mounting, a pipe-adapter kit is available that includes two drilled pipe caps and two 3/8 - 16 x 1 1/2" capscrews. One kit is required to pipe-mount HER series and two kits must be ordered to mount VE series unit heaters. (On models VE50 through VE250 supplied with 480 volt, 3 phase service, clearance is not adequate for utilization of this kit.) This kit cannot be used with Power-Throw™ (PTE series) unit heaters.

Wall Mounting Bracket

For easier unit installation, where ceiling suspension is not feasible, a wall-mounting bracket is available for models HER50 through HER250 and PTE300 through PTE500. The one-point suspension illustrated in Figure 9.4 permits swiveling the unit 90° horizontally for most effective air flow direction. Fasteners for mounting to wall are not furnished.

Figure 9.4 **Wall Mounting Bracket**

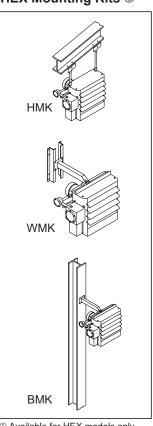


Hanging Mounting Kit (HMK) ① Simple and economical if adequate overhead structure exists. Requires 1/2" pipe, cut and threaded (not supplied)

Wall Mounting Kit (WMK) ① Ideal for use in buildings that have substantial walls. the Z sections provide additional support where necessary.

Basic Mounting Kit (BMK) ① Suitable for applications where the support arm can be bolted or welded directly to structural steel or concrete.

Figure 9.5 **HEX Mounting Kits** ①



① Available for HEX models only.

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UNIT SELECTION - ALL MODELS





- 1. Model Number:
 - HER Horizontal Electric Unit Heater
 - VE Vertical Electric Unit Heater
 - PTE Power-Throw™ Horizontal Electric Unit Heater
 - HEX Horizontal Explosion Proof Electric Unit Heater
- 2. Select the full model number from Table 10.1 by locating the model series from Step 1 within Table 10.1 at the intersection of the kW rating and supply voltage required. If that selection shows "-", then there is not a model available matching those parameters.
- 3. Add any required accessories as shown on page 7 and 9.

Table 10.1 - Full Model Number Selection

					Supply Voltage	and Power Code		
			20 <mark>8V</mark> /1ph	240V/1ph	208V/3ph	240V/3ph	480V/3ph	600V/3ph
Electri Heate	ic Unit r Type	kW Rating	11	12	31	32	33	34
		3	HE <mark>R 3</mark> 0C 1101	HER 30C 1201	HER 30C 3101	HER 30C 3201	HER 30C 3301	HER 30C 3401
		5	HER 50C 1101	HER 50C 1201	HER 50C 3101	HER 50C 3201	HER 50C 3301	HER 50C 3401
	ery	7.5	HER 75C 1101	HER 75C 1201	HER 75C 3101	HER 75C 3201	HER 75C 3301	HER 75C 3401
	eliv	10	HER100C 1101	HER100C 1201	HER100C 3101	HER100C 3201	HER100C 3301	HER100C 3401
	ïΠ	12.5	-	-	HER125C 3101	HER125C 3201	HER125C 3301	HER125C 3401
	15 20	-	=	HER150C 3101	HER150C 3201	HER150C 3301	HER150C 3401	
	nta	20	_	-	HER200C 3101	HER200C 3201	HER200C 3301	HER200C 3401
Standard Locations	rizo	25	-	-	HER250C 3101	HER250C 3201	HER250C 3301	HER250C 3401
ati	운	30	-	PTE300C 3301	-			
ř		40	-	-	-	-	PTE400C 3301	-
p.re		50	-	-	-	-	PTE500C 3301	-
nda		5	-	VE 50C 1201	VE 50C 3101	VE 50C 3201	VE 50C 3301	-
Sta	2	7.5	-	VE 75C 1201	VE 75C 3101	VE 75C 3201	VE 75C 3301	-
	ive	10	-	VE 100C 1201	VE 100C 3101	VE 100C 3201	VE 100C 3301	-
	Vertical Air Delivery	15	=	-	VE 150C 3101	VE 150C 3201	VE 150C 3301	-
	Air	20	=	=	-	VE 200C 3201	VE 200C 3301	=
	a '	25	=	=	-	-	VE 250C 3301	=
	ertic	30	=	=	-	-	VE 300C 3301	-
	Š	40	-	-	-	-	VE 400C 3301	-
		50	-	-	-	-	VE 500D 3301	-
		3	HEX5-208160-3.0	HEX5-240160-3.0	HEX5-208360-3.0	HEX5-240360-3.0	HEX5-480360-3.0	-
us (Horizontal Air Delivery	5	HEX5-208160-5.0	HEX5-240160-5.0	HEX5-208360-5.0	HEX5-240360-5.0	HEX5-480360-5.0	-
Hazardous Locations (Explosion Proof)	eliv	7.5	HEX5-208160-7.5	HEX5-240160-7.5	HEX5-208360-7.5	HEX5-240360-7.5	HEX5-480360-7.5	
.00.	Ō	10	-	HEX5-240160-10.0	HEX5-208360-10.0	HEX5-240360-10.0	HEX5-480360-10.0	-
ls L	Ā	15	-	-	-	HEX5-240360-15.0	HEX5-480360-15.0	-
90c	nta	20	-	-	-	-	HEX5-480360-20.0	-
zar	ʻizo	25	-	-	-	-	HEX5-480360-25.0	-
Ha (윤	30	-	-	-	-	HEX5-480360-30.0	-
		35	-	-	-	-	HEX5-480360-35.0	-

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A. Standards

- A.1.a. Units shall be UL and C-UL listed for safe operation, construction, and performance. Units shall be listed for use in both the U.S. and Canada for commercial and industrial installations. (Models HER, VE, and PTE)
- A.1.b. Explosion proof units, model HEX5 shall be UL listed and CSA certified for use in the following hazardous areas:
 - Class I, Divisions 1 & 2, Groups C & D

 - Class II, Division 1, Groups E, F & G
 Class II, Division 2, Groups F & G
 Class I, Zones 1 & 2, Group IIA & IIB

Units shall be rated for National Electrical Code and Canadian Electrical Code Temperature Code T3B 165°C (329°F).

B. Mechanical Configuration

- B.1.a. Heater shall be a Modine model HER horizontal air delivery electric unit heater of the size, capacity, and voltage as listed in the equipment schedule.
- B.1.b. Heater shall be a Modine Power-Throw™ model PTE horizontal air delivery electric unit heater of the size, capacity, and voltage as listed in the equipment schedule.
- B.1.c. Heater shall be a Modine model VE vertical air delivery electric unit heater of the size, capacity, and voltage as listed in the equipment schedule.
- B.1.d. Heater shall be a Modine model HEX5 horizontal air delivery electric unit heater of the size, capacity, and voltage as listed in the equipment schedule.

C. Unit Casing

- C.1. Unit shall have a steel casing that is treated for corrosion resistance and painted with an electrostatically applied, baked on, gray-green polyester powdercoat paint finish. (Models HER, VE, and PTE)
- C.2.a. Model HER unit shall have a squared corner casing and the top shall have two threaded holes (3/8" 16 TAP) for threaded rod suspension. The bottom of casing shall have a hinged panel for service access to wiring and
- C.2.b. Model PTE unit shall consist of two circular steel covers bolted together with the heating element supports. The air discharge side cover shall have a die-formed fan venturi. The back cover shall have a depression for motor mounting with openings for cooling-air circulation for the motor. Four hanging brackets shall be provided for use with 5/8" diameter suspension rods.
- C.2.c. Model VE unit shall consist of two circular steel covers bolted together with the heating element supports. The bottom cover shall have a die-formed fan venturi. The top cover shall include an inner cone for motor mounting and to provide a heat shield from radiant and convective heat from the heating elements.
- C.2.d. Model HEX5 shall be fabricated from 14 gauge steel with a baked epoxy powder coating over a 5-stage pretreatment including iron phosphate, for protection from corrosive atmospheres. The cabinet shall include two (2) 9/16" mounting holes located on the top.

D. Heating Elements

- D.1.a. Elements shall consist of a nickel-chromium resistance wire surrounded with magnesium oxide and sheathed in steel spiral-finned tubes. Elements shall have kilowatt rating as listed in the equipment schedule. (Models HER, VE, and PTE)
- D.1.b. The heat exchanger shall be fluid-to-air type consisting of steel tubes with roll-formed aluminum fins and be vacuum charged. The heat exchanger shall be protected by a preset 100 psig (690 kPa) pressure-relief valve, aluminum body, no serviceable parts. The heat exchanger shall be filled to design level with a custom-

blended, long-life solution of ethylene-glycol, water, and corrosion inhibitors. The heat exchanger shall have three heavy-duty immersion heating elements brazed into a heavy steel bulkhead. The elements shall consist of high-quality resistance wire embedded in a compacted magnesium oxide refractory and sheathed in metal tubing. The heater is to be protected by a snap-action bimetal temperature high-limit, which shall not be affected by altitude or changes in atmospheric pressure. The high-limit shall be an automatic reset type, and will shut off the heater if the exchanger temperature rises due to a lack of heat dissipation.

E. Motor and Propeller Fan

- E.1.a. Each unit shall have a single 208-230V/60Hz/1ph motor. The motor shall be totally enclosed, continuous-duty, with automatic resetting, thermal-overload protection. Propeller fan shall be directly connected to the motor shaft and be statically balanced. The motor shall be mounted to the unit with rubber vibration absorbing material. (Models HER, VE, and PTE)
- E.1.b. Each unit shall have a ball bearing, permanently lubricated, thermally protected explosion-proof motor rated for continuous duty. The fan blades shall be aluminum to prevent sparking. Propeller fan shall be directly connected to the motor shaft and be statically balanced. The fan shall be shielded with a heavy-duty epoxy coated guard of two piece construction to provide easy maintenance and cleaning of the fan and motor. The guard shall not allow a 1/4" or larger probe to enter. (Model HEX5 only)

F. Electrical

- All units shall have built-in contactors and control circuit transformers (where required) to provide single-source power connection.
- F.1.a. Models VE and PTE, sizes 300 through 500 shall have two sets of contactors to provide for two-stage operation.
- F.1.b. Model HEX5 shall have a contactor coil that is encapsulated severe duty and separately fuse-protected.
- Fuse blocks and factory-supplied fuses shall be installed on all models except HER 30, 50, and 75 with 208 volt or 230-volt single or 3-phase power supply. A wiring diagram and grounding lug shall be included in each control compartment.
- F.3.a. Transformers shall be factory installed on all models with 460 and 600 volt, 3 phase power supply to permit 230 volt motor operation. (Models HER, VE, and PTE)
- F.3.b. Transformers shall be factory installed on all HEX5 models with the primary voltage being the same as the heater voltage and the secondary being 120V grounded
- F.4. Electrical control components shall be safely enclosed in a separate junction box. A wiring diagram and a grounding lug shall be included in each power junction box.
- F.4.a. The Model HEX5 control center shall be enclosed in an explosion-proof control enclosure with a large threaded cover for easy access. The control center shall include a printed circuit board with a terminal block for room thermostat connection and in-line fuse protection, with both an operating fuse and a spare fuse.
- (opt) The HEX5 heater shall be supplied with a built-in explosion-proof room thermostat mounted on the control enclosure side of the heater.

G. Air Deflectors

- G.1.a. Adjustable horizontal air deflectors shall be furnished. (Models HER and PTE)
- G.1.b. Louvers shall be individually adjustable and made of anodized extruded aluminum. (Model HEX5)

2-116.10 11 Products from Modine are designed to provide indoor air-comfort and ventilation solutions for residential, commercial, institutional and industrial applications. Whatever your heating, ventilating and air conditioning requirements, Modine has the product to satisfy your needs, including:

HVAC

- · Unit Heaters:
 - Gas
 - Hydronic
 - Electric
 - Oil
- · Ceiling Cassettes
- Duct Furnaces
- · Hydronic Cabinet Unit Heaters, Fin Tube, Convectors
- Infrared Heaters
- Make-up Air Systems
- Unit Ventilators

Ventilation

· Packaged Rooftop Ventilation

School Products

- · Vertical Packaged Classroom HVAC:
 - DX Cooling/Heat Pump
 - Water/Ground Source Heat Pump
 - Horizontal/Vertical Unit Ventilators

Specific catalogs are available for each product. Catalogs 75-136 and 75-137 provide details on all Modine HVAC equipment.



Modine Manufacturing Company

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www.modinehvac.com

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ASCO 7000 SERIES Power Transfer Switches

ASCO 7000 SERIES Power Transfer Switches provide unmatched reliability and sophisticated control for the most demanding mission-critical backup power needs.

ASCO 7000 SERIES Transfer Switches are widely used in the most complex mission-critical hospital and healthcare facilities, enterprise and cloud-based data centers, telecommunication networks, water treatment plants, and any facility that requires the highest levels of power availability.

Every 7000 SERIES transfer switch is engineered-to-order to optimize switch functionality and provide facilities with the best solution for their specific application, and custom-engineering is available to meet any transfer switching need.

Backed by industry-leading technical support and service knowledge derived from a century of critical power switching experience, the 7000 SERIES solves the most demanding critical power challenges facing facilities today.

Power Knowledge





7000 SERIES Power Transfer Switches

ASCO Power Transfer Switches are the standard of the industry. High-speed transfer of loads between alternate sources of power, regardless of ampacity, is achieved using a reliable, field-proven solenoid operating mechanism.

- Listed to UL 1008 Transfer Switch Equipment and Certified to CSA 22.2, No. 178
- Qualified and certified to IEC 60947-6-1, optional CE mark
- Rated up to 600 VAC, 30 through 4000 amps
- 3 to 18-Cycle Withstand and Close-on Rating Standard, 30-Cycle WCR Optional
- High Withstand and Close-on Rating, including Short-Time Ratings, support breaker coordination
- Solid, switched, or overlapping neutral configurations

- Front-replaceable main and arcing contacts on 800-4000 amp models
- Central terminal block for control connections on 260-4000 amp models
- Multiple auxiliary contacts for switch status indication
- Local and remote communications for serial and ethernet monitoring systems such as ASCO monitoring solutions or 3rd party BMS
- · Comprehensive 2, 5, or 10 year warranty

Power Knowledge

Basic Automatic
Transfer Switch
Functions



Three Pole 7000 SERIES Automatic Transfer Switch rated 1600 amps

2

7000 SERIES Power Switching Solutions

Automatic and Non-Automatic Transfer Switching

ASCO Transfer Switches are available in automatic and non-automatic types. For automatic transfer switches, the controller initiates transfer. For non-automatic transfer switches, a user initiates transfer between power sources using local or remote switches. ASCO 7000 SERIES Transfer Switches offer the following features:

- · Rated up to 600VAC, sizes from 30 through 4000 amps
- · Low control circuit currents allow for long distances between remotely control switches and transfer switches
- Non-automatic models provide source acceptability lights to inform operator when sources are available to accept load

Power Knowledge

Mon-Automatic and Manual Transfer Switches for Backup Power <u>Applications</u>



Four Pole. Non-Automatic. Electrically-Operated 400 Amp Switch in a Type 1 Enclosure

Open Transition Transfer Switching

ASCO Transfer Switches are available with a standard, 2-position, open transition models that reliably transfer loads in a "break-before-make" sequence in less than 100 milliseconds. Open transition switches are suitable for a wide range of applications.

- 30 to 4000 amps
- Fast single-operator switching mechanism prevents simultaneous connection of both sources
- Available In-Phase Monitor can be activated for transferring motor loads

Power

Knowledge

Motor Loads

Power Sources

Transition Mode

Loads with Zero **Power Interruption**

Transferring

<u>between</u>

Basics

Transferring

Delayed Transition Transfer Switching

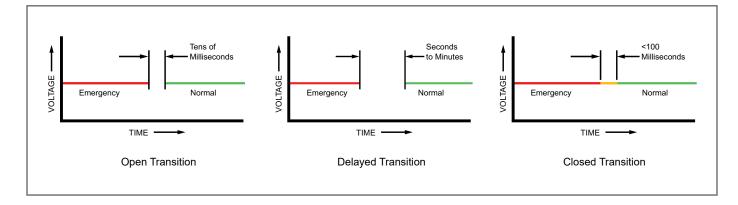
ASCO Delayed Transition Transfer Switches transfer loads between power sources using a timed, load, disconnect position with an adjustable delay. Applications include older variable frequency drives, rectifier banks, and load management applications.

- · 150 through 4000 amps
- · Mechanical interlocks to prevent interconnection of both sources
- · LED Indicator for load disconnect position
- Adjustable time delay for load disconnect position

Closed Transition Transfer Switching

ASCO Automatic Closed Transition Transfer Switches overlap the normal and emergency source to transfer without power interruption. The switch transfers in a make-before-break sequence if both power sources are within acceptable parameters. Control logic continuously monitors source conditions and automatically selects delayed or closed transition according to real-time values.

- Available 150 through 4000 amps
- · Closed Transition Transfer occurs passively without directly controlling the engine-generator set
- Overlap time is less than 100 milliseconds
- · Indications for failure-to-synchronize and extended parallel time
- · Protective circuits and sequences to prevent extended paralleling of sources.



7000 SERIES Bypass-Isolation Switches

Bypass-Isolation Automatic Transfer Switches

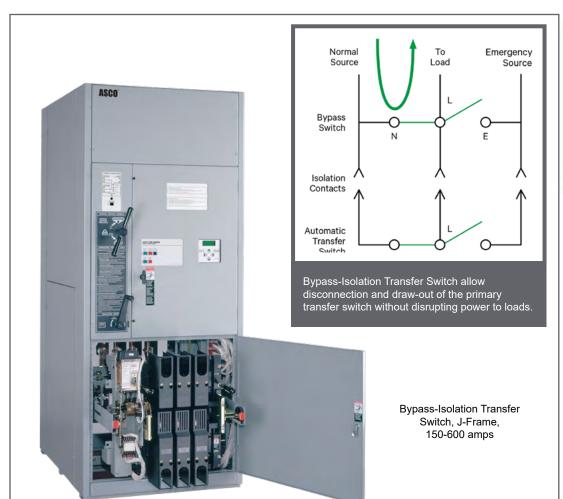
ASCO Bypass-Isolation Automatic Transfer Switches are available in open transition, delayed transition, and closed transition designs. The bypass-isolation features allow the primary automatic transfer switch to be inspected, tested, and maintained without interrupting power to the load. They also provide redundant power transfer if the ATS is disabled or removed from service.

- 150 to 4000 amps
- · Bypass switch and transfer switch have identical electrical ratings
- Mechanical interlocks prevent unintended
- · Bypass contacts carry current only during bypass operation
- · Draw-out design eases transfer switch maintenance

- Bypass switch is rated for use as a 3-position manual transfer switch
- · Non load break bypass and isolation operations keep continuous power to loads
- Bypass and isolation functions require only two permanently mounted operating handles
- · Mechanical indicators show bypass and transfer switch positions
- · Shallow depth, front-connected, or rear-connected designs

Power Knowledge

3D Bypass Switch Animation



Product Details

Bypass-Isolation **Transfer Switches**

7000 SERIES Service Entrance Switches

Service Entrance Power Transfer Switches

The ASCO Service Entrance Power Transfer Switch combines automatic power switching with a disconnect and over-current protection device for the utility source. These switches are installed at facilities that have a single utility feed and a single emergency power source. A circuit breaker serves as the utility disconnect. This product is available up to 600V and 4000 amps in Standard, Delayed, Closed Transition, and Bypass-Isolation configurations.

- Available from 70 to 4000 amps, up to 600V
 - 70 400 amp listed to UL 1008
 - 600 4000 amp listed to UL 891
- UL 1008 Listed transfer mechanism
- · Disconnect links on Neutral and Ground
- · Internet-enabled monitoring and control

- · ERMS added upon request
- · Disconnect and over-current protective device on the utility source. 70 to 2000 amp models use molded case circuit breakers; 2500 to 4000 amp models use insulated case circuit breakers.

Power Knowledge

Applications for Service Entrance **Automatic Transfer** <u>Switches</u>



Product Details

Service Entrance **Transfer Switches**

Custom-Engineered Transfer Switches

Optimized Solutions for Mission-Critical Performance

Create an exact power control solutions by integrating service equipment and protective devices and incorporating distribution equipment while accommodating unique application requirements. Custom engineered devices can save space, reduce delivery times, streamline installation and commissioning, enhance quality control, and reduce overall cost.

Integrated Distribution Breakers

Common distribution breaker applications include:

- Panels to house molded case circuit breakers
- Insulated case circuit breakers, with or without drawout capability
- Manually or electrically operated circuit breakers

Power

Benefits of

Custom-

Engineered
Transfer Switches

Knowledge

preakers

Automatic Transfer Switchboard

- Connects multiple automatic transfer switches together in a common switchboard
- Circuit breakers on the normal and load sides of each switch
- An ammeter and voltmeter are also located on the load side of each switch



Transfer Switches can be custom-engineered to integrate service entrance equipment, distribution equipment, and more.



Additional Available Custom Features

These examples are just a few of the configurations and features available through custom-engineered solutions. Additional possibilities include:

- · Custom Metering
- Bus Riser

· Customized or compression lugs

- Source Fusing
- · Utility-Specified Compartments

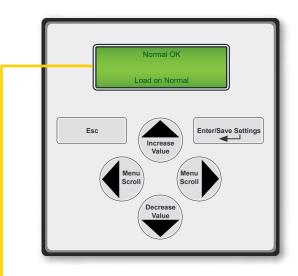
For more information, contact an authorized ASCO Power Technologies Representative.

 $_{9}$

7000 SERIES Controls and Indicators

Group 5 Controller

The 7000 SERIES Group 5 Controller is reliable and field-proven. It provides all of the voltage, frequency, control, timing, and diagnostic functions required for most emergency and standby power applications.



- Touch pad programming
- · Displays active timers
- On-board diagnostics
- Password protection
- Voltage and frequency sensing
- Status and control functions

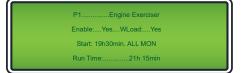
Voltage and Frequency Settings



In-phase Transfer Status



Engine Exerciser

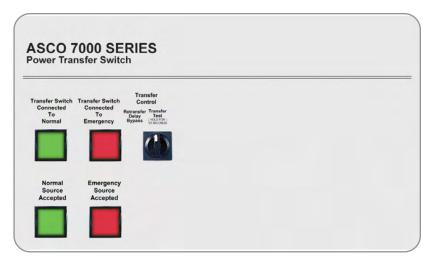


Product Details



Control Switches and Indicating Lights

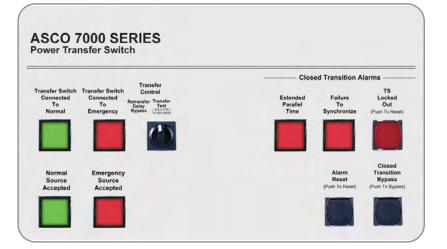
- Switch position indicating lights
- Source acceptability indicator lights
- Three-position selector switch:
- · Automatic: Normal position
- · Test: Simulate normal source failure
- Reset Delay Bypass: Bypass transfer and re-transfer time delays



Control Switches and Indicating Lights for Closed Transition Switches

Additional controls and Indicators for:

- Extended Parallel Time Provides visual indication when the pre-set extended parallel time has been exceeded. The controls automatically open the emergency or normal main contacts. Separate contact also available to shunt trip external breaker.
- Failure To Synchronize Visually displays a failure to synchronize alarm if the time delay settings are exceeded during closed transition transfer operation.
- Transfer Switch Locked Out Prevents transfer in either direction if the extended parallel time is exceeded.
- Alarm Reset Resets extended parallel and failure to synchronize alarms.
- Closed Transition Bypass Pushbutton allows transfer between sources in an open transition mode.



10 11

Transfer Switch Communications and Metering

Options to Customize Functionality and Increase Value

Product Details

- 5300 SERIES
 Annunciators
- 5700 SERIES
 Annunciator

Remote Annunciation

Monitor Power Equipment Status from Anywhere

Monitoring and control transfer switches from across the room, building, or from Internet.

5310 - LED annunciator - Single ATS

5350 - LED annunciator - up to 8 ATSs

5705 – Interactive CPMA-based graphical annunciator – up to 8 ATSs





Product Details

5170 Connectivity

Module

5701 Gateway

12

Communication

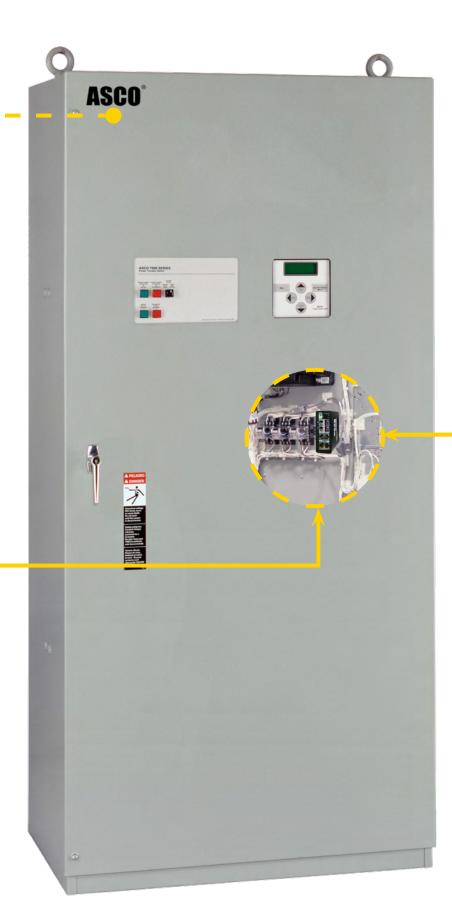
Turn Transfer Switches into Power Information Portals

5170 Connectivity Module – Makes status and power information from a single switch available to via ModBUS, SNMP, and web pages.

5701 8 Device Gateway – Provides centralized monitoring of up to 8 power devices through a transfer switch. Connects generators, transfer switches, load banks, and more to web pages for increased monitoring and control.







Metering

Transfer Switches are the Perfect Place to Monitor Power Flow, Power Conditions, and Power Events

5210 Power meter – Provides deeper insight into circuit status and conditions. Basic metering for current, voltage, frequency, harmonics, real/reactive/apparent power.

PowerLogic PM 8000 – Schneider Electric's compact, high-performance, power meter simplifies power quality and maximizes versatility. Provides additional insights with waveform capture and individual harmonic metering.



Product Details

- 5210 Power Meter
- PowerLogic PM 8000

7000 SERIES Optional Accessories

	vs and Extended Control Power
1G1	Auxiliary power connections provide for external 24VDC source to power control panel and power manager/meter when normal and emergency sources are not present or the switch is in isolation mode. Allows for use of full range of extende engine starting time delay feature 1C (0-60min 59 sec).
1GB1	Same as accessory 1G1 except using 120-volt AC external input.
1PS1	Extended control power ride-through (approx. 25 seconds) for Group 5 ATS controller and select communications and metering accessories, e.g. Acc. 72EE2, 72FC, 135L, etc.
anual Co	ntrols for Automatic Transfer Switches
6DL	Selector switch for automatic/manual re-transfer to normal. Automatic bypass if emergency fails.
dicators	and Customer Control Circuits
30A	Load-shed circuit initiated by opening of a customer-supplied contact.
30B3	24 VDC load-shed circuit initiated by removal of customer-supplied control voltage. (6, 12, 48, 120 VDC and 120 VAC also available).
31BG	Provides 2 sets of Form C contacts rated at 6A for each of the following status signals: normal source acceptability, emergency source acceptability, pre/post transfer signal.
99	"Push-to-Test" feature on all pilot light indicators.
ommunic	ations
72EE2	Offers remote Ethernet monitoring via open Mod bus and SNMP protocols, email notifications and embedded monitoring web pages. (Catalog No. 5170 for stand-alone product).
107G	Provides Building Monitoring Systems with transfer switch, bypass, and load power metering information in Modbus TCP/IP, BACnet IP, and SNMP Protocols. Compatible with any Accessory 150 Technology Package or 72EE2.
urge Prot	ection: ASCO 430 TVSS, rated 200 kA per phase
73CC1	Normal source protection. (3Ø, 4wire WYE)
73CC2	Emergency source protection. (3Ø, 4wire WYE)
73CC3	Load side protection. (3Ø, 4wire WYE)
oecial Ap	plications
29A	Manual selector switch for designating one of two utility feeds as the preferred source.
111A	Generator - to - Generator for Standby Applications
125A	Seismic Certification to International Building Code for electrical equipment
131	Certification of compliance with the American Recovery & Reinvestment Act (Buy American Provision)
ypass-Iso	olation Switch Options
14A1	Auxiliary contact to close in "Bypass to Normal" position.
14B1	Auxiliary contact to close in "Bypass to Emergency" position.
14T	Auxiliary contact to close when transfer switch is in "Automatic" position.
14U	Auxiliary contact to close when transfer switch is in "Isolate" position.
14V	Auxiliary contact to close when transfer switch is in "Test" position.
82E	LED Bypass status indicator, optional on G frame, 1600 to 4000 amps only. Standard for all other switches.
etering	
135L	ASCO Digital Power Meter monitors load source voltage, frequency, and current and calculating Power, Energy, and Power Factor.
135SB	ASCO Digital Power Meter monitors load source voltage, frequency, and current and calculating Power, Energy, and Power Factor. With additional IO for bypass position indication through communications.
eater	
44A	120VAC, 208-240VAC and/or 440-480VAC Accessory 44 Strip heater designed to keep humidity and/or temperature insi ATS enclosure within acceptable levels. Includes mounting bracket with strip heater, thermostat, and terminal block.
undles	
	ACCO Digital Power Mater (Acc. 4251.) Poolage Power Course (Acc. 4DC4.) Communications Mediule (Acc. 7255.)
150A	ASCO Digital Power Meter (Acc. 135L), Backup Power Source (Acc. 1PS1), Communications Module (Acc. 72EE2)

Withstand and Close-on Ratings

Withstand and Close-on Ratings for all 7000 SERIES Power Transfer Switches, including 0.5 second (30-cycle) designs.

Frame	Switch Ra	ating (Amps)	c	urrent Lin	niting Fuse	s	Spe	cific Brea	ıker		Time	Based				Rat	tings ³ (sec	•
	Transfer Switches	Bypass Switches	480V Max.	600V Max.	Max Size, A	Class	240V Max.	480V Max.	600V Max.	Time (sec)	240V Max.	480V Max.	600V Max.	.13 .2	$\overline{}$.5	.1 .13 .3	
			100kA	-	300	J	001.4	051.4	401.4		401.4	401.4	401.4					
D	30	-	200kA 35kA	35kA 35kA	200 200	J RK1	22kA	25kA	10kA	0.025 10kA 10kA		10kA		-	-			
			35kA 35kA	35kA 35kA	200	RK1												
D	70, 100	-	200kA	35kA	200	J	150kA	85kA	25kA	0.025	10kA	10kA	10kA		-		-	
_			35kA	35kA	200	RK1												-
D	150	-	200kA	35kA	200	J	150kA	85kA	25kA	0.025	10kA	10kA	10kA		-		-	
	000		200kA	35kA	200	J	0001-4	051.4	4.41.4	0.005	401-4	401-4	401.4					
D	200	-	35kA	35kA	200	RK1	200kA	85kA	14kA	0.025	10kA	10kA	10kA		-		-	
D	230	-	100kA	-	300	J	200kA	85kA	14kA	0.025	10kA	10kA	-		-		-	\neg
Е	260, 400	-	200kA	-	600	J	65kA	42kA	22kA	0.05	35kA	35kA	22kA		-		-	
J	150, 200, 230,	150, 200, 230, 260	200kA	200kA	600	J	200kA	200kA	100kA	0.05	65kA	42kA ⁵	35kA	7.5kA			_	
	260	100, 200, 200, 200	200101	200101	800	L	2001071	2001071	100101	0.00	00101	42KA	OOKIT	7.000				
J	400	400	200kA	200kA	600 800	J L	200kA	200kA	100kA	0.05	65kA	42kA ⁵	35kA	7.5kA	-		-	
J	600	600	200kA	200kA	800	L	200kA	200kA	100kA	0.05	65kA	42kA ⁵	35kA	7.5kA ⁹				\neg
			200kA	200kA	600	J												
H ⁸	600	600	200kA	200kA	1600	L	65kA	150kA ⁶	65kA	0.05	50kA	50kA	50kA	36kA		-	36kA	-
P ⁸	600	600	200kA	200kA	1600	L	65kA	150kA ⁶	65kA	0.05	50kA	50kA	50kA	36kA)kA	36kA	
P ⁸	800	800 - 1200	200kA	200kA	1600	L	65kA	150kA ⁶	65kA	0.05	50kA	50kA	50kA	36kA	30)kA	36kA	-
Н	800 - 1200	800 - 1200	200kA	200kA	1600 ⁴	L	65kA	150kA	65kA	0.05	50kA	50kA	50kA	36kA		-	36kA	
Q ⁸	600-1600	600-1600	200kA	200kA	2000	L	65kA	65kA	65kA	0.05	65kA	65kA	65kA	50	kA		50k	4
S ⁸	800 - 1200	800 - 1200	200kA	200kA	2500	L	100kA	100kA	65kA	0.05	100kA	100kA	65kA	65	kA		65k	4
G ⁸	1000 - 1200	1000 - 1200	200kA	200kA	2000	L	85kA	85kA	85kA	0.05	85kA	85kA	85kA		-		-	
G	1600 - 2000 (Front	Connected TS Only)	200kA	200kA	2500	L	85kA	85kA	85kA	0.05	85kA	85kA	85kA	42kA	36	βkΑ	-	
G ⁸	1600 - 2000	1600 - 2000	200kA	200kA	3000	L	200kA	200kA	100kA	0.05	100kA	100kA	100kA	42kA	36	ŝkΑ	42kA	-
S ⁸	1600 - 2000	1600 - 2000	200kA	200kA	2500	L	100kA	100kA	85kA	0.05	100kA	100kA	85kA	85kA	65	kΑ	85kA	65kA
G	2600 - 3000	2600 - 3000	200kA	200kA	4000	L	125kA ⁶	125kA ⁶	100kA	0.05	100kA	100kA	100kA	42kA	36	βkΑ	42kA	
G ⁸	3200	-	200kA	-	4000	L	100kA	100kA	-	0.05	100kA	100kA	-		-		-	
G	4000	4000	200kA	200kA	5000	L	100kA	100kA	100kA	0.05	100kA	100kA	100kA	85KA	65kA		65k	4
U ⁸	2600 - 4000	2600 - 4000	200kA	200kA	5000	L	125kA	125kA	125kA	0.05	125kA	125kA	125kA	100)kA		100k	A

Notes:

- 1. All WCR values indicated are tested in accordance with the requirements of UL 1008, 7th Edition. See ASCO Pub. 1128 for more WCR information
- 2. Application requirements may permit higher WCR for certain switch sizes.
- 3. Short Time ratings are provided for applications involving circuit breakers that utilize trip delay settings for system selective coordination
- 4. Max fuse rating is 1200A on front connected H frame switches
- 5. Switches utilizing overlapping neutral (code "C") have 35kA, 0.050 Sec time based rating at 480V May
- 6. Rating shown is for Bypass switches only, Transfer Switch rating is 100kA for the G frame and 65kA max for the H and P frames. See ASCO Pub. 1128.
- 7. See ASCO for Service Entrance Switch ratings
- 8. These frames are only available on the 7000 Series product
- 9. Short Time Rating applies to 600A Bypass switch only, the 600A Transfer Switch does not have a Short Time Rating

All units are RMS Symmetrical Amperes.

All Withstand and Close-on Rating (WCR) values are established by testing in accordance with UL 1008. For the latest ratings, including transfer switch ratings when used with specific circuit breakers, see **ASCO Publication 1128** for more WCR information.

Application characteristics may permit higher WCRs for certain switch sizes. Contact ASCO Power Technologies for more information.

Contact ASCO for Service Entrance Switch ratings.

Power Knowledge

- UL 1008 Transfer
 Switch Withstand
 and Closing
 Ratings
- Performance
 Testing for
 Transfer Switches

Additional 7000 SERIES Transfer Switch Information

Transfer Switches	Controls	Technical	Information
Bypass-Isolation	Group 5 Controller & Power Control Center	<u>Drawings</u>	Withstand and Closing Ratings
Service Entrance		Wiring Diagrams	Weights, Dimensions & Ordering Info

14 1

ASCO 7000 SERIES ORDERING INFORMATION

ATS-CR,LS,EQ,N

To order an ASCO 7000 SERIES Power Transfer Switch, complete the following catalog number:

J •	O7ATS -	- A -	- 3 -	- 0600 -	- N -	5X -	С			
Frame	Transition Type	Neutral Code	Phase Poles	Amperes	Voltage Code	Group Code	Enclosure			
D1 = 30A-230A ATS & NTS Only	Automatic 07ATS Automatic,	0 = No Neutral	2	0030	C = 208	50 No Optional	0 = Open Type (zero)			
J = 150A-600A	Conventional 2 - position	A = Solid	3	0070	D = 220	Accessories	C = Type 1 Enclosure			
H = 800A-1200A	7ACTS Automatic, Closed Transition	Neutral		0100	E = 230	5X Optional	F = Type 3R ³ Enclosure			
G = 1600A-4000A	7ADTS Automatic,	B ² = Switched Neutral		0150	F = 240	Accessories	G = Type 4 Enclosure			
	Delayed Transition	C =Overlapping		0200¹	H = 380	5Z VATS	L = Type 12 Enclosure			
	07ATB Automatic, Open Transition Bypass	Neutral		0230 ¹	J = 400	5D	M = Type 3R ³ Secure Double Door ⁴ Enclosure			
	7ACTB Automatic,			0260	K = 415	VATS with Distribution	N = Type 4 Secure			
	Closed Transition Bypass			0400	L = 440	Breakers	Double Door ⁴ Enclosure			
	7ADTB Automatic, Delayed Transition Bypass			0600	M = 460		Q =Type 12 Enclosure Double Door Enclosure			
	Non-Automatic			0800	N = 480		S = Type 3RX Secure			
	07NTS Non Automatic, Conventional 2 - position			1000	P = 550		Double Door ⁴ Enclosure (316 Stainless Steel)			
	7NCTS Non Automatic,			1200	Q = 575		U = Type 4X Enclosure			
	Closed Transition			1600	R = 600		(316 Stainless Steel)			
	Delayed Transition		7NDTS Non Automatic Delayed Transition 7NTB Non Automatic	Delayed Transition			2000			V = Type 4X Secure Double Door ⁴ Enclosure
	Open Transition Bypass			3000						
	7NCTB Non Automatic, Closed Transition Bypass			4000						
	7NDTB Non Automatic, Delayed Transition Bypass									

Notes:

- 1. 225 and 230 amp switch limited to 480 volts maximum, for D7ATS only.
- 2. Conventional switched neutral is provided on closed and delayed transition transfer products when specified. Overlapping neutral not available on delayed and closed transition designs.
- 3. Type 3R enclosures are not suitable for installations likely to experience windblown snow or rain conditions.
- 4. Double door enclosures are door over internal dead front panels/doors. All controls are mounted on internal panel/door. External door is pad-lockable for secure applications.

A comprehensive ASCO Limited Guardian Warranty covers 7000 SERIES Power Transfer Switch(s) and warranties the product to be free of defects in material and workmanship from date of shipment. The warranty provides:

- 2 years for labor and travel expenses (extendable in 1 year increments up to 5 years for a nominal fee).
- 5 years for parts (2 years for circuit breakers).
- 10 years for main contacts.

Refer to Publication 3227 for warranty details, terms and conditions.

ASCO 7000 SERIES ORDERING INFORMATION — POWER CONNECTION DETAILS

Transfer Switch Configurations 7ATS, 7NTS, 7ADTS, 7ACTS, 7NDTS, 7NCTS

Sizes of UL-Listed Solderless Screw-Type Terminals for External Power Connections

Switch Rating Amps	Max # of Conductors per Terminal	Range of AL-CU	Conductor Sizes
Switch Rating Amps	Max # 01 Conductors per Terrillia	Open Type	Enclosed Type
D¹ Frame 30-230A ATS & NTS Only	One	#14 to 4/0 AWG	#14 to 4/0 AWG
J Frame 150 - 400A	One	#4 AWG to 600 MCM	#4 AWG to 600 MCM
3 Frame 130 - 400A	Two	#1/0 AWG to 600 MCM	#1/0 AWG to 600 MCM
J Frame 600A	Two	#1/0 AWG to 600 MCM	#1/0 AWG to 600 MCM
H Frame 600A	Two	#1/0 AWG to 600 MCM	#1/0 AWG to 600 MCM
H Frame 800 - 1200A	Four	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 1000 - 1200A	Four	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 1600 - 2000A	Six	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 2600 - 4000A ²	Twelve	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM

Notes

- 1. 200 and 230 amp rating for copper conductors only for transfer switch configurations only.
- 2. All main terminals are rear connected. All other units are front connected as standard, rear connected optional via accessory.

Transfer Switch Configurations 7ATB, 7NTB, 7ADTB, 7ACTB, 7NDTB, 7NCTB

Sizes of UL-Listed Solderless Screw-Type Terminals for Power Connections

Cuitala Datina Aurus	Man # af Card at at a san Tamainal	Range of AL-CU	Conductor Sizes
Switch Rating Amps	Max # of Conductors per Terminal	Open Type	Enclosed Type
J Frame 150 - 400A	One	#4 AWG to 600 MCM	#4 AWG to 600 MCM
3 Frame 150 - 400A	Two	#1/0 AWG to 600 MCM	#1/0 AWG to 600 MCM
J Frame 600A	Two	#2 AWG to 600 MCM	#2 AWG to 600 MCM
H Frame (Front & Rear Connected) 600A	Two	#2 AWG to 600 MCM	#2 AWG to 600 MCM
H Frame (Front Connected) 800 - 960A	Three	#1/0 AWG to 600 MCM	#1/0 AWG to 600 MCM
H Frame (Rear Connected) 800 – 1200A	Four	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 1000 - 1200A ¹	Four	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 1600 – 2000A1	Six	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 2600 – 3000A1	Ten	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM
G Frame 4000A ¹	Twelve	#1/0 AWG to 750 MCM	#1/0 AWG to 600 MCM

Notes

The Example Catalog Number above is J07ATSA30600N5XC

^{1.} All main terminals are rear connected

ASCO 7000 SERIES DESIGNED TO FIT ANYWHERE

Automatic Transfer Bypass-Isolation – Open Transition: 7ATB, 7NTB

Dimensions and Shipping Weights*



	Switch	Neutral		Type 1	Enclosure ¹			Open Switcl	h Configurat	ion²
Frame	Ratings Amp	Type & Poles	Width In (mm)	Height In (mm)	Depth In (mm)	Weight Ib (kg)	Width In (mm)	Height In (mm)	Depth In (mm)	Weight Ib (kg)
	150, 200, 230,	02 or A2				1230 (561)				1100 (502)
J	260, 400	03 or A3	34 (864)	85 (2159)	28 (711)	1240 (565)	34 (864)	85 (2159)	28 (711)	1110 (506)
	(Front Connected)	B3 or C3				1260 (575)				1130 (515)
		02 or A2				1290 (588)				1190 (543)
J	600 (Front Connected)	03 or A3	34 (864)	85 (2159)	28 (711)	1300 (593)	34 (864)	85 (2159)	28 (711)	1200 (547)
		B3 or C3				1320 (602)				1220 (556)
Н	600, 800	03 or A3	38 (965)	91 (2311)	32 (813)	1400 (638)	38 (965)	72 (1829)	38 (965)	1260 (575)
	(Front Connected) ³	B3 or C3	36 (903)	91 (2311)	32 (013)	1420 (648)	36 (903)	12 (1029)	36 (903)	1280 (584)
Н	1000, 1200	03 or A3	38 (965)	91 (2311)	34 (864)	1430 (650)	38 (965)	72 (1829)	38 (965)	1290 (588)
	(Front Connected) ³	B3 or C3	36 (903)	91 (2311)	34 (604)	1450 (659)	36 (903)	12 (1029)	30 (303)	1310 (597)
Н	600, 800, 1000	03 or A3	38 (965)	91 (2311)	48 (1219)	1720 (784)	38 (965)	72 (1829)	20 (065)	1260 (575)
''	(Rear Connected)	B3 or C3	36 (903)	91 (2311)	40 (1219)	1740 (793)	36 (903)	72 (1029)	38 (965)	1280 (584)
Н	1200	03 or A3	38 (965)	91 (2311)	48 (1219)	1820 (830)	38 (965)	72 (1829)	38 (965)	1290 (588)
	(Rear Connected) ⁴	B3 or C3	36 (903)	91 (2311)	40 (1219)	1840 (839)	36 (903)	12 (1029)	36 (903)	1310 (597)
G	1000, 1600, 2000	03 or A3	38 (965)	91 (2311)	60 (1524)	2360 (1076)	38 (965)	72 (1829)	38 (965)	1500 (684)
G	(Front Connected) ⁴	B3 or C3	36 (903)	91 (2311)	00 (1324)	2540 (1158)	36 (903)	72 (1029)	36 (903)	1680 (766)
G	2600, 3000	03 or A3	20 (005)	01 (2211)	70 (1000)	2730 (1245)	20 (005)	70 (1000)	39 (OCE)	1690 (771)
G	(Rear Connected)4	B3 or C3	38 (965)	91 (2311)	72 (1829)	3360 (1532)	38 (965)	72 (1829)	38 (965)	2290 (1044)
0	4000	03 or A3	60 (1504)	00 (0011)	06 (2428)	6300 (2873)	60 (1504)	01 (2211)	06 (0430)	5153 (2338)
G	(Rear Connected) ⁴	B3 or C3	60 (1524)	92 (2311)	96 (2438)	6900 (3146)	60 (1524)	91 (2311)	96 (2438)	5500 (2495)

Notes:

- 1. Handles extend 6-1/4 inches (159mm).
- 2. Open weights include transfer switch, bypass-isolation switch and controller. 1600-4000 amp enclosures require ventilation openings, refer to drawings for details.
- 3. Specify optional accessory 40J Y for 800 Amp front, 40KY for 1000 Amp, and 40LY for 1200 Amp front connected arrangement. All service and load cables limited to top entry only.
- 4. Recommended clearance to enclosure: 3 feet (914mm) from rear, 4 feet (1219mm) from front (25 inches required for transfer switch draw out). Side or rear access required.

ASCO 7000 SERIES DESIGNED TO FIT ANYWHERE

Automatic Transfer Bypass-Isolation: Closed and Delayed Transition: 7ACTB, 7ADTB, 7NCTB, 7NDTB Dimensions and Shipping Weights*

	Switch	Neutral	Type 1 Enclosure ¹ Open Switch Configuration ²						tion ²	
Frame	Ratings Amp	Type & Poles	Width In (mm)	Height In (mm)	Depth In (mm)	Weight Ib (kg)	Width In (mm)	Height In (mm)	Depth In (mm)	Weight Ib (kg)
	150, 200,	02 or A2				1255 (572)				1125 (513)
J	230, 260, 400	03 or A3	34 (864)	85 (2159)	28 (711)	1265 (577)	34 (864)	85 (2159)	28 (711)	1135 (518)
	(Front Connected)	B3 or C3				1285 (586)				1155 (527)
		02 or A2				1315 (600)				1215 (554)
J	600 (Front Connected)	03 or A3	34 (864)	85 (2159)	28 (711)	1325 (604)	34 (864)	85 (2159)	28 (711)	1225 (559)
		B3 or C3				1345 (613)				1245 (568)
	H 600³, 800³ (Front Connected)	03 or A3	38 (965)	91 (2311)	20 (042)	1425 (650)	38 (965)	72 (1829)	38 (965)	1285 (586))
		B3 or C3	36 (965)	91 (2311)	32 (813)	1445 (659)	36 (903)	1280 (595)		
Н	1000³, 1200³	03 or A3	38 (965)	91 (2311)	34 (864)	1425 (650)	38 (965)	72 (1829)	38 (965)	1315 (600)
	(Front Connected)	B3 or C3	36 (965)	91 (2311)		1445 (659)	30 (303)	12 (1029)	36 (903)	1335 (609)
Н	600 ⁴ , 800 ⁴ , 1000 ⁴	03 or A3	38 (965)	04 (0044)	48 (1219)	1745 (796)	38 (965)	72 (1829)	38 (965)	1285 (586)
"	(Rear Connected)	B3 or C3	36 (903)	91 (2311)	40 (1219)	1765 (805)	36 (903)	12 (1029)	36 (903)	1280 (595)
Н	1200⁴	03 or A3	38 (965)	91 (2311)	48 (1219)	1845 (841)	38 (965)	72 (1829)	38 (965)	1315 (600)
	(Rear Connected)	B3 or C3	36 (965)	91 (2311)	46 (1219)	1865 (850)	36 (965)	12 (1029)	36 (903)	1335 (609)
	1000, 1600 ⁴ , 2000 ⁴	03 or A3	20 (005)	04 (0044)	00 (4504)	2385 (1088)	20 (005)	70 (4000)	20 (005)	1525 (695)
G	(Rear Connected)	B3 or C3	38 (965)	91 (2311)	60 (1524)	2565 (1170)	38 (965)	72 (1829)	38 (965)	1705 (777)
	2600 ⁴ , 3000 ⁴	03 orA3	30 (OCE)	01 (2214)	70 (1000)	2755 (1256)	30 (OCE)	70 (1000)	30 (OCE)	1715 (782)
G	(Rear Connected)	B3 or C3	38 (965)	91 (2311)	72 (1829)	3385 (1544)	38 (965)	72 (1829)	38 (965)	2315 (1056)
	40004	03 orA3	00 (450.4)	04 (0044)		6325 (2884)	00 4450 ::		00 (0 105)	6280 (2849)
G	(Rear Connected)	B3 or C3	60 (1524)	91 (2311)	96 (2438)	6925 (3158)	60 (1524)	91 (2311)	96 (2438)	6450 (2926)

Notes:

- 1. Handles extend 6-1/4 inches (159mm).
- 2. Open weights include transfer switch, bypass-isolation switch and controller. 1600-4000 amp enclosures require ventilation openings, refer to drawings for details.
- 3. Specify optional accessory 40J Y for 800 Amp front, 40KY for 1000 Amp, and 40LY for 1200 Amp connected arrangement. All service and load cables limited to
- 4. Recommended clearance to enclosure: 3 feet (914mm) from rear, 4 feet (1219mm) from front (25 inches required for transfer switch draw out). Side or rear access required.

^{*}All dimensions and weights shown are approximate and should not be used for construction purposes. Verified dimensions can be furnished upon request.

^{*}All dimensions and weights shown are approximate and should not be used for construction purposes. Verified dimensions can be furnished upon request.

ASCO 7000 SERIES SERVICE ENTRANCE POWER TRANSFER SWITCHES ORDERING INFORMATION

ATS-SE

To order an ASCO 7000 SERIES Power Transfer Switch, complete the following catalog number:

J -	07AUS -	Α -	- 3 -	- 0600 -	N -	5X -	- с
Frame	Transition Type⁵	Neutral Code	Phase Poles	Amperes	Voltage Code	Group Code	Enclosure
D = 70A - 225A AUS/NUS Only	Automatic 07AUS Automatic,	A = Solid Neutral	2	0070	C = 208	50 No Optional	C = Type 1 Enclosure
J = 150A - 600A	Conventional 2 - position	B ¹ = Switched	3	0100	D = 220	Accessories	M = Type 3R ² Secure Double Door ⁴
150A - 225A: DTTS / CTTS	7ACUS Automatic, Closed Transition	Neutral		0150	E = 230	5X Optional	Enclosure
Only	7ADUS Automatic,	C = Overlapping Neutral		0200	F = 240	Accessories	N = Type 4 Secure Double Door ⁴
H = 600-1200A	Delayed Transition			0225	H = 380	5Z VATS	Enclosure
G = 1000-4000A	07AUB Automatic, Open Transition Bypass			0260	J = 400	5D	Q = Type 12 Enclosure Double Door ⁴
	7ACUB Automatic, Closed			0400	K = 415	VATS Distribution	Enclosure S = Type 3RX³ Secure Double Door⁴ Enclosure (316 Stainless Steel) V = Type 4X Secure Double Door⁴ Enclosure
	Transition Bypass			0600	L = 440	Distribution	
	7ADUB Automatic,			0800	M = 460]	
	Non-Automatic 07NUS Non Automatic, Conventional 2 - position			1000	N = 480		
				1200	P = 550		
	7NCUS Non Automatic,			1600	Q = 575		(316 Stainless Steel)
	Closed Transition			2000	R = 600		
	7NDUS Non Automatic, Delayed Transition			2500			
				3000			
	07NUB Non Automatic, Open Transition Bypass			4000			
	7NCUB Non Automatic, Closed Transition Bypass						
	7NDUB Non Automatic, Delayed Transition Bypass						

Notes:

- 1. Conventional switched neutral is provided on closed and delayed transition transfer products when specified.
- 2. CAUTION: Type 3R enclosures are not suitable for installations likely to experience windblown snow or rain conditions.
- 3. Type 3RX limited to 1600 4000 amperes only.
- 4. Double door enclosures are door over internal dead front panels/doors. All controls are mounted on internal panel/door. External door is pad-lockable for secure applications.
- 5. AUS represents a switch with a utility service entrance breaker. In addition to the AUS, ASCO offers AGS Generator breaker, APS Utility and Generator breaker, and ARS Utility and Generator breaker, dual service entrance.

A comprehensive ASCO Limited Guardian Warranty covers 7000 SERIES Power Transfer Switch(s) and warranties the product to be free of defects in material and workmanship from date of shipment. The warranty provides:

- 2 years for labor and travel expenses (extendable in 1 year increments up to 5 years for a nominal fee).
- 5 years for parts (2 years for circuit breakers).
- 10 years for main contacts.

Refer to Publication 3227 for warranty details, terms and conditions.

The Example Catalog Number above is J07AUSA30600N5XC (X is used to specify optional accessories).

ASCO 7000 SERIES DESIGNED TO FIT ANYWHERE

Service Entrance Power Transfer Switches (Non-Bypass): 7AUS, 7NUS, 7ADUS, 7NDUS, 7ACUS, 7NCUS Dimensions and Shipping Weights*

	Switch		Type 1 E	nclosure ¹			Open Switcl	n Configurat	ion²
Frame	Ratings Amp	Width In (mm)	Height In (mm)	Depth In (mm)	Weight Ib (kg)	Width In (mm)	Height In (mm)	Depth In (mm)	Weight Ib (kg)
D	70, 100, 150, 200, 225 7AUS/7NUS Only	36.5 (927)	48.5 (1232)	13.25 (337)	490 (226)	36 (914)	48 (1219)	16 (406)	540 (249)
J	150, 250, 400	38 (965)	91 (2311)	28 (711)	880 (407)	41 (1041)	95 (2426)	33 (838)	1880 (544)
J	200, 225 7ADUS/7NDUS and 7ACUS/7NCUS only	38 (965)	91 (2311)	28 (711)	880 (407)	41 (1041)	95 (2426)	33 (838)	1880 (544)
J	600 ²	38 (965)	91 (2311)	28 (711)	980 (452)	41 (1041)	95 (2426)	33 (838)	1280 (590)
Н	600, 800²	38 (965)	91 (2311)	28 (711)	1280 (590)	41 (1041)	95 (2426)	33 (838)	1480 (683)
Н	1000²	38 (965)	91 (2311)	48 (1219)	1280 (590)	41 (1041)	95 (2426)	62 (1575)	1480 (683)
Н	1200²	38 (965)	91 (2311)	48 (1219)	1480 (683)	41 (1041)	95 (2426)	62 (1575)	1940 (895)
G	1000, 1600², 2000²	38 (965)	91 (2311)	48 (1219)	1800 (831)	41 (1041)	95 (2426)	62 (1575)	2200 (1015)
G	2600², 3000²	38 (965)	91 (2311)	72 (1829)	2180 (1006)	41 (1041)	95 (2426)	85 (2159)	2854 (1317)
G	4000²	60 (1524)	91 (2311)	72 (1829)	3485 (1606)	63 (1600)	100 (2540)	91 (2311)	4300 (1981)

lotes:

- 1. Type 3R enclosures are not suitable for installations likely to experience windblown snow or rain conditions.
- 2. Unit is designed for top and bottom cable entry for all services and load.

*All dimensions and weights shown are approximate and should not be used for construction purposes. Verified dimensions can be furnished upon request.

A comprehensive ASCO Limited Guardian Warranty covers 7000 SERIES Power Transfer Switch(s) and warranties the product to be free of defects in material and workmanship from date of shipment. The warranty provides:

- 2 years for labor and travel expenses (extendable in 1 year increments up to 5 years for a nominal fee).
- 5 years for parts (2 years for circuit breakers).
- 10 years for main contacts.

Refer to Publication 3227 for warranty details, terms and conditions.

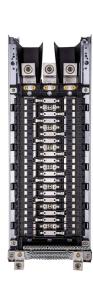
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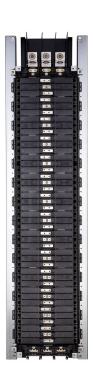
NF/NQ Panelboards OEM

Catalog 1600CT1901

2019

Class 1600





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NQ Panelboard Features and Benefits

Developed with customer input, Square DTM brand NQ panelboards are built to last, featuring innovations for ease of installation and durability. NQ panelboards are easy to assemble and available from stock in the widest variety of ready to install (RTI) configurations of any UL 67 Listed 240 Vac rated panelboard family.

- Four interior ratings—100 A, 225 A, 400 A, or 600 A
- Up to six circuit breaker counts—18, 30, 42, 54, 72, or 84
- · A full complement of field installable accessories including:
 - feed-through and/or sub-feed lugs
 - sub-feed circuit breakers
 - copper or aluminum neutrals and grounds, including 200% neutrals
 - 6", 12", 18", or 24" rail and deadfront extension kits

Details of the NQ RTI Panelboard offer may be found in Tables 9.5–9.14 and Tables 9.38–9.45 of Digest 178.

Benefits: Broadest range of interiors, circuit breakers, and accessories available RTI (from distributor stock). Reduced installation time and less errors during assembly, resulting in improved productivity and higher quality.



NQ Interiors

Main Lug Interiors (MLO)—cULus Listed up to 240 Vac, or 48 Vdc

OEM customers have two ways to order NQ main lug interiors:

- Order a main lug interior from Digest 178 Section 9, Tables 9.5, or 9.7.
- See Table 12 for OEM main lug only interior special offers (referencing the part number key below).

Table 1: NQ Main Lug Interior Part Numbering

4	1	42	L	2	С	GS	NL		
							Blank = Standard or no neutral NL = 200% neutral (non-linear)		
						14 = Fit	s in 14" wide enclosures		
							Standard width interior 20" wide enclosures)	Minu	
						'	ated ground	Stock of the stock	
						S = sho	ort rails	Se cana	
					C = cc	opper			
					Blank	= alumir	um		
				Mains	rating				
				1 = 10	_				
				2 = 22					
				4 = 40	0 A				
				6 = 60	0 A				
			Main:						
				gs only				rine	
			B or M	l = Circ	uit brea	aker			
Circuit breaker counts: 18, 30, 24, 36, 42, 54, 66, 72, 84, 126									
Blank= Single-phase 4 = 3-phase 4-wire									
	-	ase 3						□	



Family: NQ, NF

NF/NQ Panelboards OEM NQ Interiors

NQ Interior Features:

- NQ panelboards accept plug-on and bolt-on circuit breakers, up to 150 A.
- Main lugs interiors are available for 1P 3W, 3P 4W, or 3P 3W AC systems
 - 3-phase high leg delta or corner grounded delta are available factory assembled
 - 1P 2W interiors are UL Listed for DC applications up to 48 Vac
- 100 A, 225 A, 400 A, or 600 A mains rating
 - 225 A to 400 A interiors are convertible to main circuit breaker by adding a main circuit breaker and adapter kit
- · Available from stock with silver/tin copper or tin-plated aluminum bus.
 - Tin-plated or silver-plated copper bus is available as an option.
- · Branch connector fingers are tin-plated copper; silver-plated branch connectors are optional.
 - Aluminum or copper bus up to 400 A
 - Copper only at 600 A
- For more details about NQ main lug interiors please review Catalog 1640CT0801 or Digest 178, Section 9 NQ main lug interiors.

Main Circuit Breaker Interiors (MB)—240 Vac, 48 Vdc

OEM customers have two ways to order a main circuit breaker interior panel:

- · Order a main lug interior, main circuit breaker adapter kit, and a circuit breaker
- Main circuit breaker kits and interiors up to 400 A are available from stock (refer to Digest 178, Section 9, Tables 9.6 or 9.8).
- See Table 13 for OEM main circuit breaker interior special offers

Table 2: NQ Main Circuit Breaker Kit Part Numbering

Q M	В 2	2 HJ		
			Blank = Kit for standard 20" width interiors 14 = Kit for 14-inch- wide interiors	
			circuit breaker frame (PowerPact H, J, or Q)	
		rior mains page 3)	rating (see MLO section	
Mai	n circuit	breaker		

Family: NQ, NF Figure 2: NQMB2HJ

· A main circuit breaker may be factory installed onto nearly all NQ interiors

Table 3: NQ Panelboard Main/Sub-Feed Circuit Breakers

Installation Methods	Circuit Breaker Frame	Ampacity	Digest 178 Tables
Branch mounted on Interior	QOB/QOB-VH	15 to 150 A	9-11, 9-12
Vertical Main ^{1, 2} , Sub-feed ^{1, 2}	HD, HG, HJ, HL, HR	15 to 150 A	7.55, 7.57, 7.58
Vertical Main ^{1, 2} , Sub-feed ^{1, 2}	JD, JG, JJ, JL, JR	150 to 225 A	7.56, 7.57, 7.58
Vertical Main ² , Sub-feed ²	QB, QD, QG, QJ	70 to 225 A	7.59
Vertical Main ³ , ⁴	LA/LH	125 to 400 A	7.634
Vertical Main ^{1, 2, 5}	LD, LG, LJ, LL	125 to 600 A	7.65

¹ PowerPact H, J, L are available with LI or LSI electronic trip functions

For more information about 100 A, 225 A, 400 A, and 600 A main circuit breaker NQ panelboards please review Catalog 1640CT0801, Digest 178, Table 9.6, PowerPact H, J, L Catalog (0611CT1001), PowerPact Q-Frame Catalog (0734CT0201), or LA, LH, Q4 Catalog (0601CT9101).

NQ Single-Row (Column-width) Interiors—240 Vac Bolt-On

NQ column-width panelboards (see Tables 9.84 - 9.85 (see Digest 178) are for AC applications up to 240 Vac. They meet Federal Specification W-P-115c, Type 1, Class 1, and are UL Listed. NQ column-width panelboard accept 10 A–60 A bolt-on, 1-, 2-, and 3-pole QOB branch circuit breakers. QOB-VH (60 A max.) and QHB (30 A max.) branch circuit breakers are also available as factory assembled.

Mains ratings: 100 A, 225 A

· Branch circuit breakers: 60 A max. bolt-on

Interrupting ratings for PowerPact circuit breakers (at 240 Vac):
B = 10 kA; D = 25 kA; G = 65 kA; J = 100 kA; L = 125 kA; R = 200 kA (PowerPact H or J only)

Interrupting ratings for LA/LH circuit breakers (at 240 Vac): LA = 35 kA; LH = 65 kA

⁴ Add a MB suffix to part numbers in this table to obtain the short handle needed to fit in standard depth MH enclosures

⁵ PowerPact L circuit breakers are available, factory installed only

NF/NQ Panelboards OEM NQ Interiors

Table 4: NQ Column Width Interior Part Numbering

	8		10	M	1	С	SB	HR				
								Blank = Std. surf. mount HR = Hinged right HL = Hinged left (trim front)				
							SB = split bu Blank = Star					
							Diarik - Otai					
						Copper bus						
					Interior rating 1 = 100 A							
					2 = 225 A							
				l								
					n lugs on Main circ		or					
					ng back-f		.01					
			Circuit o	count: 81	, 10 ¹ , 20	, 30, or 4	2					
		Blank -	1-phase									
			nase 3-w									
- 1		4 = 3-phase 4-wire										



Figure 3: NQM810M1CSB8

Family: NQ, NF

¹ Available only as a split bus special interior

NQ 14-inch-wide—Merchandised Interiors and Enclosures 240 Vac, or 48 Vdc max.

14-inch-wide NQ panelboards provide most the capabilities of standard width NQ interiors for applications where equipment space is limited. 14-inch-wide interiors accept bolt-on and plug-on branch circuit breakers up to 100 A. 3 Ph 4 W and 1 Ph 3 W interiors are available. See Digest 178, Table 9.7 and 9.8 for more information.

Branch Circuit Breakers (Bolt-On or Plug-On)

NQ circuit breaker panelboards accept almost all QO and QOB branch circuit breakers. Review Catalog 0730CT9801 and Digest 178, Table 9.10–9.12 and Table 9.14 for information on standard interrupting QOB 10,000 AIR bolt-on circuit breakers, high interrupting QOB-VH 22,000 AIR circuit breakers, very high interrupting QHB 65,000 AIR, and specialty circuit breakers.

Table 5: QOB NQ Branch Circuit Breaker Part Numbering

QO	В	2	20	VH						
					Standard 10 kA AIR ¹ 2 kA AIR					
			Ampere Rating							
			(10 A–150 A)							
		Number of poles								
		(1, 2, 0	r 3)							
	B = Bol	t-on								
	Blank =	: Plug-or	า							
Circuit breaker frame										
QO = S	QO = Standard									
QH = 6	5 kA AIF	₹								

¹ Ampere Interrupting Rating

NQ Accessories and Options

A wide variety of "Ready to Install Accessories" are available from stock, and many "Factory Assembled Options" may be incorporated into custom OEM interiors.

View Digest 178, Tables 7.45–7.46, 7.52–7.61 and PowerPact H, J, L Catalog (0611CT1001), or PowerPact Q-frame Catalog (0734CT0201) for more information on sub-feed circuit breakers.

Sub-feed Circuit Breakers (and kits, see Digest 178, Tables 9.39-9.41)

- · Single SFB (sub-feed circuit breakers) on 225 A or 400 A interiors
- Two SFB to 225 A (only for 400 A, 600 A interiors)
- · Factory assembled only for 600 A interiors

Sub-feed Lugs (See Digest 178, Table 9.39-9.40)

- 100 A to 400 A interiors, single or three phase
- · Mechanical or compression, aluminum or copper

Feed-through Lugs (See Digest 178, Table 9.39–9.41)

- 100 A to 600 A interiors, single or three phase
- Mechanical or compression, aluminum or copper
- 600 A available factory assembled only

Table 6: NQ Sub-feed Lugs, Feed-through Lugs, and Sub-feed Circuit Breaker Kits Part Numbering

NQ	SF	L	4			
				Circuit breaker frame:		
				Blank = Lugs only		
				Q = Q-frame main circuit breaker		
				HJ = H/J-frame main circuit breaker		
			Mains r (see Ta	rating = 1, 2, 4, or 6	0	P
		L = Lug	ıs		10	-
		B = Circ	cuit brea	(8)		
	SF = S		6			
	FT = Fe					
Family:	NQ, NF	:			Figu	re 4



NQ Lug, Neutral, Ground Bar, and Rail Extension Kits

A wide variety of lug kits, neutral bar assemblies, ground bar kits, and mounting rail extensions are available from stock to customize NQ panelboard interiors to fit OEM application needs.

NQ Neutrals (100% Aluminum standard) (See Digest 178, Table 9.38)

- 200% (aluminum) neutral kit
- · Copper 100% neutral kit
- Copper 200% neutral assembly (factory assembled only)

NQ Optional Lugs (See Digest 178, Table 9.42)

Table 7: NQ Lug Kit Part Numbering

NQ	AL	М	1				
			Mains r (see Ta	rating = 1, 2, 4, or 6 able 1)			6
		V = Co	mpressi	on lug kit	0		
		M = Me	echanica	-			
	AL= alı	uminum;	CU = co	-			
Family:	NQ, NF	=			Figure 5: NQALM	2	

- · Al compression lug kit
- Cu mechanical lug kit
- Cu compression kit

Ground Bars (See Digest 178, Table 9.9, 9.31, and 9.43)

• Isolated Ground—PKGTAB kits may be added to the ground bar kits listed in Table 8 below

Table 8: Ground Bar Kits

		Terminal		Distance		
Catalog Number	Number of	Quantity Availal	ole for Each Size	Approx. Overall Length In. (mm)	Between Mounting Holes In. (mm)	
	Terminal	Material	1/11			
PK12GTA	12	AL	12/0	4.700 (119)	3.125 (79)	
PK12GTACU	12	CU	12/0	4.700 (119)	3.125 (79)	
PK18GTA	18	AL	18/0	6.560 (167)	3.125 (79)	
PK18GTACU	18	CU	18/0	6.560 (167)	3.125 (79)	
PK23GTA	24	AL	23/1	9.125 (232)	3.125 (79)	
PK23GTACU	24	CU	23/1	9.125 (232)	3.125 (79)	
PK27GTA	27	AL	24/1	9.125 (232)	3.125 (79)	
PK27GTACU	27	CU	27/0	9.125 (232)	3.125 (79)	

Table 9: Wire Range

Size	Cu	Al				
1	(1) #14 to #4 or (2) #14 or #12	(1) #12 to #4 or (2) #12 or #10				
П	(1) #1 to 4/0	(1) #1 to 4/0				



NF/NQ Panelboards OEM

NQ Lug, Neutral, Ground Bar, and Rail Extension Kits

Rail Extensions (See Digest 178, Table 9.43)

- NQ6RDE—6"
- NQ12RDE—12"
- NQ18RDE—18"
- NQ24RDE—24"

SurgeLoc SPD (Surge Protective Devices) Protection

SurgeLoc SPD (Surge Protective Devices) Protection

Square D brand SurgeLogic™ SurgeLoc surge protective device (SPD) delivers specification grade performance for service entrance or critical branch panel applications. The SurgeLoc SPD product utilizes a high-energy suppression circuit that provides 6–10 modes of suppression from 80,000 to 240,000 peak amps of surge current rating per phase. More detailed information can be found in SurgeLoc Brochure 1300BR1302.

- Available surge current ratings: 80 kA, 100 kA, 120 kA, 160 kA, 200 kA, 240 kA
- · Voltage Systems:
 - 208Y/120 Vac, 3-phase, 4-wire
 - 120/240 Vac, 1-phase
 - 240/120 Vac, 3-phase, 3-wire (high leg delta)
- See Digest 178, Table 9.44 for NQ SurgeLoc SPD part numbers

Factory Assembled Options and Interiors

Ready to install (RTI) interiors are also available factory assembled (with main, sub-feed, and/or branch circuit breakers, sub-feed or through feed lugs, and aluminum, copper, or 200% neutrals).

Some options are only available factory assembled (or as part of a custom OEM commercial reference):

- PowerPact L main circuit breaker (up to 600 A)
- PowerPact J 250 A main circuit breaker interior
- Feed-through lugs, sub-feed lugs, or sub-feed circuit breakers on 600 A interiors
- Name plates
- Lighting contactors
- Canadian service entrance barriers
- Boxes wider than 20" (26", 32")
- · Stainless steel and fiberglass enclosures
- Power meters or circuit monitors

Some Interior Types are only Available Factory Assembled:

IP2X per 60529 Fingersafe

Factory-installed IP2X for NQ Lighting and Appliance Panelboards from Square D by Schneider ElectricTM reduce the risk of electrical shock, when someone is working near energized components. IP2X barriers are designed to prevent people from accessing hazardous parts with a finger.

- Plastic barriers cover mains (lugs or circuit breaker), copper bus, and branch circuit breakers
 - IP2X per IEC 60529 on all ungrounded parts
- Supports 240 Vac maximum—3-phase, 3- and 4-wire systems
- Installs in most environments—NEMA 1, 2, 3R, 4/4X, 5, or 12 (up to 225 A)
 - NEMA 1 panelboards up to 400 A
- · Available with main lugs, PowerPact Q-, H-, J-frame, and LA/LH main circuit breakers

To read more about Fingersafe IP2X per IEC 60529 Barriers for NQ Panelboards, refer to document 1640BR1701.



NF/NQ Panelboards OEM Factory Assembled Options & Interiors

Separated Distribution, Split Bus

Square D NF and NQ separated distribution and split bus panelboards come factory assembled with copper bus, with or without an integral main circuit breaker.

Separated distribution panelboards simplify the future installation of current transformers (CTs) for the metering of electrical power and energy as required by Section 130.5-B of California's 2019 Building Energy Efficiency Standards. Special lug pad adaptors allow field removal of cables, for easy field installation of a wide variety of solid core and split core CTs for electrical energy measurement, by load type.

Split Bus Panelboards enable two or three independent branch distribution sections to be fed from dedicated main circuit breakers, in a single enclosure.

Table 10: Example NQ Split Bus Panelboards

Catalog Number	Main	Mains Amps	Main Pole Spaces	Split 1 Amps	Split 1 Pole Spaces	Split 2 Amps	Split 2 Pole Spaces	Bus Material	Deadfront	Rails Length (in./mm)	Neutral Assembly
NQ4301818SM200C	QB	200	30	125	18	125	18	CU	Yes	57.9/1470	AL
NQ4301818S2C	MLO	225	30	125	18	125	18	CU	Yes	57.9/1470	AL

For more detailed info about Square D NQ separated distribution and split bus panelboards please review document: 1600HO1701, Separated Distribution and Split Bus Panelboards.

Power Meters and Circuit Monitors (Mains and/or Branches)

PM5000 series and PM8000 series power meters are available for NQ or NF panelboards. Factory assembled power meters are mounted in a 7 inch wide extension on the side of the enclosure.

EM3550 series circuit monitors are also available for NQ panelboards. Addition of an EM3555 or EM3560 adds 6 inches to the length of the panel.

PowerLogic branch circuit power monitoring (BCPM) current transformer strips and power modules panelboards may be integrated into NQ or NF panelboards.

Please refer to Power System Catalog 3000CT1701 for more information about power meters and circuit monitors.



NQ OEM Special Offers

Original Equipment Manufacturers (OEM) may purchase interior configurations that lack features required for UL 67 Listing. The OEM becomes responsible for UL 67 Listing when choosing these options.)

- No dead front
- No neutral
- No lugs
- Short rails

Table 11: NQ OEM Main Lug Interior Part Numbering

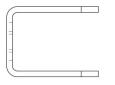
NQM	42	L	4	С	CF	
					CF = C	enter fed
					G = Iso	lated ground
					S = Sho	ort rail
					CE = E	uropean conformity
					FT = Fe	eed-through
					NL = N	on-linear (200% neutral)
				C = cop	oper	
				blank =	aluminu	ım
			Mains r	ating (s	ee Table	: 1)
		L = Lug	only			
		B = Circ	cuit brea	ker		
	Circuit	breaker	counts			
Family:	NQ, OE	ΞM				

NF/NQ Panelboards OEM NQ OEM Special Offers

Table 12: NQ OEM Main Lug Interior Examples *

Pole Spaces	Amps	Catalog Number	Main Lugs	Bus ¹	Rails Type ²	Dead Front	Rails Length ³ [in./mm]	Neutral Assembly
				1P2W				
18	100	NQM18L1C	N/A	CU	Z	N/A	12.88/327	N/A
24	100	NQM24L1C	Yes	CU	С	N/A	13.65/347	N/A
36	100	NQM36L1C	Yes	CU	С	N/A	20.40/518	N/A
24	225	NQM24L2C	Yes	CU	С	N/A	13.99/355	N/A
30	225	NQM30L2C	N/A	CU	Z	N/A	15.88/403	N/A
36	225	NQM36L2C	Yes	CU	С	N/A	20.74/527	N/A
42	400	NQM42L4CCF ⁴	Yes	CU	Z	N/A	24.50/622	N/A
54	600	NQM54L6C	Yes	CU	Z	Yes	22.55/573	N/A
				1P3W				
42	400	NQM42L4CFT2 ⁵	Yes	CU	Z	Yes	33.88/861	AL ⁶
				3P3W				
30	100	NQM430L1C	N/A	CU	Z	N/A	15.88/403	N/A
42	225	NQM342L2CGS ⁷	Yes	CU	С	N/A	26.03/661	N/A
54	225	NQM354L2CS	PS 8	CU	С	Yes	26.25/667	N/A
72	225	NQM372L2CS	PS	CU	С	N/A	33.00/838	N/A
84	225	NQM383L2CS	PS	CU	С	N/A	37.50/953	N/A
42	400	NQM383L2CS	PS	CU	Z	N/A	24.50/622	N/A
42	400	NQM342L4CGS	Yes	CU	С	N/A	26.03/661	N/A
54	400	NQM354L4CSCE	PS	CU	С	N/A	26.25/667	N/A
72	400	NQM372L4CSCE	PS	CU	С	N/A	33.00/838	N/A
84	400	NQM384L4CSCE	PS	CU	С	N/A	37.50/953	N/A
18	600	NQM324L6C	N/A	CU	С	N/A	14.00/356	N/A
30	600	NQM330L6C	N/A	CU	С	N/A	16.25/413	N/A
42	600	NQM342L6C	N/A	CU	С	N/A	20.75/527	N/A
54	600	NQM354L6CS	N/A	CU	С	Yes	25.25/641	N/A
54	600	NQM454L6C	PS	CU	Z	Yes	23.41/595	N/A
72	600	NQM372L6CS	N/A	CU	С	Yes	32.00/813	N/A
84	600	NQM384L6CS	PS	CU	С	N/A	37.50/953	N/A
126	600	NQM3126L6CS	N/A	CU	С	Yes	54.78/1391	N/A
'		'		3P4W	'		-	
18	100	NQM418L1C	Yes	CU	Z	N/A	17.25/438	NQOB Neutral ⁶
18	225	NQM418L2C	Yes	CU	Z	N/A	17.25/438	NQOB Neutral
42	225	NQM442L2CGSNL	Yes	CU	С	N/A	27.00/686	200% Neutral
48	225	NQM430SB18L2C ⁹	Yes	CU	Z	Yes	40.44/1027	AL
42	400	NQM442L4CGSNL	Yes	CU	С	N/A	27.00/686	AL
18	600	NQM318L6C	N/A	CU	С	N/A	11.75/298	N/A
42	225	NQM442L2CDR ¹⁰	Yes	CU	Z	Yes	33.64/854	AL

^{*} CAD models available upon request for most OEM interiors





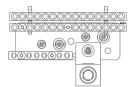




Figure 1: C-shaped rail Figure 2: Z-shaped rail

Figure 3: NQOB Neutral

Figure 4: AL Neutral

¹ Bus: AL = aluminum; CU = copper

² Rail type: C = Figure 1; Z = Figure 2

Mounting hole spacing is 1" (25 mm) shorter than rails length

⁴ Center feed bus

⁵ Comes with 225 A feed-through lug

⁶ NQOB neutral: Figure 3; AL neutral: Figure 4

⁷ Isolated ground, short rails

⁸ PS: preserved space for lugs

^{9 30/18} split bus interior

¹⁰ Density Rated (1000 A/in² bus)

Table 13: NQ Main Breaker OEM Interior Examples

Pole Spaces	Amps	Catalog Number	Main Circuit Breaker	Rus Rails Tyne [Dead Front	Rails Length [in./mm]	Neutral Assembly
				3P3W				
24	225	NQM324M2CS	Back-fed QOB	CU	С	N/A	14.00/356	N/A
30	225	NQM330M2CS	Back-fed QOB	CU	С	N/A	16.25/413	N/A
42	225	NQM342M2CS	QBL32225	CU	С	N/A	33.93/862	N/A
				3P4W				
42	225	NQM442M2CSQB1	QDL32225	CU	С	N/A	33.93/862	AL
42	225	NQM442M2SQD ²	QDL32225	CU	С	N/A	33.93/862	AL

¹ QB suffix: QB main circuit breaker installed onto interior

² QD suffix: QD main circuit breaker installed onto interior

NQ/NF Enclosures and Trims (Covers)

Enclosures (MH): Standard construction is galvanized steel with removable endwalls. Standard depth and width NEMA 1 boxes are provided with knockouts in one end and the other is blank. They are also available with knockouts or blank endwalls on both ends. For more information on NQ and NF enclosures, refer to catalog 1640CT0801, Table 21: Enclosure Types.

NEMA Type 1 Enclosures

- Standard boxes: 20" width x 5.75" depth
 - Lengths from 26" to 92" in 6 inch increments
 - Available with blank end walls (BE)
 - 6", 12" extensions available for top/bottom
 - 3", 6" extensions available for left/right side
- Deep (D9) boxes: 20" width x 8.75" depth
 - Lengths from 26" to 92" in 6 inch increments (blank end walls only)

NEMA Type 2 Enclosures

• Drip hoods available for Type 1

NEMA Type 3R, 5, 12 Enclosures

- Standard Weatherproof 21" width x 6.5" depth
 - Lengths from 26" to 86" in 6 inch increments

NEMA Type 4/4X Stainless Steel (type 304 or type 316) and Fiberglass Enclosures are Available Factory Assembled

Table 14: NEMA 1 NQ / NF Enclosure Part Numbering

МН	26	BE	
			·
		Endwall	knockouts (NEMA 1 Std. 5.75" depth):
		Blan	k = Knockout on 1 endwall 1 endwall blank
		BE =	Both ends blank
		D9 = 8.7	75" deep option
		WP = W	eatherproof (NEMA 3R/5/12)
	Height	(in.)	
MH = M	letal Ho	use	

Type 4/4X Stainless Steel (type 304 or type 316) or Fiberglass Enclosures are only available Factory Assembled.



NEMA Type 1 Trim Fronts (Covers)

- Flush or surface mounted (NEMA Type 2 are surface mount only)
- Mono-Flat® trim fronts on 100 A–225 A interiors mount to the deadfront with trim screws. Both trim screws and door hinges are concealed.
- Mono-Flat trim fronts for 400 A–600 A interiors are vented and mount to the enclosure with trim screws. Door hinges are concealed.
- Hinged trim fronts
 - 100 A-225 A interiors mount to the deadfront and to the enclosure with trim screws
 - For 400 A-600 A interiors are vented and mount to the enclosure with trim screws

Table 15: NEMA 1 Trim Fronts (Covers)—Mono-Flat / Hinged Part Numbering

NC	26	V	S	HR	WMD
					WMD = Welded metal directory holder
					Blank = Plastic directory card pouch
				HR = H	linged (right) front
				Blank =	Mono-flat front
			"F" = flu	ısh mou	int
			"S" = sı	urface m	nount
		V = Ver	nted trim	1	
		Blank =	standa	rd	
		al Height		nte ara (0.12" / 1.52" taller than nominal
	Suriace	; riusn	ulili irol	nis are t	J. 12 / 1.32 taller than nominal
NC: NE	MA cov	er			



NF Panelboard Features and Benefits

A broad range of NF panelboard kits are available ready to install (RTI) from stock to address common electrical distribution needs up to 600Y/347 Vac. Details of the NF RTI Panelboard offer may be found in Tables 9.46 - 9.48 and Tables 9.75 - 9.81 of Digest 178. Custom OEM solutions are also available to meet repetitive needs for unique panelboard configurations.

NF Interiors

Main Lug Interiors—(Refer to Digest 178, Table 9.46)

Single-phase and three-phase interiors from 125 A–800 A are available factory assembled, or setup for repetitive OEM sale. RTI interiors are available for 3-phase, 4-wire applications from 125 A–600 A.

- Accept EDB, EGB, or EJB bolt-on (125 A max.) branch circuit breakers (100 A max. at 600/347 Vac).
- 125 A and 250 A interiors are suitable for use as cULus service entrance with branch mounted EDB, EGB, or EJB circuit breakers.
- 125 A-400 A main lug interiors are available in aluminum or copper and are convertible to main circuit breaker interiors by adding a main circuit breaker adapter kit and a main circuit breaker.
- Copper bus is standard on 600 A and 800 A interiors
 - 800 A interiors require deep enclosures

Main Circuit Breaker Interiors

Single-phase and three-phase main circuit breaker interiors up to 600 A are available factory assembled or setup for repetitive OEM sale. Main lug RTI interiors accept main circuit breakers and main circuit breaker kits.

Refer to NF catalog 1670CT0701 and Digest 178, Table 9.47 for more information on NF main circuit breaker panelboards.

Table 16: NF Interior Part Numbering

NF	4	42	L	2	С	
					C = cop Blank =	pper aluminum
				Mains r 1 = 125 2 = 250 4 = 400 6 = 600 8 = 800	A A A A	
			Main ty L = lugs	pe: s M = cir	cuit brea	aker
		Circuit I				54, 66, 84
	Blank =	Single-	phase			
	4 = 3-pl	hase 4-v	vire			
	3 = 3-p	hase 3-v	vire			
Family:	NQ, NF					



NF Single-Row (Column-width) Interiors

NF column-width panelboards (see Tables 9.86–9.87 of Digest 178) support AC applications up to 600Y/347 Vac. They meet Federal Specification W-P-115c, Type 1, Class 1, and are UL Listed. NF column-width panelboard accept 10 A–60 A bolt-on 1-, 2-, and 3-pole EDB, EGB, or EJB branch circuit breakers.

Mains ratings: 125 A, or 225 A

· Branch circuit breakers: 60 A max. bolt-on

Table 17: NF Column Width Interior Part Numbering

NF	8	4	42	M	2	J	D	С		
								C =	copper	
							Main ci interrup (see Di Table 7 rcuit bre	otion gest '.46) ake	178,	
						Power	Pact H o	r J		
					Interior	rating:				
					1 = 125	5 A				
					2 = 225	5 A				_
				Main: L	. = lug; E	3, M = ci	rcuit bre	ake	r	
			Circuit (Counts:	30 or 42	2				
		Blank =	: 1-phas	e						
		3 = 3-pl	hase 3-v	vire						
		4 = 3-pl	hase 4-v	vire						
	8 = Col	umn-wic	Ith pane	lboard						
Family:	NQ, NF	:								Figure 6: NF8442M2J2DC

Branch Circuit Breakers

E-frame circuit breakers are available in 1P, 2P, 3P, and 1P EPD type. Ampere ratings start at 15 A and go up to 125 A (100 A at 600 Vac). Optional factory-installed electrical accessories include: 120 Vac shunt trip, 1A/1B auxiliary switch, and normally open alarm switch.

E-frame, Thermal-magnetic (Digest 178, Table 9.48)

- 1-pole, 277 Vac (347 Vac for Canada)
- 2-pole, 480Y/277 Vac (600Y/347 Vac for Canada)
- 3-pole, 480Y/277 Vac (600Y/347 Vac for Canada)
- Equipment protection devices (EPDs), 1-pole, 277 Vac, thermal-magnetic with 30 mA ground-fault protection

Table 18: E-frame NF Branch Circuit Breaker Part Numbering

E	D	В	1	4	015				
					Ampere rating				
				Voltage	rating:				
				4 = 480	Y/277 V	′ac			
				6 ¹ = 600Y/347 Vac					
			Numbe	er of poles: 1, 2, or 3					
		Bolt-on	constru	ction					
	Breaking capacity code: D, G, or J								
Frame	type								

Please view E-Frame Circuit Breakers website to select 600Y/347 Vac circuit breaker references



NF Main/Sub-Feed Breakers and Kits

View Digest 178, Section 7 and PowerPact H, J, L or LA, LH, Q4 catalogs for more information on the molded case circuit breakers qualified for use as main or sub-feed circuit breakers in NF Panelboards.

Ready to install (RTI) kits are available to simplify the addition of a main circuit breaker or sub-feed circuit breaker to most main lug NF panelboards with main lugs only.

Main Circuit Breakers (and kits, Digest 178, Table 9.47)

- RTI to 400 A (LA/LH frame)
 - Branch mounted to 125 A (ExB)
 - Electronic trip to 250 A (H, J Frame)
- Factory assembled (FA) to 600 A
 - Electronic trip available (PowerPact H, J, L frame)

Sub-feed Circuit Breakers (and kits, Digest 178, Table 9.77)

- Single Sub-Feed Circuit Breaker (SFB)
- Two SFB (to 250 A) only for 400 A
- · Factory assembled only for 600 A

Table 19: NF Main and Sub-Feed Circuit Breaker Kits Part Numbering

NF	400	SFB	Н						
			l	0: ''.					
			H, or J	= Circuit breaker frame					
		Blank =	Main c	ircuit breaker					
		SFB =	Sub-fee	d circuit breaker					
	Ampac	ity rating	j: 150, 2	50, 400, 600					
N = Ma	N = Main circuit breaker kit								
NF = S	ub-Feed	l Circuit	Breaker	kit					

NF Lug, Neutrals, Ground Bar, and Rail Extensions Kits

A wide variety of Ready to Install Accessories are available from stock, and many Factory Assembled Options may be incorporated into custom OEM interiors.

Sub-feed Lugs (See Digest 178, Table 9.77)

— 100 A-800 A to 400 A RTI (FA to 800 A)

Feed-through Lugs (See Digest 178, Table 9.77)

— 100 A-800 A to 400 A RTI (FA to 800 A)

NF Neutrals (100% Aluminum Standard) (See Digest 178, Table 9.76)

- 200% neutral kit
- Copper 100% neutral kit
- Copper 200% neutral factory assembled

NF Optional Lugs (See Digest 178, Table 9.80)

- AL mechanical lug kits
- AL compression lug kits
- CU mechanical lug kits
- CU compression lug kits

Ground Bars

- Isolated Ground-PKGTAB kits may be added to isolate ground bars

Table 20: Ground Bar Kits

		Terminal		Distance		
Catalog Number	Number of	Quantity Availal	ble for Each Size	Approx. Overall Length In. (mm)	Between Mounting Holes In. (mm)	
	Terminal	Material	1/11			
PK12GTA	12	AL	12/0	4.700 (119)	3.125 (79)	
PK12GTACU	12	CU	12/0	4.700 (119)	3.125 (79)	
PK18GTA	18	AL	18/0	6.560 (167)	3.125 (79)	
PK18GTACU	18	CU	18/0	6.560 (167)	3.125 (79)	
PK23GTA	24	AL	23/1	9.125 (232)	3.125 (79)	
PK23GTACU	24	CU	23/1	9.125 (232)	3.125 (79)	
PK27GTA	27	AL	24/1	9.125 (232)	3.125 (79)	
PK27GTACU	27	CU	27/0	9.125 (232)	3.125 (79)	

Table 21: Wire Range

Size	Cu	Al
1	(1) #14 to #4 or (2) #14 or #12	(1) #12 to #4 or (2) #12 or #10
II	(1) #1 to 4/0	(1) #1 to 4/0



NF Lug, Neutrals, Ground Bar, and Rail Extensions Kits

6", 12", 18", 24" Rail Extensions (See Digest 178, Table 9.81)

- NF6RDE-6"
- NF12RDE-12"
- NF18RDE-18"
- NF24RDE -- 24"

Table 22: NF Compression Lug Kit Part Numbering

NF	AL	V	1					
			Ampaci	ty:				
			1 = 125	A				
			2 = 250	A				
			4 = 400	A				
			6 = 600	A				
		V= Con	npressio	n lug kit				
		M= Me	chanical	lug kit				
	AL = aluminum; CU = copper							
Family:	NQ, NF							

NF/NQ Panelboards OEM Factory Assembled Options and Interiors

Factory Assembled Options and Interiors

Almost all RTI interiors are available factory assembled (with main, sub-feed, and/or branch circuit breakers, sub-feed or -through feed lugs, aluminum, copper, or 200% neutrals).

Some options are only available factory assembled (or as part of a custom OEM commercial reference):

- PowerPact L main circuit breaker (up to 600 A)
- · Engraved name plates
- · Lighting contactors
- Canadian service entrance barriers
- Boxes wider than 20" (26", 32")
- Power meters or circuit monitors

SurgeLogic SPD Protection

The Surgelogic IMA series surge protective device is a modular parallel surge protective device (SPD). The IMA device is a multi-stage suppression circuit consisting of field-proven, fast-acting, 34 mm metal oxide varistors (MOVs).

- Available surge current ratings: 100 kA, 120 kA, 160 kA, 200 kA, 240 kA
- Ready to install SPD interiors (42 circuit, 3-phase, 4-wire) 250 A or 400 A:
 - 480Y/277 Vac—120 kA, 160 kA
 - 600Y/347 Vac-120 kA

Separated Distribution and Split Bus

250 A NF panelboards are available in separated distribution or split bus configurations, see Separated Distribution and Split Bus section above.

Factory Assembled Interiors (available to OEMs as custom Commercial References)

- 3P 4W, 1P 3W, 3P 3W (240 Vac)
- 100 A, 250 A, 400 A, 600 A, 800 A (MLO)
 - Aluminum or copper bus up to 400 A
 - Copper only 600 A, 800 A
- For more detailed NF main lug interiors and main circuit breaker interiors please review catalog 1670CT0701, and Digest 178, Table 9.46–9.47.
- Panelboards with PowerPact L main circuit breaker require an 8.75 in. deep box.
- 800 A main lug panelboards require an 8.75 in. deep enclosure.

Power Meters

NF and NQ Panelboards accept the same power meters for mains and branch circuits, see Power Meters and Circuit Monitors (Mains and/or Branches) section above.

NF Enclosures and Trims (Covers)

NF and NQ Panelboards use the same boxes and trims, see NQ/NF Enclosures and Trims (Covers) section above.



NF OEM Special Offers

A wide variety of custom NF panelboard configurations are available only to authorized OEMs (original equipment manufacturers). The OEM becomes responsible for UL Listing when choosing these options.

- · No deadfront option
- · No neutral option
- · No lugs option
- · Short rails

Table 23: NF OEM Interior Part Numbering

NFOM	4	30	L	2	С	T2				
						CB = Continuous bus				
						S, T2 = Short rail				
					C = cop	pper				
				Mains r	ating (se	ee Table 16)				
			M = Ma	in circui	t breake	er				
			L = Mai	n lug						
		Circuit I	breaker	count:						
		12–84								
	Blank =	: 1-phas	e 3							
	3 = 3-p	hase 3-v	wire 4							
	4 = 3-phase 4-wire									
Family:	Family: NF OEM									



Figure 7: NFOM430L2T2

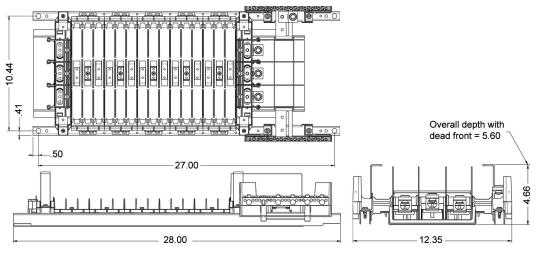


Figure 8: NFOM430L2T2 dimensions

Table 24: NF OEM Main Lug Interior Examples

Pole Spaces	Main Amps	Catalog Number	Main Lugs	Bus ¹	Rails Type	Deadfront	Rails Length ² [in./mm]	Neutral Assembly				
	1P2W											
42	800	NFOM42L8C	PS ³	CU	С	Yes	29/737	N/A				
			3	3P3W								
84	400	NFOM384L4CCB ⁴	PS	CU	С	N/A	51/1295	N/A				
42	800	NFOM442L8C	PS	CU	С	Yes	29/737	N/A				
66	400	NFOM366L4CL	PS	CU	С	N/A	44.7/1135	N/A				
84	400	NFOM384L4CL	PS	CU	С	N/A	53.8/1366	N/A				
42	250	NFOM8342L2C ⁵	300-6 MCM AL	CU	N/A	N/A	49.5 ⁶	N/A				
			3	BP4W								
42	400	NFOM442L4CHD2	750MCM-1/0 AL	CU	С	N/A	31/788	CU				
42	400	NFOM442L2T2	350MCM-6 AL	CU	С	N/A	34/864	AL				
54	250	NFOM454L2CR ⁷	350MCM-6 AL	CU	С	Yes	46/1168	AL				
54	400	NFOM454L4CR51 7	750MCM-1/0 AL	CU	С	Yes	52/1321	AL				
54	400	NF454L4CCLSR ⁸	750MCM-1/0 AL	CU	С	Yes	46/1168	AL				
84	400	NF484L\$CFTLAMZ ⁹	750MCM-1/0 AL	CU	С	Yes	82/2083	AL				

¹ Bus: AL = aluminum; CU = copper

Table 25: OEM NF Main Circuit Breaker Interiors

Pole Spaces	Main Amps	Catalog Number	Main Lugs	Buses Rails Type Deadfr		Deadfront	Rails Length [in./mm]	Neutral Assembly
				3P4W				
42	250	NFOM442M250CR ¹	N/A	CU	С	Yes	46/1168	AL
54	250	NFOM454M125CR 1	N/A	CU	С	Yes	52/1321	AL
54	250	NFOM454M250CR 1	N/A	CU	С	Yes	52/1321	AL

 $^{^{\,1}}$ $\,$ Includes connectors and mounting pan for J-frame M/B with motor operator

Table 26: OEM NF Main Circuit Breaker Kits

Catalog Number	Main Circuit Breaker Frame	Special Feature	Rails Extension Length [in./mm]
N150MHSK	PowerPact H	Attaches to short rail main lug interior	6/152
N250MJSK	PowerPact J	Attaches to short rail main lug interior	6/153

800 Federal Street Andover, MA 01810 USA 888-778-2733 www.schneider-electric.us

² Mounting hole spacing is 1" (25 mm) shorter than rails length

³ PS: preserved space

⁴ Continuous bus

⁵ NFOM8: column width interior

⁶ Length of mounting pan, no rails supplied

Accepts H- or J-frame M/B motor operator

⁸ SR Short rails

⁹ Includes AL mechanical feed through lugs, fits in 92" enclosure



VRV Selection

Project Report

Report details

Produced on: 1/9/2024

Application version: 2023.12.21.12

Project details

Project name: VA - Trinka Davis - Ox8 Selections

Solution name: 1-7-24

Client Name:

Customer reference:

Quotation reference:

Project number: 628275/787805

Selection parameters of the indoor units can be found in the Engineering Data Books
Selection parameters of the outdoor units can be found in the Engineering Data Books
Only the data published in the data book are correct. This program uses close approximations of these data.



Material list

Model	Quantity	Description
RXYQ72AATJA	1	VRV EMERION (208-230V) (VRV EMERION (208-
		230V))
REYQ144XATJB	1	VRV-IV-X -B (208-230V)
REYQ96XATJB	2	VRV-IV-X -B (208-230V)
BSF6Q54TVJ	1	Branch selector unit
BSF8Q54TVJ	1	Branch selector unit
EKEXV50-US	2	EEV4DOAS VALVE KIT
EKEXV100-US	2	EEV4DOAS VALVE KIT
EKEXV200-US	3	EEV4DOAS VALVE KIT
EKEXV250-US	2	EEV4DOAS VALVE KIT
BHFP26P100U	1	Condensing Unit Multi Connection Piping kit - VRV HR (obsolete)
BHFP26P100UA	1	Dual Module Multi Connection Piping Kit - VRV HR
EKEQDCBAV3-	4	EEV4DOAS
US		
EKEQFCBAV3-US	1	AHU Kit W-Control box
KHFP26A100CA	2	Branch Selector Closed Pipe Kit
KHRP26A250TA	4	Branch Selector 2-ports Joint Kit



Indoor unit details

Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
FCU	Device model name
Tmp C	Indoor conditions in cooling
Rq TC	Required total cooling capacity
Rv TC	Revised total cooling capacity (asked from outdoor)
Max TC	Available total cooling capacity
Rq SC	Required sensible cooling capacity
Tevap	Evaporating temperature of indoor unit coil
Tdis C	Indoor unit discharge air temperature in cooling based on maximum capacities and
	required capacities
Max SC	Available sensible cooling capacity
Tmp H	Indoor temperature in heating
Rq HC	Required heating capacity
Max HC	Available heating capacity
Tdis H	Indoor unit discharge air temperature in heating based on maximum capacities and
	required capacities
Sound	Sound pressure level low and high
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
Min coil	Minimum coil volume
Max coil	Maximum coil volume
Air Flow Rate	Air Flow Rate



CU- 1 - DOAS w/ ERV - REYQ192XATJB = REYQ96XATJB + REYQ96XATJB

Capacity data at conditions and connection ratio (100) as entered

Name	FCU	Cooling							
		Tmp C	Rq TC	Rv TC	Max TC	Rq SC	Tevap	Tdis C	Max SC
		°F	BTU/h	BTU/h	BTU/h	BTU/h	°F	°F	BTU/h
		(DBT/WBT)							
AHU 1 DX box 1	EKEXV250-US	n/a	93,700	n/a	105,094	n/a	42.8	n/a / n/a	n/a
AHU 1 RH box 1	EKEXV100-US	n/a	n/a	n/a	41,969	n/a	42.8	n/a / n/a	n/a
AHU 1 DX box 2	EKEXV250-US	n/a	93,700	n/a	105,094	n/a	42.8	n/a / n/a	n/a
AHU 1 RH box 2	EKEXV100-US	n/a	n/a	n/a	41,969	n/a	42.8	n/a / n/a	n/a
			187,400						

Name	FCU		He	ating				
		Tmp H	Rq HC	Max HC	Tdis H	Min coil	Max coil	Air Flow Rate
		°F	BTU/h	BTU/h	°F	in ³	in ³	cfm
AHU 1 DX box 1	EKEXV250-US	n/a	30,750	118,401	n/a / n/a	158.00	503.00	n/a
AHU 1 RH box 1	EKEXV100-US	n/a	45,900	47,088	n/a / n/a	63.00	201.00	n/a
AHU 1 DX box 2	EKEXV250-US	n/a	30,750	118,401	n/a / n/a	158.00	503.00	n/a
AHU 1 RH box 2	EKEXV100-US	n/a	45,900	47,088	n/a / n/a	63.00	201.00	n/a
			153,300					

Name	FCU	Room	Sound	PS	MCA	МОР	WxHxD	Weight
			dBA		Α		inch	lbs
AHU 1 - Control box 1	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 DX box 1	EKEXV250-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4
AHU 1 - Control box 1	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 RH box 1	EKEXV100-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4
AHU 1 - Control box 2	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 DX box 2	EKEXV250-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4
AHU 1 - Control box 2	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 RH box 2	EKEXV100-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4

Remarks

Outdoor vs. indoor position

Outdoor unit placed at the same level as the indoor units.

CU-1A DOAS - 1 of 2 - NO ERV - REYQ144XATJB

Capacity data at conditions and connection ratio (100) as entered

Name	FCU	4			Coolin	g			
					Max TC			Tdis C	Max SC
		°F	BTU/h	BTU/h	BTU/h	BTU/h	°F	°F	BTU/h
		(DBT/WBT)	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	7					
AHU 1 DX box 1	EKEXV200-US	n/a	79,400	n/a	83,939	n/a	42.8	n/a / n/a	n/a
AHU 1 RH box 1	EKEXV50-US	n/a	n/a	n/a	21,155	nVan	42.8	n/a / n/a	n/a
AHU 1 DX box 2	EKEXV200-US	n/a	79,400	n/a	83,939	n/a	42.8	n/a / n/a	n/a
AHU 1 RH box 2	EKEXV50-US	n/a	n/a	n/a	21,155	n/a	42.8	n/a /m/a	n/a
			158,800						4



Name	FCU		He	ating				
		Tmp H	Rq HC	Max HC	Tdis H	Min coil	Max coil	Air Flow Rate
		°F	BTU/h	BTU/h	°F	in ³	in ³	cfm
AHU 1 DX box 1	EKEXV200-US	n/a	56,000	94,516	n/a / n/a	126.00	403.00	n/a
AHU 1 RH box 1	EKEXV50-US	n/a	19,850	23,885	n/a / n/a	32.00	101.00	n/a
AHU 1 DX box 2	EKEXV200-US	n/a	56,000	94,516	n/a / n/a	126.00	403.00	n/a
AHU 1 RH box 2	EKEXV50-US	n/a	19,850	23,885	n/a / n/a	32.00	101.00	n/a
			151,700					

Name	FCU	Room	Sound	PS	MCA	MOP	WxHxD	Weight
			dBA		Α		inch	lbs
AHU 1 - Control box 1	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 DX box 1	EKEXV200-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4
AHU 1 - Control box 1	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 RH box 1	EKEXV50-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4
AHU 1 - Control box 2	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 DX box 2	EKEXV200-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4
AHU 1 - Control box 2	EKEQDCBAV3-US		-	208-230V 1ph	0.3		18.1 x 10.2 x 5.2	13.9
AHU 1 RH box 2	EKEXV50-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4

Remarks

Under capacity

The sum of the required indoor unit capacities is 158,800BTU/h for cooling. However, the selected outdoor unit has a cooling capacity of 144,189BTU/h (= -9.2%). Be aware that an undersized system may lead to reduced comfort levels, different noise levels or increased wear and tear.

Outdoor vs. indoor position

Outdoor unit placed at the same level as the indoor units.

CU- 2 - MUA-1 - No HGRH - RXYQ72AATJA

Capacity data at conditions and connection ratio (90) as entered

Name	FCU	Cooling									
		Tmp C	Rq TC	Rv TC	Max TC	Rq SC	Tevap	Tdis C	Max SC		
		°F	BTU/h	BTU/h	BTU/h	BTU/h	°F	°F	BTU/h		
		(DBT/WBT)									
MUA-1 box 1	EKEXV200-US	n/a	69,100	n/a	83,939	n/a	42.8	n/a / n/a	n/a		
			69,100								

Name	FCU		He	ating				
		Tmp H	Rq HC	Max HC	Tdis H	Min coil	Max coil	Air Flow Rate
		°F	BTU/h	BTU/h	°F	in ³	in ³	cfm
MUA-1 box 1	EKEXV200-US	n/a	49,200	94,516	n/a / n/a	283.00	403.00	n/a
			49,200					

Name	FCU	Room	Sound PS MCA MOP WxHxD		WxHxD	Weight		
			dBA		Α		inch	lbs
MUA-1 box 1	EKEXV200-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4



Outdoor vs. indoor position

Outdoor unit placed at the same level as the indoor units.



Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
Model	Device model name
▼	Optimized selection: Smaller outdoor model selected than standard proposed
	model
CR	Connection ratio
Tmp C	Outdoor conditions in cooling
WFR per module	Water flow per outdoor unit module
CC	Available cooling capacity
Rq CC	Required cooling capacity
PIC	Power input in cooling mode
InC	Water inlet temperature in cooling mode
OutC	Water outlet temperature in cooling mode
Tmp H	Outdoor conditions in heating (dry bulb temp. / RH)
HC	Available heating capacity (integrated heating capacity)
Rq HC	Required heating capacity
PIH	Power input in heating mode
InH	Water inlet temperature in heating mode
OutH	Water outlet temperature in heating mode
Piping	Largest distance from indoor unit to outdoor unit
Bse Refr	Standard factory refrigerant charge (16.4ft actual piping length) excluding extra
	refrigerant charge. For calculation of extra refrigerant charge refer to the databook
Ex Refr	Extra refrigerant charge
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
FLA	Fan Motor Input
RLA	Nominal Running Amps
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
EER	EER value at nominal condition
EER2	EER2 value at nominal condition
IEER	IEER value at nominal condition
COP47	COP value at nominal condition and at ambient temperature of 47°F
COP17	COP value at nominal condition and at ambient temperature of 17°F



Outdoor details

Name	Model	CR		Cooling		H	eating		Piping
			Tmp C	СС	Rq CC	Tmp H	HC	Rq HC	
		%	°F	BTU/h	BTU/h	°F (DBT/WBT)	BTU/h	BTU/h	ft
CU- 1 - DOAS w/ ERV	REYQ192XATJB	100.0	95.0	192,262	187,400	20.0/17.0	195,639	61,500	24.6
CU- 1A - DOAS 1 of 2 - NO ERV	REYQ144XATJB▼	100.0	95.0	144,189	158,800	20.0/17.0	126,714	112,000	24.6
CU- 2 - MUA-1 - No HGRH	RXYQ72AATJA	90.4	95.0	72,053	69,100	20.0/17.0	71,888	49,200	24.6

Name	Model	PS	MCA	МОР	RLA	FLA	WxHxD	Weight
			Α	Α	Α	Α	inch	lbs
CU- 1 - DOAS	REYQ192XATJB	208V -						
w/ ERV		230V 3ph						
Α	- REYQ96XATJB		38.1	45.0	23.3		48.9 x 66.7 x	727.0
							30.2	
В	- REYQ96XATJB		38.1	45.0	23.3		48.9 x 66.7 x	727.0
							30.2	
BS-1	BSF8Q54TVJ	208-230V	0.8	15.0	^ ^ ^		23.3 x 9.5 x	81.6
$1 \lor \lor \lor \lor$		1ph		/ / / / /	\vee \vee \vee	\vee \vee \vee	23.7	\vee \vee \vee
CU- 1A -	REYQ144XATJB	208V -	58.3	70.0	42.6		48.9 x 66.7 x	727.0
DOAS-1012	\ \\\\	√230√3ph	^	////	////	////	30.2	////
- NO ERV								
BS- 2	BSF6Q54TVJ	208-230V	0.6	15.0			23.3 x 9.5 x	72.8
		1ph					23.7	
CU- 2 - MUA-	RXYQ72AATJA	208V -	27.3	30.0	11.1		36.6 x 65.4 x	496.0
1 - No HGRH		230V 3ph					30.1	

Name				Eff	ficiency Me	trics - Duct	ed			
	EER	EER2	IEER	COP47	COP17	SCHE	SEER	SEER2	HSPF	HSPF2
CU- 1 - DOAS w/ ERV	13		21.4	3.67	2.37	22.8				
CU- 1A - DQAS- 1 of 2 - NO ERV	<u></u>	~~~	^21.6^	<u>^342</u> ~	V2,12\^	^ 22 ^	~~~~	~~~	· · · · · · · · · · · · · · · · · · ·	~~~
CU- 2 - MUA-1 - No HGRH	13		21.4	3.5	2.4					



Name				Effici	ency Metri	cs - Non Du	ıcted			
	EER	EER2	IEER	COP47	COP17	SCHE	SEER	SEER2	HSPF	HSPF2
CU- 1 - DOAS w/ ERV	13		22.6	3.85	2.5	26.6				
CU- 1A - DOAS 1 of 2 - NO ERV	\11.9 \	////	<u>^</u> 23.5^_	^ 375 ~	V2.16\ <u>\</u>	^25.5^	~~~	~~~	~~~	~~~
CU- 2 - MUA-1 - No HGRH	15.2		27	4	2.5					

Sound Data

Name	Model	Sound Power		Sound Pressure		
			Heating	Cooling	Heating	
		dBA	dBA	dBA	dBA	
CU- 1 - DOAS w/	REYQ192XATJB	-	-	68	-	
ERV						
CU-1A-DQAS-/	BEXQ144XATJB	^^^	^^^	<u> </u>	\^\^\	
1 of 2 - NO ERV						
CU- 2 - MUA-1 -	RXYQ72AATJA	-	-	58	-	
No HGRH						

Refrigerant information

Name	Model	Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
CU- 1 - DOAS w/ ERV	REYQ192XATJB	R410A	2087.5	51.59	unknown	unknown	48.85
CU- 1A -		R410A	2087.5	25.79	unknown	unknown	24.42
- NO ERV CU- 2 - MUA- 1 - No HGRH	RXYQ72AATJA	R410A	2087.5	15.21	unknown	unknown	14.40

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base



refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.

CU-1-DOAS w/ ERV - REYQ192XATJB = REYQ96XATJB + REYQ96XATJB

Model	Quantity	Description		
REYQ96XATJB	2	VRV-IV-X -B (208-230V)		
BSF8Q54TVJ	1	Branch selector unit		
EKEXV100-US	2	EEV4DOAS VALVE KIT		
EKEXV250-US	2	EEV4DOAS VALVE KIT		
BHFP26P100U	1	Condensing Unit Multi Connection Piping kit - VRV HR		
		(obsolete)		
BHFP26P100UA	1	Dual Module Multi Connection Piping Kit - VRV HR		
EKEQDCBAV3-US	2	EEV4DOAS		
KHFP26A100CA	2	Branch Selector Closed Pipe Kit		
KHRP26A250TA	2	Branch Selector 2-ports Joint Kit		

Refrigerant information

Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
R410A	2087.5	51.59	unknown	unknown	48.85

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.

Pipe capacities

Maximum Connection Index	Diameters
53.9	3/8"x5/8"x1/2"
71.9	3/8"x3/4"x5/8"
110.9	3/8"x7/8"x3/4"
161.9	1/2"x1 1/8"x3/4"
229.9	5/8"x1 1/8"x1 1/8"
299.9	3/4"x1 3/8"x1 1/8"
> 299.9	3/4"x1 5/8"x1 1/8"
Main pipe size up	3/4"x1 1/8"x1 1/8"



Sufficient distance should be respected between the modules according to the service & operation space rules as mentioned in the databook.



Piping limitations

Description	Value
Maximum total length	3,280.8ft
Maximum longest actual length	541.3ft
Maximum longest equivalent length	623.4ft
Maximum main pipe length (size up of main pipe required if longer)	-
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	131.2ft
Maximum length first branch to indoor unit	164.0ft
Maximum length of indoor units to nearest branch	131.2ft
Maximum length difference between longest and shortest distance to indoor units	131.2ft
Maximum height difference, outdoor unit below indoor units	196.9ft
Minimum connection ratio, outdoor unit below indoor units	-
Maximum height difference, outdoor unit above indoor units	196.9ft
Minimum connection ratio, outdoor unit above indoor units	-
Maximum height difference in technical cooling, outdoor unit below indoor units	196.9ft
Maximum height difference in technical cooling, outdoor unit above indoor units	196.9ft
Maximum height difference between indoor units	98.4ft
Connection ratio range	50.0% - 200.0%
Refrigerant pipe diameters	3/4" (liquid) x 1 1/8" (gas)
	x 1 1/8" (discharge)
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET (size up of intermediate	-
pipes required if longer)	
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	164.0ft
Maximum actual length between CM and HM	-
Maximum height difference between CM and HM	-

CU- 1A DOAS -1 of 2 - NO ERV - REYQ144XATJB

Model	Quantity	Description
REYQ144XATJB	1	VRV-IV-X -B (208-230V)
BSF6Q54TVJ	1	Branch selector unit
EKEXV50-US	2	EEV4DOAS VALVEKIT
EKEXV200-US	2	EEV4DOAS VALVE KIT
EKEQDCBAV3-US	2	EEV4DOAS
KHRP26A250TA	2	Branch Selector 2-ports Joint Kit

Refrigerant information

Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
R410A	2087.5	25.79	unknown	unknown	24.42

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2



Remarks

Chosen outdoor unit size differs from default proposed size. Be aware that this might lead to reduced comfort levels, increased noise levels, wear and tear. In case of doubt, contact your sales representative.

Pipe capacities

Maximum Connection Index	Diameters
53.9	3/8"x5/8"x1/2"
71.9	3/8"x3/4"x5/8"
110.9	3/8"x7/8"x3/4"
161.9	1/2"x1 1/8"x3/4"
229.9	5/8"x1 1/8"x1 1/8"
299.9	3/4"x1 3/8"x1 1/8"
> 299.9	3/4"x1 5/8"x1 1/8"
Main pipe size up	5/8"x1 1/8"x7/8"



Piping limitations

Description	Value
Maximum total length	3,280.8ft
Maximum longest actual length	541.3ft
Maximum longest equivalent length	623.4ft
Maximum main pipe length (size up of main pipe required if longer)	-
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	131.2ft
Maximum length first branch to indoor unit	164.0ft
Maximum length of indoor units to nearest branch	131.2ft
Maximum length difference between longest and shortest distance to indoor units	131.2ft
Maximum height difference, outdoor unit below indoor units	196.9ft
Minimum connection ratio, outdoor unit below indoor units	-
Maximum height difference, outdoor unit above indoor units	196.9ft
Minimum connection ratio, outdoor unit above indoor units	-
Maximum height difference in technical cooling, outdoor unit below indoor units	196.9ft
Maximum height difference in technical cooling, outdoor unit above indoor units	196.9ft
Maximum height difference between indoor units	98.4ft
Connection ratio range	50.0% - 200.0%
Refrigerant pipe diameters	5/8" (liquid) x 1 1/8" (gas)
	x 7/8" (discharge)
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET (size up of intermediate	-
pipes required if longer)	
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	164.0ft
Maximum actual length between CM and HM	-
Maximum height difference between CM and HM	-

CU- 2 - MUA-1 - No HGRH - RXYQ72AATJA

Model	Quantity	Description
RXYQ72AATJA	1	VRV EMERION (208-230V) (VRV EMERION (208-230V))
EKEXV200-US	1	AHU INTEGRATION VALVE KIT
EKEQFCBAV3-US	1	AHU Kit W-Control box

Refrigerant information

Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
R410A	2087.5	15.21	unknown	unknown	14.40

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.



Pipe capacities

Maximum Connection Index	Diameters
53.9	3/8"x5/8"
71.9	3/8"x3/4"
110.9	3/8"x7/8"
161.9	1/2"x1 1/8"
229.9	5/8"x1 1/8"
299.9	3/4"x1 3/8"
> 299.9	3/4"x1 5/8"
Main pipe size up	1/2"x7/8"

Piping limitations

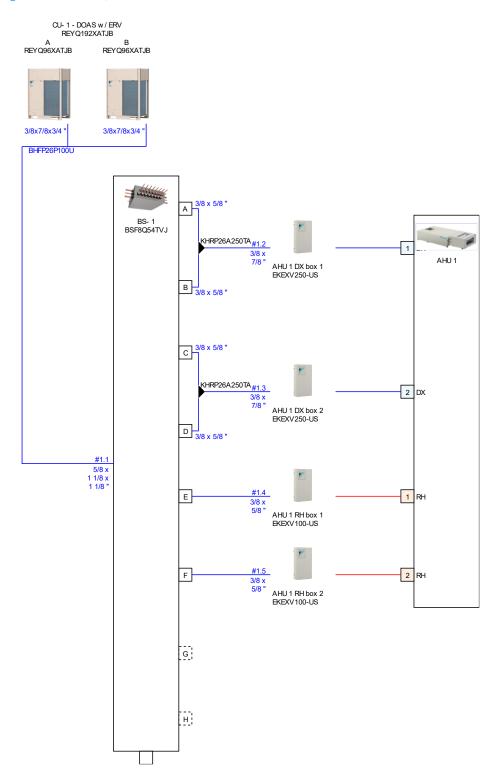
Description	Value		
Maximum total length	3,280.8ft		
Maximum longest actual length	541.3ft		
Maximum longest equivalent length	623.4ft		
Maximum main pipe length (size up of main pipe required if longer)	-		
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	131.2ft		
Maximum length first branch to indoor unit	295.3ft		
Maximum length of indoor units to nearest branch	131.2ft		
Maximum length difference between longest and shortest distance to indoor units	131.2ft		
Maximum height difference, outdoor unit below indoor units	295.3ft		
Minimum connection ratio, outdoor unit below indoor units	-		
Maximum height difference, outdoor unit above indoor units	295.3ft		
Minimum connection ratio, outdoor unit above indoor units	-		
Maximum height difference in technical cooling, outdoor unit below indoor units	295.3ft		
Maximum height difference in technical cooling, outdoor unit above indoor units	295.3ft		
Maximum height difference between indoor units	98.4ft		
Connection ratio range	50.0% - 200.0%		
Refrigerant pipe diameters	1/2" (liquid) x 7/8" (gas)		
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET (size up of intermediate	-		
pipes required if longer)			
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	295.3ft		
Maximum actual length between CM and HM	-		
Maximum height difference between CM and HM	-		





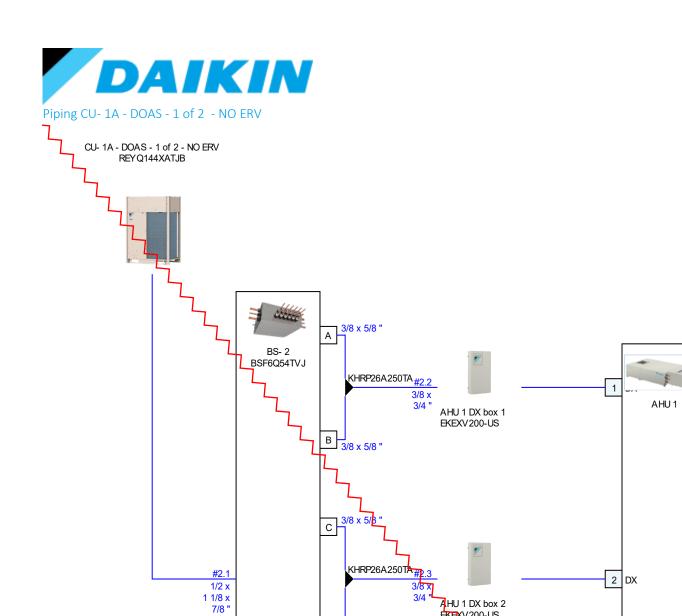
Piping diagrams

Piping CU- 1 - DOAS w/ ERV



Piping

Warning: The pipe diameter values are purely indicative. Depending on the required pipe lengths, a different pipe diameter might be required.



D 3/8 x 5/8 "

Ε

F

Piping

Warning: The pipe diameter values are purely indicative. Depending on the required pipe lengths, a different pipe diameter might be required.

EKEXV200-US

AHU 1 RH box 1 EKEXV50-US

AHU 1 RH box 2 EKEXV50-US

#2.4

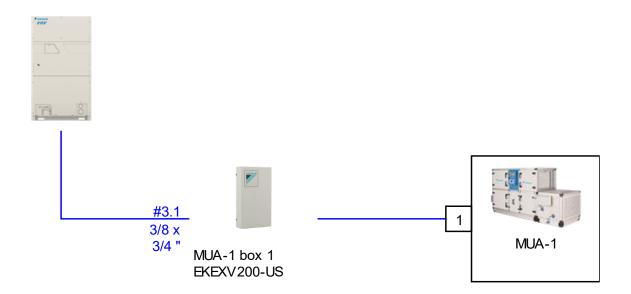
1/4 x 1/2 "

#2.5

1/4 x 1/2 "



CU- 2 - MUA-1 - No HGRH RXYQ72AATJA



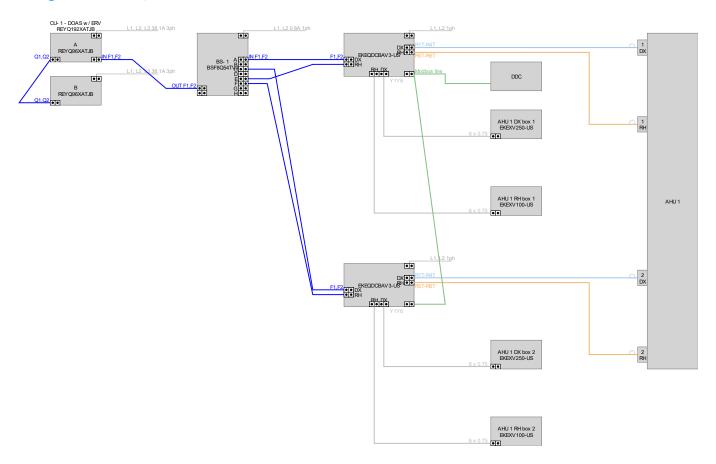
Piping

Warning: The pipe diameter values are purely indicative. Depending on the required pipe lengths, a different pipe diameter might be required.



Wiring diagrams

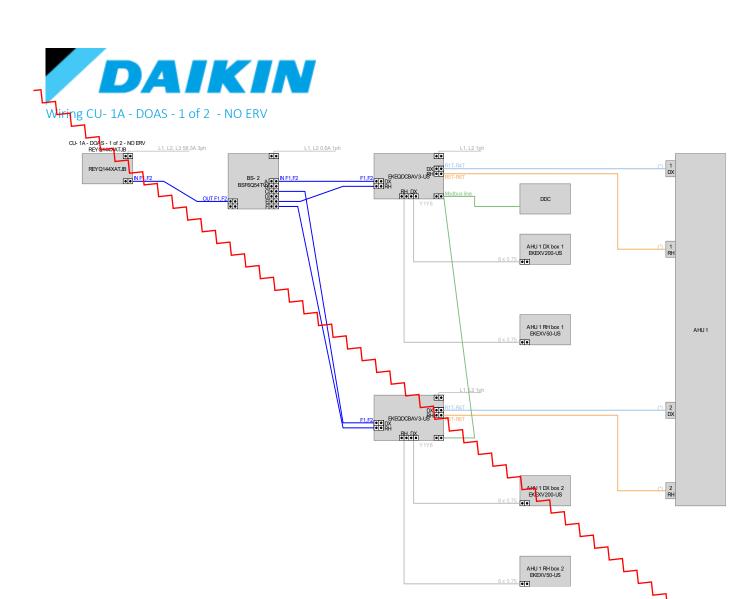
Wiring CU- 1 - DOAS w/ ERV



Remarks

F1F2 IN/OUT = AWG 18-2 is required - however always refer to local code for further information

Note:



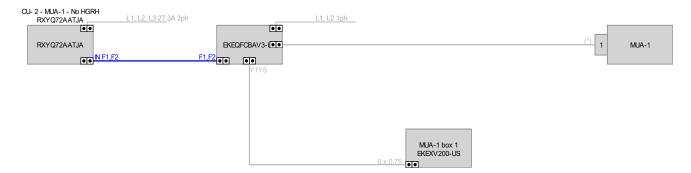
Remarks

F1F2 IN/OUT = AWG 18-2 is required - however always refer to local code for further information

Note:



Wiring CU- 2 - MUA-1 - No HGRH



Remarks

F1F2 IN/OUT = AWG 18-2 is required - however always refer to local code for further information

Note:



I-Line™ Circuit Breaker Panelboards

Class 2110

Catalog

2110CT9701 R03/2023





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Product Description Class 2110

Product Description

Type HCR-U— 1200 A Main Circuit Beaker



Square D[™]-brand I-Line[™] circuit breaker power distribution panelboards are for use on AC or DC systems. The panels, labeled cULus (compliance to UL and CSA standards certified by UL) are also Underwriters Laboratories[®] (UL[®]) Listed under File E33139. The following are suitable for use as service entrance equipment:

- All main circuit breaker panelboards. Note: Panelboards for US UL Service Entrance with vertical main circuit breaker must be factory-assembled only.
- All main lugs panelboards with branch-mounted, or group-mounted main circuit breaker. (For Canadian MLO service entrance, use HCP-SU and HCR-U only).
- All main lugs panelboards with six disconnects or less.
- A solid neutral that is insulated, but may be bonded to the box with a grounding strap.
- Service entrance panelboards meeting the requirements of CSA are available in Canada factory-assembled only.

I-Line circuit breaker panelboards are available as 400–1200 A main lugs only and 100–1200 A main circuit breakers. I-Line panelboards are designed to accept the following circuit breakers: BD, BG, BJ, BK, HD, HG, HJ, HL, HR, QB, QD, QG, QJ, JD, JG, JJ, JL, JR, LA, LG, LJ, LH, LL, LR, MG, MJ, PG, PJ, PK, PL, RG, RJ, RK, and RL.

Standards

Type HCR-U— 1200 A Main Circuit Beaker



I-Line circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

Standard	Description
UL 50	Standard for enclosures for electrical equipment
UL 67	Standard for panelboards
CSA C22.2, Nos. 29 and 94—1989	Standard for panelboards and enclosed panelboards
NFPA 70	National Electrical Code (NEC)
NEMA PB 1	Standard for panelboards
W–P 115C Type 1 Class 1	Specification for circuit breaker panelboards
IBC	US standard for seismic requirements
NBCC	Canadian standard for seismic requirements

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Class 2110 Product Description

Service

I-Line circuit breaker panelboards can be used on the following system voltages:

- 120/240 Vac; 1-phase, 3-wire, 60 Hz
- 240 Vac; 1-phase, 2-wire, 60 Hz
- 240/120 Vac; 3-phase, 4-wire, 60 Hz
- 240 Vac; 3-phase, 3-wire, 60 Hz
- 240 Vac Ground, B-phase; 3-phase, 3-wire, 60 Hz
- 208Y/120 Vac; 3-phase, 4-wire, 60 Hz
- 480Y/277 Vac; 3-phase, 4-wire, 60 Hz
- 480Y/277 Vac; 1-phase, 3-wire, 60 Hz
- 480 Vac; 3-phase, 3-wire, 60 Hz
- 600Y/347 Vac; 3-phase, 4-wire, 60 Hz
- 600 Vac; 1-phase, 2-wire, 60 Hz
- 600 Vac; 3-phase, 3-wire, 60 Hz
- 125/250 Vdc; 3-wire
- 48 Vdc; 2-wire
- 125 Vdc; 2-wire
- 250 Vdc; 2-wire
- International Voltages:
- 220/110 Vac; 3-phase, 4-wire, 50/60 Hz
- 220Y/127 Vac; 3-phase, 4-wire, 50/60 Hz
- 230/115 Vac; 3-phase, 4-wire, 50/60 Hz
- 380Y/220 Vac; 3-phase, 4-wire, 50/60Hz
- 400Y/230 Vac; 3-phase, 4-wire, 50/60Hz
- 415Y/240 Vac; 3-phase, 4-wire, 50/60 Hz
- 480Y/277 Vac; 3-phase, 4-wire, 50 Hz
- 600 Vac; 3-phase, 3-wire, 50 Hz
- 600Y/347 Vac; 3-phase, 4-wire, 50 Hz
- 110/220 Vac; 1-phase, 3-wire, 50/60 Hz
- 115/230 Vac; 1-phase, 3-wire, 50/60 Hz
- 127/220 Vac; 1-phase, 3-wire, 50/50 Hz

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Product Description Class 2110

Panelboard Types

Type HCP—600 A Main Circuit Breaker



Panel- board	Maximum Mains Ampacity		Maximum Branch Circuit Breaker Frame Size¹		Enclosure Dimensions (NEMA Type 1) ²				
Туре	Main	Main Circuit	Left	Right	Wie	Width		Depth#	
	Lugs	Breakers			in.	mm	in	mm	
HCJ	800 A	800 A	JD	JD	32.00	813	9.50	241	
HCP-SU	800 A	800 A ³	MG, PG	None	26.00	600	9.50	241	
HCP	1200 A	800 A	MG, PG	JD	42.00	1067	9.50	241	
HCR-U	1200 A	1200 A ³	RG	JD	44.00	1118	9.50	241	

Type HCR-U— 1200A Main Lugs



Type HCP-SU 800 A Main Circuit **Beaker**



Type HCJ—400 A Main Lugs



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For a complete listing of applicable circuit breaker types, refer to Dimensions for Standard NEMA Type 1 Enclosures, page 41. Refer to Dimensions for Standard NEMA Type 1 Enclosures, page 41 for standard panelboard heights.

Available as a main circuit breaker panelboard when provided with a group-mounted (back-fed) main circuit breaker.

Class 2110 Product Description

Enclosure Types

Types 1 Enclosure with Optional Door



Flush Lock used on HCJ, and HCP-SU Types 1 and 2 Fronts (Catalog No. PK4FL) Sliding Vault Lock used on HCP, and HCR-U Types 1 and 2 Fronts (Catalog No. PK5FL)





Types	Environments	Provides Protection Against	
Type 1	Indoor	Contact with the enclosed equipment	
Type 2	Indoor	Falling water and dirt	
Type 3R	Outdoor	Falling rain, sleet; undamaged by ice	
Type 4/4X Stainless	Indoor/Outdoor	Corrosion, hose-directed water, dust	
Type 5	Indoor	Settling dust, falling dirt, dripping liquids	
Type 12	Indoor	Circulating dust, falling dirt, dripping liquids	

	Fronts:	HCJ, HCP, HCP-SU, and HCR-U surface and flush trims available as four-piece construction, standard (door not included). An optional four-piece trim with door is also available. An optional hinged trim with door is also available.		
Type 1 and 2 ⁴ Enclosures		Finished with gray-baked enamel electrodeposited over cleaned phosphatized steel (ANSI 49).		
		Directory card holders provided with all fronts.		
	Boxes:	Galvanized steel in 26, 32, 42, and 44-inch (660, 813, 1067, and 1118 mm) widths.		
		Removable endwalls without knockouts.		
	Gasketed door with vault handle and directory card holder.			
	Three-point latching.			
Time 2D E and 42	End and side gutter trim.			
Type 3R, 5, and 12 Enclosures	No knockouts.			
	Removable drain screw for Type 3R.			
	Finished with gray-baked enamel electrodeposited over cleaned phosphatized steel (ANSI 49).			
	Corrosion-resistant, stainless steel (available in Type 304 or 316L stainless steel).			
Type 4X Enclosures (Factory-Assembled	Watertight ar	d dusttight.		
Only)	Gasketed door.			
	Directory card located on inside of door.			

Type 3R, 5, and 12 Enclosures



Type 3R, 5, and 12 Enclosures



Vault Handle used on all Type 3R, 5, and 12 Enclosures (Catalog No. PK4NVL)



^{4.} Type 2 includes an optional drip hood.

Product Description Class 2110

Main Circuit Breaker Panelboards

Main Circuit Breaker and Solid Neutral Compartment (Canada service entrance not shown)



- Accept a maximum 1200 A, 80% or 100% rated main breaker.
- · Available factory-assembled or merchandised.
- Factory-assembled main circuit breaker interiors are available bottom-feed or top-feed.
- Suitable for use as service entrance equipment with appropriate barriers, US and Canada. (Note: Available as be factory-assembled only)
- · Accepts mechanically restrained I-Line circuit breakers.
- Available with a short circuit current rating (SCCR) up to 200 kA maximum (100 kA @ 600 Vac) when supplied by an I-Limiter™ circuit breaker.
- Standard bus is tin plated copper (800 A and above) or tin plated aluminum (600 A and below). Options for silver plating and copper bus below 800 A are available.
- Solid neutral is mounted in the mains compartment with the main circuit breaker.
- Merchandised panelboards are provided as bottom-feed.

Main Lugs Only Panelboards

Main Lug and Solid Neutral Compartment



- Available with main lug only interiors rated up to 1200 A.
- Available factory-assembled or merchandised.
- Suitable for use as service entrance equipment when provided with a main circuit breaker, US and Canada.
- Accepts mechanically restrained I-Line circuit breakers.
- Available with a short circuit current rating (SCCR) up to 200 kA maximum (100 kA @ 600 Vac) when supplied by an I-Limiter circuit breaker.
- Standard bus is tin plated copper (800A and above) or tin plated aluminum (600 A and below). Options for silver plating and copper bus below 800 A are available.
- Solid neutral is mounted in the mains compartment with the main lugs.
- Hinged cover, isolated main lugs compartment.
- Main lug interiors are available as top-feed or bottom-feed.

Universal Mains Panelboards



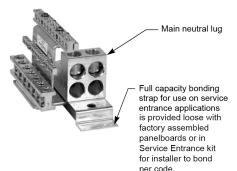
- Universal mains utilize a group mounted circuit breaker or sub feed lug as a main incoming device
- Available up to 1200 A.
- · Available factory-assembled or merchandised.
- Available with US or Canadian Service Entrance barriers.
- · Accepts mechanically restrained I-Line circuit breakers.
- Available with a short circuit current rating (SCCR) up to 200 kA maximum (100 kA @ 600 Vac) when supplied by an I-Limiter circuit breaker.
- Standard bus is tin plated copper. Option for silver plating is available.
- Solid neutral is available.
- Available as top-feed or bottom-feed by locating the main at top or bottom of the bus stack.

Class 2110 Product Description

Solid Neutral

- Mounts in main lug or main circuit breaker compartment.
- · Does not take up interior circuit breaker mounting space.
- · UL/CSA Listed for use with Al or Cu conductors.
- · Copper or aluminum neutral available.
- 200% rated neutral available as a factory-assembled option.
- Expanded neutral capacity is available to accommodate more neutral terminals and sizes. Available in Al or Cu. The number of neutral terminations are expanded as needed on factory assembled panelboards, based on circuit breaker type and count. Expanded neutrals are also available as merchandise kits (see Digest section 9).

Typical Solid Neutral



Typical Solid Neutral with Neutral Current Transformer for Ground Fault Protection



Features and Benefits Class 2110

Features and Benefits

Featured below are just a few of the many features and benefits of Square D™brand I-Line™ circuit breaker panelboards.

Circuit Breakers

I-Line circuit breakers, with their exclusive bus connection design, provide superior reliability and performance advantages.

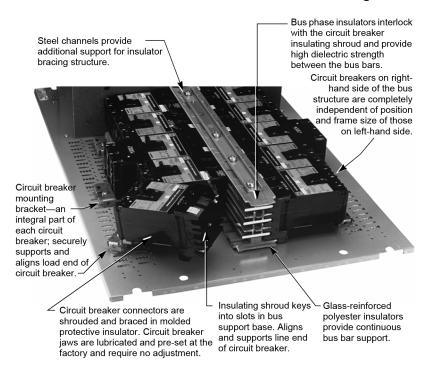
Circuit Breaker Mounting

Ratchet-Type Mounting



- 15–1200 A frame circuit breakers require only a screwdriver and are firmly attached to the bus stack and mechanically attached to the interior assembly.
- The connectors are an integral part of the I-Line circuit breaker—eliminating the assembly of connectors to the bus bar.
- Pre-assembled hardware means reduced installation time.
- The unique line side connection requires no routine maintenance.

I-Line Bus Structure and Circuit Breaker Mounting



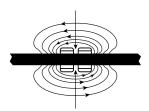
Push-to-Trip

Push-to-trip is a standard feature on all I-Line circuit breakers. It is useful for checking circuit breaker operation and for testing auxiliary devices. The circuit breaker is mechanically tripped by pressing the push-to-trip button in the circuit breaker case.

Class 2110 Features and Benefits

Blow-On Connections

Blow-On Connections



All circuit breaker connections are "blow-on" type. Under high-level short circuit conditions, the magnetic forces developed tend to draw the connector jaws together, gripping the I-Line bus bar more firmly.

Short Circuit Current Rating (SCCR)

- SCCR is equal to the lowest interrupting capacity of a branch or main circuit breaker installed in the panelboard.
- I-Line panelboards, with branch circuit breakers installed, are short-circuit tested as complete units.
- All tests are conducted in accordance with UL 67 and CSA C22.2 (Standards for Panelboards).

With I-Limiter main circuit breaker, I-Line main circuit breaker panelboards are UL/ CSA Listed for use on systems with up to a 200,000 maximum RMS symmetrical amperes available fault current (100 kA @ 600 Vac).

I-Line Plug-on Unit with Surgelogic™ SPD

I-Line Plug-On Unit with Surgelogic SPD



- SPD requires no wiring or conduit, saving labor time and materials.
- Bus-connected design enhances performance.
- Meets the requirements of UL and CSA for retrofit applications in existing I-Line panelboards and switchboards.
- Integrated and circuit breaker disconnects feature compact design, requiring only 13.50 inches (343 mm) of branch mounting space.
- SCCR up to 200 kA rating (100 kA @ 600 Vac) meets a wide variety of customer applications.
- SPD Surge Current ratings from 100 kA to 240 kA are available.
- Audible alarm with enable/disable switch, dry contacts and surge counter standard
- Indicator LEDs
- EMI/RFI filtering

Accessories Class 2110

Accessories

A wide variety of accessories are available for field or factory installation of I-Line panelboards.

Equipment Ground Bars

Equipment Ground Bar (Catalog No.

PK32DGTA)

Equipment ground bars mount in the panelboard box to provide convenient termination of equipment grounding conductors. They are available in copper or aluminum.



Box Extensions

Typical Box Extensions



Box extensions provide additional end gutter for feeding cables into the end of the cabinet; they are UL/CSA Listed. Several extension heights are available as add-on kits in the field as shown below. In addition custom extensions are available in Factory Assembled panelboards.

Interior Type	Extension		
HCP-SU	9 in.		
HCJ	9 in.		
HCP	12 in.		
HCR-U	6 in.		
HCR-U	12 in.		

Class 2110 Accessories

Blank Fillers/Extensions

Blank Fillers (Catalog Nos. HNM4BL Qty. 5 per box and HNM1BL Qty. 3 per box)

Blank fillers are required to cover unused mounting space in I-Line panelboards. Blank Extensions are used to fill the gap between the filler or circuit breaker and the panelboard deadfront.

Blank Extensions





Service Entrance Barriers

Panelboards are suitable for use as service equipment if equipped with an integral main circuit breaker and service entrance barrier kit. Vertical mains or group mounted mains can be a service entrance main circuit breaker. There are separate Service Entrance Barrier versions available for US and Canada. In the US, under the 2017 UL67 and NFPA70 standards there is an exception when not more than six main disconnecting means are provided and the panelboard is not used as a lighting and appliance branch circuit panelboard that service entrance barriers are not required. The 2020 edition of the US National Electrical Code (NEC) no longer allows two to six service disconnecting means to be in the same panelboard enclosure thereby eliminating the above exception for states that have adopted the 2020 NEC.

Note: Service Entrance option for Canada must be installed in the SE factory per Canadian Codes.

Drip Hoods

Drip Hood



Primarily used for NEMA 2 applications in Canada these hoods are intended for use on surface mounted boxes only. The Drip Hoods are designed to fit on the outside of the boxes. The Drip Hood will increase the enclosure rating of the box from Type 1 to Type 2. Reference Instruction Bulletin 80043-401-03.

General and Application Information

Circuit Breaker Types

BD, BG, BJ, BK 1-, 2-, and 3-Pole; 15-125 A (BK is 15-30 A)



QB, QD, QG, QJ 2- and 3-Pole; 70-225 A



MG, MJ 2- and 3-Pole; 300-800 A



HD, HG, HJ, HL 2- and 3-Pole; 15-150 A



JD, JG, JJ, JL 2- and 3-Pole; 150-250 A



PG, PJ, PK, PL 2- and 3-Pole; 250-1200 A



RG, RJ, RK, RL 2- and 3-Pole; 1000-1200 A



2110CT9701 15

Circuit	Maximum		Cont.	UL/CSA Interrupting Rating—RMS Amperes (Symmetrical)				cal)	
Breaker Frame	Voltage Rating	Number of Poles	Ampere Rating		AC Volts, 50/60 Hz			DC V	/olts
Type	Rating		Rating	120	240	480	600	125	250
BD	600 Y	1, 2, 3	15–125	25 K	25 K	18 K	14 K	_	_
BG	600 Y	1, 2, 3	15–125	65 K	65 K	35 K	18 K	_	_
BJ	600 Y	1, 2, 3	15–125	100 K	100 K	65 K	25 K	_	_
BK	600 Y	1, 2	15–30	100 K	100 K	65 K	65 K	_	_
HD	600	2, 3	15–150	25 K	25 K	18 K	14 K	20 K	20 K
HG	600	2, 3	15–150	65 K	65 K	35 K	18 K	20 K	20 K
HJ	600	2, 3	15–150	100 K	100 K	65 K	25 K	20 K	20 K
HL	600	2, 3	15–150	125 K	125 K	100 K	50 K	20 K	20 K
HR	600	3	15–150	200 K	200 K	200 K	100 K	_	_
QB	240	2, 3	70–225	10 K	10 K	_	_	_	_
QD	240	2, 3	70–225	25 K	25 K	_	_	_	_
QG	240	2, 3	70–225	65 K	65 K	_	_	_	_
QJ ⁵	240	2, 3	70–225	100 K	100 K	_	_	_	_
JD	600	2, 3	150–250	25 K	25 K	18 K	14 K	20 K	20 K
JG	600	2, 3	150–250	65 K	65 K	35 K	18 K	20 K	20 K
JJ	600	2, 3	150–250	100 K	100 K	65 K	25 K	20 K	20 K
JL	600	2, 3	150–250	125 K	125 K	100 K	50 K	20 K	20 K
JR	600	2, 3	150–250	200 K	200 K	200 K	100 K	_	_
LA	600	2, 3	125–400	42 K	42 K	30 K	22 K	10 K	10 K
LH ⁶	600	2, 3	125–400	65 K	65 K	35 K	25 K	_	50 K
LG	600	2, 3	250–600	65 K	65 K	35 K	18 K	_	20 K
LJ	600	2, 3	250–600	100 K	100 K	65 K	25 K	_	_
LL	600	2, 3	250–600	125 K	125 K	100 K	50 K	_	20 K
LR	600	2, 3	250–600	200 K	200 K	200 K	100 K	_	_
MG	600	2, 3	300–800	65 K	65 K	35 K	18 K	_	_
MJ	600	2, 3	300–800	100 K	100 K	65 K	25 K	_	_
PG	600	2, 3	600–1200	65 K	65 K	35 K	18 K	_	_
PJ	600	2, 3	600–1200	100 K	100 K	65 K	25 K	_	_
PK ⁷	600	2, 3	600–1200	65 K	65 K	50 K	50 K	_	_
PL	480	2, 3	600–1200	125 K	125 K	100 K	25 K	_	_
RG	600	2, 3	1000–1200	65 K	65 K	35 K	18 K	_	_
RJ	600	2, 3	1000–1200	100 K	100 K	65 K	25 K	_	_
RK ⁷	600	2, 3	1000–1200	65 K	65 K	65 K	65 K	_	_
RL	600	2, 3	1000–1200	125 K	125 K	100 K	50 K	_	_

Full circuit breaker ratings can be found in the following breaker catalogs:

B-Frame—0611CT1603

H/J/L- Frame—0611CT1001

M/P/R-Frame—0612CT0101

16 2110CT9701

QJ 3-pole is rated 100 KA@208Y/120 Vac.

Separate UL rating available for 240 V and 480 V grounded B phase systems. Circuit breakers must be ordered with 5861 suffix. For use in Canada Only

Q-Frame—0734CT0201

Please refer to Digest Section 9 for further circuit breaker selection information and catalog numbers.

Wire Range Information

Table 1 - Main Lug and Vertical Main Circuit Breaker Lug Quantities and Sizes (Standard Mechanical Lugs)

	Main	Lugs	Vertically Mounted Main Circuit Breaker		
Mains Ampere Rating	Actual Lug Size ⁸	Maximum Allowed Cable Size Per UL/CSA Wire Bending Space	Actual Lug Size ⁸	Maximum Allowed Cable Size Per UL/CSA Wire Bending Space	
Mechanical Lug	Sizes				
100	_	_	(1) #14-1/0 Al/Cu	(1) #14-#1 Al/Cu	
225	(1) #6-300 kcmil Al/Cu	(1) #6-300 kcmil Al/Cu	(1) #4-300 kcmil Al/Cu	(1) #4-300 kcmil Al/Cu	
400	(2) #2-600 kcmil Al/Cu	(1) #2-600 kcmil Cu or (2) #2-500 kcmil Al/Cu	(1) #1-600 kcmil Al/Cu (2) #1-250 kcmil Al/Cu	(1) #1-600 kcmil Cu or (2) #1-250 kcmil Al/Cu	
600	(2) #2-600 kcmil Al/Cu	(2) #2-500 kcmil Al/Cu	(3) 3/0-500 kcmil Al/Cu	(3) 3/0-500 kcmil Al/Cu	
800	(4) 3/0-750 kcmil Al/Cu	(3) 3/0-500 kcmil Al/Cu	(4) 3/0-500 kcmil Al/Cu	(3) 3/0-500 kcmil Al/Cu	
1200	(4) 3/0-750 kcmil Al/Cu	(4) 3/0-500 kcmil Al/Cu	(4) 3/0-600 kcmil Al/Cu	(4) 3/0-500 kcmil Al/Cu	
Compression Lu	g Sizes			•	
225	(1) #4-300 kcmil Al/Cu	(1) #4-300 kcmil Al/Cu	(1) #4-300 kcmil Al/Cu	(1) #4-300 kcmil Al/Cu	
400	(1) 2/0-500 kcmil Al/Cu or (1) 500-750 kcmil Al or (2) #4-300 kcmil Al/Cu	(1) 2/0-500 kcmil Al/Cu or (1) 500-750 kcmil Al or (2) #4-250 kcmil Al/Cu	(1) 500 kcmil Cu or (1) 500-750 kcmil Al	(1) 500 kcmil Cu or (1) 500-750 kcmil Al	
600	(2) 2/0-500 kcmil Al/Cu	(2) 2/0-500 kcmil Al/Cu	(2) 2/0-500 kcmil Al/Cu	(2) 2/0-500 kcmil Al/Cu	
800	(3) 2/0-500 kcmil Al/Cu	(3) 2/0-500 kcmil Al/Cu	(2) 500 kcmil Cu or (2) 500-750 kcmil Al	(2) 500 kcmil Cu or (2) 500-750 kcmil Al	
1200	(4) 500 kcmil Cu or (4) 500-750 kcmil Al	(4) 500 kcmil Cu or (4) 600 kcmil Al	_	_	

NOTE: All lugs are suitable for 75°C wire. Torque values are included on the neutral diagram.

Solid Neutral, Standard and Expanded Lug Quantities and Sizes (Standard Mechanical Lugs)

Panel Type	Amps	Solid Neutral Assembly Terminal Wire Range
	225	(1) 6 - 300, (9) #1/0 - 14, (45) #4 - 14
1101	400	(7) 6 - 350, (45) #4 - 14
HCJ -	600	(7) 6 - 350, (9) #1/0 - 14, (28) #4 - 14
	800	(7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14
	400	(2) 4 - 600, (7) 6 - 350, (45) #4 - 14
HCP -	600	(4) 3/0 - 750, (7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14
ПСР	800	(4) 3/0 - 750, (7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14
	1200	(4) 3/0 - 750, (7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14
HCP-SU	800	(4) 3/0 - 750, (7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14
HCR-U	1200	(4) 3/0 - 750, (7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14
HUK-U	1200	(7) 6 - 350, (9) #1/0 - 14, (34) #4 - 14

^{8.} These wire ranges may require a box extension to meet UL/CSA wire bending requirements. Do not use for standard panelboard purposes. Only the wires sizes and counts as shown in the column immediately to the right are available in the standard dimensioned panelboard. Contact factory any time cable requirements do not match standard panelboard to determine box size needed.

Branch or Group Mounted Main Circuit Breaker Terminal Data

Circuit Breaker	Frame Size	Ampere Rating	Terminal Lug Wire Size
BD, BG, BJ	125 A	15–125	#14-2/0 Al/Cu
ВК	125 A	15–30	#14–2/0 Al/Cu
HD, HG, HJ, HL, HR	150 A	15–150	#14-3/0 Al/Cu
QB, QD, QG, QJ	225 A	70–225	#4-300 kcmil Al/Cu
JD, JG, JJ, JL	250 A	150–175	#4-4/0 AI/Cu
JD, JG, JJ, JL, JR	250 A	200–250	#3/0-350 kcmil Al/Cu
LA, LH	400 A	125–400	(1) #1-600 kcmil or (2) #1-250 kcmil Al/Cu
LG, LJ, LL, LR	400 A	250	(1) #2-600 kcmil CU or (1) #2-500 kcmil AL
LG, LJ, LL, LR	600 A	400–600	(2) #2-500kcmil AL/CU
MG, MJ	800 A	300–800	(3) 3/0-500 kcmil Al/Cu ⁹
PG, PJ, PK ¹⁰ , PL	1200 A	250-800	(3) 3/0-500 kcmil Al/Cu ⁹
PG, PJ, PK ¹⁰ , PL	1200 A	1000–1200	(4) 3/0-500 kcmil Al/Cu
RG, RJ, RK ¹⁰ , RL	1200 A	1000–1200	(4) 3/0-600 kcmil Al/Cu

NOTE: Lugs are rated for 75°C wire. Torque values are listed on the circuit breaker faceplate tables.

^{9.} On HCP/HCP-SU type interiors a Side Extension is required for the optional (4) 3/0 -500 kcmil or (2) 3/0 -750kcmil lug sizes. Contact factory.

factory.

10. For use in Canada Only

Plug-On Lugs Terminal Data

(used as either a subfeed lug or on Universal Panelboards as a back fed main lug)

Plug-On Lugs



Amperage Rating	Frame Size	Catalog No.	Terminal Lug Wire Size		
250 A	250 A	SL250	(1) #4-300 kcmil Al/Cu		
400 A	400 A	SL400	(1) #1-600 kcmil Al/Cu or (2) #1-250 kcmil Al/Cu		
800 A	800 A	SL800M5	(3) 3/0 AWG-500 kcmil		
1200 A	1200 A	SL1200P5	(4) 3/0 AWG-500 kcmil		
1200 A	1200 A	SL1200P6	(3) 350-600 kcmil		
1200 A	1200 A	SL1200P7	(3) 3/0 AWG-750 kcmil (750 kcmil: Compact Al only		
1200 A ¹¹	1200 A	S33930	(4) 3/0-600 kcmil Al/Cu		

Circuit Breaker Accessories

- Shunt trip
- · Undervoltage trip
- Alarm switch
- · Auxiliary contacts
- · Ground-fault shunt trip

NOTE: All accessories, except for the Ground-fault shunt trip are field installable for LA, LH circuit breakers.

For detailed information on circuit breakers and accessories, refer to the Digest.

Circuit Breaker	Digest Table Number
HD, HG, HJ, HL	7.99, 7.100
QB, QD, QG, QJ	7.100
JD, JG, JJ, JL	7.99, 7.100
LA, LH	7.61
LG, LJ, LL, LR	7.99, 7.100
MG, MJ	7.99, 7.100
PG, PJ, PK ¹² , PL	7.99, 7.100
RG, RJ, RK ¹² , RL	7.99, 7.100

^{11.} For 100% rated applications ("R" frame breakers).

^{12.} For use in Canada Only

Plug-On QO™ Distribution Panel (Catalog No. HQO306)

QO with Visi-Trip™ Indicator 1-, 2-, and 3-Pole



- Six-pole, 240 Vac maximum
- Use with QO, QO-H, QO-VH, QH, and Qwik-Gard[™] plug-on circuit breakers through 30 A. For detailed information, refer to DP Catalog Class 730 and 910.
- · Mounts in all I-Line panelboards.

QO Distribution Panel Branch Circuit Breakers

Qwik-Gard Circuit Breaker with Ground Fault Circuit Interrupter



Distribution Channel Type	Number of Poles & Amperages		
	1-Pole 10–30 A		
10 k AIR, QO	2-Pole 10–30 A		
	3-Pole 10–30 A		
10 k AIR, QO-GFI	1-Pole 15–30 A ¹³		
TO KAIN, QO-GIT	2-Pole 15–30 A ¹³		
	1-Pole 15–30 A		
22 k AIR, QO-VH	2-Pole 15–30 A		
	3-Pole 15–30 A		
22 k AIR, QO-VHGFI	1-Pole 15–30 A ¹³		
	1-Pole 15–30 A		
65 k AIR, QH	2-Pole 15–30 A		
	3-Pole 15–30 A		

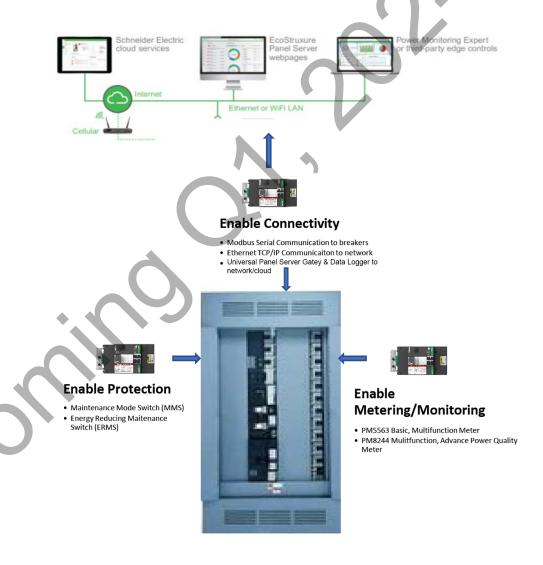
^{13.} Maximum of three GFI-suffix circuit breakers can be installed.

I-Line Enable Modules

I-Line Enable Modules (formerly known as Smart Cells) are a space-saving module for value-added digital solutions. The self-contained unit fits onto the I-Line bus taking up only a 6-inch circuit breaker mounting space and using the same mounting as a circuit breaker. This allows the I-Line panelboard to be transformed into a digital communication or metered electrical distribution solution with enhanced protection now or in the future.

I-Line Enable modules are available for:

- · IFM Modbus serial network communications interface
- Energy Reduction Maintenance Setting (ERMS)
- Maintenance Mode Switch (MMS)
- PM5563 or PM8244 meter with or without communications
- Universal Panel Server Gateway & Data Logger for Ethernet networking or cloud-based solutions

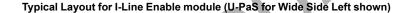


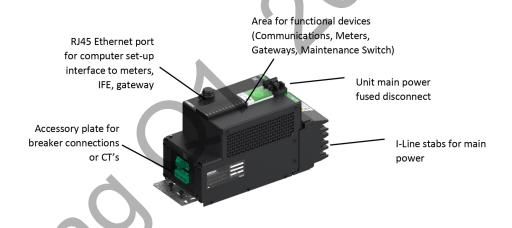
Product Description

I-Line Enable modules are compact, self-contained plug-on devices intended for installation on I-Line panelboard bus. Each module includes I-Line stab power connections for module functions as well as 24Vdc connections for trip units of connected circuit breakers. A main power disconnect with fuses is provided to denergize main power and for short circuit protection of the unit. An interface is provided on the front of some of the units for an RJ45 Ethernet programming (Meters/U-PaS) via connected computer.

Narrow side I-Line Enable modules can only be installed on the narrow side of HCJ, HCP, and HCR I-Line Panelboards, as well as Switchboard QED2 I-Line Distribution Section. Wide side I-Line Enable modules can be installed on the wide side of HCP, HCPSU, HCR I-Line Panelboards, as well as Switchboard QED2 I-Line Distribution Section. I-Line Enable module placement in the Panelboard is typically directly above the related MAIN or feeder circuit breaker.

The I-Line Enable modules can be included in Square D I-Line factory assembled equipment or ordered individually for field installations such as Retrofit or RTI. For more information refer to Handout (998-22301121_US) or User Guide (JYT97577).





Features



- Space-saving design significantly reduces carbon footprint and fits onto the I-Line bus in place of a circuit breaker; eliminating the need for an I-Line panelboard box extension
- Easy to install; a screwdriver is all that's needed to mount I-Line Enable Module; mounts firmly onto the bus stack and fastens with captive retaining screws
- Minimizes impact of project changes, allowing customers to add components to an I-Line panelboard after shipment or for future upgrade.
- I-Line Enable Module is available in factory-assembled panelboards as well as ready-to-install (RTI) for new and retrofit applications

Reduced exposure

- On models with Ethernet communications, front access makes checking breaker meter values and maintenance details quicker and safer than ever
- On meter models, branch level metering is integrated into the panelboard, no need to remove trim to access meter points

Integration of value-added devices

· Easily integrate digital solutions without increasing equipment footprint

 Reduce retrofit installation costs with a quick install I-Line Enable Module meter options

NOTE: Uses 6 inches of bus space, the same as an L-frame circuit breaker.

Protection Modules

Energy Reduction Maintenance Setting (ERMS) meets NEC 2014 code (Section 240.87) requirements and reduces arc energy during maintenance to improve electrical personnel safety. ERMS trip setting offers electronic adjustability for coordination (factory-assembled only). Consists of two-position ON-Off selector switch and I/O module of interface with P/R frame circuit breakers equipped with Micrologic 5.0 or higher P or H trip units. 24 Vdc power supply for I/O module and breaker trip unit is provided for customer to wire. Several versions are available and include Ethernet Modbus TCP/IP communications connections or Modbus Serial communications connections. See table below for standard number of connections and additional connections available with field additions.

ERMS module shown, Wide Left



Catalog Number	Voltage Vac	Features	Number of circuit breakers unit will communication to as standard	Additional number of circuit breakers unit can communicate to with Field Kit* added	Total possible number of communicat- ing circuit breakers per module
ICWL2222ERMS	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, ERMS - Ethernet communications	1	0	1
ICWR2222ERMS	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, ERMS - Ethernet communications	1	0	1
ICWL2422ERMS	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, ERMS - Ethernet communications	1	0	1
ICWR2422ERMS	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, ERMS - Ethernet communications	1	0	1
ICWL2222ERM2	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, ERMS - Modbus communications	2	2 (IFMs)	4
ICWR2222ERM2	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, ERMS - Modbus communications	2	2 (IFMs)	4
ICWL2422ERM2	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, ERMS - Modbus communications	2	2 (IFMs)	4
ICWR2422ERM2	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, ERMS - Modbus communications	2	2 (IFMs)	4

Catalog Number	Voltage Vac	Features	Number of circuit breakers unit will communication to as standard	Additional number of circuit breakers unit can communicate to with Field Kit* added	Total possible number of communicat- ing circuit breakers per module
ICWL2622ERM2	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, ERMS - Modbus communications	1	0	1
ICWR2622ERM2	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, ERMS - Modbus communications	1	0	1

*Kits for IFM Install

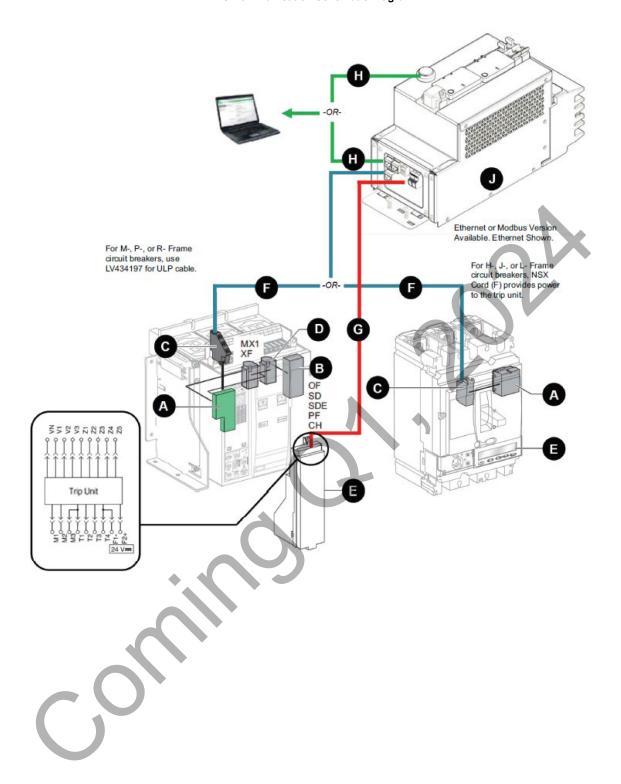
(Refer to Instruction Bulletin JYT97577 for details regarding expanding the module using IFM Kits)

Part Number	Description
ICIFM1	IFM Kit (Qty 1)
ICIFM5	IFM Kit (Qty 5)

NOTES:

- When ERMS is installed, Zone Selective Interlocking (ZSI) cannot be used on the same breaker.
- The P/R frame circuit breakers should be equipped with LSI or LSIG features and Micrologic trip units 5.0/6.0, P/H.
- MMS or ERMS/ERM2 is required per NEC for a Panelboard that utilizes a 1200 A Main circuit breaker or larger. It is optional on circuit breakers smaller than 1200 A.
- ERMS is not available with H/J/L frame circuit breakers.
- ERMS can be applied to back-fed main breakers and branch breakers.
- Each P/R frame circuit breaker to be used with the ERMS Smart Cell will require the suffix E1.
- Each breaker to be communicated with will require an NSX Cord and BSCM communication module. See schematic below.
 - o □ P/R NSX Cord (0.35m) = LV434195
 - □ P/R NSX Cord (1.35m) = LV434196
 - o □ P/R NSX Cord (3.00m) = LV434197
 - □ P/R Breaker BSCM (replacement unit) =S64205
- ERM2 modules contains two IFMs for 480 V or less versions and one IFM for 600 V versions. One of the IFMs is used to communicate to the MAIN breaker that is utilizing the ERMS functionality. The second IFM and any additional IFMs added by Field Kits is for communication to additional circuit breakers, preferably an H/J/L Frame version.
- I-Line Enable Communication modules from Communication Modules section below can be added to the panel to provide space for more circuit breaker communication connections.

ERMS Communication Schematic Diagram

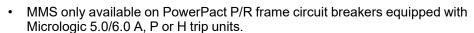


Maintenance Mode Setting (MMS) switch can be used to temporarily reduce the short-time delay setting of a Powerpact P/R-frame circuit breaker. MMS meets the National Electrical Code (NEC) 240.87 requirements for arc flash reduction. The switch can reduce a short-time delay (STD) setting from 0.3 seconds to 0.08 seconds or less. For an MMS-controlled circuit breaker to be effective for arc-flash reduction, the circuit breaker short-time current pickup setting (considering positive tolerance) must be set below 85% of the minimum arcing current at the system location where it is expected to provide "fast" interruption (considering all fault current scenarios in an arc flash study).





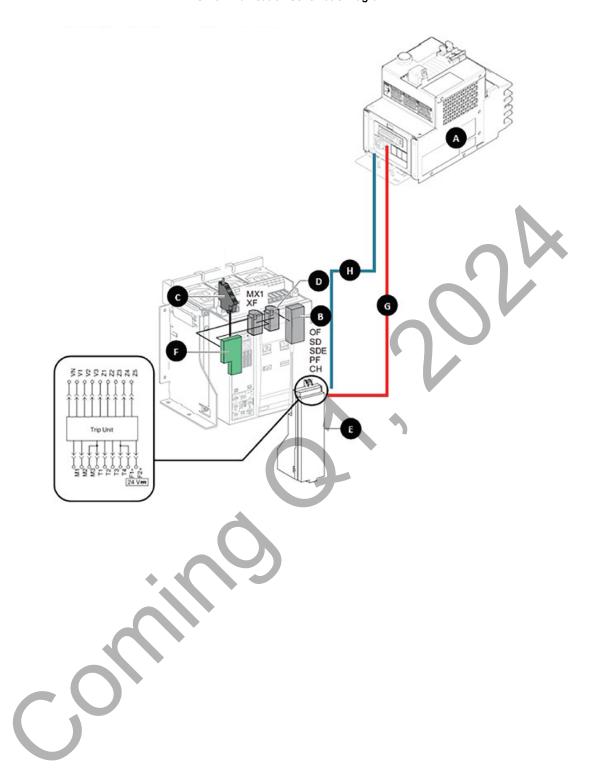
Catalog Number	Voltage Vac	Features
ICNL2222MMS	120–240	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Left, Maintenance Mode Switch
ICNR2222MMS	120–240	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Right, Maintenance Mode Switch
ICNL2422MMS	277–480	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Left, Maintenance Mode Switch
ICNR2422MMS	277–480	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Right, Maintenance Mode Switch
ICWL2222MMS	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, Maintenance Mode Switch
ICWR2222MMS	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, Maintenance Mode Switch
ICWL2422MMS	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, Maintenance Mode Switch
ICWR2422MMS	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, Maintenance Mode Switch
ICWL2622MMS	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, Maintenance Mode Switch
ICWR2622MMS	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, Maintenance Mode Switch



- When MMS is installed, Zone Selective Interlocking (ZSI) cannot be used on the same circuit breaker.
- MMS or ERMS/ERM2 is required for a Panelboard that utilizes a 1200 A Main circuit breaker. It is optional on circuit breakers smaller than 1200 A.
- MMS is not available on H/J/L frame circuit breakers.
- MMS can be applied to back-fed main circuit breakers and branch circuit breakers.
- Refer to MFR70008 Maintenance Mode Switch (MMS) Installation Instructions.

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MMS Communication Schematic Diagram

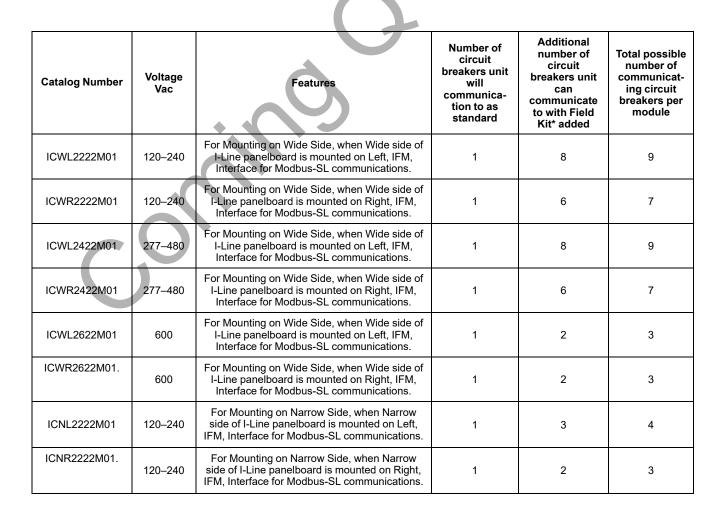


Communication Modules

I-Line Enable Communications Modules facilitate Ethernet connected electrical distribution devices to help customers reduce downtime, manage energy use, and improve operational efficiency. Modules feature real-time monitoring of Square D PowerPact with Micrologic circuit breakers, as well as a variety of other power distribution and monitoring devices. The solution collects data in real time and can send configurable email alerts to allow remote monitoring. The data can be used to pinpoint and immediately address troublesome areas and help facilitate a predictive maintenance program.

The modules consist of a 24 Vdc power supply with main power disconnect, communication device (IFM for Modbus Serial or both). For 600 V modules, a step-down transformer, and an additional Isolation module, mandatory to ensure data integrity on the ULP network is included. The accessory plate (see Figure MMS Communication Schematic Diagram) has available RJ45 ports for a certain numberr of circuit breakers to be communicated with as standard with room for expansion to additional breakers by adding parts in the field (see Catalog Number table below).

IFM module, Right 120-480 V



Catalog Number	Voltage Vac	Features	Number of circuit breakers unit will communication to as standard	Additional number of circuit breakers unit can communicate to with Field Kit* added	Total possible number of communicat- ing circuit breakers per module
ICNL2422M01	277–480	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Left, IFM, Interface for Modbus-SL communications.	1	3	4
ICNR2422M01	277–480	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Right, IFM, Interface for Modbus-SL communications.	1	2	3



*Kits for IFM Install

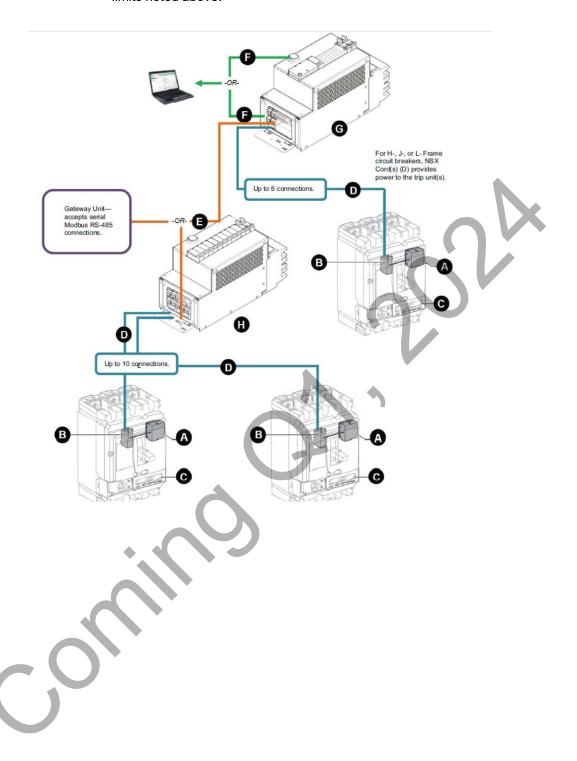
(Refer to Instruction Bulletin JYT97577 for details regarding expanding the module using IFM Kits)

Part Number	Description
ICIFM1	IFM Kit (Qty 1)
ICIFM5	IFM Kit (Qty 5)

NOTES:

- Narrow Side units are not available for greater than 480 Vac.
- Maximum of 11 IFM interfaces can be physically connected to one UPaS Interface. This can be used for applications that have the lowest performance requirement and are recommended for simple applications.
- Maximum of eight UPaS interfaces should be used for applications that
 require regular access via the IFE web pages or that have other primaries
 communicating, such as FDM128 display. This normally provides a
 reasonable response time for up to three primaries.
- Each circuit breaker communications application will require an NSX Cord and BSCM communication module.
- H-/J-/L- frame breakers will require the suffix EH or EL.
- Each P-/R- frame circuit breaker to be used for communications will require the suffix E1.
- P-/R- Frame Circuit breakers require that the trip unit be powered externally
 when the breaker is in the "OFF" position. This may be accomplished by
 utilizing the external 24 Vdc power source provided by the IFM version of the
 Wide Side communicating versions of I-Line Enable module or a Narrow Side
 Power Supply Only version may be utilized. No other power source would be
 required. The U-PaS units do not include a 24 Vdc output.
- H-/J-/L- Frame circuit breakers are powered via the ULP Connections. No other external power supply sources are required for these breakers when utilizing any Communication I-Line Enable module version (Wide Side or Narrow Side).
- When adding IFMs to the I-Line Enable modules, count the number of communicating circuit breakers, "X+. For IFM I-Line Enable modules, catalog numbers ICW*2*22M01, the additional number of IFMs would be X-1. Refer to Instruction Bulletin, JYT97577 for additional components required for each additional IFM.
- For each additional IFM for 600 V systems it will require qty. 1 of 600 V Isolation Module and Comms Cord.

Multiple Communication Modules (IFM) can be connected to UPaS to provide a serial network of breakers to an Ethernet network as shown below, respecting limits noted above.



EcoStruxure Panel Server Module

EcoStruxure Panel Server is a gateway, providing connection of wired smart IoT devices to edge control software or cloud application. Connect most of Modbus/RS485 and Modbus/TCP devices from the market including Power Meters and Protection devices from Schneider Electric. User friendly web pages offer first-level of monitoring of measurements of all the connected devices including log of all alarms. Simple troubleshooting of the system through embedded web pages with advanced diagnostic information and logs. Easy commissioning through embedded web pages or with EcoStruxure Power Commission software that will offer commissioning reports and advanced features. Refer to Ecostruxure Panel Server Technical Leaflet (PLSED310196EN) for more information.

The modules consist of a 24 Vdc power supply with main power disconnect and Ethernet Gateway/Cloud Server (catalog # PAS600L) communication device. For 600 V modules, a step-down transformer is included. Two Ethernet ports are provided for networking: one for customer SCADA system and one for possible daisy-chaining of other I-Line Enable modules or Ethernet communicating equipment. In addition, a front bulkhead connector for computer software programming and access to the U-PaS panel server component.

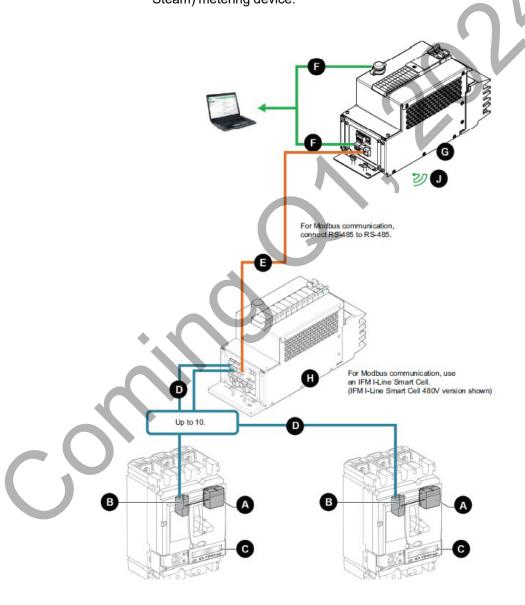
Ecostruxure Panel Server I-Line Enable Module



Catalog Number	Voltage Vac	Features
ICWL222XUPAS	120-240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, Universal Panel Server
ICWR222XUPAS	120–240	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, Universal Panel Server
ICWL242XUPAS	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, Universal Panel Server
ICWR242XUPAS	277–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, Universal Panel Server
ICWL262XUPAS	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, Universal Panel Server
ICWR262XUPAS	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, Universal Panel Server
ICNL222XUPAS	120–240	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Left, Universal Panel Server
ICNR222XUPAS	120–240	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Right, Universal Panel Server
ICNL242XUPAS	277–480	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Left, Universal Panel Server
ICNR242XUPAS	277–480	For Mounting on Narrow Side, when Narrow side of I-Line panelboard is mounted on Right, Universal Panel Server

NOTES:

- Connect U-PaS to either a Modbus communicating device or a Communicating I-Line Enable module (IFM Only Version) via RS-485 port (2-wire Modbus). See diagram below.
- U-PaS I-Line Enable module can be connected to either an Ethernet communicating device or an Ethernet network via the dual Ethernet ports, ETHER 1 or ETHER 2. See diagram below. Daisy-chaining of multiple Ecostruxure Panel Server I-Line Enable modules is also possible via the dual Ethernet ports.
- Ecostruxure Panel Server I-Line Enable modules do not have space to add IFM devices nor do they have a 24 Vdc output. It is intended to connect to downstream IFM I-Line Enable modules.
- Two digital outputs (dry contact type) are standard and can be re-configured via Ecostruxure Power Commission (EPC) software as pulse type inputs, used to count pulses delivered by as WAGES (Water, Air, Gas, Electricity, Steam) metering device.



Metering Modules

I-Line Enable Metering modules are available for various voltage systems. Below is a chart for which meter packages are available for the various voltage configurations offered.

	Metering Syst	em Available
Applicable Voltage System	PM5563	PM8244
208Y/120 3P4W	X	Х
480Y/277 3P4W	X	X*
240/120 3P4W	X	Х
240 3P3W	X	Х
240 3P3W GND B	_	7 -
480 3P3W	Х	12
480 3P3W GND B	- (-
600 3P3W	7	_
600Y/347 3P4W	X*	X*
120/240 1P3W	X*	X*
480Y/227 1P3W	X*	X*
240 1P2W	X*	X*
600 1P2W	X*	X*
220Y/110 3P4W	X	Х
230Y/115 3P4W	Х	Х
380Y/220 3P4W	Х	Х
415Y/240 3P4W	X	Х
110/220 1P3W	X*	X*
115/230 1P3W	X*	X*
127/220 1P3W	X*	X*

^{*}Requires Neutral Connection to I-Line Enable module

Power Meters

PM5563 is a basic, multi-function meter with a backlit LCD remote display. The meter provides Class 0.2S accuracy per IEC 62053-22 standard and 128 samples per cycle. The meter will measure Energy, Active and Reactive Power, Voltage, Current, Frequency, Power Factor and up to the 63rd Harmonic. Include 1.1 Megabytes of memory for up to 14 selectable parameters with configurable interval and duration. Communication protocol are Modbus RTU and ASCII two wires with RS485 port support plus Modbus TCP/IP, Ethernet/IP and BACnet/IP based on 10/100 Mbit/s, daisy chain Ethernet with RJ45 port support. The embedded communication capabilities allow the support of the DNP 3.0 protocol, the access to an onboard web server. The meter also has four digital inputs with WAGES support and two digital outputs.

These modules contain a 3-pole main fused disconnect to remove power from the inside of the unit while installed on the I-Line bus stack, meter device, CT (Split Core Current Transformer) connection terminals, front local Ethernet bulkhead connector for meter programming, two Ethernet ports networking: one for customer SCADA system and one for possible daisy-chaining of other I-Line Enable modules or Ethernet communicating equipment, two digital inputs and two digital outputs for customer alarms.

Power Meter Series I-Line Enable Module

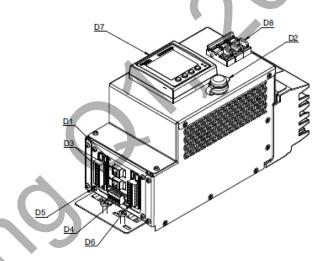


Table 2 - Power Meter 5563 Series Catalog Numbers

Catalog Number	Voltage Vac	Features
ICWL243X5563	120–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, PM5563 meter
ICWR243X5563	120–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, PM5563 meter
ICWL263X5563	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, PM5563 meter
ICWR263X5563	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, PM5563 meter

NOTES:

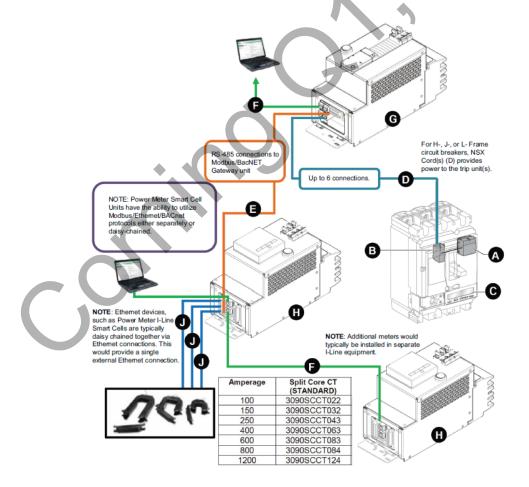
 Power Meter 5563 series I-Line Enable modules require a set of iron core current transducers (CTs) be installed by the customer or factory installed on fully assembled I-Line panelboards. Select transducer kits from the following list based on the specific amperage rating:

100 A	3090SCCT022
150 A	3090SCCT032
250 A	3090SCCT043
400 A	3090SCCT063
600 A	3090SCCT083
800 A	3090SCCT084
1200 A	3090SCCT124

- Power Meter 5563 Series I-Line Enable modules include a Shorting Block Kit
 to be installed prior to installing the module in the panelboard according to the
 instructions packaged with the kit.
- See PowerLogic Catalog (PLSED309005EN) for more information.

The Power Meter 5563 Series I-Line Enable module can be connected to a Communications I-Line Enable module with UPaS gateway, by connecting the RS-485 2-wire Modbus connection. It is also possible to daisy chain the Power Meter I-line Enable module Cell via Ethernet connections. See diagram below.

Power Meter Series Communication Schematic Diagram



PowerLogic PM8244 meters are compact, cost-effective multifunction advanced power quality meters that will help you ensure reliability and efficiency of your power-critical facility. They reveal and provide understanding of complex power quality conditions enabling action to be taken to mitigate issues. With patented Disturbance Direction Detection, revenue grade accuracy, multiple communication ports, onboard power quality analysis, web interface and a color graphical display.

These modules contain a 3-pole main fused disconnect to remove power from the inside of the unit while installed on the I-Line bus stack, meter device, CT (Split Core Current Transformer) connection terminals, front local Ethernet bulkhead connector for meter programming, 2 Ethernet ports networking: 1 for customer SCADA system and 1 for possible daisy-chaining of other I-Line Enable modules or Ethernet communicating equipment, 2 digital inputs & 2 digital outputs for customer alarms.

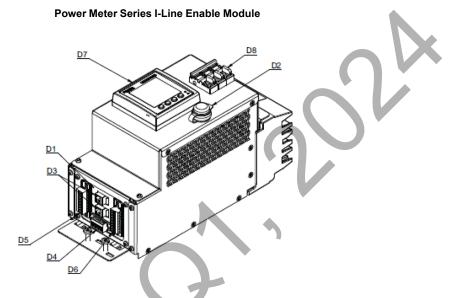


Table 3 - Power Meter 8244 Series Catalog Numbers

Catalog Number	Voltage Vac	Features
ICWL243X8244	120–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, PM8244 meter
ICWR243X8244	120–480	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, PM8244 meter
ICWL263X8244	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Left, PM8244 meter
ICWR263X8244	600	For Mounting on Wide Side, when Wide side of I-Line panelboard is mounted on Right, PM8244 meter

NOTES:

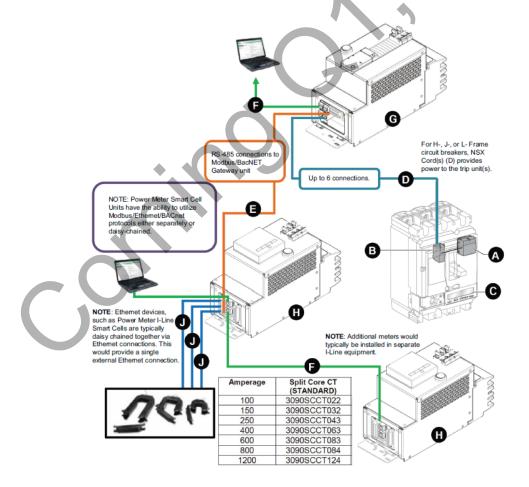
 Power Meter 8244 series I-Line Enable modules require a set of iron core current transducers (CTs) be installed by the customer or factory installed on fully assembled I-Line panelboards. Select transducer kits from the following list based on the specific amperage rating:

100 A	3090SCCT022
150 A	3090SCCT032
250 A	3090SCCT043
400 A	3090SCCT063
600 A	3090SCCT083
800 A	3090SCCT084
1200 A	3090SCCT124

- Power Meter 8244 Series I-Line Enable modules include a Shorting Block Kit
 to be installed prior to installing the module in the panelboard according to the
 instructions packaged with the kit.
- See PowerLogic Catalog (PLSED309005EN) for more information.

The Power Meter 8244 Series I-Line Enable module can be connected to a Communications I-Line Enable module with UPaS gateway, by connecting the RS-485 2-wire Modbus connection. It is also possible to daisy chain the Power Meter I-line Enable module Cell via Ethernet connections. See diagram below.

Power Meter Series Communication Schematic Diagram

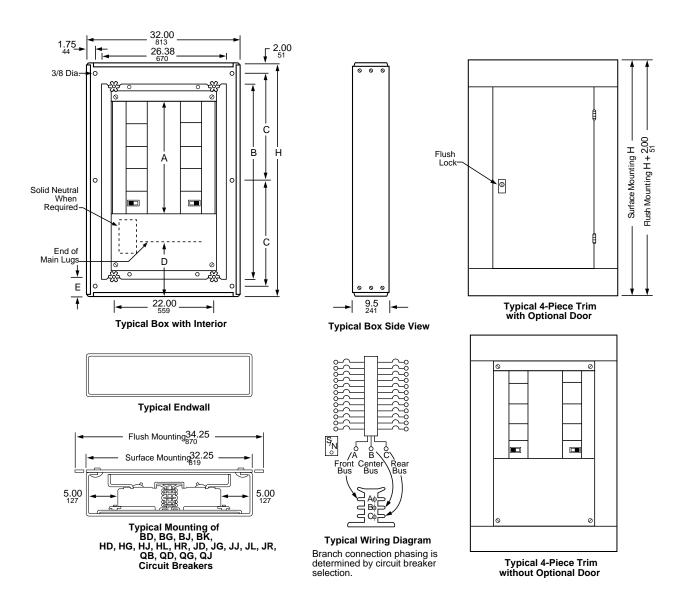


I-Line Enable modules provided with Power Meter 5563 or 8244 require different numbers of CTs based on the Voltage and Wiring configurations. Refer to the chart below for the number of CTs required.

Applicable Voltage System	Qty of CTs Required (minimum)
208Y/120 3P4W	4
480Y/277 3P4W	4
240/120 3P4W	4
240 3P3W	3
240 3P3W GND B	3
480 3P3W	3
480 3P3W GND B	3
600 3P3W	3
600Y/347 3P4W	4
120/240 1P3W	2
480Y/227 1P3W	2
240 1P2W	1
600 1P2W	1
220Y/110 3P4W	4
230Y/115 3P4W	4
380Y/220 3P4W	4
415Y/240 3P4W	4
110/220 1P3W	2
115/230 1P3W	2
127/220 1P3W	2

Dimensions for Standard NEMA Type 1 Enclosures

Type HCJ—800 A Maximum Main Lugs



Main Lugs			I	В	С		D		E			
Ampere Rating	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
	48	1219	13.5	343	30	762	21.85	555	14.9	378	9.3	236
400–800	73	1854	31.5	800	48	1219	22.9	582	18.4	467	12.8	325
	91	2311	49.5	1257	66	1676	28.9	734	18.4	467	12.8	325

H = Box height for surface mount panel

A = Circuit breaker mounting space (x2 for double row)

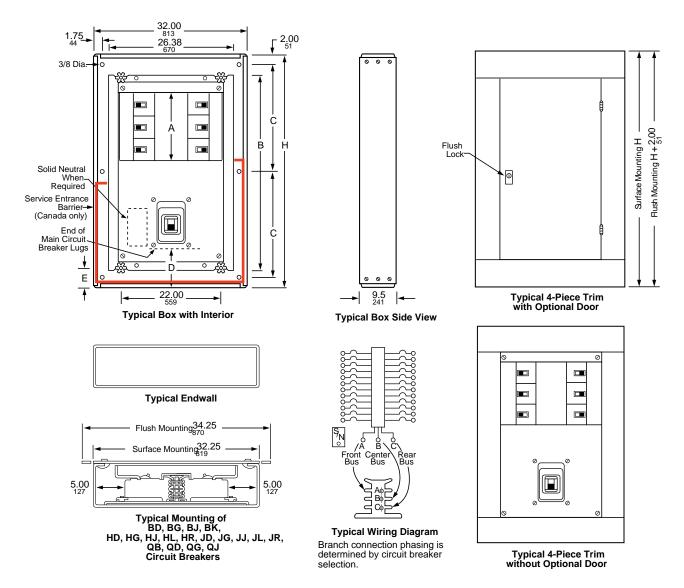
B = Total height of interior

C = Height between box mounting holes center to center

D = Distance between end of panel and end of main lugs or main circuit breaker lugs

E = Distance between end of panel and interior mounting studs.

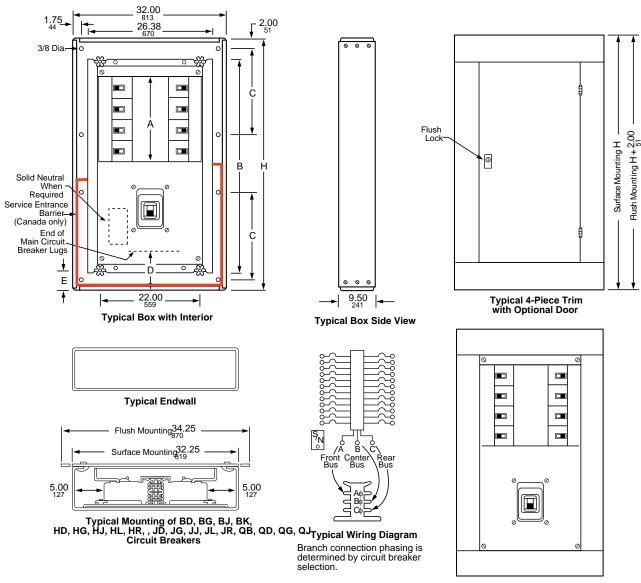
Type HCJ 400 A Maximum Main Circuit Breaker



Main Circuit Breaker Ampere Rating	Н		Α		В		С		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
400	64	1626	13.5	343	48	1219	22.9	582	16.96	431	12.8	325
	73	1854	22.5	572	48	1219	22.9	582	16.96	431	12.8	325
	91	2311	40.5	1029	66	1676	28.9	734	16.96	431	12.8	325

- H = Box height for surface mount panel
- A = Circuit breaker mounting space (x2 for double row)
- B = Total height of interior
- C = Height between box mounting holes center to center
- D = Distance between end of panel and end of main lugs or main circuit breaker lugs
- E = Distance between end of panel and interior mounting studs.

Type HCJ—800 A Maximum Main Circuit Breaker



Typical 4-Piece Trim without Optional Door

Main Circuit Breaker Ampere Rating	Н		Α		В		С		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
600–800	73	1854	18	457	48	1219	22.9	582	18.68	474	12.8	325
	91	2311	36	914	66	1676	28.9	734	18.68	474	12.8	325

H = Box height for surface mount panel

A = Circuit breaker mounting space (x2 for double row)

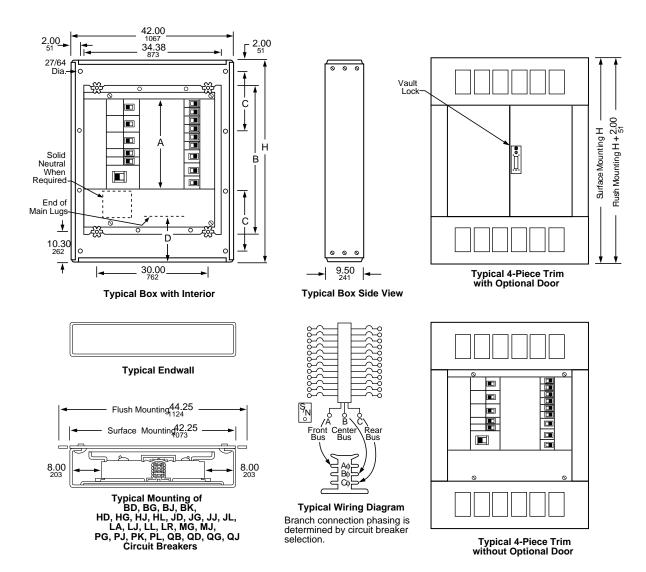
B = Total height of interior

C = Height between box mounting holes center to center

D = Distance between end of panel and end of main lugs or main circuit breaker lugs

E = Distance between end of panel and interior mounting studs.

Type HCP—800 A Maximum Main Lugs



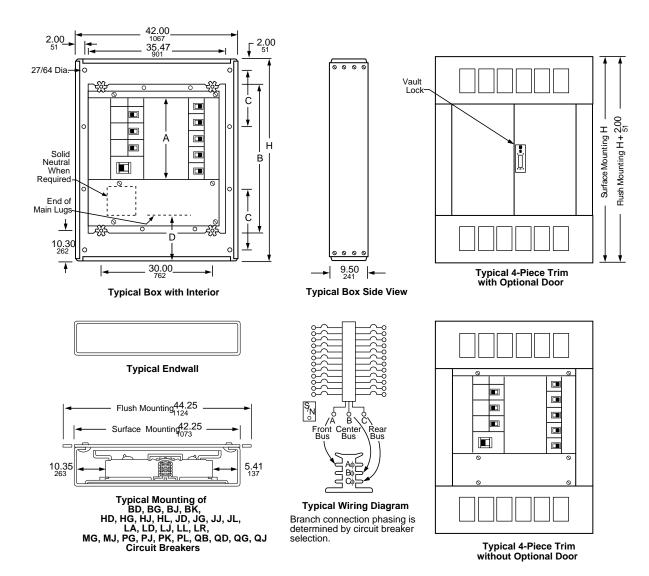
Main Lugs	н		A		В		С		D	
Ampere Rating	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
	50	1270	13.5	343	30	762	22.85	580	17.5 ¹⁴	44514
400,000	59	1499	22.5	572	39	991	27.35	695	17.5 ¹⁴	445 ¹⁴
400–800	68	1727	31.5	800	48	1219	31.85	809	17.514	44514
	86	2184	49.5	1257	66	1676	27.23	692	17.5 ¹⁴	44514

- H = Box height for surface mount panel
- A = Circuit breaker mounting space (x2 for double row)
- B = Total height of interior
- C = Height between box mounting holes center to center
- D = Distance between end of panel and end of main lugs or main circuit breaker lugs
- E = Distance between end of panel and interior mounting studs.

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^{14.} For 800 A dimension D = 16.32 in, or 415 mm)

Type HCP—1200 A Maximum Main Lugs



Main Lugs	н		Α		В		С		D	
Ampere Rating	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
	50	1270	13.5	343	30	762	22.85	580	16.32	415
4000	59	1499	22.5	572	39	991	27.35	695	17.5	445
1200	68	1727	31.5	800	48	1219	31.85	809	17.5	445
	86	2184	49.5	1257	66	1676	27.23	692	17.5	445

H = Box height for surface mount panel

A = Circuit breaker mounting space (x2 for double row)

B = Total height of interior

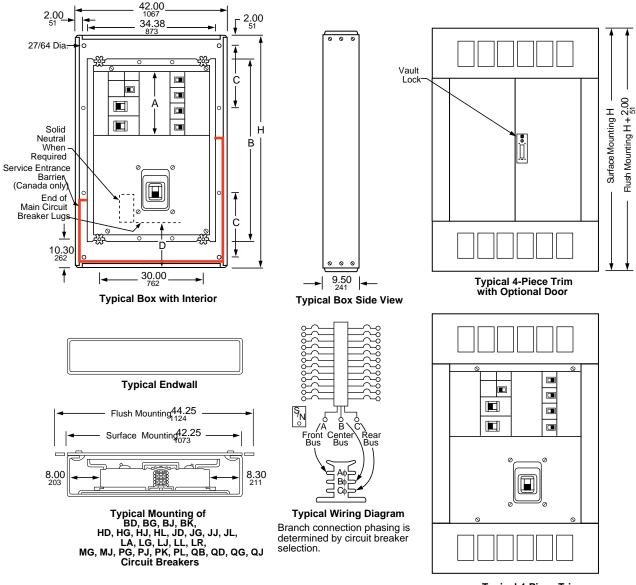
C = Height between box mounting holes center to center

D = Distance between end of panel and end of main lugs or main circuit breaker lugs

 $\ensuremath{\mathsf{E}}$ = Distance between end of panel and interior mounting studs.

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Type HCP—800 A Maximum Main Circuit Breaker



Typical 4-Piece Trim without Optional Door

Main Circuit	H	1	A	4	E	3	O)
Breaker Ampere Rating	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
600–800	68	1727	18	457	48	1219	31.85	809	18.68	474
800–800	86	2184	36	914	66	1676	27.23	692	18.68	474

H = Box height for surface mount panel

A = Circuit breaker mounting space (x2 for double row)

B = Total height of interior

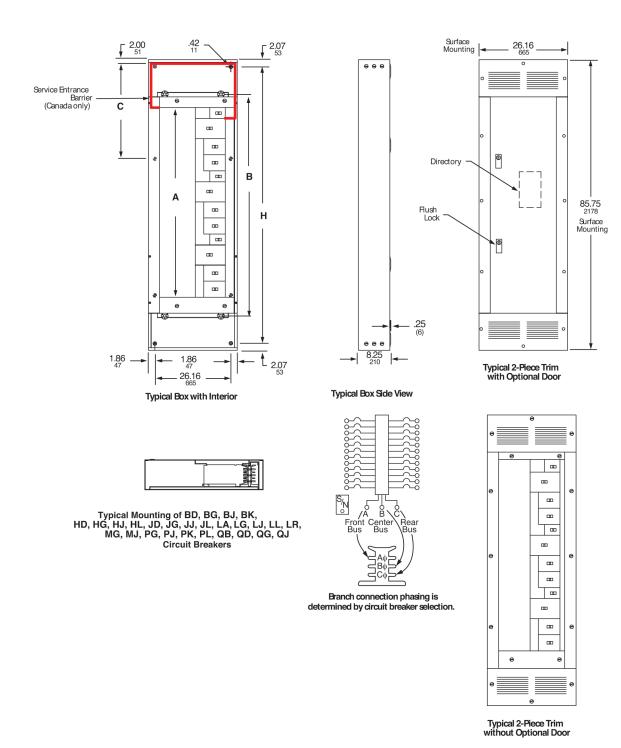
C = Height between box mounting holes center to center

D = Distance between end of panel and end of main lugs or main circuit breaker lugs

E = Distance between end of panel and interior mounting studs.

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Type HCP-SU—800 A Maximum Main Circuit Breaker



Main Circuit Bre	aker		Н	A	A	E	В	C	;
Ampere Ratir	g	in.	mm	in.	mm	in.	mm	in.	mm
800		86	2184	54	1372	65.4	1661	27.23	692

H = Box height for surface mount panel

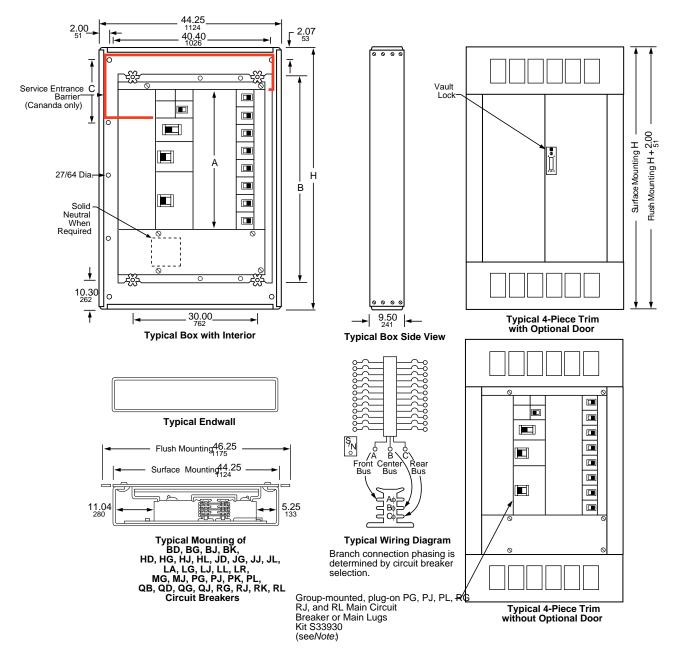
A = Circuit breaker mounting space

B = Total height of interior

C = Height between box mounting holes center to center

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Type HCR-U—1200 A Main Lugs or Main Circuit Breaker



Main Lugs or Main	ŀ	1	A	4	E	3	(;
Circuit Breaker Ampere Rating	in.	mm	in.	mm	in.	mm	in.	mm
1200	86	2184	54	1372	65.1	1654	18	457

H = Box height for surface mount panel

A = Circuit breaker mounting space

B = Total height of interior

C = Height between box mounting holes center to center

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I-Line Panelboard Estimated Weights

I-Line MLO Panelboard—Type 1

Ampere Rating	I-Line Interior	Total Circuit Breaker Mounting Height	Interior Weight ¹⁵	Box Weight	4 Piece Trim Weight	Neutral	Ground Bar	Total PB less C/B's
		27	94	78	22			200
800A	HCJ	45	115	99	27	5		247
800A	ПСЈ	63	140	111	32	5		289
		99	190	135	37			368
800A	HCP-SU	54	180	140	32	9	1	362
		27	140	104	39		ı	294
1200A	HCP	45	175	121	39	10		346
1200A	ПСР	63	206	136	41	10		394
		99	268	167	45			491
1200A	HCR-U	108	215	185	49	10		460

I-Line MLO Panelboard—Type 1 with door

Ampere Rating	I-Line Interior	Total Circuit Breaker Mounting Height	Interior Weight ¹⁵	Box Weight	Trim with door weight	Neutral	Ground Bar	Total PB less C/B's
		27	94	78	45			223
800A	HCJ	45	115	99	59	5		279
000A	ПСЛ	63	140	111	67	5		324
		99	190	135	83			414
800A	HCP-SU	54	180	140	92	9	1	422
		27	140	104	68		'	323
1200A	HCP	45	175	121	78	10		385
1200A	TICE	63	206	136	92	10		445
		99	268	167	108			554
1200A	HCR-U	108	215	185	110	10		521

I-Line MLO Panelboard—Type 3R

Ampere Rating	I-Line Interior	Total Circuit Breaker Mounting Height	Interior Weight ¹⁵	Type 3R Box & Trim Weight	Neutral	Ground Bar	Total PB less C/B's
		27	94	250			350
800A	HCJ	45	115	268	5		389
BOUA	псл	63	140	278	5		424
		99	190	338		1	534
A008	HCP-SU	54	180	352	9	ı	542
		27	140	270			421
1200A	HCP	45	175	305	10		491
		63	206	340			557

^{15.} All of the interior weights include copper bus.

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		99	268	419		698
1200A	HCR-U	108	215	492	10	718

	Weight
Copper neutral	2
100 A Sub Feed Lugs	5
250 A Sub Feed Lugs	6
400 A Sub Feed Lugs	10
800 A Sub Feed Lugs	17
1200 A Sub Feed Lugs, 9"	28
1200 A Sub Feed Lugs, 15"	42
I-Line SPD	23

NOTE: For all panelboards, add all circuit breaker weights from circuit breaker catalog. For Main Circuit Breaker panelboards, use MLO Panelboard weight and add main breaker weight from circuit breaker catalog.

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Appendix—Merchandise Unit Catalog Numbers

Table 4 - Interiors, Boxes and Fronts

Total Circuit Breaker Mains Ampere Rating Catalog Number	Catalog Number	NEMA 3R/5/12 18 (Includes Front) Catalog Number barrier kit. HCJ3248WP	Box Height (In.)
Catalog Catalog Number	Number t breaker and service	Number b barrier kit.	48
3-pole—Suitable for use as service equipment when provided with a main circuit 400 A			48
27 HCJ14484CU HCJ14486 HCJ14486CU 800 A HCJ14488	HC3248DB9	HCJ3248WP	48
27 HCJ14484CU HCJ14486 HCJ14486CU 800 A HCJ14488	HC3248DB9	HCJ3248WP	48
600 A HCJ14486CU 800 A HCJ14488	HC3248DB9	HCJ3248WP	48
HCJ14486CU 800 A HCJ14488			
400 A HCJ23734			 _
1007.			<u></u>
45 600 A HCJ23736			
800 A HCJ23738			
HCJ32734			
400 A HCJ32734CU HCM73T()D	HC3273DB9	HCJ3273WP	73
63 HCJ32736			
600 A HCJ32736CU			
800 A HCJ32738			
400 A HCJ50914			
99 600 A HCJ50916 HCM91T() HCM91T()D	HC3291DB9	HCJ3291WP	91
800 A HCJ50918			
HCJ Main Circuit Breaker ¹⁹ , Includes 3-pole, vertically mounted main circuit breaker		•	
27 400 A HCJ14734M			
600 A HCJ18736MP			
36 HCM73T()D HCM73T()D	HC3273DB9	HCJ3273WP	73
45 400 A HCJ23734M			
72 600 A HCJ36916MP			
HCJ41914MCU HCM04T()	1100001755	110 1000 1115	6.4
81	HC3291DB9	HCJ3291WP	91
800 A HCJ36918MP			
HCP-SU ²⁰ Universal Single Row Main Lugs or Main Circuit Breaker 3-pole—Suitable for use as service equipment when provided with a main circuit breaker panel, order plug-on I-Line type PG, PJ, PL, MG, or MJ circuit breakers fr (order solid neutral from).			
54 800 HCP54868SU HC2686T()4P HC2686T()HR ²	HC2686DB	HC2886WP	86

^{16.} Add "F" for flush mount, "S" for surface mount.

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^{17.} For Type 1 applications, order interior, front, and box. For Type 3R/5/12 applications, order interior and box only. The front is included with the box.

^{18.} Remove drain screws for Type 3R rating.

Bottom feed standard.

^{20.} For main lugs panel, order sub-feed lug kit and back-feed as main lugs.

^{21.} Hinged trim with door.

Table 5 - (1200 A Interiors Include solid neutral, all others without solid neutral) 22

Total		Max.	Interior Assembly	Fro	nt ²³		
Circuit Breaker	Mains Amp.	No. of	(Less Branch Circuit Breakers)	4 Piece Trim Without Door ²⁵	Trim With Door	Box ²⁴	Box Height
Mtg. Space	Rating	Circuit	Catalog	Catalog	Catalog	Catalog	(ln.)
(ln.)		Breakers	Number	Number	Number	Number	
HCP Main L	ugs Only—	3-pole		1		l	
Suitable for	use as servi	ce equipment when	provided with a main circuit b	reaker and service b	arrier kit.		
	400		HCP14504				
	600	15.	HCP14506	LIOM/FOT()	LIOWEOT/ \D	HC4250D-	
27	800	1PL	HCP14508	- HCW50T()	HCW50T()D	В	50
	1200		HCP145012N				
	400		HCP23594				
45	600	an.	HCP23596	HCWEOT()	HCW59T()D	HC4259D-	50
45	800	2PL	HCP23598	- HCW59T()	HCW591()D	В	59
	1200		HCP235912N]			
	400		HCP32684				
63	600	3PL	HCP32686	HCW68T()	HCW68T()D	HC4268D-	68
03	800	3PL	HCP32688	1100001()	TICWOOT()D	В	00
	1200		HCP326812N				
	400		HCP50864				
99	600	5PL	HCP50866	HCW86T()	HCW86T()D	HC4286D-	86
99	800	JI L	HCP50868	11000001()	11000001()B	В	80
	1200		HCP508612N				
		ker—Includes 3-pole	9				
vertically mo		circuit breaker		1		<u> </u>	
36	600	2LC	HCP18686M	HCW68T()	HCW68T()D	HC4268D- B	68
	800		HCP18688M				
72	800	4LC	HCP36866M HCP36868M	HCW86T()	HCW86T()D	HC4286D- B	86
1 2			HL.P.3DXDXIVI	i	l	_	l

For Main Circuit Breaker panel, order plug-on I-Line type PG, PJ, PL, RGC, RJC, or RLC 27 circuit breakers from and, and back feed as the main circuit breaker. (Order solid neutral separately)

108 28	1200	6PL or 3RLC	HCR548612U	HCR86T() ²⁹	HCR86T()D	HC4486D- B	86
--------	------	-------------	------------	-------------------------	------------	---------------	----

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Order solid neutral separately for 800 A and below. Add "F" for flush mount, "S" for surface mount.

For 42 in. wide weatherproof enclosures,replace "DB" suffix with "WP" Type 3R/5/12 Enclosures

Add-on door kit available. Example: For HCW50TS trim kit, order HCW50D door kit.

When RL main circuit breakers with equipment ground fault are applied on a 3Ø4W system, order solid neutral catalog number HCR12SNCT. The HCR12SNCT includes a neutral current transformer.

When RL main circuit breakers with equipment ground fault are applied on a 3Ø4W system, order solid neutral catalog number HCR12SNCT.

The HCR12SNCT includes a neutral current transformer.

¹⁵ in. of mounting space is taken up by the back fed main lug kit or RG, RJ, RL main circuit breaker, leaving 93 in. of branch circuit breaker mounting space.

Add-on door kit available. Example: For HCR86TS trim kit, order HCW86D door kit.

Glossary

C

Circuit Breaker Communication Module (BSM or BSCM):

A module which, when installed in a circuit breaker, receives and transmits information on the communication network.

Com'X:

A compact plug and play gateway and data logger and is an essential part of an entry level energy management system.

Ε

EcoStruxure Panel Server Universal (U-PaS):

A Wireless Concentrator, Modbus Gateway, and Energy Server.

Energy Reduction Maintenance Setting (ERMS):

Square D brand PowerPacT P-, R-Frame, and MasterPacT circuit breakers, manufactured by Schneider Electric, provide arc flash protection characteristics. Additional components can be integrated to increase the options available to reduce the arc flash incident energy (AFIE).

L

Low Voltage Current Transducer (LVCT):

The PowerLogic LVCTxxx series of 1 or 0.333 volt split-core current transducers provide secondary voltage AC proportional to the primary (sensed) current.

M

Maintenance Mode Switch (MMS):

A switch that is used to reduce the typical short-time delay (STD) from 0.30 seconds to 0.08 seconds or less. Used only in conjunction with trip units that have the Short-time Zone Selective Interlocking (ST-ZSI) capability.

MicroLogic:

The family of electronic trip systems available on molded case circuit breakers, insulated case circuit breakers, and low-voltage power circuit breakers.

Modbus Communication Interface Module (IFM):

This module, required for connection to the network, contains the Modbus address (1 to 99) declared by the user using the two rotary switches on the front of the unit. It automatically adapts (baud rate, parity) to the Modbus network in which it is installed.

N

NSX Cord:

A shielded communication cable consisting of two twisted pairs of stranded wire that is typically black/red and blue/white color. The NSX Cord has an RJ45 jack at one end, and four wires terminated into a small terminal block on the other end. This is used with PowerPacT H, J, or L breakers. If the terminal block is not needed, it can be removed.

U

Universal Logic Plug (ULP) Cable:

The Circuit Breaker ULP Cord has an RJ45 jack at one end, and at the other end, the four wires are ready to be connected into screw terminals of an accessory such

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as a communication module. This is used with PowerPacT P, R, and MasterpacT NT and NW breakers to connect the BCM to the communication network.

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Schneider Electric 1415 S. Roselle Road Palatine, IL 60067 USA

888-778-2733

www.se.com

As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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2110CT9701

VA - ATL - TRINKA DAVIS CLC

Revision #: 2

Created Date: 2023-06-08

Revised Date: 2024-01-08

Company Name: Hoffman Hoffman

Contact Name: Joe Schrader

Prepared By: Haleigh Longo

SELECTION ONLY

Not for Submittal. Contact Oxygen8 for final submittals prior to ordering.



Performance

Unit Tag: DOAS-1 - WITH ERV

Summary				
Unit Details				
Unit Tag:	DOAS-1 - WITH ERV	Orientation:	Vertical	
Model:	V50IN-ERV - (4000-4800 CFM)	ESP SA / RA (inH2O):	0.75 / 0.75	
Qty:	1	Filters OA / RA:	4" 85% MERV-13 / 4" 30% MERV-8	
Location:	Indoor	Controls Preference:	Constant Volume	
Altitude (ft):	1027	Dampers & Actuator:	Factory Mounted and Wired	
Bypass:	No			

Electrical Requirements

Total Number of Connections Required: 1

Unit		D-controller
Voltage:	208V/3ph/60Hz	Qty: 2
Range:	200 - 240V	
FLA:	34.73	
MCA:	36.88	
MROPD:	45.48	
RFS:	45A	

Unit and Daikin controller(s) will be single-point power

Heat Exchanger

Design Condtions	Outdoor Air	Return Air
SCFM:	4550	4550
Summer DB (F) / WB (F) / RH (%):	91.6 / 73.9 / 44.3	75 / 63 / 51.2
Winter DB (F) / WB (F) / RH (%):	26.4 / 26.3 / 98.8	70 / 52.9 / 30

Performance Leaving Air	Supply Air	Exhaust Air
Summer SCFM:	4550	4550
Winter SCFM:	4550	4550
Summer DB (F) / WB (F) / RH (%):	78.9 / 66.4 / 52.5	87.7 / 70.8 / 44.5
Winter DB (F) / WB (F) / RH (%):	59.5 / 46.9 / 37.8	36.9 / 34 / 75.5

Performance	Summer	Winter
Supply Air PD (inH2O):	0.57	0.53
Exhaust Air PD (inH2O):	0.56	0.56
Sensible Effectiveness %:	76.4	75.9
Latent Effectiveness %:	65.0	66.4
Total Effectiveness %:	70.1	74.4
EATR %:	0.0	0.0
OACF:	1.00	1.00
Net Supply Airflow (SCFM):	4660	4185
Energy Recover Ratio %:	71.61	73.46
BTUH:	134267	190738
Supply Condensation (USgal/hr):	0.000	0.000
Exhaust Condensation (USgal/hr):	0.000	0.000



Summer performance: Certified in accordance with the AHRI ERV Certification Program, which is based on AHRI Standard 1060. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Winter performance: Application rating is outside the scope of the AHRI ERV Certification Program but is rated in accordance with AHRI Standard 1060.

SELECTION ONLY

Not for Submittal Use

Cooling DX

Coil	
Model:	DXM05C14- 25.00x56.00R
Fin Height:	25
Fin Length:	56
Face Area:	9.7
FPI:	14
Rows:	5
Total Feeds:	12
Fin Surface:	Flat
Fin Material:	0.0075 Aluminum
Tube Material:	0.016 Copper
Tuba Curfaces	Cmooth

Tube Surface: Smooth 130.3 Coil Weight (lbs): Suction Size (in): 1.125

Coil Style: Interlaced 2 Circuits

Qty Conn. / Header: 2

Entering	
Airflow (CFM):	4550
DB (F):	78.9
WB (F):	66.4
Refrigerant:	R-410A
Refrig. Suction Temp (F):	43
Refrig. Liquid Temp (F):	77
Refrig. Superheat Temp (F):	9

Setpoint DB (F): 55

Coil Performance	
Capacity (MBH):	187.4
Capacity Sensible (MBH):	121.2
DB (F):	54.7
WB (F):	53.1
Air Vel (FPM):	468
Air PD (IWG):	0.4
Internal Vol (cu.in):	717.5
Refrig. PD (psi):	7.249

VRV Integration Kit

AHU Integration Valve Kit Type:

Daikin Manufacturer:

Model: EKEXV250

Qty of Valves:

Heating DX

Coil	
Model:	DXM05C14- 25.00x56.00R
Fin Height:	25
Fin Length:	56
Face Area:	9.7
FPI:	14
Rows:	5
Total Feeds:	12
Fin Surface:	Flat
Fin Material:	0.0075 Aluminum
Tube Material:	0.016 Copper
Tube Surface:	Smooth

Entering	
Airflow (CFM):	4550
DB (F):	59.5
Refrigerant:	R-410A
Refrig. Cond. Temp (F):	115
Refrig. Vapor Temp (F):	140
Refrig. Subcooling Temp (F):	5.4

Setpoint	
DB (F):	72
Capacity (MBH):	61.5

SELECTION ONLY

Not for Submittal Use

Reheat Hot Gas Reheat Coil

Coil	
Model:	CDM02C08-25x56R
Fin Height:	25
Fin Length:	56
Face Area:	9.7
FPI:	8.0
Rows:	2
Total Feeds:	6
Fin Surface:	Flat
Fin Material:	0.006 Aluminum
Tube Material:	0.016 Copper
Coil Weight (lbs):	54.3
Connection Size (in):	0.825

Entering	
Airflow (CFM):	4550
DB (F):	55
Refrigerant:	R-410A
Refrig. Cond. Temp (F):	115
Refrig. Subcooling Temp (F):	5.4

Setpoint	
DB (F):	70
Coil Performance	
	04.0
Capacity (MBH):	91.8
DB (F):	73.6
Air Vel (FPM):	468
Air PD (IWG):	0.08
Internal Vol (cu.in):	286.3
Refrig. PD (psi):	3.04

VRV Integration I	Kit
-------------------	-----

Qty Conn. / Header:

Coil Style:

Type: AHU Integration Valve Kit

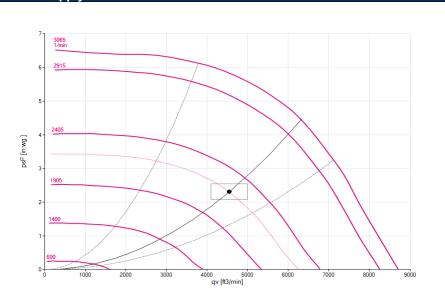
Face Split 2 Circuits

Manufacturer: Daikin
Model: EKEXV100

Qty of Valves: 2

Supply Fan

Fan	
Model: Fan motor: Type:	GR35C-ZID.DC.CR ECM, direct drive Plenum
Nominal values for s	ingle fan
Power Input (KW):	2.70
FLA (A):	17.20
Operating point for t	wo fans
Power Input (KW):	1.98
Current (A):	5.48
RPM:	2214
SFP (W/CFM):	0.43
Filter Pressure Drop:	:
Included in TSP and fan curve (in w.g.):	0.50
Clean filter (in w.g.):	0.40
Dirty filter (in w.g.):	1.00



Exhaust Fan

Fan

Model: GR35C-ZID.DC.CR
Fan motor: ECM, direct drive
Type: Plenum

Nominal values for single fan

Power Input (KW): 2.70 FLA (A): 17.20

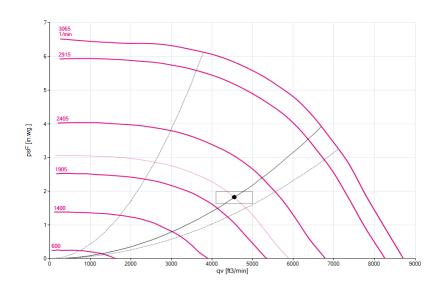
Operating point for two fans
Power Input (KW): 1.61
Current (A): 4.49
RPM: 2093
SFP (W/CFM): 0.35

Filter Pressure Drop:

Included in TSP and 0.50

fan curve (in w.g.):

Clean filter (in w.g.): 0.25 Dirty filter (in w.g.): 1.00



Unit Sound Data									
	63	125	250	500	1000	2000	4000	8000	dB (A)
Unit Radiated	72	72	71	63	58	56	48	43	66
Supply Fan Lw: 4550 CFM	80	75	85	81	82	78	73	69	86
Exhaust Fan Lw: 4550 CFM	79	77	84	81	82	77	72	68	85

^{*}Sound data are estimate

NOMENCLATURE:

SA - SUPPLY AIR

RA - RETURN AIR

OA - OUTDOOR AIR

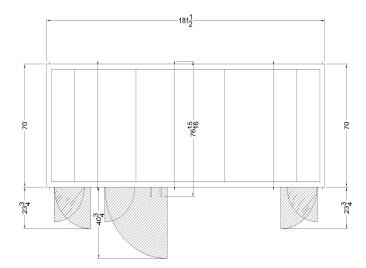
EA - EXHAUST AIR

NOTES:

36" OF CLEARANCE MUST BE MAINTAINED PERPENDICULAR TO THE ELECTRICAL BOX AS PER THE NATIONAL ELECTRIC CODE (NEC).

UNIT DIMENSIONS SHOWN ARE IN INCHES

OVERALL UNIT DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.



SECTION WEIGHT (lbs) FAN-FILTER SECTION 814 COIL SECTION 927 CORE SECTION 1975 FAN-FILTER SECTION 822

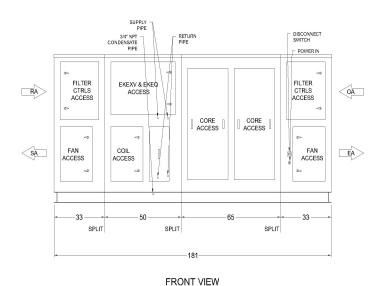
NOTES:

SECTION WEIGHTS EXCLUDE COIL WEIGHTS

REFER TO COIL SELECTION FOR COIL WEIGHTS

SECTION WEIGHTS ARE SHIPPING WEIGHTS NOT OPERATIONAL

TOP VIEW



55³/₄
OPENING

69¹/₂
70⁷/₁₆
72¹¹/₁₆

RIGHT VIEW

31 OPENING OPENING OPENING

LEFT VIEW

THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DRAWING AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO THIRD PARTIES WITHOUT EXPLICIT AUTHORIZATION IS

PROHIBITED.

OA MERV13: 16x16 (3), 16x16 (3)

FILTERS

OXYGEN

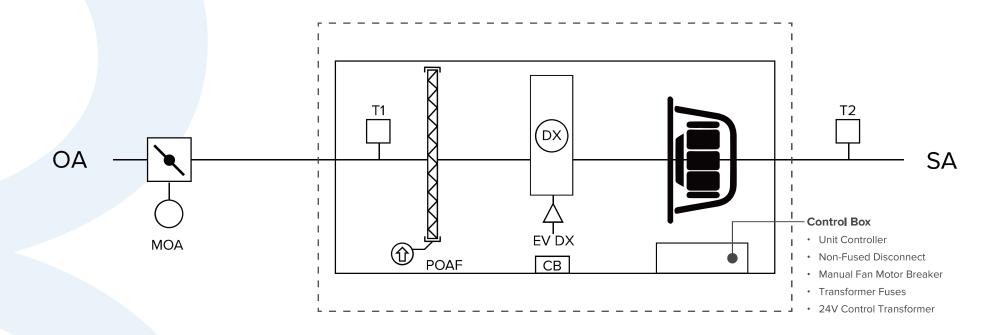
1575 Vernon Drive, Vancouver, British Columbia, V6A 3P8, Canada

RA MERV8: 16x16 (3), 16x16 (3)

	SALES DRAWING		Rev: B	Size: B	Scale: 1:40		
_ [Description: VENTUM V50 ERV STD IDU LH FP2 NO DP HGC						
3	Draw No: VENTUM_V50_ERV_S_I_L_S2_ND_08						
	Drawn By: E. Q.	Drawn Date: 2	2023-04-10	Installation: BASE MOUN			
	Appd By: D. N.	Appd Date: 2	2023-05-04	Weight: 4538	LBS		

ALL DIMENSIONS ARE IN INCHES

Control Points: Terra + DX Coil + Dampers



Sensor Legend

MOA - Outdoor Air Damper Actuator

T1 - Outdoor Air Temperature Sensor

T2 - Supply Air Temperature Sensor

POAF - Outdoor Air Filter Pressure Sensor

Symbol Legend



Damper



Expansion Valve



Fan



Daikin Control



Temperature Sensor



DX Coil Post-Cooling



Electric Preheat Coi**l**



Hot Gas Reheat Coil

Sequence of Operations

Airflow Control: Constant Air Volume

Supply air fan maintains constant speed to provide setpoint airflow rates for low and high speed during operation time. Fan speeds will automatically adjust to compensate for changes in air density due to temperature fluctuations and to overcome filter loading.

Temperature Control

Unit controller sends 0-10V signal to Daikin W-Controller to adjust DX coil valves to maintain set point for discharge air temperature control.



Daikin VRV Responsibility Chart for Terra and Ventum+

	Coil	Daikin Controller Installation	EEV Brazing to Coil	Thermistors Installation	O8 Unit & Daikin Controller Interlocking	Power	Piping to Outdoor Unit	Daikin Controller & ODU Interlocking	O8 Unit & ODU Interlocking
Oxygen8 Factory	X	X	X	X	X	X			
Mechanical Contractor							X		
Controls Contractor								Х	Х
Electrical Contractor									

Responsibility Descriptions

DX Coil / HGRH Coil

Oxygen8 is responsible for supplying and factoryinstalling DX and/or HGRH coil(s) matching Daikin coil selection parameter requirements.

Daikin Controller

Daikin Representative is responsible for supplying Daikin Controller(s). Oxygen8 is responsible for factory-mounting them on the coil casing section and factory wiring between Daikin Controller(s) and EEV kit(s).

Note: Only for W-Controller (ABC Terminal [BRP2A82] with 3T,4T, and 5T outdoor units)

EEV

Daikin Representative is responsible for supplying Daikin EEV kit(s). Oxygen8 is responsible for factory-mounting and brazing them to the coil. Coil and EEV kit(s) to be factory tested at 700psi and nitrogen charged.

Thermistors

Daikin Representative is responsible for supplying Thermistors. Oxygen8 is responsible for factory-installing Daikin gas and liquid thermistors and wiring back to the Daikin Controller.

O8 Unit & Daikin Controller Interlocking

Unit coil casing section with EEV kit(s) brazed to the coil, with Daikin Controller(s) mounted on the section will ship attached to the unit. Oxygen8 is responsible for running wiring between Daikin controller(s) and Oxygen8 Unit controller.

Power

Daikin controller(s) will be powered through Oxygen8 unit. Unit and Daikin controller(s) will be single-point power connection.

Piping to ODU

Mechanical contractor is responsible for running the gas and liquid line piping to ODU.

Daikin Controller & ODU Interlocking

Controls contractor to run 18-2 wire between the W-Controller and ODU.

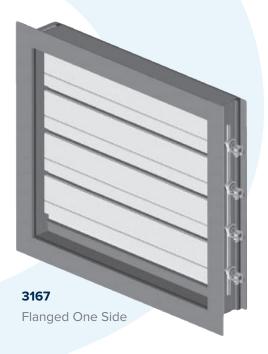
O8 Unit & ODU Interlocking

Controls contractor to wire between the Unit controller and ODU.

For questions and concerns, please contact the Oxygen8 Applications Team | applications@oxygen8.ca

Airfoil Blade Control Dampers

Model: 3167



STANDARD CONSTRUCTION

Depth	4" (101 mm) - 3167
Depth with Blades Open	6.125" (156 mm)
Minimum Height	8" (203 mm) - Single Blade 15" (381 mm) - Multiple Blade
Maximum Panel Width	48" (1219 mm)
Maximum Panel Height	60" (1524 mm)
Maximum Panel Size	20 sq. ft.
Maximum System Pressure	See chart on page 2.
Operating Temperature Range	-40° to +180°F
Standard Finish	Mill
Standard Motor Installation	6" Side Shaft Direct Drive
Linkage	Outside of Frame
Blade End Cap	Nylon

AVAILABLE ACCESSORIES

4" blade construction

Factory supplied actuators
End switch for signaling peripheral devices
Jack shaft
Hand quadrants
Chain operation for manual operation spring closed
Silicone blade and jamb seals

FRAME 0.081" Extruded 6063-T5 Aluminum

BLADE 0.063" Extruded 6063-T5 Aluminum

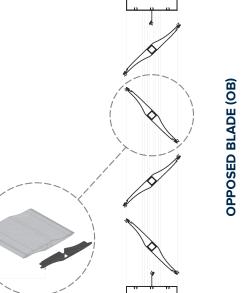
BEARINGS Celcon Inner Bearing Within a Polycarbonate Outer Bearing

BLADE SEALS Santoprene

AXLES 3/6" Aluminum Square Bar

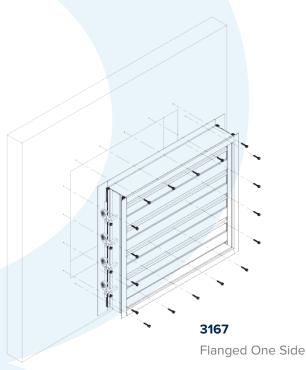
JAMB SEALS Santoprene

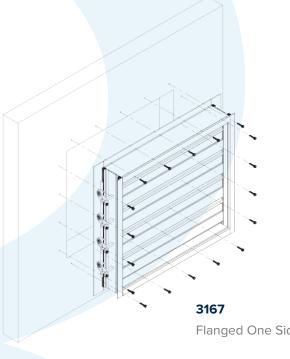
BLADE END CAP (Standard) Nylon

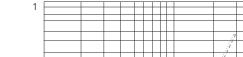


Airfoil Blade Control Dampers

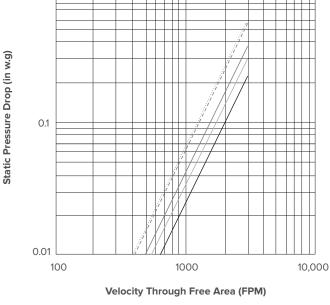
Model: 3167



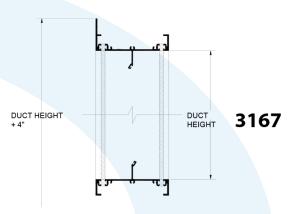




PRESSURE DROP

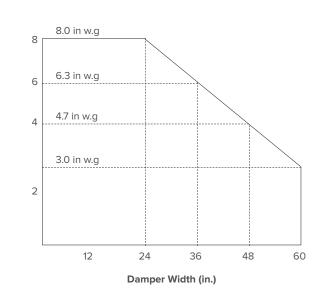






Clearance = 1/4" Overall for Single Panel Construction Clearance = 1/2" Overall for Multiple Panel Construction

PRESSURE LIMITATIONS



RECOMMENDED SPECIFICATION

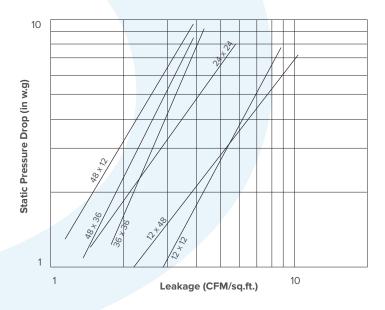
Furnish and install control damper models 3167 as manufactured by Alumavent, Bolton Ontario. Dampers shall be 4" (101 mm) deep. Blades shall be 0.063" (1.60 mm) thick, hollow airfoil shape. Frames shall be 0.081" (2.06 mm) thick. Axles shall be 0.375" (9.53 mm) thick, Aluminum square bar. Blade and Jamb seals shall be Santoprene. Linkage is concealed outside of frame for model 3167. Air leakage through a 48"x " damper shall not exceed 8 CFM/ ft2 (40.6 L/s/m2) against 4" w.g (1 kPa) static pressure at standard air. Operating temperature range shall be -40° to +180°F.

Pressure (in w.g)

Airfoil Blade Control Dampers

Model: 3167

LEAKAGE



Leakage test was conducted in accordance with AMCA Standard 500-D-98. Holding torque applied was 6 in - lbs/sq.ft on parallel blade dampers. Air leakage is based on operation between 0°C - 49°C (32°F - 120°F).

DAMPER LEAKAGE RATING

Damper Size	Pressure in w.g (kPa)					
Daniper Size	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)			
12" x 12" (305 x 305 mm)	1A	1	1			
24" x 24" (610 x 610 mm)	1A	1	1			
36" x 36" (914 x 914 mm)	1A	1	1			
12" x 48" (305 x 1219 mm)	1A	1	1			
48" x 12" (1219 x 305 mm)	1A	1	1			
48" x 36" (1219 x 914 mm)	1A	1	1			

DEFINITION OF LEAKAGE CLASSIFICATION

Class	Leakage ft²/min/ft² (L/s/m²)					
Class		1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)		
1A		3 (15.2)	N/A	N/A		
1		4 (20.3)	8 (40.6)	14 (71.1)		
2		10 (50.8)	20 (102)	35 (178)		
3		40 (203)	80 (406)	140 (711)		



Rotary actuator fail-safe for adjusting dampers in technical building installations

- Air damper size up to approx. 0.5 m²
- Torque motor 2.5 Nm
- Nominal voltage AC/DC 24 V
- Control Open/close



Fechnical data						
Electrical data	Nominal voltage	AC/DC 24 V				
	Nominal voltage frequency	50/60 Hz				
	Nominal voltage range	AC 19.228.8 V / DC 21.628.8 V				
	Power consumption in operation	2.5 W				
	Power consumption in rest position	1.5 W				
	Power consumption for wire sizing	5 VA				
	Connection supply / control	Cable 1 m, 2 x 0.75 mm ²				
	Parallel operation	Yes (note the performance data)				
Functional data	Torque motor	2.5 Nm				
	Torque fail-safe	2.5 Nm				
	Direction of motion motor	selectable by mounting L/R				
	Direction of motion fail-safe	selectable by mounting L/R				
	Manual override	No				
	Angle of rotation	Max. 95°				
	Angle of rotation note	adjustable starting at 37% in 2.5% steps (with mechanical end stop)				
	Running time motor	75 s / 90°				
	Running time fail-safe	<25 s / 90°				
	Sound power level, motor	50 dB(A)				
	Mechanical interface	Universal shaft clamp 612.7 mm				
	Position indication	Mechanical				
	Service life	Min. 60'000 fail-safe positions				
Safety	Protection class IEC/EN	III Safety Extra-Low Voltage (SELV)				
	Degree of protection IEC/EN	IP42				
	EMC	CE according to 2014/30/EU				
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14				
	Mode of operation	Type 1.AA				
	Overvoltage category	III				
	Rated impulse voltage supply / control	0.8 kV				
	Control pollution degree	3				
	Ambient temperature	-3050°C				
	Storage temperature	-4080°C				
	Ambient humidity	Max. 95% r.H., non-condensing				

1.5 kg

Weight

Weight



Safety notes



- The device must not be used outside the specified field of application, especially not in aircraft or in any other airborne means of transport.
- Outdoor application: only possible in case that no (sea) water, snow, ice, insolation
 or aggressive gases interfere directly with the actuator and that is ensured that the
 ambient conditions remain at any time within the thresholds according to the data
 sheet.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.
- The device may only be opened at the manufacturer's site. It does not contain any
 parts that can be replaced or repaired by the user.
- · Cables must not be removed from the device.
- The device contains electrical and electronic components and must not be disposed
 of as household refuse. All locally valid regulations and requirements must be
 observed.

Product features

Mode of operation

The actuator moves the damper to the operating position at the same time as tensioning the return spring. The damper is turned back to the safety position by spring energy when the supply voltage is interrupted.

Simple direct mounting

Simple direct mounting on the damper shaft with a universal shaft clamp, supplied with an anti-rotation device to prevent the actuator from rotating.

Adjustable angle of rotation

Adjustable angle of rotation with mechanical end stops.

High functional reliability

The actuator is overload protected and automatically stops when the end stop is reached.

Accessories

Mechanical	accessories

Description	Type
Actuator arm	AH-TF
Shaft extension 170 mm Ø10 mm for damper shaft Ø 616 mm	AV6-20
Ball joint suitable for damper crank arm KH8 / KH10	KG10A
Ball joint suitable for damper crank arm KH8	KG8
Damper crank arm Slot width 8.2 mm, clamping range Ø1018 mm	KH8
Screw fastening kit	SB-TF
Angle of rotation limiter, with end stop	ZDB-TF
Form fit adapter 8x8 mm	ZF8-TF
Mounting kit for linkage operation for flat and side installation	ZG-TF1
Anti-rotation mechanism 180 mm, Multipack 20 pcs.	Z-ARS180

Electrical installation



Notes

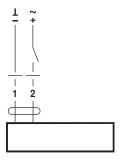
- · Connection via safety isolating transformer.
- Parallel connection of other actuators possible. Observe the performance data.



Electrical installation

Wiring diagrams

AC/DC 24 V, open/close



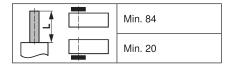
Cable colours:

1 = black

2 = red

Dimensions [mm]

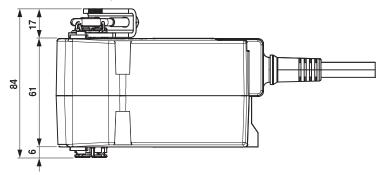
Spindle length

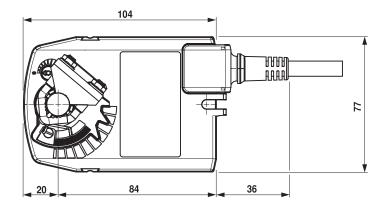


Clamping range

OI	♦1				
612.7	612.7				

Dimensional drawings









Technical data						
Electrical data	Nominal voltage	AC/DC 24 V				
	Nominal voltage frequency	50/60 Hz				
	Nominal voltage range	AC 19.228.8 V / DC 21.628.8 V				
	Power consumption in operation	6 W				
	Power consumption in rest position	2.5 W				
	Transformer sizing	8.5 VA				
	Electrical Connection	18 GA appliance cable, 1 m, with 1/2" conduit connector				
	Overload Protection	electronic throughout 095° rotation				
	Electrical Protection	actuators are double insulated				
Functional data	Torque motor	90 in-lb [10 Nm]				
	Direction of motion motor	selectable by ccw/cw mounting				
	Direction of motion fail-safe	reversible with cw/ccw mounting				
	Manual override	5 mm hex crank (3/16" Allen), supplied				
	Angle of rotation	95°				
	Angle of rotation note	adjustable with mechanical end stop, 3595°				
	Running Time (Motor)	75 s / 90°				
	Running time fail-safe	<20 s @ -4122°F [-2050°C], <60 s @ -22°F [-30°C]				
	Noise level, motor	50 dB(A)				
	Noise level, fail-safe	62 dB(A)				
	Position indication	Mechanical				
Safety data	Power source UL	Class 2 Supply				
	Degree of protection IEC/EN	IP54				
	Degree of protection NEMA/UL	NEMA 2				
	Enclosure	UL Enclosure Type 2				
	Agency Listing	cULus listed to UL60730-1A:02; UL 60730-2-14:02 and CAN/CSA-E60730-1:02				
	Quality Standard	ISO 9001				
	UL 2043 Compliant	Suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC				
	Ambient humidity	Max. 95% RH, non-condensing				
	Ambient temperature	-22122°F [-3050°C]				
	Storage temperature	-40176°F [-4080°C]				
	Servicing	maintenance-free				
Weight	Weight	4.9 lb [2.2 kg]				
Materials	Housing material	Galvanized steel and plastic housing				



Footnotes †Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

Product features

Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

Operation

The NF..24 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The NF..24 series provides 95° of rotation and is provided with a graduated position indicator showing 0...95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The NF..24 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Typical specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Accessories

Electrical accessories	Description	Туре
	Auxiliary switch, mercury-free	P475
	Auxiliary switch, mercury-free	P475-1
	Signal simulator, Power supply AC 120 V	PS-100
	Cable conduit connector 1/2"	TF-CC US
	Transformer, AC 120 V to AC 24 V, 40 VA	ZG-X40

Technical data sheet

Mechanical accessories

Description	Туре
Anti-rotation bracket, for AF / NF	AF-P
Shaft extension 240 mm Ø20 mm for damper shaft Ø 822.7 mm	AV8-25
End stop indicator	IND-AFB
Shaft clamp reversible, for central mounting, for damper shafts Ø12.7 /	K7-2
19.0 / 25.4 mm	
Ball joint suitable for damper crank arm KH8 / KH10, Multipack 10 pcs.	KG10A
Ball joint suitable for damper crank arm KH8, Multipack 10 pcs.	KG8
Damper crank arm Slot width 8.2 mm, clamping range Ø1425 mm	KH10
Damper crank arm Slot width 8.2 mm, for Ø1.05"	KH12
Damper crank arm Slot width 8.2 mm, clamping range Ø1018 mm	KH8
Actuator arm, for 3/4" shafts, clamping range Ø1022 mm, Slot width 8.2	KH-AFB
mm	
Push rod for KG10A ball joint 36" L, 3/8" diameter	SH10
Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).	SH8
Wrench 0.32 in and 0.39 in [8 mm and 10 mm]	TOOL-06
Retrofit clip	Z-AF
Mounting bracket for AF	ZG-100
Mounting bracket	ZG-101
Mounting bracket	ZG-109
Linkage kit	ZG-110
Mounting bracket	ZG-118
for AF / NF	
Jackshaft mounting bracket.	ZG-120
Mounting kit for linkage operation for flat and side installation	ZG-AFB
Mounting kit for foot mount installation	ZG-AFB118
Damper clip for damper blade, 3.5" width.	ZG-DC1
Damper clip for damper blade, 6" width.	ZG-DC2
1" diameter jackshaft adaptor (11" L).	ZG-JSA-1
1-5/16" diameter jackshaft adaptor (12" L).	ZG-JSA-2
1.05" diameter jackshaft adaptor (12" L).	ZG-JSA-3
Weather shield 330x203x152 mm [13x8x6"] (LxBxH)	ZS-100
Base plate, for ZS-100	ZS-101
Weather shield 406x213x102 mm [16x8-3/8x4"] (LxWxH)	ZS-150
Explosion proof housing 406x254x164 mm [16x10x6.435"] (LxBxH), UL	ZS-260
and CSA, Class I, Zone 1&2, Groups B, C, D, (NEMA 7), Class III, Hazardous	
(classified) Locations	
Weather shield 438x222x140 mm [17-1/4x8-3/4x5-1/2"] (LxBxH), NEMA	ZS-300
4X, with mounting brackets	
Weather shield 438x222x140 mm [17-1/4x8-3/4x5-1/2"] (LxBxH), NEMA	ZS-300-5
4X, with mounting brackets	
Shaft extension 1/2"	ZS-300-C1
Shaft extension 3/4"	ZS-300-C2
Shaft extension 1"	ZS-300-C3
Base plate extension	Z-SF
	ZG-JSL

Electrical installation



Marning! Live electrical components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Meets cULus requirements without the need of an electrical ground connection.

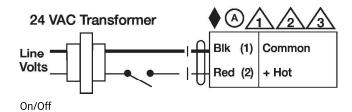
(A) Actuators with appliance cables are numbered.

• Provide overload protection and disconnect as required.

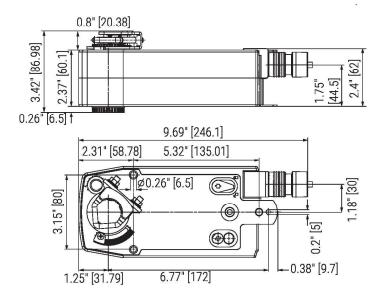
🐧 Actuators may also be powered by DC 24 V.

Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.





Dimensions





SHIELD™ WATER HEATER

Submittal Sheet

SWH-Sub-08

SHIELD™ COMMERCIAL GAS WATER HEATER

Job Name:	Model No.		
Location:	Type Gas:	BTU/Hr Input	
Engineer:	Recovery Rate in GPH	@	°F Rise
Agent/Wholesaler:	Equipment Tag(s):		
Contractor:			
NOTES:			

Standard Features

- > Up to 96% Thermal Efficiency
- > Modulating Burner with 5:1 Turndown
- Operates at Temperatures up to 180°F for Sanitizing Applications
- > Stainless Steel Heat Exchanger
- > Glass-Lined Steel Tank
- > Magnesium Anode Rods
- > 150 PSI Working Pressure
- > ASME Construction (SWA150-500)
- > ASME Temperature & Pressure Relief Valve
- > Zero Clearances to Combustible Material
- Certified for Installation on Combustible Floors
- > PVC, CPVC, Polypropylene and Stainless Steel Venting up to 150 Equivalent Feet
- > Direct-Vent Sealed Combustion
- > Rooftop and Sidewall Venting
- > Advanced SMART CONTROL

LCD Display

Time Clock

Night Setback

Alarm Contacts

Runtime Contacts

Manual Reset High Limit

3 Water Temperature Sensors

Flue Temperature Sensor

Contacts for Louvers

Adjustable Pump Delay

Security Protection

Enable/Disable Contacts

- Low-NOx Operation, meets SCAQMD
 Rule 1146.2
- > Low Gas Pressure Operation
- > Direct-Spark Ignition
- > Brass Drain Valve
- > 8-Foot Power Cord
- > 3-Year Limited Warranty
- > 1-Year Parts Warranty

Optional Equipment

Audible Alarm Kit

BACnet Communication

Concentric Vent Kit

Condensate Neutralization Kit

CON·X·US® Remote Connectivity

Flow Switch

Low Water Cutoff Kit

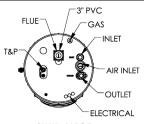
Modbus Communication

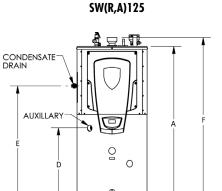
Sidewall Vent Termination Kit



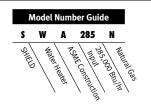


SHIELD COMMERCIAL WATER HEATER - DIMENSIONS AND SPECIFICATIONS

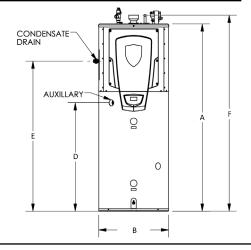


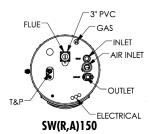


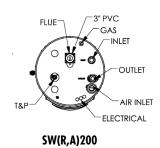
В

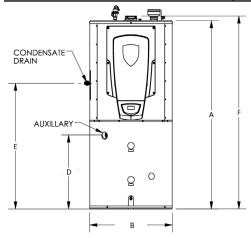


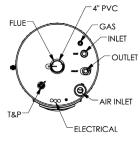
SHIELD **W**ater Heater ASME 285,000 Btu/hr Input **N**atural Gas

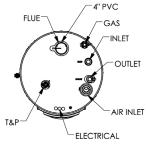


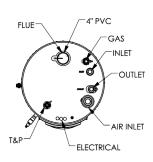












SW(R,A)285

ŚW(R,A)400

SWA500

Model Number	Btu/hr Input	Capacity (Gals.)	Thermal Eff.	GPH @ 100° Rise	1st Hour	A	В	D	E	F	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Ship Wgt. (lbs.)
Regular Constr	uction														
SWR125N	125,000	65	96%	145	197	62 1/2"	28"	29-1/2"	46 1/2"	66"	1/2"	1-1/2"	3"	3"	377
SWR150N	150,000	90	96%	175	247	76"	28"	44"	61"	79-1/2"	1/2"	1-1/2"	3"	3"	700
SWR200N	199,000	90	96%	232	304	76"	28"	44"	61"	79-1/2"	1/2"	1-1/2"	3"	3"	725
SWR285N	285,000	110	95%	328	416	77-1/2"	34"	30-1/2"	51-3/4"	79-1/2"	1/2"	1-1/2"	4"	4"	800
SWR400N	399,000	110	95%	459	547	77-1/2"	34"	30-1/2"	51-3/4"	79-1/2"	1"	1-1/2"	4"	4"	850
ASME Construc	tion														
SWA150N	150,000	90	96%	175	247	76"	28"	44"	61"	79-1/2"	1/2"	1-1/2"	3"	3"	700
SWA200N	199,000	90	96%	232	304	76"	28"	44"	61"	79-1/2"	1/2"	1-1/2"	3"	3"	725
SWA285N	285,000	110	95%	328	416	77-1/2"	34"	30-1/2"	51-3/4"	79-1/2"	1/2"	1-1/2"	4"	4"	800
SWA400N	399,000	110	95%	459	547	77-1/2"	34"	30-1/2"	51-3/4"	79-1/2"	1"	1-1/2"	4"	4"	850
SWA500N	500,000	110	96%	582	670	77-1/2"	34"	30-1/2"	51-3/4"	79-1/2"	1"	1-1/2"	4"	4"	875

Change "N" to "L" for LP gas. Field convertible to LP Gas. All Information is subject to change without notice.

A = ASME Construction / Check local and state codes for ASME requirements

Electrical Requirements: 120V/1PH/60Hz















GENERATOR DOCKING STATION

GDS LINE



THE INDUSTRY'S LARGEST SELECTION OF GENERATOR DOCKING STATION SOLUTIONS

Trystar Generator Docking Stations are designed to safely connect and disconnect a portable generator to a building, lift station, or portable piece of equipment. During a power outage, a generator docking station allows you to quickly return power without an electrician, which helps protect your building from the risks and costs of power loss.

Generator Docking Stations can also be used to support temporary and emergency power needs for pandemic response, mass casualty disasters and other urgent needs, including medical testing/screening centers and temporary hospitals.

Usually, during a power failure or emergency, electricians are in high-demand, resulting in shortages and additional fees. Trystar generator docking stations makes it easy for you to restore power to your building with minimal delay.

KEY END USER BENEFITS

- Eliminate need to make costly modifications to accommodate temporary generator install
- Eliminate need for onsite electrician to make hardwire terminations
- Reduces wear and tear on mechanical components through industry standard camlok connections
- Minimize facility downtime by incorporating a fast, safe, and legal connection to temporary power
- Control placement of temporary generator to allow adequate space for fueling, cabling, and monitoring



STANDARD TRYSTAR SPECIFIC FEATURES:

- Standard phase rotation monitor on all three phase products
- Corrosion resistant powder coated aluminum construction
- ETL listed UL 1008 standards without need for fans for external cooling devices
- Tamper resistant cable rake system

GENERATOR DOCKING STATION

FEATURES AND OPTIONS



APPLICATION RANGE

- 100-4000A
- Up To 600V

STANDARD FEATURES

- · Factory installed phase rotation monitor
- · All aluminum NEMA 3R or stainless 4X construction
- Patented tamper-resistant rake system to prevent cable theft and unauthorized disconnection
- Industry standard 16 Series CamLok connections compatible with any rental generator or load bank for facility backup and permanent generator testing

AVAILABLE OPTIONS

- · Strip heater & unit thermostat (375 Watt)
- Secondary convenience receptacles for added power options
- Patented solenoid safety interlock door to comply with NEC 702.12C
- · Utility indicator lights
- · Visit trystar.com for a full list of additional options and features

LISTINGS

- · Listed to UL 1008 standards
- · UL 50 listed enclosure
- NEC 702.12C compliant with safety interlock door adder



SAMPLE INDUSTRIES









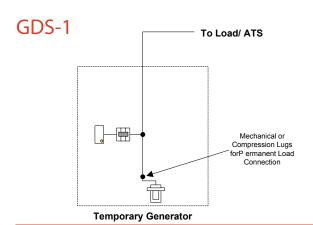




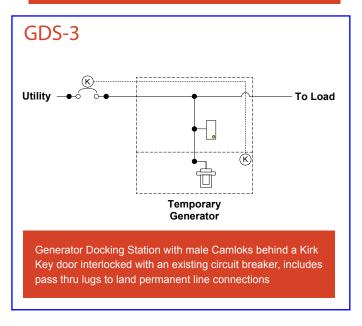
GENERATOR DOCKING STATION

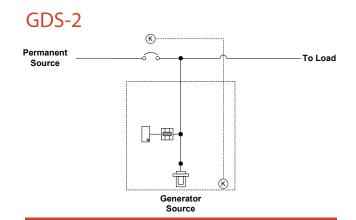






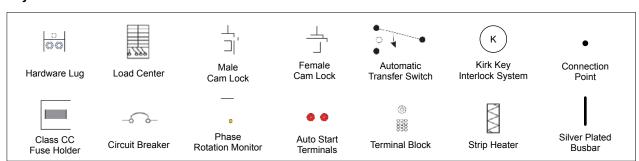
Generator Docking Station with male Camloks to connect a temporary power source





Generator Docking Station with male Camloks behind a Kirk Key door interlocked with an existing circuit breaker

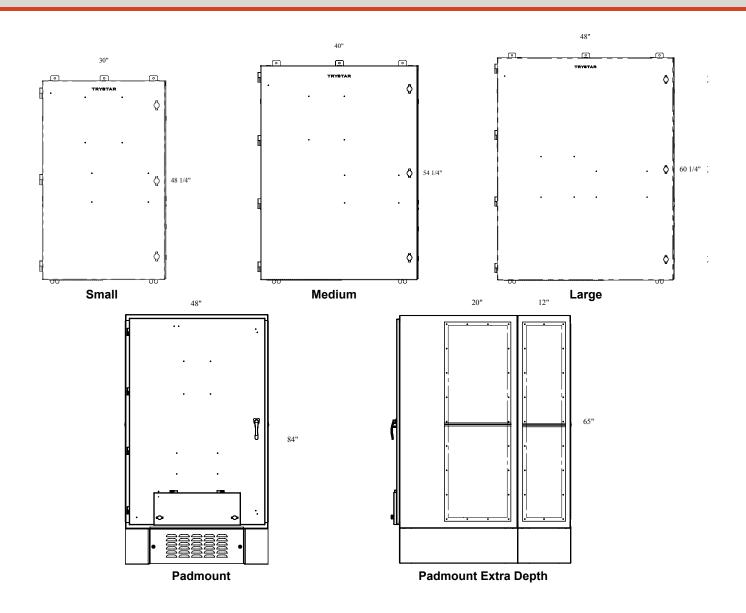
Key



GENERATOR DOCKING STATION







GDS Line	Small	Medium	Large	Padmount	Padmount Extra Depth
GDS-1	100-600A	601-1200A	1201-2000A	800-4000A	
GDS-2	100-600A	601-1200A	1201-2000A	800-4000A	
GDS-3	100-400A	401-800A	801-1200A	800-2500A	2501-4000A
Dimensions	48" x 30" x 16"	54" x 40" x 16"	60" x 48 x 16"	84" x 48" x 43"	84" x 48" x 43"
Approx. Weight	150lb	250lb	350lb	750lb	750lb

Honeywell E-Mon

Honeywell E-Mon CLASS 2000 3-Phase KWH/Demand Meter

PRODUCT DATA

MMU Style (Multiple Meter Unit) MMU8, 16 or 24





Stand-Alone Configuration Dim: 6 3/4" H x 5 3/16" W x 3 1/4" D

FEATURES

- Direct-read 2-line alpha-numeric LCD display without multiplier displays cumulative kWh & "real-time" kW
- Demand option displays kW/Demand and kW Peak date and time (15 minute interval standard, 30 minute interval available.)
- Available in MMU (Multiple Meter Unit) enclosures containing up to 24 meters in one compact enclosure.
- Patented 0-2 volt output split-core current sensors promote enhanced safety and accurate remote mounting of current sensors up to 2,000 feet from meter without power interruption. (Optional solid-core sensors available for 100 & 200 Amp meters.)
- Onboard installation diagnostics & verification system.
- Parallel up to three (3) sets of current sensors for cumulative reading.
- Meter can be used on the following configurations:
 - 3-Phase, 4-Wire
 - 3-Phase, 3-Wire
 - For other configurations contact factory.
- Fixed kWh pulse output
- Industrial JIC steel enclosure (standard) with padlocking hasp & mounting flanges for indoor installation. Knockouts 1 1/16" (3/4" cond.) bottom, 7/8" (1/2" cond.) top.
- Optional NEMA 4X polycarbonate enclosure with padlocking hasp & mounting flanges for indoor/outdoor installation (stand alone) with one 1 1/16" KO on bottom of enclosure.

- Non-volatile Memory.
- UL/CUL Listed.
- Revenue Grade Accuracy. Certified by independent test lab to ANSI C12.20 national accuracy standards. (+/ 0.2% from 1% to 100% of rated load.)
- California CTEP approved for use with solid-core current sensors. Listed by the California Energy Commission.
- · Con Edison approved for RSP program.

MODEL NUMBERS

Table 1. 120/208-240V. 3-Phase.

Amperage	KWH Meter	KWH/Demand Meter
100 Amp	E20-208100-JKIT	E20-208100-J-D-KIT
200 Amp	E20-208200-JKIT	E20-208200-J-D-KIT
400 Amp	E20-208400-JKIT	E20-208400-J-D-KIT
800 Amp	E20-208800-JKIT	E20-208800-J-D-KIT
1600 Amp	E20-2081600JKIT	E20-2081600J-D-KIT
3200 Amp	E20-2083200JKIT	E20-2083200J-D-KIT

Table 2, 277/480V, 3-Phase.

Amperage	KWH Meter	KWH/Demand Meter
100 Amp	E20-480100-JKIT	E20-480100-J-D-KIT
200 Amp	E20-480200-JKIT	E20-480200-J-D-KIT
400 Amp	E20-480400-JKIT	E20-480400-J-D-KIT
800 Amp	E20-480800-JKIT	E20-480800-J-D-KIT
1600 Amp	E20-4801600JKIT	E20-4801600J-D-KIT
3200 Amp	E20-4803200JKIT	E20-4803200J-D-KIT

Table 3. 347/600V, 3-Phase.

Amperage	KWH Meter	KWH/Demand Meter
100 Amp	E20-600100-JKIT	E20-600100-J-D-KIT
200 Amp	E20-600200-JKIT	E20-600200-J-D-KIT
400 Amp	E20-600400-JKIT	E20-600400-J-D-KIT
800 Amp	E20-600800-JKIT	E20-600800-J-D-KIT
1600 Amp	E20-6001600JKIT	E20-6001600J-D-KIT
3200 Amp	E20-6003200JKIT	E20-6003200J-D-KIT



Optional Meter Enclosures

Replace "J" in model number with optional enclosure specification.

Specification M - MMU Configuration (ex. E20-208100-MKIT)

Specification R - NEMA 4X Raintight Enclosure (ex. E20-6001600RKIT)

NOTE: All meter kits include one set of three (3) splitcore current sensors

SPECIFICATIONS

- Meter shall be fully electronic with a 2-line alphanumeric LCD display without muiltiplier displaying cumulative kWh and "real-time kW load. Meter shall provide rate of consumption indication and also a test sequence to ensure integrity of the display.
- Meter shall be optionally available with kW/Demand and kW peak date and time displays. (15 minute interval standard, 30 minute interval available.)
- Meter shall provide a load indicator to indicate realtime consumption levels for field testing and certification.
- Meter shall provide current sensor installation diagnostics indicator.
- Meter shall use 0-2 volt output current sensors to allow paralleling and/or mounting up to 2,000 feet from the meter. Sensors shall be of split-core configuration to allow installation without powering down. Sensors shall

- be available from 100 amp to 3200 amp. Sensors shall be optionally available in solid-core configuration (100 & 200 amp.)
- Meter shall be enclosed in a heavy-duty JIC steel enclosure suitable for indoor installation. Meter enclosure provides a method of locking to prevent unauthorized access.
- Meter shall be optionally available in an outdoor NEMA 4X polycarbonate enclosure with padlocking hasp & mounting flanges for indoor/outdoor installation.
- Meter shall be optionally available in MMU (Multiple Meter Configuration) enclosures containing up to 24 meters in one compact enclosure.
- Meter shall be UL Listed/CUL Listed to latest applicable standards for safety.
- Meter shall be certified by a nationally recognized independent test facility to ANSI C12.20 (+/- 0.2% from 1% to 100% of rated load) specifications with splitcore current sensors.
- Meter shall be California CTEP approved for use with solid-core current sensors, listed by the California Energy Commission, and Con Edison approved for RSP program.
- Meter shall be provided with a non-volatile memory to maintain reading during power outages.
- Meter shall be provided with modular connector(s) to provide interfacing with:
 - AMR (Automatic Meter Reading)
 - Building Management/Energy Management Systems
- Meters shall be compatible with Honeywell E-Mon Energy™ software.

ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number. If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

- 1. Your local Honeywell Environmental and Combustion Controls Sales Office (check white pages of your phone directory).
- 2. Honeywell Customer Care 1985 Douglas Drive North Golden Valley, Minnesota 55422-4386
- 3. http://customer.honeywell.com or http://customer.honeywell.ca

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Home and Building Technologies

In the U.S.:
Honeywell E-Mon
715 Peachtree Street NE

U.S. Registered Trademark
2019 Honeywell International Inc. 38-00065-01 M.S. 01-19
Printed in United States



VA - ATL - TRINKA DAVIS CLC

Revision #: 4

Created Date: 2023-06-08

Revised Date: 2024-06-21

Company Name: Hoffman Hoffman

Contact Name: Joe Schrader

Prepared By: Haleigh Longo

SELECTION ONLY

Not for Submittal. Contact Oxygen8 for final submittals prior to ordering.

T18



Performance

Unit Tag: MUA-1 - 1620CFM

Summary					
Unit Details					
Unit Tag:	MUA-1 - 1620CFM	Orientation:	Horizontal		
Model:	T18IN - (1500-1800 CFM)	ESP SA (inH2O):	0.75		
Qty:	1	Filters OA:	2" 85% MERV-13		
Location:	Indoor	Controls Preference:	Constant Volume		
Altitude (ft):	1027	Dampers & Actuator:	Field Installed and Wired		
		EKEXV Valves & Controllers:	Customer Supplied and Factory Installed		

Electrical Requirements

Total Number of Connections Required: 1

Unit		W-controller
Voltage:	208V/1ph/60Hz	Qty: 1
Range:	207 - 253V	
FLA:	8.61	
MCA:	8.78	
MOP/RFS:	15A	

⁻Unit and Daikin controller(s) will be single-point power

T18

SELECTION ONLY

Not for Submittal Use

Cooling DX

Coil Model: DXM05C08-15.00x36.00L Fin Height: 15 Fin Length: 36 Face Area: 3.8 FPI: 8 5 Rows: 7 Total Feeds: Fin Surface: Flat Fin Material: 0.006 Aluminum

Fin Surface: Flat
Fin Material: 0.006 Aluminum
Tube Material: 0.014 Copper
Tube Surface: Smooth
Coil Weight (lbs): 48.4
Suction Size (in): 1.125
Coil Style: Standard
Qty Conn. / Header: 1

 Entering

 Airflow (CFM):
 1620

 DB (F):
 91.6

 WB (F):
 73.9

 Refrigerant:
 R-410A

 Refrig. Suction Temp (F):
 43

 Refrig. Liquid Temp (F):
 77

 Refrig. Superheat Temp (F):
 9

Setpoint
DB (F): 65

Coil Performance Capacity (MBH): 84.4 Capacity Sensible (MBH): 49.97 DB (F): 63.7 WB (F): 59.5 432 Air Vel (FPM): Air PD (IWG): 0.24 Internal Vol (cu.in): 289.76 Refrig. PD (psi): 3.02

VRV Integration Kit

Type: AHU Integration Valve Kit

Manufacturer: Daikin
Model: EKEXV200

Qty of Valves: 1 Nominal Tonnage: 6

Heating DX

Coil	
Model:	DXM05C08-
	15.00x36.00L
Fin Height:	15
Fin Length:	36
Face Area:	3.8
FPI:	8
Rows:	5
Total Feeds:	7
Fin Surface:	Flat
Fin Material:	0.006 Aluminum
Tube Material:	0.014 Copper

Smooth

Entering

Airflow (CFM): 1620

DB (F): 26.4

Refrigerant: R-410A

Refrig. Cond. Temp (F): 115

Refrig. Vapor Temp (F): 140

Refrig. Subcooling Temp (F): 5.4

Setpoint
DB (F): 72
Capacity (MBH): 79.8

Tube Surface:

Not for Submittal Use

Supply Fan

Fan Model:

PI2E280133TB2M-IS-SB
Fan motor:

ECM, direct drive

Type: Plenum TSP (in w.g.): 1.6

Nominal values for single fan

Power Input (KW): 0.78 FLA (A): 3.90

Operating point for two fans

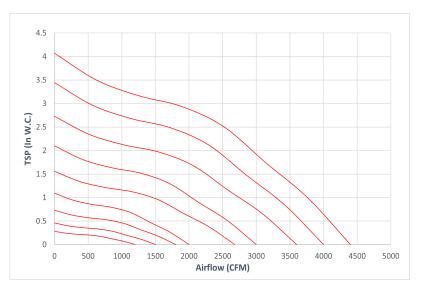
Power Input (KW): 0.6386 Current (A): 1.54 RPM: 2456 SFP (W/CFM): 0.39

Filter Pressure Drop:

Included in TSP and 0.50

fan curve (in w.g.):

Clean filter (in w.g.): 0.40 Dirty filter (in w.g.): 1.00



The fan curve does not show an operating point. Please contact the Oxygen8 applications team for an accurate fan curve.

Unit Sound Data									
	63	125	250	500	1000	2000	4000	8000	dB (A)
Unit Radiated	59	59	62	56	53	56	27	22	61
Supply Fan Lw: 1620 CFM	68	66	75	71	72	69	62	59	76

^{*}Sound data are estimate

NOMENCLATURE:

OA - OUTDOOR AIR SA - SUPPLY AIR

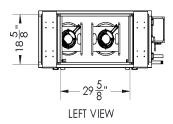
NOTES:

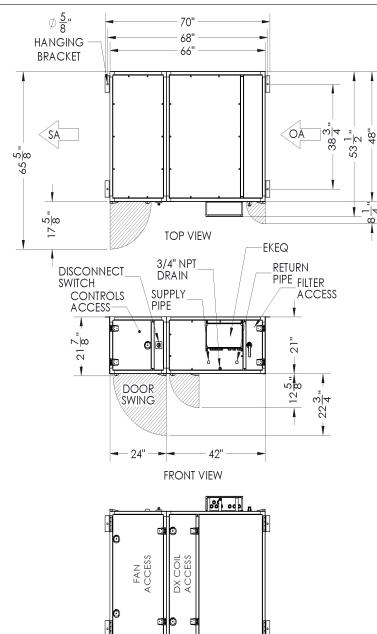
36" OF CLEARANCE MUST BE MAINTAINED PERPENDICULAR TO THE EKEQ KIT AS PER THE NATIONAL ELECTRIC CODE (NEC).

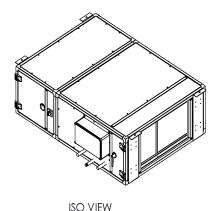
OVERALL UNIT DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

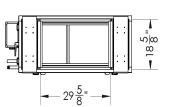
WEIGHT EXCLUDES COILS.

SECTIONS SHIP ATTACHED. OPTIONAL SPLIT SHIPPING AVAILABLE UPON REQUEST.









RIGHT VIEW

BOTTOM VIEW

SALES DRAWING Rev: C Size: B Scale: 1:26

Description: TERRA T18 DX W-CONTROL STD IDU LH 208/1 NO ACC Weight: 456

Appd Date: 2023-03-21

Sheet 1 of 1

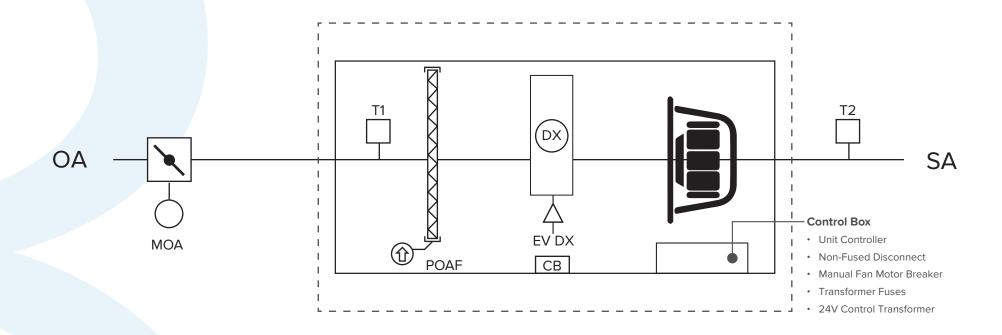
Appd By: D. N.

Draw №: TERRA T18 DXW S I L 2081 NA Drawn By: L. O. Drawn Date: 2022-07-11 Installation: CEILING HUNG

THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DRAWING AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO THIRD PARTIES WITHOUT EXPLICIT AUTHORIZATION IS PROHIBITED

300-638 Smithe Street, Vancouver, British Columbia, V6B 1E3, Canada

Control Points: Terra + DX Coil + Dampers



Sensor Legend

MOA - Outdoor Air Damper Actuator

T1 - Outdoor Air Temperature Sensor

T2 - Supply Air Temperature Sensor

POAF - Outdoor Air Filter Pressure Sensor

Symbol Legend



Damper



Expansion Valve



Fan



Daikin Control



Temperature Sensor



DX Coil Post-Cooling



Electric Preheat Coil



Hot Gas Reheat Coil

Sequence of Operations

Airflow Control: Constant Air Volume

Supply air fan maintains constant speed to provide setpoint airflow rates for low and high speed during operation time. Fan speeds will automatically adjust to compensate for changes in air density due to temperature fluctuations and to overcome filter loading.

Temperature Control

Unit controller sends 0-10V signal to Daikin W-Controller to adjust DX coil valves to maintain set point for discharge air temperature control.



Daikin VRV Responsibility Chart for Terra and Ventum+

	Coil	Daikin Controller Installation	EEV Brazing to Coil	Thermistors Installation	O8 Unit & Daikin Controller Interlocking	Power	Piping to Outdoor Unit	Daikin Controller & ODU Interlocking	O8 Unit & ODU Interlocking	Indoor Branch Selector Box (HGRH)
Oxygen8 Factory	X	X	X	X	X	X				
Mechanical Contractor							Χ			X
Controls Contractor								X	X	
Electrical Contractor										

Responsibility Descriptions

DX Coil / HGRH Coil

Oxygen8 is responsible for supplying and factory-installing DX and/or HGRH coil(s) matching Daikin coil selection parameter requirements.

Daikin Controller

Daikin Representative is responsible for supplying Daikin Controller(s). Oxygen8 is responsible for factory-mounting them on the coil casing section and factory wiring between Daikin Controller(s) and EEV kit(s).

Note: Only for W-Controller (ABC Terminal [BRP2A82] with 3T,4T, and 5T outdoor units)

EEV

Daikin Representative is responsible for supplying Daikin EEV kit(s). Oxygen8 is responsible for factory-mounting and brazing them to the coil. Coil and EEV kit(s) to be factory tested at 700psi and nitrogen charged.

Thermistors

Daikin Representative is responsible for supplying Thermistors. Oxygen8 is responsible for factory-installing Daikin gas and liquid thermistors and wiring back to the Daikin Controller.

O8 Unit & Daikin Controller Interlocking

Unit coil casing section with EEV kit(s) brazed to the coil, with Daikin Controller(s) mounted on the section will ship attached to the unit. Oxygen8 is responsible for running wiring between Daikin controller(s) and Oxygen8 Unit controller.

Power

Daikin controller(s) will be powered through Oxygen8 unit. Unit and Daikin controller(s) will be single-point power connection.

Piping to ODU

Mechanical contractor is responsible for running the gas and liquid line piping to ODU.

Daikin Controller & ODU Interlocking

Controls contractor to run 18-2 wire between the W-Controller and ODU.

O8 Unit & ODU Interlocking

Controls contractor to wire between the Unit controller and ODU.

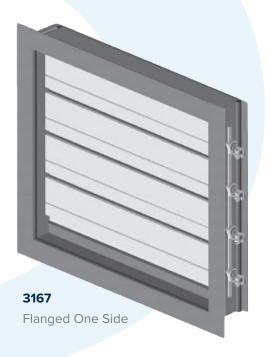
Indoor Branch Selector Box (HGRH Only)

Mechanical contractor to pipe and install branch selector box. It is rated for indoor installation only.

For questions and concerns, please contact the Oxygen8 Applications Team | applications@oxygen8.ca

Airfoil Blade Control Dampers

Model: 3167 (Non-Insulated)



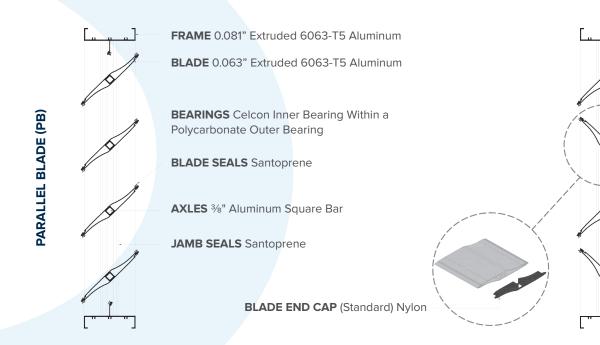
STANDARD CONSTRUCTION

Depth	4" (101 mm) - 3167
Depth with Blades Open	6.125" (156 mm)
Minimum Height	8" (203 mm) - Single Blade 15" (381 mm) - Multiple Blade
Maximum Panel Width	48" (1219 mm)
Maximum Panel Height	60" (1524 mm)
Maximum Panel Size	20 sq. ft.
Maximum System Pressure	See chart on page 2.
Operating Temperature Range	-40° to +180°F
Standard Finish	Mill
Standard Motor Installation	6" Side Shaft Direct Drive
Linkage	Outside of Frame
Blade End Cap	Nylon

AVAILABLE ACCESSORIES

4" blade construction

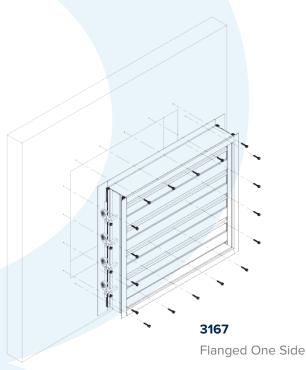
Factory supplied actuators
End switch for signaling peripheral devices
Jack shaft
Hand quadrants
Chain operation for manual operation spring closed
Silicone blade and jamb seals

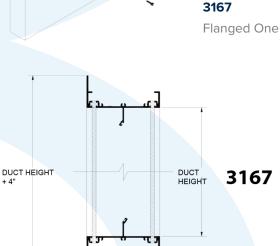


OPPOSED BLADE (OB)

Airfoil Blade Control Dampers

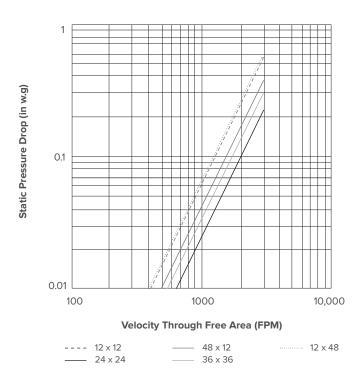
Model: 3167



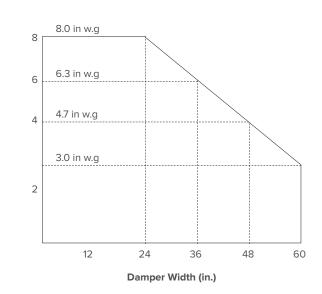


Clearance = 1/4" Overall for Single Panel Construction Clearance = 1/2" Overall for Multiple Panel Construction

PRESSURE DROP



PRESSURE LIMITATIONS



RECOMMENDED SPECIFICATION

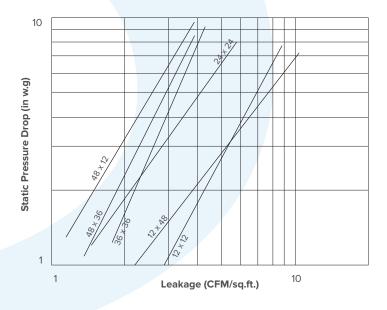
Furnish and install control damper models 3167 as manufactured by Alumavent, Bolton Ontario. Dampers shall be 4" (101 mm) deep. Blades shall be 0.063" (1.60 mm) thick, hollow airfoil shape. Frames shall be 0.081" (2.06 mm) thick. Axles shall be 0.375" (9.53 mm) thick, Aluminum square bar. Blade and Jamb seals shall be Santoprene. Linkage is concealed outside of frame for model 3167. Air leakage through a 48"x" damper shall not exceed 8 CFM/ ft2 (40.6 L/s/m2) against 4" w.g (1 kPa) static pressure at standard air. Operating temperature range shall be -40° to +180°F.

Pressure (in w.g)

Airfoil Blade Control Dampers

Model: 3167

LEAKAGE



Leakage test was conducted in accordance with AMCA Standard 500-D-98. Holding torque applied was 6 in - lbs/sq.ft on parallel blade dampers. Air leakage is based on operation between 0°C - 49°C (32°F - 120°F).

DAMPER LEAKAGE RATING

Damper Size	Pressure in w.g (kPa)					
Daniper Size	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)			
12" x 12" (305 x 305 mm)	1A	1	1			
24" x 24" (610 x 610 mm)	1A	1	1			
36" x 36" (914 x 914 mm)	1A	1	1			
12" x 48" (305 x 1219 mm)	1A	1	1			
48" x 12" (1219 x 305 mm)	1A	1	1			
48" x 36" (1219 x 914 mm)	1A	1	1			

DEFINITION OF LEAKAGE CLASSIFICATION

Class	Leakage ft²/min/ft² (L/s/m²)				
Cldss	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)		
1A	3 (15.2)	N/A	N/A		
1	4 (20.3)	8 (40.6)	14 (71.1)		
2	10 (50.8)	20 (102)	35 (178)		
3	40 (203)	80 (406)	140 (711)		

Rotary actuator fail-safe for adjusting dampers in technical building installations

- Air damper size up to approx. 0.8 m²
- Torque motor 4 Nm
- Nominal voltage AC/DC 24 V
- Control Open/close



Technical data

_			
	lectri	ıcal	data

Nominai voitage	AC/DC 24 V
Nominal voltage frequency	50/60 Hz
Nominal voltage range	AC 19.228.8 V / DC 21.628.8 V
Power consumption in operation	5 W
Power consumption in rest position	2.5 W
Power consumption for wire sizing	7 VA
Power consumption for wire sizing note	Imax 5.8 A @ 5 ms
Connection supply / control	Cable 1 m, 2 x 0.75 mm ²
Parallel operation	Yes (note the performance data)

Functional data

Torque motor	4 Nm
Torque fail-safe	4 Nm
Direction of motion motor	selectable by mounting L/R
Direction of motion fail-safe	selectable by mounting L/R
Manual override	No
Angle of rotation	Max. 95°
Angle of rotation note	Adjustable 37100% with integrated
	mechanical limitation
Running time motor	75 s / 90°
Running time fail-safe	<20 s @ -2050°C / <60 s @ -30°C
Sound power level, motor	50 dB(A)
Mechanical interface	Universal shaft clamp 816 mm
Position indication	Mechanical
Service life	Min. 60'000 fail-safe positions
D L. JEC/EN	TT C C + E + - I - V I + - (CELVA

Safety data

Protection class IEC/EN	III, Safety Extra-Low Voltage (SELV)
Degree of protection IEC/EN	IP54
EMC	CE according to 2014/30/EU
Low voltage directive	CE according to 2014/35/EU
Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14
Mode of operation	Type 1.B
Rated impulse voltage supply / control	0.8 kV
Pollution degree	3
Ambient humidity	Max. 95% RH, non-condensing
Ambient temperature	-3050°C [-22122°F]
Storage temperature	-4080°C [-40176°F]
Servicing	maintenance-free
Weight	1.4 kg



Safety notes



- This device has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Outdoor application: only possible in case that no (sea) water, snow, ice, insolation or aggressive gases interfere directly with the device and that it is ensured that the ambient conditions remain within the thresholds according to the data sheet at any time.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- Cables must not be removed from the device.
- To calculate the torque required, the specifications supplied by the damper manufacturers concerning the cross-section, the design, the installation situation and the ventilation conditions must be observed.
- The device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

Mode of operation

The actuator moves the damper to the operating position at the same time as tensioning the return spring. The damper is turned back to the safety position by spring energy when the supply voltage is interrupted.

Simple direct mounting

Simple direct mounting on the damper shaft with a universal shaft clamp, supplied with an antirotation device to prevent the actuator from rotating.

Adjustable angle of rotation

Adjustable angle of rotation with mechanical end stops.

High functional reliability

The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.

Accessories

Electrical accessories	Description	туре
	Auxiliary switch 2 x SPDT	S2A-F
	Feedback potentiometer 200 Ω	P200A-F
	Feedback potentiometer 1 k Ω	P1000A-F
Mechanical accessories	Description	Туре
	Shaft extension 170 mm Ø10 mm for damper shaft Ø 616 mm	AV6-20
	Shaft clamp reversible, clamping range Ø1620 mm	K6-1
	Ball joint suitable for damper crank arm KH8 / KH10, Multipack 10 pcs.	KG10A
	Ball joint suitable for damper crank arm KH8, Multipack 10 pcs.	KG8
	Damper crank arm Slot width 8.2 mm, clamping range Ø1018 mm	KH8
	Actuator arm, clamping range Ø816 mm, Slot width 8.2 mm	KH-LF
	Angle of rotation limiter, with end stop	ZDB-LF
	Form fit adapter 8x8 mm	ZF8-LF
	Mounting kit for linkage operation for flat installation	ZG-LF1
	Mounting kit for linkage operation for side installation Slot width 6.2 mm	ZG-LF3
	Anti-rotation mechanism 180 mm, Multipack 20 pcs.	Z-ARS180L

Electrical installation



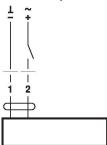
Supply from isolating transformer.

Parallel connection of other actuators possible. Observe the performance data.



Wiring diagrams

AC/DC 24 V, open/close



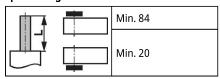
Cable colours:

1 = black

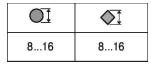
2 = red

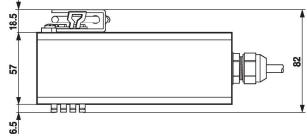
Dimensions

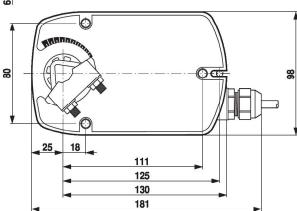




Clamping range













Circuit breaker enclosure, LA, 125A to 400A, NEMA 3R, 15.38in W x 44in H x 7.88in D

LA400R

Product availability: Stock - Normally stocked in distribution facility

Main

Breaker Compatibility Circuit breaker LAL/LHL/Q4L/KAL/KHL 125...400 A

Complementary

Height	44.0 in (1117.60 mm)
Width	15.38 in (390.65 mm)
Depth	7.88 in (200.15 mm)

Environmental

Nema Degree Of Protection NEMA 3R

Ordering and shipping details

Category	US10DE100030
Discount Schedule	0DE1
Gtin	785901508021
Returnability	Yes
Country Of Origin	US

Packing Units

Unit Type Of Package 1	PCE	
Number Of Units In Package 1	1	
Package 1 Height	8.82 in (22.4 cm)	
Package 1 Width	16.61 in (42.2 cm)	
Package 1 Length	45.20 in (114.8 cm)	
Package 1 Weight	64.99 lb(US) (29.48 kg)	

Contractual warranty

Warranty 18 months

Price is "List Price" and may be subject to a trade discount – check with your local distributor or retailer for actual price.



Green PremiumTM label is Schneider Electric's commitment to delivering products with best-inclass environmental performance. Green Premium promises compliance with the latest regulations, transparency on environmental impacts, as well as circular and low-CO₂ products.

Guide to assessing product sustainability is a white paper that clarifies global eco-label standards and how to interpret environmental declarations.

Learn more about Green Premium >

Guide to assess a product's sustainability >





Transparency RoHS/REACh

Well-being performance

⊘	Toxic Heavy Metal Free	
⊘	Mercury Free	
Ø	Rohs Exemption Information	Yes
⊘	Pvc Free	
②	Halogen Free Plastic Parts Product	

Certifications & Standards

Reach Regulation	REACh Declaration
Eu Rohs Directive	Compliant EU RoHS Declaration
China Rohs Regulation	China RoHS declaration Pro-active China RoHS declaration (out of China RoHS legal scope)
Environmental Disclosure	Product Environmental Profile
Circularity Profile	No need of specific recycling operations
California Proposition 65	WARNING: This product can expose you to chemicals including: Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov







Transformer, dry type, DOE 2016, 225kVA, 3 phase, 480V delta primary, 208Y/120V secondary, 25J, 150C rise, Cu

EX225T3HCU

Product availability: Stock - Normally stocked in distribution facility

Main

Range Of Product	Square D
Product Or Component Type	Transformer
Device Short Name	DOE 2016
Transformer Type	Energy efficient
Device Application	Low voltage electrical distribution

Complementary

Box Number	25J
Phase	3 phase
Rated Operational Power In Va	225 kVA
Network Frequency	60 Hz
Type Of Cooling	Natural convection
Primary Voltage	480 V delta
Number Of Tap-Offs	2 2.5 % FCAN 4 2.5 % FCBN
Secondary Voltage	208Y/120 V
Coil Material	Copper
Basic Imp Level (Bil)	10 kV
Temperature Rise	150 °C 220 °C insulated
Doe Efficiency	99.04 % at 35 % load factor , 167 °F (75.0 °C)
Sound Level	6 dB NEMA ST-20 49 dB
%lz	0.057 %
%lx	0.0536 %
X/R Ratio	2.68
Let Through Current	10.9 kA
Transformer Losses	311.0 no load (core loss) 4492.0 load loss (coil loss)

Price is "List Price" and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Transformer Btu/Hr	1483.536394404384 16.6 % 2019.1350284999999 25 % 4893.011627999999 50 % 9682.8059605 75 % 16388.518025999998 1.0 %
Height	57.52 in (1461 mm)
Depth	32.76 in (832 mm)
Width	40.08 in (1018 mm)
Net Weight	1545.00 lb(US) (700.8 kg)
Mounting Support	Floor Floor, with 7400FMB
Degree Of Protection	UL type 1 UL type 2, with 7400DS25J UL type 3R, with 7400WS25J
Electrical Connection	4 Hole Nema Pad primary 0.44 in (11.1 mm) 6 Hole Nema Pad secondary 0.44 in (11.1 mm) 8 Hole Nema Pad sec - XO 0.44 in (11.1 mm)

Environment

Ambient Air Temperature For Operation	104 °F (40 °C)
Average Ambient Air Temperature For Operation	30 °C
Standards	UL 1561 CSA C22.2 No 47 NEMA ST-20

Ordering and shipping details

Category	US1PE2X16251
Discount Schedule	PE2X
Gtin	785901767152
Returnability	Yes
Country Of Origin	MX

Packing Units

Unit Type Of Package 1	PCE
Number Of Units In Package 1	1
Package 1 Height	64.49 in (163.8 cm)
Package 1 Width	40.31 in (102.4 cm)
Package 1 Length	47.99 in (121.9 cm)
Package 1 Weight	1786.00 lb(US) (810.116 kg)



Green PremiumTM **label** is Schneider Electric's commitment to delivering products with best-inclass environmental performance. Green Premium promises compliance with the latest regulations, transparency on environmental impacts, as well as circular and low-CO₂ products.

Guide to assessing product sustainability is a white paper that clarifies global eco-label standards and how to interpret environmental declarations.

Learn more about Green Premium >

Guide to assess a product's sustainability >





Transparency RoHS/REACh

Well-being performance

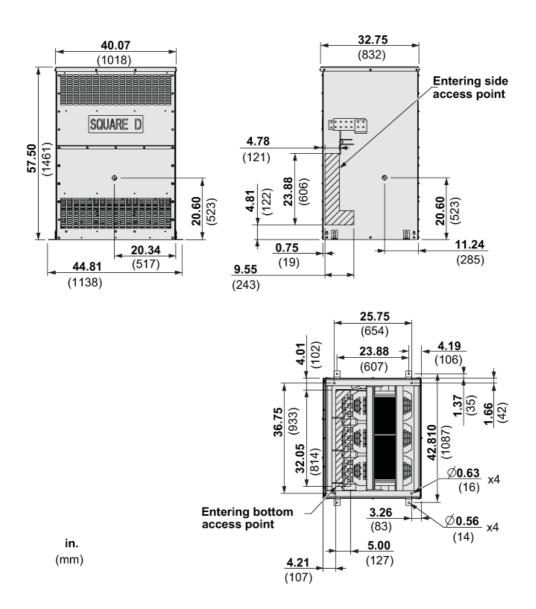
⊘	Reach Free Of Svhc
⊘	Toxic Heavy Metal Free
⊘	Mercury Free
②	Rohs Exemption Information Yes
②	Pvc Free

Certifications & Standards

Reach Regulation	REACh Declaration
Eu Rohs Directive	Compliant
	EU RoHS Declaration
China Rohs Regulation	China RoHS declaration
	Pro-active China RoHS declaration (out of China RoHS legal scope)
Environmental Disclosure	Product Environmental Profile
Circularity Profile	No need of specific recycling operations
California Proposition 65	WARNING: This product can expose you to chemicals including: Phenyl Glycidyl Ether, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Dimensions Drawings

Approximate Dimensions



EPA Certified Stationary Emergency



Standby Power Rating 250 kW, 313 kVA, 60 Hz

Prime Power Rating* 225 kW, 281 kVA, 60 Hz





*EPA Certified Prime ratings are not available in the US or its Territories

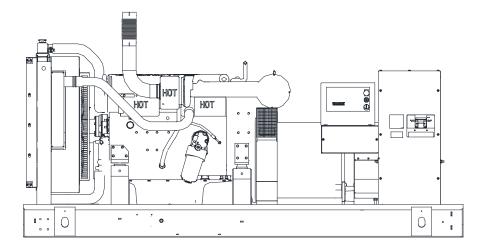


Image used for illustration purposes only

Codes and Standards

Not all codes and standards apply to all configurations. Contact factory for details.





UL2200, UL6200, UL1236, UL489, **UL142**





CSA C22.2, ULC S601





BS5514 and DIN 6271



SAE J1349



NFPA 37, 70, 99, 110



NEC700, 701, 702, 708



ISO 3046, 7637, 8528, 9001



NEMA ICS10, MG1, 250, ICS6, AB1



ANSI C62.41





IBC 2009, CBC 2010, IBC 2012, ASCE 7-05, ASCE 7-10, ICC-ES AC-156 (2012)

Powering Ahead

For over 60 years, Generac has provided innovative design and superior manufacturing.

Generac ensures superior quality by designing and manufacturing most of its generator components, including alternators, enclosures and base tanks, control systems and communications software.

Generac gensets utilize a wide variety of options, configurations and arrangements, allowing us to meet the standby power needs of practically every application.

Generac searched globally to ensure the most reliable engines power our generators. We choose only engines that have already been proven in heavy-duty industrial applications under adverse conditions.

Generac is committed to ensuring our customers' service support continues after their generator purchase.

INDUSTRIAL

SD250 | 8.7L | 250 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

STANDARD FEATURES

ENGINE SYSTEM

- Oil Drain Extension
- Heavy Duty Air Cleaner
- Level 1 Fan and Belt Guards (Open Set Only)
- Stainless Steel Flexible Exhaust Connection
- Factory Filled Oil and Coolant
- · Radiator Duct Adapter (Open Set Only)
- Critical Silencer

FUEL SYSTEM

- Fuel Lockoff Solenoid
- Primary Fuel Filter

COOLING SYSTEM

- · Closed Coolant Recovery System
- UV/Ozone Resistant Hoses
- Factory-Installed Radiator
- Radiator Drain Extension
- 50/50 Ethylene Glycol Antifreeze
- 120 VAC Coolant Heater

ELECTRICAL SYSTEM

- Battery Charging Alternator
- Battery Cables
- Battery Tray
- · Rubber-Booted Engine Electrical Connections
- Solenoid Activated Starter Motor

ALTERNATOR SYSTEM

- GENprotect[™]
- 12 Leads (3-Phase, Non 600V)
- · Class H Insulation Material
- Vented Rotor
- 2/3 Pitch
- Skewed Stator
- Auxiliary Voltage Regulator Power Winding
- Permanent Magnet Excitation
- Sealed Bearings
- Automated Manufacturing (Winding, Insertion, Lacing, Varnishing)
- Rotor Dynamically Spin Balanced
- · Amortisseur Winding
- Full Load Capacity Alternator
- · Protective Thermal Switch

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of Circuits High/Low Voltage
- · Separation of Circuits Multiple Breakers
- Wrapped Exhaust Piping
- · Standard Factory Testing
- 2 Year Limited Warranty (Standby Rated Units)
- 1 Year Limited Warranty (Prime Rated Units)
- Silencer Mounted in the Discharge Hood (Enclosed Units Only)

ENCLOSURE (If Selected)

- Rust-Proof Fasteners with Nylon Washers to Protect Finish
- High Performance Sound-Absorbing Material (Sound Attenuation Enclosures)
- Gasketed Doors

GENERAC

- Upward Facing Discharge Hoods (Radiator and Exhaust)
- Stainless Steel Lift Off Door Hinges
- Stainless Steel Lockable Handles
- RhinoCoat™ Textured Polyester Powder Coat Paint

FUEL TANKS (If Selected)

- UL 142/ULC S601
- Double Wall
- Vents
- Sloped Top
- Sloped Bottom
- Factory Pressure Tested 2 psi
- Rupture Basin Alarm
- Fuel Level
- · Check Valve In Supply and Return Lines
- . RhinoCoat™ Textured Polyester Powder Coat Paint
- Stainless Steel Hardware

CONTROL SYSTEM



Digital H Control Panel- Dual 4x20 Display

Program Functions

- · Programmable Crank Limiter
- 7-Day Programmable Exerciser
- Special Applications Programmable Logic Controller
- RS-232/485 Communications
- All Phase Sensing Digital Voltage Regulator
- 2-Wire Start Capability
- Date/Time Fault History (Event Log)
- Isochronous Governor Control
- Waterproof/Sealed Connectors
- Audible Alarms and ShutdownsNot in Auto (Flashing Light)
- Auto/Off/Manual Switch

- E-Stop (Red Mushroom-Type)
- NFPA110 Level I and II (Programmable)
 Customizable Alarms, Warnings, and Events
- Modbus[®] Protocol
- Predictive Maintenance Algorithm
- Sealed Boards
- Password Parameter Adjustment Protection
- Single Point Ground
- 16 Channel Remote Trending
- 0.2 msec High Speed Remote Trending
- Alarm Information Automatically Annunciated on the Display

Full System Status Display

- Power Output (kW)
- Power Factor
- kW Hours, Total, and Last Run
- Real/Reactive/Apparent Power
- All Phase AC Voltage
- All Phase Currents
- Oil Pressure
- · Coolant Temperature
- Coolant Level
- Engine Speed
- Battery Voltage
- Frequency

- Oil Pressure
- Coolant Temperature
- Coolant Level
- Engine Overspeed
- Battery Voltage
- Alarms and Warnings Time and Date Stamped
- Snap Shots of Key Operation Parameters During Alarms and Warnings
- Alarms and Warnings Spelled Out (No Alarm Codes)

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC* INDUSTRIAL POWER

CONFIGURABLE OPTIONS

ENGINE SYSTEM

- O Block Heater
- Oil Make-Up System
- Oil Heater
- O Industrial Exhaust Silencer (Open Set Only)

FUEL SYSTEM

- O Flexible Fuel Lines
- O Primary Fuel Filter

ELECTRICAL SYSTEM

- O 10A UL Listed Battery Charger
- O Battery Warmer

ALTERNATOR SYSTEM

- O Alternator Upsizing
- O Anti-Condensation Heater
- Tropical Coating

CIRCUIT BREAKER OPTIONS

- O Main Line Circuit Breaker
- O 2nd Main Line Circuit Breaker
- O Shunt Trip and Auxiliary Contact
- O Electronic Trip Breakers

GENERATOR SET

- Extended Factory Testing
- O IBC Seismic Certification
- 8 Position Load Center

ENCLOSURE

- O Weather Protected Enclosure
- O Level 1 Sound Attenuated
- Level 2 Sound Attenuated
- O Steel Enclosure
- O Aluminum Enclosure
- Up to 200 MPH Wind Load Rating (Contact Factory for Availability)
- O AC/DC Enclosure Lighting Kit
- O Spring or Pad Vibration Isolators

FUEL TANKS (Size On Last Page)

- Overfill Prevention Valve
- O Fuel Fill Drop Tube
- O 5 Gal Spill Return Hose
- O Tank Risers
- O Florida DEP-DERM
- Vent Extensions
- O Fire Rated Fuel Hose
- O 8 in (203.2 mm) Fill Extension
- O 13 in (330.2 mm) Fill Extension

CONTROL SYSTEM

- O NFPA 110 Compliant 21-Light Remote Annunciator
- O Remote Relay Assembly (8 or 16)
- Remote E-Stop (Break Glass-Type, Surface Mount)
- Remote E-Stop (Red Mushroom-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Flush Mount)
- O Remote Communication Modem
- 10A Engine Run Relay
- Ground Fault Annunciator

WARRANTY

- O 2 Year Extended Limited Warranty
- 5 Year Limited Warranty
- 5 Year Extended Limited Warranty
- O 7 Year Extended Limited Warranty
- 10 Year Extended Limited Warranty

ENGINEERED OPTIONS

ENGINE SYSTEM

- O Coolant Heater Ball Valves
- O Fluid Containment Pan

CONTROL SYSTEM

- O Spare Inputs (x4)/Outputs (x4)
- Battery Disconnect Switch

ALTERNATOR SYSTEM

O 3rd Breaker System

GENERATOR SET

- Motorized Dampers
- O Door Open Alarm Horn
- O Enclosure Heaters
- Special Testing

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency



APPLICATION AND ENGINEERING DATA

ENGINE SPECIFICATIONS

(-)	pր	ΙРΙ	rai	ı

Make	Iveco/FPT
EPA Emissions Compliance	Stationary Emergency
EPA Emissions Reference	See Emission Data Sheet
Cylinder #	6
Туре	In-Line
Displacement - in ³ (L)	530.91 (8.7)
Bore - in (mm)	4.61 (117)
Stroke - in (mm)	5.31 (135)
Compression Ratio	16.5:1
Intake Air Method	Turbocharged/Aftercooled
Cylinder Head Type	4-Valve
Piston Type	Aluminum
Crankshaft Type	Forged Steel
Engine Governing	

Governor	Electronic Isochronous
Frequency Regulation (Steady State)	+0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full-Flow Cartridge
Crankcase Capacity - qt (L)	29.6 (28.0)

Cooling System

Cooling System Type	Closed
Water Pump Type	Pre-Lubed, Self Sealing
Fan Type	Pusher
Fan Speed - RPM	2,538
Fan Diameter - in (mm)	30 (762)

Fuel System

Fuel Type	Ultra Low Sulfur Diesel Fuel #2
Fuel Specifications	ASTM
Fuel Filtering (Microns)	5
Fuel Inject Pump Make	Electronic
Fuel Pump Type	Engine Driven Gear
Injector Type	Common Rail
Engine Type	Direct Injection
Fuel Supply Line - in (mm)	0.5 (12.7) NPT
Fuel Return Line - in (mm)	0.5 (12.7) NPT

Engine Electrical System

System Voltage	24 VDC
Battery Charger Alternator	Standard
Battery Size	See Battery Index 0161970SBY
Battery Voltage	12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	K0250124Y21
Poles	4
Field Type	Revolving
Insulation Class - Rotor	Н
Insulation Class - Stator	Н
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	< 50

Standard Excitation	Permanent Magnet Excitation
Bearings	Single Sealed Cartridge
Coupling	Direct via Flexible Disc
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	±0.25%

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency



OPERATING DATA

POWER RATINGS - DIESEL

	Standby		
Three-Phase 120/208 VAC @0.8pf	250 kW	Amps: 867	
Three-Phase 120/240 VAC @0.8pf	250 kW	Amps: 752	
Three-Phase 277/480 VAC @0.8pf	250 kW	Amps: 376	
Three-Phase 346/600 VAC @0.8pf	250 kW	Amps: 301	

MOTOR STARTING CAPABILITIES (skVA)

skVA vs. Voltage Dip

277/480 VAC 3Ø	30%	208/240 VAC 3Ø	30%
K0250124Y21	630	K0250124Y21	506
K0300124Y21	996	K0300124Y21	730
K0350124Y21	1,190	K0350124Y21	987

FUEL CONSUMPTION RATES*

Fuel Pump Lift- ft (m)
3 (1)
Total Fuel Pump Flow (Combustion + Return) - gph (Lph)
26 (98)

Diesel - gph (Lph)

Percent Load	Standby
25%	5.5 (20.8)
50%	10.4 (39.4)
75%	14.8 (56.0)
100%	18.5 (70.0)

^{*} Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby
Coolant Flow	gpm (Lpm)	63.3 (240.0)
Coolant System Capacity	gal (L)	12.7 (49.2)
Heat Rejection to Coolant	BTU/hr (kW)	682,058 (200)
Inlet Air	cfm (m³/hr)	8,872 (251)
Maximum Operating Radiator Air Temperature	°F (°C)	122 (50)
Maximum Operating Ambient Temperature (Before Derate)		See Bulletin No. 0199280SSD
Maximum Additional Radiator Backpressure	in H ₂ O (kPa)	0.5 (0.12)

COMBUSTION AIR REQUIREMENTS

Standby

Flow at Rated Power - cfm (m³/min) 720 (20.4)

ENGINE			EXHAUST		
		Standby			Standby
Rated Engine Speed	RPM	1,800	Exhaust Flow (Rated Output)	cfm (m³/min)	1,550 (43.9)
Horsepower at Rated kW**	hp	389	Maximum Allowable Backpressure	inHg (kPa)	1.5 (5.1)
Piston Speed	ft/min (m/min)	1,593 (486)	Exhaust Temperature (Rated Output)	°F (°C)	1,000 (538)
BMEP	psi (kPa)	332 (2.289)			

^{**} Refer to "Emissions Data Sheet" for maximum bHP for EPA and SCAQMD permitting purposes.

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions.

Please contact a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528, and DIN6271 standards. Standby - See Bulletin 0187500SSB

Prime - See Bulletin 0187500SSB

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

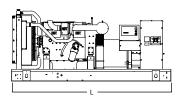
GENERAC* INDUSTRIAL POWER

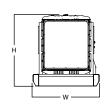
7,500 - 8,283

(3,111 - 3,502) 8,365 - 9,148

(3,759 - 4,150)

DIMENSIONS AND WEIGHTS

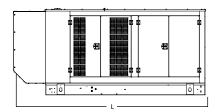


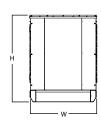


OPEN SET						
Run Time - Hours	Usable Capacity - Gal (L)	L x W x H - in (mm)	Weight - Ibs (kg)			
No Tank	-	128.0 (3,250) x 53.4 (1,357) x 57.5 (1,460)	<mark>4,325 - 5,108</mark> (1,926 - 2,317)			
8	153 (579)	128.0 (3,250) x 53.4 (1,357) x 70.5 (1,790)	5,330 - 6,113 (2,382 - 2,773)			
20	372 (1,408)	128.0 (3,250) x 53.4 (1,357) x 82.5 (2,095)	5,752 - 6,535 (2,573 - 2,964)			
31	589 (2,230)	128.0 (3,250) x 53.4 (1,357) x 94.5 (2,400)	6,169 - 6,952 (2,762 - 3,153)			
27	500 (1,893)	172.6 (4,384) x 53.4 (1,357) x 81.5 (2,070)	6,388 - 7,171 (2,696 - 3,087)			
37	693 (2,623)	136.0 (3,455) x 53.4 (1,357) x 94.5 (2,400)	5,890 - 6,673 (2,636 - 3,027)			
51	946 (3,581)	208.3 (5,292) x 53.4 (1,357) x 98.5 (2,500)	7,350 - 8,133 (3,298 - 3,689)			

1,000 (3,785) 208.3 (5,292) x 53.4 (1,357) x 98.5 (2,500)

1,325 (5,016) 277.8 (7,055) x 53.4 (1,357) x 96.9 (2,460)





WEATHER PROTECTED ENCLOSURE

54

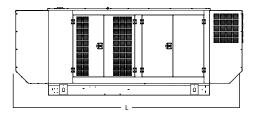
Run Time - Hours	Usable Capacity	L x W x H - in (mm)		nt - Ibs (kg) osure Only		
- nouis	- Gal (L)			Aluminum		
No Tank	-	154.5 (3,923) x 54 (1,371) x 69.8 (1,772)				
8	153 (579)	154.5 (3,923) x 54 (1,371) x 82.8 (2,102)		474		
20	372 (1,408)	154.5 (3,923) x 54 (1,371) x 94.8 (2,407)	•			
31	589 (2,230)	154.5 (3,923) x 54 (1,371) x 106.8 (2,712)	0.44			
27	500 (1,893)	172.6 (4,384) x 54 (1,371) x 93.8 (2,382)	941 (427)	474 (215)		
37	693 (2,623)	154.5 (3,923) x 54 (1,371) x 106.8 (2,712)	(421)	(210)		
51	946 (3,581)	208.3 (5,292) x 54 (1,371) x 110.8 (2,812)				
54	1,000 (3,785)	208.3 (5,292) x 54 (1,371) x 110.8 (2,812)				
71	1,325 (5,016)	277.8 (7,055) x 54 (1,371) x 109.2 (2,772)				

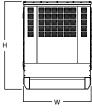
INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

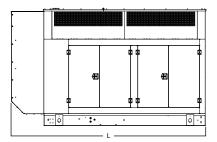
GENERAC* INDUSTRIAL POWER

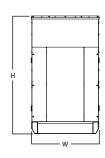
DIMENSIONS AND WEIGHTS*





LEVEL 1	LEVEL 1 SOUND ATTENUATED ENCLOSURE					
Run Time	Usable Capacity	L x W x H - in (mm)		- Ibs (kg) sure Only		
- Hours	- Gal (L)		Steel	Aluminum		
No Tank	-	179.9 (4,569) x 54.0 (1,371) x 70.0 (1,772)				
8	153 (579)	179.9 (4,569) x 54.0 (1,371) x 83.0 (2,102)				
20	372 (1,408)	179.9 (4,569) x 54.0 (1,371) x 95.0 (2,407)				
31	589 (2,230)	179.9 (4,569) x 54.0 (1,371) x 107.0 (2,712)	1 0 10	000		
27	500 (1,893)	179.9 (4,569) x 54.0 (1,371) x 94.0 (2,382)	1,246 (565)	606 (275)		
37	693 (2,623)	179.9 (4,569) x 54.0 (1,371) x 107.0 (2,712)	(000)	(210)		
51	946 (3,581)	208.3 (5,292) x 54.0 (1,371) x 111.0 (2,812)				
54	1,000 (3,785)	197.8 (5,024) x 54.5 (1,384) x 105.0 (2,661)				
71	1,325 (5,016)	277.8 (7,055) x 54.0 (1,371) x 109.4 (2,772)				



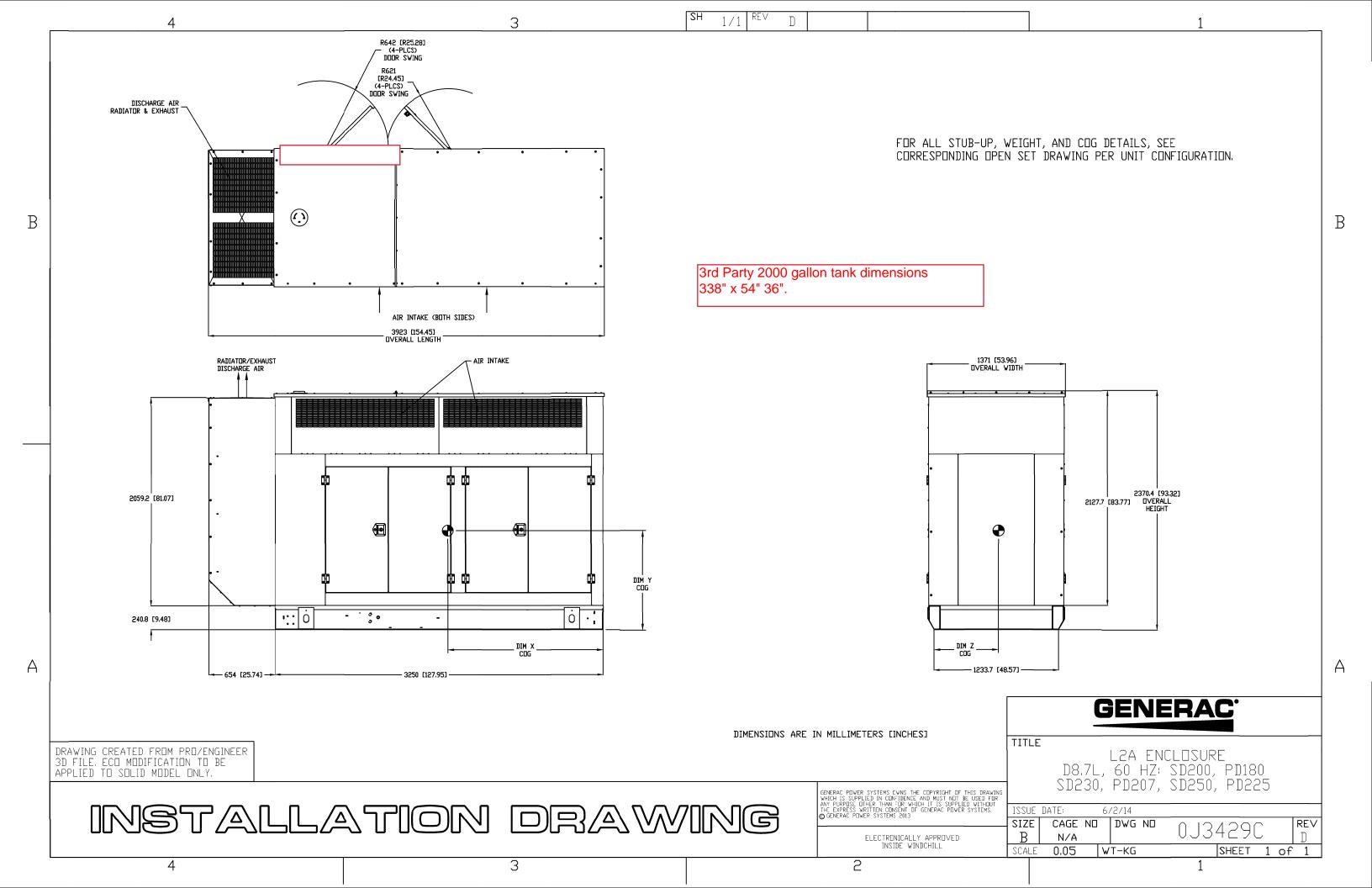


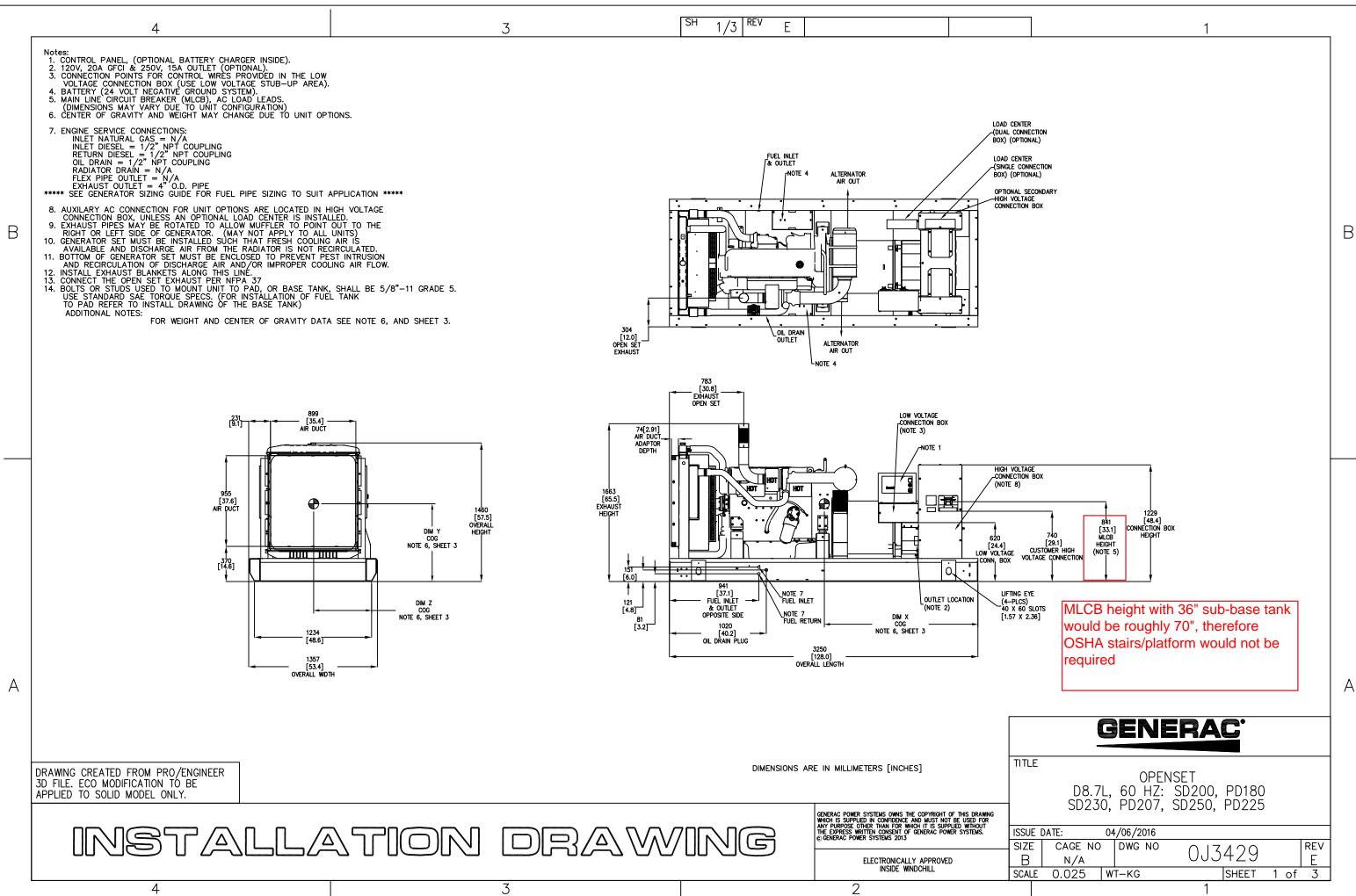
LEVEL 2 SOUND ATTENUATED ENCLOSURE

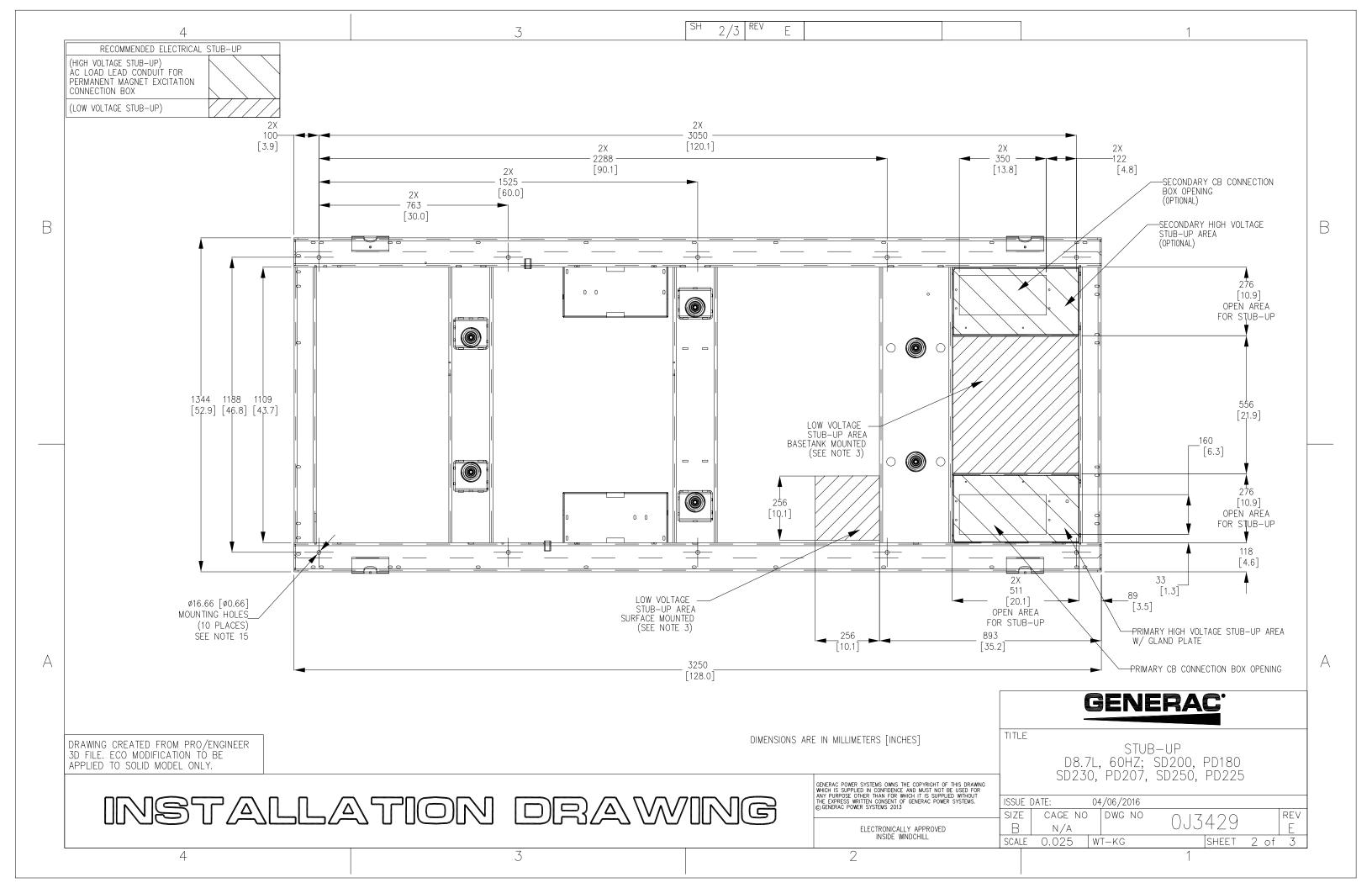
Run Time	Usable Capacity	L x W x H - in (mm)	0	- Ibs (kg) sure Only
- Hours	- Gal (L)		Steel	Aluminum
No Tank	-	154.5 (3,923) x 54.0 (1,371) x 93.3 (2,370)		
8	153 (579)	154.5 (3,923) x 54.0 (1,371) x 106.3 (2,700)		
20	372 (1,408)	154.5 (3,923) x 54.0 (1,371) x 118.3 (3,005)		
31	589 (2,230)	154.5 (3,923) x 54.0 (1,371) x 130.3 (3,310)	1 400	700
27	500 (1,893)	172.6 (4,384) x 54.0 (1,371) x 117.3 (2,980)	(672)	708 (321)
37	693 (2,623)	154.5 (3,923) x 54.0 (1,371) x 130.3 (3,310)	(012)	(021)
51	946 (3,581)	208.3 (5,292) x 54.0 (1,371) x 134.3 (3,410)		
54	1,000 (3,785)	197.8 (5,024) x 54.5 (1,384) x 128.3 (3,259)		
71	1,325 (5,016)	277.8 (7,055) x 54.0 (1,371) x 132.7 (3,370)		

3rd Party 2000 gallon tank dimensions 338" x 54" 36"

^{*} All measurements are approximate and for estimation purposes only. Specification characteristics may change without notice. Please contact a Generac Power Systems Industrial Dealer for detailed installation drawings.







MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SD200, PD180	240V, 1 n	1,962 kg [4,325 lbs]	1789 [70.4]	618 [24.3]	
SD200, PD180	208V, 240V, 480V	1,976 kg [4,356 lbs]	1784 [70.2]	617 [24.3]	
SD200, PD180	600V	1,968 kg [4,339 lbs]	1787 [70.3]	618 [24.3]	
SD230, PD207	208V, 240V, 480V	2,108 kg [4,647 lbs]	1723 [67.8]	614 [24.2]	617 [24.3]
SD230, PD207	600V	2,100 kg [4,630 lbs]	1726 [67.9]		
SD250, PD225	208V, 240V, 480V	2,167 kg [4,777 lbs]	1702 [67.0]	613 [24.1]	
SD250, PD225	600V	2,100 kg [4,630 lbs]	1704 [67.1]		
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (300kW UPSIZE)	2,307 kg [5,086 lbs]	1645 [64.8]	610 [24.0]	
SD200, PD180, SD230, PD207, SD250, PD225	600V (300kW UPSIZE)	2,160 kg [4,762 lbs]	1704 [67.1]	613 [24.1]	
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (350kW UPSIZE)	2,317 kg [5,108 lbs]	1654 [65.1]	644 [25.4]	639 [25.2]
SD200, PD180, SD230, PD207, SD250, PD225	600V (350kW UPSIZE)	2,297 kg [5,064 lbs]	1648 [64.9]	610 [24.0]	617 [24.3]

NOTE:

CENTER OF GRAVITY AND WEIGHT MAY CHANGE DUE TO UNIT OPTIONS

STD ENCLOSURE, STEEL

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SD200, PD180	240V, 1 n	2,389 kg [5,267 lbs]	1869 [73.6]	700 [27.6]	
SD200, PD180	208V, 240V, 480V	2,403 kg [5,298 lbs]	1865 [73.4]	699 [27.5]	
SD200, PD180	600V	2,395 kg [5,280 lbs]	1867 [73.5]	700 [27.5]	
SD230, PD207	208V, 240V, 480V	2,535 kg [5,589 lbs]	1811 [71.3]	692 [27.2]	
SD230, PD207	600V	2,527 kg [5,571 lbs]	1813 [71.4]	561 [561 [22.1]
SD250, PD225	208V, 240V, 480V	2,594 kg [5,719 lbs]	1791 [70.5]	689 [27.1]	
SD250, PD225	600V	2,587 kg [5,703 lbs]	1793 [70.6]	009 [27.1]	
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (300kW UPSIZE)	2,734 kg [6,027 lbs]	1739 [68.5]	682 [26.9]	
SD200, PD180, SD230, PD207, SD250, PD225	600V (300kW UPSIZE)	2,587 kg [5,703 lbs]	1793 [70.6]	689 [27.1]	
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (350kW UPSIZE)	2,744 kg [6,049 lbs]	1746 [68.7]	711 [28.0]	580 [22.8]
SD200, PD180, SD230, PD207, SD250, PD225	600V (350kW UPSIZE)	2,724 kg [6,005 lbs]	1742 [68.6]	683 [26.9]	561 [22.1]

STD ENCLOSURE, ALUMINUM

WEIGHT	CENTER OF GRAVITY	CENTER OF GRAVITY	CENTER OF GRAVITY	
	DIM X	DIM Y	DIM Z	
2,177 kg [4,801 lbs]	1850 [72.9]	663 [26.1]		
2,191 kg [4,831 lbs]	1846 [72.7]	662 [26.1]		
2,183 kg [4,814 lbs]	1848 [72.8]	663 [26.1]		
2,323 kg [5,122 lbs]	1787 [70.4]	657 [25.9]		
2,315 kg [5,105 lbs]	1790 [70.5]	037 [23.9]	556 [21.9]	
2,382 kg [5,252 lbs]	1766 [69.5]	654 [25.7]		
2,375 kg [5,237 lbs]	1768 [69.6]	034 [23.7]		
2,522 kg [5,561 lbs]	1711 [67.4]	649 [25.6]		
2,375 kg [5,237 lbs]	1768 [69.6]	654 [25.8]		
2,532 kg [5,583 lbs]	1719 [67.7]	680 [26.8]	577 [22.7]	
2,512 kg [5,539 lbs]	1714 [67.5]	650 [25.6]	556 [21.9]	

L1A ENCLOSURE, STEEL

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY	CENTER OF GRAVITY	CENTER OF GRAVITY DIM Z
SD200, PD180	240V, 1 n	2,527 kg [5,571 lbs]	1790 [73.6]	719 [28.3]	
SD200, PD180	208V, 240V, 480V	2,541 kg [5,602 lbs]	1786 [70.3]	718 [28.3]	
SD200, PD180	600V	2,533 kg [5,584 lbs]	1789 [70.4]	/18 [28.3]	564 [22.2]
SD230, PD207	208V, 240V, 480V	2,673 kg [5,893 lbs]	1739 [71.3]	710 [28.0]	
SD230, PD207	600V	2,665 kg [5,875 lbs]	1741 [68.6]		
SD250, PD225	208V, 240V, 480V	2,732 kg [6,023 lbs]	1722 [67.8]	707 [27.8]	
SD250, PD225	600V	2,725 kg [6,007 lbs]	1724 [67.9]	707 [27.0]	
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (300kW UPSIZE)	2,872 kg [6,332 lbs]	1676 [66.0]	700 [27.5]	
SD200, PD180, SD230, PD207, SD250, PD225	600V (300kW UPSIZE)	2,725 kg [6,007 lbs]	1724 [67.9]	707 [27.8]	
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (350kW UPSIZE)	2,882 kg [6,354 lbs]	1683 [66.3]	727 [28.6]	581 [22.9]
SD200, PD180, SD230, PD207, SD250, PD225	600V (350kW UPSIZE)	2,862 kg [6,309 lbs]	1679 [66.1]	700 [27.5]	564 [22.2]

L1A ENCLOSURE, ALUMINUM

WEIGHT	CENTER OF GRAVITY	CENTER OF GRAVITY	CENTER OF GRAVITY	
WEIGHT	l DIM X	DIM Y		
2,237 kg [4,931 lbs]	1812 [71.3]			
2,237 kg [4,931 lbs]	1012 [71.3]			
2,251 kg [4,962 lbs]	1808 [71.2]	673 [26.5]		
2,243 kg [4,945 lbs]	1810 [71.3]			
2,383 kg [5,253 lbs]	1753 [69.0]	666 [26.2]		
2,375 kg [5,236 lbs]	1755 [69.1]	000 [20.2]	557 [21.9]	
2,442 kg [5,383 lbs]	1733 [68.2]	664 [26.1]		
2,435 kg [5,368 lbs]	1735 [68.3]	004 [20.1]		
2,582 kg [5,692 lbs]	1682 [66.2]	658 [25.9]		
2,435 kg [5,368 lbs]	1735 [68.3]	664 [26.1]		
2,592 kg [5,714 lbs]	1689 [66.5]	689 [27.1]	577 [22.7]	
2,572 kg [5,670 lbs]	1684 [66.3]	659 [25.9]	558 [22.0]	

L2A ENCLOSURE, STEEL

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SD200, PD180	240V, 1 n	2,634 kg [5,807 lbs]	1883 [74.2]	825 [32.5]	
SD200, PD180	208V, 240V, 480V	2,648 kg [5,838 lbs]	1879 [74.0]	823 [32.4]	
SD200, PD180	600V	2,640 kg [5,820 lbs]	1882 [74.1]	7 823 [32.4]	
SD230, PD207	208V, 240V, 480V	2,780 kg [6,129 lbs]	1829 [72.0]	811 [31.9]	566 [22.3]
SD230, PD207	600V	2,772 kg [6,111 lbs]	1832 [72.1]		
SD250, PD225	208V, 240V, 480V	2,839 kg [6,259 lbs]	1811 [71.3]	805 [31.7]	
SD250, PD225	600V	2,832 kg [6,243 lbs]	1813 [71.4]		
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (300kW UPSIZE)	2,979 kg [6,567 lbs]	1763 [69.4]	793 [31.2]]
SD200, PD180, SD230, PD207, SD250, PD225	600V (300kW UPSIZE)	2,832 kg [6,243 lbs]	1813 [71.4]	806 [31.7]]
SD200, PD180, SD230, PD207, SD250, PD225	208V, 240V, 480V (350kW UPSIZE)	2,989 kg [6,589 lbs]	1769 [69.6]	819 [32.2]	583 [22.9]
SD200, PD180, SD230, PD207, SD250, PD225	600V (350kW UPSIZE)	2,969 kg [6,545 lbs]	1765 [69.5]	794 [31.3]	566 [22.3]

L2A ENCLOSURE, ALUMINUM

WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
2,283 kg [5,033 lbs]	1858 [73.2]		
2,297 kg [5,064 lbs]	1854 [73.0]	727 [28.6]	
2,289 kg [5,046 lbs]	1856 [73.1]		558 [22.0]
2,429 kg [5,355 lbs]	1798 [70.8]	717 [28.2]	
2,421 kg [5,337 lbs]	1800 [70.9]	718 [28.3]	
2,488 kg [5,485 lbs]	1777 [70.0]	713 [28.1]	
2,481 kg [5,469 lbs]	1779 [70.0]	714 [28.2]	559 [22.0]
2,628 kg [5,793 lbs]	1724 [67.9]	705 [27.8]	339 [22.0]
2,481 kg [5,469 lbs]	1779 [70.0]	714 [28.1]	
2,638 kg [5,815 lbs]	1731 [68.2]	735 [28.9]	578 [22.8]
2,618 kg [5,771 lbs]	1727 [68.0]	706 [27.8]	559 [22.0]

GENERAC

TITLE

WEIGHT & COG D8.7L, 60 HZ; SD200, PD180 SD230, PD207, SD250, PD225

INSTALLATION DRAWING

GENERAC POWER SYSTEMS OWNS THE COPYRIGHT OF THIS DRAWING WHICH IS SUPPLIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN FOR WHICH IT IS SUPPLIED WITHOUT THE EXPRESS WRITTEN CONSENT OF GENERAC POWER SYSTEMS.

ELECTRONICALLY APPROVED INSIDE WINDCHILL

ISSUE DATE: 04/06/2016 SIZE CAGE NO DWG NO REV 0J3429 N/A SCALE 0.025 WT-KG SHEET 3 of 3

DRAWING CREATED FROM PRO/ENGINEER

3D FILE. ECO MODIFICATION TO BE APPLIED TO SOLID MODEL ONLY.

А

Α

AC/DC LED LIGHT KITS FOR ENCLOSED UNITS ONLY

Description

6" Oval 15 WATT Heavy Duty High Powered LED Work Light

Specifications

Beam Angle: 45°LED Color: Cool White

• LED Type: Epistar

• Light Output: 780 Lumens

· RoHS Compliant

• Power Consumption: 11.61 WATTS

• Operating Voltage: 9~32 VDC

Color Temperature 6,000 K

• Color Rendering Index: 69

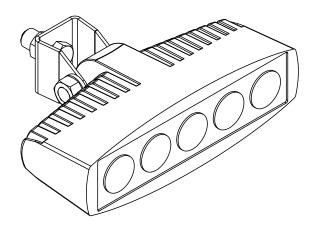
IP Rating: Waterproof IP68

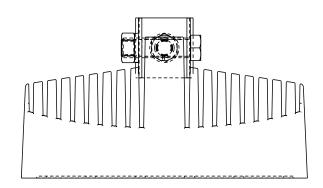
• Construction: Aluminum, Black Finish

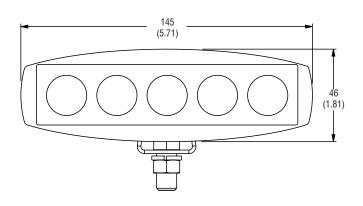
Beam Pattern: Flood

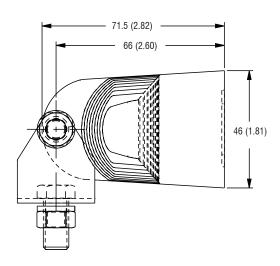
· Oil and Weather Resistant Wiring

• Adjustable Mount Angles





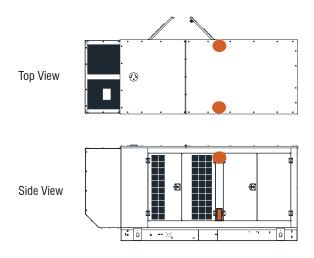




Dimensions: mm (inches)

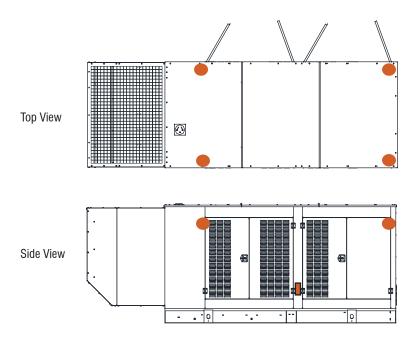


AC/DC LED LIGHT KITS FOR ENCLOSED UNITS ONLY



A-D Group Enclosures

- 2 Light Assemblies
- Diesel: 2.2L 6.7L
- Gas: 4.5L 9.0L



E-H Group Enclosures

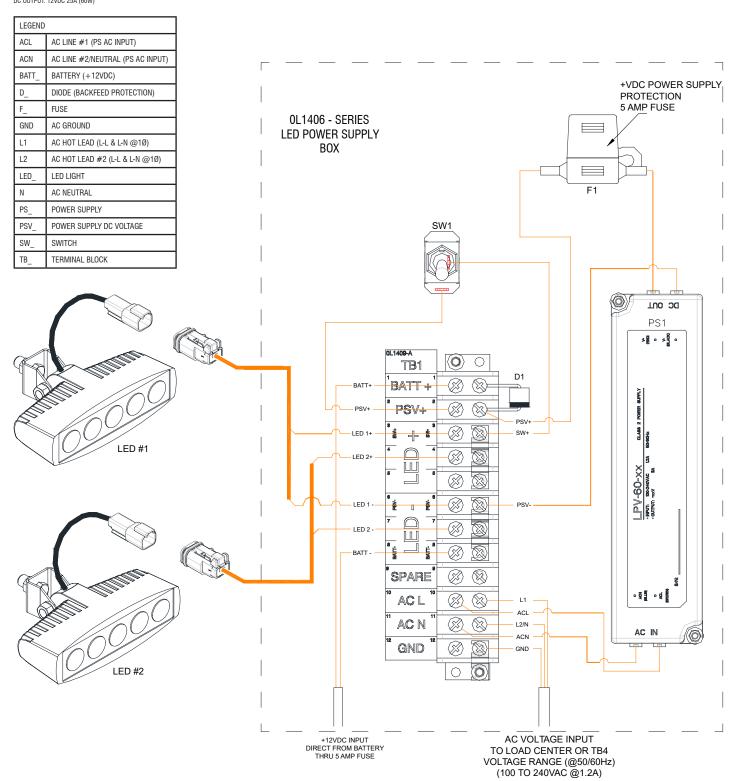
- 4 Light Assemblies
- Diesel: 8.7L 18.1L
- Gas: 14.2L 33.9L





AC/DC LED LIGHT KITS FOR ENCLOSED UNITS ONLY

POWER SUPPLY NOTES
AC INPUT: 1000-240VAC @ 1.2A @50-60HZ
LINE-TO-NEUTRAL OR LINE-TO-LINE
DC OUTPUT: 12VDC 25A (60W)



1 OF 2



21 Light Remote Annunciator and Remote Relay Panel

Model G0098511 Gray Remote Annunciator Panel with 8 Relays

Model G0098521 Gray Remote Relay Panel without LEDs and Keypad (Relays only) Model G0098531 Gray Remote Annunciator Panel without Relays



Description

The Remote Annunciator Panel provides remote monitoring and annunciation for up to 21 generator and system indications. 21 LEDs indicate 18 generator, 2 system, and 1 programmable condition.

The Relay panel has up to 8 selectable functions on form A relays; multiple relay panels can be connected for all 21 generator parameters.

The specific faults can be programmed through the Power Zone® display located on the generator.

Communications for a Power Zone® or G8601 equipped generator is RS-485.

All models require battery power (+12 or +24 VDC) sourced from the generator battery.

The Remote Annunciator Panel complies with NFPA 99 and NFPA 110.

Environmental Specifications

Livi official Specifications	
Operating Temperature	-25 °C to 60 °C
Operating Temperature Humidity	0 to 95% Non-Condensing
Power Supply	Generator Battery, +12 or +24 Volts DC
Power Usage	6 Watts Typical
RS-485 Communications	Fully Isolated Twisted Pair Cable with Shield
RS-485 Length	4,000 ft
Relay Output One N.O. Contact and 8** N.O. & N.C. Contacts (Ener	rgized when Annunciator is Powered and No Faults are Present)
Relay Contact Rating	
Enclosure Rating	NEMA 1
Alarm Horn (Remote Annunciator Panels Only)	90 dB @ 10 cm

^{*}Max Distance Between Hubs - No Limit on Number of Hubs or Total Distance **Only available on Models G0098511, G0098521

2 OF 2



21 Light Remote Annunciator and Remote Relay Panel

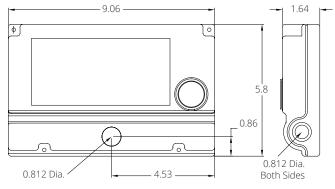
Function	Color	Alarm	Latched
Pre-Low Oil Pressure	Yellow	Yes	Yes
Pre-High Water Temperature	Yellow	Yes	Yes
Pre-Low Water Temperature	Yellow	Yes	Yes
Pre-Low Fuel	Yellow	Yes	Yes
Battery Charge AC Fail	Yellow	Yes	No
Low Battery Voltage	Yellow	Yes	No
High Battery Voltage	Yellow	No	No
Not in Auto	Red	Yes	No
RPM Sensor Loss	Red	Yes	Yes
Overcrank	Red	Yes	Yes
Overspeed	Red	Yes	Yes
Low Oil Pressure	Red	Yes	Yes
High Water Temperature	Red	Yes	Yes
Low Water Level	Red	Yes	Yes
Emergency Stop	Red	Yes	No
Gen Running	Yellow	No	No
Gen Power (ATS)	Yellow	No	No
Line Power (ATS)	Green	No	No
Systems Ready	Green	Yes	No
Communications OK	Green	Yes	No
Spare	Green	No	No

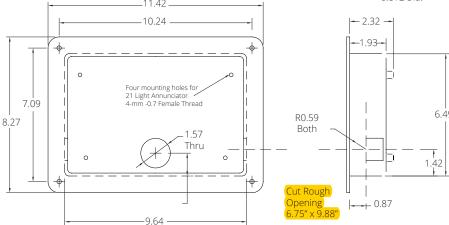
Spare Keypad Switch can be used to implement a remote start function (Models G0098511 and G0098521 only).

Annunciators

Surface Mount

The 21 Light Annunciator can mount to a flat surface with connections through the 0.812 inch diameter knockout on the back surface or through 0.812 inch diameter knockouts on sides as shown.





Flush Mount

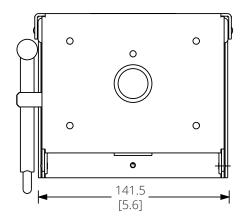
This Flush Mount Box is recessed into the wall opening and the surface mount annunciator mounts to the (4) 4 mm screw holes on the back surface. After wire connections are made the front annunciator cover is attached.

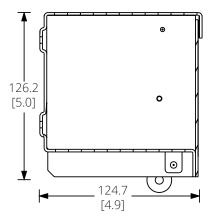
All dimensions are in inches.

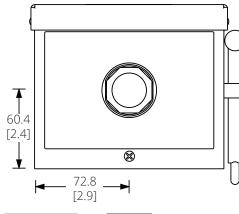
Outside



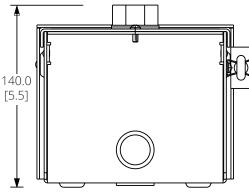
REMOTE EMERGENCY STOP SWITCH Break Glass - Power Zone® Pro & Pro Sync, G8601







Dimensions: mm [in]



Specifications

Generac Part Number: A0000960234 Surface Mount, NEMA 3R 5 Replacement Glasses

Aluminum Enclosure

Contact Rating: AC-15 3A 240V, DC-13 1.1A 125V

Contact Blocks: 3

Compatible Controllers: Power Zone® Pro, Power Zone® Pro Sync, G8601

Wiring varies by engine; refer to unit specific wiring diagram.



125 A LOAD CENTER



DESCRIPTION

The 125 AMP Load Center is a unit-mounted distribution panel utilized for optional equipment on all Generac generators utilizing H-100, PM-GC, or PM-PC control systems. This main lug load center includes all of the circuit breakers required for the coolant heater, battery charger, and other factory-installed AC loads within the generator set. The load center also serves as a convenient connection point for the customer's utility feed for AC loads. All breakers are labeled for specific load circuits.

SPECIFICATIONS

- · Siemens Part Numbers:
- NEMA 1: E0816ML1125SCU (Applies to Open Gensets)
- NEMA 3R: W0816ML1125CU (Applies to Enclosed Gensets)
- 125 AMP Main Lugs EQ Load Center
- 100,000A IR
- 1Ø, Copper Bus
- · UL Listed
- · Siemens QP Type Circuit Breakers
- · Maximum of 8 Single Pole Breakers
- Maximum of 4 Two Pole 240 V Breakers
- Mounted on Genset Frame Near Control Panel/Display Unit*

DIMENSIONS (IN)

	Н	W	D
NEMA 1	14.75	12.375	3.87
NEMA 3R	14.75	12.128	4.25

^{*}Please refer to applicable generator set installation drawing for load center location details.

Part No. 0183630SSD Rev. F 03/18/20



4.0 Ton VRV-IVS Heat Pump RXTQ48TBVJUA

FEATURES

- Variable Refrigerant Temperature (VRT) technology allows VRV IV S series to deliver improved efficiencies and year round comfort
- High Efficiency with SEER2 up to 18.6 and HSPF2 up to 9.0
- Engineered with highly reliable Daikin Swing compressors
- All inverter compressors to increase efficiency and avoid starting current rush
- High heating capacities down to -4 as factory standard
- Added safety with optional auto changeover to auxiliary heat
- Compact design with under 13" depth and weight under 230lbs

BENEFITS

- Single-phase technology enables installation in light commercial and residential applications
- Broader diversity with up to 9 indoor units connectivity
- Space saving compact design
- Design flexibility with long piping lengths up to 984ft total and 49ft vertical separation between indoor units
- Designed with reduced MOP to optimize installation costs
- Backed by best in class 10-years Parts Limited Warranty and 10-years Replacement Compressor Limited Warranty*









Submittal Date: 1/13/2023 4:35:51 PM

Page 1 of 3



4.0 Ton VRV-IVS Heat Pump RXTQ48TBVJUA

PERFORMANCE			
Outdoor Unit Model No.	RXTQ48TBVJUA	Outdoor Unit Name:	4.0 Ton VRV-IVS Heat Pump
Type:	Heat Pump		
Rated Cooling Conditions:	Indoor (°F DB/DB): 80 / 67 Ambient (°F DB/WB): 95 / 75	Rated Heating Conditions:	Indoor (°F DB/WB): 70 / 60 Ambient (°F DB/WB): 47 / 43
Rated Piping Length(ft):			
Rated Height Difference (ft):			
Cooling Capacity (Rated/Non- Ducted/Ducted) (Btu/hr):	45,500 / 45,500	Heating Capacity (Rated/Non- Ducted/Ducted) (Btu/hr):	49,500 / 46,000
Cooling Input Power (kW):		Heating Input Power (kW):	
EER2 (Non-Ducted/Ducted):	10.3 / 7.9	SEER2 (Non-Ducted/Ducted):	18.6 / 14.6
HSPF2 (Non-Ducted/Ducted):	8.5 / 8.3	Heating COP (Non-Ducted/Ducted):	4.0 / 3.3

OUTDOOR UNIT DETAILS			
Power Supply (V/Hz/Ph):	208-230 / 60 / 1	Compressor Stage:	
Power Supply Connections:	L1, L2 G	Capacity Control Range (%):	14 - 100
Min. Circuit Amps MCA (A):	29.1	Airflow Rate (H) (CFM):	
Max Overcurrent Protection (MOP) (A):	35	Gas Pipe Connection (inch):	5/8
Max Starting Current MSC(A):		Liquid Pipe Connection (inch):	3/8
Rated Load Amps RLA(A):	19	Sound Pressure (H) (dBA):	58
Dimensions (HxWxD) (in):	39 x 37 x 12-5/8	Sound Power Level (dBA):	76
Net Weight (lb):	176		

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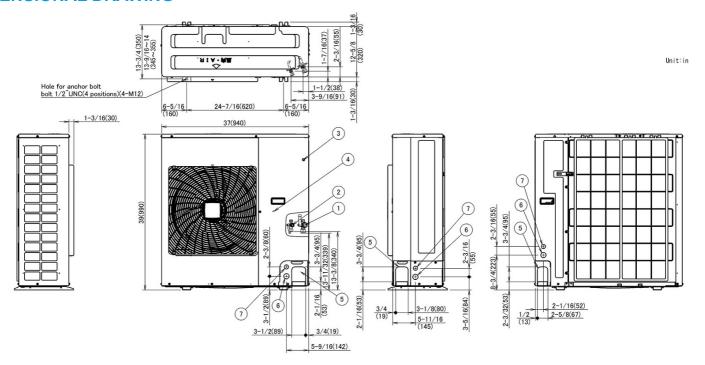
Page 2 of 3

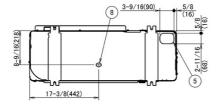


4.0 Ton VRV-IVS Heat Pump RXTQ48TBVJUA

SYSTEM DETAILS			
Refrigerant Type:	R-410A	Cooling Operation Range (°F DB):	23 - 122
Holding Refrigerant Charge (lbs):	7.5	Heating Operation Range (°F WB):	-4 - 60
Additional Charge (lb/ft):		Max. Pipe Length (Vertical) (ft):	98
Pre-charge Piping (Length) (ft):		Cooling Range w/Baffle (°F DB):	-
Max. Pipe Length (Total) (ft):	984	Heating Range w/Baffle (°F WB):	-
Max Height Separation (Ind to Ind ft):	49		

DIMENSIONAL DRAWING







2.0-Ton Round Flow Sensing Cassette - FXFQ24AAVJU

Project: VA - ATL - Trinka Davis CLC - 4 Ton System

Submitted by: Joe Schrader of HOFFMAN & HOFFMAN INC - CHARLOTTE on 7/23/2024

Submitted to: Charlotte Engineers

Tags: FCU-4-1, FCU-4-2

FEATURES

- True 360 Airflow distribution and three-room sensors enables optimized occupant comfort and efficiency
- Optional self-cleaning filter panel to further increase efficiency and reduce maintenance costs
- Individually controlled supply air louvers for comfortable air supply
- Improved efficiency with new DC fan motor and auto logic that adjusts fan speed based on space load
- Industry leading flexibility with 23 possible airflow patterns
- Integral condensate pump with up to 26-1/2" lift
- Standard Limited Warranty: 10-year warranty on compressor and all parts

BENEFITS

- Compact design to allow for installation in small ceiling voids
- Very low sound levels increase flexibility regarding location of the unit
- Increased indoor air quality with high efficiency filter options & ventilation connection kit
- Automatic occupancy dependent Set back function to save energy





2.0-Ton Round Flow Sensing Cassette - FXFQ24AAVJU

Project: VA - ATL - Trinka Davis CLC - 4 Ton System

Submitted by: Joe Schrader of HOFFMAN & HOFFMAN INC - CHARLOTTE on 7/23/2024

Submitted to: Charlotte Engineers

Tags: FCU-4-1, FCU-4-2

PERFORMANCE			
Indoor Unit Model No.	FXFQ24AAVJU	Indoor Unit Name:	2.0-Ton Round Flow Sensing Cassette
Туре:		Rated Cooling Conditions:	Indoor (°F DB/WB): / Ambient (°F DB/WB): /
Rated Cooling Capacity (Btu/hr):	23,000	Rated Heating Conditions:	Indoor (°F DB/WB): / Ambient (°F DB/WB): /
Sensible Capacity (Btu/hr):		Rated Piping Length(ft):	
Cooling Input Power (kW):		Rated Height Separation (ft):	
Rated Heating Capacity (Btu/hr):	27,000		

INDOOR UNIT DETAILS			
Power Supply (V/Hz/Ph):	208-230 / 60 / 1	Airflow Rate (H/M/L) (CFM):	777/618/477
Power Supply Connections:		Moisture Removal (Gal/hr):	
Min. Circuit Amps MCA (A):	0.5	Gas Pipe Connection (inch):	5/8
Max Overcurrent Protection (MOP) (A):	15	Liquid Pipe Connection (inch):	3/8
Dimensions (HxWxD) (in):	9-11/16 x 33-1/16 x 33-1/16	Condensate Connection (inch):	1-1/4
Net Weight (lb):	51	Sound Pressure (H/L) (dBA):	38/28
Ext. Static Pressure (Rated/Max) (inWg):	1	Sound Power Level (dBA):	



2.0-Ton Round Flow Sensing Cassette - FXFQ24AAVJU

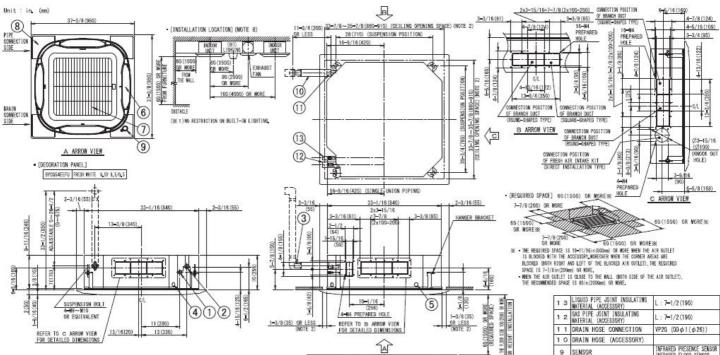
Project: VA - ATL - Trinka Davis CLC - 4 Ton System

Submitted by: Joe Schrader of HOFFMAN & HOFFMAN INC - CHARLOTTE on 7/23/2024

Submitted to: Charlotte Engineers

Tags: FCU-4-1, FCU-4-2

DIMENSIONAL DRAWING



- MOTE)

 1. STICKING LOCATION FOR NUMBERCHIEFS SLARE.

 **MANFACTURER'S LABEL FOR INDIGE UNIT: CONTROL BOX GOVER INSIDE SUCTION SHILLE

 **MANFACTURER'S LABEL FOR INDIGEN UNIT: CONTROL BOX GOVER INSIDE SUCTION SHILLE

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 B. LIFTSCHALLADOR OR MAINTER IN ATTIO 25 OFFI THE TRANSPORT AND THE SEALUND WATERIAL KIT (SOLD SEPARATELY).

	LIGUID PIPE JOINT INSULATING MATERIAL (ACCESSORY)	L : 7-1/2 (190)
	GAS PIPE JOINT INSULATING MATERIAL (ACCESSORY)	L: 7-1/2(190)
11	DRAIN HOSE CONNECTION	VP20 (00φ1(φ26))
10	DRAIN HOSE (ACCESSORY)	1 - DE 15 - DE 10
9	SENSOR	INFRAGED PRESENCE SENSOR INFRAGED FLOOR SENSOR
8	CORNER COVER	
7	SUCTION GRILLE	
6	AIR OUTLET	
5	RENOTE CONTROLLER AND TRANSMISSION WIRING CONNECTION	
4	POWER SUPPLY WIRING CONNECTION	AND CONTRACTOR
3	DRAIN PIPE CONNECTION	VP25 (0D φ 1-1/4 (φ 32))
2	GAS PIPE CONNECTION	φ5/8(φ15,9) (FLARE CONNECTION)
1	LIQUID PIPE CONNECTION	φ3/8(φ9,5) (FLARE CONNECTION)
ITEM	PART NAME	REMARK

Submittal Date: 7/23/2024 7:03:29 AM

Page 3 of 3



2 PIPE REFNET JOINT KHRP26A22TA

DESCRIPTION

REFNET Joints provide a factory designed option for the branching within the refrigerant piping network.

FEATURES

- Engineered for uniform refrigerant flow and refrigerant distribution.
- Designed to help smoother oil return.
- Flexible installation; vertical or ± 30° from horizontal.
- Designed with tube diameters (I.D. and O.D.) required for VRV system installations.
- Pre-formed clamshell style insulation¹ for cleaner and reliable application.
- Accounts for 1.5 ft equivalent pipe length calculation.
- Insulation tested in accordance with ASTM E84 Class A



*Picture for reference only





SPECIFICATIONS			
Model No.:	KHRP2	6A22TA	
Piping Material:	ACR Copper	Alloy C12200	
Ports / Branches:		2	
Included in Branch Kit:	1 pcs. –	Gas Side	
iliciuueu III Dialicii Kii.	1 pcs L	iquid Side	
Kit Name:	GAS SIDE	LIQUID SIDE	
Reducer Fittings:	1 pcs – I.D. Ø 3/4 1 pcs – I.D. Ø 7/8	-	
Insulation Material:	Polypropylene	Polypropylene	
Insulation Quantity (per Header):	1 pcs.	1 pcs.	
Insulation Flammability	ASTM E84 – Class A		
Flame Spread Index	< 25		
Smoke Develop Index	< 50		
Indoor Unit Capacity Index:	< 72		
Pipe Connection Size:	Refer to Dimensional Drawing	and VRV Express Calculations	

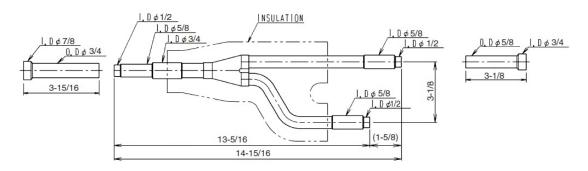
The insulation of the refrigerant piping must be reinforced based on the environment of the installation. Otherwise dew may condensate on the surface of



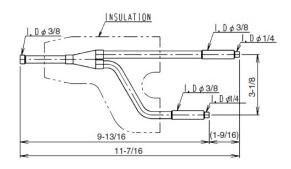
2 PIPE REFNET JOINT KHRP26A22TA

DIMENSIONAL DRAWING

GAS SIDE JOINT



LIQUID SIDE JOINT

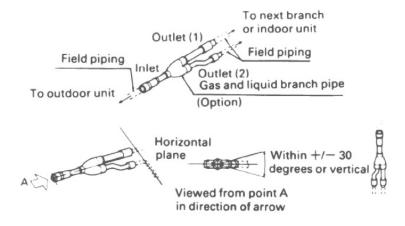


ACCESSORY

REDUCER: GAS SIDE: 2pcs
INSULATION: 2pcs
INSTALLATION MANUAL

C: D3K05234A

TYPICAL INSTALLATION DRAWING



Daikin North America LLC, 5151 San Felipe, Suite 500, Houston TX, 77056 <u>www.daikinac.com</u> <u>www.daikincomfort.com</u>



BRC1E73 – Navigation Remote Controller

Project Name:		
Location:	_ Approval:	
Engineer:	Date:	
Submitted to:	Construction:	
Submitted by:	Unit #:	
Reference:	Drawing #:	

MODEL COMPATIBILITY:

Compatible with VRV and VRV Life[™] indoor unit models: FXAQ, FXDQ, FXEQ, FXFQ, FXHQ, FXLQ, FXMQ_MF, FXNQ, FXSQ, FXTQ, FXUQ, FXZQ, VAM, CXTQ

Compatible with SkyAir indoor unit models: FAQ, FBQ, FCQ, FHQ, FTQ

Compatible with Single and Multi-zone system indoor unit model: FFQ, FDMQ

SPECIFICATIONS:

Model	BRC1E73
Description	Navigation Remote Controller
Maximum Connections	16 indoor units
Communication Wire	18AWG-2, No polarity Stranded, Non-shielded
Total Wiring Length	1,640 ft. (500 m)
Communication Protocol	Daikin proprietary P1P2 protocol
Power	16VDC supplied by indoor unit (1.58VA maximum)
Comfort Setpoint Range	60 to 90 °F (16 to 32 °C)
Setback Setpoint Range	40 to 95 °F (5 to 35°C)
Operating Temp Range	14 to 122°F (-10 to 50°C)
Operating Humidity Range	75% or less (RH) (without condensation)
Dimensions (WxHxD)	4.72x4.72x0.75 inch (120x120x19 mm)
Weight (Mass)	0.42 lbs. (0.19 kg)

PRODUCT IMAGE:



Notes:

(1) 1 of 3 display options – Detailed display shown

FEATURES:

- 1. Up to 16 indoor units are controllable within one group
- 2. Within one group, up to 2 Navigation Remote Controllers can be used, one as a main and one as a sub
- 3. Backlit LCD displays in English, Spanish or French
- 4. Temperature sensor built-in with configurable offset
- 5. Display of Temperature and Setpoint in 1°F / °C increments
- 6. Three configurable display options: Detailed, Standard and Simple
- 7. Dual setpoints (independent cooling and heating setpoints) with configurable minimum setpoint differential or Single Setpoint (occupied period)
- 8. Setpoint range limit for cooling and heating modes

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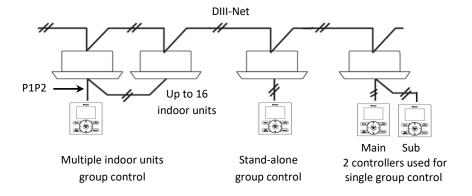


BRC1E73 – Navigation Remote Controller

Project Name.		
Location:	Approval:	
Engineer:	Date:	
Submitted to:	Construction:	
Submitted by:	Unit #:	
Reference:	Drawing #:	

- 9. Independent cooling and heating setback setpoints (unoccupied period)
- 10. Auto changeover control with configurable primary and secondary changeover dead bands and guard timer
- 11. Airflow Individual air flow direction, dual airflow and auto draft prevention (prevents air blowing directly on occupants)*
- 12. Built-in 7 days, weekdays+weekend, weekdays+Sat+Sun, and Everyday schedules with up to 5 actions per day with independent cooling and heating or setback setpoints
- 13. Automatic Setback by occupancy sensor*
- 14. Automatic Off by occupancy sensor*
- 15. Configuration for Self-cleaning filter panel**
- 16. Automatic adjustment for Daylight Savings Time (DST)
- 17. 48 hour clock/calendar battery backup (protects schedule timing in cases of short term power loss from indoor unit)
- 18. Real-time monitoring of system malfunctions with immediate display of unit in error and error code
- 19. The buttons on the remote controller are selectable by locking out the unwanted buttons
- 20. The operation modes can be restricted to provide only the desired mode(s) of operation
- 21. Display can be configured to show "Off" and room temperature only when indoor unit is turned off
- 22. To prevent unwanted changes, fan speed selection and display may be hidden
- 23. Auto off timer configurable in 10 minute increments (range 30-180 minutes)
- 24. Can be used to replace earlier versions of remote controllers
 - * Available for FXFQ TVJU, FXUQ PVJU, and FXZQ TA indoor units
 - **Available for FXFQ TVJU indoor units

SYSTEM DIAGRAM:



FACE DECAL OPTIONS:

Face decal options are used to hide unnecessary buttons:

- 1. The face decal is designed to adhere to the faceplate
- 2. Hidden buttons can be accessed by service personnel without removing the face decal due to its flexibility



BRC1E73 - Navigation Remote Controller

Pro	ject	Na	me:

Location:	Approval:
Engineer:	Date:
Submitted to:	Construction:
Submitted by:	Unit #:
Reference:	Drawing #:





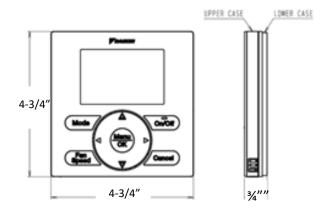






Used with		Single Setpoint mode		Dual Setpoint mode					
	BRC1E72RM	BRC1E72RF	BRC1E72RMF	BRC1E72RM2	BRC1E72RF2	BRC1E72RMF2			
Model	Planten Shoke Do Off Torono,	Factorial	Francisco Line A Co-Cost For O	Francis Linds A CHOCK THE CONTRIBUTION OF	France (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	Francis Scale Control			
On/Off	X	X	X	X	X	X			
Mode	X		X	X		X			
Fan		X	X		X	X			
Up, Down	Х	Х	X	Х	X	X			
Left, Right				Х	Х	X			
Menu/Ok									
Cancel									

DIMENSIONS:



DOCUMENTATION:

Documentation available on www.daikincity.com and/or www.daikinac.com:

- Installation Manual
- Operation Manual

Daikin North America LLC, 5151 San Felipe, Suite 500, Houston TX, 77056 www.daikinac.com www.daikincity.com



BRC1E73 – Navigation Remote Controller

Project Name:	
Location:	Approval:
Engineer:	Date:
Submitted to:	Construction:
Submitted by:	Unit #:
Reference:	Drawing #:

- Submittal
- Guide Specifications
- Quick User Guide
- Field Setting Table







MARK: EF-1

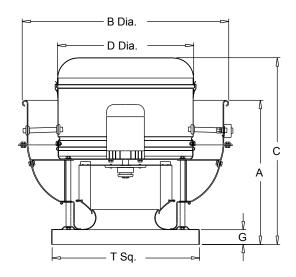
PROJECT: VA - Trinka Davis

DATE: 07/22/2024

VCR-D VF

Upblast Centrifugal Exhaust Ventilator Roof Mounted/Direct Drive Electronically Commutated Vari-Flow® Motor

STANDARD CONSTRUCTION FEATURES:
All aluminum housing - Backward inclined all aluminum wheel - Two piece top cap with stainless steel quick release latches - One piece bottom spinning - Welded curb cap corners - Permanently lubricated ball bearing motors - Corrosion resistant fasteners - Transit tested packaging.



Performance

Qt	Catalog Number	~ 1 1		Power (HP)			Speed Control	
1	120V28D (VF)	2025	.600	2210	.724	n/a(<1HP)	0.87	EC

Altitude (ft): 1000 Temperature (F): 70

Motor Information

HP	RPM*	Volts/Ph/Hz	Enclosure	RLA	
7/8	2800	208/1/60	OPEN -EC	6.2	



^{*}Motor programmed to max speed of 2252 RPM.

RLA based on motor manufacturer's data at programmed HP and max RPM. Motor is electronically/thermally protected.

Sound Data Inlet Sound Power by Octave Band

1	2	თ	4	5	6	7	8	LwA	dBA	Sones
81	91	93	89	78	75	72	66	89	78	27

⁻ Distance from Sound source 5 ft

Accessories:

FAN MOUNTED SPEED CONTROL ROOF CURB RCG 18 9.5H -C-T-N UL762 (327Y-300DEG)

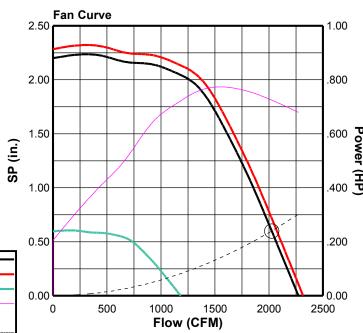
Dimensions (inches)

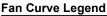
Α	19-1/16
B Dia.	30-3/16
С	28-1/4
D Dia.	20-3/8
G	2
T Sq.	20
Roof Open. Sq.*	15-1/2

NOTE: Accessories may affect dimensions shown.

Weight(lb)*** Shipping 86 Unit	ing 86 Unit 69
--------------------------------	----------------------

^{*} Roof opening size for curbs supplied by Cook only.
***Includes fan, motor & accessories.





CFM vs SP (2210)

100% EC (2252)

Min EC (1150)

CFM vs HP

Point of Operation

System Curve



CONTROL SOURCE AND A SOURCE AND

MARK: EF-1

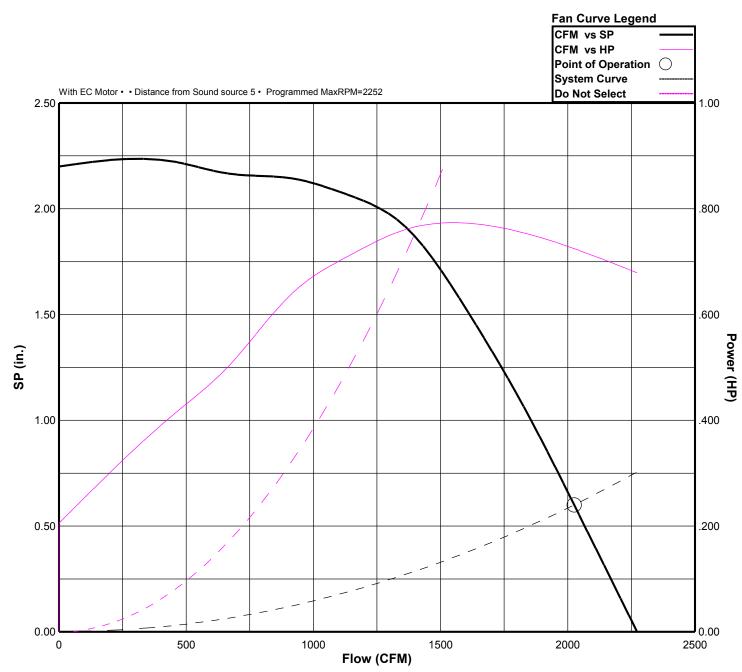
PROJECT: VA - Trinka Davis

DATE: 07/22/2024

VCR-D VF

Performance

				Power (HP)			OVEL (FPM)			Temp (°F)	
120V28D (VF)	2025	.600	2210	.724	n/a(<1HP)	0.87	1000	6943	26%	70	1000





MARK: EF-1

PROJECT: VA - Trinka Davis

DATE: 07/22/2024

AMCA License Information



Loren Cook Company certifies that the 120V28D shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Performance certified is for installation type A: free inlet, free outlet. Power rating (BHP/kW) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories). The sound ratings shown are loudness values in hemispherical sones at 5 ft. in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation type A: free inlet hemispherical sone levels.

The sound power level ratings shown are in decibels, referred to 10(-12) watts calculated per AMCA Standard 301. Values shown are for inlet Lwi and LwiA sound power levels for installation type A: free inlet, free outlet. Ratings do not include the effects of duct end correction. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. The dBA levels shown have been calculated for a distance of 5 ft in a hemispherical free field. The AMCA Certified Ratings Seal applies to sone ratings only. Octave Band, LwA and dBA levels are not AMCA International licensed.

CookSelect v2.0 - February 2024 Page 3 of 6



PROJECT: VA - Trinka Davis

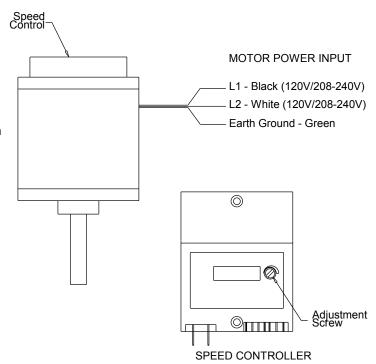
DATE: 07/22/2024

Speed Control

Internal Speed Control Electronically Commutated (EC) Motor Type N

STANDARD CONSTRUCTION FEATURES:

Some motors come with a factory programmed maximum RPM for specific applications - Integral potentiometer with slotted screw for speed adjustment.



Dimensions (inches)

Zilleriere (menee)							
	_	Description					
EF-1	1	OPEN -7/8HP - 208V/1 PH/ 60 2800/0000-EC					

CookSelect v2.0 - February 2024 Page 4 of 6



PROJECT: VA - Trinka Davis

DATE: 07/22/2024

RCG

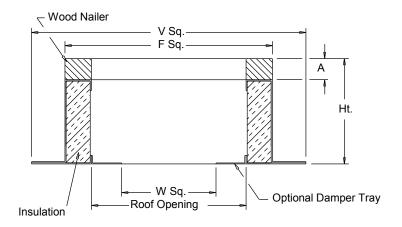
Galvanized Steel Roof Curb

STANDARD CONSTRUCTION FEATURES:

18 gauge galvanized steel - 1-1/2", 3 lbs. density thermal and acoustical insulation - Continuously welded corners -Wood nailer.

Options:(As noted below*)

- 1) No wood nailer (deduct 1-1/2" for actual height).
- 2) Damper tray.
- 3) Liner.
- 4) Gasket on wood nailer.
- 5) Lorenized coating.
- 6) Enamel coating.
- 7) Burglar bars.



Dimensions (inches)

Mark	Qty	Description	Ht	Options*	Α	F Sq.	V Sq.		Roof Opening
EF-1	1	RCG 18	9.5	1;	1-1/2	18-1/2	22-1/2	11-3/4	15-1/2

CookSelect v2.0 - February 2024 Page 5 of 6



MARK: EF-1

PROJECT: VA - Trinka Davis

DATE: 07/22/2024

Limited Warranty

Loren Cook Company warrants that your Loren Cook fan was manufactured free of defects in materials and workmanship, to the extent stated herein. For a period of one (1) year after date of shipment, we will replace any parts found to be defective without charge, except for shipping costs which will be paid by you.

This warranty is granted only to the original purchaser placing the fan in service.

This warranty is void if the fan or any part thereof has been altered or modified from its original design or has been abused, misused, damaged or is in worn condition or if the fan has been used other than for the uses described in the company manual. This warranty does not cover defects resulting from normal wear and tear.

To make a warranty claim, notify Loren Cook Company, General Offices, 2015 East Dale Street, Springfield, Missouri 65803-4637, explaining in writing, in detail, your complaint and referring to the specific model and serial numbers of your fan. Upon receipt by Loren Cook Company of your written complaint, you will be notified, within thirty (30) days of our receipt of your complaint, in writing, as to the manner in which your claim will be handled. If you are entitled to warranty relief, a warranty adjustment will be completed within sixty (60) business days of the receipt of your written complaint by Loren Cook Company.

This warranty gives only the original purchaser placing the fan in service specifically the right. You may have other legal rights which vary from state to state.

For fans provided with motors, the motor manufacturer warrants motors for a designated period stated in the manufacturer's warranty. Warranty periods vary from manufacturer to manufacturer. Should motors furnished by Loren Cook Company prove defective during the designated period, they should be returned to the nearest authorized motor service station. Loren Cook Company will not be responsible for any removal or installation costs.

CookSelect v2.0 - February 2024 Page 6 of 6



VRV Selection

Project Report

Report details

Produced on: 7/23/2024

Application version: 2024.7.18.2

Project details

Project name: VA - ATL - Trinka Davis CLC - 4 Ton s

Solution name: Unnamed solution (1)

Client Name:

Customer reference:

Quotation reference:

Project number: 662085/835461

Selection parameters of the indoor units can be found in the Engineering Data Books
Selection parameters of the outdoor units can be found in the Engineering Data Books
Only the data published in the data book are correct. This program uses close approximations of these data.



Material list

Model	Quantity	Description
RXTQ48TBVJUA	1	VRV-IV-S -TB -A R410A (208-230V)
FXFQ24AAVJU	2	FXFQ_AA - Round Flow Sensing Cassette
KHRP26A22TA	1	Refnet branch piping kit
BRC1E73	2	new Navigation Remote Controller
BYCQ54EEFU	2	Standard sensing decoration panel

Remarks

Note: Upon depletion of inventory of current REFNET models, order of current REFNET models will be substituted with the new upgraded -A models with no additional fee.



Indoor unit details

Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
FCU	Device model name
Tmp C	Indoor conditions in cooling
Rq TC	Required total cooling capacity
Rv TC	Revised total cooling capacity (asked from outdoor)
Max TC	Available total cooling capacity
Rq SC	Required sensible cooling capacity
Tevap	Evaporating temperature of indoor unit coil
Tdis C	Indoor unit discharge air temperature in cooling based on maximum capacities and
	required capacities
Max SC	Available sensible cooling capacity
Tmp H	Indoor temperature in heating
Rq HC	Required heating capacity
Max HC	Available heating capacity
Tdis H	Indoor unit discharge air temperature in heating based on maximum capacities and
	required capacities
Sound	Sound pressure level low and high
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
Min coil	Minimum coil volume
Max coil	Maximum coil volume
Air Flow Rate	Air Flow Rate



CU- 4 - RXTQ48TBVJUA

Capacity data at conditions and connection ratio (100) as entered

Name	FCU				Cool	ing			
		Tmp C	Rq TC	Rv TC	Max TC	Rq SC	Tevap	Tdis C	Max SC
		°F	BTU/h	BTU/h	BTU/h	BTU/h	°F	°F	BTU/h
		(DBT/WBT)							
FCU-4-1	FXFQ24AAVJU	78.0/65.5	n/a	0	21,789	n/a	42.8	57.7 / 57.7	17,365
FCU-4-2	FXFQ24AAVJU	78.0/65.5	n/a	0	21,789	n/a	42.8	57.7 / 57.7	17,365
			0						

Name	FCU			Heating				
		Tmp H Rq HC Max HC		Tdis H	Min coil	Max coil	Air Flow Rate	
		°F	BTU/h	BTU/h	°F	in ³	in ³	cfm
FCU-4-1	FXFQ24AAVJU	68.0	n/a	28,000	100.7 / 100.7	n/a	n/a	777
FCU-4-2	FXFQ24AAVJU	68.0	n/a	28,000	100.7 / 100.7	n/a	n/a	777
			n/a					

Name	FCU	Room	Sound	PS	MCA	MOP	WxHxD	Weight
			dBA		Α		inch	lbs
FCU-4-1	FXFQ24AAVJU		28 - 38	208-230V 1ph	0.5	15 A	33.1 x 9.7 x 33.1	50.7
FCU-4-2	FXFQ24AAVJU		28 - 38	208-230V 1ph	0.5	15 A	33.1 x 9.7 x 33.1	50.7

Remarks

Reduced operational load

The sum of the required indoor unit capacities is 56,000BTU/h for heating. However, the outdoor unit selection uses reduced load values for heating of 44,240BTU/h (=79%). Be aware that unrealistic reductions may lead to reduced comfort levels, different noise levels or increased wear and tear.

Outdoor vs. indoor position

Outdoor unit placed at the same level as the indoor units.



Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
Model	Device model name
CR	Connection ratio
Tmp C	Outdoor conditions in cooling
WFR per module	Water flow per outdoor unit module
CC	Available cooling capacity
Rq CC	Required cooling capacity
PIC	Power input in cooling mode
InC	Water inlet temperature in cooling mode
OutC	Water outlet temperature in cooling mode
Tmp H	Outdoor conditions in heating (dry bulb temp. / RH)
HC	Available heating capacity (integrated heating capacity)
Rq HC	Required heating capacity
PIH	Power input in heating mode
InH	Water inlet temperature in heating mode
OutH	Water outlet temperature in heating mode
Piping	Largest distance from indoor unit to outdoor unit
Bse Refr	Standard factory refrigerant charge (16.4ft actual piping length) excluding extra
	refrigerant charge. For calculation of extra refrigerant charge refer to the databook
Ex Refr	Extra refrigerant charge
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
FLA	Fan Motor Input
RLA	Nominal Running Amps
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
EER	EER value at nominal condition
EER2	EER2 value at nominal condition
IEER	IEER value at nominal condition
COP47	COP value at nominal condition and at ambient temperature of 47°F
COP17	COP value at nominal condition and at ambient temperature of 17°F



Outdoor details

Name	Model	CR	Cooling			He	ating		Piping
			Tmp C	CC	Rq CC	Tmp H	HC	Rq HC	
		%	°F	BTU/h	BTU/h	°F	BTU/h	BTU/h	ft
						(DBT/WBT)			
CU- 4	RXTQ48TBVJUA	100.0	95.0	46,039	43,578	20.0/17.0	44,764	44,240	24.6

Name	Model	PS	MCA	MOP	RLA	FLA	WxHxD	Weight
			Α	Α	Α	Α	inch	lbs
CU- 4	RXTQ48TBVJUA	208-230V	29.1	35.0	19.0		37.0 x 39.0 x	176.4
		1ph					12.6	

Name	Efficiency Metrics - Ducted										
	EER	EER EER2 IEER COP47 COP17 SCHE SEER SEER2 HSPF HSPF2									
CU- 4		7.9						14.6		8.3	

Name	Efficiency Metrics - Non Ducted										
	EER	EER EER2 IEER COP47 COP17 SCHE SEER SEER2 HSPF HSPF2									
CU- 4		10.3						18.6		8.5	

Sound Data

Name	Model	Sound	Sound Power		Pressure
		Cooling	Heating	Cooling	Heating
		dBA	dBA	dBA	dBA
CU- 4	RXTQ48TBVJUA	76	78	58	61

Refrigerant information

Name	Model	Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
CU- 4	RXTQ48TBVJUA	R410A	2087.5	7.50	unknown	unknown	7.10

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.



CU- 4 - RXTQ48TBVJUA

Model	Quantity	Description
RXTQ48TBVJUA	1	VRV-IV-S -TB -A R410A (208-230V)
FXFQ24AAVJU	2	FXFQ_AA - Round Flow Sensing Cassette
KHRP26A22TA	1	Refnet branch piping kit
BRC1E73	2	new Navigation Remote Controller
BYCQ54EEFU	2	Standard sensing decoration panel

Refrigerant information

Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
R410A	2087.5	7.50	unknown	unknown	7.10

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.

Pipe capacities

Maximum Connection Index	Diameters	
>0	3/8"x5/8"	
Main pipe size up	3/8"x3/4"	

Piping limitations

Description	Value
Maximum total length	984.3ft
Maximum longest actual length	229.7ft
Maximum longest equivalent length	295.3ft
Maximum main pipe length (size up of main pipe required if longer)	-
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	131.2ft
Maximum length first branch to indoor unit	131.2ft
Maximum length of indoor units to nearest branch	131.2ft
Maximum length difference between longest and shortest distance to indoor units	131.2ft
Maximum height difference, outdoor unit below indoor units	98.4ft
Minimum connection ratio, outdoor unit below indoor units	-
Maximum height difference, outdoor unit above indoor units	98.4ft
Minimum connection ratio, outdoor unit above indoor units	-
Maximum height difference in technical cooling, outdoor unit below indoor units	98.4ft
Maximum height difference in technical cooling, outdoor unit above indoor units	98.4ft
Maximum height difference between indoor units	49.2ft
Connection ratio range	50.0% - 130.0%
Refrigerant pipe diameters	3/8" (liquid) x 3/4" (gas)

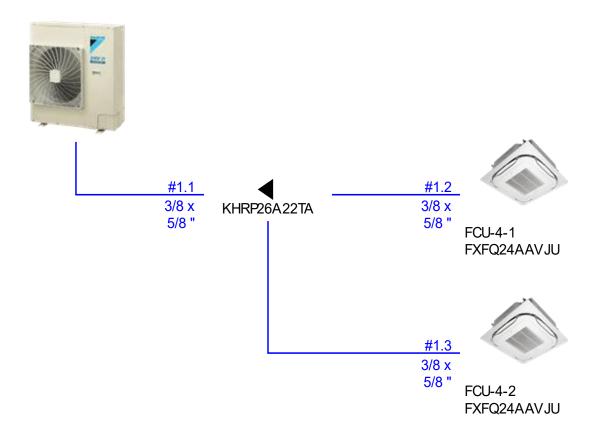


Maximum equivalent length from BP unit or VRV indoor to VRV REFNET (size up of intermediate	-
pipes required if longer)	
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	131.2ft
Maximum actual length between CM and HM	-
Maximum height difference between CM and HM	-



Piping CU- 4

CU- 4 RXTQ48TBVJUA



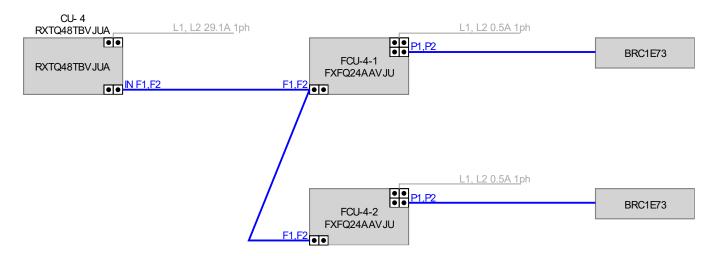
Piping

Warning: The pipe diameter values are purely indicative. Depending on the required pipe lengths, a different pipe diameter might be required.



Wiring diagrams

Wiring CU- 4



Remarks

P1P2 = AWG 18-2 is required - however always refer to local code for further information.

F1F2 IN/OUT = AWG 18-2 is required - however always refer to local code for further information

Note:





VRV Selection

Project Report

Report details

Produced on: 6/9/2024

Application version: 2024.6.5.1

Project details

Project name: VA - Trinka Davis - Ox8 Selections

Solution name: 6-9-24

Client Name:

Customer reference:

Quotation reference:

Project number: 628275/825308

Selection parameters of the indoor units can be found in the Engineering Data Books
Selection parameters of the outdoor units can be found in the Engineering Data Books
Only the data published in the data book are correct. This program uses close approximations of these data.



Material list

Model	Quantity	Description
RXYQ72AATJA	1	VRV EMERION (208-230V) (VRV EMERION (208-
		230V))
FXMQ72MFVJU	1	OA Processing Unit
BRC1E73	1	new Navigation Remote Controller

Remarks

Outdoor air processing units are considered as indoor units. They have an influence on the selection of outdoor units, the piping diagram, the wiring diagram and the centralized controller diagram.



Indoor unit details

Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
FCU	Device model name
Tmp C	Indoor conditions in cooling
Rq TC	Required total cooling capacity
Rv TC	Revised total cooling capacity (asked from outdoor)
Max TC	Available total cooling capacity
Rq SC	Required sensible cooling capacity
Tevap	Evaporating temperature of indoor unit coil
Tdis C	Indoor unit discharge air temperature in cooling based on maximum capacities and required capacities
Max SC	Available sensible cooling capacity
Tmp H	Indoor temperature in heating
Rq HC	Required heating capacity
Max HC	Available heating capacity
Tdis H	Indoor unit discharge air temperature in heating based on maximum capacities and required capacities
Sound	Sound pressure level low and high
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
Min coil	Minimum coil volume
Max coil	Maximum coil volume
Air Flow Rate	Air Flow Rate



CU- 2 - MUA-1 - No HGRH - RXYQ72AATJA

Capacity data at conditions and connection ratio (100) as entered

Name	FCU		Cooling						
		Tmp C	Rq TC	Rv TC	Max TC	Rq SC	Tevap	Tdis C	Max SC
		°F	BTU/h	BTU/h	BTU/h	BTU/h	°F	°F	BTU/h
		(DBT/WBT)	_						
MUA-1	FXMQ72MFVJU	n/a	50,229	n/a	50,229	n/a	42.8	n/a / n/a	n/a
			50,229						

Name	FCU		Heating					
		Tmp H	Rq HC	Max HC	Tdis H	Min coil	Max coil	Air Flow Rate
		°F	BTU/h	BTU/h	°F	in ³	in ³	cfm
ΜΠΔ-1	FXMQ72MFVJU	n/a	47.000	47.000	n/a / n/a	n/a	n/a	n/a
11110711		,	,	,	, , ,	,	,	· '

ſ	Name	FCU	Room	Sound	PS	MCA	MOP	WxHxD	Weight
				dBA		Α		inch	lbs
N	ИUA-1	FXMQ72MFVJU		-	208-230V 1ph	3.6		54.3 x 18.5 x 43.3	271.2

Remarks

Outdoor vs. indoor position

Outdoor unit placed at the same level as the indoor units.



Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
Model	Device model name
CR	Connection ratio
Tmp C	Outdoor conditions in cooling
WFR per module	Water flow per outdoor unit module
CC	Available cooling capacity
Rq CC	Required cooling capacity
PIC	Power input in cooling mode
InC	Water inlet temperature in cooling mode
OutC	Water outlet temperature in cooling mode
Tmp H	Outdoor conditions in heating (dry bulb temp. / RH)
НС	Available heating capacity (integrated heating capacity)
Rq HC	Required heating capacity
PIH	Power input in heating mode
InH	Water inlet temperature in heating mode
OutH	Water outlet temperature in heating mode
Piping	Largest distance from indoor unit to outdoor unit
Bse Refr	Standard factory refrigerant charge (16.4ft actual piping length) excluding extra
	refrigerant charge. For calculation of extra refrigerant charge refer to the databook
Ex Refr	Extra refrigerant charge
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
FLA	Fan Motor Input
RLA	Nominal Running Amps
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
EER	EER value at nominal condition
EER2	EER2 value at nominal condition
IEER	IEER value at nominal condition
COP47	COP value at nominal condition and at ambient temperature of 47°F
COP17	COP value at nominal condition and at ambient temperature of 17°F



Outdoor details

Name	Model	CR		Cooling		He	ating		Piping
			Tmp C	CC	Rq CC	Tmp H	НС	Rq HC	
		%	°F	BTU/h	BTU/h	°F (DBT/WBT)	BTU/h	BTU/h	ft
CU- 2 - MUA-1 - No HGRH	RXYQ72AATJA	100.0	95.0	69,630	50,229	20.0/17.0	71,888	47,000	24.6
Name	Model	CR		Cooling		He	ating		Piping
			Tmp C	СС	Rq CC	Tmp H	HC	Rq HC	
		%	°F	BTU/h	BTU/h	°F (DBT/WBT)	BTU/h	BTU/h	ft

Name	Model	PS	MCA	МОР	RLA	FLA	WxHxD	Weight
			Α	Α	Α	Α	inch	lbs
CU- 2 - MUA-	RXYQ72AATJA	208V -	27.3	30.0	11.1		36.6 x 65.4 x	496.0
1 - No HGRH		230V 3ph					30.1	

Name		Efficiency Metrics - Ducted								
	EER	EER2	IEER	COP47	COP17	SCHE	SEER	SEER2	HSPF	HSPF2
CU- 2 -										
MUA-1 - No HGRH	13		21.4	3.5	2.4					

Name		Efficiency Metrics - Non Ducted								
	EER	EER2	IEER	COP47	COP17	SCHE	SEER	SEER2	HSPF	HSPF2
CU- 2 -										
MUA-1 - No	15.2		27	4	2.5					
HGRH										



Sound Data

Name	Model	Sound	Sound Power		Pressure
		Cooling	Heating	Cooling	Heating
		dBA	dBA	dBA	dBA
CU- 2 - MUA-1 -	RXYQ72AATJA	-	-	58	-
No HGRH					

Refrigerant information

Name	Model	Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
	RXYQ72AATJA	R410A	2087.5	15.21	unknown	unknown	14.40
1 - No HGRH							

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.

CU- 2 - MUA-1 - No HGRH - RXYQ72AATJA

Model	Quantity	Description
RXYQ72AATJA	1	VRV EMERION (208-230V) (VRV EMERION (208-230V))
FXMQ72MFVJU	1	OA Processing Unit
BRC1E73	1	new Navigation Remote Controller

Refrigerant information

Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
R410A	2087.5	15.21	unknown	unknown	14.40

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.



Pipe capacities

Maximum Connection Index	Diameters
53.9	3/8"x5/8"
71.9	3/8"x3/4"
110.9	3/8"x7/8"
161.9	1/2"x1 1/8"
229.9	5/8"x1 1/8"
299.9	3/4"x1 3/8"
> 299.9	3/4"x1 5/8"
Main pipe size up	1/2"x7/8"

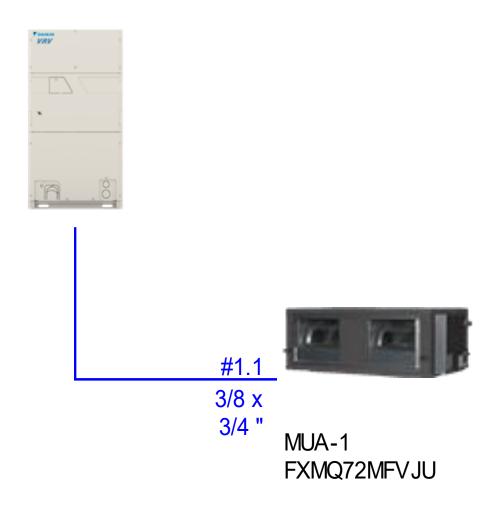
Piping limitations

Description	Value
Maximum total length	3,280.8ft
Maximum longest actual length	541.3ft
Maximum longest equivalent length	623.4ft
Maximum main pipe length (size up of main pipe required if longer)	-
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	131.2ft
Maximum length first branch to indoor unit	295.3ft
Maximum length of indoor units to nearest branch	131.2ft
Maximum length difference between longest and shortest distance to indoor units	131.2ft
Maximum height difference, outdoor unit below indoor units	295.3ft
Minimum connection ratio, outdoor unit below indoor units	-
Maximum height difference, outdoor unit above indoor units	295.3ft
Minimum connection ratio, outdoor unit above indoor units	-
Maximum height difference in technical cooling, outdoor unit below indoor units	131.2ft
Maximum height difference in technical cooling, outdoor unit above indoor units	295.3ft
Maximum height difference between indoor units	98.4ft
Connection ratio range	50.0% - 200.0%
Refrigerant pipe diameters	1/2" (liquid) x 7/8" (gas)
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET (size up of intermediate	-
pipes required if longer)	
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	295.3ft
Maximum actual length between CM and HM	-
Maximum height difference between CM and HM	-



Piping CU- 2 - MUA-1 - No HGRH

CU- 2 - MUA-1 - No HGRH RXYQ72AATJA



Piping

Warning: The pipe diameter values are purely indicative. Depending on the required pipe lengths, a different pipe diameter might be required.



Wiring diagrams

Wiring CU- 2 - MUA-1 - No HGRH



Remarks

The room temperature cannot be controlled by an outdoor air processing unit.

P1P2 = AWG 18-2 is required - however always refer to local code for further information.

F1F2 IN/OUT = AWG 18-2 is required - however always refer to local code for further information

Note:





VRV Selection

Project Report

Report details

Produced on: 7/23/2024

Application version: 2024.7.18.2

Project details

Project name: VA - Trinka Davis - Kitchen MUA Selections

Solution name: 7-22-24

Client Name:

Customer reference:

Quotation reference:

Project number: 628275/835380

Selection parameters of the indoor units can be found in the Engineering Data Books
Selection parameters of the outdoor units can be found in the Engineering Data Books
Only the data published in the data book are correct. This program uses close approximations of these data.



Material list

Model	Quantity	Description
RXYQ72XATJA	1	VRV-IV-X -A (208-230V)
EKEXV200-US	1	AHU INTEGRATION VALVE KIT
EKEQFCBAV3-US	1	AHU Kit W-Control box



Indoor unit details

Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
FCU	Device model name
Tmp C	Indoor conditions in cooling
Rq TC	Required total cooling capacity
Rv TC	Revised total cooling capacity (asked from outdoor)
Max TC	Available total cooling capacity
Rq SC	Required sensible cooling capacity
Tevap	Evaporating temperature of indoor unit coil
Tdis C	Indoor unit discharge air temperature in cooling based on maximum capacities and required capacities
Max SC	Available sensible cooling capacity
Tmp H	Indoor temperature in heating
Rq HC	Required heating capacity
Max HC	Available heating capacity
Tdis H	Indoor unit discharge air temperature in heating based on maximum capacities and required capacities
Sound	Sound pressure level low and high
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
Min coil	Minimum coil volume
Max coil	Maximum coil volume
Air Flow Rate	Air Flow Rate



CU- 2 - MUA-1 - RXYQ72XATJA

Capacity data at conditions and connection ratio (110) as entered

Name	FCU	Cooling							
		Tmp C	Rq TC	Rv TC	Max TC	Rq SC	Tevap	Tdis C	Max SC
		°F	BTU/h	BTU/h	BTU/h	BTU/h	°F	°F	BTU/h
		(DBT/WBT)							
AHU 1 box 1	EKEXV200-US	n/a	83,938	n/a	83,939	n/a	42.8	n/a / n/a	n/a
			83,938						

Name	FCU		He	ating				
			Rq HC	Max HC	Tdis H	Min coil	Max coil	Air Flow Rate
		°F	BTU/h	BTU/h	°F	in ³	in ³	cfm
AHU 1 box 1	EKEXV200-US	n/a	79,800	94,516	n/a / n/a	n/a	n/a	n/a
			79,800					

N	ame	FCU	Room	Sound	PS	MCA	MOP	WxHxD	Weight
				dBA		Α		inch	lbs
Α	HU 1 box 1	EKEXV200-US		-	12 1ph			8.5 x 15.8 x 3.1	6.4

Remarks

Reduced operational load

The sum of the required indoor unit capacities is 83,938BTU/h for cooling and 79,800BTU/h for heating. However, the outdoor unit selection uses reduced load values for cooling of 41,969BTU/h (=50%) and for heating of 39,900BTU/h (=50%). Be aware that unrealistic reductions may lead to reduced comfort levels, different noise levels or increased wear and tear.

Outdoor vs. indoor position

Outdoor unit placed at the same level as the indoor units.



Table of abbreviations

Abbreviation	Description
Name	Logical name of the device
Model	Device model name
CR	Connection ratio
Tmp C	Outdoor conditions in cooling
WFR per module	Water flow per outdoor unit module
CC	Available cooling capacity
Rq CC	Required cooling capacity
PIC	Power input in cooling mode
InC	Water inlet temperature in cooling mode
OutC	Water outlet temperature in cooling mode
Tmp H	Outdoor conditions in heating (dry bulb temp. / RH)
HC	Available heating capacity (integrated heating capacity)
Rq HC	Required heating capacity
PIH	Power input in heating mode
InH	Water inlet temperature in heating mode
OutH	Water outlet temperature in heating mode
Piping	Largest distance from indoor unit to outdoor unit
Bse Refr	Standard factory refrigerant charge (16.4ft actual piping length) excluding extra
	refrigerant charge. For calculation of extra refrigerant charge refer to the databook
Ex Refr	Extra refrigerant charge
PS	Power supply (voltage and phases)
MCA	Minimum Circuit Amps
MOP	Maximum Overcurrent Protection
FLA	Fan Motor Input
RLA	Nominal Running Amps
WxHxD	WidthxHeightxDepth
Weight	Weight of the device
EER	EER value at nominal condition
EER2	EER2 value at nominal condition
IEER	IEER value at nominal condition
COP47	COP value at nominal condition and at ambient temperature of 47°F
COP17	COP value at nominal condition and at ambient temperature of 17°F



Outdoor details

Name	Model	CR		Cooling	He	Piping			
			Tmp C	Tmp C CC Rq CC		Tmp H	HC	Rq HC	
		%	°F	BTU/h	BTU/h	°F	BTU/h	BTU/h	ft
						(DBT/WBT)			
CU- 2 -	RXYQ72XATJA	109.8	95.0	72,951	41,969	20.0/17.0	73,043	39,900	24.6
MUA-1									

Name	Model	PS	MCA	MOP	RLA	FLA	WxHxD	Weight
			Α	Α	Α	Α	inch	lbs
CU- 2 - MUA-	RXYQ72XATJA	208V -	27.6	35.0	15.7		36.7 x 66.7 x	436.5
1		230V 3ph					30.2	

Name	Efficiency Metrics - Ducted									
	EER	EER2	IEER	COP47	COP17	SCHE	SEER	SEER2	HSPF	HSPF2
CU- 2 -	12.7		20.7	3.3	2.25					
MUA-1	12.7		20.7	3.5	2.23					

Name	Efficiency Metrics - Non Ducted									
	EER	EER2	IEER	COP47	COP17	SCHE	SEER	SEER2	HSPF	HSPF2
CU- 2 - MUA-1	14.8		25.9	3.88	2.49					

Sound Data

Name	Name Model		Power	Sound Pressure		
		Cooling	Heating	Cooling	Heating	
		dBA	dBA	dBA	dBA	
CU- 2 - MUA-1	RXYQ72XATJA	-	-	58	-	

Refrigerant information

Name	Model	Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
CU- 2 - MUA- 1	RXYQ72XATJA	R410A	2087.5	13.01	unknown	unknown	12.32

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2



CU-2-MUA-1-RXYQ72XATJA

Model	Quantity	Description
RXYQ72XATJA	1	VRV-IV-X -A (208-230V)
EKEXV200-US	1	AHU INTEGRATION VALVE KIT
EKEQFCBAV3-US	1	AHU Kit W-Control box

Refrigerant information

Refrigerant type	GWP	Base charge lbs	Extra charge lbs	Total refrigerant charge lbs	Total CO2 equivalent tonnes
R410A	2087.5	13.01	unknown	unknown	12.32

The system(s) contain fluorinated greenhouse gases.

When extra refrigerant charge requirements are not calculated, TCO2 equivalent is calculated only considering the base refrigerant charge. Depending on the field pipe length extra refrigerant needs to be added which will increase the TCO2 equivalent.

Pipe capacities

Maximum Connection Index	Diameters
53.9	3/8"x5/8"
71.9	3/8"x3/4"
110.9	3/8"x7/8"
161.9	1/2"x1 1/8"
229.9	5/8"x1 1/8"
299.9	3/4"x1 3/8"
> 299.9	3/4"x1 5/8"
Main pipe size up	1/2"x7/8"

Piping limitations

Description	Value
Maximum total length	3,280.8ft
Maximum longest actual length	360.9ft
Maximum longest equivalent length	360.9ft
Maximum main pipe length (size up of main pipe required if longer)	-
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	131.2ft
Maximum length first branch to indoor unit	295.3ft
Maximum length of indoor units to nearest branch	131.2ft
Maximum length difference between longest and shortest distance to indoor units	131.2ft



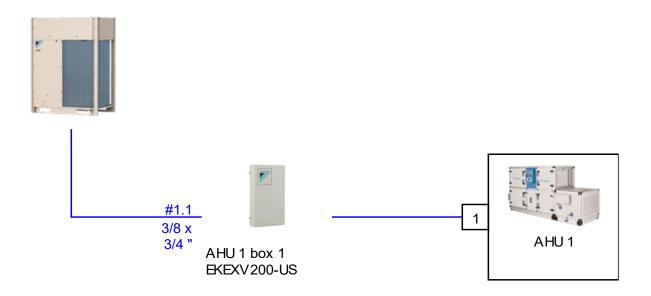
Maximum height difference, outdoor unit below indoor units	295.3ft
Minimum connection ratio, outdoor unit below indoor units	-
Maximum height difference, outdoor unit above indoor units	295.3ft
Minimum connection ratio, outdoor unit above indoor units	-
Maximum height difference in technical cooling, outdoor unit below indoor units	295.3ft
Maximum height difference in technical cooling, outdoor unit above indoor units	295.3ft
Maximum height difference between indoor units	98.4ft
Connection ratio range	50.0% - 200.0%
Refrigerant pipe diameters	1/2" (liquid) x 7/8" (gas)
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET (size up of intermediate	-
pipes required if longer)	
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	295.3ft
Maximum actual length between CM and HM	-
Maximum height difference between CM and HM	-



Piping diagrams

Piping CU- 2 - MUA-1

CU- 2 - MUA-1 RXYQ72XATJA



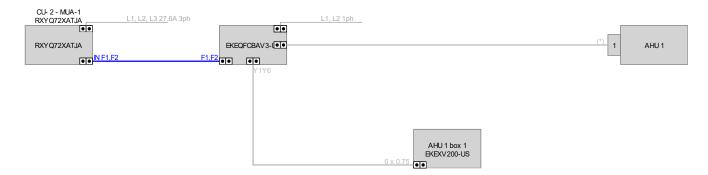
Piping

Warning: The pipe diameter values are purely indicative. Depending on the required pipe lengths, a different pipe diameter might be required.



Wiring diagrams

Wiring CU- 2 - MUA-1

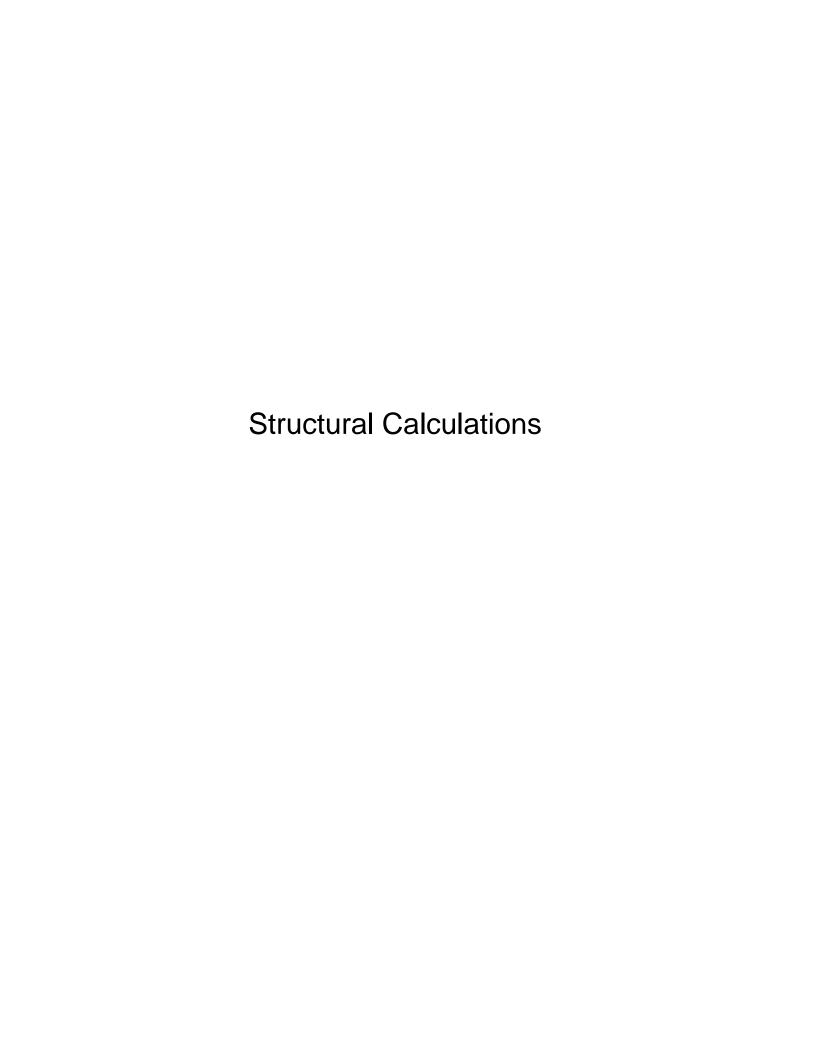


Remarks

F1F2 IN/OUT = AWG 18-2 is required - however always refer to local code for further information

Note:





Sample Steel Beam Calculation

Gravity Beam Design



RAM Steel 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Steel Code: AISC360-16 LRFD

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08/16/24 14:36:41

Floor Type: Main Roof Beam Number = 41

SPAN INFORMATION (ft): I-End (27.33,26.00) J-End (27.33,60.02)

Beam Size (User Selected) = W16X40 Fy = 50.0 ksi

Total Beam Length (ft) = 34.02

COMPOSITE PROPERTIES (Not Shored):

	Left	Right					
Deck Label	4" NW on 1 1/2" MRD 4	4" NW on 1 1/2" MRD					
Concrete thickness (in)	4.00	4.00					
Unit weight concrete (pcf)	150.00	150.00					
fc (ksi)	3.00	3.00					
Decking Orientation	Perpendicular	Perpendicular					
Decking type	VULCRAFT 1.5VL	VULCRAFT 1.5VL					
$b_{eff}(in) = 65.46$	Y bar(in)	= 16.25					
Mnf (kip-ft) = 576.85	Mn (kip-ft)	= 502.74					
C (kips) $= 297.88$	PNA (in)	= 15.58					
$I_{eff}(in^4) = 1342.08$	$I_{tr}(in^4)$	= 1677.77					
Stud length (in) $= 3.00$	Stud diam (in)	= 0.50					
Rg Stud Red. Factor Rg[1]	= 1.00 Rg[2] = 0.85						
Rp Stud Red. Factor Rp[1]	= 0.60 Rp[2] = 0.60						
Stud Capacity (kips) $Qn[1] = 7.7$ $Qn[2] = 6.5$							
# of studs: $Max = 136$ Partial = 82 Actual = 82							
Number of Stud Rows = 2	Percent of Full Composi	ite Action = 50.49					

LINE LOADS (k/ft):

		· /•						
Load	Dist	DL	CDL	LL	Red%	Type	PartL	CLL
1	0.000	0.336	0.336	0.000		NonR	0.000	0.000
	34.020	0.336	0.336	0.000			0.000	0.000
2	0.000	0.055	0.000	0.109	0.0%	Roof	0.000	0.000
	34.020	0.055	0.000	0.109			0.000	0.000
3	0.000	0.040	0.040	0.000		NonR	0.000	0.000
	34.020	0.040	0.040	0.000			0.000	0.000

USER-SPECIFIED DEMAND/CAPACITY LIMITS:

Strength: 0.900

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 11.77 kips 1.00Vn = 146.40 kips

MOMENTS (Ultimate):

	(
Span	Cond	LoadCombo	Mu	@	Lb	Cb	Phi	Phi*Mn
			kip-ft	ft	ft			kip-ft
Center	PreCmp+	1.4DL	76.2	17.0	0.0	1.00	0.90	273.75
	Init DL	1.4DL	76.2	17.0				
	Max +	1.2DL+1.6LL	100.1	17.0			0.90	452.47

Gravity Beam Design



RAM Steel 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Steel Code: AISC360-16 LRFD

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08/16/24 14:36:41

Controlling	1.4DL	76.2	17.0	0.0	1.00	0.90	273.75
REACTIONS (kips):		Left	Right				
Initial reaction		6.40	6.40				
DL reaction		7.33	7.33				
Max +LL reaction		1.86	1.86				
Max +total reaction (factor	ed)	11.77	11.77				

DEFLECTIONS:

					Ratio
Initial load (in)	at	17.01 ft	= -0.755	L/D = 541	
Live load (in)	at	17.01 ft	= -0.084	L/D = 4832 >	360 0.07
Post Comp load (in)	at	17.01 ft	= -0.127	L/D = 3221 >	240 0.07
Net Total load (in)	at	17.01 ft	= -0.882	L/D = 463 >	240 0.52

Sample Steel Gravity Column Calculation

Gravity Column Design



RAM Steel 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Steel Code: AISC360-16 LRFD

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Story level Main Roof, Column Line 3-H, Column # 10

Fy (ksi)	= 50.00	Column Size	= HSS6X6X3/8
------	------	---------	-------------	--------------

Orientation (deg.) = 90.0

INPUT DESIGN PARAMETERS:

		X-Axis	Y-Axis
Lu (ft)		14.50	14.50
K		1	1
Braced Against Joint Translati	on	Yes	Yes
Column Eccentricity (in)	Top	5.50	5.50
	Bottom	5.50	5 50

CONTROLLING AXIAL COLUMN LOADS - Skip-Load Case 1:

					Dead	Live	Kooi	
Axial (kip)					30.36	0.34	6.13	
DEMAND	CAPACITY	RATIO:	(1.2DL + 0.5LL +	- 1.6RF)				
Pu (kip)	=	46.40	0.90Pnx (kip)	=	223.04	Pu/0.90Pnx	=	0.208
			0.90Pny (kip)	=	223.04	Pu/0.90Pny	=	0.208
			0.90Pn (kip)	=	223.04	Pu/0.90Pn	=	0.208

DEMAND/CAPACITY LIMIT FOR STRENGTH: 1.000

CONTROLLING COMBINED COLUMN LOADS - Skip-Load Case 12:

	Dead	Live	Roof
	30.36	0.34	5.54
TopMx (kip-ft)	-0.83	0.00	-0.44
My (kip-ft)	0.69	0.15	0.15
BotMx (kip-ft)	-0.09	-0.00	-0.05
My (kip-ft)	0.07	0.02	0.02
	My (kip-ft) BotMx (kip-ft)	TopMx (kip-ft) -0.83 My (kip-ft) 0.69 BotMx (kip-ft) -0.09	30.36 0.34 TopMx (kip-ft) -0.83 0.00 My (kip-ft) 0.69 0.15 BotMx (kip-ft) -0.09 -0.00

Single curvature about X-Axis

Single curvature about Y-Axis

CALCULATED PARAMETERS: (1.2DL + 0.5LL + 1.6RF)

Pu (kip)	=	45.46	0.90*Pn (kip)	=	223.04
Mux (kip-ft)	=	-1.69	0.90*Mnx (kip-ft)	=	59.25
Muy (kip-ft)	=	1.15	0.90*Mny (kip-ft)	=	59.25
Rm	=	1.00			
Cbx	=	1.67	Cby	=	1.67
Cmx	=	0.60	Cmy	=	0.60
Pex (kip)	=	373.42	Pey (kip)	=	373.42

Gravity Column Design

Bentley B

RAM Steel 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Steel Code: AISC360-16 LRFD

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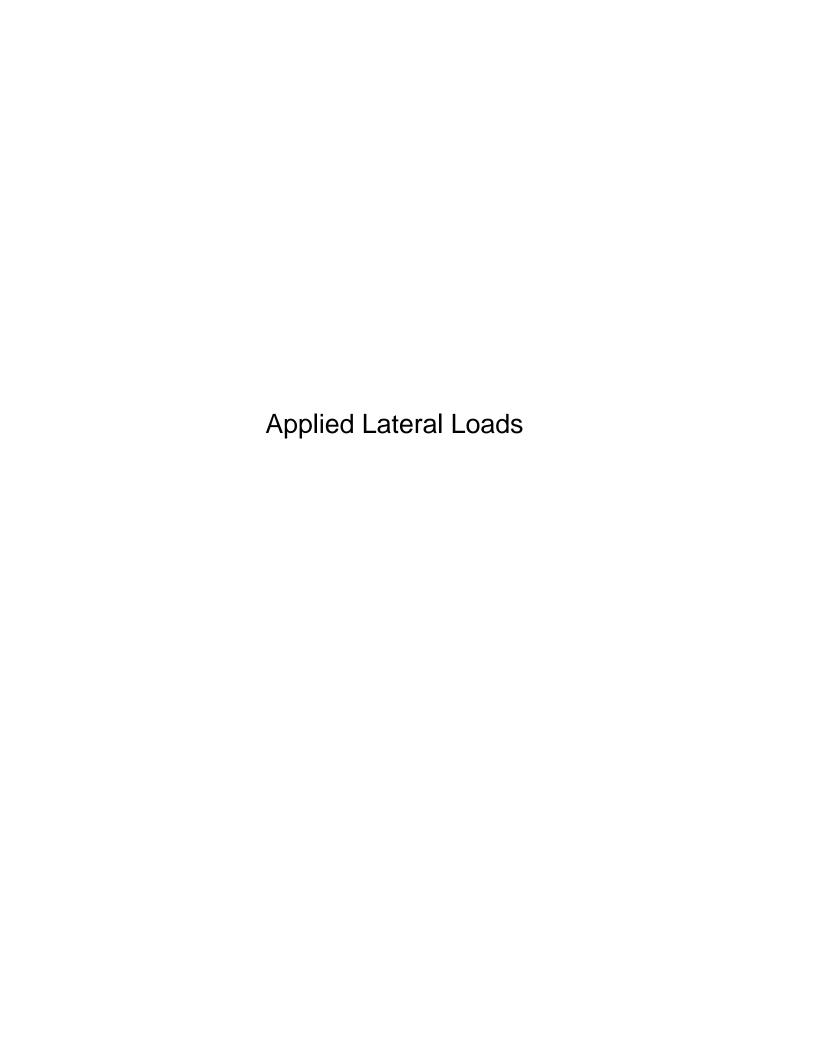
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B1x = 1.00 B1y = 1.00

INTERACTION EQUATION

Pu/0.90*Pn = 0.204

Eq H1-1a: 0.204 + 8/9(0.029 + 0.019) = 0.246





RAM Frame 24.00.00.160 DataBase: Trinka Davis CLC V4 Trusses

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LOAD CASE: EQ

Seismic ASCE 7-16 Equivalent Lateral Force

Importance Factor: 1.00 TL: 12.00 s

Site Class D: Stiff Soil, Default Ss: 0.187 g S1: 0.085 g

Fa: 1.600 Fv: 2.400 SDs: 0.199 g SD1: 0.136 g

Use Specified Seismic Design Category: C

Provisions for: Force

Ground Level: Basement

Dir	Ec	cent	R	Ta	Equation		Building Perio	od-T	
X	+ A	And -	3.00	Std	,Ct=0.028,x=	=0.80	Calculated		
Y	+ A	And -	3.00	Std	,Ct=0.028,x=	=0.80	Calculated		
Dir	Ta	Cu	T	T-used	Cs Eq12.8-	2 Cs(max) Eq12.8-3	` /	Cs-used	k
X	0.316	1.628	1.479	0.514	0.066	0.088	0.010	0.066	1.007
Dir	Ta	Cu	T	T-used	Cs Eq12.8-	2 Cs(max) Eq12.8-3	\ /	Cs-used	k
Y	0.316	1.628	1.652	0.514	0.066	0.088	0.010	0.066	1.007

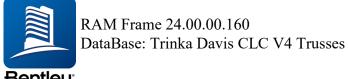
Total Building Weight (kips) = 1373.07

APPLIED DIAPHRAGM FORCES

Type: EQ_ASCE/16_	X_+E_F					
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	6.56	0.00	35.50	87.67
Pop Up Roofs	2	20.66	6.56	0.00	35.50	14.65
Pop Up Roofs	3	20.66	10.15	0.00	145.09	51.70
Main Roof	1	13.00	68.03	0.00	79.31	55.64

APPLIED STORY FORCES

Type: EQ_ASCE716_2	X_+E_F			
Level	Ht	Fx	Fy	
	ft	kips	kips	
Pop Up Roofs	20.66	23.26	0.00	
Main Roof	13.00	68.03	0.00	
	_	91.29	0.00	



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Pop Up Roofs

2

20.66

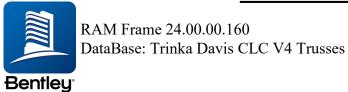
Benfiey [®]						
Type: EQ ASCE716	X -E F					
Level	 Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	6.56	0.00	35.50	84.37
Pop Up Roofs	2	20.66	6.56	0.00	35.50	11.35
Pop Up Roofs	3	20.66	10.15	0.00	145.09	47.34
Main Roof	1	13.00	68.03	0.00	79.31	45.39
APPLIED STORY FOR						
Type: EQ_ASCE716 Level	_^EF Ht	Fx	Fy			
Level	ft	kips	kips			
Pop Up Roofs	20.66	23.26	0.00			
Main Roof	13.00	68.03	0.00			
Walli Kooi	13.00	08.03	0.00			
		91.29	0.00			
APPLIED DIAPHRAG	M FORCES					
Type: EQ_ASCE716	_Y_+E_F					
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	0.00	6.56	36.66	86.02
Pop Up Roofs	2	20.66	0.00	6.56	36.66	13.00
Pop Up Roofs	3	20.66	0.00	10.15	146.43	49.52
Main Roof	1	13.00	0.00	68.03	87.72	50.52
APPLIED STORY FOR						
Type: EQ_ASCE716		Г	Г			
Level	Ht	Fx	Fy			
D. H. D. C	ft	kips	kips			
Pop Up Roofs	20.66	0.00	23.26			
Main Roof	13.00	0.00	68.03			
	_	0.00	91.29			
APPLIED DIAPHRAG						
Type: EQ_ASCE716			_	_		
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	0.00	6.56	34.33	86.02
^	_					

0.00

34.33

6.56

13.00



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49.52

50.52

Pop Up Roofs	3	20.66	0.00	10.15	143.76
Main Roof	1	13.00	0.00	68.03	70.90

APPLIED STORY FORCES

Type: EQ_ASCE716_Y	/E_F		
Level	Ht	Fx	Fy
	ft	kips	kips
Pop Up Roofs	20.66	0.00	23.26
Main Roof	13.00	0.00	68.03
	_	0.00	91.29



RAM Frame 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

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LOAD CASE: Wind

ASCE 7-16

Exposure: B Basic Wind Speed (mph): 115.0

Apply Directionality Factor, Kd = 0.85 Use Topography Factor, Kzt: 1.00

Ground Elevation Factor, Ke: 1.00 Use Calculated Frequency for X-Dir. Use Calculated Frequency for Y-Dir.

Gust Factor for Flexible Structures, G: Use Calculated G for X-Dir. Gust Factor for Flexible Structures, G: Use Calculated G for Y-Dir.

Damping Ratio for Flexible Structures= 0.01

Mean Roof Height in X-Dir. (ft): Top Story Height + Parapet = 20.66 Mean Roof Height in Y-Dir. (ft): Top Story Height + Parapet = 20.66

Ground Level for X-Dir.: Basement
Ground Level for Y-Dir.: Basement

WIND PRESSURES:

X-Direction: Natural Frequency = 0.676 Structure is Flexible Y-Direction: Natural Frequency = 0.605 Structure is Flexible

CpWindward = 0.80

qLeeward (qh X-Dir.) = 18.12 psf qLeeward (qh Y-Dir.) = 18.12 psf

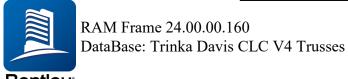
GCpn (Parapet): Windward = 1.50 Leeward = -1.00

X-Direction:

Pressure (psf)	CpLeeward	Gust Factor G	qz (psf)	Kzt	Kz	Height (ft)
23.549	-0.446	1.043	18.123	1.000	0.630	20.66
23.549	-0.446	1.043	18.123	1.000	0.630	20.66
23.549	-0.446	1.043	18.123	1.000	0.630	20.66
21.004	-0.383	1.041	16.539	1.000	0.575	13.00
21.004	-0.383	1.041	16.539	1.000	0.575	0.00

Y-Direction:

Height (ft)	Kz	Kzt	qz (psf)	Gust Factor G	CpLeeward	Pressure (psf)
20.66	0.630	1.000	18.123	1.037	-0.500	24.437
20.66	0.630	1.000	18.123	1.037	-0.500	24.437
20.66	0.630	1.000	18.123	1.037	-0.500	24.437
13.00	0.575	1.000	16.539	0.998	-0.500	22.246
0.00	0.575	1.000	16.539	0.998	-0.500	22.246



Pop Up Roofs

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Bentley [®]						
Type: Wind ASCE71	16 1 X					
Level	Diaph.#	Ht	Fx	Fy	X	Y
	•	ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	3.13	0.00	35.50	87.31
Pop Up Roofs	2	20.66	3.13	0.00	35.50	11.71
Pop Up Roofs	3	20.66	3.80	0.00	145.12	49.52
Main Roof	1	13.00	22.58	0.00	76.67	49.51
APPLIED STORY FOR	RCES					
Type: Wind_ASCE71	16_1_X					
Level	Ht	Fx	Fy			
	ft	kips	kips			
Pop Up Roofs	20.66	10.05	0.00			
Main Roof	13.00	22.58	0.00			
	_	32.63	0.00			
	M EODCES					
APPLIED DIAPHRAG Type: Wind_ASCE7						
Level	Diaph.#	Ht	Fx	Fy	X	Y
Level	Біаріі.	ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	0.00	2.12	35.50	86.02
Pop Up Roofs	2	20.66	0.00	2.12	35.50	13.00
Pop Up Roofs	3	20.66	0.00	2.12	145.12	49.52
Main Roof	1	13.00	0.00	28.72	79.33	49.52
Main Rooi	1	13.00	0.00	28.72	19.33	49.31
APPLIED STORY FOR	RCES					
Type: Wind_ASCE71	16_1_Y					
Level	Ht	Fx	Fy			
	ft	kips	kips			
Pop Up Roofs	20.66	0.00	6.67			
Main Roof	13.00	0.00	28.72			
	_	0.00	35.39			
APPLIED DIAPHRAG	M FORCES					
Type: Wind_ASCE71						
Level	 Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	2.35	0.00	35.50	92.35
	2	20.66	2.24	0.00	25.50	15.15

2

20.66

2.34

0.00

35.50

17.15



RAM Frame 24.00.00.160 DataBase: Trinka Davis CLC V4 Trusses

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Bentley

Bernieg						
Pop Up Roofs	3	20.66	2.85	0.00	145.12	54.04
Main Roof	1	13.00	16.93	0.00	76.67	61.91
APPLIED STORY FOR	RCES					
Type: Wind_ASCE71	16_2_X+E					
Level	Ht	Fx	Fy			
	ft	kips	kips			
Pop Up Roofs	20.66	7.54	0.00			
Main Roof	13.00	16.93	0.00			
	_	24.47	0.00			
APPLIED DIAPHRAG	M FORCES					
Type: Wind_ASCE71						
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	2.35	0.00	35.50	82.27
Pop Up Roofs	2	20.66	2.34	0.00	35.50	6.28
Pop Up Roofs	3	20.66	2.85	0.00	145.12	45.00
Main Roof	1	13.00	16.93	0.00	76.67	37.10
APPLIED STORY FOR						
Type: Wind_ASCE71						
Level	Ht	Fx	Fy			
	ft	kips	kips			
Pop Up Roofs	20.66	7.54	0.00			
Main Roof	13.00	16.93	0.00			
	_	24.47	0.00			
APPLIED DIAPHRAG	M FORCES					
Type: Wind_ASCE71	16_2_Y+E					
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	0.00	1.59	39.23	86.02
Pop Up Roofs	2	20.66	0.00	1.59	39.20	13.00
Pop Up Roofs	3	20.66	0.00	1.82	151.27	49.52
Main Roof	1	13.00	0.00	21.54	102.76	49.51

APPLIED STORY FORCES

Type: Wind_ASCE716_2_Y+E



RAM Frame 24.00.00.160 DataBase: Trinka Davis CLC V4 Trusses

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Ht	Fx	Fy			
13.00	0.00	21.54			
	0.00	26.54			
I FORCES 6 2 Y-E					
- -	Ht	Fx	Fy	X	Y
	ft	kips	kips	ft	ft
1	20.66	0.00	1.59	31.76	86.02
2	20.66	0.00	1.59	31.79	13.00
3	20.66	0.00	1.82	138.98	49.52
1	13.00	0.00	21.54	55.90	49.51
CES 6 2 Y-E					
Ht	Fx	Fy			
ft	kips	kips			
20.66	0.00	5.00			
13.00	0.00	21.54			
_	0.00	26.54			
I FORCES					
	Ht	Fx	Fv	X	Y
2 Tapin			_		ft
1					87.31
					11.71
					49.52
1	13.00	16.93	21.54	79.33	49.51
CES					
6_3_X+Y					
Ht	Fx	Fy			
ft	kips	kips			
20.66	7.54	5.00			
13.00	16.93	21.54			
	ft 20.66 13.00 - I FORCES 6_2_Y-E	ft kips 20.66 0.00 13.00 0.00 ### FORCES 6_2_Y-E	ft kips kips 20.66 0.00 5.00 13.00 0.00 21.54	ft kips kips 20.66 0.00 5.00 13.00 0.00 21.54	ft kips kips 20.66 0.00 5.00 13.00 0.00 21.54



RAM Frame 24.00.00.160 DataBase: Trinka Davis CLC V4 Trusses

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		24.47	26.54			
PPLIED DIAPHRAGI	M FORCES					
Type: Wind_ASCE71	16_3_X-Y					
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	f
Pop Up Roofs	1	20.66	2.35	-1.59	35.50	87.3
Pop Up Roofs	2	20.66	2.34	-1.59	35.50	11.7
Pop Up Roofs	3	20.66	2.85	-1.82	145.12	49.52
Main Roof	1	13.00	16.93	-21.54	79.33	49.5
PPLIED STORY FOR						
Type: Wind_ASCE71 Level	16_3_A-1 Ht	Fx	Fy			
Level	ft	kips	kips			
Pop Up Roofs	20.66	7.54	-5.00			
Main Roof	13.00	16.93	-21.54			
Main Rooi	13.00	10.93	-21.34			
		24.47	-26.54			
PPLIED DIAPHRAG	M FORCES					
PPLIED DIAPHRAGE Type: Wind_ASCE71						
		Ht	Fx	Fy	X	Y
Type: Wind_ASCE71	16_4_X+Y_CW	Ht ft	Fx kips	Fy kips	X ft	
Type: Wind_ASCE71	16_4_X+Y_CW			•		f
Type: Wind_ASCE71 Level	16_4_X+Y_CW Diaph.#	ft	kips	kips	ft	92.33
Type: Wind_ASCE71 Level Pop Up Roofs	16_4_X+Y_CW Diaph.#	ft 20.66	kips 1.76	kips 1.19	ft 31.76	92.3: 17.1:
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs	16_4_X+Y_CW Diaph.#	ft 20.66 20.66	kips 1.76 1.76	kips 1.19 1.19	ft 31.76 31.79	Y f 92.33 17.13 54.04 61.93
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs	16_4_X+Y_CW Diaph.# 1 2 3 1	ft 20.66 20.66 20.66	kips 1.76 1.76 2.14	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW	ft 20.66 20.66 20.66 13.00	kips 1.76 1.76 2.14 12.70	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW Ht	ft 20.66 20.66 20.66 13.00	kips 1.76 1.76 2.14 12.70	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW	ft 20.66 20.66 20.66 13.00	kips 1.76 1.76 2.14 12.70	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW Ht	ft 20.66 20.66 20.66 13.00	kips 1.76 1.76 2.14 12.70	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71 Level	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW Ht ft	ft 20.66 20.66 20.66 13.00 Fx kips	kips 1.76 1.76 2.14 12.70 Fy kips	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	f 92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71 Level Pop Up Roofs	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW Ht ft 20.66	ft 20.66 20.66 20.66 13.00 Fx kips 5.65	kips 1.76 1.76 2.14 12.70 Fy kips 3.75	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	f 92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71 Level Pop Up Roofs	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW Ht ft 20.66 13.00	ft 20.66 20.66 20.66 13.00 Fx kips 5.65 12.70	kips 1.76 1.76 2.14 12.70 Fy kips 3.75 16.16	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04
Type: Wind_ASCE71 Level Pop Up Roofs Pop Up Roofs Pop Up Roofs Main Roof PPLIED STORY FOR Type: Wind_ASCE71 Level Pop Up Roofs Main Roof	16_4_X+Y_CW Diaph.# 1 2 3 1 RCES 16_4_X+Y_CW Ht ft 20.66 13.00	ft 20.66 20.66 20.66 13.00 Fx kips 5.65 12.70	kips 1.76 1.76 2.14 12.70 Fy kips 3.75 16.16	kips 1.19 1.19 1.37	ft 31.76 31.79 138.98	92.33 17.13 54.04

Loads and Applied Forces



Main Roof

RAM Frame 24.00.00.160 DataBase: Trinka Davis CLC V4 Trusses

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Bentley						
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	1.76	1.19	39.23	82.27
Pop Up Roofs	2	20.66	1.76	1.19	39.20	6.28
Pop Up Roofs	3	20.66	2.14	1.37	151.27	45.00
Main Roof	1	13.00	12.70	16.16	102.76	37.10
APPLIED STORY FOR	RCES					
Type: Wind_ASCE71		_				
Level	Ht	Fx	Fy			
	ft	kips	kips			
Pop Up Roofs	20.66	5.65	3.75			
Main Roof	13.00	12.70	16.16			
		18.35	19.91			
APPLIED DIAPHRAG	M FORCES					
Type: Wind_ASCE71						
Level	Diaph.#	Ht	Fx	Fy	X	Y
		ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	1.76	-1.19	39.23	92.35
Pop Up Roofs	2	20.66	1.76	-1.19	39.20	17.15
Pop Up Roofs	3	20.66	2.14	-1.37	151.27	54.04
Main Roof	1	13.00	12.70	-16.16	102.76	61.91
APPLIED STORY FOR						
Type: Wind_ASCE71		-	-			
Level	Ht	Fx	Fy			
	ft	kips	kips			
Pop Up Roofs	20.66	5.65	-3.75			
Main Roof	13.00	12.70	-16.16			
		18.35	-19.91			
APPLIED DIAPHRAGE Type: Wind_ASCE71						
Level	Diaph.#	Ht	Fx	Fy	X	Y
	- Impii.	ft	kips	kips	ft	ft
Pop Up Roofs	1	20.66	1.76	-1.19	31.76	82.27
Pop Up Roofs	2	20.66	1.76	-1.19	31.79	6.28
Pop Up Roofs	3	20.66	2.14	-1.17	138.98	45.00
Top op Roots	<i>J</i>	20.00	4.17	-1.3/	150.70	75.00

1

13.00

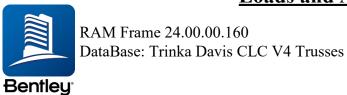
12.70

-16.16

55.90

37.10

Loads and Applied Forces



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APPLIED STORY FORCES

Type: Wind_ASCE710	6_4_X-Y_CCW		
Level	Ht	Fx	Fy
	ft	kips	kips
Pop Up Roofs	20.66	5.65	-3.75
Main Roof	13.00	12.70	-16.16
		18.35	-19.91

Sample Lateral Beam Analysis and Design

Member Code Check



RAM Frame 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Steel Code: AISC360-16 LRFD

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BEAM INFORMATION:

Story Level = Main Roof Frame Number = 0 Beam Number = 31

Fy (ksi) = 50.00 Beam Size = W16X36

INPUT DESIGN PARAMETERS:

	X-Axis	Y-Axis
Lu for Axial (ft)	16.33	5.44
Lu for Bending (ft)	16.33	5.44
K	1.00	1.00
Top Flange Continuously Braced	No	
Bottom Flange Continuously Braced	No	

CONTROLLING BEAM SEGMENT FORCES - SHEAR

Load Combination: 1.240 D + 0.500 Lp - 1.000 E1

 Segment distance (ft) i - end
 0.00

 j - end
 5.44

SHEAR CHECK:

Vux (kip)	=	13.60	1.00Vnx (kip)	=	140.71	Vux/1.00Vnx	=	0.097
Vuy (kip)	=	0.00	0.90Vny (kip)	=	162.31	Vuy/0.90Vny	=	0.000

CONTROLLING BEAM SEGMENT FORCES - AXIAL

Load Combination: 1.400 D

Segment distance (ft) i - end	0.00
i - end	5.44

AXIAL CHECK:

Pu (kip)	=	0.00	0.90Pnx (kip)	=	477.00	Pu/0.90Pnx	=	0.000
			0.90Pny (kip)	=	477.00	Pu/0.90Pny	=	0.000
			0.90Pn (kip)	=	477.00	Pu/0.90Pn	=	0.000

CONTROLLING BEAM SEGMENT FORCES - FLEXURE

Load Combination: 1.240 D + 0.500 Lp - 1.000 E1

Segment distance (ft) 1 - end	0.00
j - end	5.44

CALCULATED PARAMETERS:

Pu (kip)	=	0.00	0.90Pn (kip)	=	477.00
Mux (kip-ft)	=	-81.23	0.90Mnx (kip-ft)	=	240.00
Muy(kip-ft)	=	0.00	0.90Mny (kip-ft)	=	40.50
Cbx	=	1.51			

INTERACTION EQUATION:

Pu/0.90*Pn=0.000Mrx/Mcx = 0.338 Sample Lateral Column Analysis and Design

Member Code Check



RAM Frame 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Steel Code: AISC360-16 LRFD

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COLUMN INFORMATION:

Story Level = Main Roof Frame Number = 0 Column Number = 6

Fy (ksi) = 50.00

Column Size = HSS8X8X5/8

INPUT DESIGN PARAMETERS:

	X-Axis	Y-Axis
Lu for Axial (ft)	14.50	14.50
Lu for Bending (ft)	14.50	14.50
K	1.00	1.00

CONTROLLING COLUMN FORCES - SHEAR

Load Combination: 1.240 D - 1.000 E1

Shear	Top	Vux (kip)	-0.36
		Vuy (kip)	11.76
Shear	Bot.	Vux (kip)	-0.36
		Vuy (kip)	11.76

SHEAR CHECK:

Vux (kip)	=	-0.36	0.90Vnx (kip)	=	196.31	Vux/0.90Vnx	=	0.002
Vuy (kip)	=	11.76	0.90Vny (kip)	=	196.31	Vuy/0.90Vny	=	0.060

CONTROLLING COLUMN FORCES - AXIAL

Load Combination: 1.200 D + 1.600 Rfp - 0.500 W7

AXIAL CHECK:

Pu (kip)	=	58.93	0.90Pnx (kip)	=	575.52	Pu/0.90Pnx	=	0.102
			0.90Pny (kip)	=	575.52	Pu/0.90Pny	=	0.102
			0.90Pn (kip)	=	575.52	Pu/0.90Pn	=	0.102

CONTROLLING COLUMN FORCES - FLEXURE

Load Combination: 1.240 D - 1.000 E1

Axial		Load (kip)	58.64
Moment	Top	Mux (kip-ft)	2.57
		Muy (kip-ft)	-73.31
Moment	Bot.	Mux (kip-ft)	-1.92
		Muy (kin-ft)	71.78

CALCULATED PARAMETERS:

CITE C C BITT BD					
Pu (kip)	=	58.64	0.90Pn (kip)	=	575.52
Mux (kip-ft)	=	2.57	0.90Mnx (kip-ft)	=	167.63
Muy(kip-ft)	=	-73.31	0.90Mny (kip-ft)	=	167.63
KL/Rx	=	58.32	KL/Ry	=	58.32
C1		2.26			

INTERACTION EQUATION:

Member Code Check

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Steel Code: AISC360-16 LRFD



RAM Frame 24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

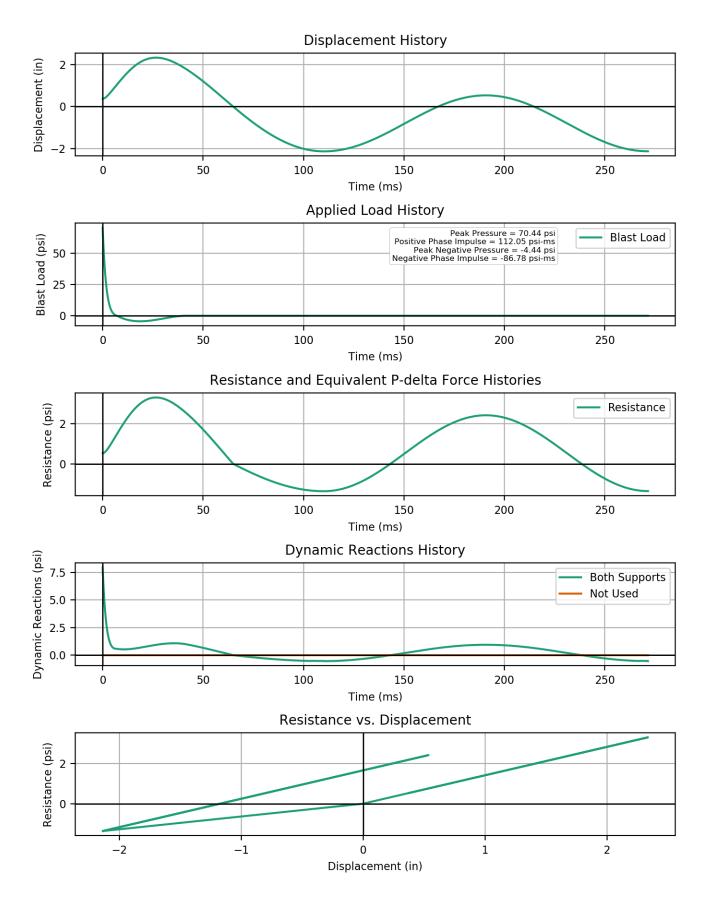
Building Code: IBC

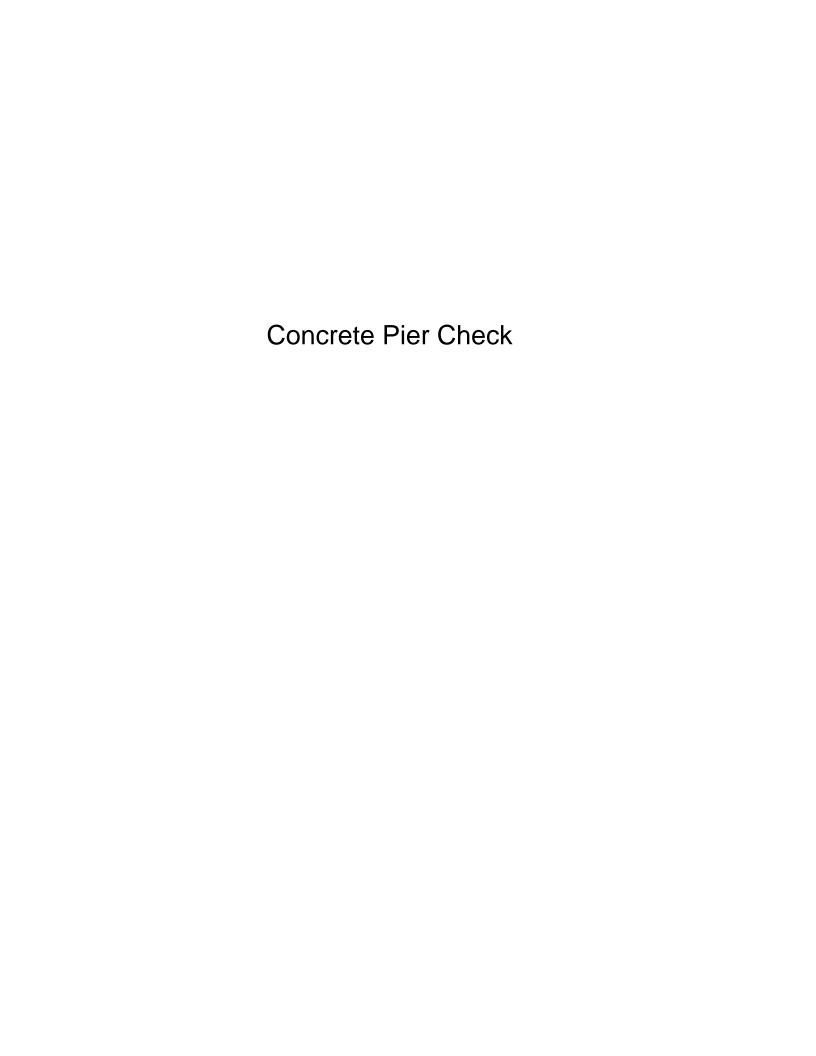
Pu/0.90*Pn=0.102

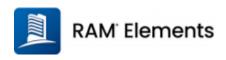
Eq H1-1b: 0.051 + 0.015 + 0.437 = 0.504

Sample Steel Beam Blast Calculation

Error/Warning Messages									
		20500	2.0.01	1.0					
		SBEDS V	6.2: St	eel Beam with Co		b			
	None			Component: N	one		Date: 08/19/2		kennedy
Component In	out	0.1.0				_	Dynamic Rea		
Span, L:		34.0			ad Type	_		Elastic	Plastic
Spacing, B:	Cincala Cinc	5.41			t and Standoff		F constant =	0.110	0.120
Boundary Conditions:		ple, Uniformly vith Composite			splacement	_	R constant =	0.390	0.380
Response Type: Beam Structural & Ma			Siab		<mark>of blast load</mark> Time Input	_	F (fixed support)=		
Axis of Bending:		rong (X-X)					R (fixed support)=		
Shape Size:		W16X40		Time (ms) N/A	Pressure (psi) N/A				
Self-Weight, w:		40.0	lb/ft	N/A N/A	N/A N/A	_			
Moment of Inertia, I:		518.00		N/A N/A	N/A		Solution	n Control	
Section Modulus: Z(hot-rolled beam)) S(cold-	72.899		N/A	N/A	_	Inbound Natural Per		161.26
Depth, d:),5(COIU-	16.01	in	N/A	N/A	_	Rebound Natural Pe		161.26
Area, A:		11.8	in ²	N/A	N/A	_	Max Rec. Time Step		0.1
Loaded Area Factor - Enter 1.0 for U	Iniform Load			N/A	N/A	_	Time Step: (ms)	(1113)	0.1
Unbraced Length for Bottom (Unload			ft	N/A	N/A		% of Critical Dampin	u.	0.0
	A992 (Grad			Charge Weight (W		3)	Initial Velocity: (in/m		0.0
Yield Strength, f _v :	, LOUZ TOIAU	50000.0	psi	W (lb)	Explosive Typ		minut volocity. (III/III	<i>∪</i> ,	0.0
Elastic Modulus, E:		29000000	psi	55.00	TNT	J			
Static Strength Increase Factor:		1.05	POI	W(TNT Equiv)(lb)			Property	Inbour	d Rebound
Dynamic Increase Factor:		1.19		55.00	25.00		Mass, M psi-ms ² /in	1200.9	
Dynamic Yield Stress, f _{dy} :		62475.0	psi		ad Phase		Load-Mass Factors		1200.00
Slab Prop	erties	02 17 0.0	POI		egative phase		K _{LM1}	0.78	0.78
Slab Thickness, ts:	CITICO	5.5	in		Orientation		K _{LM2}	0.66	
Concrete Strength, fc:		4000.0	psi		hout Clearing		K _{LM3}	0.66	0.66
Reinforcing Steel Area, As:		0.0	in ² /ft	Parameters for		:	Stiffness, K	0.00	0.00
Metal Deck Orientation	Deck ribs	perpendicu		Wall Height (ft)			K ₁ (psi/in)	1.42	1.42
Metal Deck Rib Height (h r)	D O O K 1100	1.5	in	Wall Width (ft)			K ₂ (psi/in)	1.42	0.64
Number of Studs per Rib		1.0		Incidence Angle			K ₃ (psi/in)	0.00	0.00
Slab Weight (Including Supported W	/eiaht). W:	59.375	psf		Files		Resistance, R	0.00	0.00
Stud Prop				AxialLoad Input		d	R ₁ (psi)	4.91	0.00
Diameter		0.5	in		/A		R ₂ (psi)	4.91	-1.41
Ultimate Strength		65000.000		Response	Criteria ⁵		_ ,,, - ,		
Total Number Along Beam		52.0			npact section		Yield Displacement,	Х	
Calculated Pr	roperties			LOP/Type	MLOP/Primary		x ₁ (in)	3.45	0.00
Effective Slab Width, be:	•	5.41	ft	θ (deg)	u		x ₂ (in)	3.45	
Nominal Shear Strength per Stud		7657.63	lb	N/A	1.0				
Stud Strength Reduction Factors; Rg		= 0.60 Rg					Equiv Yield Defl.(in)	3.45	-2.20
Total Shear Force in Studs (Positive		199098	lb						
Total Shear Force in Studs (Negative		0	lb						
Positive Moment Capacity for Comp	osite	6636223	lb-in		Re	sults	Summary		
Negative Moment Capacity for Comp	posite	0	lb-in	$\theta_{\text{max}} =$	0.66	deg	Design Criteria: M	LOP/Prim	nary
Moment of Inertia for Composite Sec		1148	in ⁴	μ=	0.97		Response meets input de		
Rebound Positive Moment Capacity		190326	lb-in	X _{max} Inbound =		in	at time	26.60	msec
Notes	3			X _{min} Rebound =		in	at time	110.20	msec
1 Used for clearing of reflected load				R _{max} =	3.32	psi	at time	26.60	msec
2 Angle in degrees from normal				R _{min} =	-1.37	psi	at time	110.20	msec
3 Entering data in white cells will OVER ERRONEOUS results!! To recover form.	WRITE formulas, save yo	ulas and caus ur input data	se and	Shortest Yield Line			<u>e θ: </u>	in	
reinitiate Component Type on Intro work	sheet.			Peak Reactions Ba			ıral Resistance: Vu		
⁴ Shear controlled response ONLY occu	rs if the user	sets Shear F	lag" > 0.	Vu at Support A =			65061	lb	
This response typically has very limited o				Vu at Support B =			65061	lb	
a maximum value of 1 is assumed in SB				Shear Capacity					
clearly understand shear-controlled resp	onse when u	sing the		Shear Capacity: V	s =		167788	lb	
shear flag - see User's Guide.				Results for Shear	Check		Shear	is OK	
				* Based on larger including tension n		eboun	d ultimate flexural re	sistance,	not







Current Date: 8/19/2024 5:09 PM

Units system: English

File name: P:\22.9003 - VA Atlanta Trinka Davis CLC - G-CE SDVOSB JV LLC\4. Reports-Calcs\4-3_Structural\3-5_RAM Miscellaneous\Pier 1

Check.ccc

Design Results Reinforced Concrete Columns

General Information

Design Code : ACI 318-2019

Load Conditions included in design:

C1 : DL

Materials

Concrete, f'c 4.00 [Kip/in2] Steel, fy 60.00 [Kip/in2] 60.00 [Kip/in2] Concrete type Normal Steel, fyt Modulus of elasticity 3605.00 [Kip/in2] Type of splices Tangential 0.15 [Kip/ft3] Minimum provided Rho 0.010 Unit weight

Maximum provided Rho : 0.080

General status : OK

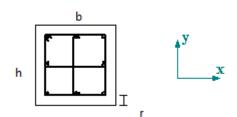
Column 1

Data

Geometry

Section type : Rectangular
Column location : Center
Distance between levels : 12.00 [ft]
Width b (// to axis x) : 24.00 [in]
Height h (// to axis y) : 24.00 [in]

Rebar



 Longitudinal
 :
 8-#8

 Free cover
 :
 3.00 [in]

 As provided
 :
 6.32 [in2]

 Provided Rho
 :
 0.011

 Number of bars // to axis x
 :
 3

 Spacing between bars
 :
 7.25 [in]

 Number of bars // to axis y
 :
 3

 Spacing between bars
 :
 7.25 [in]

Transverse : 12 #2 @ 12.00"

Number of legs // to axis x : 3
Number of legs // to axis y : 3
Initial spacing (Sini) : 0.00 [in]

Design parameters

Slenderness	Axis yy	Axis xx
Lu[in] K Pc[Kip]	174.00 1.00 8122.88	174.00 1.00 8122.88
Sway	Yes	Yes

Forces

Condition	Location	Pu	Muxx	Muyy	Vx	Vy	Transver	se load
		[Kip]	[Kip*ft]	[Kip*ft]	[Kip]	[Kip]	XX	уу
C1	Тор	50.25	5.00	0.00	0.00	0.00	No	No
	Bottom	0.00	0.00	0.00	0.00	0.00	No	No

Design

Column status : OK

Biaxial compression

Controlling condition : C1
Stress in bars : fs>0.5fy
Dowel splice length : 62.00 [in]
Bar clear spacing at splices : 6.25 [in]

Condit	ion Pos.	Pu [Kip]	Mcxx [Kip*ft]	Mcyy [Kip*ft]	δnsxx	δnsyy	Cmxx	Cmyy
C1	Top	50.25	5.00	0.00	1.00	1.00	0.600	1.000
	Bot.	0.00	0.00	0.00	1.00	1.00	0.600	1.000

Condition	on Pos.	φ*Mnxx [Kip*ft]	φ*Mnyy [Kip*ft]	Mc/(φ*Mn)	Pu/(φ*Pn)	Asreq/Asprov	Demand: Capacity Ratio
C1	Top Bot.	239.22 275.71	0.00 0.00	0.02 0.00	0.15 0.00	0.91 0.91	0.15

Shear

Page2

Sini provided :		0.00 [in]		Sini required	:	6.00 [in]		
Dir	Condition Gob.	Pos.	Vu [Kip]	Vc [Kip]	Vs [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)	
2	C1	 Тор	0.00	54.41	15.19	52.20	0.00	
		Bot.	0.00	61.47	15.19	57.50	0.00	
3	C1	Тор	0.00	54.41	15.19	52.20	0.00	
		Bot.	0.00	61.47	15.19	57.50	0.00	

S required

12.00 [in]

Notes

S provided

12.00 [in]

^{*} Torsion is not considered for design.

^{*} Only columns with rectangular or circular sections are designed.

^{*} Each column is verified considering only the forces at the ends of the member.

^{*} The transverse reinforcement is ordered from bottom to top of the column.

^{*} Lu = Unsupported length.

^{*} K = Effective length factor.

^{*} Cm = A factor relating actual moment diagram to an equivalent uniform moment diagram.

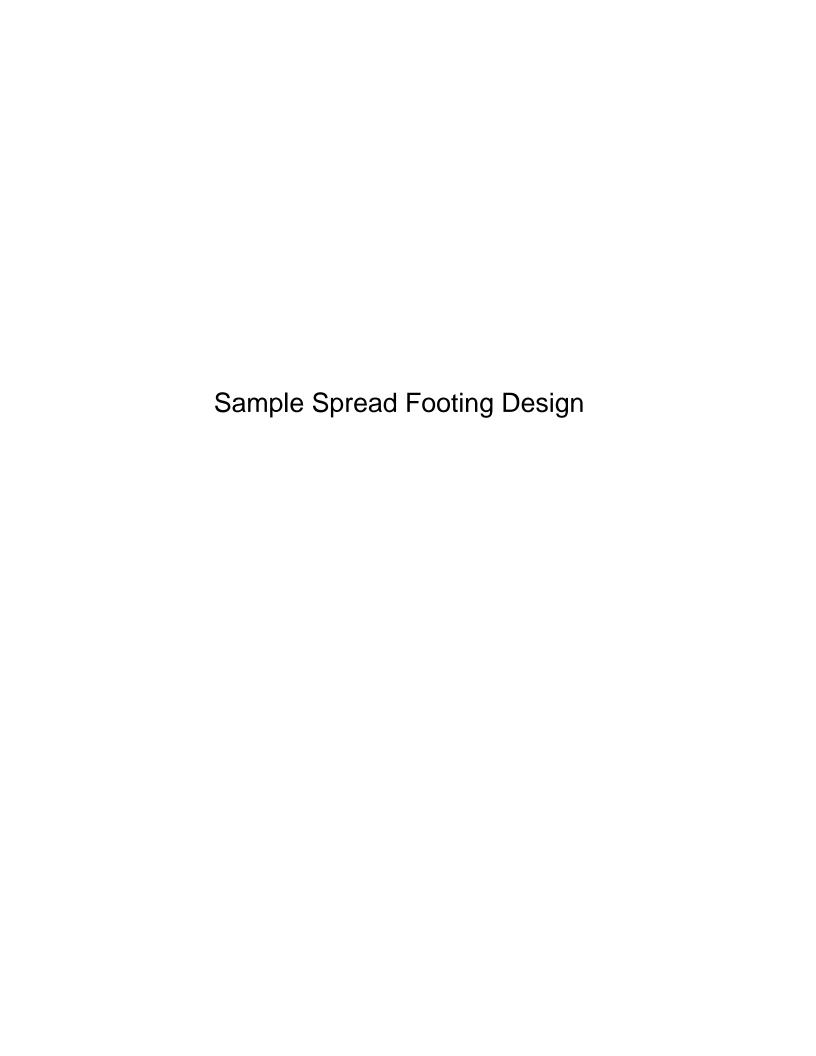
^{*} Sway = True if column is considered unbraced in its local axis.

^{*} Mc = Factored moment to be used for design. Considers the slenderness effects of the column. Mc = $Mu^*\delta ns$.

^{*} δ n2 = Amplification factor to account for small P-delta effects (P- δ).

^{*} Mn = Nominal moment strength

^{*} $Mc/(\phi^*Mn)$ = Strength ratio. The bar graphs indicate the relative ratio of $Mc/(\phi^*Mn)$ for each load condition. If a bar is shown in red the ratio is greater than one.



Spread Footing Design



RAM Foundation v24.00.00.160

DataBase: Trinka Davis CLC V4 Trusses

Building Code: IBC Design Code: ACI318-19

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Date: 08/19/24 16:59:36

FOOTING DESIGN

Footing # 13	Footing Column Location:(3 - E)

Bottom Reinf. Parallel to Length: 9 - #6 Width: 9 - #6
Top Reinf. Parallel to Length: 9 - #6 Width: 9 - #6

Concrete f'c (ksi): 4.00 fct (ksi): CODE Density (pcf): 150.00 Ec (ksi): 3834.25

Reinf. fy (ksi): 60.00

Safety Factor Overturning: Major....... 1.7 (613) Minor....... 1.3 (614)

INPUT DATA

Column Size: HSS8X8X5/8

Base Plate Dimensions (in) 20.00 x 20.00 Percent of overhang to assume Rigid: 50.00

LOADS

Surcharge (ksf) Dead Load: 0.000 Live Load: 0.000 Axial (kip) Dead Load: 29.13

Pos. Live: 0.18 Neg. Live: N/A
Pos. Roof: 5.62 Neg. Roof: -0.01

CONCRETE CAPACITY

	Major	Ld Co/Code Ref.	Minor	Ld Co/Code Ref.
Required Shear (kip)	25.90	182	29.39	175
Provided Shear: (kip)	81.43	Table 22.5.5.1(c)	78.62	Table 22.5.5.1(c)
Required Moment: (kip-ft)	74.14	182	82.65	175
Provided Moment: (kip-ft)	254.85		241.49	
Required Punching Shear: (kip)	95.17	175		
Provided Punching Shear: (kip)	305.52	Sec. 22.6.5.1(a)		

Table 22.6.5.2 Eq (a)

REINFORCEMENT

		Bott	tom Bars 1	Parallel to		Top Bars Parallel to		
		Len	gth	Width		Length	Width	
Bar Quantity/Bar	Size:	9-#6	Ó	9-#6		9-#6	9-#6	
RequiredSteel/Provided Steel (in ²⁾		3.50/ 3.96		3.50/ 3.96		3.50/ 3.96	3.50/ 3.96	
Required Steel Co	ode Ref.	Sec. 24.4.3.2		Sec. 24.4.3.2		Sec. 22.2	Sec. 22.2	
Bar Spacing (in)		12.6	55	12.65		12.65	12.65	
Bar Depth (in)		14.6	3	13.88		15.63	14.88	
Cover (in)	Top. 2.00	Bottom:	3.00	Side:	3.00			

SOIL CAPACITY

Spread Footing Design

RAM Foundation v24.00.00.160
DataBase: Trinka Davis CLC V4 Trusses
Building Code: IBC

Page 2/2
Date: 08/19/24 16:59:36

Design Code: ACI318-19

Allowable Soil Bearing Capacity (ksf)	3.00	
Max Unfactored Soil Bearing (ksf)	1.51	614
Max Average Unfactored Soil Bearing (ksf)	0.72	614
Max Soil Bearing for Factored Design (ksf)	1.94	219
Max Average Soil Bearing for Factored Design (ksf)	0.83	219

Exterior Basement/Retaining Wall Design



Current Date: 8/19/2024 5:02 PM

Units system: English

File name: P:\22.9003 - VA Atlanta Trinka Davis CLC - G-CE SDVOSB JV LLC\4. Reports-Calcs\4-3_Structural\3-5_RAM Miscellaneous\12 ft Retaining

Wall w Brick.rtw

Design Results Retaining wall

General Information

Design code : ACI 318-2019

Materials

 Description
 : C 4-60

 Concrete, f'c
 : 4.00 [Kip/in2]

 Steel, fy
 : 60.00 [Kip/in2]

 Elasticity modulus
 : 3605.00 [Kip/in2]

 Unit weight
 : 0.15 [Kip/ft3]

Soil

Modulus of subgrade reaction:200.00 [Kip/ft3]Backfill slope:0.00 [°]

Description	U.W. [Kip/ft3]	Saturated U.W. [Kip/ft3]	phi [°]	c [Lb/ft2]	Friction wall/soil	Ko
Base Soil	0.12	0.14	30.00	0.00	26.57	
Soil1	0.12		30.00	0.00	0.00	0.53

Cantilever

Geometry

Wall type

Kd

Btl

Tt Hf

Hf

Tt Thl Ht

Κw

Retained height H	:	12.00 [ft]	Wall height above retained soil Hf	:	0.00 [ft]
Base depth Df	:	2.00 [ft]	Use key	:	No
Top toe length Ttl	:	2.50 [ft]	Toe thickness Tt	:	1.50 [ft]
Bottom toe length Btl	:	2.00 [ft]			
Top heel length Thl	:	4.50 [ft]	Heel thickness Ht	:	1.50 [ft]

C 4-60

Stem thickness at base Bt : 12.00 [in]
Stem blocks number : 1

Block	Thickness [in]	Height [ft]	Material
1	12.00	12.00	C 4-60

Loads

Backfill surcharge : 0.10 [Kip/ft2]

Stem axial load (DL) : 0.73 [Kip] Load eccentricity : 4.00 [in]

Load conditions included in the design:

Service Load Combinations:

S1 = DL+LL+H

Base material

Strength Design Load Combinations:

R1 = 1.2DL+1.6LL+1.6H

Reinforcement

Steel reinforcement bars:

Stem free cover:0.25 [ft]Base free cover:0.25 [ft]Maximum Rho/Rho balanced ratio:0.75Round longitudinal bar lengths to:1.00 [in]

Longitudinal reinforcement

Element	Size	Spacing [in]	Pos	Axis	Dist1 [ft]	Dist2 [ft]	Hook1	Hook2
Toe	#6	12.00	Int.	1	-2.25	5.25	No	No
Heel	#6	12.00	Ext.	2	-3.25	4.25	No	No
Stem	#8	13.00	Int.	3	-1.25	11.75	Yes	No
Stem	#8	13.00	Ext.	3	-1.25	11.75	Yes	No

Development and splice lengths

Element	Diameter	Ld [in]	Ldh [in]	L. Splice [in]	L. total [ft]
Toe	#6	29.00	10.00	37.00	7.50
Heel	#6	37.00	10.00	49.00	7.50
Stem	#8	48.00	14.00	62.00	14.17
Stem	#8	48.00	14.00	62.00	14.17

Horizontal reinforcement

Element	Diameter	Nr	@ [in]	Position
Base	#5	10	10.00	Ext.
Base	#5	10	10.00	Int.
Stem	#5	10	14.00	Int.
Stem	#5	10	14.00	Ext.

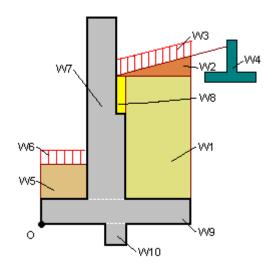
Assumptions

Active pressures calculation method Rankine Use resistant soil pressures for overturning Active Calculation method for lateral soil pressures Boussinesq Calculation method for soil bearing pressures Hansen Use vertical component of soil pressures for overturning No Use vertical component of soil pressures for sliding No Use vertical component of soil pressures for bearing No Frost depth 0.00 [ft] 0.00 [ft] Undermining depth

Design

Status : OK

Calculation of resisting forces



Force [Kip]	Distance [ft]	Moment [Kip*ft]
6.48	5.75	37.26
0.45	5.75	2.59
0.15	1.25	0.19
1.80	3.00	5.39
1.80	4.00	7.19
0.73	2.67	1.94
11.40		54.56
0.72	0.67	0.48
0.08	0.67	0.05
	[Kip] 6.48 0.45 0.15 1.80 1.80 0.73	[Kip] [ft] 6.48 5.75 0.45 5.75 0.15 1.25 1.80 3.00 1.80 4.00 0.73 2.67

Calculation of destabilizing forces

Descr	Description				Force [Kip]	Distance [ft]		nent p*ft]		
Heel horizontal soil pressure (Pah)				soil pressure (Pah) 4.10		4.75	19).44 		
Globa	l stability									
Allowa	ble safety fact	or for overturn	ning			:	1.50			
Allowa	ble safety fact	or for sliding				:	1.50			
Minim	um additional s	safety factor fo	or soil pressure	es		:	1.00			
Load	case qmax	qa	Soil Pres.	RM	ОТМ	Overt.	Res F	Slid F	Slid.	Defl
	[Lb/ft2]	[Lb/ft2]	SF	[Kip*ft]	[Kip*ft]	SF	[Kip]	[Kip]	SF	[in]
S1	2403.72	3000.00	1.25	54.61	19.44	2.81	6.42	4.10	1.57	0.27

Bending and Shear per element

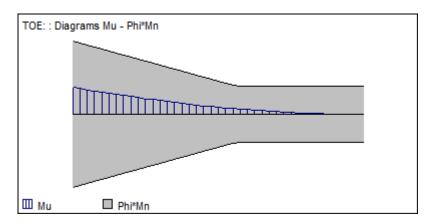
Element : Toe

Sta	tion	d	Mu[ł	(ip*ft]	φ*Mn	[Kip*ft]	Asred	in2]	Asprov	/ [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	14.63	0.00	9.93	-26.89	26.89	0.00	0.15	0.42	0.42	12.00	12.00	0.37
2	10%	14.63	0.00	8.13	-23.96	23.96	0.00	0.12	0.37	0.37	12.00	12.00	0.34
3	20%	14.63	0.00	6.49	-21.02	21.02	0.00	0.10	0.32	0.32	12.00	12.00	0.31
4	30%	14.63	0.00	5.02	-18.06	18.06	0.00	80.0	0.28	0.28	12.00	12.00	0.28
5	40%	14.63	0.00	3.72	-15.08	15.08	0.00	0.06	0.23	0.23	12.00	12.00	0.25
6	50%	14.63	0.00	2.61	-12.10	12.10	0.00	0.04	0.19	0.19	12.00	12.00	0.22
7	60%	14.63	0.00	1.69	-10.25	10.25	0.00	0.00	0.14	0.14	12.00	12.00	0.16
8	70%	14.63	0.00	0.96	-10.25	10.25	0.00	0.00	0.09	0.09	12.00	12.00	0.09
9	80%	14.63	0.00	0.43	-10.25	10.25	0.00	0.00	0.05	0.05	12.00	12.00	0.04
10	90%	14.63	0.00	0.11	-10.25	10.25	0.00	0.00	0.00	0.00	12.00	12.00	0.01
11	100%	14.63	0.00	0.00	-10.25	10.25	0.00	0.00	0.00	0.00			0.00
С	0%	14.63	0.00	9.93	-26.89	26.89	0.00	0.15	0.42	0.42	12.00	12.00	0.37

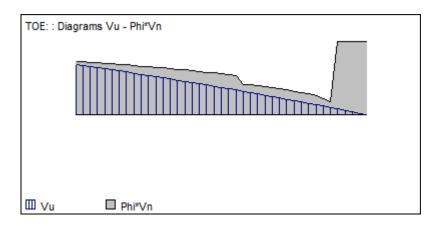
Maximum allowed spacing between bars : 18.00 [in]

Base transverse reinforcement:

Top reinforcement : 0.37 [in2]
Bottom reinforcement : 0.37 [in2]
Minimum shrinkage and temperature reinforcement : 0.43 [in2]



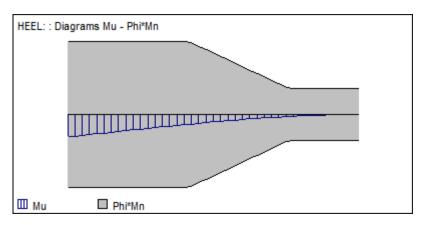
Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ *Vn [Kip]	Vu/(φ*Vn)
1	0%	7.54	10.68	8.01	0.94
2	10%	6.89	10.27	7.70	0.89
3	20%	6.23	9.82	7.37	0.84
4	30%	5.53	9.33	7.00	0.79
5	40%	4.82	8.78	6.59	0.73
6	50%	4.07	8.15	6.11	0.67
7	60%	3.31	7.41	5.55	0.74
8	70%	2.52	6.47	4.85	0.65
9	80%	1.70	5.14	3.85	0.55
10	90%	0.86	18.21	13.66	0.08
11	100%	0.00	18.21	13.66	0.00
С	0%	7.54	10.68	8.01	0.94



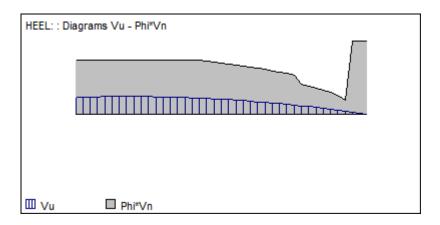
Element : Heel

Sta	tion	d	Mu[l	<pre>Kip*ft]</pre>	φ*Mn	[Kip*ft]	Asred	i [in2]	Aspro	/ [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	14.63	-8.67	0.00	-28.32	28.32	0.13	0.00	0.44	0.44	12.00	12.00	0.31
2	10%	14.63	-7.50	0.00	-28.32	28.32	0.11	0.00	0.44	0.44	12.00	12.00	0.26
3	20%	14.63	-6.31	0.00	-28.32	28.32	0.10	0.00	0.44	0.44	12.00	12.00	0.22
4	30%	14.63	-5.12	0.00	-28.32	28.32	0.08	0.00	0.44	0.44	12.00	12.00	0.18
5	40%	14.63	-3.98	0.00	-28.32	28.32	0.06	0.00	0.44	0.44	12.00	12.00	0.14
6	50%	14.63	-2.91	0.00	-23.96	23.96	0.04	0.00	0.37	0.37	12.00	12.00	0.12
7	60%	14.63	-1.96	0.00	-18.65	18.65	0.03	0.00	0.29	0.29	12.00	12.00	0.10
8	70%	14.63	-1.15	0.00	-13.29	13.29	0.02	0.00	0.20	0.20	12.00	12.00	0.09
9	80%	14.63	-0.54	0.00	-10.25	10.25	0.00	0.00	0.12	0.12	12.00	12.00	0.05
10	90%	14.63	-0.14	0.00	-10.25	10.25	0.00	0.00	0.04	0.04	12.00	12.00	0.01
11	100%	14.63	0.00	0.00	-10.25	10.25	0.00	0.00	0.00	0.00			0.00
С	0%	14.63	-8.67	0.00	-28.32	28.32	0.13	0.00	0.44	0.44	12.00	12.00	0.31

Maximum allowed spacing between bars : 18.00 [in]



Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)
1	0%	2.53	10.87	8.15	0.31
2	10%	2.63	10.87	8.15	0.32
3	20%	2.66	10.87	8.15	0.33
4	30%	2.60	10.87	8.15	0.32
5	40%	2.47	10.87	8.15	0.30
6	50%	2.26	10.27	7.70	0.29
7	60%	1.96	9.43	7.08	0.28
8	70%	1.59	8.42	6.31	0.25
9	80%	1.14	7.06	5.30	0.27
10	90%	0.61	4.77	3.58	0.21
11	100%	0.00	18.21	13.66	0.00
С	18%	2.66	10.87	8.15	0.33



Element : Stem (Block 1)

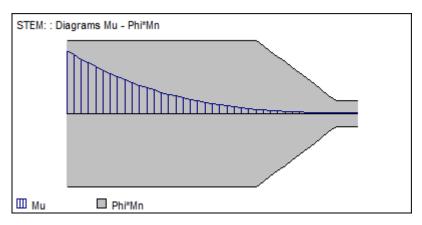
Sta	tion	d	Mu[Kip*ft]	φ*Mn	[Kip*ft]	Asred	ן [in2]	Aspro	/ [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	8.50	0.00	 22.56	-26.13	26.13	0.00	0.62	0.73	0.73	13.00	13.00	0.86
2	10%	8.50	0.00	16.84	-26.13	26.13	0.00	0.46	0.73	0.73	13.00	13.00	0.64
3	20%	8.50	0.00	12.19	-26.13	26.13	0.00	0.33	0.73	0.73	13.00	13.00	0.47
4	30%	8.50	0.00	8.49	-26.13	26.13	0.00	0.23	0.73	0.73	13.00	13.00	0.33
5	40%	8.50	0.00	5.65	-26.13	26.13	0.00	0.15	0.73	0.73	13.00	13.00	0.22
6	50%	8.50	0.00	3.55	-26.13	26.13	0.00	0.09	0.73	0.73	13.00	13.00	0.14
7	60%	8.50	0.00	2.08	-26.13	26.13	0.00	0.05	0.73	0.73	13.00	13.00	0.08

8	70%	8.50	0.00	1.13	-22.38	22.38	0.00	0.03	0.62	0.62	13.00	13.00	0.05
9	80%	8.50	0.00	0.59	-14.65	14.65	0.00	0.02	0.40	0.40	13.00	13.00	0.04
10	90%	8.50	0.00	0.35	-6.60	6.60	0.00	0.01	0.18	0.18	13.00	13.00	0.05
11	100%	8.50	0.00	0.29	-4.55	4.55	0.00	0.00	0.00	0.00	13.00	13.00	0.06
С	0%	8.50	0.00	22.56	-26.13	26.13	0.00	0.62	0.73	0.73	13.00	13.00	0.86

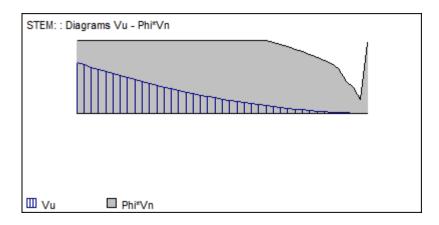
Maximum allowed spacing between bars : 18.00 [in]

Stem transverse reinforcement:

Exterior reinforcement : 0.27 [in2]
Interior reinforcement : 0.27 [in2]
Minimum shrinkage and temperature reinforcement : 0.29 [in2]



Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)
1	0%	5.25	9.94	7.46	0.70
2	10%	4.31	9.94	7.46	0.58
3	20%	3.46	9.94	7.46	0.46
4	30%	2.71	9.94	7.46	0.36
5	40%	2.04	9.94	7.46	0.27
6	50%	1.47	9.94	7.46	0.20
7	60%	0.99	9.94	7.46	0.13
8	70%	0.61	9.41	7.06	0.09
9	80%	0.31	8.12	6.09	0.05
10	90%	0.11	6.18	4.64	0.02
11	100%	0.00	12.14	9.11	0.00
С	0%	5.25	9.94	7.46	0.70



Notes

- * The soil beneath the wall is considered elastic and homogeneous. A linear variation of pressures is adopted.
- * The required reinforcement for bending takes into account the minimum reinforcement ratio given by Code.
- * For bending and shear design, the critical section is adopted at the support faces and axial forces are not considered.
- * Shear reinforcement is not considered.
- * Values shown in red are not in compliance with a provision of the code
- * Ld,Ldh = Development length of each bar. If the bar ends with a hook, it considers the Ldh length.
- *qprom = Mean compression pressure on soil.
- *qmax = Maximum compression pressure on soil.
- * SF = Safety factor, RM = Resisting moment, OTM = Overturning moment.
- * ResF = Resisting force, SlidF = Sliding force, Defl = Deflection.
- * sb = Free distance between bars.
- * If the section at which member flexural strength is being calculated is within the development length of a group of bars, the bars will contribute to the bending capacity an amount proportional to their actual length / their full development length.
 - * Asprov is the provided reinforcement, considering the reduction due to the development length as described previously.

Freestanding Retaining Wall shown on Civil Drawings



Current Date: 8/19/2024 5:06 PM

Units system: English

File name: P:\22.9003 - VA Atlanta Trinka Davis CLC - G-CE SDVOSB JV LLC\4. Reports-Calcs\4-3_Structural\3-5_RAM Miscellaneous\Freestanding

Exterior Retaining.rtw

Design Results Retaining wall

General Information

Design code : ACI 318-2019

Materials

 Description
 : C 4-60

 Concrete, f'c
 : 4.00 [Kip/in2]

 Steel, fy
 : 60.00 [Kip/in2]

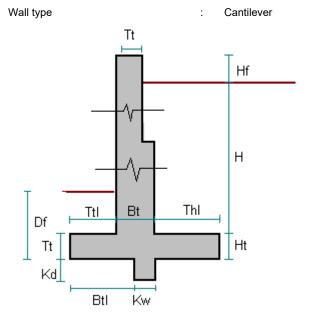
 Elasticity modulus
 : 3605.00 [Kip/in2]

 Unit weight
 : 0.15 [Kip/ft3]

Soil

Description	U.W. [Kip/ft3]	Saturated U.W. [Kip/ft3]	phi [°]	c [Lb/ft2]	Friction wall/soil	Ko
Base Soil	0.12	0.14	30.00	0.00	19.29	
Soil1	0.12		30.00	0.00	0.00	0.53

Geometry



Retained height H	:	7.00 [ft]	Wall height above retained soil Hf	:	0.00 [ft]
Base depth Df	:	1.50 [ft]	Use key	:	No
Top toe length Ttl	:	1.50 [ft]	Toe thickness Tt	:	1.00 [ft]
Bottom toe length Btl	:	2.00 [ft]			
Top heel length Thl	:	3.50 [ft]	Heel thickness Ht	:	1.00 [ft]
Base material	:	C 4-60			

Stem thickness at base Bt : 10.00 [in]
Stem blocks number : 1

Block	Thickness [in]	Height [ft]	Material
1	10.00	7.00	C 4-60

Loads

Load conditions included in the design:

Service Load Combinations:

S1 = DL+H

Strength Design Load Combinations:

R1 = 1.2DL+1.6H

Reinforcement

Steel reinforcement bars:

Stem free cover:0.25 [ft]Base free cover:0.25 [ft]Maximum Rho/Rho balanced ratio:0.75Round longitudinal bar lengths to:1.00 [in]

Longitudinal reinforcement

Element	Size	Spacing [in]	Pos	Axis	Dist1 [ft]	Dist2 [ft]	Hook1	Hook2
Stem	#5	12.00	Int.	3	-0.75	6.75	Yes	No
Stem	#5	12.00	Ext.	3	-0.75	6.75	No	No
Toe	#5	12.00	Ext.	1	-1.25	4.08	No	No
Toe	#5	12.00	Int.	1	-1.25	4.08	No	No

Development and splice lengths

Element	Diameter	Ld Ldh [in] [in]		L. Splice [in]	L. total [ft]
Stem	#5	24.00	9.00	31.00	8.25
Stem	#5	24.00	9.00	31.00	7.50
Toe	#5	31.00	9.00	41.00	5.33
Toe	#5	24.00	9.00	31.00	5.33

Horizontal reinforcement

Element	Diameter	Nr	@ [in]	Position
Stem	#5	5	12.00	Ext.
Stem	#5	5	12.00	Int.
Base	#5	4	12.00	Ext.
Base	#5	4	12.00	Int.

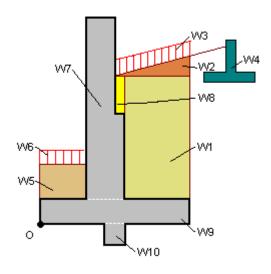
Assumptions

Active pressures calculation method Rankine Use resistant soil pressures for overturning Active Calculation method for lateral soil pressures Boussinesq Calculation method for soil bearing pressures Hansen Use vertical component of soil pressures for overturning No Use vertical component of soil pressures for sliding No Use vertical component of soil pressures for bearing No Frost depth 0.00 [ft] 0.00 [ft] Undermining depth

Design

Status : OK

Calculation of resisting forces



Description	Force [Kip]	Distance [ft]	Moment [Kip*ft]	
Weight of soil over heel (W1)	2.94	4.08	12.01	-
Weight of soil over toe (W5)	0.09	0.75	0.07	
Stem weight (W7)	0.87	1.92	1.68	
Base weight (W9)	0.87	2.92	2.55	
Total	4.78		16.30	•
Toe horizontal soil pressure against sliding (Pp)	0.41	0.50	0.20	
Toe horizontal soil pressure against overturning (Pp)	0.05	0.50	0.02	

Calculation of destabilizing forces

Page3

Description	Force [Kip]	Distance [ft]	Moment [Kip*ft]
Heel horizontal soil pressure (Pah)	1.28	2.67	3.41
Global stability Allowable safety factor for overturning Allowable safety factor for sliding		: :	1.50 1.50

Load c	[Lb/ft2]	qa [Lb/ft2]	Soil Pres. SF	RM [Kip*ft]	OTM [Kip*ft]	Overt. SF	Res F [Kip]	Slid F [Kip]	Slid. SF	Defl [in]
S1	1000.64	3000.00	3.00	16.32	3.41	4.78	2.08	1.28	1.62	0.15

1.00

Bending and Shear per element

Minimum additional safety factor for soil pressures

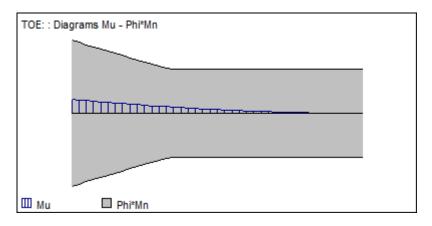
Element : Toe

Sta	tion	d	Mu[l	<pre>Kip*ft]</pre>	φ*Mn[Kip*ft]	Asred	ן [in2]	Aspro	v [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	8.69	0.00	1.46	-7.54	7.54	0.00	0.04	0.20	0.20	12.00	12.00	0.19
2	10%	8.69	0.00	1.19	-6.65	6.65	0.00	0.03	0.17	0.17	12.00	12.00	0.18
3	20%	8.69	0.00	0.94	-5.75	5.75	0.00	0.02	0.15	0.15	12.00	12.00	0.16
4	30%	8.69	0.00	0.72	-4.85	4.85	0.00	0.02	0.13	0.13	12.00	12.00	0.15
5	40%	8.69	0.00	0.53	-4.55	4.55	0.00	0.00	0.10	0.10	12.00	12.00	0.12
6	50%	8.69	0.00	0.37	-4.55	4.55	0.00	0.00	80.0	0.08	12.00	12.00	0.08
7	60%	8.69	0.00	0.24	-4.55	4.55	0.00	0.00	0.05	0.05	12.00	12.00	0.05
8	70%	8.69	0.00	0.14	-4.55	4.55	0.00	0.00	0.03	0.03	12.00	12.00	0.03
9	80%	8.69	0.00	0.06	-4.55	4.55	0.00	0.00	0.01	0.01	12.00	12.00	0.01
10	90%	8.69	0.00	0.02	-4.55	4.55	0.00	0.00	0.00	0.00			0.00
11	100%	8.69	0.00	0.00	-4.55	4.55	0.00	0.00	0.00	0.00			0.00
С	0%	8.69	0.00	1.46	-7.54	7.54	0.00	0.04	0.20	0.20	12.00	12.00	0.19

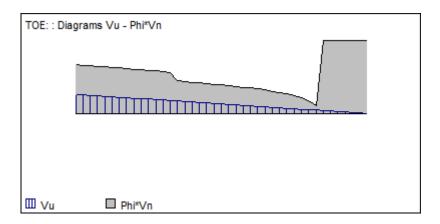
Maximum allowed spacing between bars : 18.00 [in]

Base transverse reinforcement:

Top reinforcement : 0.31 [in2]
Bottom reinforcement : 0.31 [in2]
Minimum shrinkage and temperature reinforcement : 0.29 [in2]



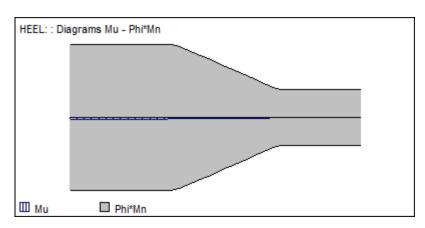
Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ* Vn [Kip]	Vu/(φ*Vn)
1	0%	1.91	6.51	4.88	0.39
2	10%	1.73	6.24	4.68	0.37
3	20%	1.55	5.94	4.46	0.35
4	30%	1.36	5.61	4.21	0.32
5	40%	1.17	5.24	3.93	0.37
6	50%	0.98	4.80	3.60	0.34
7	60%	0.79	4.26	3.19	0.31
8	70%	0.60	3.53	2.65	0.28
9	80%	0.40	2.23	1.67	0.30
10	90%	0.20	12.14	9.11	0.03
11	100%	0.00	12.14	9.11	0.00
С	82%	0.35	1.40	0.84	0.42



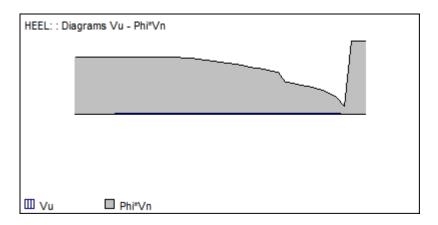
Element : Heel

Sta	tion	d	Mu[l	<pre>Kip*ft]</pre>	φ*Mn	[Kip*ft]	Asred	i [in2]	Aspro	/ [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	8.69	-0.32	0.00	-11.80	11.80	0.01	0.00	0.31	0.31	12.00	12.00	0.03
2	10%	8.69	-0.31	0.00	-11.80	11.80	0.01	0.00	0.31	0.31	12.00	12.00	0.03
3	20%	8.69	-0.29	0.00	-11.80	11.80	0.01	0.00	0.31	0.31	12.00	12.00	0.02
4	30%	8.69	-0.26	0.00	-11.80	11.80	0.01	0.00	0.31	0.31	12.00	12.00	0.02
5	40%	8.69	-0.22	0.00	-11.07	11.07	0.01	0.00	0.29	0.29	12.00	12.00	0.02
6	50%	8.69	-0.17	0.00	-9.01	9.01	0.00	0.00	0.24	0.24	12.00	12.00	0.02
7	60%	8.69	-0.12	0.00	-6.94	6.94	0.00	0.00	0.18	0.18	12.00	12.00	0.02
8	70%	8.69	-0.07	0.00	-4.85	4.85	0.00	0.00	0.13	0.13	12.00	12.00	0.02
9	80%	8.69	-0.04	0.00	-4.55	4.55	0.00	0.00	0.07	0.07	12.00	12.00	0.01
10	90%	8.69	-0.01	0.00	-4.55	4.55	0.00	0.00	0.02	0.02	12.00	12.00	0.00
11	100%	8.69	0.00	0.00	-4.55	4.55	0.00	0.00	0.00	0.00			0.00
С	2%	8.69	-0.32	0.00	-11.80	11.80	0.01	0.00	0.31	0.31	12.00	12.00	0.03

Maximum allowed spacing between bars : 18.00 [in]



Station Nr.	n Dist	Vu [Kip]	Vc [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)
1	0%	0.02	7.59	5.69	0.00
2	10%	0.03	7.59	5.69	0.01
3	20%	0.08	7.59	5.69	0.01
4	30%	0.11	7.59	5.69	0.02
5	40%	0.13	7.42	5.56	0.02
6	50%	0.14	6.92	5.19	0.03
7	60%	0.14	6.33	4.75	0.03
8	70%	0.12	5.61	4.21	0.03
9	80%	0.09	4.63	3.47	0.03
10	90%	0.05	2.81	2.10	0.03
11	100%	0.00	12.14	9.11	0.00
С	92%	0.04	1.40	0.84	0.05



Element : Stem (Block 1)

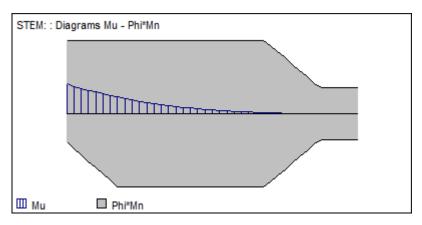
Station		d	Mu [Kip*ft]		φ*Mn∣	φ*Mn [Kip*ft]		Asreq [in2]		Asprov [in2]		[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	 0%	6.69	0.00	3.66	-3.49	9.01	0.00	0.12	0.12	0.31	12.00	12.00	0.41
2	10%	6.69	0.00	2.67	-6.67	9.01	0.00	0.09	0.23	0.31	12.00	12.00	0.30
3	20%	6.69	0.00	1.87	-9.01	9.01	0.00	0.06	0.31	0.31	12.00	12.00	0.21
4	30%	6.69	0.00	1.25	-9.01	9.01	0.00	0.04	0.31	0.31	12.00	12.00	0.14
5	40%	6.69	0.00	0.79	-9.01	9.01	0.00	0.03	0.31	0.31	12.00	12.00	0.09
6	50%	6.69	0.00	0.46	-9.01	9.01	0.00	0.02	0.31	0.31	12.00	12.00	0.05
7	60%	6.69	0.00	0.23	-9.01	9.01	0.00	0.01	0.31	0.31	12.00	12.00	0.03

8 9	70% 80%	6.69 6.69	0.00	0.10 0.03	-8.45 -5.32	8.45 5.32	0.00	0.00 0.00	0.29 0.18	0.29 0.18	12.00 12.00	12.00 12.00	0.01 0.01
10 11	90% 100%	6.69 6.69	0.00	0.00	-3.16 -3.16	3.16 3.16	0.00	0.00	0.07	0.07	12.00	12.00	0.00
	0%	6.69	0.00	3.66	-3.49	9.01	0.00	0.12	0.12	0.31	12.00	12.00	0.41

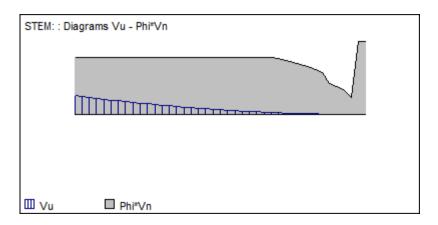
Maximum allowed spacing between bars : 18.00 [in]

Stem transverse reinforcement:

Exterior reinforcement : 0.31 [in2]
Interior reinforcement : 0.31 [in2]
Minimum shrinkage and temperature reinforcement : 0.24 [in2]



Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)
1	0%	1.57	6.37	4.78	0.33
2	10%	1.27	6.37	4.78	0.27
3	20%	1.00	6.37	4.78	0.21
4	30%	0.77	6.37	4.78	0.16
5	40%	0.56	6.37	4.78	0.12
6	50%	0.39	6.37	4.78	0.08
7	60%	0.25	6.37	4.78	0.05
8	70%	0.14	6.23	4.67	0.03
9	80%	0.06	5.32	3.99	0.02
10	90%	0.02	3.89	2.92	0.01
11	100%	0.00	10.12	7.59	0.00
С	0%	1.57	6.37	4.78	0.33



Notes

- * The soil beneath the wall is considered elastic and homogeneous. A linear variation of pressures is adopted.
- * The required reinforcement for bending takes into account the minimum reinforcement ratio given by Code.
- * For bending and shear design, the critical section is adopted at the support faces and axial forces are not considered.
- * Shear reinforcement is not considered.
- * Values shown in red are not in compliance with a provision of the code
- * Ld,Ldh = Development length of each bar. If the bar ends with a hook, it considers the Ldh length.
- *qprom = Mean compression pressure on soil.
- *qmax = Maximum compression pressure on soil.
- * SF = Safety factor, RM = Resisting moment, OTM = Overturning moment.
- * ResF = Resisting force, SlidF = Sliding force, Defl = Deflection.
- * sb = Free distance between bars.
- * If the section at which member flexural strength is being calculated is within the development length of a group of bars, the bars will contribute to the bending capacity an amount proportional to their actual length / their full development length.
 - * Asprov is the provided reinforcement, considering the reduction due to the development length as described previously.

Restrained Interior Basement Wall



Current Date: 8/19/2024 5:04 PM

Units system: English

File name: P:\22.9003 - VA Atlanta Trinka Davis CLC - G-CE SDVOSB JV LLC\4. Reports-Calcs\4-3_Structural\3-5_RAM Miscellaneous\Restrained

Basement Wall.rtw

Design Results Retaining wall

General Information

Design code : ACI 318-2019

Materials

 Description
 : C 4-60

 Concrete, f'c
 : 4.00 [Kip/in2]

 Steel, fy
 : 60.00 [Kip/in2]

 Elasticity modulus
 : 3605.00 [Kip/in2]

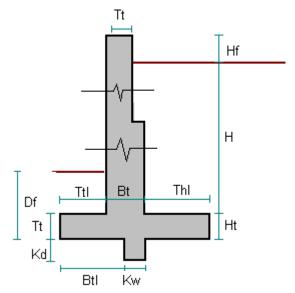
 Unit weight
 : 0.15 [Kip/ft3]

Soil

Description	U.W. [Kip/ft3]	Saturated U.W. [Kip/ft3]	phi [°]	c [Lb/ft2]	Friction wall/soil	Ko
Base Soil Soil1	0.12 0.12	0.14 	30.00 30.00	0.00 0.00	26.57 0.00	0.53

Geometry

Wall type : Restrained



Retained height H	:	12.50 [ft]	Wall height above retained soil Hf	:	0.00 [ft]
Base depth Df	:	2.50 [ft]	Use key	:	No
Top toe length Ttl	:	3.00 [ft]	Toe thickness Tt	:	2.00 [ft]
Bottom toe length Btl	:	3.00 [ft]			
Top heel length Thl	:	8.00 [ft]	Heel thickness Ht	:	2.00 [ft]
Base material	:	C 4-60			

Stem thickness at base Bt 18.00 [in] Stem blocks number

Block	Thickness [in]	Height [ft]	Material
1	18.00	12.50	C 4-60

Loads

Backfill surcharge 0.10 [Kip/ft2] 0.70 [Kip] Stem axial load (DL) Stem axial load (LL) 0.84 [Kip]

Load conditions included in the design:

Service Load Combinations:

S1 = DL+LL+H

Strength Design Load Combinations:

R1 = 1.2DL+1.6LL+1.6H

Reinforcement

Steel reinforcement bars:

Stem free cover 0.25 [ft] 0.25 [ft] Base free cover Maximum Rho/Rho balanced ratio 0.75 Round longitudinal bar lengths to 1.00 [in]

Longitudinal reinforcement

Element	Size	Spacing [in]	Pos	Axis	Dist1 [ft]	Dist2 [ft]	Hook1	Hook2
Heel	#7	13.00	Int.	2	-4.25	7.75	No	No
Stem	#8	12.00	Ext.	3	-1.75	12.25	Yes	No
Stem	#8	12.00	Int.	3	-1.75	12.25	Yes	No
Heel	#7	13.00	Ext.	2	-4.25	7.75	No	No

Development and splice lengths

Element	Diameter	Ld [in]	Ldh [in]	L. Splice [in]	L. total [ft]
Heel	#7	42.00	12.00	54.00	12.00
Stem	#8	48.00	14.00	62.00	15.17
Stem	#8	48.00	14.00	62.00	15.17
Heel	#7	54.00	12.00	71.00	12.00

Horizontal reinforcement

Element	Diameter	Nr	@ [in]	Position
Base	#5	21	7.00	Int.
Stem	#8	14	12.00	Ext.
Stem	#8	14	12.00	Int.
Base	#5	21	7.00	Ext.

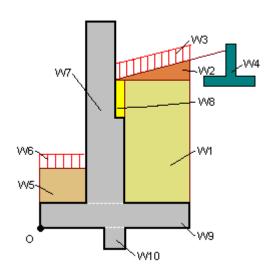
Assumptions

Active pressures calculation method : At rest
Calculation method for lateral soil pressures : Boussinesq
Calculation method for soil bearing pressures : Hansen
Frost depth : 0.00 [ft]
Undermining depth : 0.00 [ft]

Design

Status : OK

Calculation of resisting forces



Description	Force [Kip]	Distance [ft]	Moment [Kip*ft]
Weight of soil over heel (W1)	12.00	8.50	102.00
Surcharge over heel (W3)	0.80	8.50	6.80
Weight of soil over toe (W5)	0.18	1.50	0.27
Stem weight (W7)	2.81	3.75	10.53
Base weight (W9)	3.75	6.25	23.41
Stem axial load (DL)	0.70	3.75	2.63
Stem axial load (LL)	0.84	3.75	3.15
Total	21.07		148.79
Toe horizontal soil pressure against sliding (Pp)	0.72	0.67	0.48

Calculation of destabilizing forces

Page3

Description	Force	Distance	Moment
	[Kip]	[ft]	[Kip*ft]
Heel horizontal soil pressure (Pah)	7.45	5.08	37.89

Global stability

Minimum additional safety factor for soil pressures

Load c	ase qmax	qa	Soil Pres.	RM	OTM	Overt.	Res F	Slid F	Slid.	Defl
	[Lb/ft2]	[Lb/ft2]	SF	[Kip*ft]	[Kip*ft]	SF	[Kip]	[Kip]	SF	[in]
S1	1721.74	3000.00	1.74	-	-	N.A.	-	-	N.A.	-

1.00

Bending and Shear per element

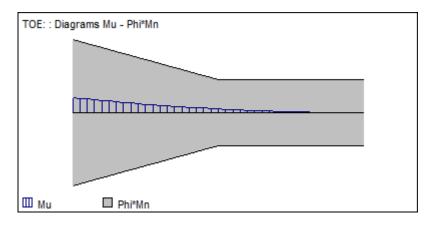
Element : Toe

Sta	tion	d	Mu[ł	(ip*ft]	φ*Mn	[Kip*ft]	Asred	ן [in2]	Aspro	v [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	20.56	0.00	8.38	-40.11	40.11	0.00	0.09	0.44	0.44	13.00	13.00	0.21
2	10%	20.56	0.00	6.76	-35.79	35.79	0.00	0.07	0.39	0.39	13.00	13.00	0.19
3	20%	20.56	0.00	5.32	-31.46	31.46	0.00	0.06	0.34	0.34	13.00	13.00	0.17
4	30%	20.56	0.00	4.05	-27.12	27.12	0.00	0.04	0.30	0.30	13.00	13.00	0.15
5	40%	20.56	0.00	2.97	-22.76	22.76	0.00	0.03	0.25	0.25	13.00	13.00	0.13
6	50%	20.56	0.00	2.05	-18.39	18.39	0.00	0.02	0.20	0.20	13.00	13.00	0.11
7	60%	20.56	0.00	1.31	-18.21	18.21	0.00	0.00	0.15	0.15	13.00	13.00	0.07
8	70%	20.56	0.00	0.73	-18.21	18.21	0.00	0.00	0.10	0.10	13.00	13.00	0.04
9	80%	20.56	0.00	0.32	-18.21	18.21	0.00	0.00	0.06	0.06	13.00	13.00	0.02
10	90%	20.56	0.00	80.0	-18.21	18.21	0.00	0.00	0.01	0.01	13.00	13.00	0.00
11	100%	20.56	0.00	0.00	-18.21	18.21	0.00	0.00	0.00	0.00			0.00
С	0%	20.56	0.00	8.38	-40.11	40.11	0.00	0.09	0.44	0.44	13.00	13.00	0.21

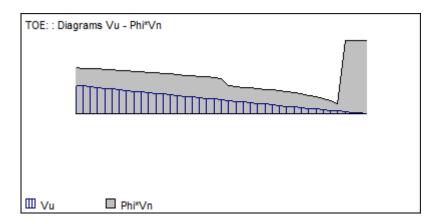
Maximum allowed spacing between bars : 18.00 [in]

Base transverse reinforcement:

Top reinforcement:0.53 [in2]Bottom reinforcement:0.53 [in2]Minimum shrinkage and temperature reinforcement:0.58 [in2]



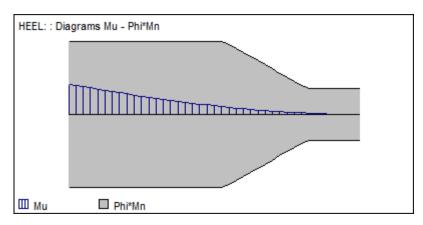
Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ *Vn [Kip]	Vu/(φ*Vn)
1	0%	5.70	12.25	9.19	0.62
2	10%	5.10	11.79	8.84	0.58
3	20%	4.51	11.29	8.46	0.53
4	30%	3.92	10.73	8.05	0.49
5	40%	3.34	10.12	7.59	0.44
6	50%	2.76	9.42	7.06	0.39
7	60%	2.20	8.60	6.45	0.43
8	70%	1.64	7.57	5.68	0.36
9	80%	1.08	6.16	4.62	0.29
10	90%	0.54	3.22	2.42	0.28
11	100%	0.00	24.29	18.21	0.00
С	0%	5.70	12.25	9.19	0.62



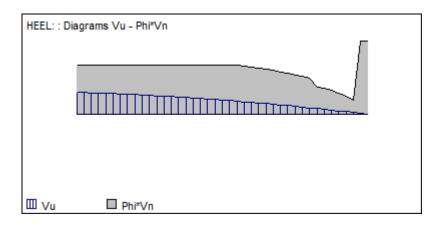
Element : Heel

Sta	tion	d	Mu[Kip*ft]	φ*Mn	[Kip*ft]	Asred	i [in2]	Asprov	/ [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	20.56	0.00	20.93	-50.23	50.23	0.00	0.23	0.55	0.55	13.00	13.00	0.42
2	10%	20.56	0.00	17.48	-50.23	50.23	0.00	0.19	0.55	0.55	13.00	13.00	0.35
3	20%	20.56	0.00	14.23	-50.23	50.23	0.00	0.15	0.55	0.55	13.00	13.00	0.28
4	30%	20.56	0.00	11.22	-50.23	50.23	0.00	0.12	0.55	0.55	13.00	13.00	0.22
5	40%	20.56	0.00	8.48	-50.23	50.23	0.00	0.09	0.55	0.55	13.00	13.00	0.17
6	50%	20.56	0.00	6.05	-50.23	50.23	0.00	0.07	0.55	0.55	13.00	13.00	0.12
7	60%	20.56	0.00	3.98	-42.97	42.97	0.00	0.04	0.47	0.47	13.00	13.00	0.09
8	70%	20.56	0.00	2.30	-31.46	31.46	0.00	0.02	0.34	0.34	13.00	13.00	0.07
9	80%	20.56	0.00	1.05	-19.85	19.85	0.00	0.01	0.22	0.22	13.00	13.00	0.05
10	90%	20.56	0.00	0.27	-18.21	18.21	0.00	0.00	0.09	0.09	13.00	13.00	0.01
11	100%	20.56	0.00	0.00	-18.21	18.21	0.00	0.00	0.00	0.00			0.00
С	0%	20.56	0.00	20.93	-50.23	50.23	0.00	0.23	0.55	0.55	13.00	13.00	0.42

Maximum allowed spacing between bars : 18.00 [in]



Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)
1	0%	4.41	13.22	9.92	0.44
2	10%	4.19	13.22	9.92	0.42
3	20%	3.92	13.22	9.92	0.40
4	30%	3.60	13.22	9.92	0.36
5	40%	3.24	13.22	9.92	0.33
6	50%	2.82	13.22	9.92	0.28
7	60%	2.36	12.54	9.41	0.25
8	70%	1.84	11.29	8.46	0.22
9	80%	1.28	9.66	7.25	0.18
10	90%	0.66	7.16	5.37	0.15
11	100%	0.00	24.29	18.21	0.00
С	0%	4.41	13.22	9.92	0.44



Element : Stem (Block 1)

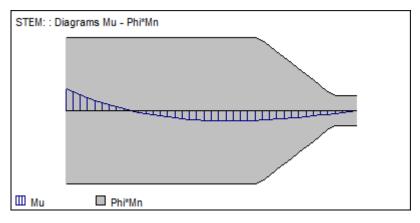
Sta	tion	d	Mu[Kip*ft]	φ*Mn	[Kip*ft]	Asred	ן [in2]	Aspro	/ [in2]	sb	[in]	Mu/(φ*Mn)
Nr.	Dist	[in]	neg	pos	neg	pos	ext	int	ext	int	ext	int	
1	0%	 14.50	0.00	 14.78	-49.48	49.48	0.00	0.23	0.79	0.79	12.00	12.00	0.30
2	10%	14.50	0.00	7.04	-49.48	49.48	0.00	0.11	0.79	0.79	12.00	12.00	0.14
3	20%	14.50	0.00	1.23	-49.48	49.48	0.00	0.02	0.79	0.79	12.00	12.00	0.02
4	30%	14.50	-2.87	0.00	-49.48	49.48	0.04	0.00	0.79	0.79	12.00	12.00	0.06
5	40%	14.50	-5.44	0.00	-49.48	49.48	0.08	0.00	0.79	0.79	12.00	12.00	0.11
6	50%	14.50	-6.69	0.00	-49.48	49.48	0.10	0.00	0.79	0.79	12.00	12.00	0.14
7	60%	14.50	-6.81	0.00	-49.48	49.48	0.10	0.00	0.79	0.79	12.00	12.00	0.14

8	70%	14.50	-6.00	0.00	-44.02	44.02	0.09	0.00	0.70	0.70	12.00	12.00	0.14
9	80%	14.50	-4.46	0.00	-28.67	28.67	0.07	0.00	0.45	0.45	12.00	12.00	0.16
10	90%	14.50	-2.40	0.00	-12.91	12.91	0.04	0.00	0.20	0.20	12.00	12.00	0.19
11	100%	14.50	0.00	0.00	-10.25	10.25	0.00	0.00	0.00	0.00	12.00	12.00	0.00
С	0%	14.50	0.00	14.78	-49.48	49.48	0.00	0.23	0.79	0.79	12.00	12.00	0.30

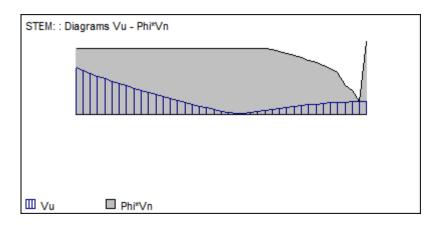
Maximum allowed spacing between bars : 18.00 [in]

Stem transverse reinforcement:

Exterior reinforcement : 0.79 [in2]
Interior reinforcement : 0.79 [in2]
Minimum shrinkage and temperature reinforcement : 0.43 [in2]



Station Nr.	Dist	Vu [Kip]	Vc [Kip]	φ*Vn [Kip]	Vu/(φ*Vn)
1	0%	7.01	13.17	9.88	0.71
2	10%	5.40	13.17	9.88	0.55
3	20%	3.94	13.17	9.88	0.40
4	30%	2.64	13.17	9.88	0.27
5	40%	1.50	13.17	9.88	0.15
6	50%	0.52	13.17	9.88	0.05
7	60%	0.30	13.17	9.88	0.03
8	70%	0.96	12.65	9.49	0.10
9	80%	1.47	10.92	8.19	0.18
10	90%	1.81	8.33	6.25	0.29
11	100%	1.99	18.21	13.66	0.18
С	98%	1.96	3.31	1.98	0.99



Notes

- * The soil beneath the wall is considered elastic and homogeneous. A linear variation of pressures is adopted.
- * The required reinforcement for bending takes into account the minimum reinforcement ratio given by Code.
- * For bending and shear design, the critical section is adopted at the support faces and axial forces are not considered.
- * Shear reinforcement is not considered.
- * Values shown in red are not in compliance with a provision of the code
- * Ld,Ldh = Development length of each bar. If the bar ends with a hook, it considers the Ldh length.
- *qprom = Mean compression pressure on soil.
- *qmax = Maximum compression pressure on soil.
- * SF = Safety factor, RM = Resisting moment, OTM = Overturning moment.
- * ResF = Resisting force, SlidF = Sliding force, Defl = Deflection.
- * sb = Free distance between bars.
- * If the section at which member flexural strength is being calculated is within the development length of a group of bars, the bars will contribute to the bending capacity an amount proportional to their actual length / their full development length.
 - * Asprov is the provided reinforcement, considering the reduction due to the development length as described previously.