



Liebert[®] CW Thermal Management System

Installer/User Guide

**38 to 181 kW (10 to 52 ton) Capacity, Upflow and Downflow,
50 Hz and 60 Hz**

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Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relating to the application, installation, and operation of this product.

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

TABLE OF CONTENTS

1 Important Safety Instructions	1
2 Nomenclature and Components	5
2.1 Vertiv™ Liebert® CW Model Number Nomenclature	5
2.2 Component Location	7
3 Pre-installation Preparation and Guidelines	9
3.1 Planning Dimensions	9
3.2 Location Considerations	11
3.3 Air Distribution Considerations for Downflow Units	11
3.4 Air Distribution Considerations for Upflow Units	13
3.5 Connections and System Setup	14
3.6 Operating Conditions	14
3.6.1 Cooling, Dehumidification and Humidification	15
3.6.2 Heating	15
3.7 Shipping Dimensions and Unit Weights	15
4 Equipment Inspection and Handling	17
4.1 Packaging Material	18
4.2 Handling the Unit while Packaged	18
4.3 Unpacking the Unit	19
4.3.1 Removing the Unit from the Skid with a Forklift	21
4.3.2 Removing the Unit from the Skid Using Rigging	22
4.3.3 Moving the Unit to the Installation Location Using Piano Jacks	24
4.4 Placing the Unit on a Floor Stand	25
5 Piping Requirements	27
5.1 Drain and Humidifier Fluid Connections	28
5.1.1 Field Installed, Gravity Fed Drain Line Requirements	28
5.1.2 Condensate Pump Drain Line Requirements	30
5.1.3 Water Supply Line Requirements for the Optional Humidifier	31
5.2 Chilled Water Loop Piping Guidelines	31
5.2.1 Leak Checking for Unit and Field Installed Piping	33
6 Electrical Connections	35
7 EC Fans and Plenums	37
7.1 Downflow Units with EC Fans	37
7.1.1 Lowering the EC Fans into the Floor Stand on Downflow Models	37
7.2 Upflow Unit Plenums with EC Fans	40
7.2.1 Assembly Inspection	41
7.2.2 Assemble Plenum Rear and Side Panels	45
7.2.3 Place Assembled Panels and EC Fans on Top of Unit	48
7.2.4 Wire the EC Fans	51

- 7.2.5 Install Front Panels on Plenum54
- 8 Checklist for Completed Installation 67**
- 8.1 Moving and Placing Equipment 67
- 8.2 Electrical Installation Checks 67
- 8.3 Piping Installation Checks 67
- 8.4 Other Installation Checks 67
- 9 Initial Start-up Checks and Commissioning Procedure for Warranty Inspection 69**
- 10 Troubleshooting 71**
- 11 Maintenance 73**
- 11.1 Filters 74
- 11.2 Blower Drive System—EC Fans 75
 - 11.2.1 Protective Features 76
 - 11.2.2 Fan Impellers and Bearings Maintenance 76
 - 11.2.3 Fan Assembly Troubleshooting 76
 - 11.2.4 Removing EC Fans from Downflow Units 80
 - 11.2.5 Removing EC Fans from Upflow Units 84
- 11.3 Blower Drive System—Forward Curved Blowers 88
 - 11.3.1 Blower Motor Lubrication 88
 - 11.3.2 Belt Inspection 88
- 11.4 Electronic Variable Speed Drive - Inverter 88
- 11.5 Infrared Humidifier Maintenance 89
 - 11.5.1 Cleaning Humidifier Pan and Float Switch 89
 - 11.5.2 Changing Humidifier Lamps 90
- 11.6 Condensate Drain and Condensate Pump System Maintenance 91
 - 11.6.1 Condensate Drain 91
 - 11.6.2 Condensate Pump 91
- 11.7 Facility Fluid and Piping Maintenance for Water and Glycol Systems 91
- 12 Preventive Maintenance Checklist 93**
- Appendices 97**
- Appendix A: Technical Support and Contacts 97
- Appendix B: Submittal Drawings 99

1 Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ Liebert® CW. Read this manual thoroughly before attempting to install or operate this unit.

Only qualified personnel should move, install or service this equipment.

Adhere to all warnings, cautions, notices and installation, operating and safety instructions on the unit and in this manual. Follow all installation, operation and maintenance instructions and all applicable national and local building, electrical and plumbing codes.



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied disconnect switch is inside the unit. The line side of this switch contains live high-voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers’ specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of electric shock. Can cause serious injury or death. The Liebert® iCOM™ microprocessor does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ control. Open all local and remote electric power disconnect switches and verify with a voltmeter that power is Off before working on any component of the system.



WARNING! Risk of improper moving, lifting, or handling of the unit. Can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. See [Shipping Dimensions and Unit Weights](#) on page 15 , for weights.



WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



WARNING! Risk of improper wire sizing/rating and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.



WARNING! Risk of top-heavy unit falling over. Improper handling can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation.



WARNING! Risk of unsecured unit rolling off pallet. Can cause equipment damage, injury or death. The unit is on casters. Ensure that the unit/pallet is located on a flat surface before loosening the hardware securing the to its shipping pallet.



WARNING! Risk of hair, clothing and jewelry entanglement with high speed rotating fan blades. Can cause equipment damage, serious injury or death. Keep hair, jewelry and loose clothing secured and away from rotating fan blades during unit operation.



WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.



WARNING! Risk of contact with extremely hot and/or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved PPE before working within the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized and component temperatures have become safe for human contact.



CAUTION: Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within $\pm 10\%$ of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and very expensive building damage. Cooling coils and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil and piping corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before start up to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

Water chemistry varies greatly by location, as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and or growth of sulfate reducing bacteria.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

We recommend installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

NOTICE

Risk of frozen pipes and corrosion from improper coolant mixture. Can cause water leaks resulting in equipment and building damage.

When the cooling unit or piping may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient temperature. Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system. Use only HVAC glycol solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

NOTICE

Risk of no-flow condition. Can cause equipment damage.

Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and water/coolant fluid-supply circuit system operating continuously.

NOTICE

Risk of clogged or leaking drain lines and leaking water-supply lines. Can cause equipment and building damage.

This unit requires a water drain connection. Drain lines must be inspected at start-up and periodically, and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in catastrophic and expensive building and equipment damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

We recommend installing a monitored fluid-detection system to immediately discover and report coolant-fluid system and condensate drain-line leaks.

NOTICE

Risk of doorway/hallway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a doorway or hallway while on the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

NOTICE

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

NOTICE

Risk of improper storage. Can cause unit damage.

Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.

2 Nomenclature and Components

This section describes the model number for Vertiv™ Liebert® CW units and components.

2.1 Vertiv™ Liebert® CW Model Number Nomenclature

Table 2.2 below describes each digit of the model number.

Table 2.1 Liebert® CW Model Number Example

Model Number digits 1 to 10										Factory Configuration Number				Configuration Code
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	W	0	3	8	D	C	1	A	1	1	2	3	4	A

Table 2.2 Liebert® CW Model Number Digit Definitions

Digit	Description
Digits 1 and 2 = Unit Family	CW = Liebert® CW floor-mounted, chilled-water unit
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	038 = 38 kW 041 = 41 kW 051 = 51 kW 060 = 60 kW 076 = 76 kW 084 = 84 kW 106 = 106 kW 114 = 114 kW 146 = 146 kW 181 = 181 kW
Digit 6 = Air Distribution	D = Downflow U = Upflow
Digit 7 = Cooling Type	C = Chilled water

Table 2.2 Liebert® CW Model Number Digit Definitions (continued)

Digit	Description
Digit 8 = Fan Type	<p>S = Forward-curved blower with standard motor</p> <p>V = Forward-curved blower with variable-speed drive</p> <p>1 = EC fan</p> <p>H = EC fan with THD</p>
Digit 9 = Voltage	<p>A = 460 V - 3 ph - 60 Hz</p> <p>B = 575 V - 3 ph - 60 Hz</p> <p>C = 208 V - 3 ph - 60 Hz</p> <p>D = 230 V - 3 ph - 60 Hz</p> <p>2 = 380 V - 3 ph - 60 Hz</p> <p>F = 380 V - 3 ph - 50 Hz</p> <p>G = 415 V - 3 ph - 50 Hz</p> <p>M = 380-415 V - 3 ph - 50 Hz</p>
Digit 10 = Valve Type	<p>1 = 2-way valve, high pressure</p> <p>T = 3-way valve, high pressure</p>
Digit 11-14 = Factory Configuration Number	
Digit 15 = Configuration Code	<p>A-Z = Standard configuration</p> <p>S = SFA</p>

Not all combinations of options are available on all units:

- Models CW146 and CW181 only available in downflow configuration.
- Disconnect switch, Locking
 - Not available on 208-V units with 20-hp motor
- Flow switch that activates the warning system
 - Ships loose
- Steam/Hot-water reheat package
 - Not available on units with EC fans

2.2 Component Location

The unit component locations are described in the submittal documents included in the [Submittal Drawings](#) on page 99 .

The following table lists the relevant documents by number and title.

Table 2.3 Component Location Drawings

Document Number	Title
DPN002869	Component Location, Downflow Models
DPN002868	Component Location, Upflow Models

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3 Pre-installation Preparation and Guidelines

NOTE: Before installing unit, determine whether any building alterations are required to run piping, wiring and duct work. Follow all unit dimensional drawings and refer to the submittal engineering dimensional drawings of individual units for proper clearances.

Refer to **Table 2.2** on page 5, and submittal drawings to determine the type of system being installed and anticipate building alterations, piping and duct work needed.

The unit dimensions, pipe-connection locations, and piping schematics are described in the submittal documents included in the [Submittal Drawings](#) on page 99.

- Verify that the floor is level, solid and sufficient to support the unit. See **Table 3.3** on page 15, for unit weights.
- Confirm that the room is properly insulated and has a sealed vapor barrier.
- For proper humidity control, keep outside or fresh air to an absolute minimum (less than 5% of total air circulated in the room).
- Do not install a Vertiv™ Liebert® CW in an alcove or at the end of a long, narrow room.
- Install the units as close as possible to the largest heat load.
- Allow at least the minimum recommended clearances for maintenance and service. See the appropriate submittal drawings for dimensions.
- We recommend installing an under-floor water detection system. Contact your Vertiv representative for information.

3.1 Planning Dimensions

The unit, floor stand, and plenum dimensions are described in the submittal documents included in the [Submittal Drawings](#) on page 99.

The following table lists the relevant documents by number and title.

Table 3.1 Dimension Planning Drawings

Document Number	Title
Downflow Units with EC Fans	
DPN003192	Cabinet Dimensional Data, CW038 to CW084
DPN003222	Cabinet Dimensional Data, Front Discharge, CW038 and CW041
DPN003223	Cabinet Dimensional Data, Front Discharge, CW051, CW060, CW076, and CW084
DPN003193	Cabinet Dimensional Data, CW106, and CW114
DPN003224	Cabinet Dimensional Data, Front Discharge, CW106 and CW114
DPN003208	Cabinet Dimensional Data, CW146 and CW181
DPN003225	Cabinet Dimensional Data, Front Discharge, CW146 and CW181
Upflow Units with EC Fans	
DPN003215	Cabinet Dimensional Data, CW038 to CW084
DPN003216	Cabinet Dimensional Data, CW106 and CW114

Table 3.1 Dimension Planning Drawings (continued)

Document Number	Title
Upflow Units with Forward-curved Blowers	
DPN003194	Cabinet Dimensional Data, CW038 to CW084
DPN003195	Cabinet Dimensional Data, CW106 and CW114
Floor Stands for Units with EC Fans	
DPN003212	Floorstand Dimensional Data, Downflow Models, CW038 to CW041
DPN003211	Floorstand Dimensional Data, Downflow Models, CW051 and CW060
DPN003210	Floorstand Dimensional Data, Downflow Models, CW076 and CW084
DPN003191	Floorstand Dimensional Data, Downflow Models, CW106 and CW114
DPN003207	Floorstand Dimensional Data, Downflow Models, CW146 and CW181
Floor Stands for Upflow Units	
DPN001676	Floorstand Dimensional Data, Upflow Models, CW038 to CW084
DPN001677	Floorstand Dimensional Data, Upflow Models, CW106 and CW114
Plenums for Units with EC Fans	
DPN004604	Plenum Dimensional Data, Downflow Models, CW038 to CW084
DPN004605	Plenum Dimensional Data, Downflow Models, CW106 and CW114
DPN003214	Plenum Dimensional Data, Upflow Models, CW038 to CW084
DPN003213	Plenum Dimensional Data, Upflow Models, CW106 and CW114
Plenums for Units with Forward-curved Blowers	
DPN003204	Plenum Dimensional Data, Upflow Models, CW038 to CW084
DPN003205	Plenum Dimensional Data, Upflow Models, CW106 and CW114

3.2 Location Considerations

For a downflow unit, the unit can sit on an accessible, elevated flooring system. It may be necessary to furnish additional pedestal support below the unit to ensure maximum structural support. A separate floor stand for the unit may be used as support, independent of the elevated floor and installed prior to the flooring system.

For downflow and upflow units, provide approximately 34 in. (864 mm) service clearance on the left, right and in front of the unit whenever possible. The minimum space required for service is 18 in. (457 mm) on the left end, 18 in. (457 mm) on the right end and 24 in. (610 mm) in front of the unit. This space is necessary to permit routine maintenance, such as replacing filters and adjusting the fan speed. On downflow and upflow CW106 and CW114 models, left- and right-end minimum clearances are 0 in. (0 mm) except for rear return.

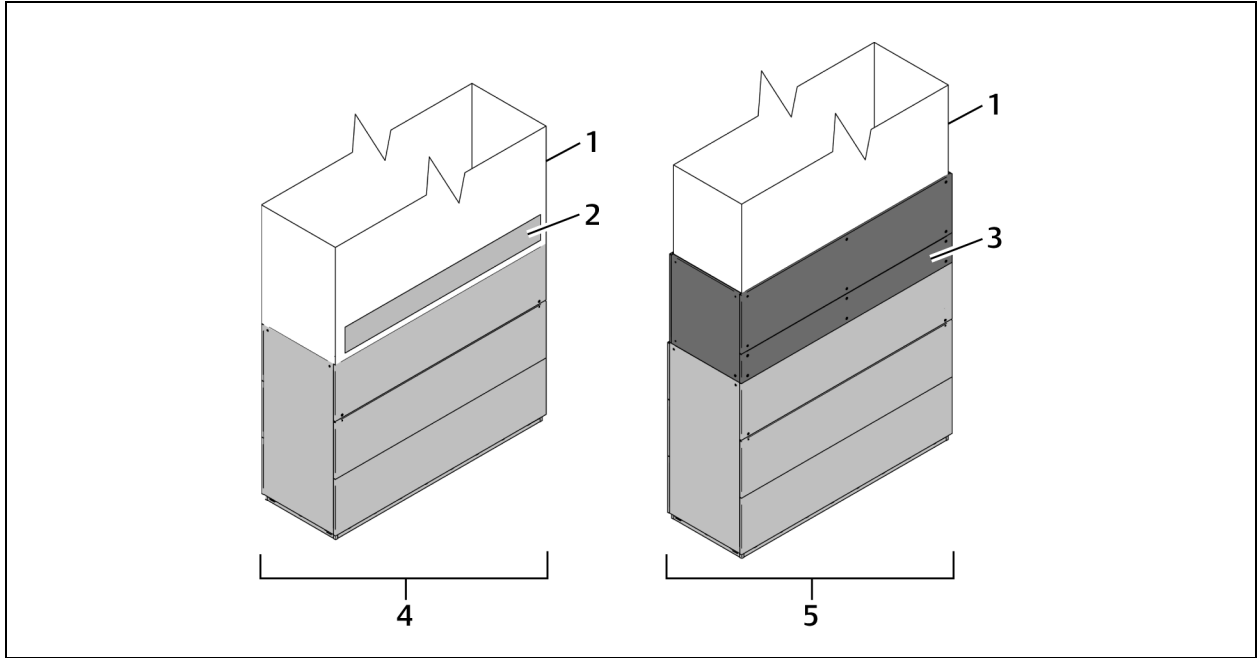
Avoid installing units in an alcove or at the extreme end of a room that has a high aspect ratio (long narrow room). Also avoid installing units too close together. This tends to reduce the effectiveness of the air distribution as compared to units located 30 to 40 ft (9 to 12 m) apart.

3.3 Air Distribution Considerations for Downflow Units

- Verify that the raised floor has been properly sized for the unit's airflow and the room is free of airflow restrictions.
- Perforated floor tiles in the raised floor should ensure minimal pressure loss.
- The raised floor must provide 7-1/2 in. (191 mm) of clearance.
- Ensure that there is adequate clearance above the unit for service, such as replacing filters.
- Optional plenums are available for downflow unit ducting.
- If installing units with electrically-commutated fans (EC fans), there must be 24 in. minimum clearance below the unit to lower the fans. Fans may also remain in the unit if desired.
- A filter plenum is required for the following units: CW146 and CW181.

NOTE: The floor stand used with EC units is not symmetrical and its orientation to the Vertiv™ Liebert® CW is critical to lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.

Figure 3.1 Downflow Unit Ducting and Plenum Ducting



Item	Description
1	Field-fabricated duct work
2	Field service access for filter replacement Minimum height = 12 in. (305 mm) Minimum distance from unit = 2 in. (51 mm)
3	Service-access door for filter replacement provided in plenum.
4	Direct-to-unit ducting
5	Plenum ducting

3.4 Air Distribution Considerations for Upflow Units

Various configurations are available:

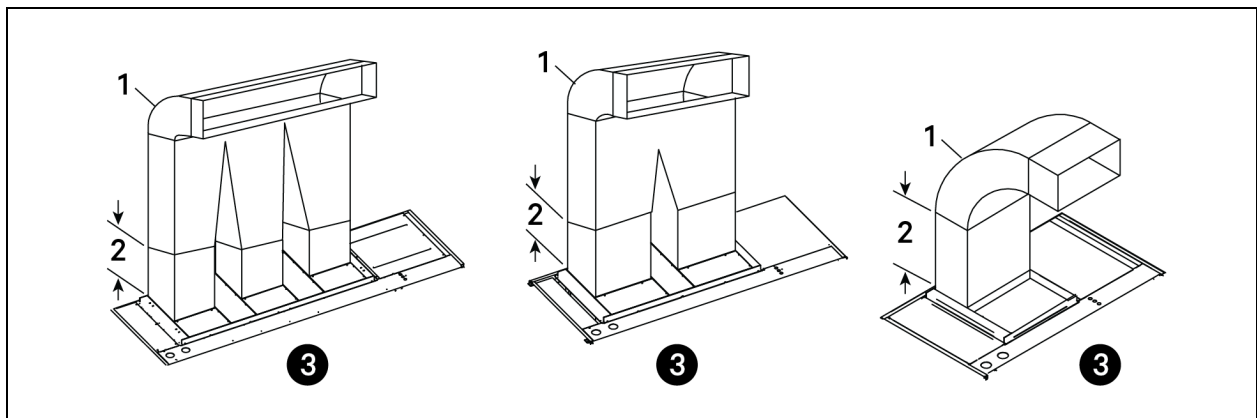
- Front return
- Rear return
- Bottom return (not available on CW106 and CW114 models)

For in-room applications with supply and return grilles, several feet of clearance must be maintained at the intake and discharge of the unit.

Upflow rear-return configurations use a filter box attached to the back of the unit. Allow 25 in. (635 mm) on one side of the unit for access to the rear-return filter box. Refer to the rear-return installation sheet, inside the rear-return filter box package.

For ducted applications, duct flanges are supplied on the blower outlets. Follow the SMACNA-Duct Construction Standard for single-, dual-, or triple-blower systems. Do not run duct work off the perimeter flange on the top of the unit. This flange is for positioning and attaching the optional air discharge plenum with grille. Attaching a duct to this flange may reduce airflow to inadequate levels.

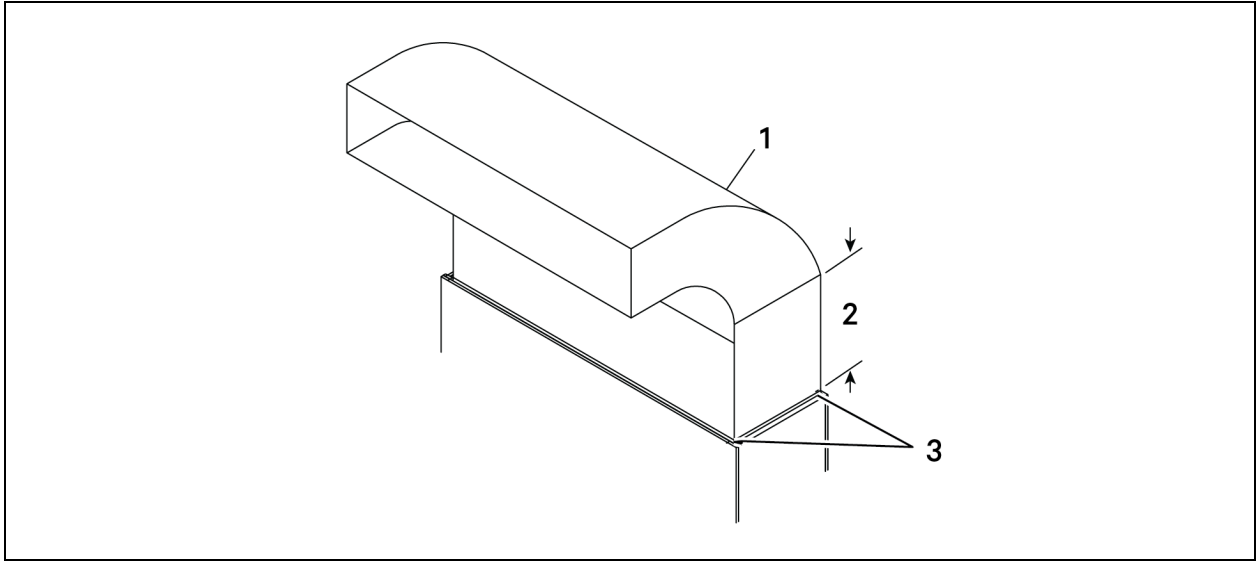
Figure 3.2 Upflow Ducting Configurations (Forward Curved Blowers)



Item	Description
1	Typical ducting
2	Straight sections must be 1.5 to 2.5 times the longest blower dimension.
3	Front of unit

NOTE: Drain traps are qualified to a return duct static of negative 1.5 i.w.g. (-1.5 i.w.g).

Figure 3.3 Upflow Ducting Configurations for EC Fans



Item	Description
1	Typical ducting. May run to either side.
2	Straight section must be 2.5 times the depth of blower.
3	Ducting only attached to flanges on provided plenum.

NOTE: Follow standard practices in all duct work.

3.5 Connections and System Setup

- The unit requires a drain, which must comply with all applicable codes. See [Field Installed, Gravity Fed Drain Line Requirements](#) on page 28 , for details.
- Plan the routing of wiring, piping and duct work to the unit. Refer to the appropriate piping connection location drawings, piping schematics, and electrical-connection drawings for your system in [Submittal Drawings](#) on page 99 .
- If seismic requirements apply, please preview submittal DPN003209 and consult your Vertiv representative if seismic rated floor stand is required.

NOTE: Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit’s cooling performance.

3.6 Operating Conditions

The Vertiv™ Liebert® CW must be operated in a conditioned space within the operating envelope that ASHRAE recommends for data centers. The ASHRAE recommended maximum dew point is 59°F (15°C). Operating the Liebert® CW outside of this envelope can decrease equipment reliability. Refer to ASHRAE’s publication, “Thermal Guidelines for Data Processing Environments.”

3.6.1 Cooling, Dehumidification and Humidification

Return air to the unit must be no cooler than the ASHRAE recommendation of 68°F (20°C) DB and 40% RH or minimum WB of 54°F (12.2°C) for proper unit operation. Operating below this can decrease equipment reliability.

3.6.2 Heating

The Vertiv™ Liebert® CW is qualified for heating-only operation at temperatures not exceeding 80°F (27°C).

3.7 Shipping Dimensions and Unit Weights

Table 3.2 Shipping Dimensions

Model	Domestic Packed, in. (mm)	Export Packed, in. (mm)
038, 041	64 x 45 x 85 (1,626 x 1,143 x 2,159)	64.5 x 45 x 85.5 (1,638.3 x 1,143 x 2,172)
051, 060	97 x 45 x 85 (2,464 x 1,143 x 2,159)	97.5 x 45 x 85.5 (2,476.5 x 1,143 x 2,172)
076, 084	120 x 45 x 85 (3,048 x 1,143 x 2,159)	120.5 x 45 x 85.5 (3,061 x 1,143 x 2,172)
106, 114	143 x 45 x 85 (3,632.2 x 1,143 x 2,159)	143.5 x 45 x 85.5 (3,645 x 1,143 x 2,172)
146, 181	136 x 54 x 85 (3,454.5 x 1,372 x 2,159)	136.5 x 54.5 x 85.5 (3,467.1 x 1,384.3 x 2,172)

Table 3.3 Shipping Weights

Model	Domestic Packaging, lb. (kg)	Export Packaging, lb. (kg)
038	840 (381)	1065 (483)
041	890 (404)	1115 (506)
051	1135 (515)	1360 (617)
060	1200 (544)	1425 (646)
076	1380 (625)	1630 (739)
084	1480 (671)	1730 (785)
106	1950 (885)	2225 (1,009)
114	2090 (949)	2365 (1,073)
146	2900 (1,314)	3200 (1,450)
181	2900 (1,314)	3200 (1,450)

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4 Equipment Inspection and Handling



WARNING! Risk of top-heavy unit falling over. Improper handling can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation.



WARNING! Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.

NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

NOTICE

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

NOTICE

Risk of improper storage. Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.

Upon arrival of the unit and before unpacking:

- Verify that the labeled equipment matches the bill of lading.
- Carefully inspect all items for visible or concealed damage.
- Report damage immediately to the carrier and file a damage claim with a copy sent to Vertiv or to your sales representative.
- For initial access use a 7/32 in. Allen wrench for panel removal.

Equipment Recommended for Handling the Unit:

- Forklift
- Pallet jack
- Piano jacks
- Lift beam
- Slings
- Spreader bars

4.1 Packaging Material



All material used to package this unit is recyclable. Please save for future use or dispose of the material appropriately.

4.2 Handling the Unit while Packaged

Transport the unit with a forklift or pallet jack. If that is not possible, use a crane with slings and spreader bars that are rated for the weight of the unit.

When using a forklift or pallet jack:

- Ensure that the fork length is suitable for the unit length and, if adjustable, spread to the widest allowable distance that will fit under the skid.
- When moving the packaged unit, lift the unit from the end with the indicated labeling, and do not lift the unit any higher than 4 in. (102 mm). Ensure that the opposite end of the skid still touches the floor. The unit must be pulled by the forklift. All personnel except those moving the unit must be kept 12 ft (3.7 m) or more from the unit while it is being moved.
- If the unit must be lifted higher than 4 in. (102 mm), all personnel not directly involved in moving the unit must be 20 ft (5 m) or farther from the unit.
- On CW146 through CW400 models, Always refer to the location of the center-of-gravity indicators when lifting the unit, see **Figure 4.1** below .

Figure 4.1 Center of Gravity Indicator



4.3 Unpacking the Unit

1. Remove the exterior stretch wrap packaging from around the unit and any planks tightened with the stretch wrap, exposing the protective corner and side packaging planks, as shown in **Figure 4.2** below and **Figure 4.3** on the next page .

NOTE: The bag may remain in place to protect from dust and to protect the unit panels, or it may be removed for immediate installation.

2. Remove the bag from the unit when ready to remove the skid and install the unit.

Figure 4.2 Unpacking the Vertiv™ Liebert® CW026-CW114 Units

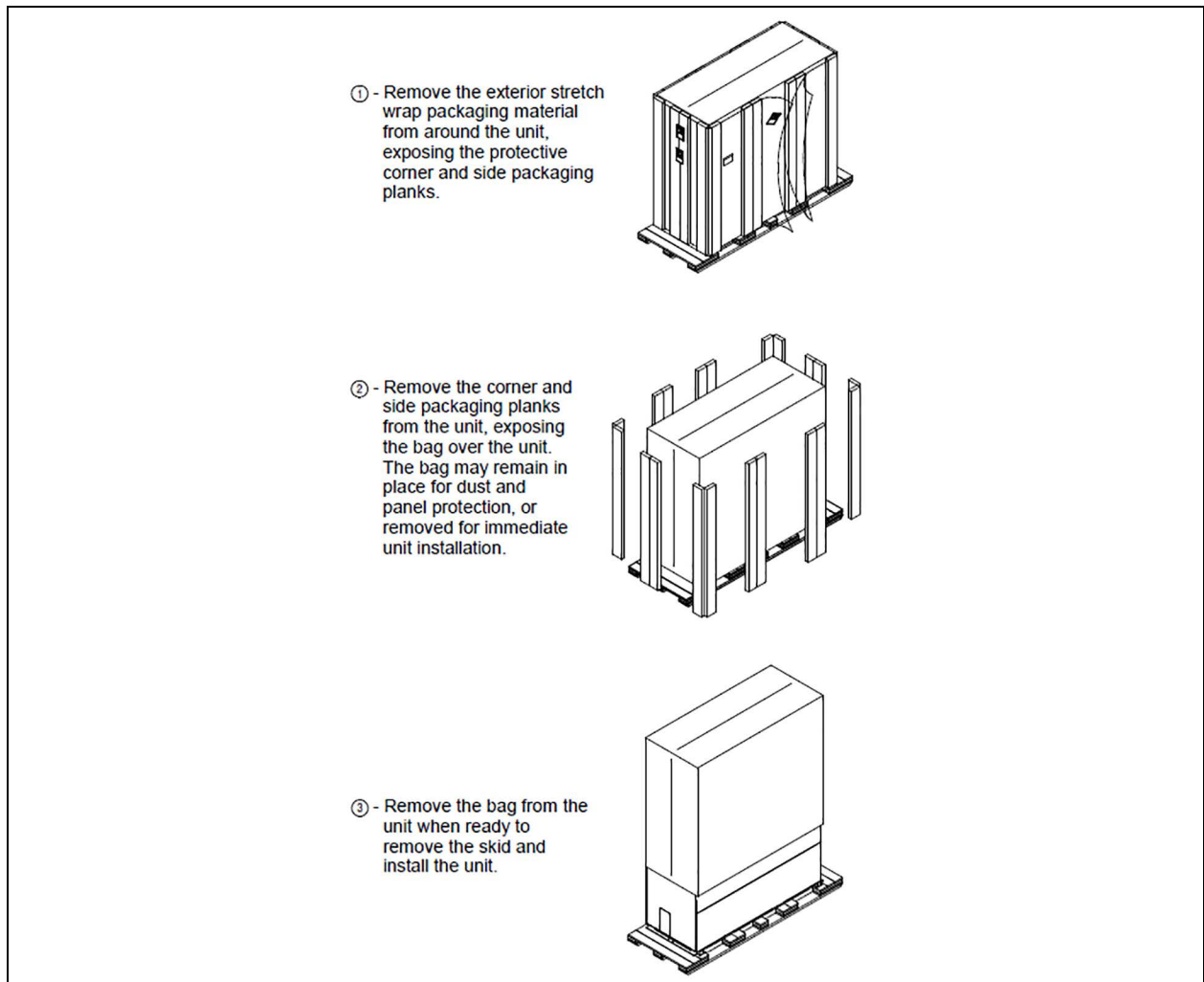
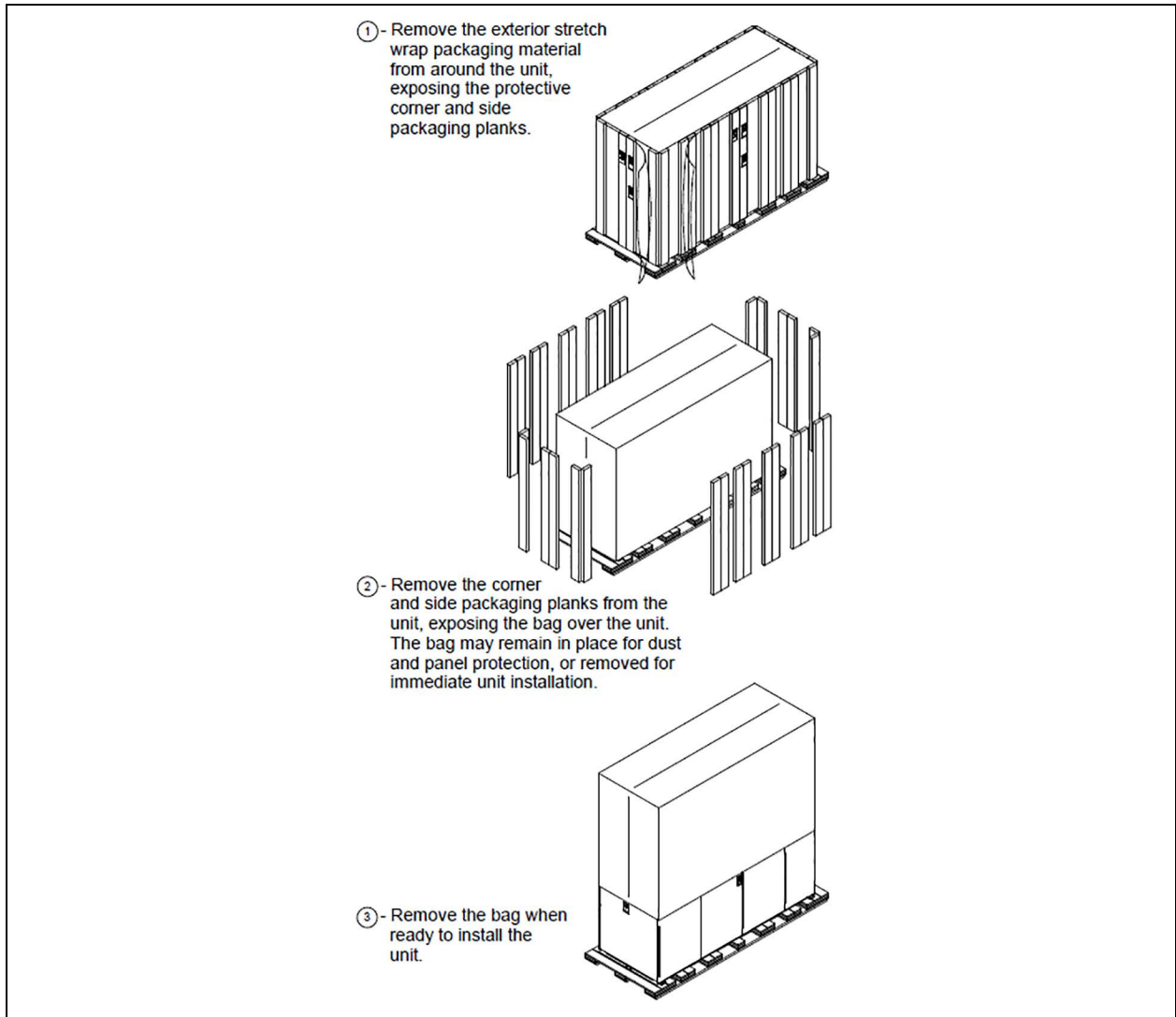


Figure 4.3 Unpacking the Vertiv™ Liebert CW146-CW181 Units



4.3.1 Removing the Unit from the Skid with a Forklift

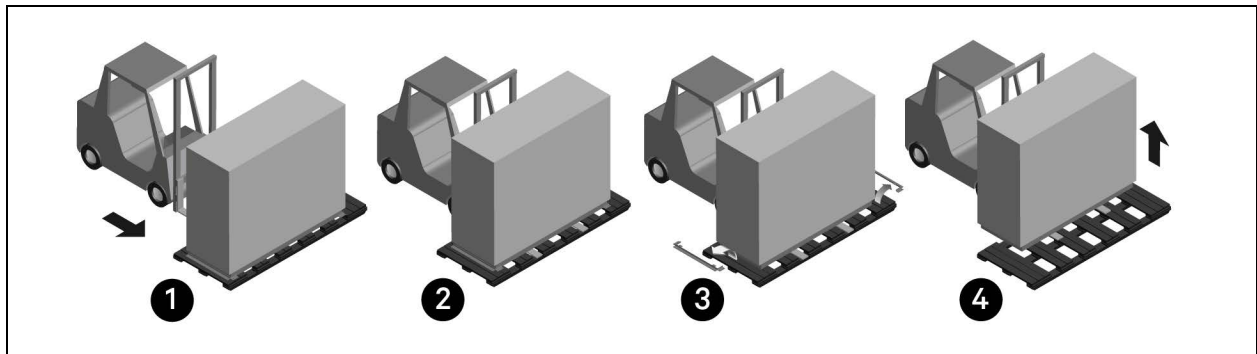
Refer to **Figure 4.4** below .

1. Align a forklift with either the front or rear side of the unit.
 - Ensure that the tines of the fork lift are locked to the widest location.
 - Use the center of gravity indicators on the unit panels when determining the entry points for the tines. Center of gravity varies per unit size and selected options.
 - The tines shall be equally spaced on either side of the center of gravity indicator.
2. Insert the tines of the forklift completely under the base of the unit.
 - Ensure that the tines are level, not angled in an upward direction.
 - The tines are to be at a height that will allow proper clearance under the unit.
 - Ensure that the tines extend beyond the opposite side of the unit.

NOTE: If these steps are not followed, damage may occur to the panels and/or base of the unit.

3. Remove the lag bolts from each bracket located around the base, and remove the brackets.
4. Lift the unit off the skid to an elevation point where the skid is not supporting the weight of the unit and remove the skid from under the unit.

Figure 4.4 Removing from Skid with a Forklift



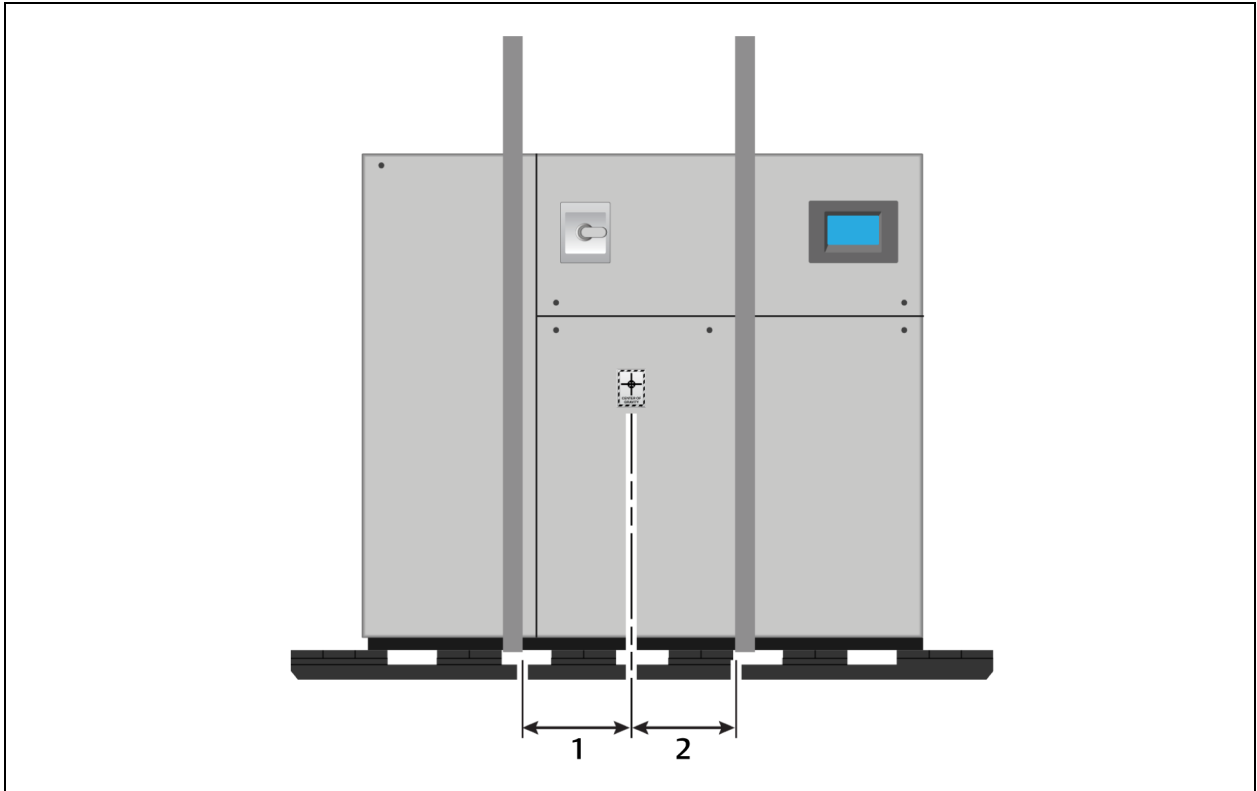
Item	Description
1	Align forklift with front or rear of unit.
2	Insert tines completely under base of unit.
3	Remove lag bolts and brackets
4	Lift unit and remove skid.

4.3.2 Removing the Unit from the Skid Using Rigging

1. Use the center-of-gravity indicators on the unit panels to determine the position of the slings.
 - The slings shall be equally-spaced on either side of the center-of-gravity indicator
2. Place the slings and between the bottom rails of the unit and the skid as shown in **Figure 4.5** below .

NOTE: Unit is shown without packaging. These instructions may be followed with or without the outer packaging in place.

Figure 4.5 Example Sling Placement on CW146 to CW181 Units



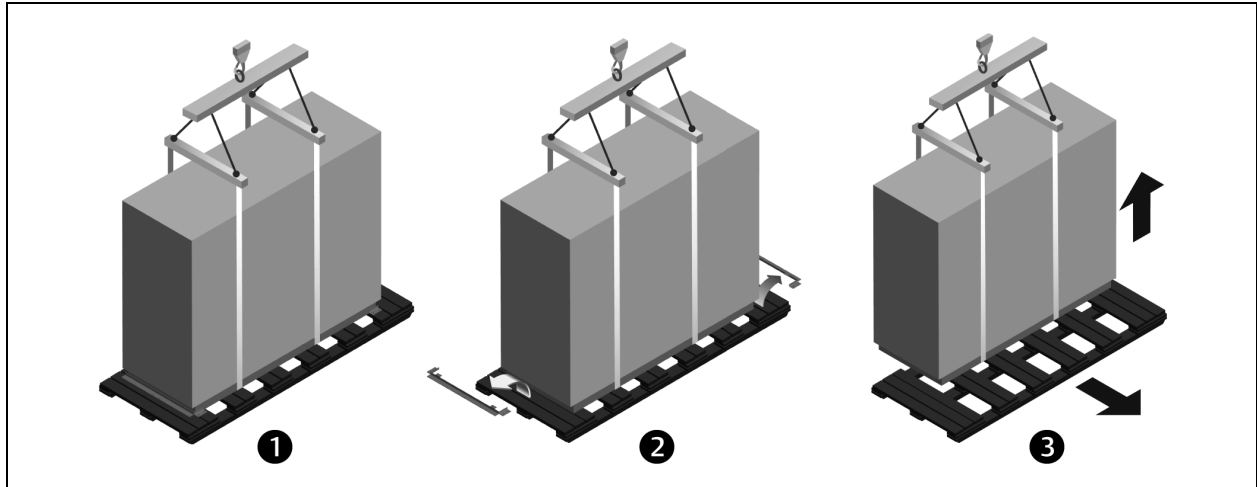
Item	Description
1	Distance between sling and center-of-gravity marker equal to item 2.
2	Distance between sling and center-of-gravity marker equal to item 1.

3. Referring to **Figure 4.6** on the facing page :
 - Align the slings as described previously.
 - Use spreader bars or equivalent device to ensure proper protection of the unit (Item 1).
 - Remove the lag bolts from each bracket located around the base, and remove the brackets (Item 2).

NOTE: Depending on final installation location, the skid may need to remain under the unit. Therefore, the lag bolts and brackets would not yet be removed.

- Lift the unit off the skid to an elevation point where the skid is not supporting the weight of the unit and remove the skid from under the unit (Item 3).

Figure 4.6 Moving Unit with Rigging



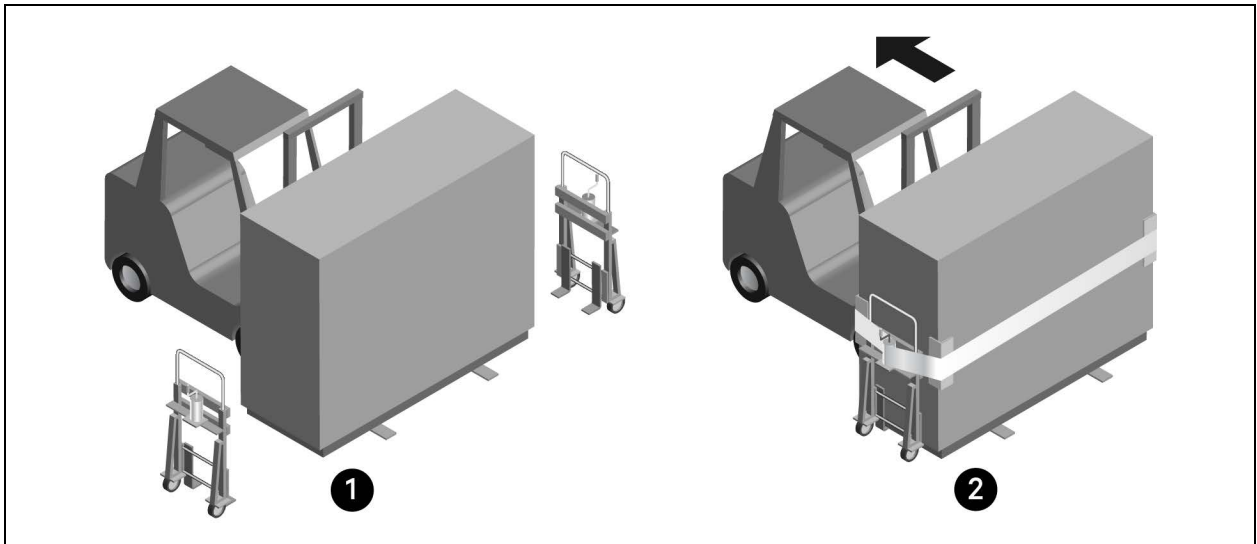
Item	Description
1	Spreader bars and rigging on unit.
2	Remove lag bolts and brackets.
3	Lift the unit and remove the skid.

4.3.3 Moving the Unit to the Installation Location Using Piano Jacks

Refer to **Figure 4.7** below .

1. With the unit elevated, position piano jacks at each end of the unit.
2. Lower the unit to a height suitable for the piano jacks, place protective material between the unit and the piano jacks and straps.
3. With the unit secured to the piano jacks, move the forklift away from the unit.
4. Using the piano jacks, at least two trained personnel can move the unit to the site for installation.
 - For location considerations, refer to [Pre-installation Preparation and Guidelines](#) on page 9 .

Figure 4.7 Moving Unit with Piano Jacks



Item	Description
1	Place piano jacks on each end of the unit.
2	Use padding between unit and straps and, with the unit secured to the piano jacks, move the forklift away from the unit.

4.4 Placing the Unit on a Floor Stand

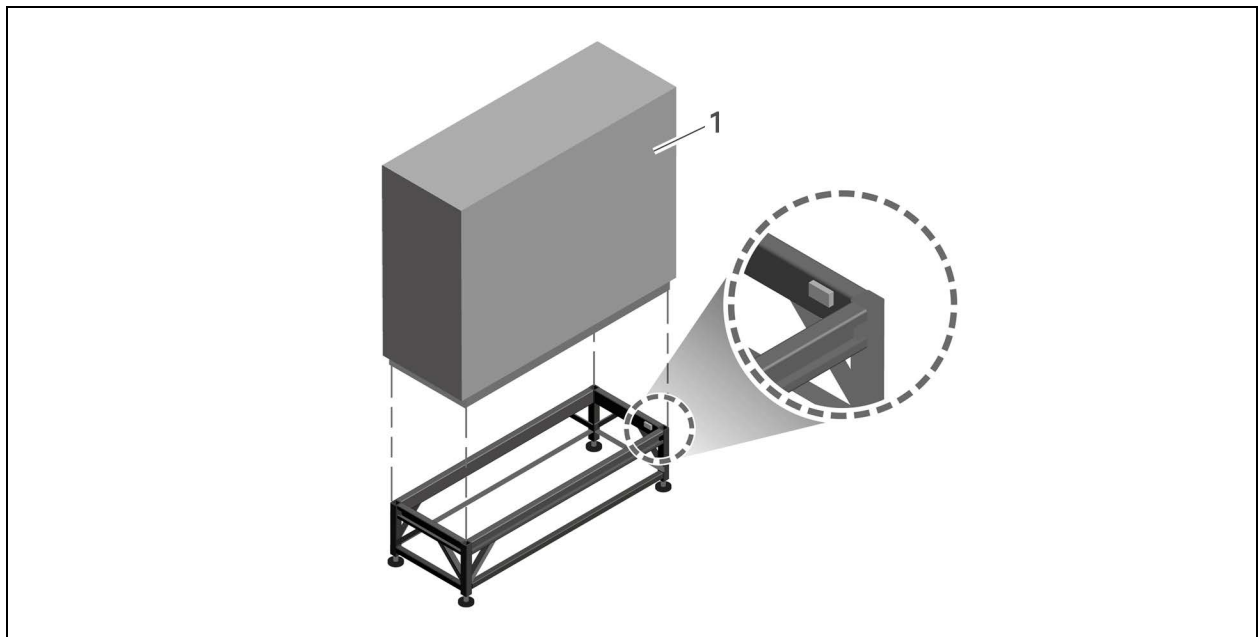


CAUTION: Risk of heavy unit falling into defective raised floor. Can cause injury and equipment damage. Prior to installation, all floor tiles immediately around floor stand are to be removed and inspected. Make sure tiles are not cracked, and ribs have not been cut. If free from defects, re-install. Replace with new tiles if defects are found.

Refer to the floor-stand installation sheet, located inside the floor-stand package. Unit to be placed onto floor stand using process that will provide safest method based on site layout. Professional installers to be used when placing unit. Unit may require lift onto a floor stand if elevated flooring has not been installed. If flooring is installed, unit will be placed over floor opening containing floor stand. Refer to **Figure 4.8** below. Be sure to align the welded tabs on top of the floor stand with the inside of the unit frame base.

NOTE: The floor stand for the units equipped with EC fans is not symmetrical. Its orientation to the unit is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the fans will not lower into the floor stand.

Figure 4.8 Welded Tabs on Floor Stand



Item	Description
1	Front of unit

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5 Piping Requirements

All fluid connections to the unit, with the exception of the condensate drain, are sweat copper. Factory-installed piping brackets must not be removed. Field-installed piping must be installed in accordance with local codes and must be properly assembled, supported, isolated and insulated. Avoid piping runs through noise-sensitive areas, such as office walls and conference rooms.

Refer to specific text and detailed diagrams in this manual for other unit-specific piping requirements.

All piping below the elevated floor must be located so that it offers the least resistance to air flow. Careful planning of the piping layout under the raised floor is required to prevent the air flow from being blocked. When installing piping on the subfloor, we recommend that the pipes be mounted in a horizontal plane rather than stacked one above the other. Whenever possible, the pipes should be run parallel to the air flow.

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the [Submittal Drawings](#) on page 99 .

The following tables list the relevant documents by number and title.

Table 5.1 Piping General Arrangement Drawings

Document Number	Title
DPN004561	Piping Schematic, Downflow, CW038 to CW114
DPN004138	Piping Schematic, Downflow, CW146 and CW181
DPN004562	Piping Schematic, Upflow, CW038 to CW114

Table 5.2 Piping Connection Drawings

Document Number	Title
Downflow Units with EC Fans	
DPN002036	Connection Locations, CW038 to CW041
DPN002035	Connection Locations, CW051 and 050
DPN002034	Connection Locations, CW075 to CW084
DPN001628	Connection Locations, CW106 and CW114
DPN001693	Connection Locations, CW146 and CW181
Upflow Units	
DPN001668	Connection Locations, CW038 to CW084 with forward curved blowers
DPN004324	Connection locations, CW038 to CW084 with EC fans
DPN001669	Connection Locations, CW106 and CW114 with EC fans or forward curved blowers

5.1 Drain and Humidifier Fluid Connections

NOTICE

Risk of water leakage. Can cause severe property damage and loss of critical data center equipment.

The Vertiv™ Liebert® CW requires a water drain connection. Improper installation, application and service practices can result in water leakage from the unit.

Do not locate the unit directly above any equipment that could sustain water damage.

We recommend installing monitored leak detection equipment for the water supply lines and the internal unit water lines.

The following pipe connections are required:

- A drain line from the evaporator coil drain pan.
- A water-supply line to the optional humidifier (if applicable).
- Connections to the building chilled-water source.

5.1.1 Field Installed, Gravity Fed Drain Line Requirements

NOTICE

Risk of water backing up in the drain line. Leaking and overflowing water can cause equipment and building damage.

Do not install an external trap in the drain line. This line already has a factory-installed trap inside the cabinet. Installation of a second trap will prevent drain-water flow and will cause the water to overflow the drain pan.

Sagging condensate drain lines may inadvertently create an external trap.

NOTICE

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install an overflow drain pan under the unit with a monitored leak detection system in the pan and shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. If it is not possible to install an overflow drain pan, then a monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

The overflow drain pan should have a drain line connected to it that flows to a floor drain or maintenance sink in case of a shutoff valve or leak detection system malfunction.

A 3/4 in. NPT-Female drain connection is provided on CW038 to CW084 units without an optional condensate pump. A 1-1/4 in. NPT-Female drain connection is provided on CW106 to CW181 units. A 1-1/4 in. NPT-Female

Observe the following requirements and refer to **Figure 5.1** below, when installing and routing the drain line:

- The drain line must be sized for 2 gpm (7.6 l/m) flow.
- The drain line must be located so it will not be exposed to freezing temperatures.
- The drain should be the full size of the drain connection.
- The drain line must slope continuously away from the unit. Pitch drain line toward drain a minimum of 1/8 in. (3 mm) per 1 ft (305 mm) of length.
- Drain is trapped internally. Do not externally-trap the drain line.
- The drain line must be rigid enough that it does not sag between supports, which unintentionally creates traps.
- The drain line must comply with all applicable codes.
- On units with the optional, field-installed condensate pump, see [Field Installed Condensate Pump](#) on the next page and [Condensate Pump Drain Line Requirements](#) on the next page.

Figure 5.1 Correct and Incorrect Gravity Drains for Downflow and Upflow Units

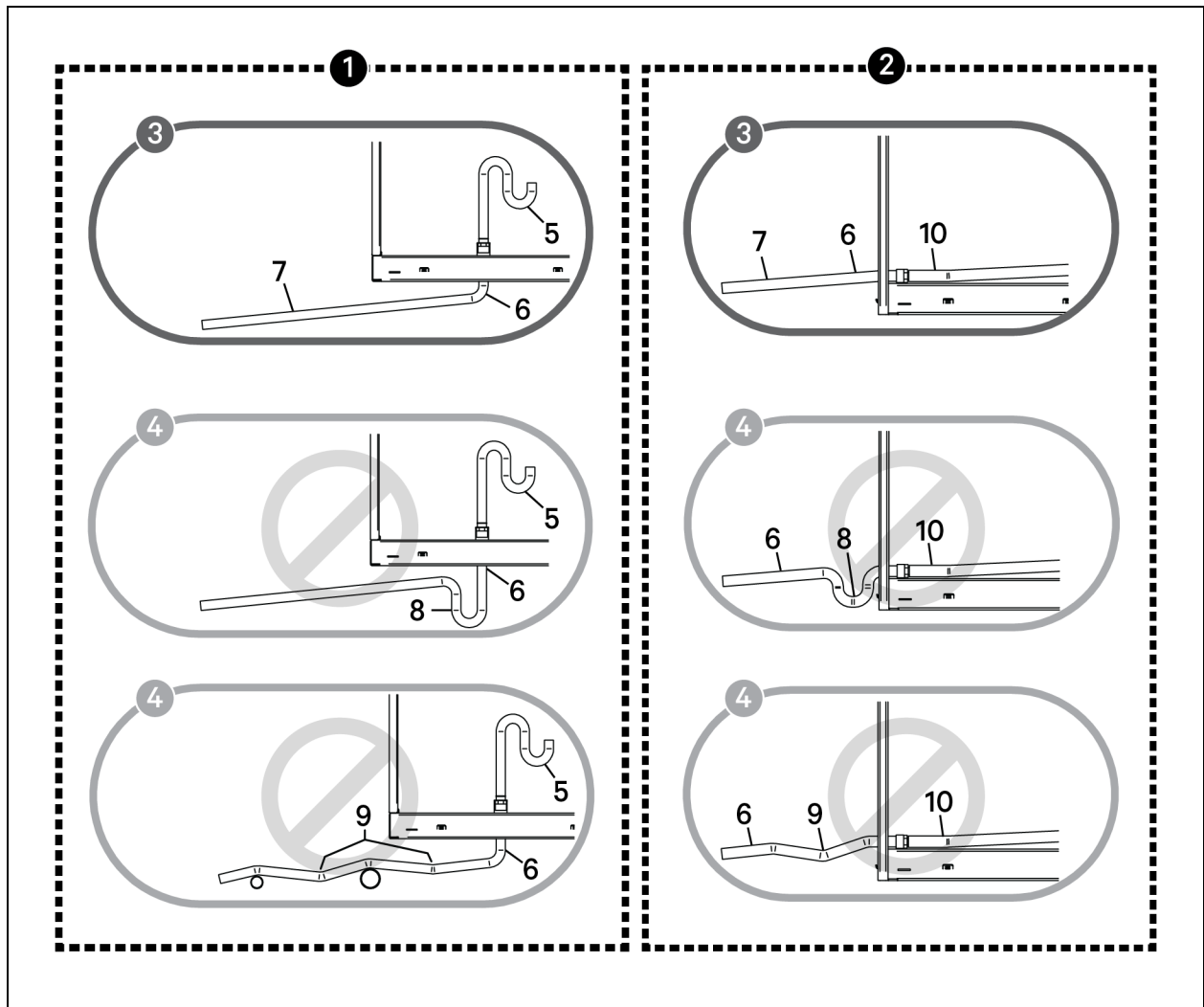


Table 5.3 Gravity Fed Drain Line Figure Descriptions

Item	Description
1	For downflow units
2	For upflow units
3	Correct drain installation
4	Incorrect drain installation
5	Internal drain
6	External drain
7	Continuous downward slope
8	External trap. Do not trap externally.
9	External traps, although unintentional. Lines must be rigid enough not to bow.
10	Internal drain

5.1.2 Condensate Pump Drain Line Requirements

NOTICE

Risk of water backing up in the drain line. Leaking and overflowing water can cause equipment and building damage.

Do not install an external trap in the drain line. This line already has a factory-installed trap inside the cabinet. Installation of a second trap will prevent drain-water flow and will cause the water to overflow the drain pan.

Sagging condensate drain lines may inadvertently create an external trap.

Observe the following requirements when installing and routing the drain line:

- Do not reduce drain lines.
- The drain line must be located so it will not be exposed to freezing temperatures.
- Size the piping based on the available condensate head.
- Drain is trapped internally. Do not externally-trap the drain line.
- The drain line must be rigid enough that it does not sag between supports, which unintentionally creates traps.
- We recommend installing monitored, under-floor leak-detection equipment.

Field Installed Condensate Pump

In most cases of units with a field-installed condensate pump, the unit ships from the factory with the un-mounted condensate pump inside the unit, with the following exceptions:

- On upflow units with bottom-return, the pump ships loose for field-installation.
- On CW038 and CW060 units with EC fans, the pumps ships loose for under-floor field installation.
- The unit has an internally-mounted trap. The discharge (drain) line from the pump must comply with all applicable codes.

5.1.3 Water Supply Line Requirements for the Optional Humidifier

The unit may have an optional humidifier. Refer to the appropriate supply-line piping requirements if a humidifier is included on your unit:

Infrared Humidifier:

- 1/4 in. supply line, maximum water pressure is 150 psi (1034 kPa).
- Size supply line for 1 gpm (3.8 l/m), with a minimum water pressure of 20 psi (138 kPa).
- Do not supply de-ionized water to the humidifier.

5.2 Chilled Water Loop Piping Guidelines



WARNING! Risk of improper piping installation, leak checking, fluid chemistry and fluid maintenance can cause equipment damage and personal injury. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.

NOTICE

Risk of frozen pipes and corrosion from improper coolant mixture. Can cause water leaks resulting in equipment and building damage.

When the cooling unit or piping may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient temperature. Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system. Use only HVAC glycol solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and expensive building damage. Cooling coils, heat exchangers and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain an inhibitor to prevent premature corrosion.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor level and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion. The fluid complexity and variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

NOTICE

Risk of no-flow condition. Can cause equipment damage.

Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and water/coolant fluid-supply circuit system operating continuously.

Refer to the appropriate piping general-arrangement schematics for your system for the recommended, field-installed hardware such as shut-off valves. See **Table 5.1** on page 27 .

- Use copper piping with a brazing alloy with a minimum temperature of 1350°F (732°C), such as Sil-Fos. Avoid soft solders, such as 50/50 or 95/5.
- Follow local piping codes and safety codes.
- Qualified personnel must install and inspect system piping.
- The water/glycol-cooled system will operate in conjunction with a cooling tower, city water or drycooler.
- Contact a local water consultant regarding water quality, corrosion protection and freeze-protection requirements.
- Install manual shut-off valves at the supply and return line to each indoor unit to permit routine service and emergency isolation of the unit.
- Install a monitored, fluid-detection system that is wired to activate the automatic closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

Table 5.4 Coil Volume

Chilled Water Units	Coil Volume Gallons (Liters)
CW038	5.4 (20.4)
CW041	7.9 (29.9)
CW051	8.2 (31.0)
CW060	12.4 (46.9)
CW076	11.2 (42.4)
CW084	16.1 (60.9)
CW089	23.4 (88.6)
CW106	16.3 (61.7)
CW114	23.4 (88.6)
CW146	22.2 (84.0)
CW181	33.4 (126.4)

5.2.1 Leak Checking for Unit and Field Installed Piping

The fluid systems in the Vertiv™ Liebert® CW are factory-checked for leaks and may be shipped with an inert-gas holding charge. At installation, check all fluid circuits for leaks.

NOTE: We recommend isolating the unit with field-installed shutoff valves during leak checking of field-installed piping. When the units are included in a leak test, use of fluid for pressure testing is recommended. When pressurized gas is used for leak testing the unit, the maximum recommended pressure is 30 psig (207 kPa) and tightness of the unit should be verified by pressure decay over time, (<2 psig/hour [13.8 kPa/hour]) or sensing a tracer gas with suitable instrumentation. Dry seals in fluid valves and pumps may not hold a high gas pressure.

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6 Electrical Connections

Three-phase electrical service is required for all models. Electrical service must conform to national and local electrical codes. Refer to equipment nameplate regarding wire size and circuit protection requirements. Refer to electrical schematic when making connections. Refer the appropriate submittal drawing, listed in **Table 6.1** on the next page, for electrical service entrances into unit.

A manual electrical disconnect switch should be installed in accordance with local codes and distribution system. Consult local codes for external disconnect requirements.



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied disconnect switch is inside the unit. The line side of this switch contains live high-voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



WARNING! Risk of improper wire sizing/rating and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within $\pm 10\%$ of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

NOTE: Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

The electrical and unit-to-unit connections are described in the submittal documents included in the [Submittal Drawings](#) on page 99 .

The following table lists the relevant documents by number and title.

Table 6.1 Electrical Field Connection Drawings

Document Number	Title
Downflow Units	
DPN004548	Electrical Field Connections, Downflow CW038 to CW084
DPN004549	Electrical Field Connections, Downflow, CW106 and CW114
DPN004550	Electrical Field Connections, Downflow, CW146 and CW181
Upflow Units	
DPN003200	High-voltage Connections, Upflow, CW038 to CW084
DPN004552	Low-voltage and Ethernet Connections, Upflow, CW038 to CW084
DPN003202	High-voltage Connections, Upflow, CW106 and CW114
DPN004551	Low-voltage and Ethernet Connection, Upflow CW106 and CW114
Unit-to-Unit Networking	
DPN004351	Vertiv™ Liebert® iCOM™ Unit-to-unit Network Connections

7 EC Fans and Plenums

Depending on the air-distribution options of your unit, you may have EC fans and/or plenums to install.

7.1 Downflow Units with EC Fans

Vertiv™ Liebert® CW downflow models are equipped with EC fans that may operate in the fully-raised position or lowered into the floor stand for increased efficiency from reduced air resistance.



WARNING! Risk of very heavy 125 lb (56.7 kg) fan modules dropping downward suddenly. Can cause injury or death. Support fan modules before removing mounting hardware. Use caution to keep body parts out of the fan modules pathway during repositioning. Only properly trained and qualified personnel should work on this equipment.



CAUTION: Risk of improper handling of heavy and lengthy parts. Can cause personal injury and equipment damage. Cabinet panels can exceed 5 ft (1.5 m) in length and weigh more than 35 lb (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.

NOTE: Use fans either in their original raised position or with the fans in their fully-lowered position. Suspension of fans in an intermediate position will directly affect product performance and is not recommended.

7.1.1 Lowering the EC Fans into the Floor Stand on Downflow Models

NOTE: If your floor-stand height is between 9 in. (228.6 mm) and 21 in. (533.5 mm), please contact the factory before attempting to lower the fans into the floor stand. If the floor-stand height is 24 in. (609.6 mm) up to 48 in. (1219.2 mm), the fans can be installed and lowered into the floor stand.

Tools needed

- 1/2 in. hex socket and wrench
- Factory-supplied jack, crank and jack support
- Cable tie cutter

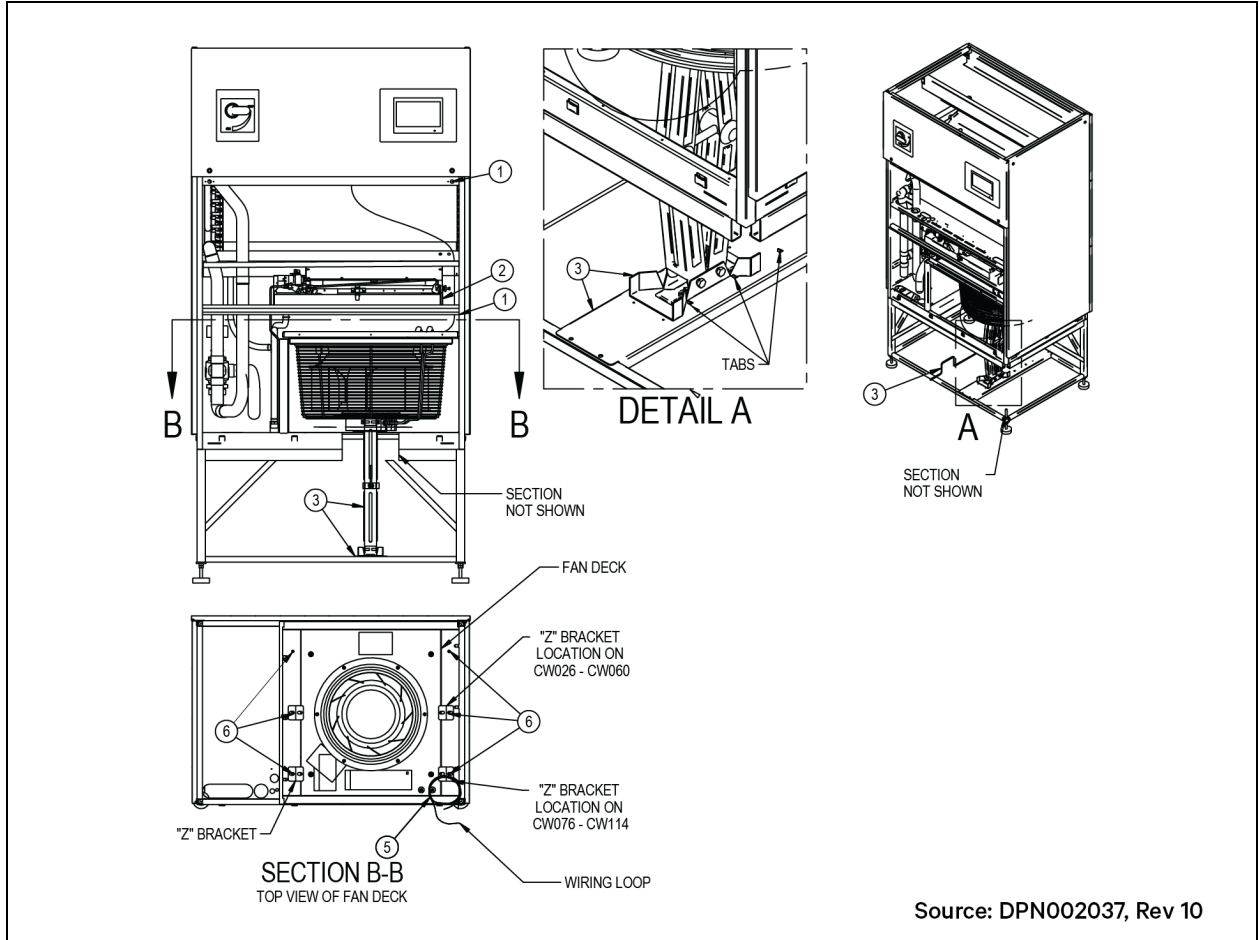
To lower the fans:

1. Remove the middle and bottom panels from the front of the unit.
2. For ease of fan lowering, we recommend removing the infrared humidifier, if one is installed.
3. Position the factory-supplied jack and jack support under the fan to be lowered. Raise the jack to safely support the fan before removing any hardware.

NOTE: The jack should be centered between the first and second set of tabs on the jack support (see Detail A in Figure 7.1 on the next page).

4. For models CW106 and CW114, remove the two guide rails and store them. These will be needed if the fan module is removed.
5. Cut and remove the cable tie that holds the wiring loop to the blower mounting plate. All other cable ties that route the fan wiring should remain intact.
6. Remove the 6 1/2 in. hex head screws,
 - and –
 - On CW038 through CW114 models, remove the “Z” bracket(s) using a socket wrench.
 - Retain the hardware for later steps.

Figure 7.1 Lowering EC Fans into Floor Stand, Steps 1 through 6



7. Using the jack, lower the fan module slowly until it rests on the frame of the unit.

NOTICE

Risk of equipment snagging cables and wiring. Can damage the unit wiring and components.

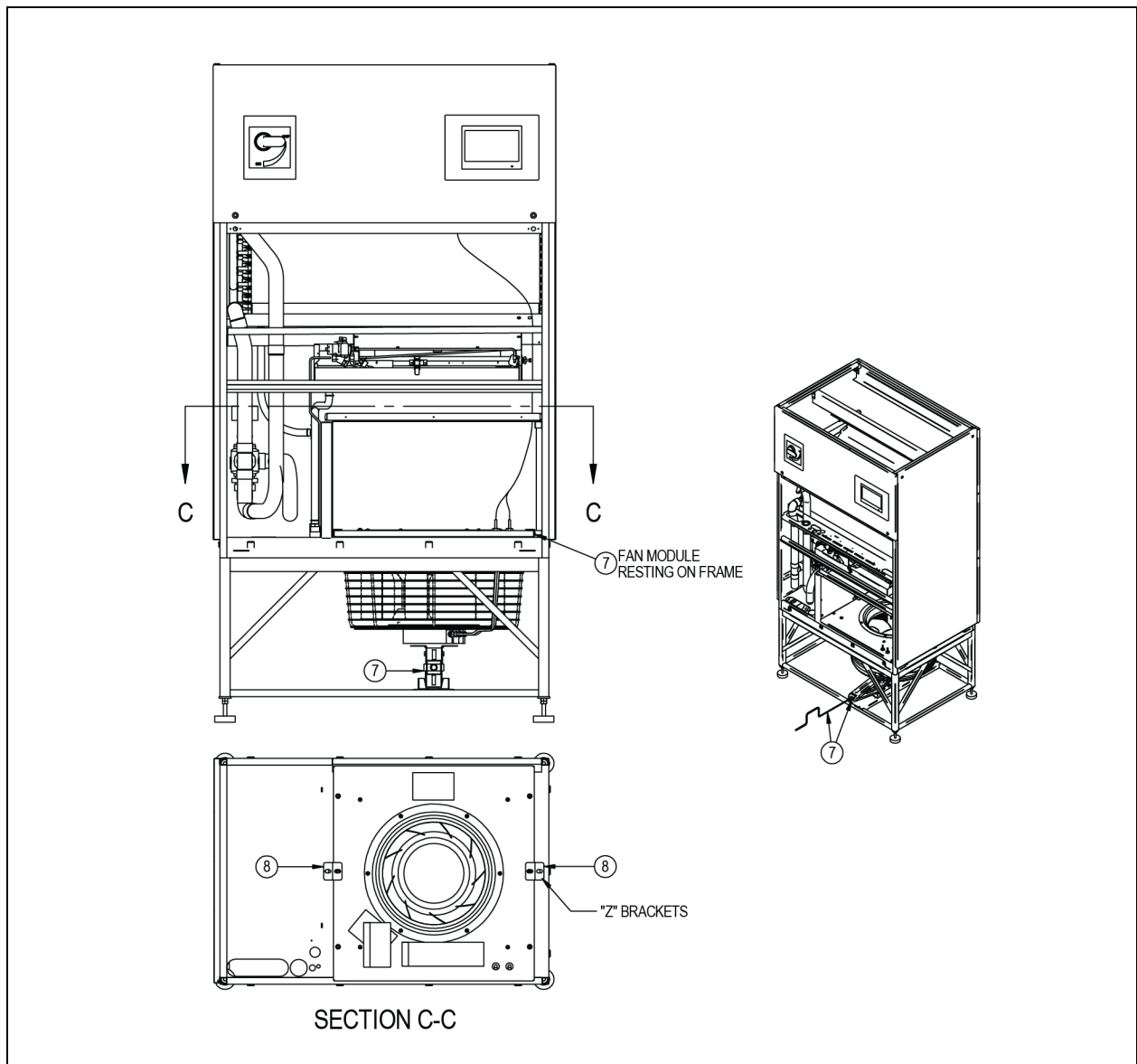
Carefully monitor the position of the EC-fan wire harnesses and other parts while lowering the fan to be sure that they are not caught or pinched.

8. Secure the fan module depending on the unit model type:
 - **CW038, CW041, CW076 through CW114 Models:** Secure the fan module in the fully-lowered position by re-installing the “Z” bracket(s), using the retained hex-head screws.
 - **CW051 and CW060 models,** the fan module is secured to the center frame support. The “Z” brackets will be used to secure the fan at the outer attachment point.
 - **CW146 and CW181 models:** Use the hex head screws removed in step 6 to secure the fan module directly to the frame. Screw clearance holes are provided in the fan module.

NOTE: Not all hardware retained will be used to secure the fans in the lowered positioned.

9. Repeat steps 3 through 8 to lower remaining fan modules.

Figure 7.2 Lowering EC Fans into Floor, Steps 7 through 9



7.2 Upflow Unit Plenums with EC Fans

EC fans on upflow units are mounted external to the unit in a factory-provided plenum. The plenum distributes air to the conditioned space through adjustable, double-deflection grilles, or connects with field-supplied duct work.

Read all instructions before installing plenums and EC fans.



WARNING! Risk of electric shock and contact with high-speed moving parts. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and visually verify that all fans have stopped rotating before opening doors, removing panels, and working within the unit cabinet. This unit may start and stop operating automatically. Do not assume that electric power is off when the unit is not operating.



WARNING! Risk of contact with sharp edges, exposed fasteners, and improper handling of very heavy parts. Can cause equipment damage, injury or death. Use extreme caution, wear appropriate, OSHA-approved PPE, and install the EC fan(s) and plenum to the unit only as described in these instructions.

More than one person may be required to complete the assembly and installation. Installer(s) must be properly trained and qualified to lift, move and manipulate very heavy equipment from floor level to the top of the unit.

Wear appropriate, OSHA-approved PPE when moving, lifting and installing the fan(s) and plenum.

Equipment used in moving, lifting and installing the fan(s) and plenum must meet OSHA requirements and be rated for the weight of the fan(s) and plenum. If ladders are used, verify that they are rated for the combined weight of the fan(s), plenum and installer(s) as loaded. EC Fan and plenum weights are specified in **Table 7.1** on the facing page and **Table 7.2** on the facing page .

Read and follow the lifting equipment and/or ladder manufacturer's operating instructions and safety requirements.

NOTE: Grilled plenums are intended for use in upflow configurations only. Non-grilled plenums provide service access on upflow units with duct work.

NOTE: We recommend using a duct lift or scissors lift when installing the EC-fan assemblies on top of the unit.

Equipment recommended to install the upflow plenum and EC fans

- Ladders
- Over-head winch or crane
- Duct lift
- Lift chains with hooks
- Scissor lift

7.2.1 Assembly Inspection

1. Inspect all items for visible or concealed damage. Immediately report any damage to the carrier and file a damage claim, sending a copy of the claim to your local sales representative.
2. Move to the installation location, remove items from packaging and verify that the assembly number is correct:
 - Refer to **Table 7.1** below to verify plenum number by unit length, plenum height, quantity, and grille size.
 - Refer to **Table 7.2** below to verify EC fan number by unit voltage.
 - Verify that the fan-motor voltage rating is appropriate for the marked voltage rating of the cooling unit.
3. Verify that all assembly contents are present:
 - Refer to **Figure 7.3** on the next page and **Table 7.3** on the next page to verify plenum parts.
 - Refer to **Table 7.4** on page 43 to verify EC-fan parts.

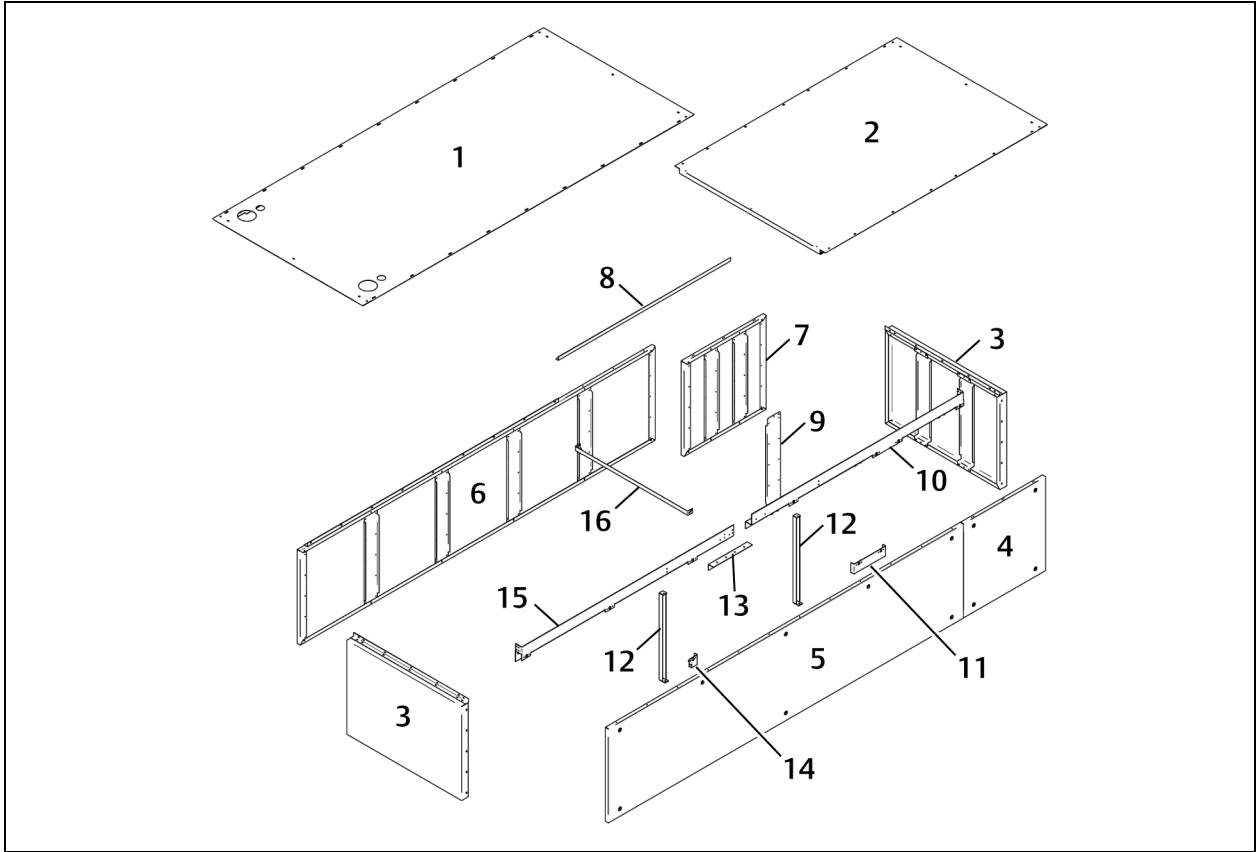
Table 7.1 Plenum Assembly Numbers, Plenum Heights, Plenum Weights and Unit Lengths

Plenum Height:	24 in. (610 mm)	30 in. (762 mm)	36 in. (917 mm)
Unit Description	Assembly Number and Weight		
CW106–114, Unit Length 122 in. (3099 mm)			
Non-grilled plenum	305211G1 - 150 lb. (68 kg)	305211G2 - 181 lb. (82 kg)	305211G3 - 207 lb. (94 kg)
Front discharge	306584G1 - 281 lb. (127 kg)	—	—
Rear discharge	305468G1 - 281 lb. (127 kg)	—	—
CW076–084, Unit Length 99 in. (2515 mm)			
Non-grilled plenum	306085G1 - 124 lb. (56 kg)	306085G2 - 148 lb. (67 kg)	306085G3 - 168 lb. (76 kg)
Front discharge	306585G1 - 221 lb. (100 kg)	—	—
Rear discharge	306082G1 - 221 lb. (100 kg)	—	—
CW051–060, Unit Length 74 in. (1880 mm)			
Non-grilled plenum	306205G1 - 99 lb. (45 kg)	306205G2 - 119 lb. (54 kg)	306205G3 - 137 lb. (62 kg)
Front discharge	306586G1 - 159 lb. (72 kg)	—	—
Rear discharge	306204G1 - 159 lb. (72 kg)	—	—
CW026–041, Unit Length 50" (1270 mm)			
Non-grilled plenum	306194G1 - 74 lb. (34 kg)	306194G2 - 91 lb. (41 kg)	306194G3 - 104 lb. (47 kg)
Front discharge	306587G1 - 130 lb. (59 kg)	—	—
Rear discharge	306193G1 - 130 lb. (59 kg)	—	—

Table 7.2 EC-Fan Assembly Numbers, Weights and Voltage

Assembly Number and Weight	Voltage
306943G1 - 102 lbs. (46 kg)	480 V
306943G2 - 102 lbs. (46 kg)	208V

Figure 7.3 Plenum Parts Identification



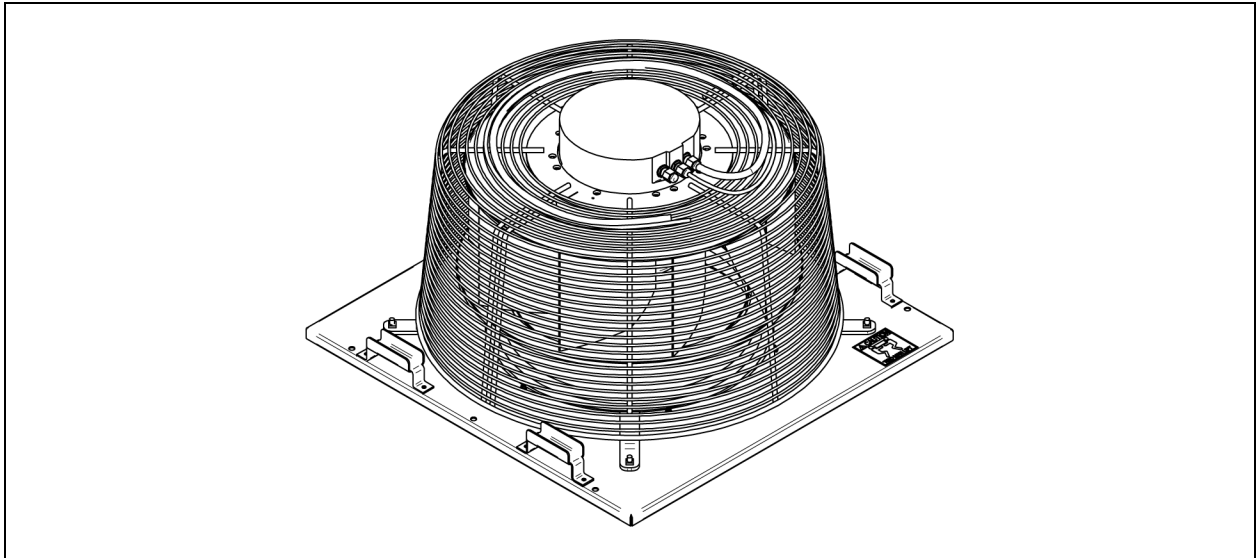
NOTE: Not all parts are used in all models: Units shorter than 122 in. do not include short front and rear panels or channel panels. 50 in. and 74 in. units have only 1 top panel (with holes). Front-discharge units do not include channel frames. 50 in. units do not include channel frames or panel-mounting brackets.

Table 7.3 Plenum Parts and Quantities

Item	Description	Quantity
1	Top Panel (plain)	1
2	Top Panel (with holes)	1
3	Side Panel	2
4	Front Panel (solid or grilled)	1
5	Short Front Panel (solid or grilled)	1
6	Rear Panel (solid or grilled)	1
7	Short Rear Panel (solid or grilled)	1
8	Angle Top Rear	1
9	Channel Panel	1 or 2
10	Top Frame Extension	1
11	Panel Mounting Bracket (double panel)	1

Table 7.3 Plenum Parts and Quantities (continued)

Item	Description	Quantity
12	Channel Frame	1 or 2
13	Top Frame Angle Brace	1
14	Panel Mounting Bracket (single panel)	1
15	Top Frame	1
16	Plenum Brace	1
Not shown	Washer 1/4	varies
Not shown	Bolt 1/4-20 x 1	varies
Not shown	Sheet Metal Screw #8-18 x 1/2	varies
Not shown	Insulation/Gasket tape	varies

Figure 7.4 EC Fan Assembly**Table 7.4 EC Fan Parts and Quantities**

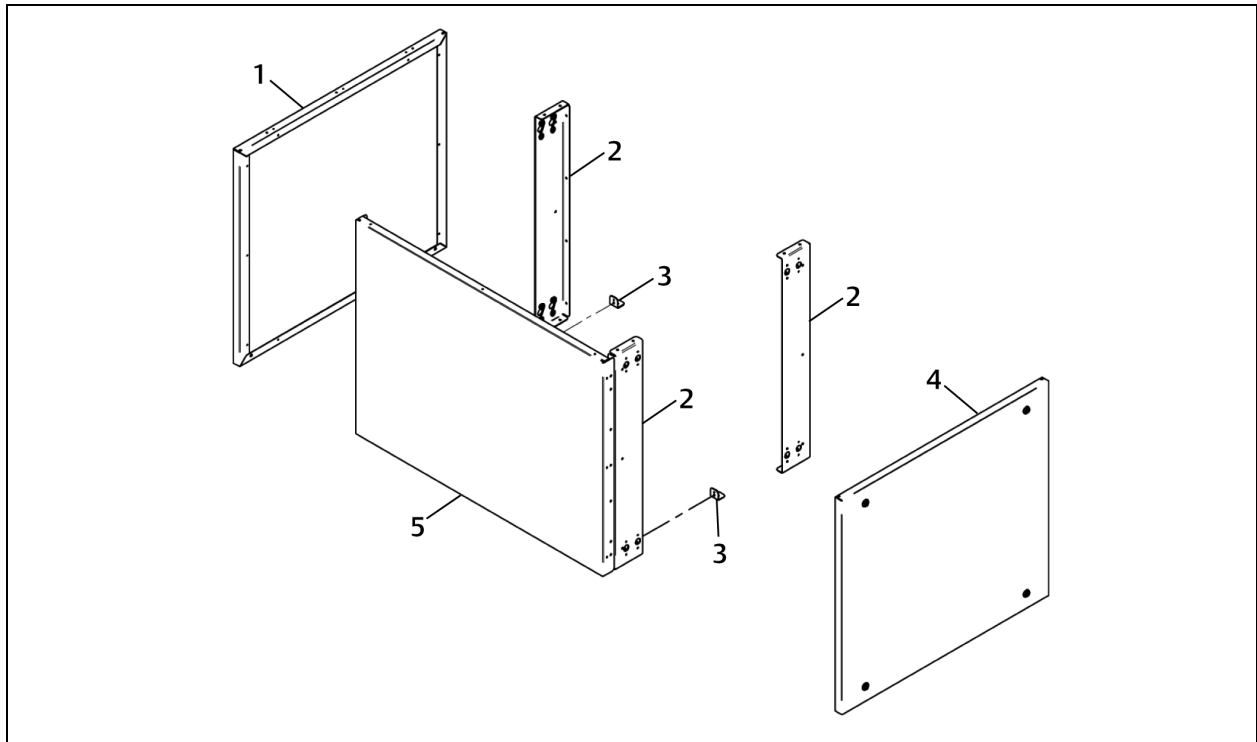
Item	Description	Quantity
Not shown	Washer	6
Not shown	Bolt	6
Not shown	Spacer	6

Compressor Plenum Parts Identification

Table 7.5 Compressor Plenum Assembly Numbers, Weights and Size

Assembly Number and Weight	Plenum Size, in. (mm)
313202G10 - 27 lb (11 kg)	17 x 24 (432 x 610)
313202G11 - 30 lb (14 kg)	17 x 30 (432 x 762)
313202G12 - 33 lb (15 kg)	17 x 36 (432 x 914)

Figure 7.5 Compressor Plenum Parts Identification



NOTE: Not all parts are used in all plenum sizes: 26 in (660-mm) wide compressor plenums include 3 angle-mounting brackets and a front panel with quarter-turn fasteners.

NOTE: Compressor plenums shorter than 26 in. (660 mm) include 2 angle-mounting brackets and do not include a front panel with quarter-turn fasteners.

Table 7.6 Compressor Plenum Parts and Quantities

Item	Description	Quantity
1	Front/Rear panel	1 or 2
2	Angle-mounting channel	2 or 3
3	Angle-mounting bracket	2
4	Front panel with quarter-turn fasteners	1
5	Side panel	1
Not shown	Sheet-metal screw	varies

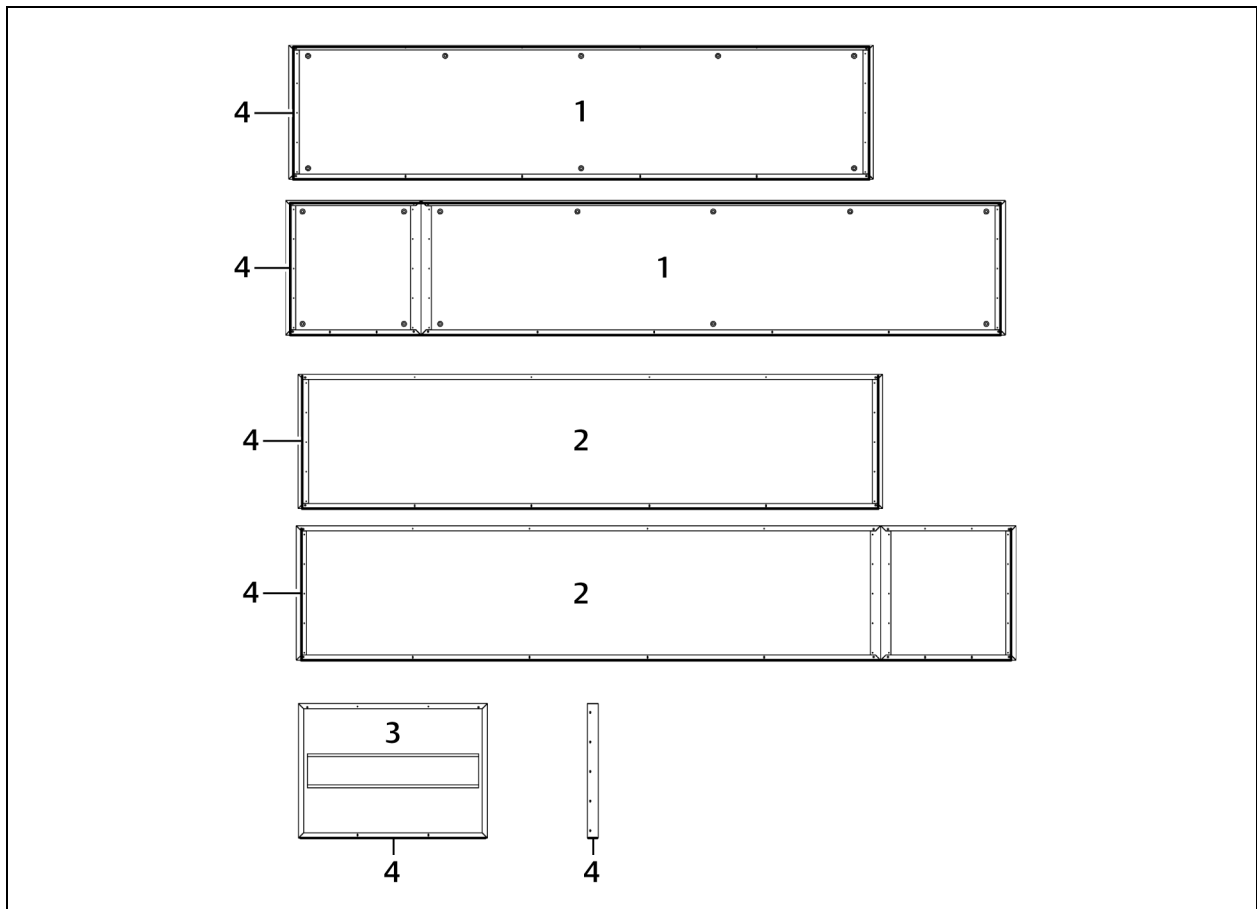
7.2.2 Assemble Plenum Rear and Side Panels

NOTE: Grilles can be installed on different sides of the plenum depending on discharge configuration. Verify grill location and install according to facility-layout plans.

NOTE: Electrical connections and some piping connections are made through the plenum. Plan accordingly.

1. Apply factory-supplied gasket/insulation tape to plenum panels, **Figure 7.6** below :
 - On front solid panels and on front and rear grilled panels install the gasketing on the inner edge of the sides, and along the top and bottom edges.
 - On rear solid panels, install the gasketing on the inner edge of the sides and along the bottom edge only.
 - On side panels, install the gasketing along the bottom edge.

Figure 7.6 Apply Gasket/Insulation Tape

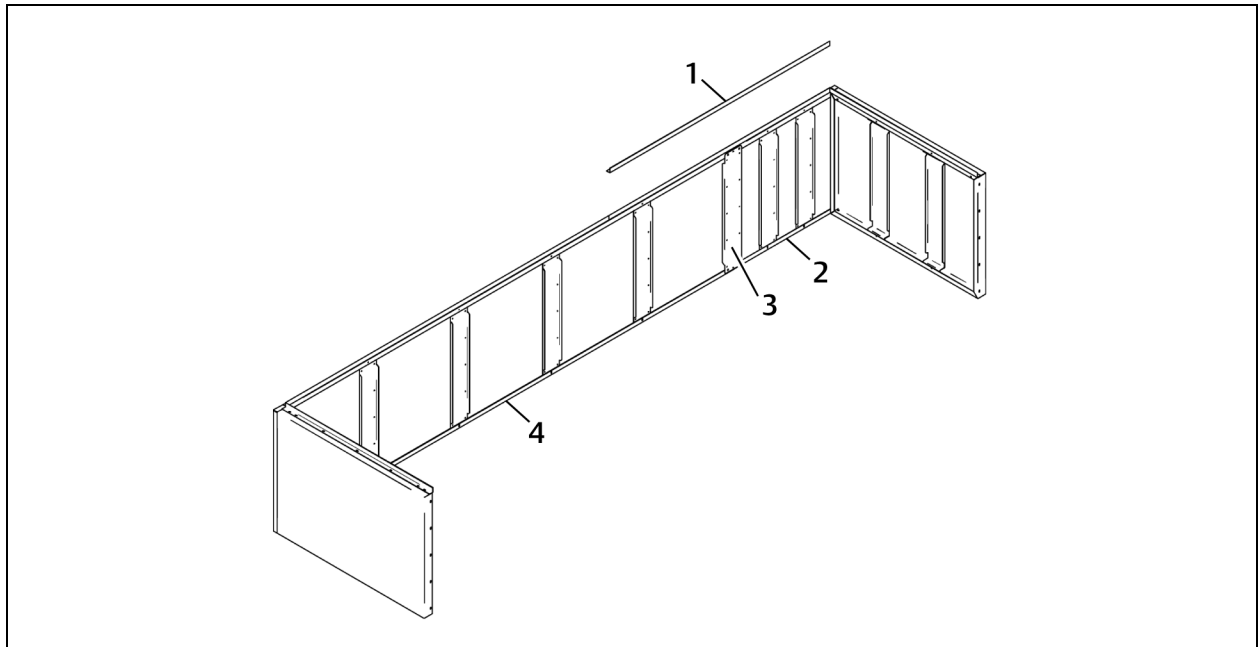


Item	Description
1	Front solid, front and rear grilled panel
2	Rear solid panel
3	Side panel
4	Gasketing/Insulation tape

2. If assembling a 50 in. to 99 in. plenum, skip to step 5 .
 – or –
 If assembling a 122 in. plenum, continue with step 3 .
3. Attach the long and short panel together using the channel panel and sheet-metal screws as shown in **Figure 7.7** below .
4. If assembling a non-grilled plenum, attach the angle along the top of the rear panel.

NOTE: Figure 7.7 below shows a non-grilled rear plenum as an example. If your unit is rear-discharge, the rear plenum panels have grilles.

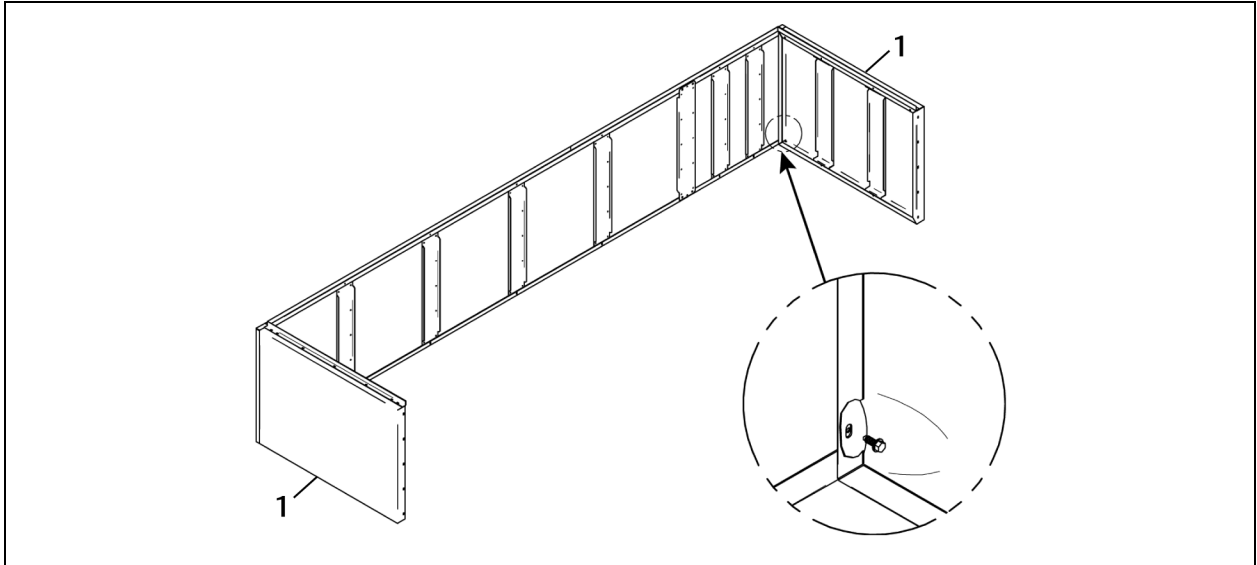
Figure 7.7 122 in. Rear Panel Assembly



Item	Description
1	Angle
2	Short rear panel
3	Channel panel
4	Long rear panel

- Attach the 2 side panels to each end of the rear-panel assembly by pushing in the gasket/insulation to access the screw holes and using sheet-metal screws as shown in **Figure 7.8** below .

Figure 7.8 Push in Gasket to Access Screw Holes



Item	Description
1	Side panel

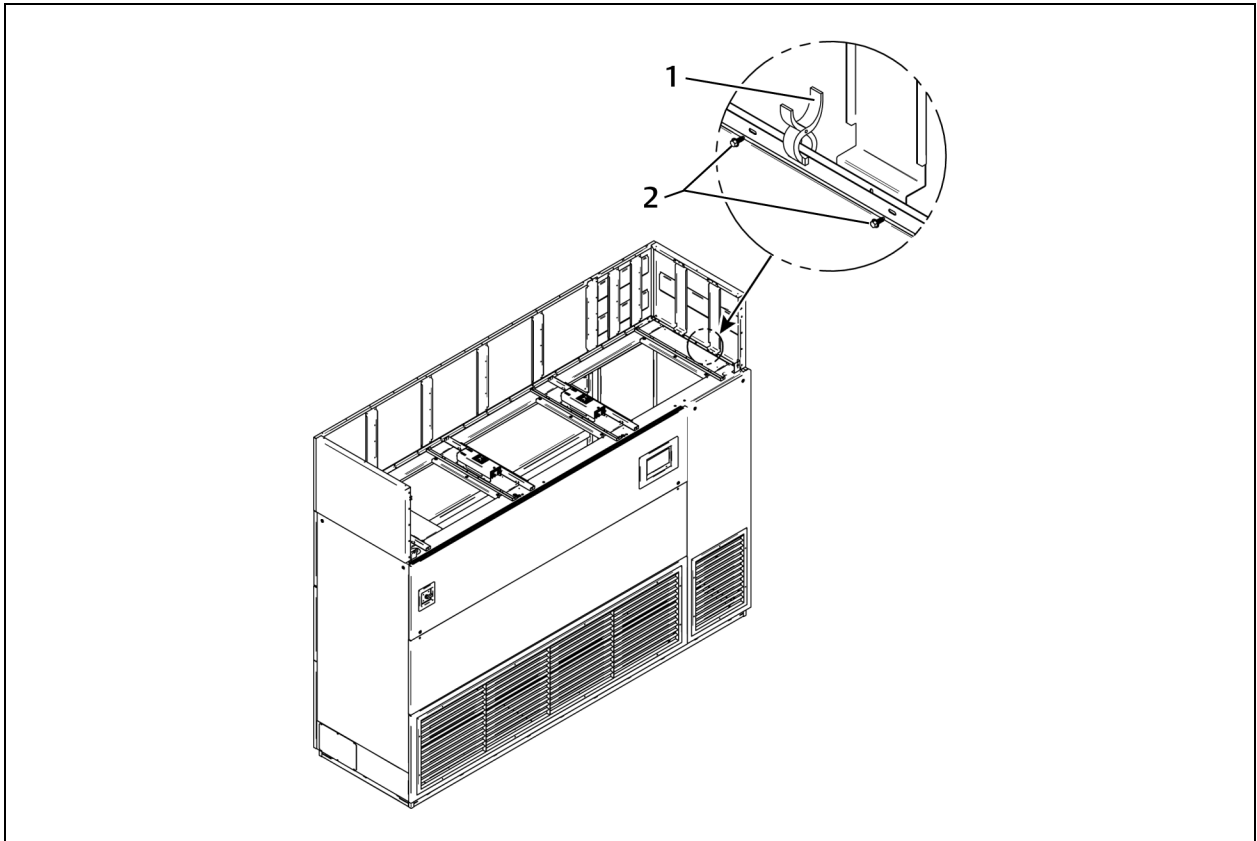
7.2.3 Place Assembled Panels and EC Fans on Top of Unit

1. Lift the assembled plenum panels and place on top of the unit, **Figure 7.9** below .

NOTE: Figure 7.9 below shows a non-grilled rear plenum as an example. If your unit is rear-discharge, the rear plenum panels have grilles.

2. Make sure that the panels fit snugly along the collar flange on top of the unit, and temporarily install clamps, **Figure 7.9** below , to hold the panels to the collar flange for final attachment.
3. Use sheet-metal screws in the provided holes to attach the panels to the collar flange, **Figure 7.9** below .

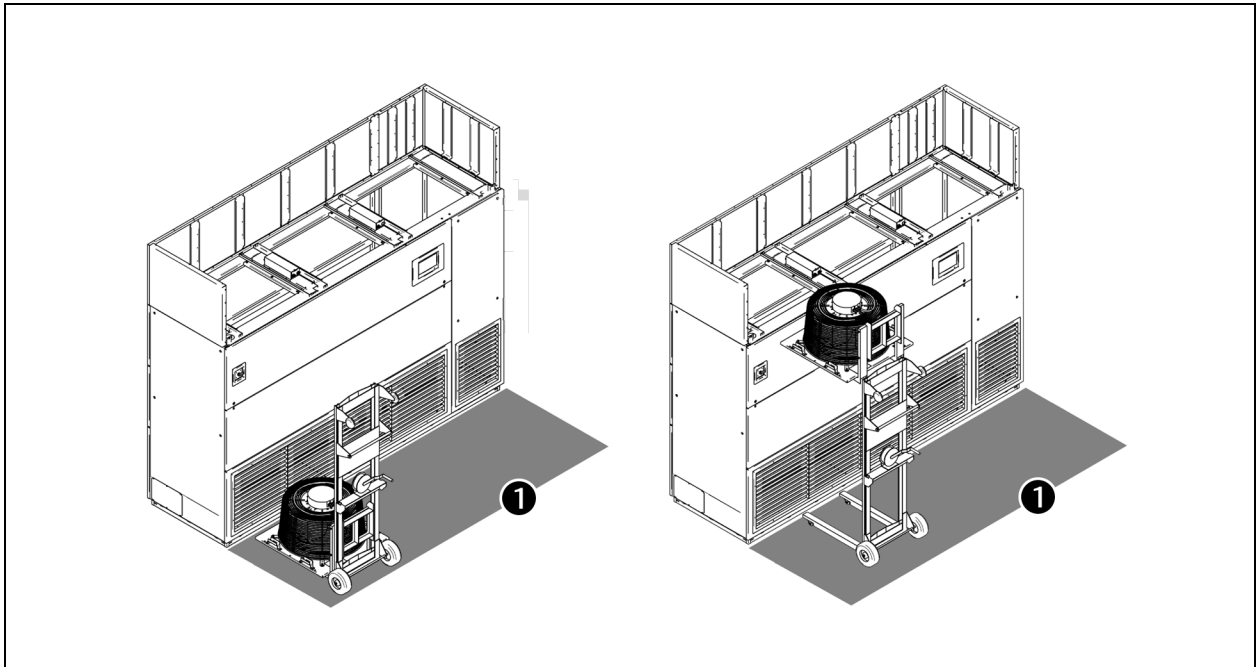
Figure 7.9 Assembled Panels on Top of Unit



Item	Description
1	Clamp
2	Sheet-metal screws

4. Refer to **Figure 7.10** below for the recommended clearance from bottom of the unit to the top of the plenum for access to install the fan(s).
- Place an EC fan assembly on the lifting device.
(**Figure 7.10** below, shows a duct lift as one option to lift the EC fan assembly.)
 - Position the lifting device so that it lines-up with the installation location of the EC fan assembly.
 - Use the device to lift the EC fan assembly just above the top of the unit.

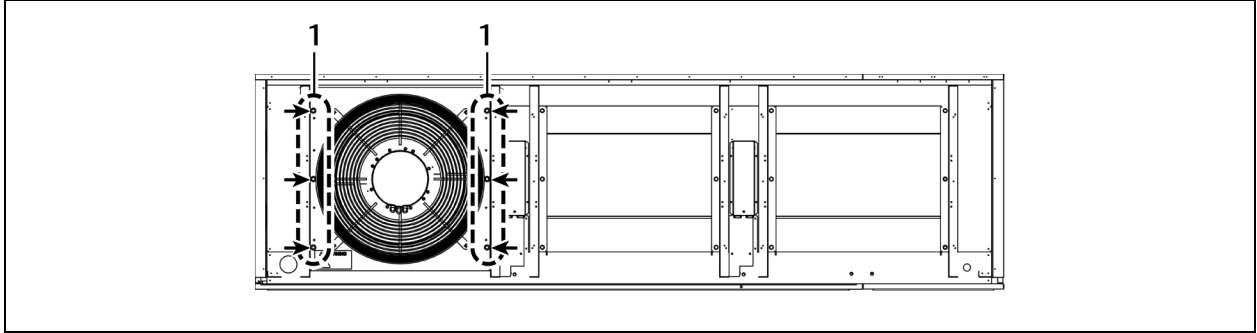
Figure 7.10 EC Fan Assembly Positioned for Lifting



Item	Description
1	Access clearance area of 36 in. (914 mm) from top to bottom of unit

- Using the handles on the EC fan assembly, carefully lift the assembly over the hinge along the top of the unit, and slide the assembly onto the top of the unit until the mounting holes on the base of the assembly align with the threaded holes on top of the unit, **Figure 7.11** below .

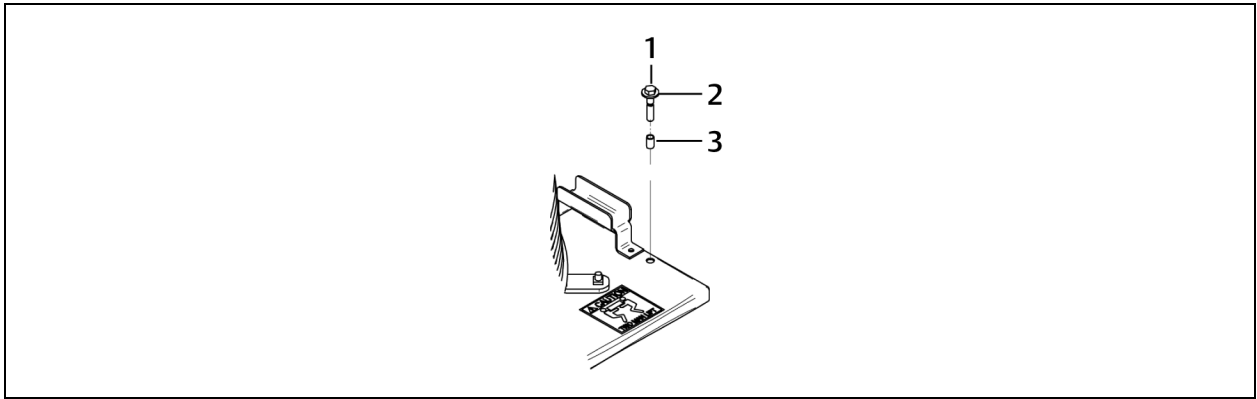
Figure 7.11 Assembly in Place on the Unit



Item	Description
1	Mounting holes

- Use the bolts, washers and spacers, **Figure 7.12** below , to attach the assembly to the unit.
- Repeat steps 4 to 5 for each EC fan assembly.

Figure 7.12 Attach EC Fan Assembly to Top of Unit (6 Places)



Item	Description
1	Bolt
2	Washer
3	Spacer

7.2.4 Wire the EC Fans



WARNING! Risk of cut insulation and damaged wires. Can cause short circuits, overheated wiring, smoke, fire, activation of fire suppression systems and EMS personnel, equipment damage, loss of power to fans, injury or death. Verify that all wiring connections are tight and that all wiring is contained within the junction box prior to closing and securing the cover.

Black-sleeved harness contains fan-control wires. Grey-sleeved harness contains motor high-volt connection.

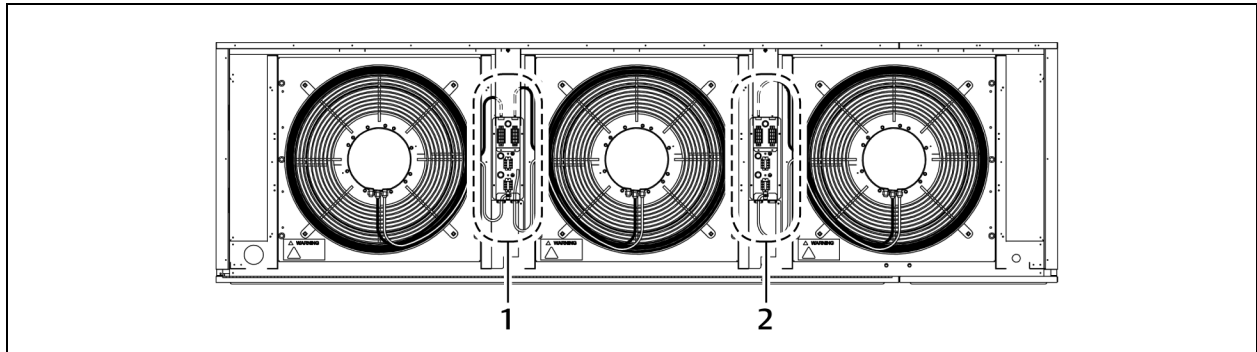
1. Refer to **Figure 7.13** below, **Figure 7.14** on the next page, and **Figure 7.15** on page 53, to route the wire harnesses and insert them into the indicated openings on the junction boxes.

- You may need to remove existing wire ties that hold the harness to the fan cage.

NOTE: Do not route the wiring over the handles on the EC fan assembly.

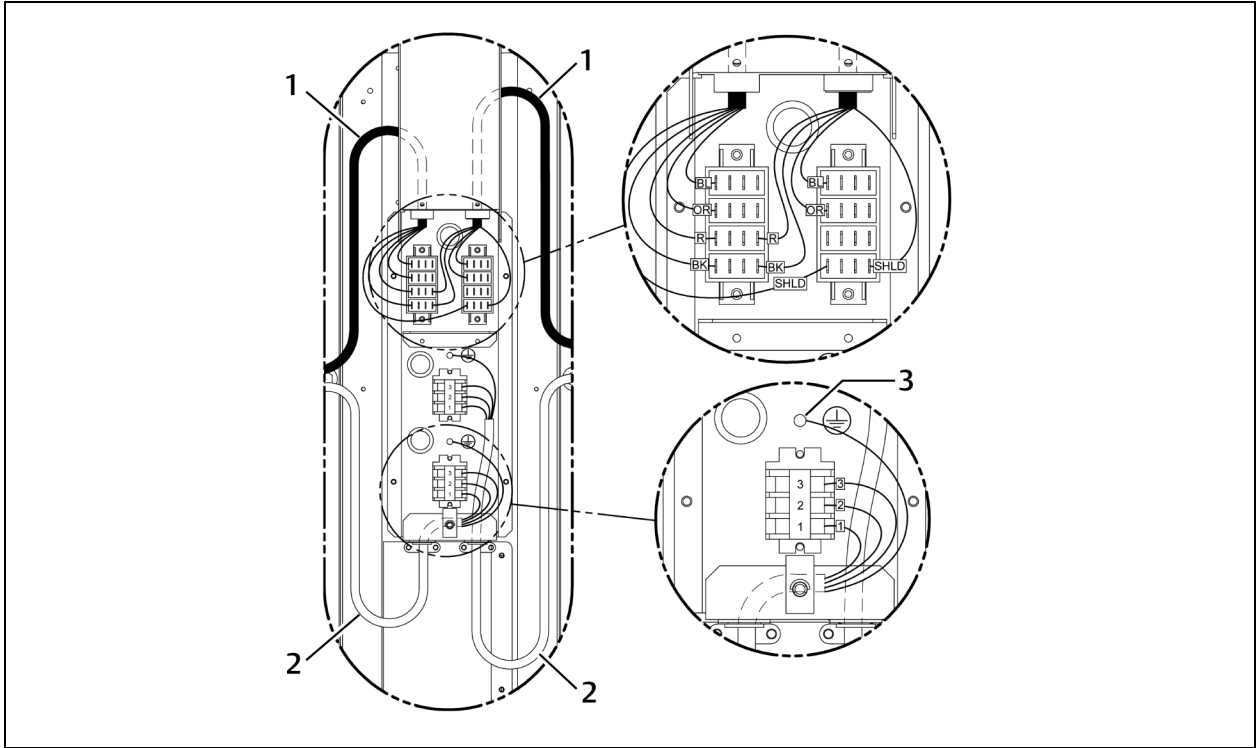
2. Connect the wires inside the junction box:
 - Between fan 1 and 2 on 2- and 3-fan units, refer to **Figure 7.14** on the next page.
 - On single-fan or fan 3 of 3-fan units, refer to **Figure 7.15** on page 53.
3. Use provided wire ties to secure the wire harnesses to the fan cage to prevent harness movement when fans are running.

Figure 7.13 EC Fan Junction Boxes



Item	Description
1	Junction box between fans 1 and 2 on 2- and 3-fan unit
2	Junction box for 1- or 3-fan unit

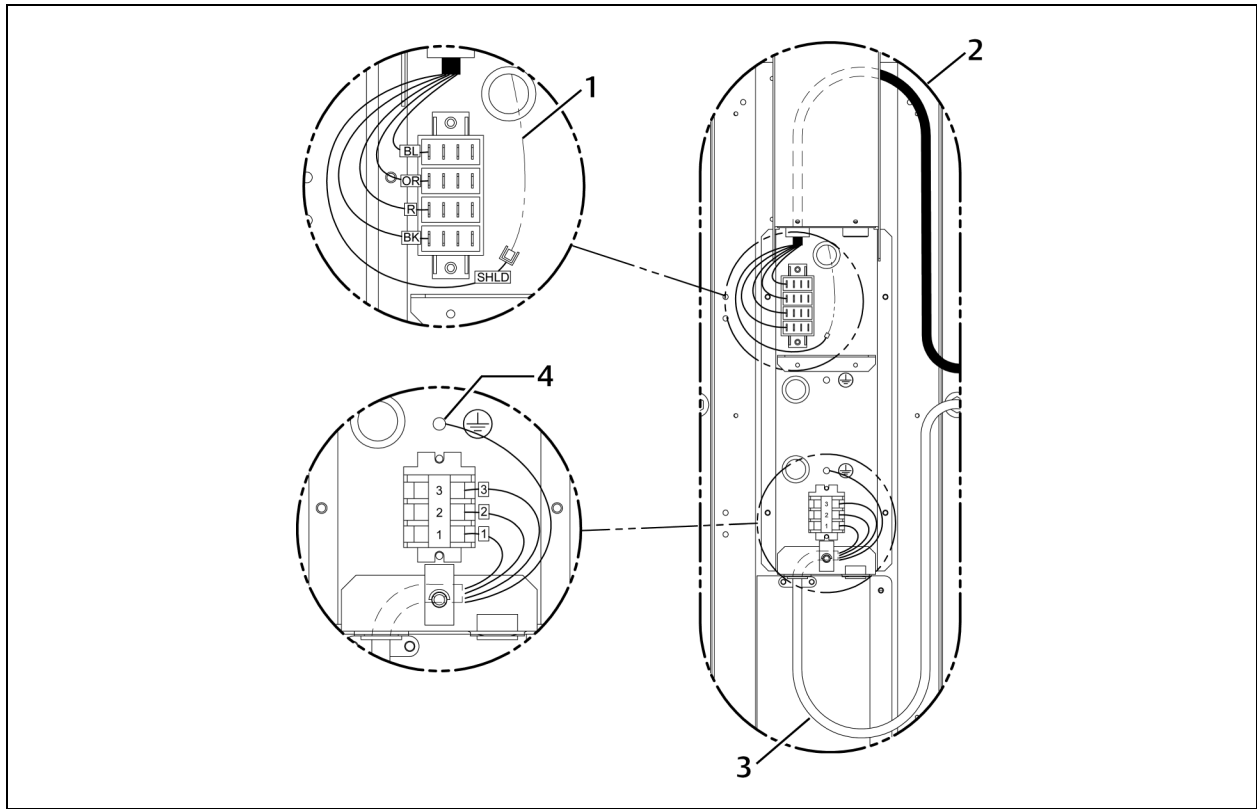
Figure 7.14 Junction Box Between Fans 1 and 2



NOTE: For the high-volt terminal blocks, the wire-termination torque is 16-20 in-lbs.

Item	Description
1	Fan (low-volt) wiring
2	Motor (high-volt) wiring
3	Green/Yellow ground wire

Figure 7.15 Junction Box for Single Fan or Fan 3



NOTE: For the high-volt terminal blocks, the wire-termination torque is 16-20 in-lbs.

Item	Description
1	SHLD wire from unit harness
2	Fan (low-volt) wiring
3	Motor (high-volt) wiring
4	Green/Yellow ground wire

7.2.5 Install Front Panels on Plenum

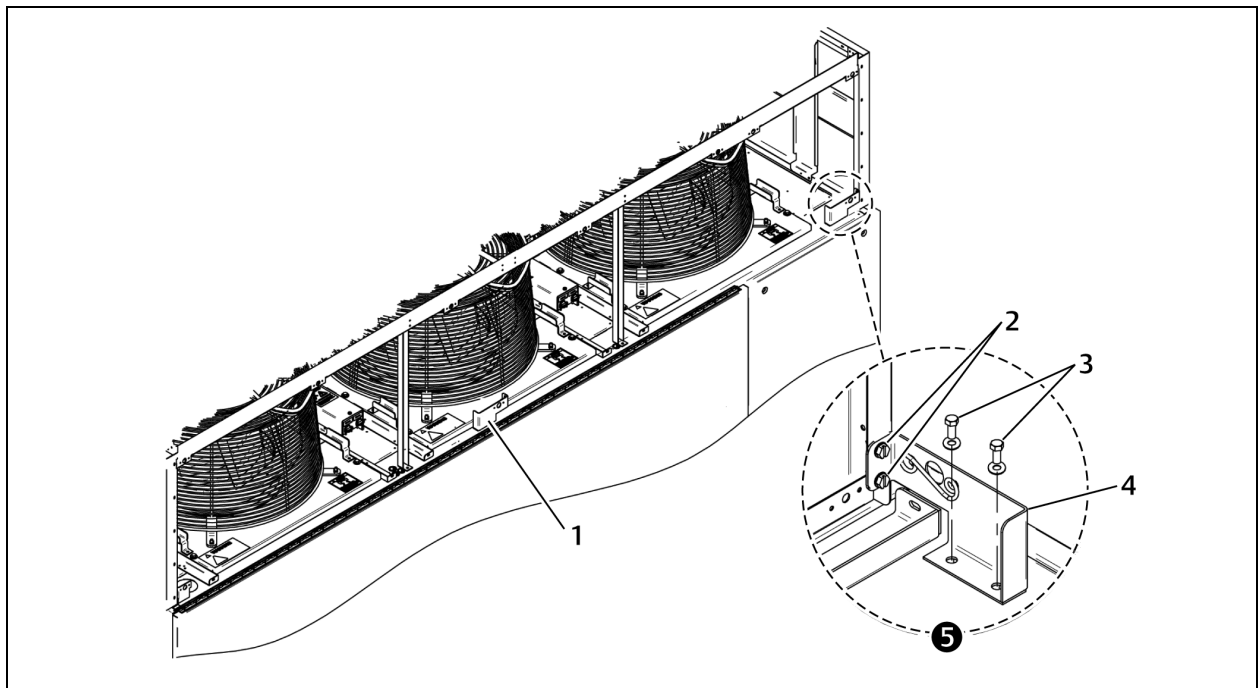
Non-grilled plenum front panels require assembly and attachment before mounting the panels, see [Non-grilled and Rear Discharge Front Panel Assembly](#) below .

Grilled plenums do not require a frame assembly, see [Front Discharge Front Panel Assembly](#) on page 64 .

Non-grilled and Rear Discharge Front Panel Assembly

1. Attach the panel-mounting bracket(s), **Figure 7.16** below :
 - For single- and double-panel plenum, attach the panel-mounting bracket using 1 bolt and 1 washer.
 - For double-panel plenum, attach the panel-mounting bracket using 2 bolts and 2 washers.

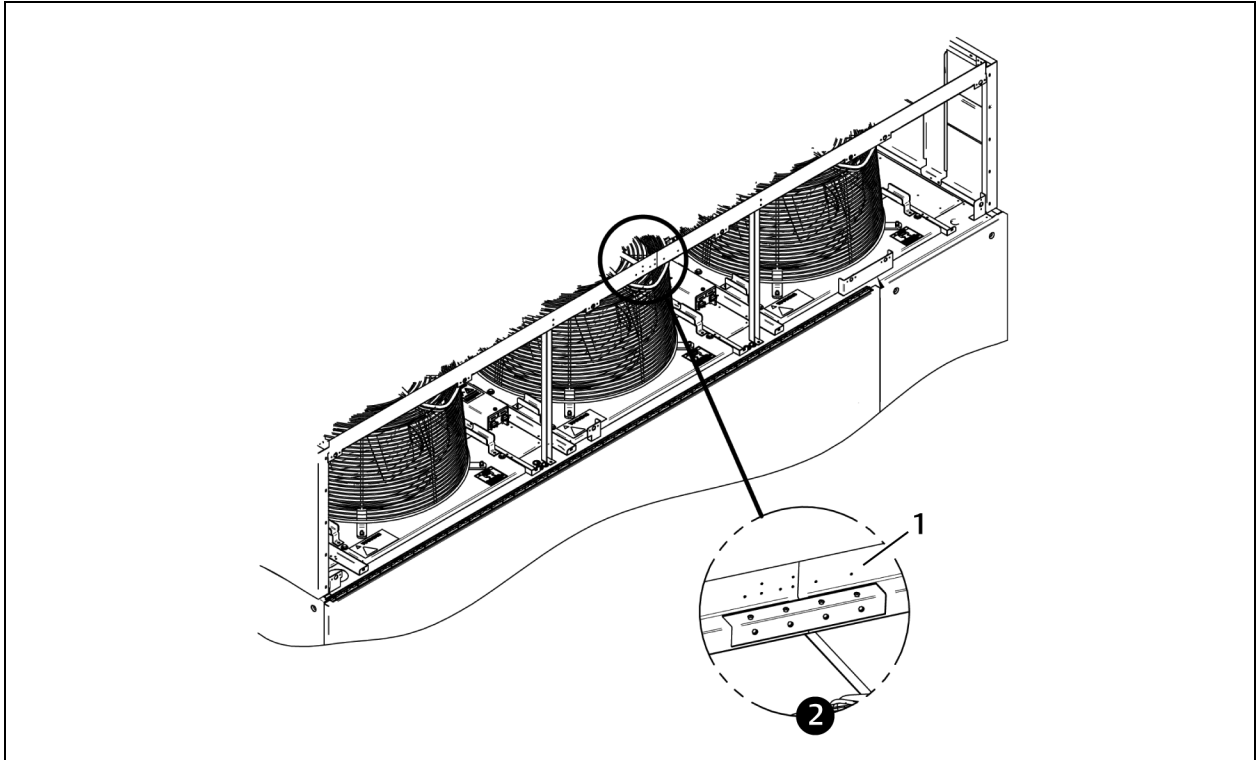
Figure 7.16 Panel Mounting Bracket Attachment



Item	Description
1	Single panel-mounting bracket
2	Double panel-mounting bracket

2. Using the top-frame angle brace and 8 sheet-metal screws, connect the top frame to the top-frame extension, **Figure 7.17** below.

Figure 7.17 Top Frame Assembly

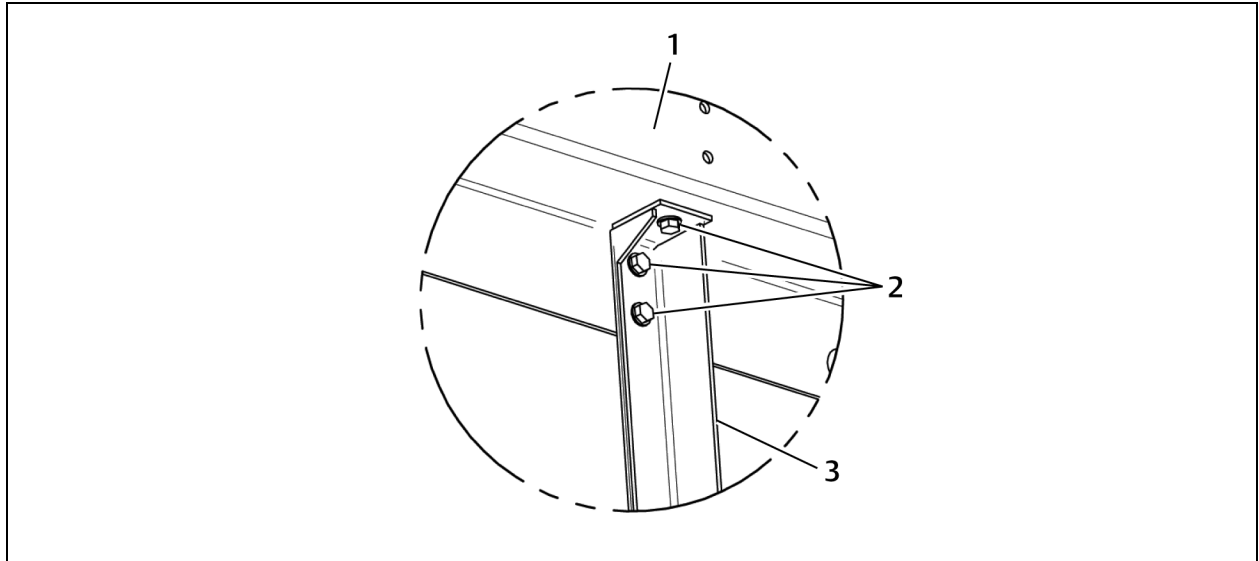


Item	Description
1	Top frames attached with angle brace.
2	Bottom view.

- Using 3 sheet-metal screws, attach the top of the channel frame(s) to the top frame.
The number of channel frames varies depending on the size of plenum, **Figure 7.18** below .

NOTE: The bottom of the channel frame has a longer flange.

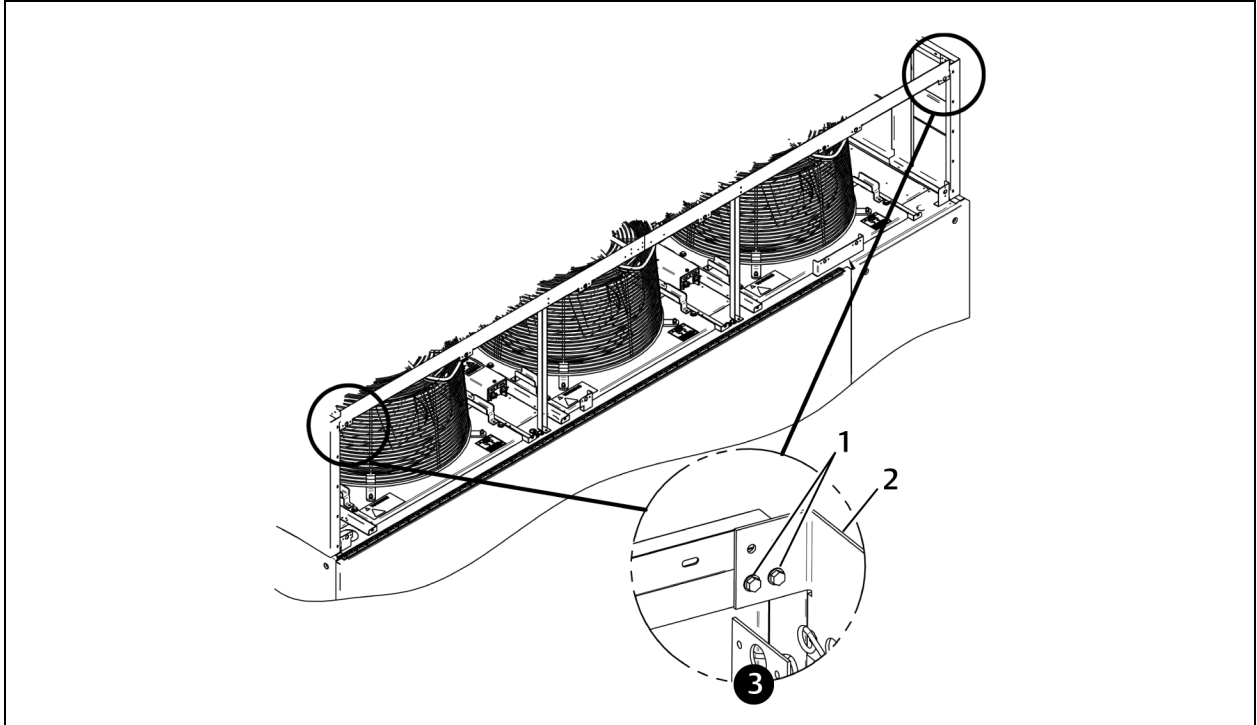
Figure 7.18 Channel Frame Top Attachment



Item	Description
1	Front of plenum
2	Sheet-metal screws
3	Channel frame

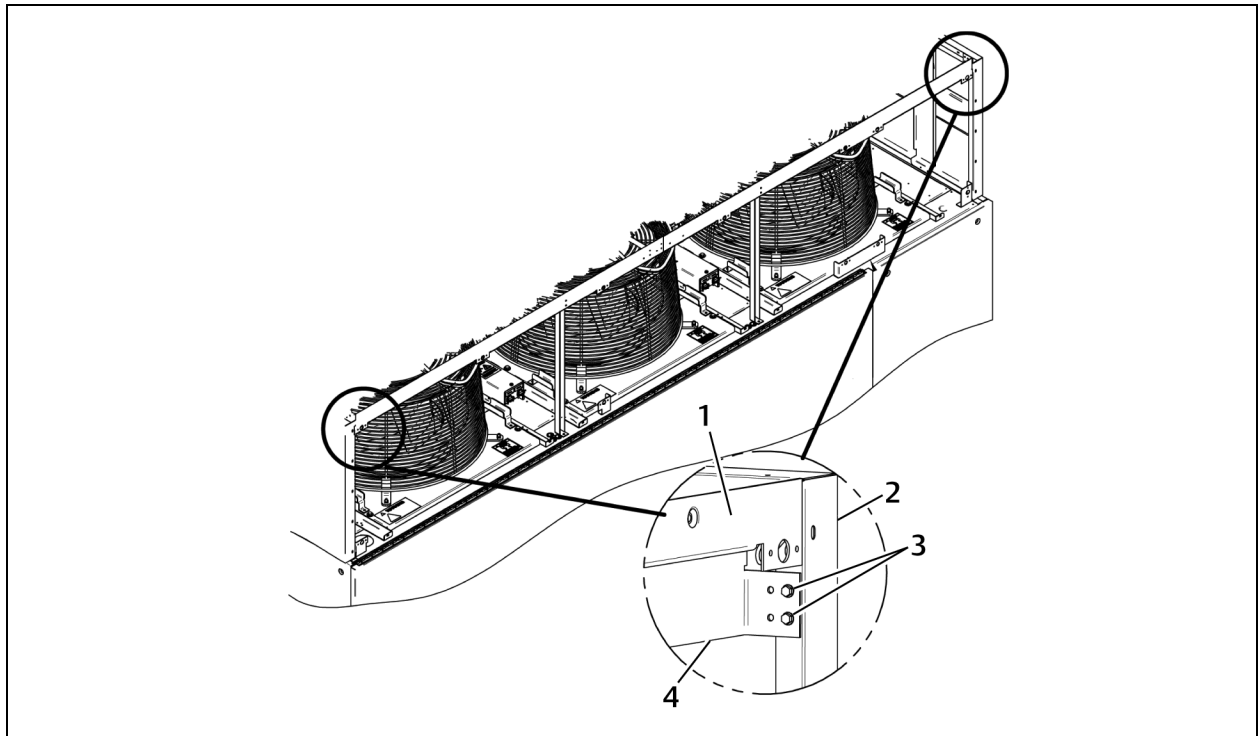
4. Attach the assembled top/channel frame to the side panels on top of the unit:
- For rear-discharge, refer to **Figure 7.19** below and use 2 sheet-metal screws on each end.
 - For non-grilled plenums, refer to **Figure 7.20** on the next page and use 2 sheet-metal screws on each end.

Figure 7.19 Rear Discharge Plenum Top Frame Attachment to Sides



Item	Description
1	Sheet-metal screws
2	Top frame
3	View shown from opposite side.

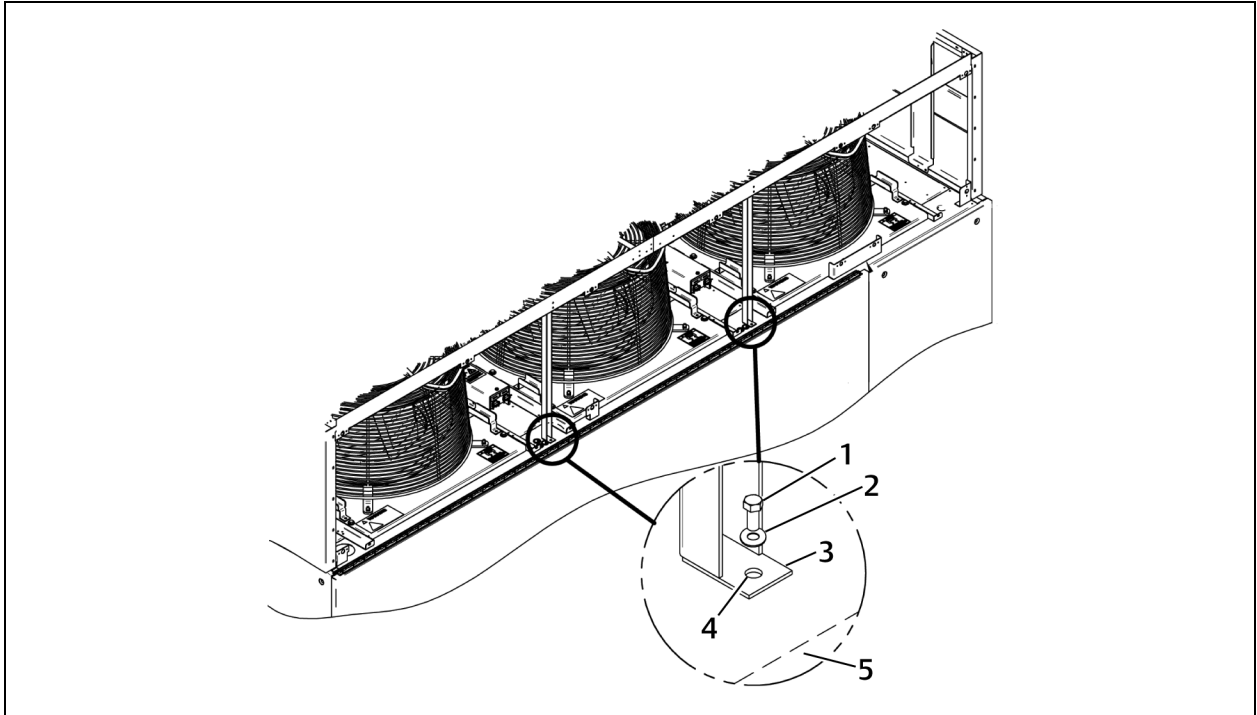
Figure 7.20 Non-grilled Plenum Top Frame Attachment to Sides



Item	Description
1	Front of plenum
2	Side panel
3	Sheet-metal screws
4	Top frame

5. Attach the bottom of the channel frame(s) to the top of the unit using 1 washer and 1 bolt for each, **Figure 7.21** below .

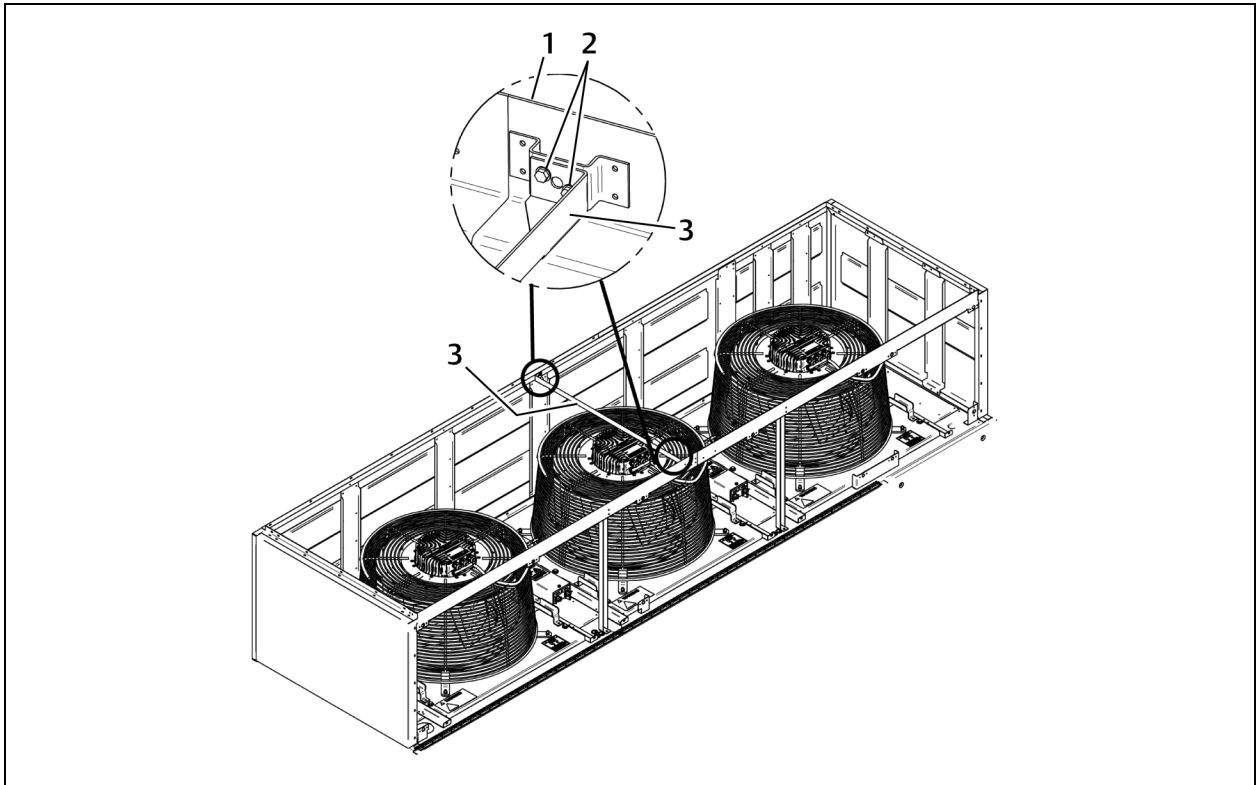
Figure 7.21 Channel Frame Bottom Attachment



Item	Description
1	Bolt
2	Washer
3	Channel frame
4	Bolt hole/Hexsert
5	Front of unit

- For non-grilled plenums, refer to **Figure 7.22** below and attach the plenum brace to the top frame and the rear panel using 2 sheet-metal screws on each end.

Figure 7.22 Non-grilled Plenum Plenum-Brace Attachment



Item	Description
1	Top frame
2	Sheet-metal screws
3	Plenum brace

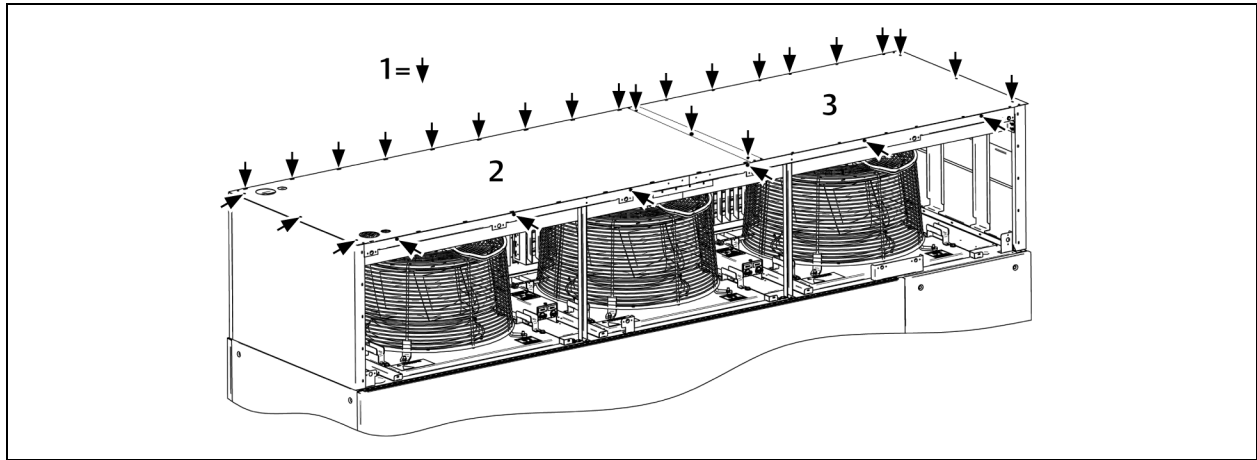
7. For non-grilled plenums, skip to step 9 .

– or –

For rear-discharge plenums, attach the top panels, **Figure 7.23** below :

- Attach the plain top panel to the side and rear panels using 9 sheet-metal screws.
- Attach the top panel with holes to side, rear, and edge of the plain top panel using 15 sheet-metal screws.
- Attach the top panels to the top frame using 6 sheet-metal screws.

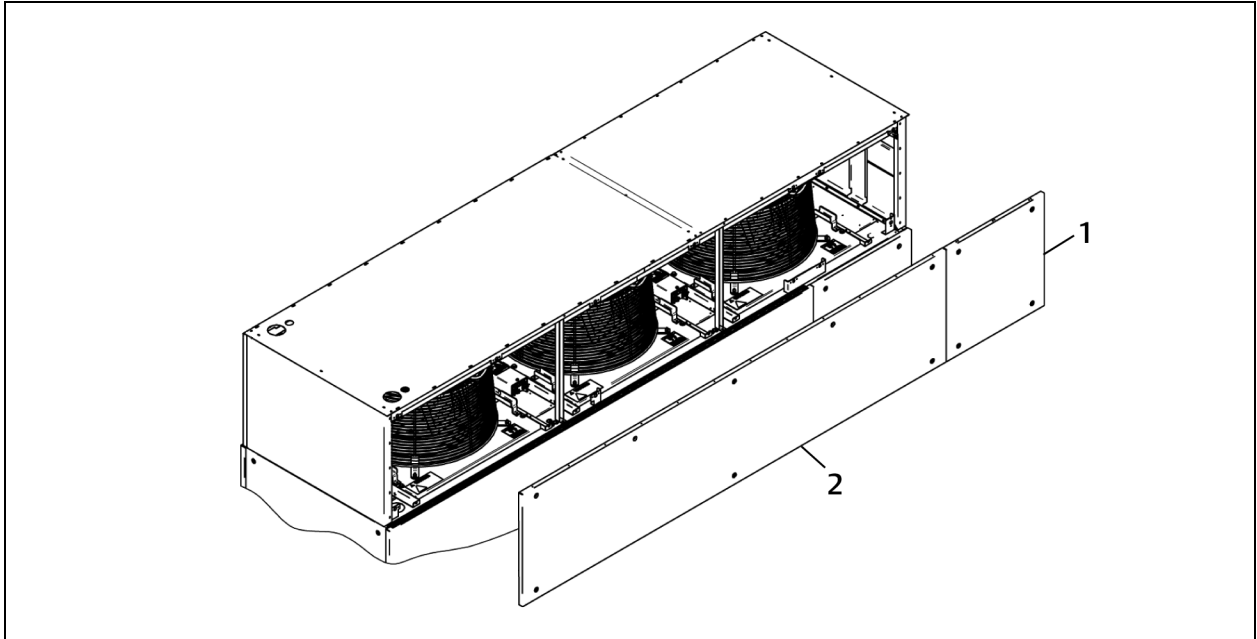
Figure 7.23 Rear Discharge Top Panel Attachment



Item	Description
1	Sheet-metal screws
2	Top panel (with holes)
3	Top panel (plain)

8. Attach the solid front panel and the short, solid front panel using the quarter-turn fasteners in the panels, **Figure 7.24** below .

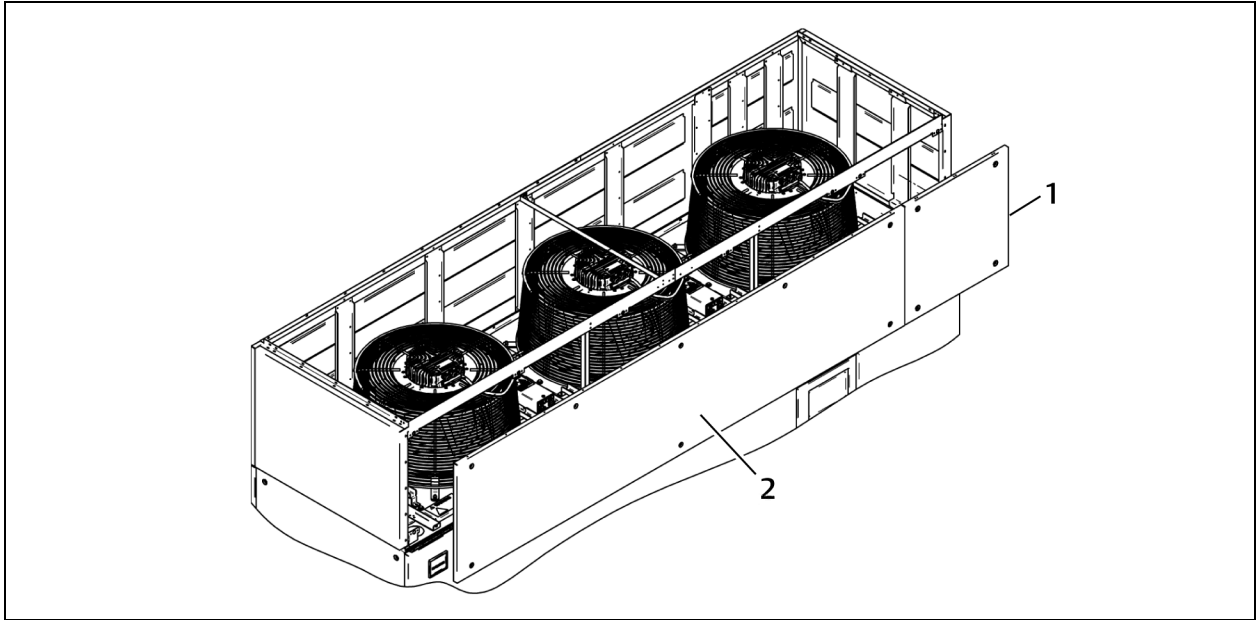
Figure 7.24 Rear Discharge Front Panel Attachment



Item	Description
1	Short front panel
2	Front panel

9. Attach the solid front panel and the short, solid front panel using the quarter-turn fasteners in the panels, **Figure 7.25** below.

Figure 7.25 Non-grilled Front Panel Attachment

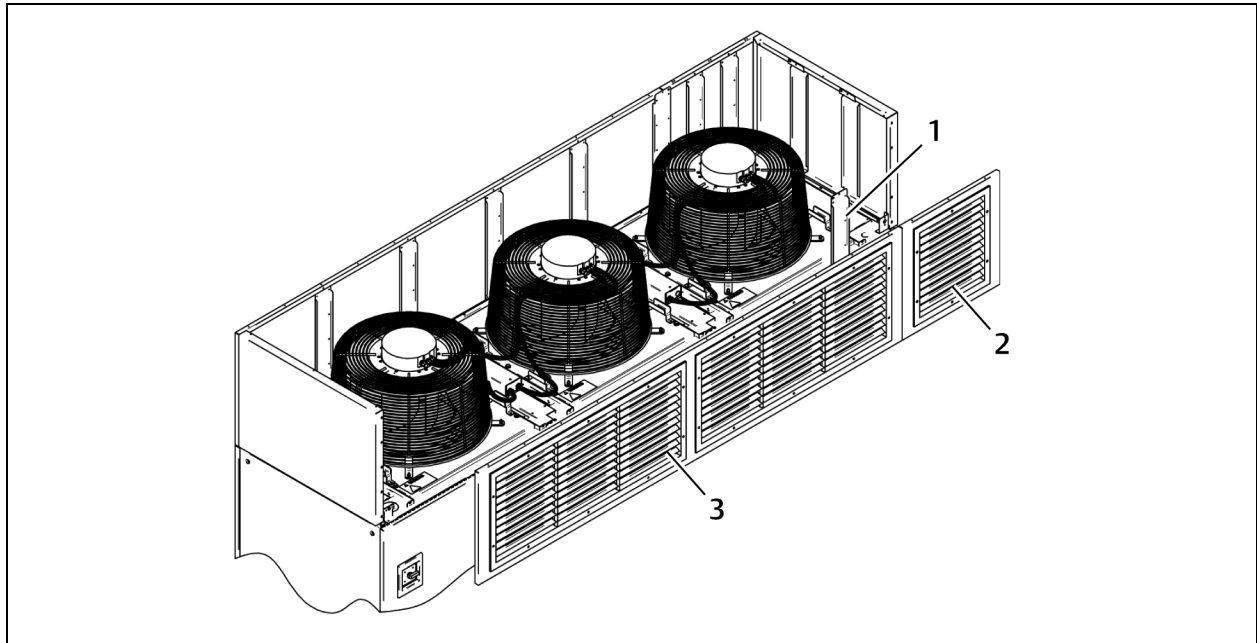


Item	Description
1	Short front panel
2	Front panel

Front Discharge Front Panel Assembly

1. Using the channel panel and 10 sheet-metal screws, attach the grilled front panel and the short, grilled front panel, **Figure 7.26** below .
2. Attach the assembled front panels to the plenum sides using 10 sheet-metal screws, 5 on each end.

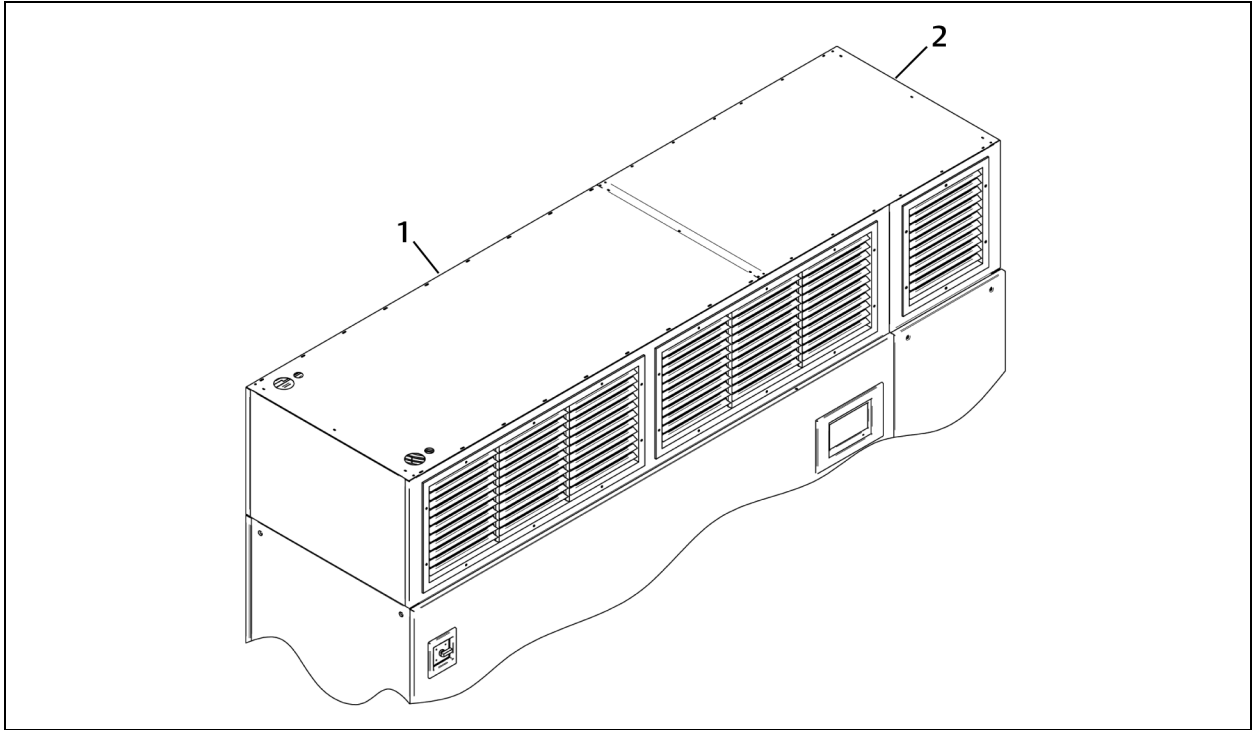
Figure 7.26 Front Discharge Front Panel Attachment



Item	Description
1	Channel panel
2	Short front panel
3	Front panel

3. Attach the plain top panel and the top panel with holes to top of the plenum assembly using 39 sheet-metal screws, **Figure 7.27** below .

Figure 7.27 Front Discharge Top Panel Attachment



Item	Description
1	Top panel (with holes)
2	Top panel (plain)

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8 Checklist for Completed Installation

8.1 Moving and Placing Equipment

1. Unpack and check received material.
2. Proper clearance for service access has been maintained around the equipment.
3. Equipment is level and mounting fasteners are tight.
4. If equipment has been disassembled for installation, unit must be reassembled per instructions.

8.2 Electrical Installation Checks

1. Supply voltage and phase matches equipment nameplate.
2. Power wiring connections completed to the disconnect switch and unit.
3. Power line circuit breakers or fuses have proper ratings for equipment installed.
4. Control wiring connections completed between indoor evaporator and heat-rejection equipment.
5. All internal and external high- and low-voltage wiring connections are tight.
6. Confirm that unit is properly grounded to an earth ground.
7. Control transformer setting matches incoming power.
8. Electrical service conforms to national and local codes.
9. Check blowers and compressors for proper rotation.

8.3 Piping Installation Checks

1. Piping completed to coolant loop.
2. Piping has been leak-checked.
3. Piping has been flushed to clear debris, pipe dope, and contaminants.
4. Piping is properly sized, sloped and trapped as shown in the piping schematics.
5. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub-through.
6. Ensure that factory clamps have been reinstalled.
7. Drain line connected, not obstructed, and pitched per local code.
8. Water supply line connected to humidifier and not leaking.
9. Condensate drain connected.
10. Condensate pump, if applicable, is operational.

8.4 Other Installation Checks

1. Ducting or plenum assembly complete (if required), maintain access to filters.
2. Filters installed.
3. Check fasteners that secure , reheats, humidifier and motors—some may have become loose during shipment.
4. Verify water detection is properly installed around all units (recommended).
5. Blower drive system rotates freely and belts are properly aligned and tensioned.
6. All fans are free of debris.
7. Remove rubber band from float in optional infrared humidifier.

8. Seal openings around piping and electrical connections.
9. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).
10. Locate blank start-up sheet, ready for completion by installer or start-up technician.

9 Initial Start-up Checks and Commissioning Procedure for Warranty Inspection



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied disconnect switch is inside the unit. The line side of this switch contains live high-voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



CAUTION: Risk of smoke generation. Can cause fire suppression and alarm system activation, resulting in injury during building evacuation and mobilization of emergency fire and rescue services. Start-up operation of optional electric reheat elements can create smoke or fumes that can activate the facility alarm and fire suppression system. Prepare and take appropriate steps to manage this possibility. Activating reheat during initial start-up may burn off particulates from electric reheat elements. Before beginning initial start-up checks, make certain that unit was installed according to the instructions in this manual. All exterior panels must be in place.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

- Confirm that all items on [Checklist for Completed Installation](#) on page 67 have been done.
- Locate “Vertiv™ Liebert® CW Warranty Inspection Check Sheet” in the unit’s electric panel.
- Complete “Liebert® CW Warranty Inspection Check Sheet” during start-up.
- Forward the completed “Liebert® CW Warranty Inspection Check Sheet” to your local sales office. **This information must be completed and forwarded to validate warranty.**
- Contact your local sales representative or technical support if you have any questions or problems during unit start-up and commissioning. Visit <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778 for contacts.

10 Troubleshooting



WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

NOTICE

Risk of improper control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

Table 10.1 Blower Troubleshooting

Symptom	Possible Cause	Check or Remedy
Blower will not start	No main power	Check L1, L2 and L3 for rated voltage. Check Vertiv™ Liebert® CW for unit status (Stand-by, Unit Off, Monitoring Off or Remote Off).
	Blown fuse or tripped circuit breaker (CB)	Check fuses or CBs to main fan.
	Overloads tripped (main panel on Liebert® CW)	Push reset button on main fan overload. Check amp. draw.
	No output voltage from transformer	Check for 24 VAC between P24-2 and P24-1. If no voltage, check primary voltage.
	Control fuse blown or circuit breaker tripped	Check for 24 VAC between P4-4 and E1. If no voltage, check for short. Replace fuse or reset circuit breaker.
Blower runs but controls will not operate	Relay R1 not making contact (standard controls only)	Check for 24 VAC between P36-9 and P36-10. If voltage is not present, R1 is not receiving power.
		Check air switch. Jumper P36-4 to P36-7 If R1 closes, air switch is not closing (check for blower rotation, loose wiring and pinched tubing.) Remove jumper.
		Check for 24 VAC at R1 coil. If the voltage is present and R1 is not pulling, replace R1.

Table 10.2 Chilled Water Troubleshooting

Symptom	Possible Causes	Check or Remedy
Actuator Motors	No 24 VAC power to motor	Check for 24 VAC between P22-3 and P22-5 (open), or P22-1 and P22-5 (closed).
Chilled water or hot water/steam valve not opening	Motor operates but valve won't open	Check linkage for adjustment and be sure that it is tight on the valve.
Modulating Motors	No 24 VAC power to motor	Check control fuses and power at PCB and PCT.
	No signal from control	Check DC voltage on printed circuit board in motor. Terminal No. 1 is grounded and No. 3 is positive. DC voltage should vary from 0.8 to 2.0 VDC or above as temperature control is varied below room temperature on cooling valve or above room temperature on heating valve.
	Motor not working	Remove wires on terminal No. 1 and No. 3 from the motor (do not short). With 24 VAC power from TR to TR jumper terminal 1 and 2 on motor to drive open. Remove jumper to drive closed, if motor fails to work, replace it.

Table 10.3 Humidifier—Infrared Troubleshooting

Symptom	Possible Cause	Check or Remedy
No humidification	Humidifier pan not filling	Check water supply.
		Check fill valve operation
		Check drain stand pipe adjustment
		Check for clogged waterline
		Check float orientation (see)
	Control not calling for humidity	Check monitor status
	Humidity contact not pulling in	Check visually. If contact is made, check line voltage after contactor and fuses or CBs.
		Check for open humidifier safety stat. Jumper between terminals P35-6 and P35-5. If contactor pulls in, replace safety. Remove jumper.
	Humidifier bulb burned out	Replace bulb. Loosen lead on old bulb. Trim excess lead length on new bulb to avoid shorts.

Table 10.4 Reheat Troubleshooting

Symptom	Possible Cause	Check or Remedy
Reheat will not operate; contactor not pulling in	Control not calling for heat	Check monitor status.
	Reheat safety stat open	Jumper between terminals P34-1 and P34-2. If reheat operates, safety is open. Remove jumper. Replace safety.
Reheat not operating, contactor pulling in	Heater burned out	Turn off power and check heater continuity with Ohm meter.

11 Maintenance



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied disconnect switch is inside the unit. The line side of this switch contains live high-voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers’ specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



WARNING! Risk of electric shock. Can cause serious injury or death. The Vertiv Liebert® iCOM™ microprocessor does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ control. Open all local and remote electric power disconnect switches and verify with a voltmeter that power is Off before working on any component of the system.

The Vertiv™ Liebert® CW is a single component in the facility heat-removal system. The system includes air distribution (raised floors, duct systems), outdoor heat rejection (pumps) and indoor cooling and humidity loads (equipment load, location, outside air infiltration). Proper application and maintenance of the entire system is critical to the life and reliability of the thermal-management units.

- Good maintenance practices are essential to minimizing operation costs and maximizing product life.
- Read and follow monthly and semi-annual maintenance schedules included in this manual. These MINIMUM maintenance intervals may need to be more frequent based on site-specific conditions.
- See the Vertiv™ Liebert® iCOM™ user manual, SL-31075, available at www.Vertiv.com, for instructions on using the controller to predict some service maintenance intervals.
- We recommend the use of trained and authorized service personnel, extended service contracts and factory-specified replacement parts. Contact your Vertiv sales representative.

11.1 Filters

Filters are usually the most neglected item in an environmental control system. To maintain efficient operation, they should be checked monthly and changed as required. Because replacement intervals vary with environmental condition and filter type, each unit is equipped with a filter clog switch. This warns of restricted airflow through the filter compartment by activating the Change Filter alarm.

- Turn power Off before replacing filters.
- Filters can be replaced through the filter plenum.
- Replacement filters are commercially available in several efficiencies. Contact Liebert service for filters.
- After replacing the filter(s), test the operation of the filter clog switch. Turn the adjusting screw counter clockwise to trip the switch—this will energize the Clogged Filter alarm. Acknowledge the alarm by pressing the horn button once.

To adjust the switch:

1. With the fan running, set the switch to energize the light with clean filters. The unit panels must all be in place and closed to accurately find this point.
2. Turn the adjusting knob one turn clockwise, or to the desired filter change point.

11.2 Blower Drive System—EC Fans



WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within the fan-motor electric-connection enclosures. Fan-motor controls can maintain an electric charge for 10 minutes after power is disconnected. Wait 10 minutes after power is verified as off before working within the electric control/connection enclosures. Use only fully-trained and qualified HVAC technicians to perform maintenance on the fans.



CAUTION: Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed. Do not operate upflow units without installing a plenum, ductwork of gaurd over the blower opening(s) on the top surface of the unit cabinet. Ductwork must be connected to the blower(s) or a plenum must be installed on the blower deck for protection from rotating blower wheel(s) on upflow units.



CAUTION: Risk of improper moving, lifting and handling. Can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Evaporator fan modules weigh in excess of 125 lb (56.7 kg). Use proper lifting techniques and wear appropriate, OSHA-approved PPE to avoid injury and dropping the fan module during removal. Equipment used in handling/lifting, and/or installing the fan assembly must meet OSHA requirements. Use handling/lifting equipment rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to handling/lifting, and/or installation equipment operating manual for manufacturer's safety requirements and operating procedures.

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within $\pm 10\%$ of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTICE

Risk of improper installation. Can cause equipment damage.

Only a properly trained and qualified technician should install or open this motor.

Use 60/75°C Class 1 copper wire only.

11.2.1 Protective Features

Monitoring functions protect the motor against overtemperature of electronics, overtemperature of motor and incorrect rotor position detection. With any of these failures, an alarm will display through the Vertiv™ Liebert® iCOM™ controller and the motor stops electronically. There is no automatic restart. The power must be switched off for a minimum of 20 seconds once the motor is at a standstill.

The motor also provides locked rotor protection, undervoltage/phase failure detection and motor current limitation. These conditions will display an alarm through the Liebert® iCOM™.

11.2.2 Fan Impellers and Bearings Maintenance

Fan impellers should be periodically inspected and any debris removed. Check to ensure that the impellers can rotate freely and that the fan guards are still properly mounted for sufficient protection against accidentally contacting the impeller. Bearings used on the units are maintenance-free. Consult the factory for more information.

11.2.3 Fan Assembly Troubleshooting

Any safety hazards stemming from the device must be re-evaluated once it is installed in the end device.

Do not make any modifications, additions or conversions to the fan assembly without the approval of Vertiv.



WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches and verify with a voltmeter that power is off before opening the fan motor electric-connection enclosure. Use only fully-trained and qualified HVAC technicians to replace or perform maintenance on the EC fans.



WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.



CAUTION: Risk of exposure to harmful noise levels. Can cause hearing injury or loss. Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) may arise. Take appropriate technical safety measures. Operating personnel must wear appropriate, OSHA-approved PPE and observe all appropriate hearing-protection safety requirements.



CAUTION: Risk of contact with hot surfaces. Can cause injury. The fan motor, and some electrical components are extremely hot during unit operation. Allow sufficient time for them to cool to a touch-safe temperature before working within the unit cabinet. Use extreme caution and wear appropriate, OSHA-approved PPE when working on or near hot components.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within $\pm 10\%$ of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTE: Do not assume that the fan blades will not start to spin. If the motor is in a fault condition, it will safely shut down. Once the fault condition is cleared, there are certain conditions in which the motor will automatically resume operation.

NOTE: Further troubleshooting procedures relating to fan connection/operation in the thermal management unit are included in Table 10.1 on page 71 .

EC Fan Fault Conditions**Table 11.1 EC Fan Fault Conditions**

Fault Condition	Reset Trigger	Description
Phase Failure	Automatic	One phase is missing. In this case the motor will come to a stop and then automatically restart when all phases are present.
Locked/Blocked Rotor	Automatic	The rotor is blocked. Once the locking mechanism has been removed, the motor will automatically restart.
Hall Effect Sensor Error	Manual (Mains/Software)	The Hall Effect Sensor is used to monitor fan speed. If there is a hall sensor communication failure with the electronics, the motor will stop. In this case there has to be a manual restart (either with the mains power or software).
Motor Over Temperature	Manual (Mains/Software)	The motor will stop in the event there is a motor over temperature condition. In this case there has to be a manual restart (either with the mains power or software).
Electronics Over Temperature	Manual (Mains/Software)	The motor will stop in the event there is an electronics over temperature condition. In this case there has to be a manual restart (either with the mains power or software).
Line Under-Voltage	Automatic	Once the line voltage returns within permitted operating range, the fan will automatically restart.

EC Fan High Voltage Tests

1. Check Fuses. If fuses are okay, perform the following:
 - Check all connections.
 - Make sure connections are on the wire strand and not on the wire insulation.
 - Cycle Power. Disconnect mains voltage to power down the motor and then re-apply power.
 - Check mains voltage at each phase (phase to ground) at the KL1 connector. Confirm phase failure not present.
 - Check that the voltage is within the acceptable voltage range at the KL1 connector. Confirm line under-voltage is not present.
2. Check Fuses. If fuses are blown, perform the following:
 - Check resistances across the phases at the KL1 connector and note them in the following table.

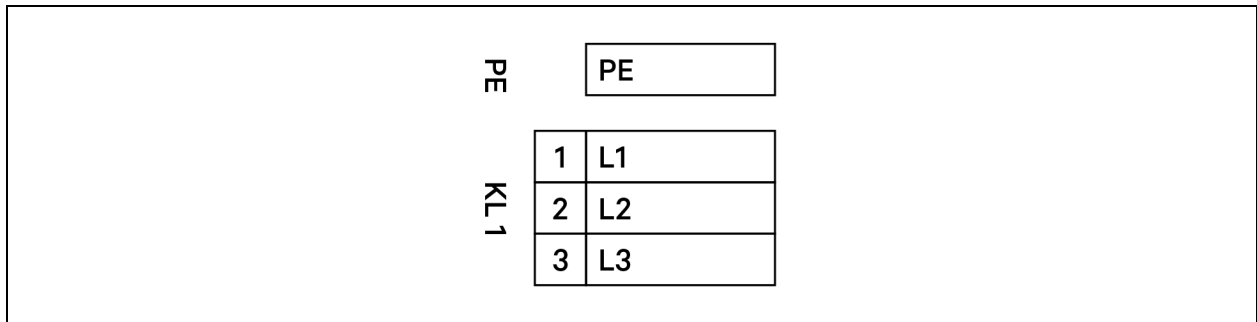
NOTE: Power wires must be removed from the motor for resistance test.

Table 11.2 Resistances at KL1 Connector

L1 - L2	Figure 11.1	Ohm
L2 - L3		Ohm
L1 - L3		Ohm

- Resistances should be similar for all 3 readings.
- Resistance readings should be greater than 2 Ohm.
 - Check all connections. Make sure connections are on the wire strand and not on the wire insulation.
 - Replace fuses.
 - Check mains voltage at each phase (phase to ground) at the KL1 connector. Confirms phase failure not present.

Figure 11.2 KL1 Connector



- Check that the voltage is within the acceptable voltage range at the KL1 connector. Confirms line under-voltage is not present.

EC Fan Low Voltage Tests

- Check control input at the KL3 connector (Ain1U to GND). Confirm that there is a control voltage present at the KL3 connector.

NOTE: Use the GND in the KL3 connector. Do not connect the control ground to the PE in KL1!

- Check +10 V output on KL3 connector (between +10 V and GND).

Figure 11.3 KL3 Connector

KL3	1	RSA		8	OR	KL3	1	RSA	Din 2	8
	2	RSB	+10V	9			2	RSB	Din 3	9
	3	GND	Ain 1 U	10			3	GND	GND	10
	4			11			4	Ain 1 U	Ain 2 U	11
	5			12			5	+ 10 V	+ 20 V	12
	6			13			6	Ain 1 I	Ain 2 I	13
	7			14			7	Din 1	Aout	14

EC Fan Alarm Contact Tests

Check the alarm contact at KL2 to determine if there are any fault conditions present.

Figure 11.4 KL2 Connector

KL2	1	NO
	2	COM
	3	NC

Table 11.3 No Fault/Fault Conditions while Motor Actively Energized

Condition	No Fault Condition	Fault Condition
NO - COM	Open	Closed
NC - COM	Closed	Open

NOTE: The table refers to conditions while the motor is actively energized. When the motor is de-energized, it will be in a fault condition.

- Check EC Control to determine the fault condition.

11.2.4 Removing EC Fans from Downflow Units

The EC fans in Vertiv™ Liebert® CW units can be removed for easier maintenance or for replacement.



WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within the fan-motor electric-connection enclosures. Fan-motor controls can maintain an electric charge for 10 minutes after power is disconnected. Wait 10 minutes after power is verified as off before working within the electric control/connection enclosures. Use only fully-trained and qualified HVAC technicians to perform maintenance on the fans.



WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.



WARNING! Risk of extremely heavy fan modules dropping downward suddenly. Can cause injury or death. Fan modules weigh in excess of 125 lb (56.7 kg) each. Support fan modules before removing mounting hardware. Use caution to keep body parts out of fan module pathway of movement during removal. Only properly trained and qualified personnel should work on this equipment.

Read these instructions and unit labeling before removing fan modules. The instructions show a Liebert® CW with a 24 in. floor stand. Your unit may look slightly different.

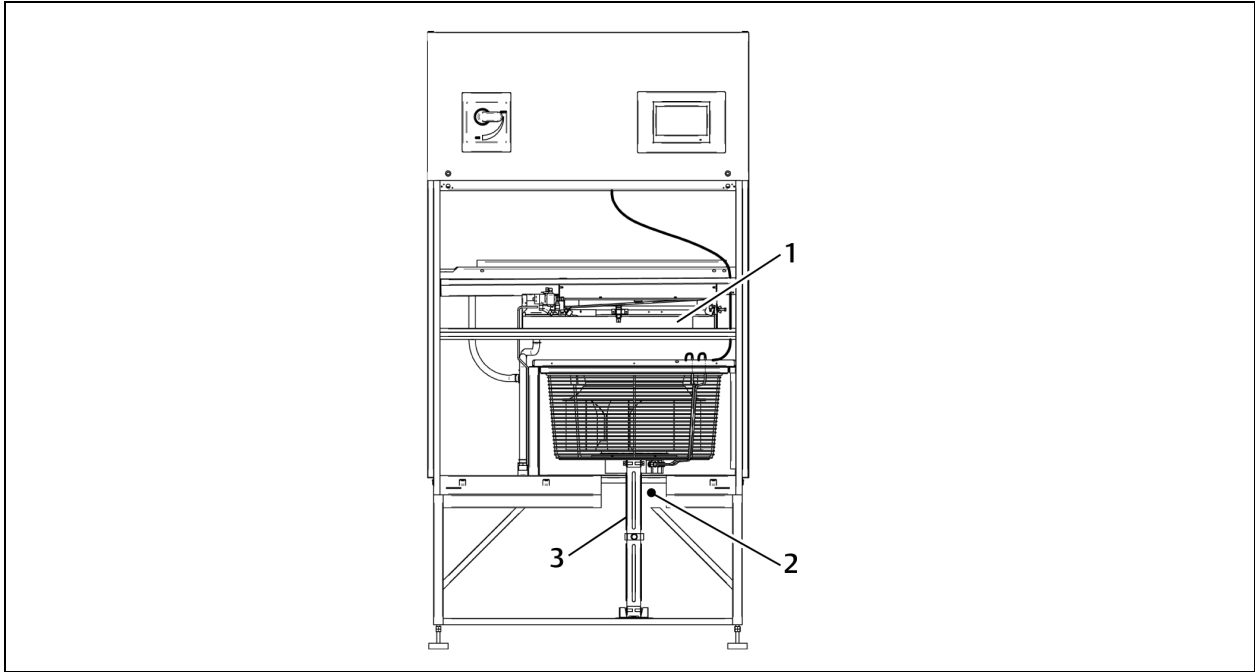
Hardware and tools required

- 1/2 in. hex socket and wrench
- Factory-supplied jack, crank and jack support
- Cable tie cutter
- Field-supplied fan removal device capable of supporting fan assembly weight

To remove an EC fan module:

1. Remove panels from the front of the unit.
2. Remove the humidifier pan. You can remove fans without removing the humidifier pan, but removing it makes fan removal easier, see **Figure 11.5** on the facing page .

Figure 11.5 Humidifier Pan Removal

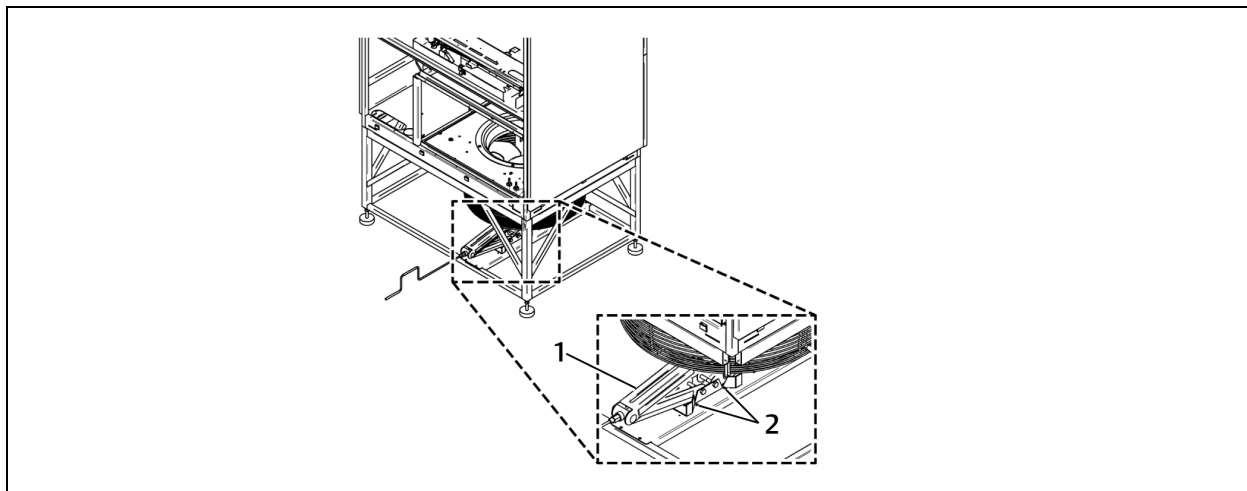


Item	Description
1	Humidifier pan
2	Section not shown
3	Jack under raised EC-fan module

3. If the fan module is raised and in the unit, proceed to step 6 .
– or –

If the fan module is lowered into the floor stand, refer to **Figure 11.6** below and before removing any hardware, center the factory-supplied jack between the tabs on the jack support.

Figure 11.6 Jack Placement to Support EC Fan Module

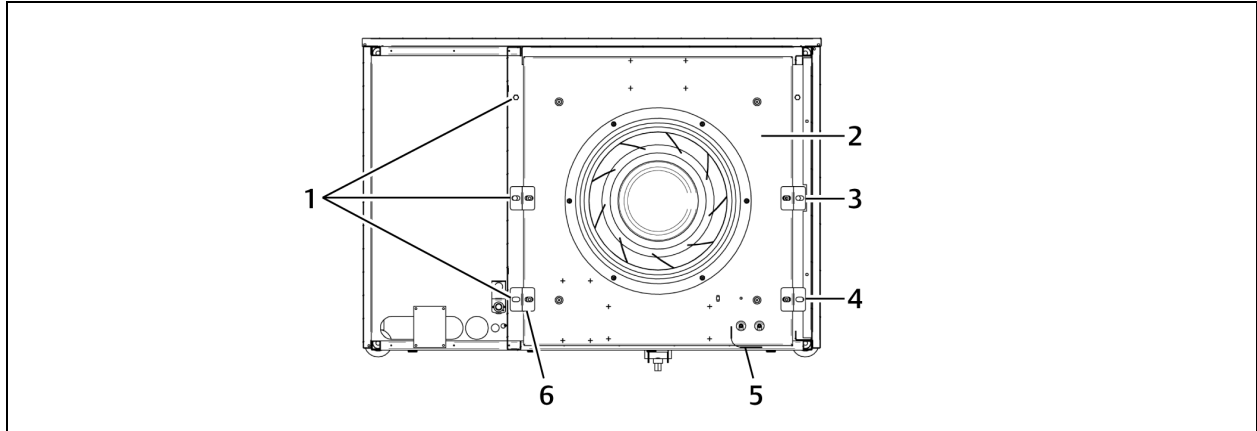


Item	Description
1	Position jack to support fan
2	Tabs

4. Remove hardware, **Figure 11.7** below, that retains the fan in the lowered position, and save it for re-installation.

NOTE: Hardware quantity and location varies depending on the type of unit.

Figure 11.7 Hardware Removal



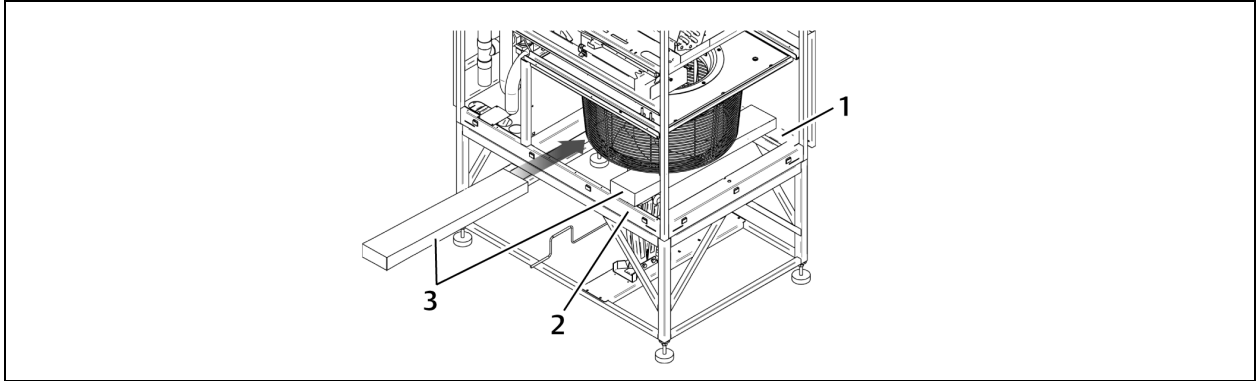
Item	Description	Item	Description
1	1/2 in. (13 mm) Hex-head bolts (typical both sides)	4	Z bracket location on CW076 to CW114
2	Fan deck	5	Wiring loop
3	Z bracket location on CW038 to CW0060	6	Z bracket

5. Use the jack to raise the fan module slowly until the fan motor clears the front frame channel.
6. Insert a field-supplied fan-removal device securely on the front and rear frame channels under the fan module as shown in **Figure 11.8** on the next page.
 - A suitable fan-removal device is two lengths of rigid material that is 4 in. (100 mm) wide and strong enough to support the weight of the fan module.
7. Disconnect high-voltage and low-voltage fan-motor wiring from the fan-motor electric component inside the electric panel. Cut cable ties as needed.
8. Using the removal device shown inserted in **Figure 11.8** on the next page, slide the fan module out through the front of the unit.

9. To reinstall the fan module, reverse these steps. Remove the field-supplied fan-removal device before resuming operation.

NOTE: Refer to the unit's electrical schematic for specific wire-attachment points.

Figure 11.8 Slide EC Fan Out of the Unit



Item	Description
1	Rear frame channel (right-side panel not shown)
2	Front channel
3	Fan-removal devices

11.2.5 Removing EC Fans from Upflow Units



WARNING! Risk of electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within the fan-motor electric-connection enclosures. Fan-motor controls can maintain an electric charge for 10 minutes after power is disconnected. Wait 10 minutes after power is verified as off before working within the electric control/connection enclosures. Use only fully-trained and qualified HVAC technicians to perform maintenance on the fans.



WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed.

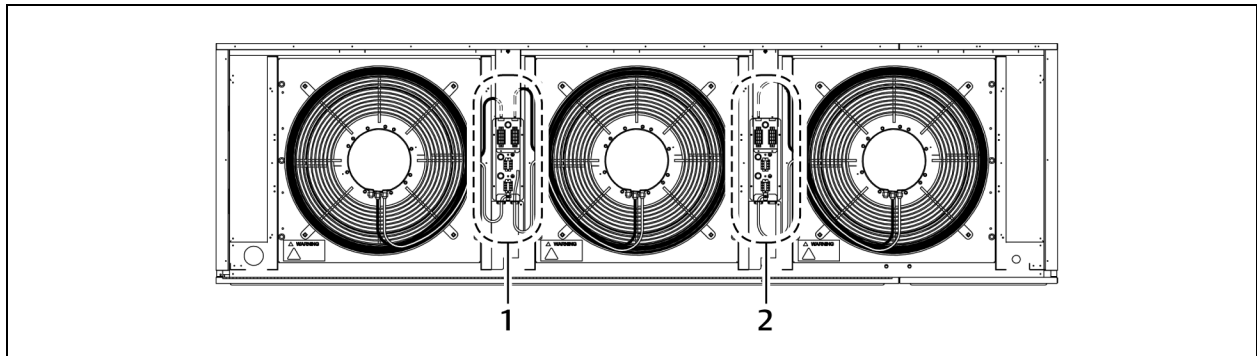


WARNING! Risk of extremely heavy fan modules dropping downward suddenly. Can cause injury or death. Fan modules weigh in excess of 125 lb (56.7 kg) each. Support fan modules before removing mounting hardware. Use caution to keep body parts out of fan module pathway of movement during removal. Only properly trained and qualified personnel should work on this equipment. More than one person may be required to complete the assembly and installation. Installer(s) must be properly trained and qualified to lift, move and manipulate very heavy equipment from floor level to the top of the unit. Wear appropriate, OSHA-approved PPE when moving, lifting, installing, and removing the fan(s) and plenum. Read and follow the lifting equipment and/or ladder manufacturer's operating instructions and safety requirements.

NOTE: We recommend using a duct lift or scissors lift when installing or removing the EC fan assemblies on top of the unit.

1. Disconnect the black-sleeved low-voltage harness and the green-sleeved high-voltage harness from the junction box, **Figure 11.9** below .

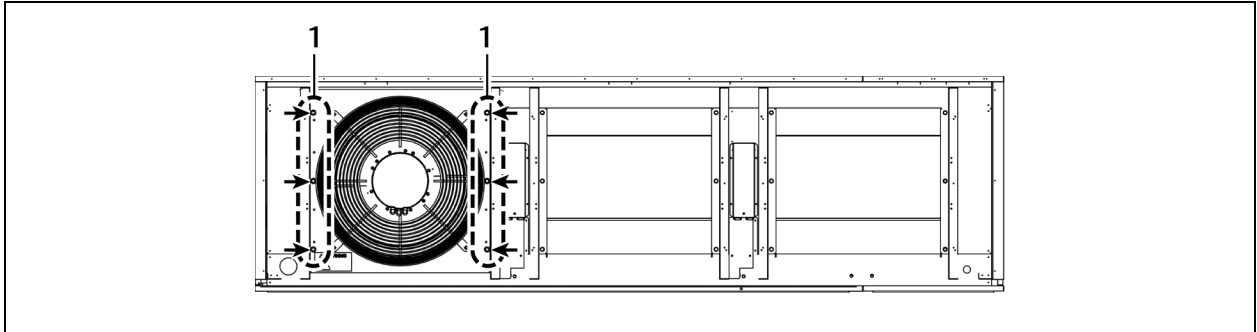
Figure 11.9 EC Fan Junction Boxes



Item	Description
1	Junction box between fans 1 and 2 on 2- and 3-fan unit
2	Junction box for 1- or 3-fan unit

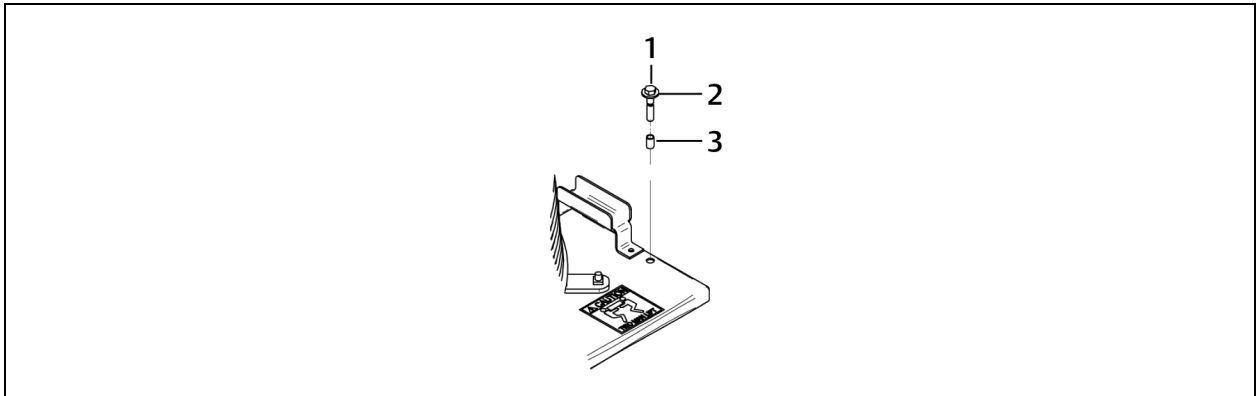
2. Locate the 6 places where the EC-fan assembly attaches to the unit, **Figure 11.10** below , and remove the bolts, washers and spacers, **Figure 11.11** below .

Figure 11.10 Assembly in Place on the Unit



Item	Description
1	Mounting holes

Figure 11.11 Bolts, Washers and Spacers on EC Fan Assembly (6 Places)



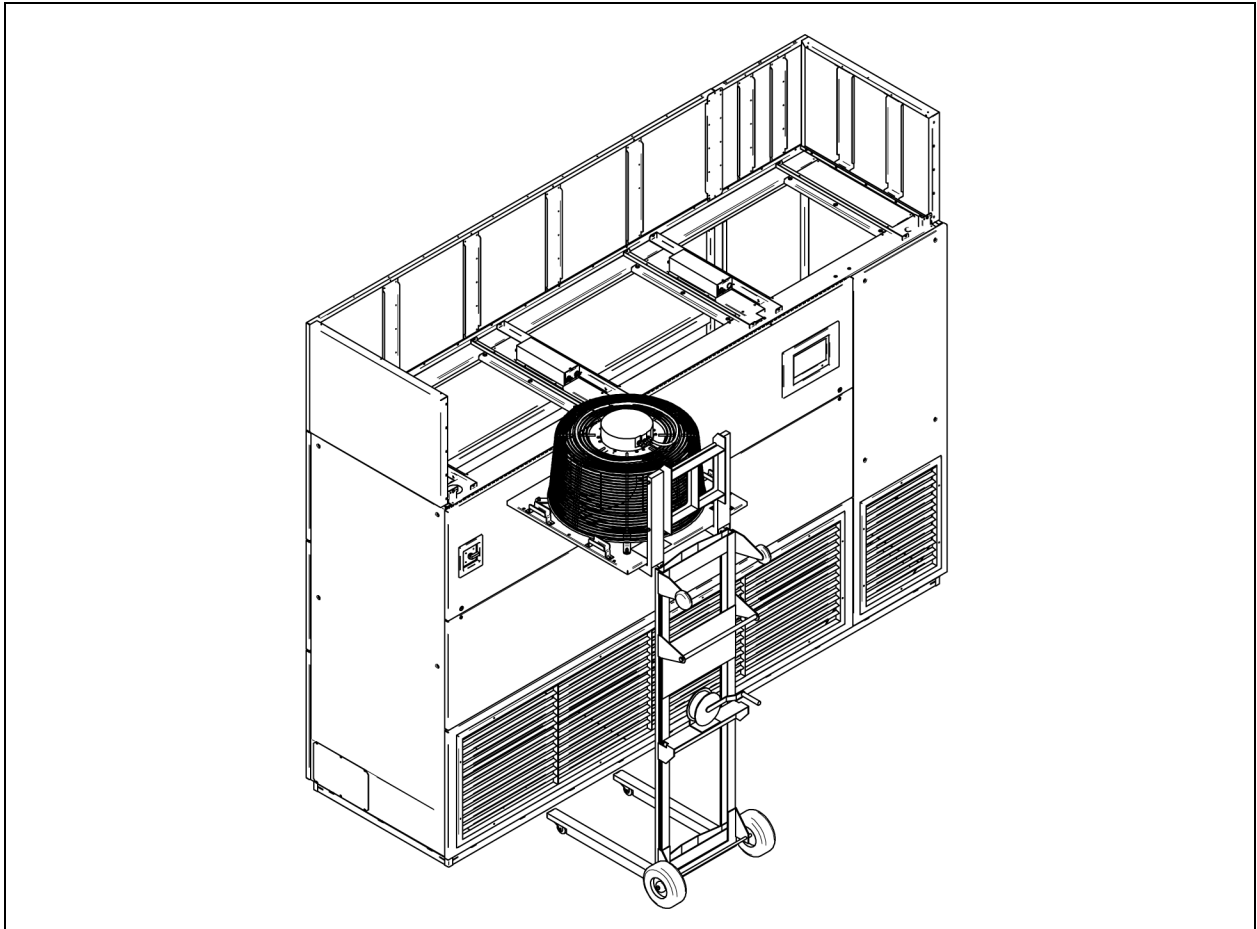
Item	Description
1	Bolt
2	Washer
3	Spacer

3. Position the lifting device so that it lines-up with the EC-fan assembly.

NOTE: A minimum clearance of 36 in. (914 mm) from the bottom of the unit to the top of the plenum is required for component access.

4. Using the handles on the EC-fan assembly, carefully lift the assembly over the hinge along the top of the unit, and slide the assembly onto the lifting device, **Figure 11.12** below .
5. Use the lifting device to lower the EC-fan assembly for transport to service or maintenance area.

Figure 11.12 EC Fan Assembly moved onto Lifting Device



11.3 Blower Drive System—Forward Curved Blowers

Periodic checks of the blower package include the belt, motor mounts, fan bearings and impellers.

The units are manufactured with factory-supplied, adjustable motor sheaves. Due to variations in application, you may want to substitute a fixed motor pulley for the adjustable sheave after you obtain and confirm the desired air flow. This substitution reduces vibration and wear on the belts and pulleys. Consult your Vertiv sales representative for more information.

11.3.1 Blower Motor Lubrication

- Motor is lubricated at the factory and does not require initial lubrication.
- Contact the motor manufacturer for the lubrication interval for motor bearings that have grease fittings.
- Contact the motor manufacturer to determine what type of grease to use for lubrication. Greases of different bases may not be compatible when mixed.

11.3.2 Belt Inspection

Check the drive belt monthly for signs of wear and for proper tension. With proper care, a belt should last several years.

Replace belts that appear worn or cracked with an identically-sized belt. Belts that are too tight can cause excessive wear.

To check belt tension:

Press the belt midway between the sheave and the pulley and check for movement from 1/2 in. to 1 in. (12 mm to 25 mm). If there is less than 1/2 in. (12 mm) of movement, the belt is too tight.

11.4 Electronic Variable Speed Drive - Inverter

An optional, variable-speed drive is available. This packaged unit is factory-set and should not require field adjustment. If you suspect a problem with the inverter, contact the factory.

To removing VSD from the unit:

1. Turn off power at the unit disconnect.
2. Open the unit accent panel and electric box cover.
3. Find the main fan motor wires, which are connected to the motor overload relay in the high-voltage section of the electric box.
 - a. Mark motor wires to ensure they can be reconnected in the same order.
 - b. Disconnect motor wires at the load side of the motor overload relay.
 - c. Close the electric box cover.
4. Remove the right front vertical panel to gain access to the variable speed drive.
5. With the panel removed, restore power to the unit by turning the disconnect on.
6. Place the right front vertical panel back on the unit.
7. Reconnect the motor wires to the overload and close the electric box cover and unit accent panel.
8. Restore power at the disconnect.

11.5 Infrared Humidifier Maintenance

During normal humidifier operation, deposits of mineral solids will collect in humidifier pan and on the float switch. These must be cleaned periodically to ensure proper operation. Frequency of cleaning must be locally established since it is dependent on humidifier usage and local water quality. A spare pan is recommended to reduce maintenance time at unit. The Liebert autoflush system can greatly increase the time between cleanings, but does not eliminate the need for periodic checks and maintenance (see Vertiv™ Liebert® iCOM™ user manual SL-31075 for autoflush setup). To help reduce excessive scaling in locations with difficult water quality, the use of Vapure is recommended (contact your local sales representative).



WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied disconnect switch is inside the unit. The line side of this switch contains live high-voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



CAUTION: Risk of contact with extremely hot water and part surfaces. Can cause burn injury. The infrared humidifier bulbs, metal enclosure, humidifier water, water reservoir pan and drain tubing are very hot during and shortly after operation. Allow sufficient time for these parts to cool to a touch-safe temperature before handling. Use extreme caution, and wear appropriate, OSHA-approved PPE when performing maintenance on the infrared humidifier.

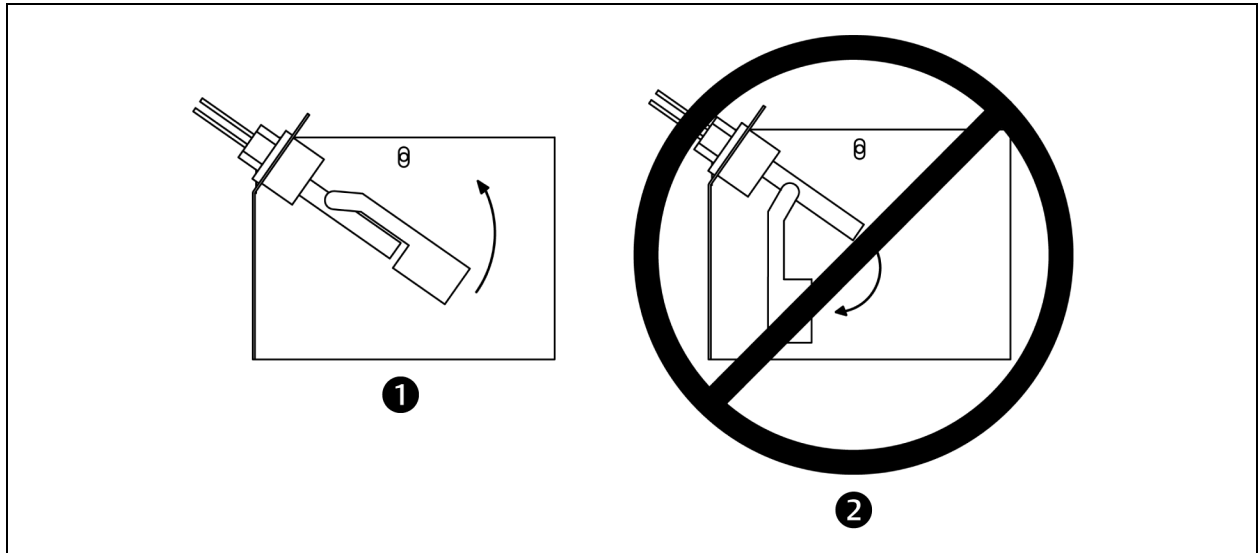
11.5.1 Cleaning Humidifier Pan and Float Switch

Before turning the unit Off:

1. With unit operating, remove call for humidification at the Liebert® iCOM™ control.
2. Let the blower operate 5 minutes to allow the humidifier and water to cool.
3. If unit has a condensate pump, turn unit OFF at Liebert® iCOM™ control.
4. Pull out the humidifier standpipe in pan.
5. Inspect the O-ring (replace if necessary).
6. Let the pan drain and condensate pump operate (if applicable).
7. Disconnect power from the unit.
8. Disconnect the drain coupling from the bottom of the pan.
9. Remove the thermostat from the bottom of the pan and the retaining screws from the sides of the pan.
10. Slide the pan out.
11. Loosen scale on side and bottom of pan with a stiff nylon brush or plastic scraper.
12. Flush with water.
13. Carefully clean scale off float switch (make sure to reinstall correctly (see **Figure 11.13** on the next page).

14. Reinstall the pan, thermostat, standpipe, drain coupling and screws into the humidifier.
15. Operate the humidifier and check for leaks.

Figure 11.13 Correct Float Switch Orientation



Item	Description
1	Correct switch orientation
2	Incorrect switch orientation

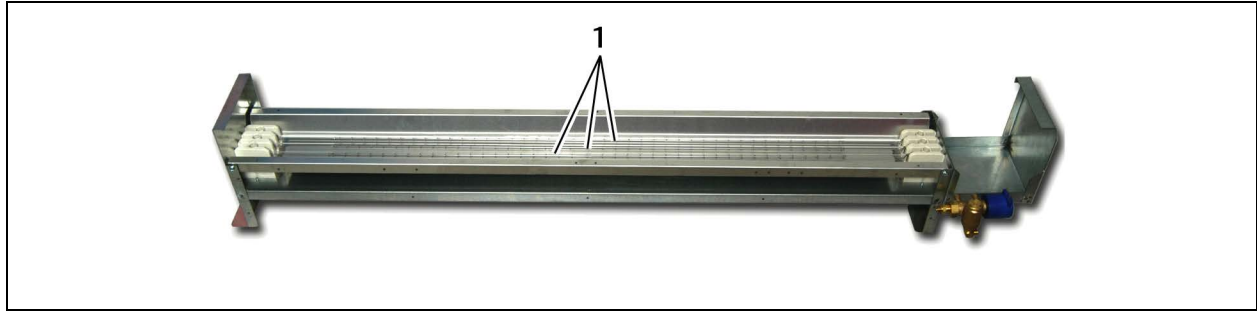
11.5.2 Changing Humidifier Lamps

NOTE: Touching quartz lamps with bare hands will severely shorten bulb life. Skin oils create hot spots on lamp surface. Wear clean cotton gloves when handling lamps.

The lamps are shown in **Figure 11.14** on the facing page .

1. Remove humidifier pan (see [Cleaning Humidifier Pan and Float Switch](#) on the previous page , steps 1 through 10).
2. Disconnect power from unit.
3. At humidifier, remove screws and cover from high-voltage compartment.
4. Disconnect one end of purple jumper wires.
5. Using a continuity meter, locate burned out lamp.
6. Remove lamp brackets under lamps.
7. Loosen two screws securing lamp lead wires to junction block.
8. Pull bulb straight down and discard.
9. Wrap lead wires once around new lamp’s metal ends. This will support lamp and allow for thermal expansion. Insert lead wires into junction block and torque screws to 30 in-lb.
10. Reassemble by reversing steps 1 through 9 .

Figure 11.14 Infrared Humidifier Lamps



Item	Description
1	Infrared bulbs

11.6 Condensate Drain and Condensate Pump System Maintenance

11.6.1 Condensate Drain

Check for and clear obstructions in tubing during routine maintenance.

11.6.2 Condensate Pump



WARNING! Risk of electric shock. Can cause injury or death. Open all local and remote electric power-supply disconnect switches and verify that power is Off with a voltmeter before working within the condensate pump electrical connection enclosure. The Vertiv™ Liebert® iCOM™ does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™.

To maintain the condensate pump:

1. Disconnect power to the unit using the disconnect switch.
2. Check for and clear obstructions in gravity lines leading to the condensate pump.
3. Remove the sump, clean with a stiff nylon brush and flush with water.
4. Inspect and clear clogs in the discharge check valve and float mechanism.
5. Reassemble and check for leaks.

11.7 Facility Fluid and Piping Maintenance for Water and Glycol Systems

Maintaining the system fluid quality is required throughout the life of the system. Fluid and piping system maintenance schedules must be established and performed. A coolant-fluid maintenance program must be established that will evaluate fluid chemistry and apply necessary treatment. The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water-treatment specialist and follow a regularly-scheduled coolant-fluid system-maintenance program.

Perform periodic inspections of the facility and the unit coil and/or heat exchanger and coolant-fluid piping system for leaks and visible damage.

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12 Preventive Maintenance Checklist

Source: DPN002952, Rev. 4

Inspection Date	Job Name		
Indoor Unit Model #	Indoor Unit Serial Number #		
Room Temperature/Humidity	°	%	Ambient Temperature °

Not all units will have all components. To determine your unit's configuration, compare the [Indoor Unit Model #](#) above and the information in the Components and Nomenclature section.

Good maintenance practices are essential to minimizing operation cost and maximizing product life. Read and follow all applicable maintenance checks listed below. At a minimum, these checks should be performed semi-annually. However, maintenance intervals may need to be more frequent based on site-specific conditions. Review the unit user manual for further information on unit operation. We recommend the use of trained and authorized service personnel, extended service contracts, and factory-certified replacement parts. Contact your local sales representative for more details.

Check all that apply:

Evaporator/Filters

1. Check/Replace filters.
2. Grille area unrestricted.
3. Wipe section clean.
4. Coil clean.
5. Clean condensate pan.
6. Clean trap in condensate drain.
7. Check/Test filter-clog switch operation (if equipped).

Blower Section (EC fan)

1. Mounting bolts tight.
2. Fan-guard bolts tight.
3. Impeller spins freely.
4. Check/Test air sail switch (if equipped).
5. Motor amp draw
 - Compare to nameplate amps

#1	L1	L2	L3
#2	L1	L2	L3
#3	L1	L2	L3

Blower Section (forward-curved)

1. Blower wheels free of debris.
2. Check belt tension and condition (replace if needed).
3. Check/Lube bearings.
4. Check/Lube motor (if supplied with grease ports). Check motor manufacturer’s web site for procedure, amount and type of grease required.
5. Check sheave/pulley (replace if worn).
6. Check motor mount.
7. Check/Test air sail switch.
8. Motor amp draw
 - Compare to nameplate amps

#1	L1	L2	L3
#2	L1	L2	L3
#3	L1	L2	L3

Reheat

1. Inspect elements.
2. Check wire connections (inside reheat box).
3. Reheat amp draw.

L1	L2	L3
L1	L2	L3

Infrared Humidifier (if equipped)

1. Check drain lines and trap for damage/clogs/leaks.
2. Check/Clean pan for mineral deposits.
3. Clean reflector.
4. Check water make-up valve/supply lines/connections for leaks.
5. Check humidifier lamps (replace if burnt out).
6. Check/Re-torque wire connections (inside humidifier box).
7. Check humidifier high-water alarm operation.
8. Humidifier amp draw

L1	L2	L3
----	----	----

Condensate Pump (if equipped)

1. Check for debris in sump.
2. Check operation of float(s) (free movement).
3. Check/Clean discharge check valve.

Electrical Panel

1. Check fuses.
2. Check contactors for pitting (replace if pitted).
3. Check/Re-torque wire connections.

Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road

Wanchai, Hong Kong

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Appendix B: Submittal Drawings

Table B.1 below, groups the drawings by topic/application.

Table B.1 Submittal Drawings Contents

Document Number	Title
Component Location	
DPN002869	Component Location, Download Models
DPN002868	Component Location, Upflow Models
Planning Dimensions-Downflow Units with EC Fans	
DPN003192	Cabinet Dimensional Data, CW038 to CW084
DPN003222	Cabinet Dimensional Data, Front Discharge, CW038 and CW041
DPN003223	Cabinet Dimensional Data, Front Discharge, CW051, CW060, CW076, and CW084
DPN003193	Cabinet Dimensional Data, CW106, and CW114
DPN003224	Cabinet Dimensional Data, Front Discharge, CW106 and CW114
DPN003208	Cabinet Dimensional Data, CW146 and CW181
DPN003225	Cabinet Dimensional Data, Front Discharge, CW146 and CW181
Planning Dimensions-Upflow Units with EC Fans	
DPN003215	Cabinet Dimensional Data, CW038 to CW084
DPN003216	Cabinet Dimensional Data, CW106 and CW114
Planning Dimensions-Upflow Units with Forward-curved Blowers	
DPN003194	Cabinet Dimensional Data, CW038 to CW084
DPN003195	Cabinet Dimensional Data, CW106 and CW114
Planning Dimensions-Floor Stands for Units with EC Fans	
DPN003212	Floorstand Dimensional Data, Downflow Models, CW038 to CW041
DPN003211	Floorstand Dimensional Data, Downflow Models, CW051 and CW060
DPN003210	Floorstand Dimensional Data, Downflow Models, CW076 and CW084
DPN003191	Floorstand Dimensional Data, Downflow Models, CW106 and CW114
DPN003207	Floorstand Dimensional Data, Downflow Models, CW146 and CW181
Planning Dimensions-Floor Stands for Units with Forward-curved Blowers	
DPN001676	Floorstand Dimensional Data, CW038 to CW084
DPN001677	Floorstand Dimensional Data, CW106 and CW114

Table B.1 Submittal Drawings Contents (continued)

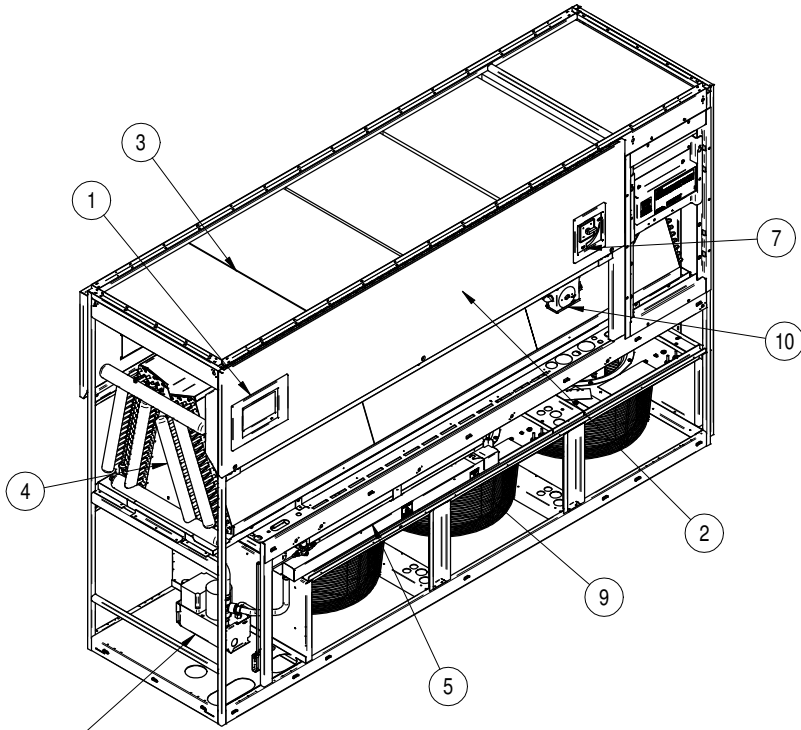
Document Number	Title
Planning Dimensions-Plenums for Units with EC Fans	
DPN004604	Plenum Dimensional Data, Downflow Models, CW038 to CW084
DPN004605	Plenum Dimensional Data, Downflow Models, CW106 and CW114
DPN003214	Plenum Dimensional Data, Upflow Models, CW038 to CW084
DPN003213	Plenum Dimensional Data, Upflow Models, CW106 and CW114
Planning Dimensions-Plenums for Units with Forward-curved Blowers	
DPN003204	Plenum Dimensional Data, Upflow Models, CW038 to CW084
DPN003205	Plenum Dimensional Data, Upflow Models, CW106 and CW114
Piping Schematics	
DPN004561	Piping Schematic, Downflow, CW038 to CW114
DPN004138	Piping Schematic, Downflow, CW146 and CW181
DPN004562	Piping Schematic, Upflow, CW038 to CW114
Piping Connections-Downflow Units with EC Fans	
DPN002036	Connection Locations, CW038 to CW041
DPN002035	Connection Locations, CW051 and CW060
DPN002034	Connection Locations, CW075 to CW084
DPN001628	Connection Locations, CW106 and CW114
DPN001693	Connection Locations, CW146 and CW181
Piping Connections-Upflow Units	
DPN001668	Connection Locations, CW038 to CW084
DPN004324	Connection locations, CW038 to CW084 with EC fans
DPN001669	Connection Locations, CW106 and CW114
Electrical Connections-Downflow Units	
DPN004548	Electrical Field Connections, Downflow CW038 to CW084
DPN004549	Electrical Field Connections, Downflow, CW106 and CW114
DPN004550	Electrical Field Connections, Downflow, CW146 and CW181
Electrical Connections-Upflow Units	
DPN003200	High-voltage Connections, Upflow, CW038 to CW084
DPN004552	Low-voltage and Ethernet Connections, Upflow, CW038 to CW084
DPN003202	High-voltage Connections, Upflow, CW106 and CW114
DPN004551	Low-voltage and Ethernet Connection, Upflow, CW106 and CW114

Table B.1 Submittal Drawings Contents (continued)

Document Number	Title
Unit-to-Unit Networking	
DPN004351	Liebert® iCOM™ Unit-to-unit Network Connections
Liebert® CW Seismic Application	
DPN003209	Seismic Application Assumptions and Requirements

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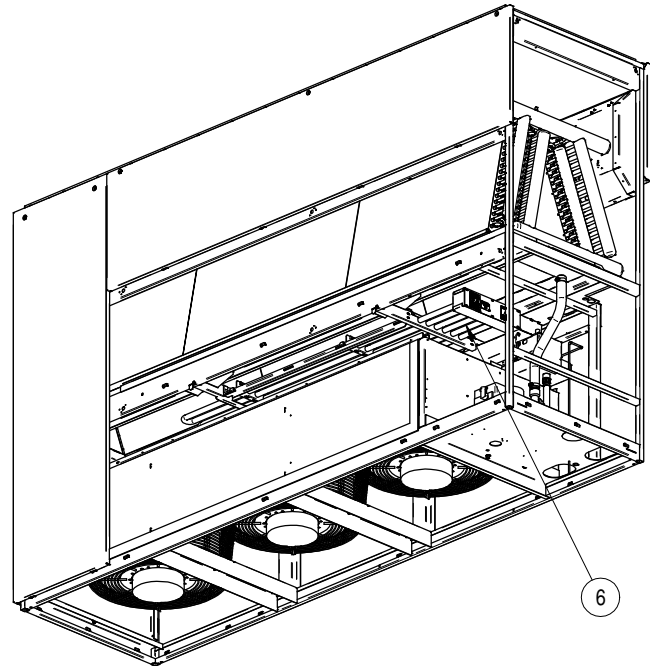
COMPONENT LOCATION DOWNFLOW MODELS



Front View

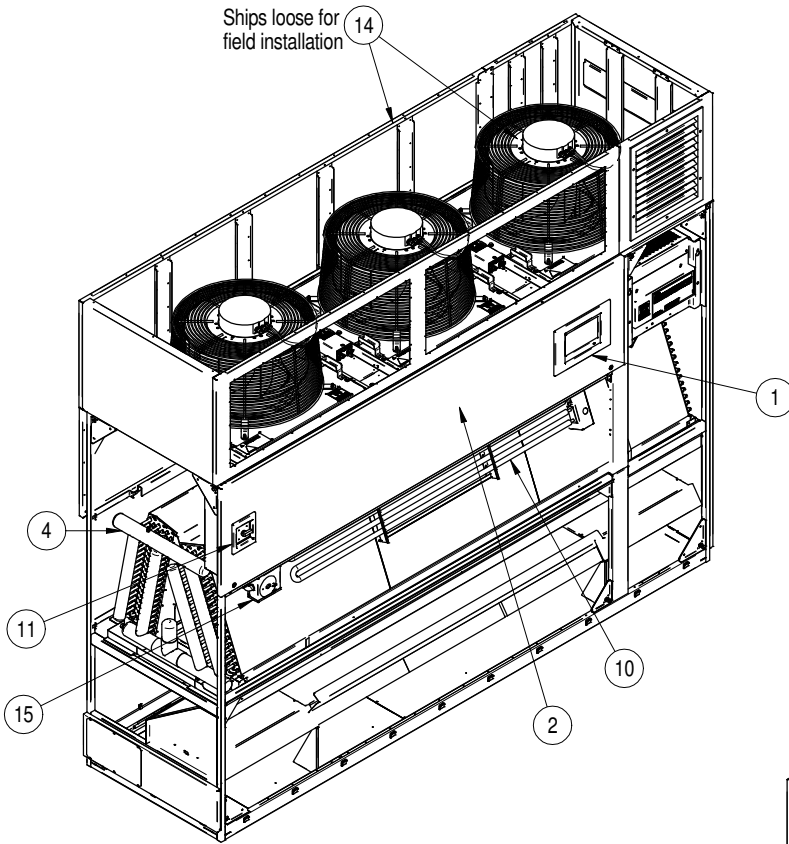
1.	Liebert® iCOM™ Control Display
2.	Electric Box
3.	Filters
4.	Coil
5.	Infrared Humidifier (optional)
6.	Reheat (optional)
7.	Disconnect
8.	Condensate Pump (optional)
9.	EC Fans
10.	Smoke Detector (optional)

8 Ships loose for field installation on CW038-CW060 units.



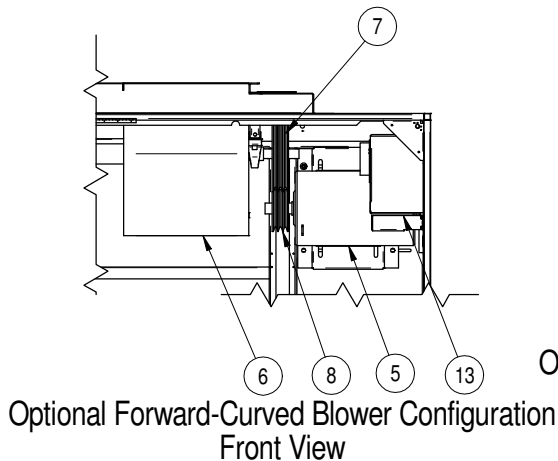
Rear View

COMPONENT LOCATION UPFLOW MODELS

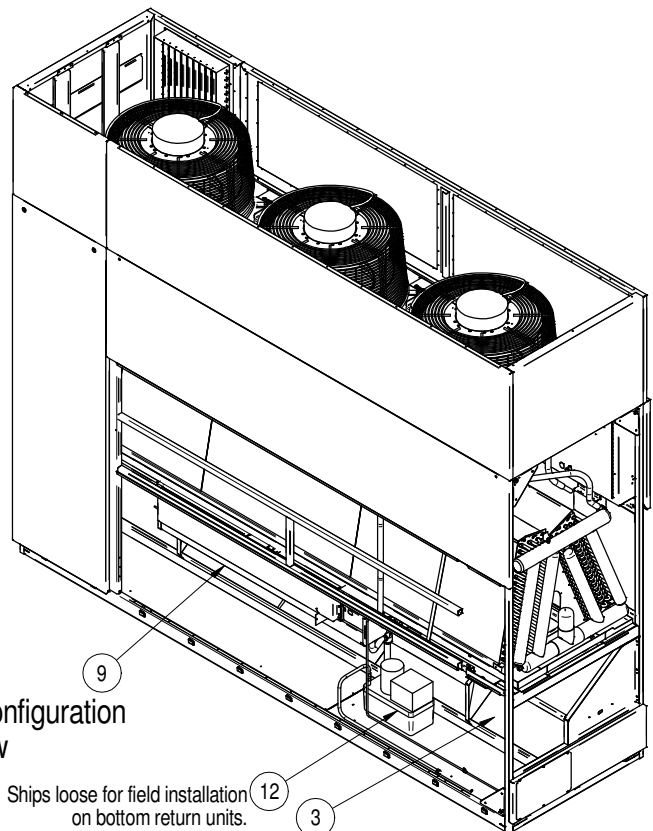


1.	Liebert® iCOM™ Control Display
2.	Electric Box
3.	Filters
4.	Coil
5.	Motor
6.	Blower
7.	Fan Pulley
8.	Motor Sheave & Belts
9.	Infrared Humidifier (optional)
10.	Reheat (optional)
11.	Disconnect (optional)
12.	Condensate Pump (optional)
13.	Variable Frequency Drive (optional)
14.	Plenum with EC Fans (optional)
15.	Smoke Detector (optional)

Optional EC Fan Configuration
Front View

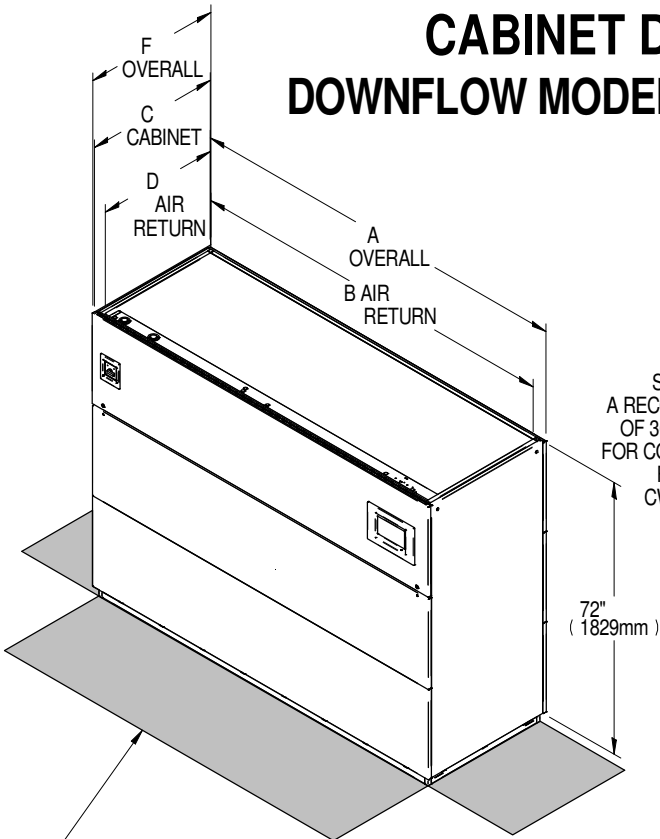


Optional Forward-Curved Blower Configuration
Front View

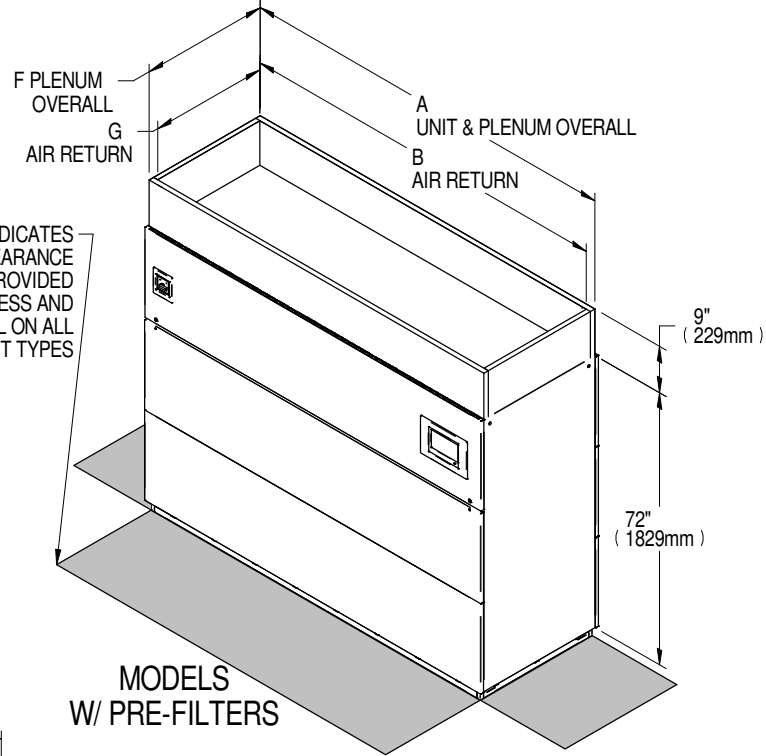


Optional EC Fan Configuration
Rear View

**CABINET DIMENSIONAL DATA
DOWNFLOW MODELS CW038 - CW084 W/ EC FANS**



UNIT DIMENSIONAL DATA



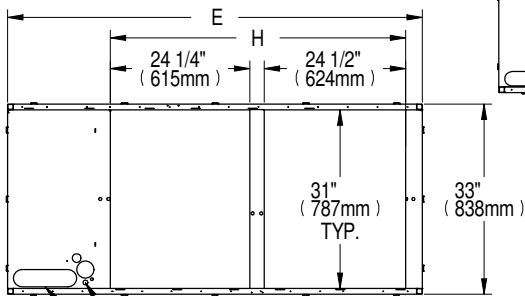
**MODELS
W/ PRE-FILTERS**

SHADED AREA INDICATES A RECOMMENDED CLEARANCE OF 36" (914mm) BE PROVIDED FOR COMPONENT ACCESS AND FILTER REMOVAL ON ALL CW026-CW084 UNIT TYPES

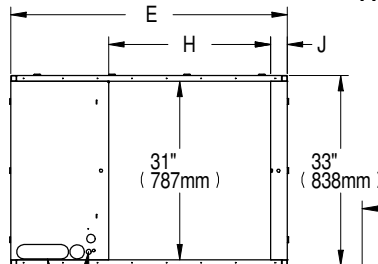
SHADED AREA INDICATES A RECOMMENDED CLEARANCE OF 36" (914mm) BE PROVIDED FOR COMPONENT ACCESS AND FILTER REMOVAL ON ALL CW026-CW084 UNIT TYPES

NOTES:

1. MINIMUM CLEARANCE OF 24" (610mm) REQUIRED BELOW THE UNIT TO LOWER THE FANS. FANS MAY ALSO REMAIN IN UNIT IF DESIRED.
2. VIEWS OF ELECTRICAL & AIR DISCHARGE OPENINGS ARE FROM INSTALLER'S POINT OF VIEW.

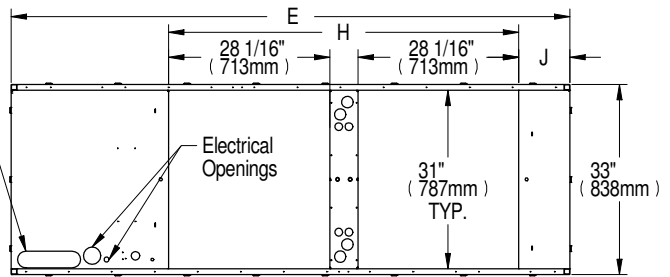


**FRONT OF UNIT
CW051 - 060**



**FRONT OF UNIT
CW038 - 041**

Electrical Openings
Standard Piping Opening



**FRONT OF UNIT
CW076 - 084**

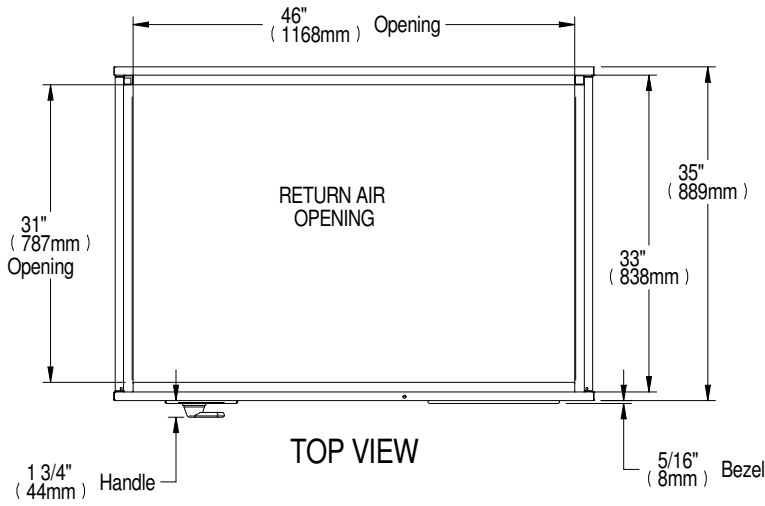
Electrical Openings
Standard Piping Opening

STANDARD PIPING, ELECTRICAL & AIR DISCHARGE OPENINGS

CHILLED WATER MODEL	DIMENSIONAL DATA inches (mm)									NET WT. lb. (kg)
	A	B	C	D	E	F	G	H	J	
CW038	50 (1270)	46 (1168)			48 (1219)			28 (711)	2 7/8 (73)	840 (381)
CW041					900 (408)					
CW051	74 (1880)	70 (1778)	35 (889)	32 (813)	72 (1829)	35 5/8 (905)	31 (787)	51 1/4 (1302)		1220 (553)
CW060					1250 (567)					
CW076	99 (2515)	95 (2413)			97 (2464)			60 3/4 (1543)	8 7/8 (225)	1440 (653)
CW084					1540 (690)					

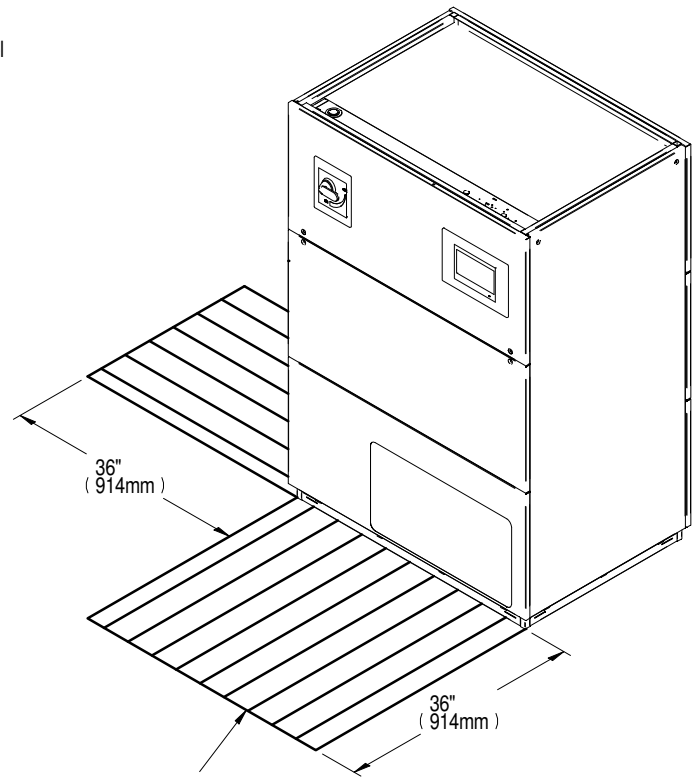
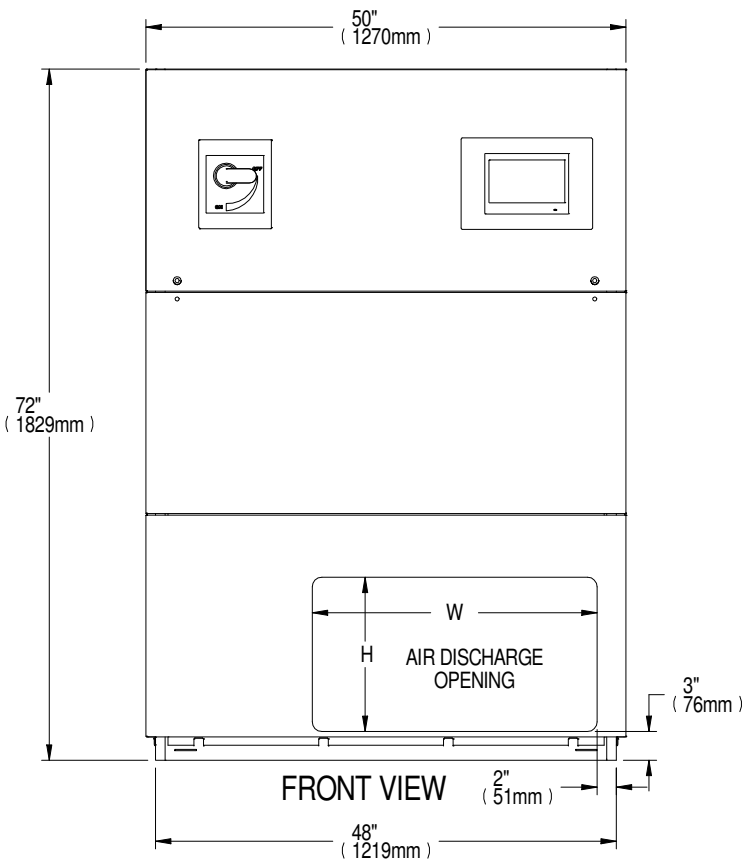
Standard Piping Opening
Electrical Openings

CABINET DIMENSIONAL DATA
DOWNFLOW CW038 - CW041 W/ EC FANS & FRONT DISCHARGE



Notes:

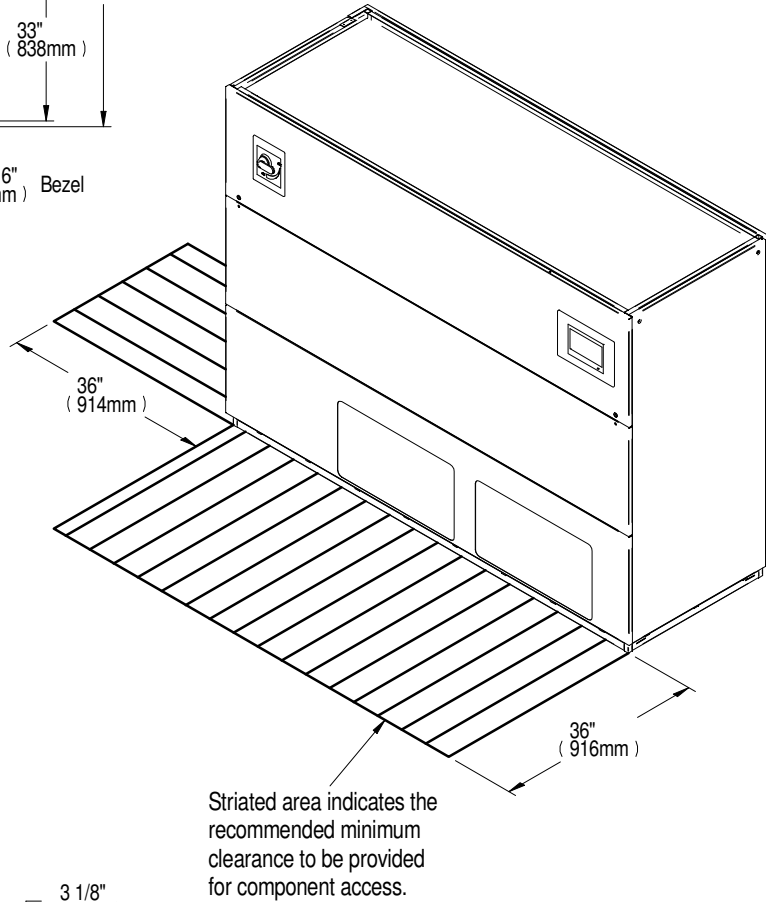
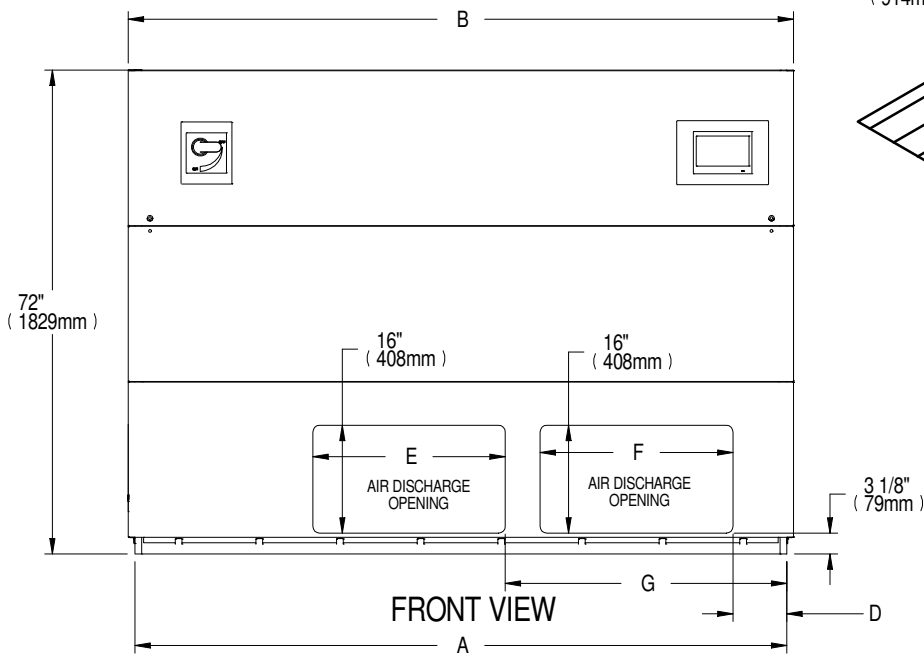
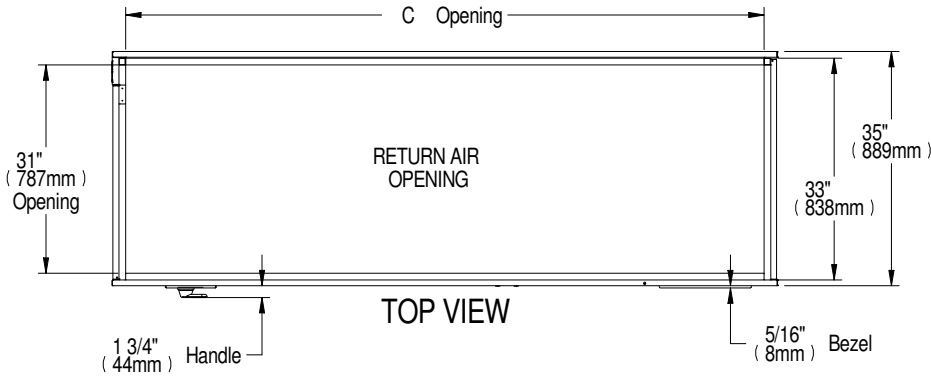
1. Customer piping and wiring connections
 - a) Standard bottom connections require unit to be placed on a minimum of a 9" floorstand.
 - b) If unit is to be placed directly on the floor, additional modifications are required to relocate customer connections. Contact your local Vertiv™ Sales Representative.



Striated area indicates the recommended minimum clearance to be provided for component access.

Model	H	W	Dry Weight lbs. (kg)
CW038	16-1/16" (408mm)	29-11/16" (754mm)	840 (381)
CW041			900 (408)

CABINET DIMENSIONAL DATA
DOWNFLOW CW051 - CW084 W/ EC FANS & FRONT DISCHARGE

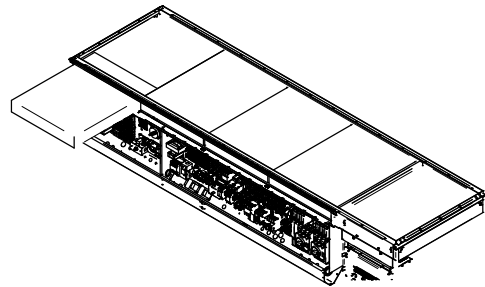
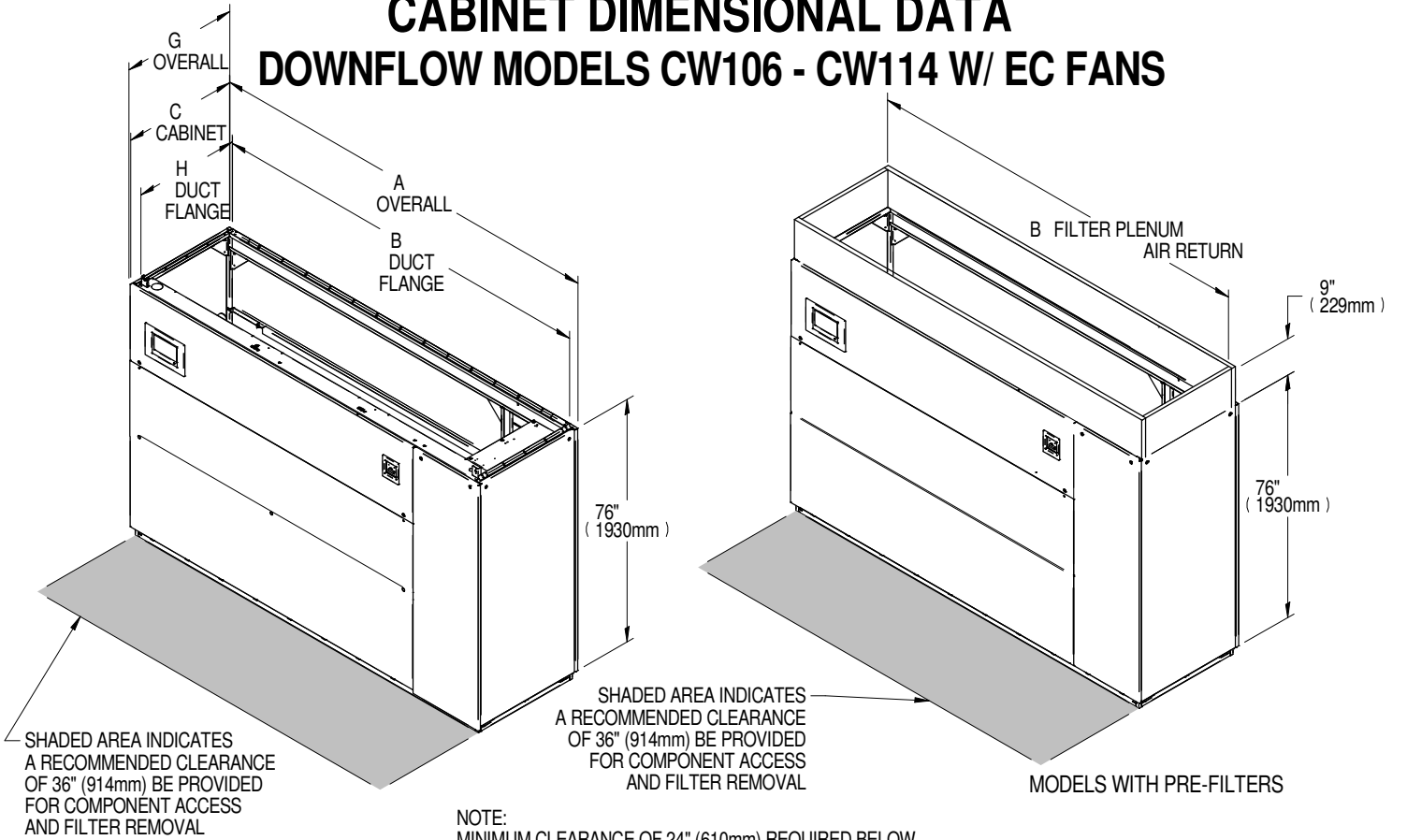


Notes:

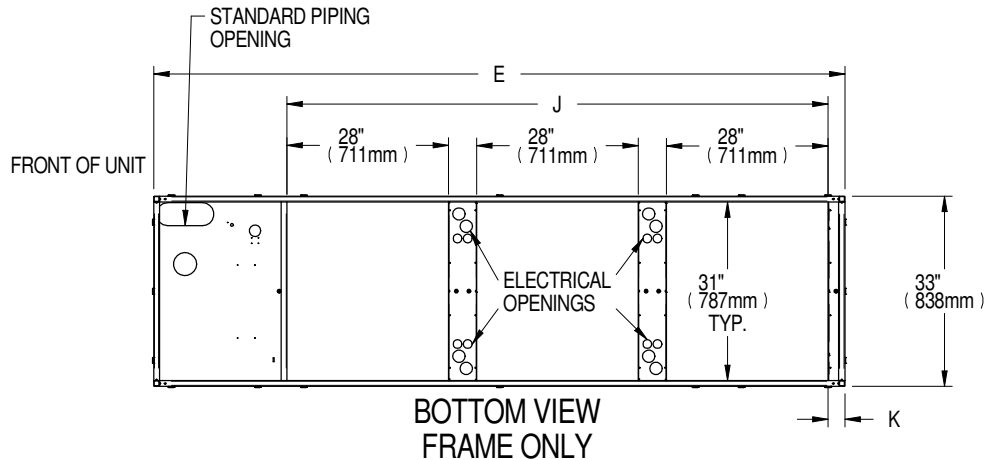
1. Customer piping and wiring connections
 - a) Standard bottom connections require unit to be placed on a minimum of a 9" floorstand.
 - b) If unit is to be placed directly on the floor, additional unit modifications are required to relocate customer connections. Contact your local Vertiv™ Sales Representative.

CHILLED WATER MODEL	DIMENSIONAL DATA inches (mm)							DRY WEIGHT lbs. (kg)
	A	B	C	D	E	F	G	
CW051	72 (1829)	74 (1880)	70 (1778)	2 (51)	25 (636)	25.3 (643)	30.1 (764)	1220 (553)
CW060								1250 (567)
CW076	97 (2464)	99 (2515)	95 (2413)	8 (203)	28.6 (727)	28.8 (730)	41.9 (1064)	1440 (653)
CW084								1540 (690)

**CABINET DIMENSIONAL DATA
DOWNFLOW MODELS CW106 - CW114 W/ EC FANS**

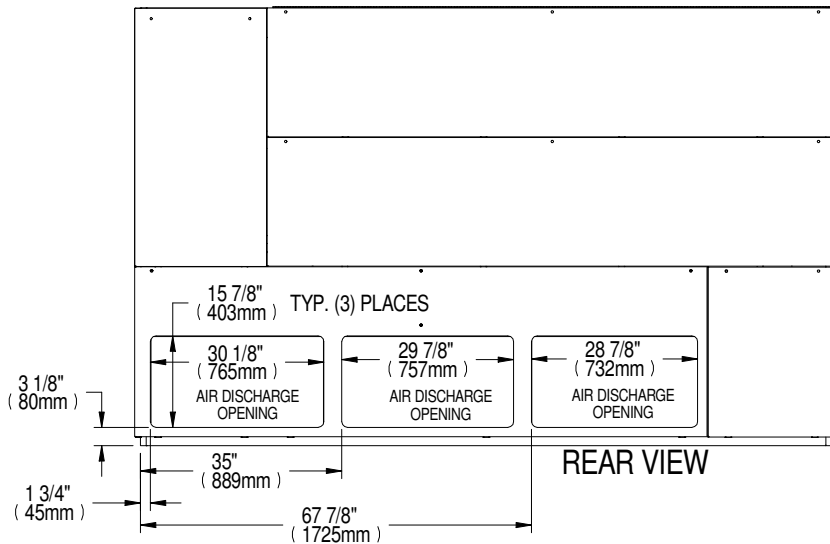
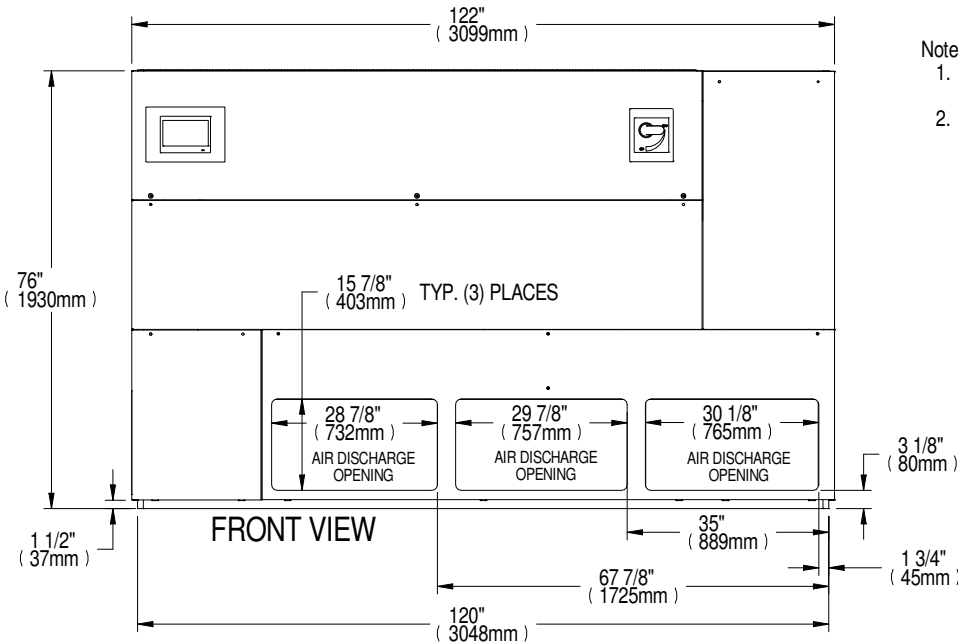
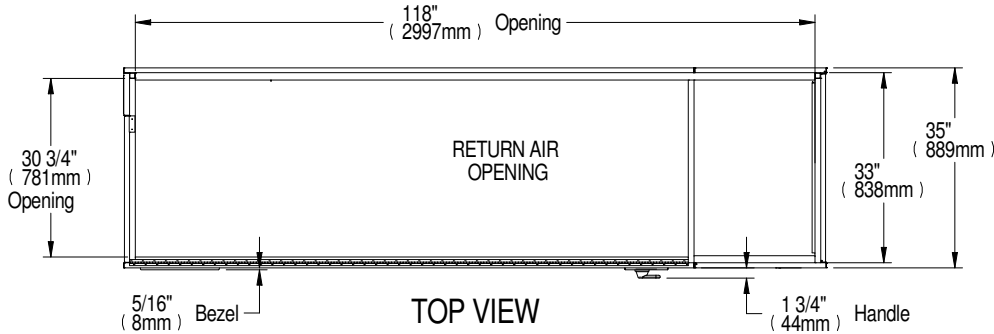


- NOTE:
1. FILTERS ARE ACCESSIBLE THRU FRONT OF UNIT. ACCESS PANEL LOCATED ABOVE ELECTRICAL PANEL.
 2. ELECTRICAL CONNECTIONS CAN BE MADE FROM TOP OR BOTTOM OF UNIT.



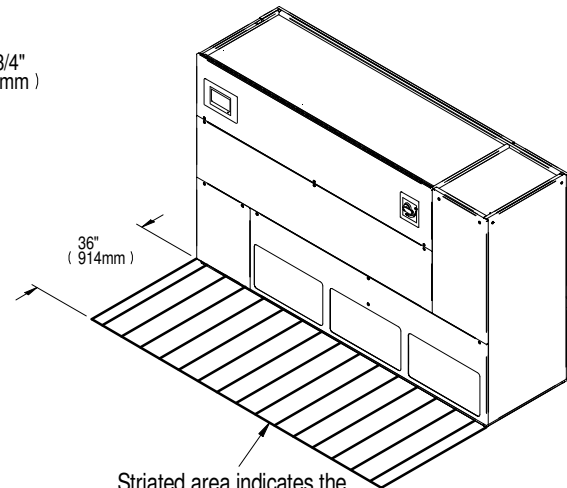
CHILLED WATER MODEL	DIMENSIONAL DATA inches (mm)										NET WEIGHT lbs. (kg)
	A	B	C	D	E	F	G	H	J	K	
CW106	122 (3099)	118 (2997)	35 (889)	31 (787)	120 (3048)	33 (838)	34-3/4 (883)	32 (813)	94 (2388)	2.88 (73)	1785 (810)
CW114											1925 (873)

CABINET DIMENSIONAL DATA
DOWNFLOW CW106 - CW114 W/ EC FANS & FRONT DISCHARGE



Notes:

1. Filters are accessible from front of unit only.
2. Customer piping and wiring connections
 - a) Standard bottom connections require unit to be placed on a minimum of a 9" floorstand.
 - b) If unit is to be placed directly on the floor, additional unit modifications are required to relocate customer connections. Contact your local Vertiv™ Sales Representative.



Striated area indicates the recommended minimum clearance to be provided for component access.

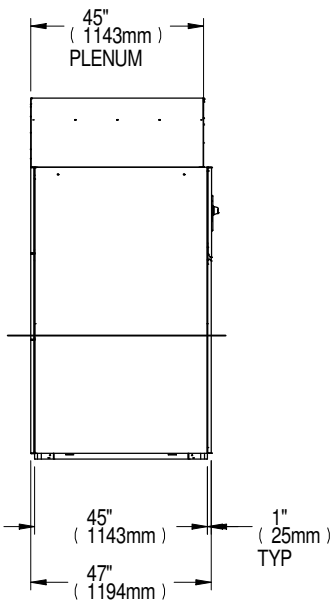
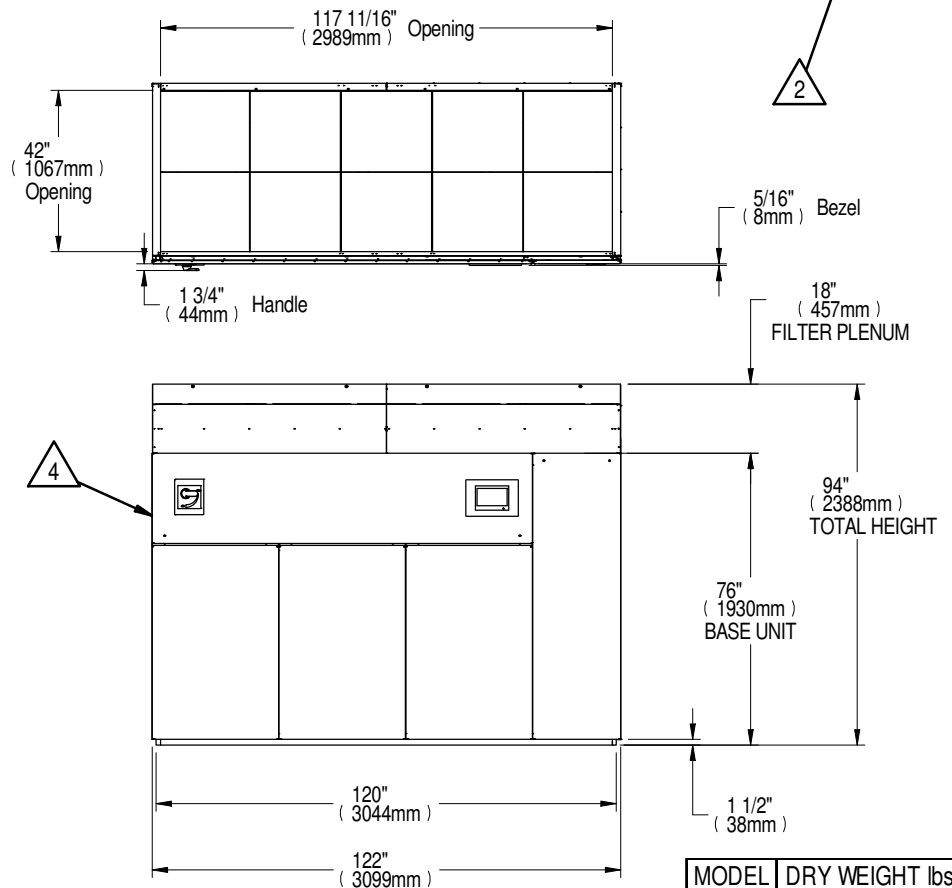
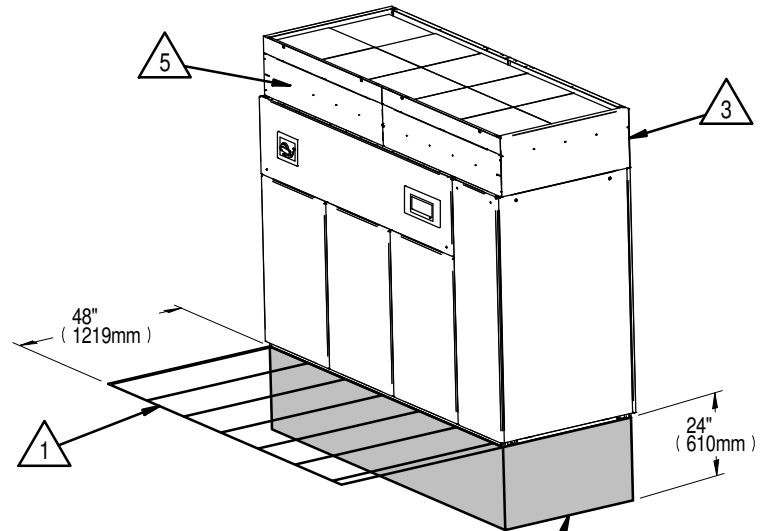
Model	Dry Weight lbs. (kg)
CW106	1785 (810)
CW114	1925 (873)

CABINET DIMENSIONAL DATA

DOWNFLOW CW146 & CW181 W/ EC FANS AND FILTER PLENUM (plenum shipped separately)

Notes:

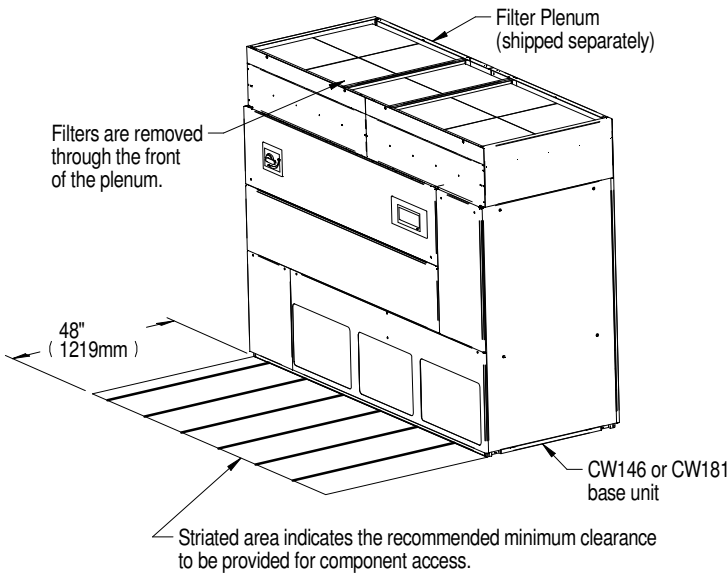
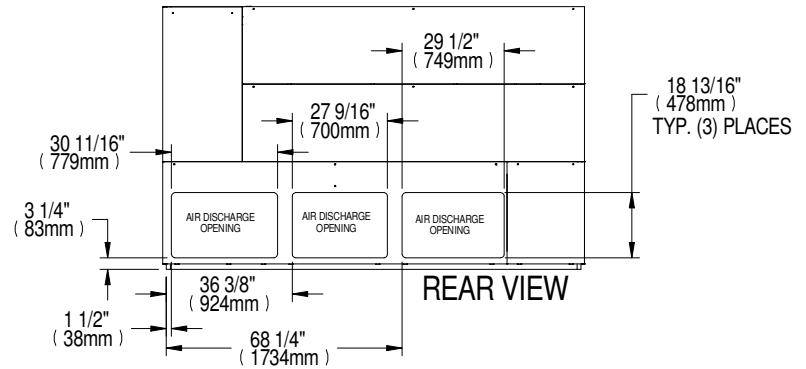
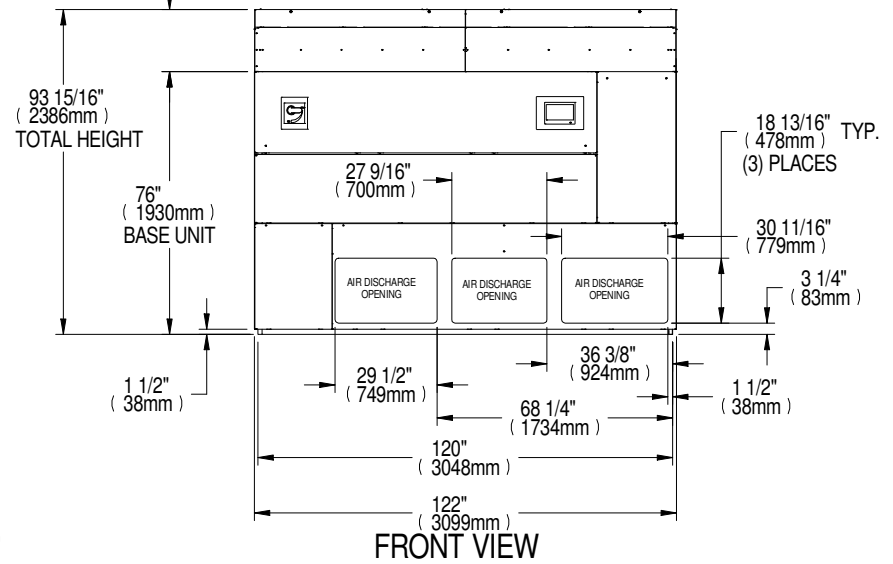
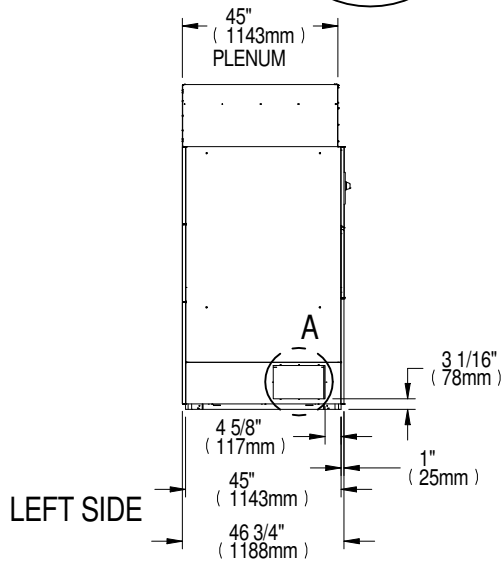
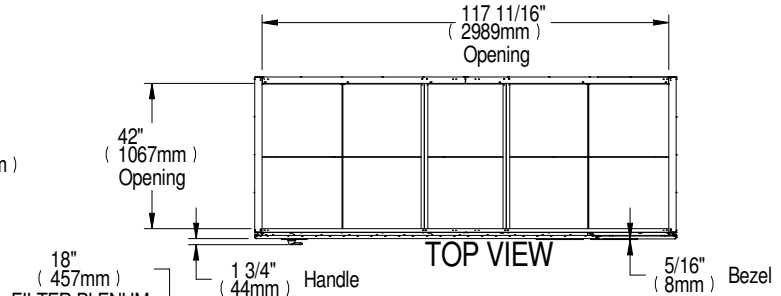
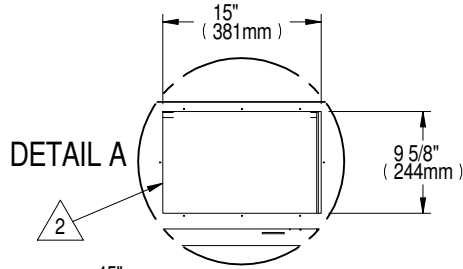
- 1. Striated area indicates the recommended minimum clearance to be provided for component access.
- 2. Shaded area indicates the required minimum clearance below the unit to lower the fans into the floor. Fans may also remain in their shipped position if desired.
- 3. Filter Plenum shipped separately
- 4. CW146 or CW181 base unit
- 5. Filters are removed through the front of the plenum.
- 6. Reference DPN001693 for the electrical and plumbing requirements.



MODEL	DRY WEIGHT lbs. (kg)
CW146	2520 (1143)
CW181	

CABINET DIMENSIONAL DATA

DOWNFLOW CW146 & CW181 W/ EC FANS & FRONT DISCHARGE

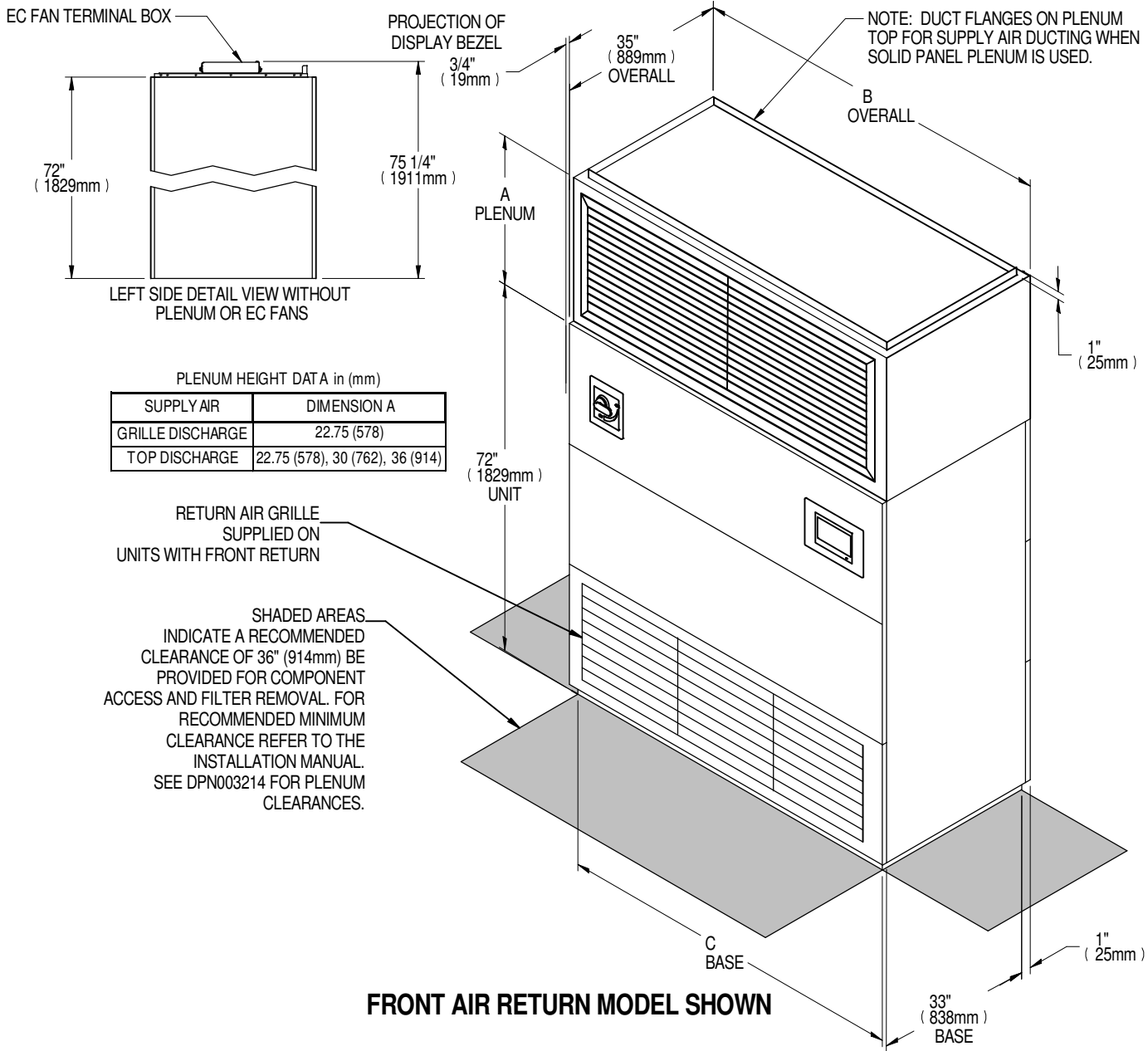


Notes:

- Standard bottom connections require unit to be placed on a minimum of 9" floorstand.
- If unit is to be placed on the floor an opening is provided in front left end panel for piping and high voltage wire routings (See Detail A).
- customer must drill holes in right end panel to route low volt connections to standard location (must be routed separate from any high voltage wires).

MODEL	DRY WEIGHT lbs. (kg)
CW146	2520 (1143)
CW181	

CABINET DIMENSIONAL DATA UPFLOW MODELS CW038 - CW084 W/ EC FANS

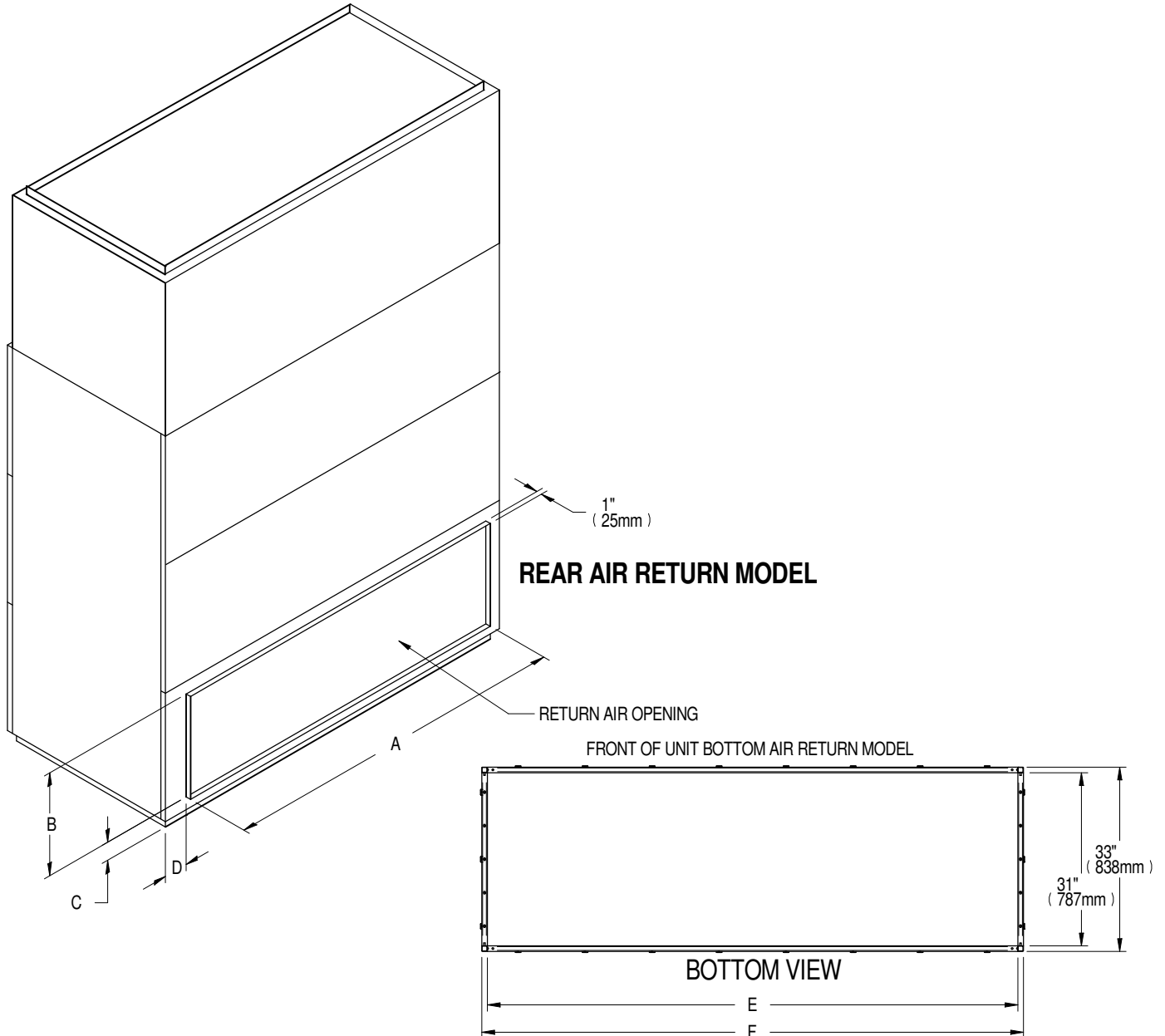


PLENUM HEIGHT DATA in (mm)

SUPPLY AIR	DIMENSION A
GRILLE DISCHARGE	22.75 (578)
TOP DISCHARGE	22.75 (578), 30 (762), 36 (914)

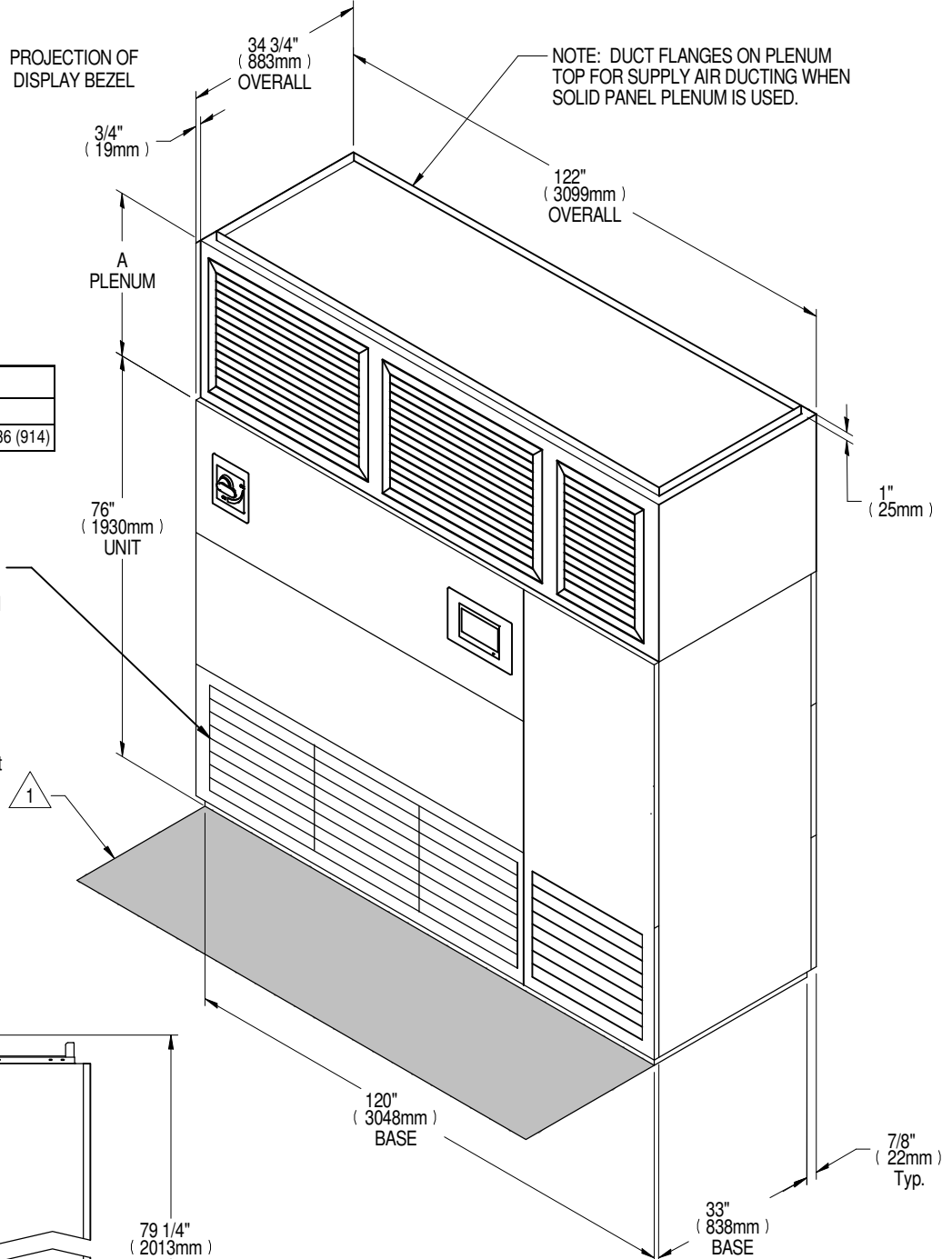
MODEL	UNIT DIMENSIONAL DATA in. (mm)		NET WEIGHT lbs. (kg)	
	B	C	UNIT ONLY	UNIT W/ PLENUM & FANS
CW038	50 (1270)	48 (1219)	542 (246)	774 (351)
CW041			589 (267)	821 (372)
CW051	74 (1880)	72 (1829)	755 (342)	1118 (507)
CW060			827 (375)	1190 (540)
CW076	99 (2515)	97 (2464)	1141 (518)	1566 (710)
CW084			1239 (562)	1664 (755)

CABINET DIMENSIONAL DATA UPFLOW MODELS CW038 - CW084 W/ EC FANS



CHILLED WATER MODEL	Dimensional Data in. (mm)					
	A	B	C	D	E	F
CW038	44 (1118)	18 (457)	5 (127)	3 (76)	46 (1168)	48 (1219)
CW041					70 (1778)	72 (1829)
CW051	68 (1727)	20 (508)	4 (102)		70 (1778)	72 (1829)
CW060	86 (2184)	18 (457)	5 (127)	6-1/2 (165)	95 (2413)	97 (2464)
CW076						
CW084						

CABINET DIMENSIONAL DATA UPFLOW MODELS CW106 & CW114 W/ EC FANS

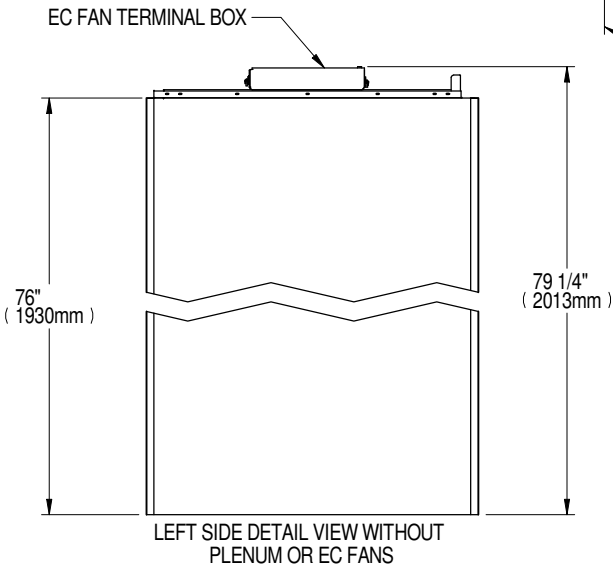


PLENUM HEIGHT DATA in (mm)

SUPPLY AIR	DIMENSION A
GRILLE DISCHARGE	22.75 (578)
TOP DISCHARGE	22.75 (578), 30 (762), 36 (914)

Note:

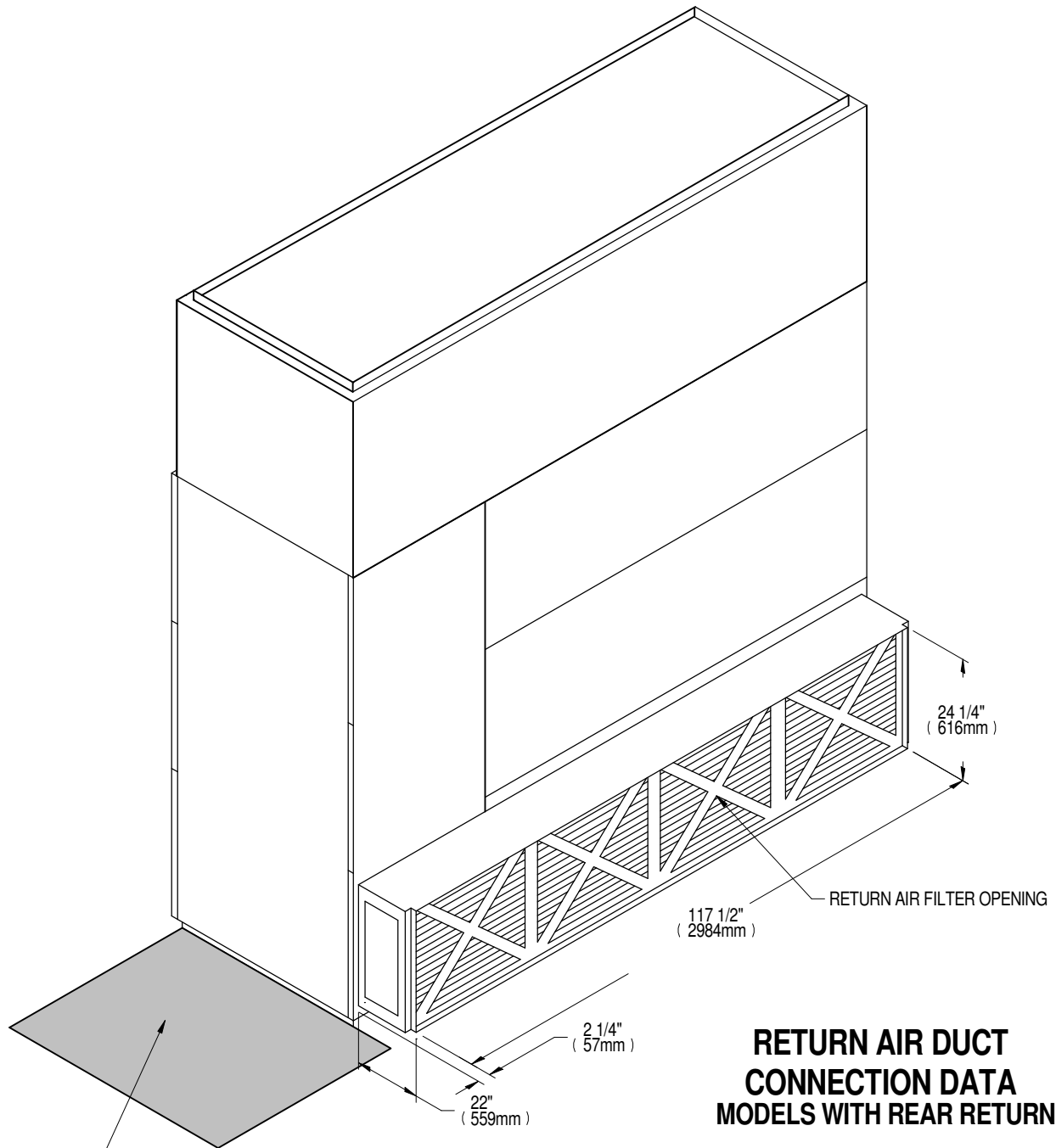
1. Shaded areas indicate a recommended minimum CLEARANCE OF 36" (914mm) for component access from the bottom of the unit to the top of the plenum.



FRONT AIR RETURN MODEL SHOWN

Model	Net Wt lbs. (kg)	
	Unit Only	Unit w/ Plenum & Fans
CW106	1240 (562)	1827 (829)
CW114	1375 (624)	1962 (890)

**CABINET DIMENSIONAL DATA
UPFLOW MODELS CW106 & CW114 W/ EC FANS**

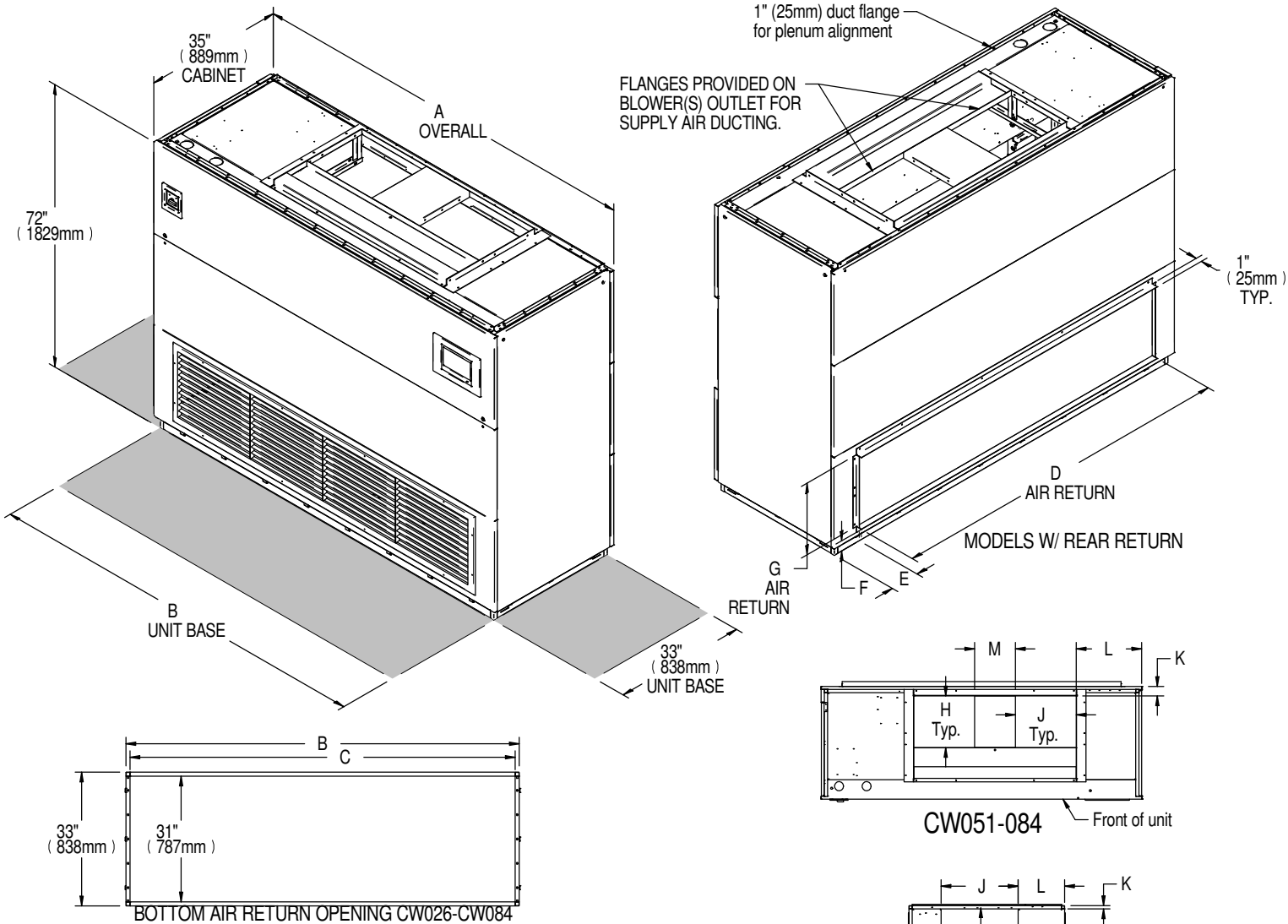


SHADED AREA INDICATES A RECOMMENDED CLEARANCE OF 25" (635mm) BE PROVIDED FOR REAR RETURN FILTER REMOVAL ON ONE END OF THE UNIT.

**RETURN AIR DUCT
CONNECTION DATA
MODELS WITH REAR RETURN**

CABINET DIMENSIONAL DATA

UPFLOW MODELS CW038 THRU CW084 W/ FORWARD CURVED BLOWERS

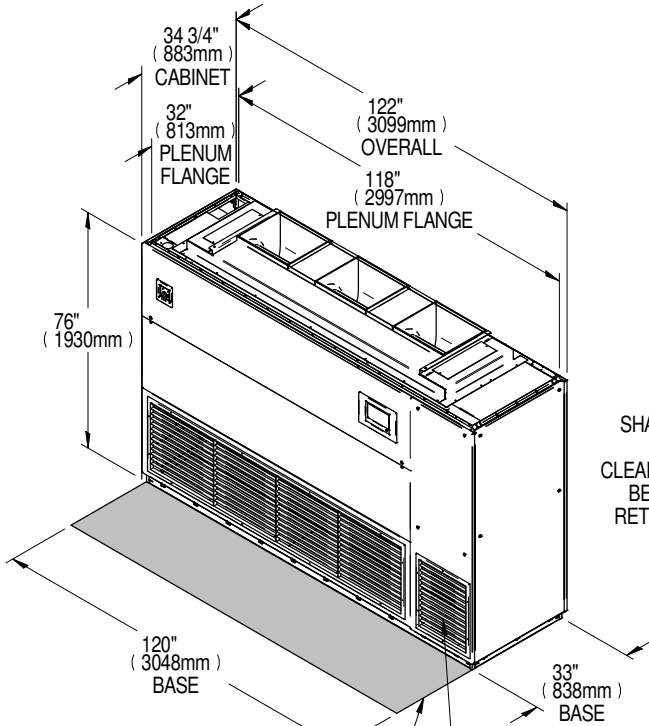


Notes:

1. Air Grille may be supplied on units with front or rear return air.
2. Shaded areas indicate a recommended clearance of 36" (914mm) be provided for component access and filter removal.
3. A Return Air Grille may be ordered in place of the duct flange on units with rear return air (see specification sheet for option supplied).

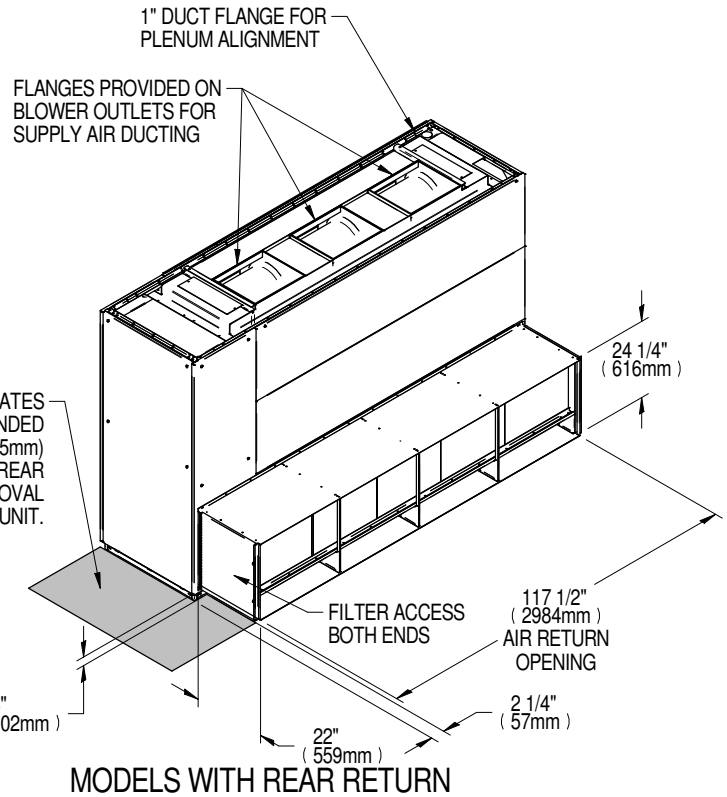
MODEL	NUMBER OF BLOWERS	DIMENSIONAL DATA inches (mm)											NET WEIGHT lb. (kg)	
		A	B	C	D	E	F	G	H	J	K	L		M
CW038	1	50 (1270)	48 (1219)	46 (1168)	44 (1118)	3 (76)	5 (127)	18 (457)		18-5/8 (473)			N/A	795 (361)
CW041														855 (388)
CW051	2	74 (1880)	72 (1289)	70 (1778)	68 (1727)		4 (102)	20 (508)	15-7/8 (403)	14-3/4 (375)		19-1/2 (495)	11 (279)	1090 (494)
CW060														1155 (524)
CW076														1320 (599)
CW084														1420 (644)

CABINET DIMENSIONAL DATA
UPFLOW MODELS CW106, CW114 W/ FORWARD CURVED BLOWERS

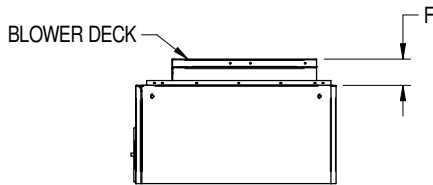


SHADED AREA INDICATES A RECOMMENDED CLEARANCE OF 36" (914mm) BE PROVIDED FOR COMPONENT ACCESS AND FILTER REMOVAL. FOR RECOMMENDED MINIMUM CLEARANCE REFER TO THE INSTALLATION MANUAL.

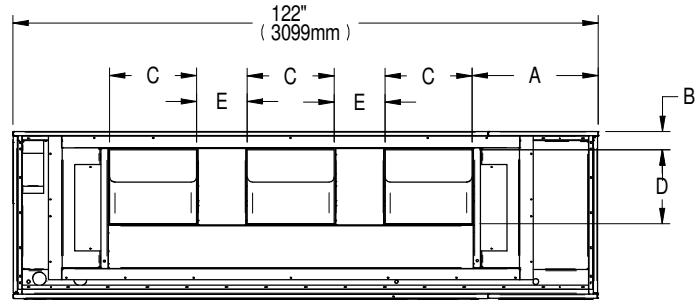
AIR GRILLE MAY BE SUPPLIED ON UNITS WITH FRONT RETURN AIR ONLY.



MODELS WITH REAR RETURN



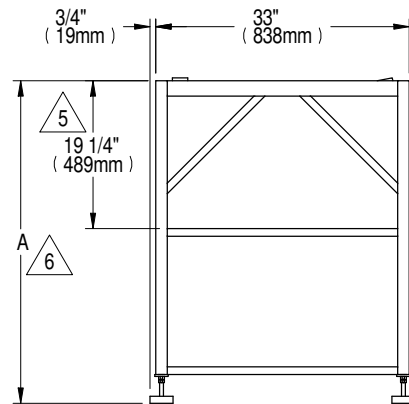
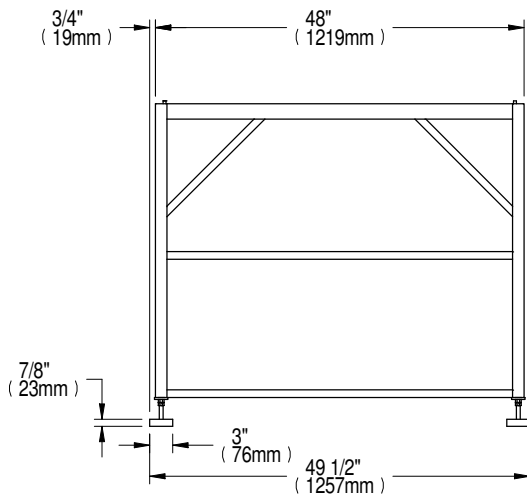
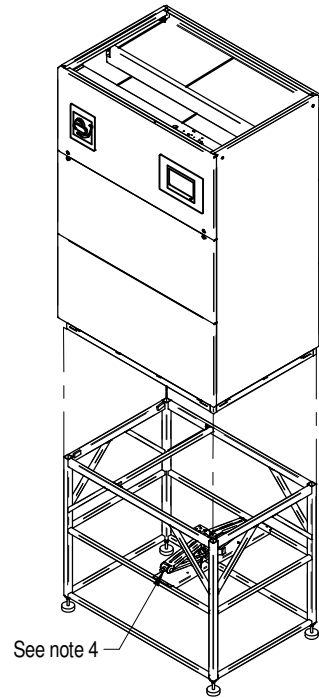
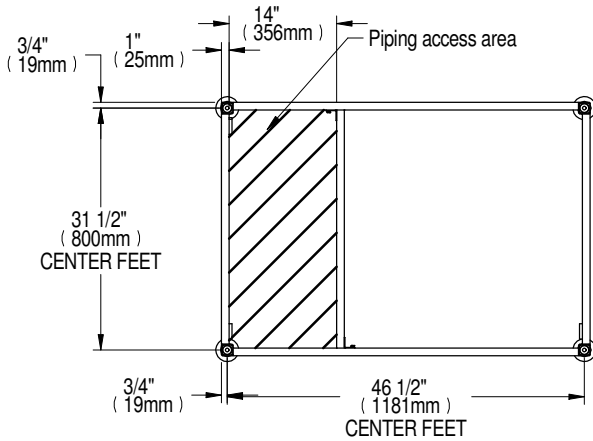
RIGHT SIDE OF UNIT
FRONT OR REAR
RETURN AIR



FRONT OF UNIT

MODEL	BLOWER	SUPPLY	MOTOR HP	DIMENSIONAL DATA inches (mm)						NET WT. lbs. (kg)
				A	B	C	D	E	F	
CW106	15 x 15	TOP FRONT	10-15	26-1/4 (667)	2-3/4 (70)	18-5/8 (473)	15-7/8 (403)	10 (254)	4-1/2 (114)	1785 (810)
		TOP REAR			11-1/2 (292)					
CW114	15 x 11	TOP FRONT	10-15	28-1/4 (718)	2-3/4 (70)	14 3/4 (375)	15-7/8 (403)	10 (254)	4-1/2 (114)	1925 (873)
		TOP REAR	20							

**FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA
DOWNFLOW MODELS CW038 & CW041 W/ EC FANS**



NOTE:

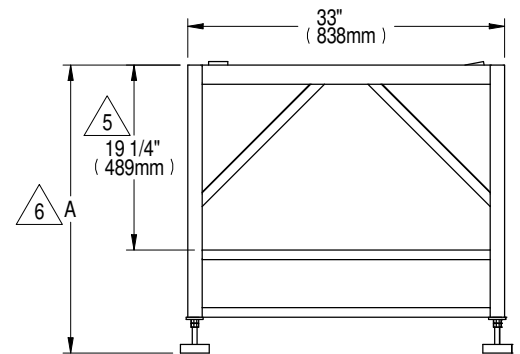
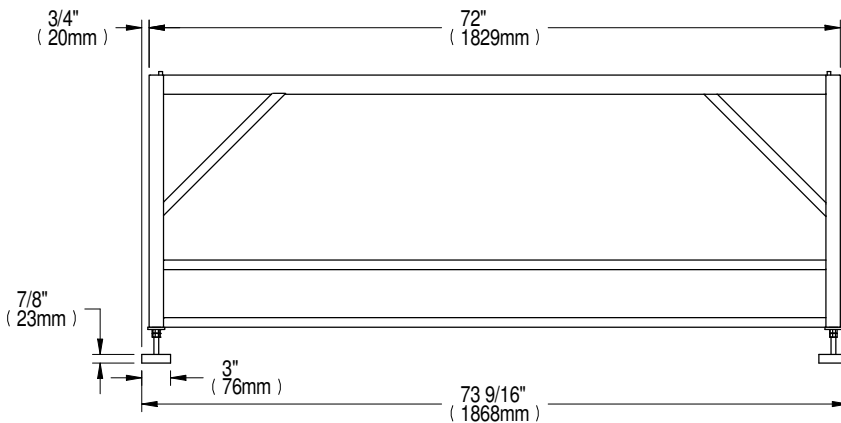
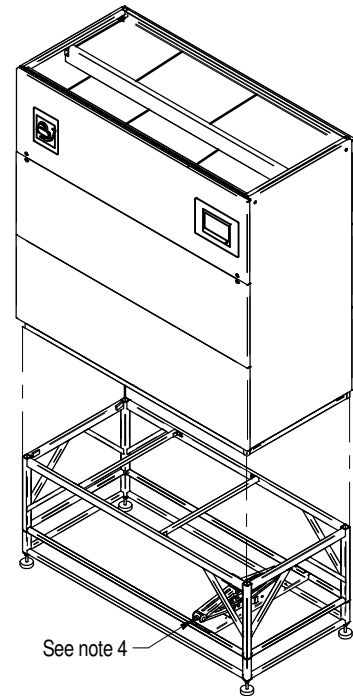
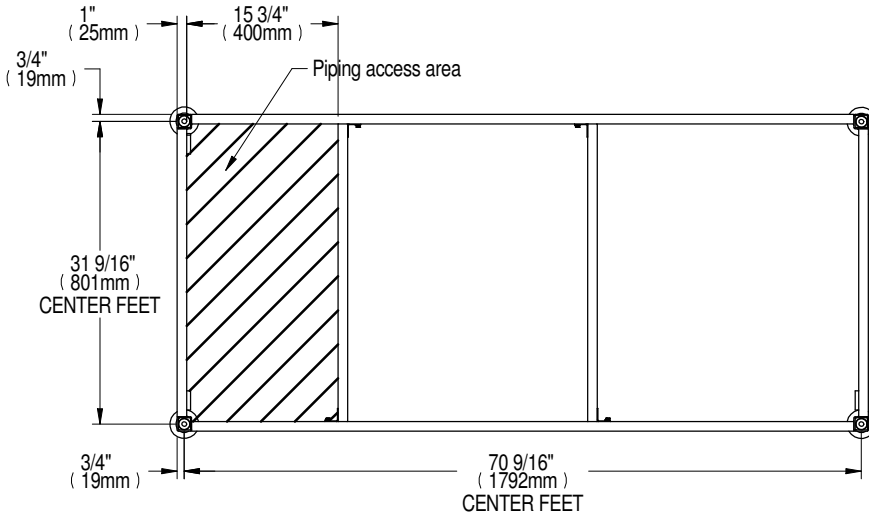
1. This floor stand should be used when EC fans are intended to be lowered under a raised floor. The standard Liebert® CW floor stand can be used "if" the fans are to remain in their original raised position.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.
4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.
5. Not applicable to 24" high floorstand.



6. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height "A".

Height in (mm)
A \triangle 6
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

**FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA
DOWNFLOW MODELS CW051 & CW060 W/ EC FANS**



NOTE:

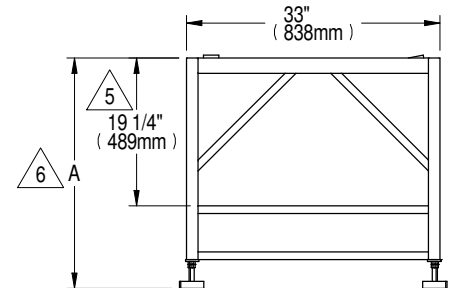
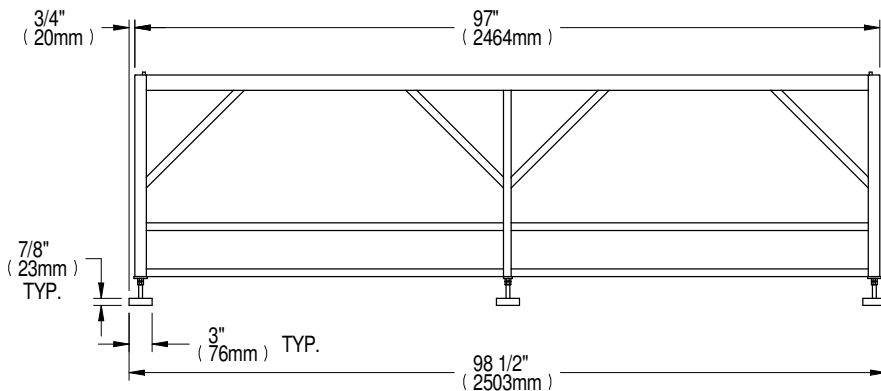
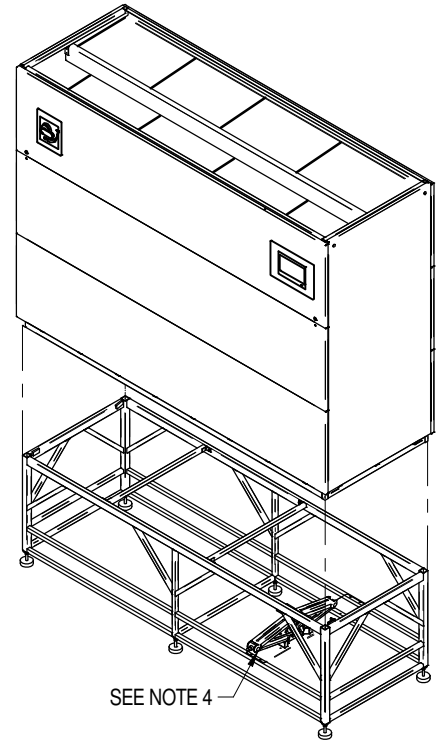
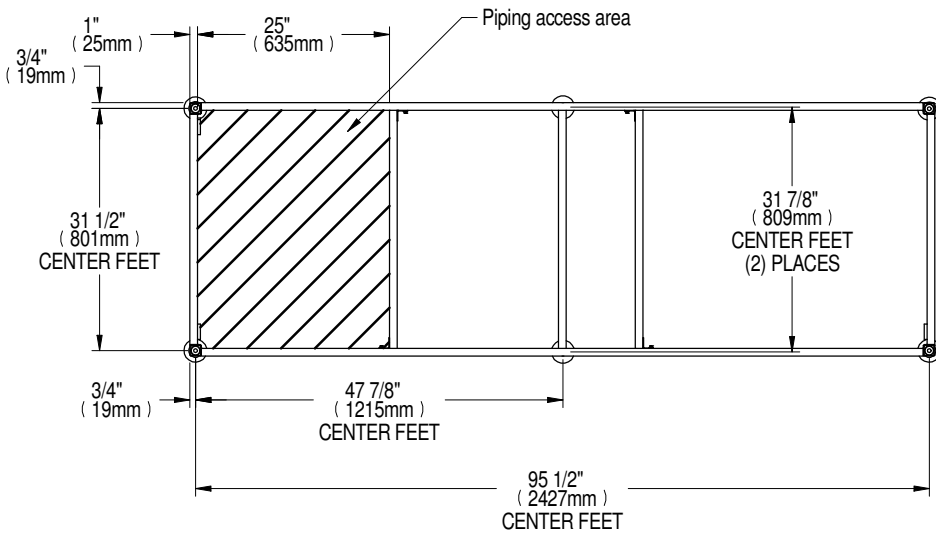
1. This floor stand should be used when EC fans are intended to be lowered under a raised floor. The standard Liebert® CW floor stand can be used if the fans are to remain in their original raised position.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.
4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.

5. Does not apply to 24" high floorstand.

6. Leveling feet are provided with $\pm 1\text{-}1/2"$ (38mm) adjustment from nominal height "A".

Height in (mm)
A Δ 6
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA DOWNFLOW MODELS CW076 & CW084 W/ EC FANS



NOTE:

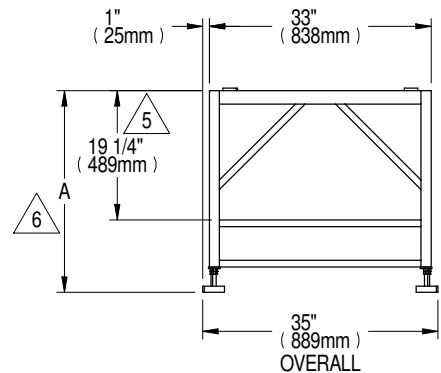
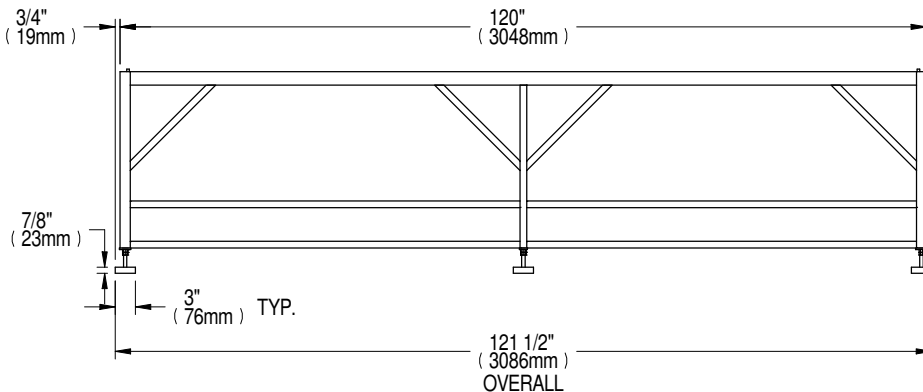
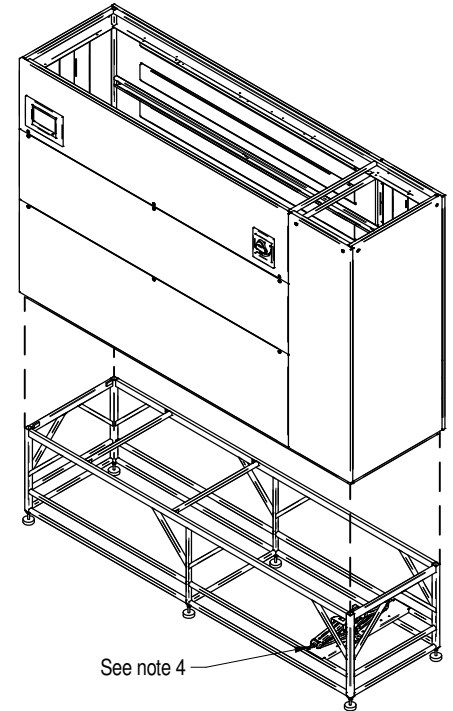
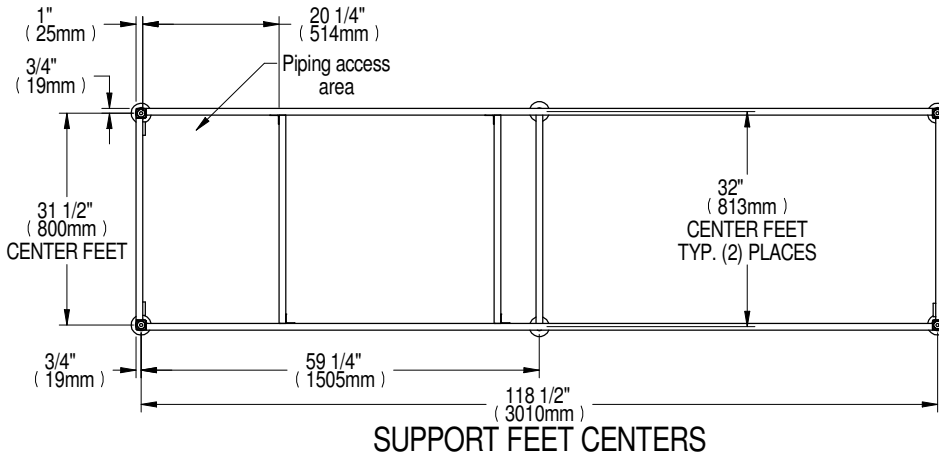
1. This floor stand should be used when EC fans are intended to be lowered under a raised floor. The standard Liebert® CW floor stand can be used "if" the fans are to remain in their original raised position.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.
4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.

△ 5. Does not apply to 24" high floorstand.

△ 6. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height "A".

Height in (mm)
A △ 5
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

**FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA
DOWNFLOW MODELS CW106 & CW114 W/ EC FANS**



NOTE:

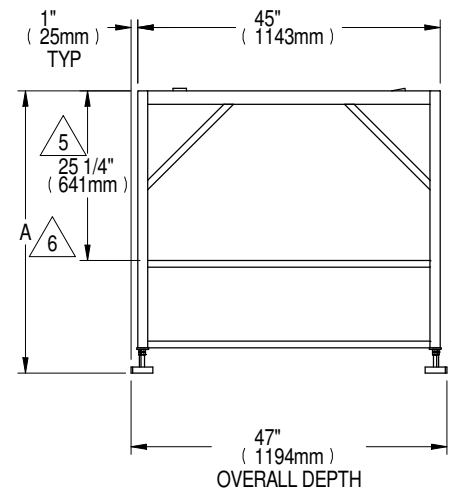
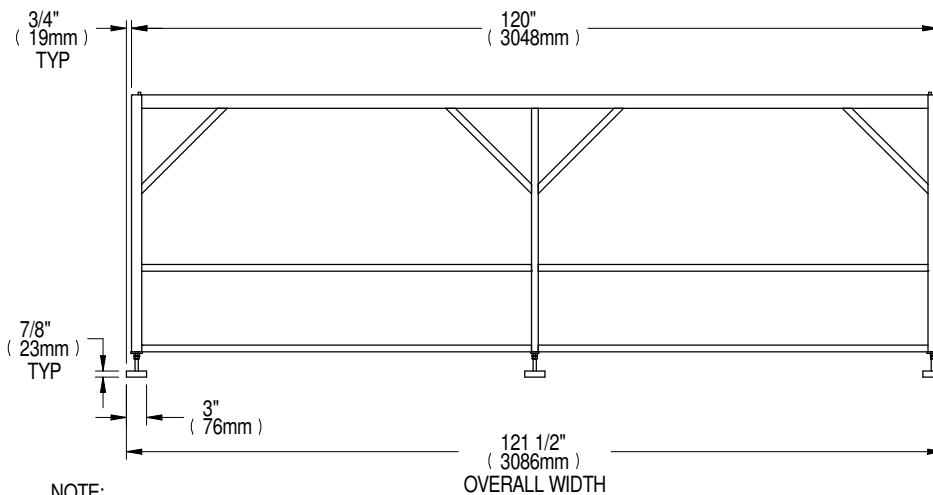
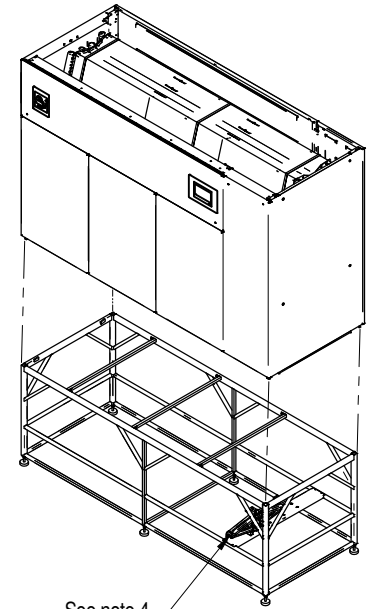
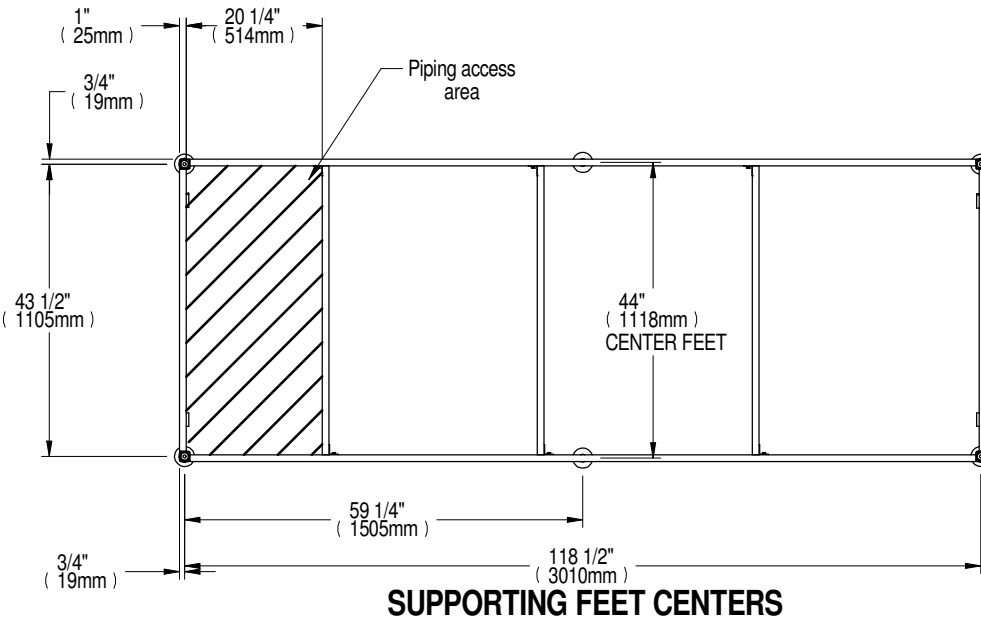
1. This floor stand should be used when EC fans are intended to be lowered into the floor stand. The standard Liebert® CW floor stand can be used "if" the fans are to remain in their original raised position.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.
4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.

△ 5. Does not apply to 24" high floorstand.

△ 6. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height "A".

Height in (mm)
A*
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA DOWNFLOW MODELS CW146 & CW181 W/ EC FANS



NOTE:

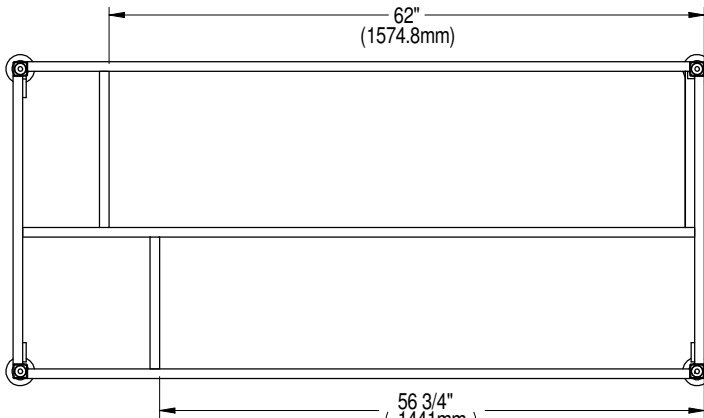
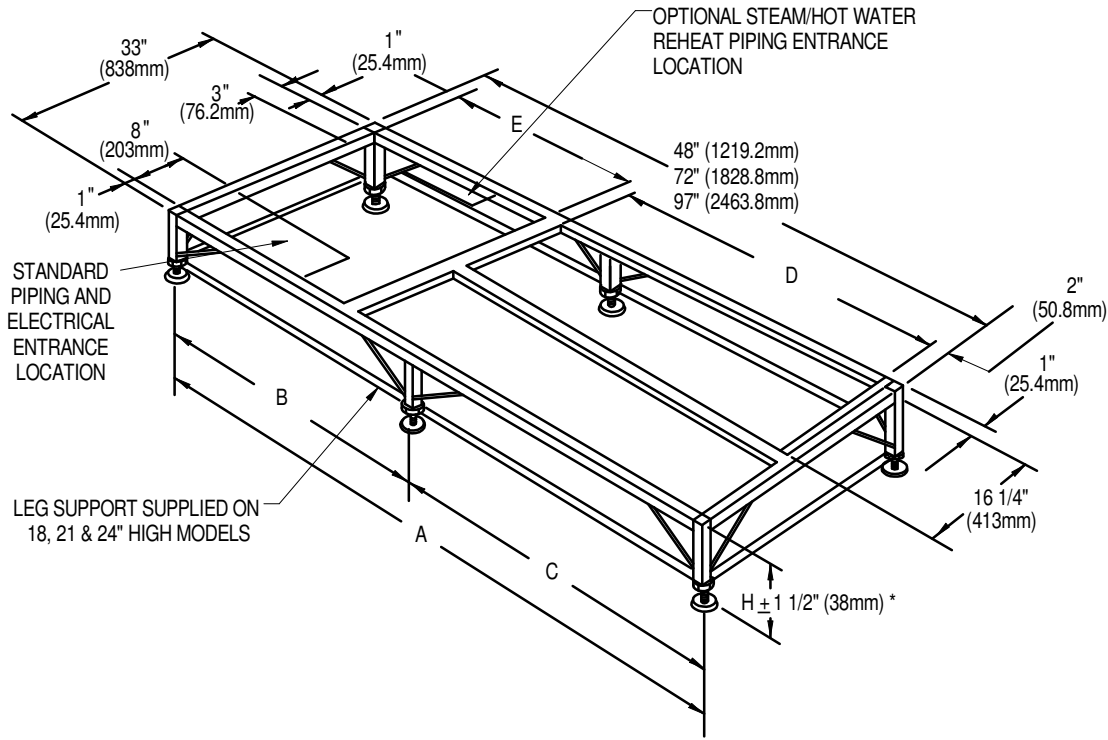
1. This floor stand should be used when EC fans are intended to be lowered into the floor stand. The standard Liebert® CW floor stand can be used "if" the fans are to remain in their original raised position.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.
4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.

5. Does not apply to 24" & 30" high floorstands.

6. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height "A".


Height in (mm)
A \triangle
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

**FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA
CW038-084 UPFLOW MODELS**




CROSS-BRACING LOCATION FOR 72" FRAMES ONLY

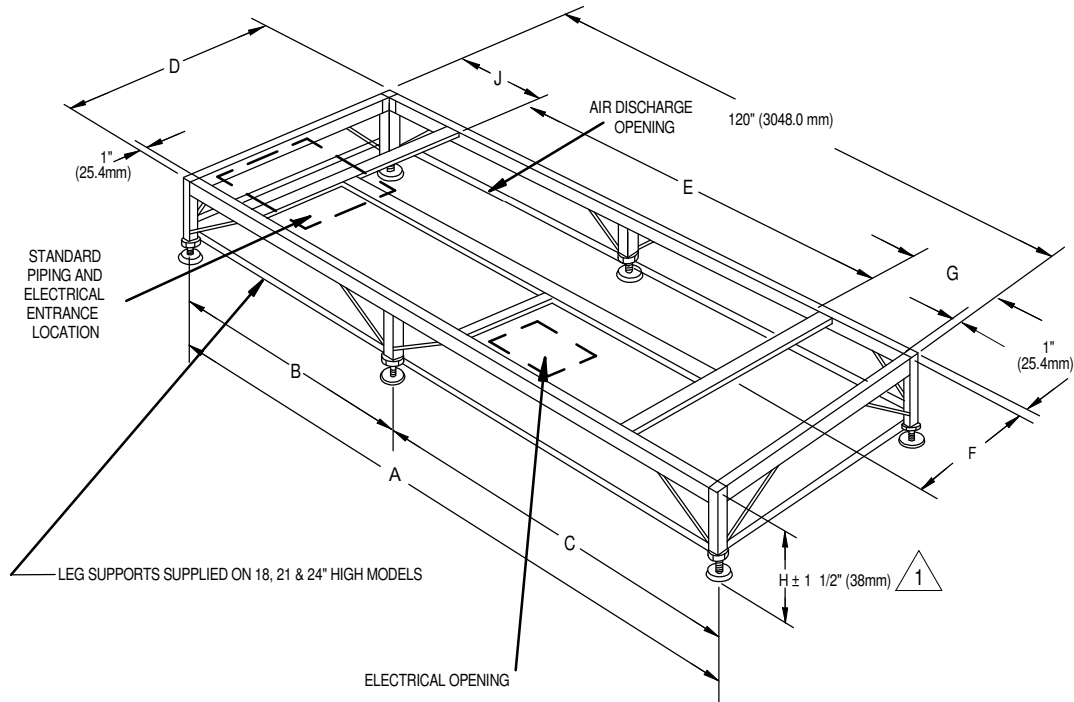
Dimensional Data in. (mm)						
Model	Overall Width of Unit	A	B	C	D	E
CW038, CW041	50 (1270)	48 (1219)	0		36 (914)	8 (203)
CW051, CW060	74 (1880)	72 (1829)			60 (1524)	
CW076, CW084	99 (2515)	97 (2464)	48-1/2 (1232)		77-3/4 (1975)	15-1/4 (362)

Height in. (mm)
H Nominal 
9 (229)
12 (305)
15 (381)
18 (458)
21 (553)
24 (610)

Notes:

-  Leveling feet are provided with ±1-1/2" (38mm) adjustment from nominal height H.

FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA CW106, CW114 UPFLOW MODELS



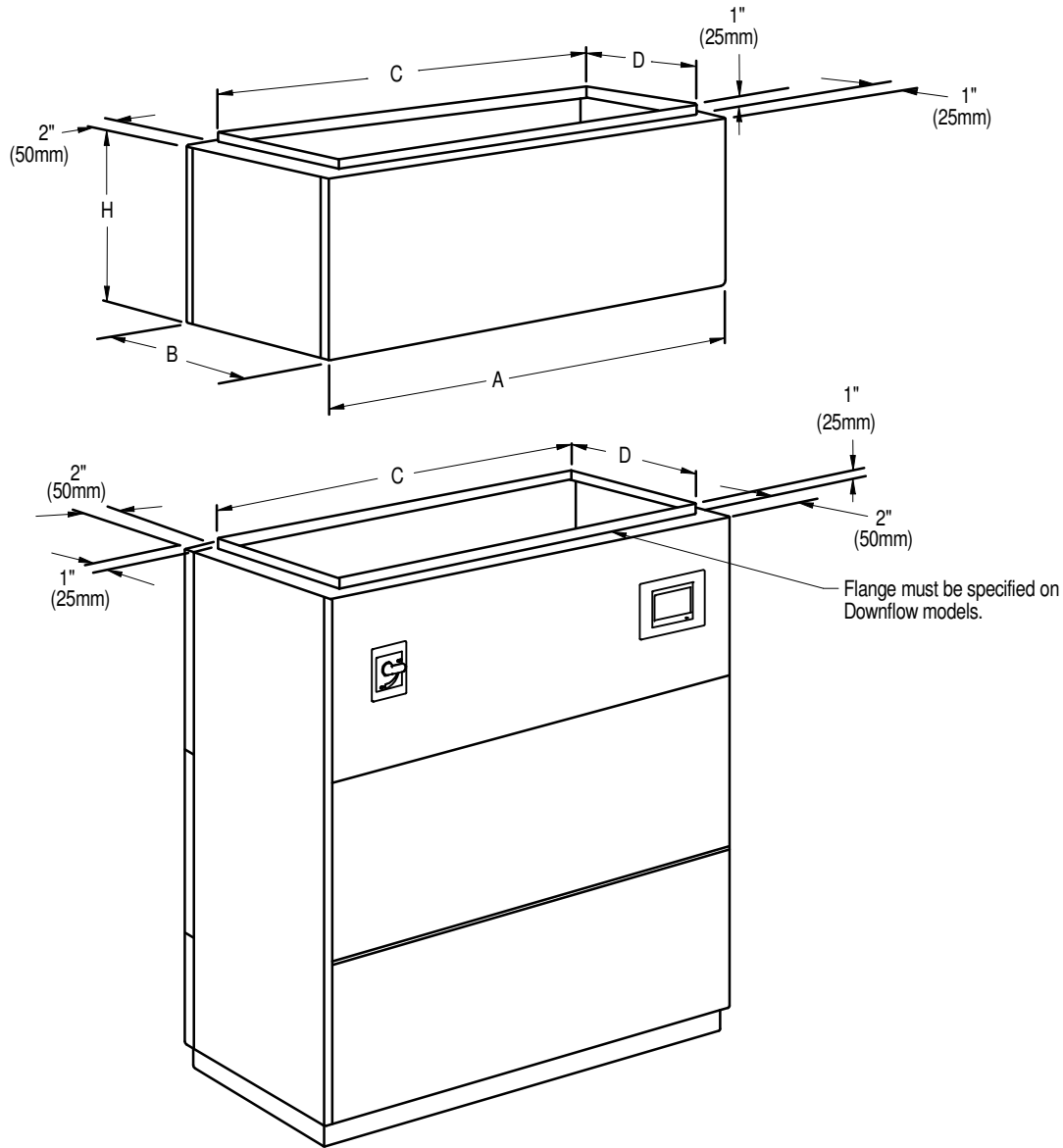
Height in. (mm)
H Nominal $\triangle 1$
9 (229)
12 (305)
15 (381)
18 (458)
21 (553)
24 (610)

Dimensional Data in. (mm)									
Model	Overall Width of unit	A	B	C	D	E	F	G	J
CW106, CW114	122 (3099)	120 (3048)	60 (1524)	33 (838)	100-3/4 (2559)	16-1/4 (413)	8-1/4 (210)	11 (279)	

Notes:

1. $\triangle 1$ Leveling feet are provided with $\pm 1 \frac{1}{2}" (38\text{mm})$ adjustment from nominal height H.

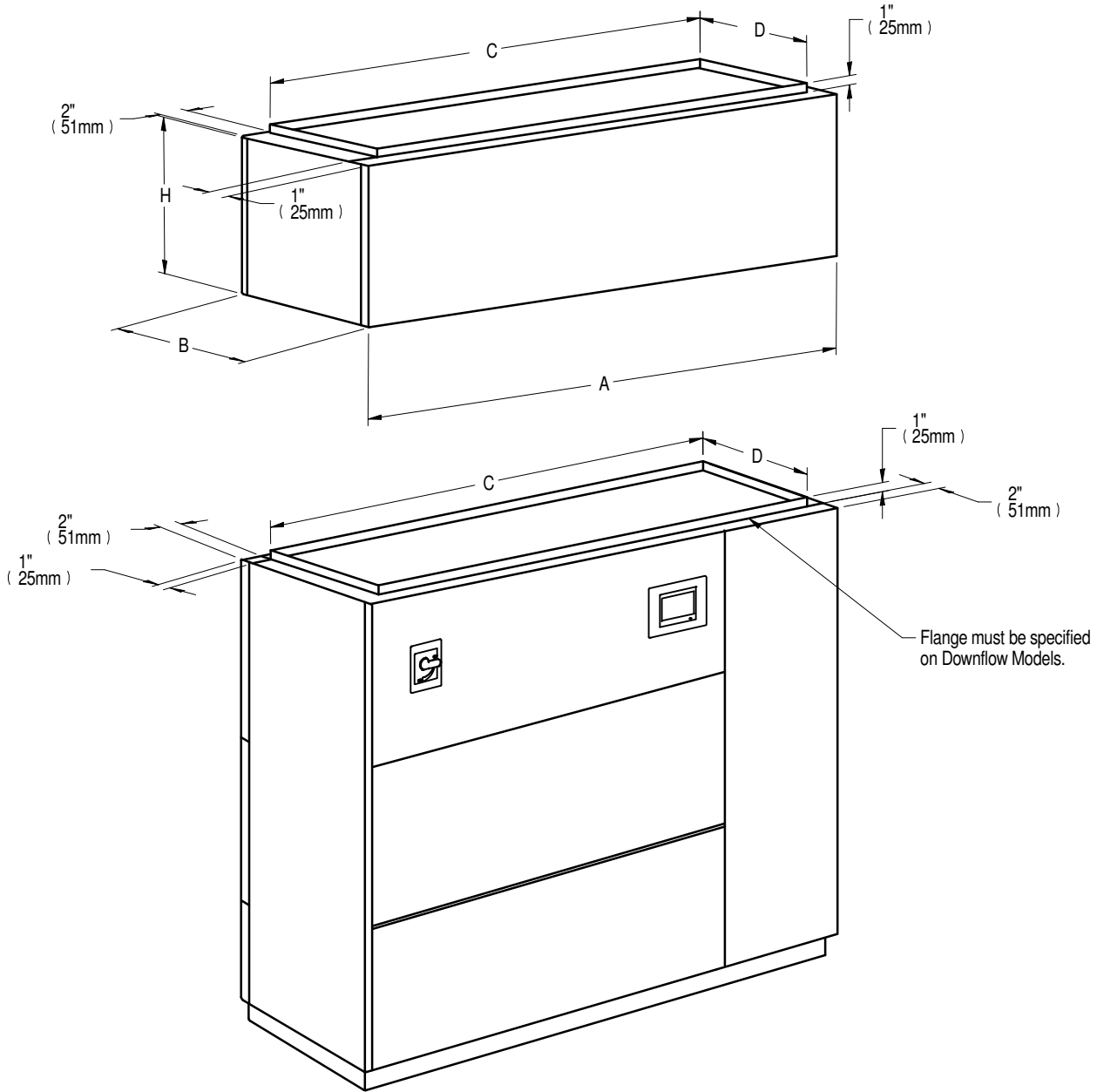
PLENUM DIMENSIONAL DATA DOWNFLOW MODELS CW038 - CW084 W/ EC FANS



Plenum Dimensional Data in. (mm)				
Model	A	B	C	D
CW038, CW041	50 (1270)	34 (864)	46 (1168)	32 (813)
CW051, CW060	74 (1880)		70 (1778)	
CW076, CW084	99 (2515)		95 (2413)	

Plenum Height in. (mm)
H
20 (508)
22-3/4 (578)
34-3/4 (883)

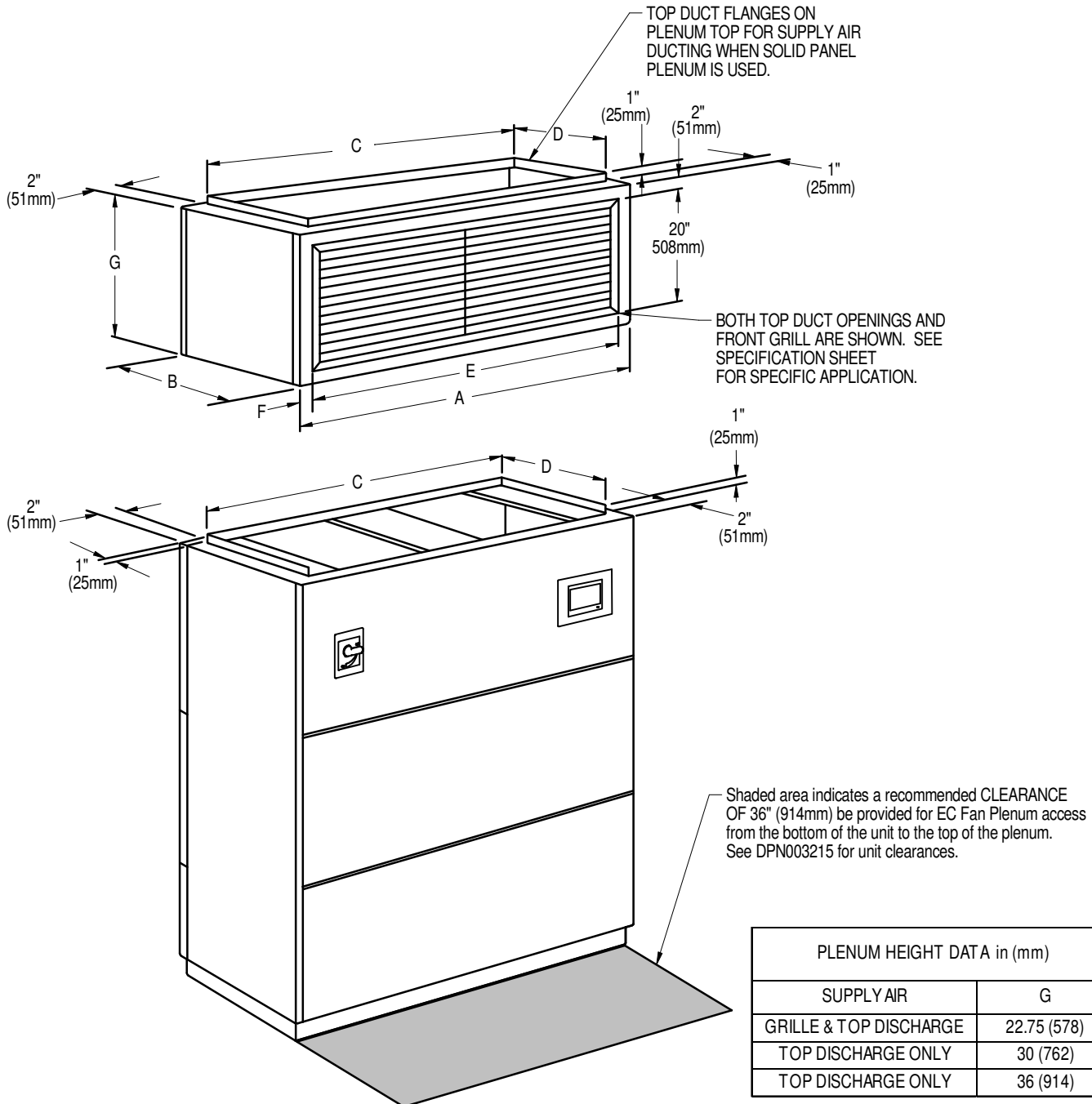
PLENUM DIMENSIONAL DATA DOWNFLOW MODELS CW106 - CW114 W/ EC FANS



Plenum Dimensional Data in. (mm)			
A	B	C	D
122 (3099)	34 (864)	118 (2997)	32 (813)

Plenum Height in. (mm)
H
20 (508)
22-3/4 (578)
34-3/4 (883)

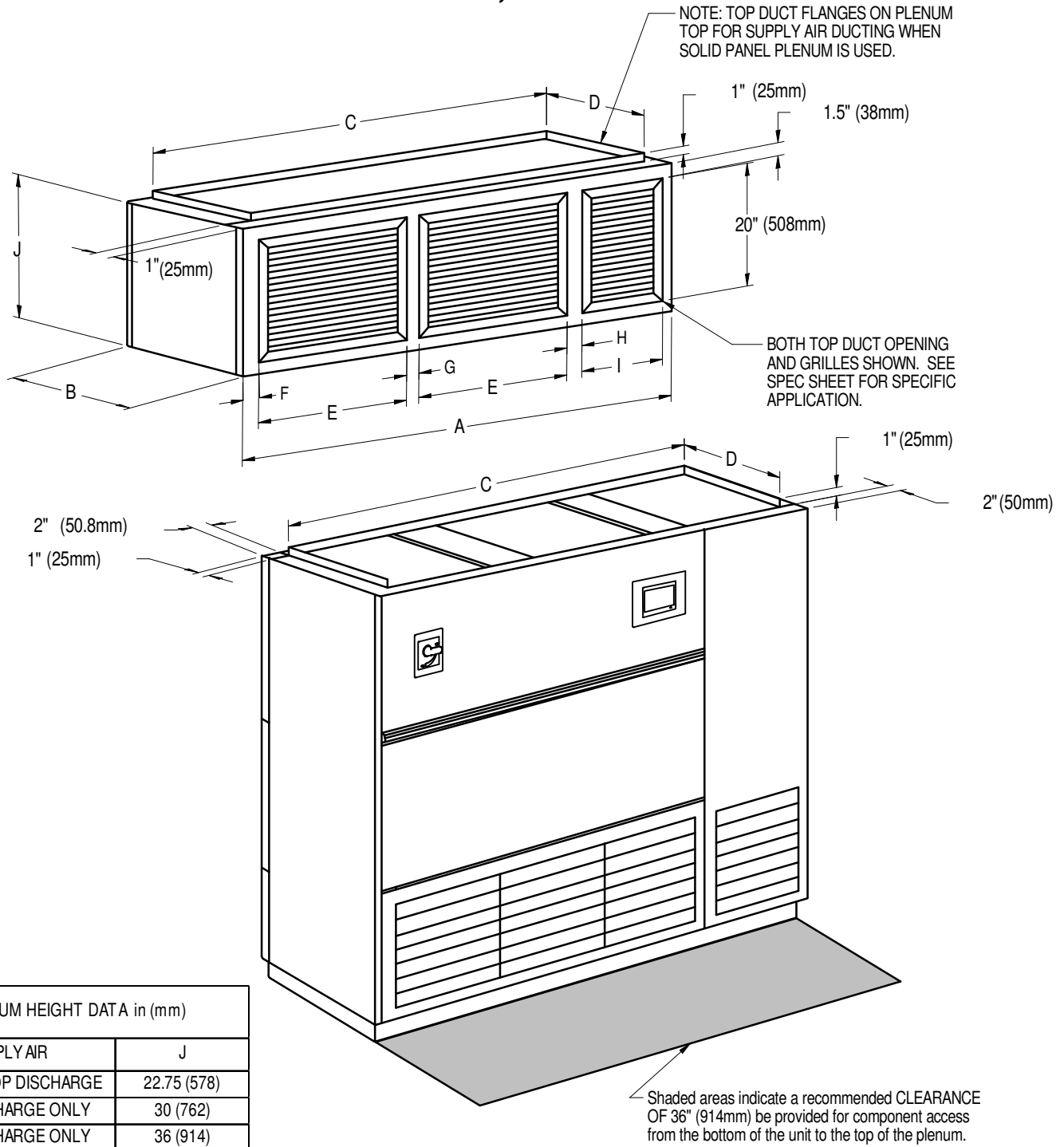
PLENUM DIMENSIONAL DATA UPFLOW MODELS CW038 - CW084 W/ EC FANS



PLENUM HEIGHT DATA in (mm)	
SUPPLY AIR	G
GRILLE & TOP DISCHARGE	22.75 (578)
TOP DISCHARGE ONLY	30 (762)
TOP DISCHARGE ONLY	36 (914)

PLENUM DIMENSIONAL DATA in (mm)							GRILL FREE AREA SQ. FT. (SQ. METERS)
MODEL	A	B	C	D	E	F	
CW038, CW041	50 (1270)	34 (864)	46 (1168)	32 (813)	46 (1168)	2 (51)	4.29 (.40)
CW051, CW060	74 (1880)		70 (1778)		62 (1575)	6 (152)	5.85 (.54)
CW076, CW084	99 (2515)		95 (2413)		70 (1778)	14 1/2 (368)	6.83 (.63)

PLENUM DIMENSIONAL DATA UPFLOW MODELS CW106, CW114 W/ EC FANS

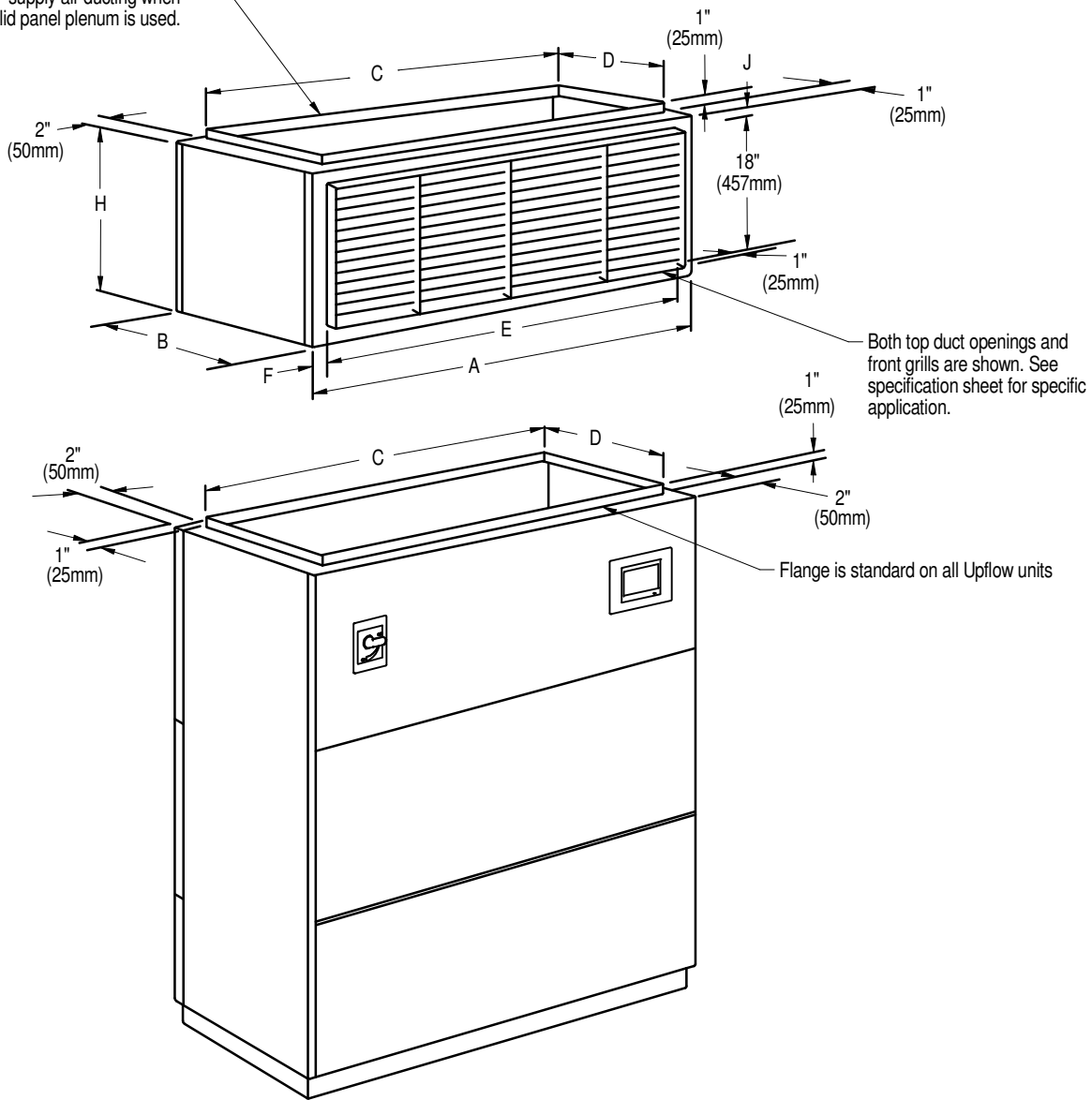


PLENUM HEIGHT DATA in (mm)	
SUPPLY AIR	J
GRILLE & TOP DISCHARGE	22.75 (578)
TOP DISCHARGE ONLY	30 (762)
TOP DISCHARGE ONLY	36 (914)

MODEL	PLENUM DIMENSIONAL DATA in (mm)									GRILL FREE AREA SQ. FT. (SQ. METERS)
	A	B	C	D	E	F	G	H	I	
CW106, CW114	122 (3099)	34 (864)	118 (2997)	32 (813)	44 (1118)	3 (76)	2 (51)	5 (127)	18 (457)	10.14 (.94)

PLENUM DIMENSIONAL DATA
UPFLOW MODELS CW038 - CW084 W/ FORWARD CURVED BLOWERS

Note: Flanges provided on blower(s) outlet for supply air ducting when solid panel plenum is used.



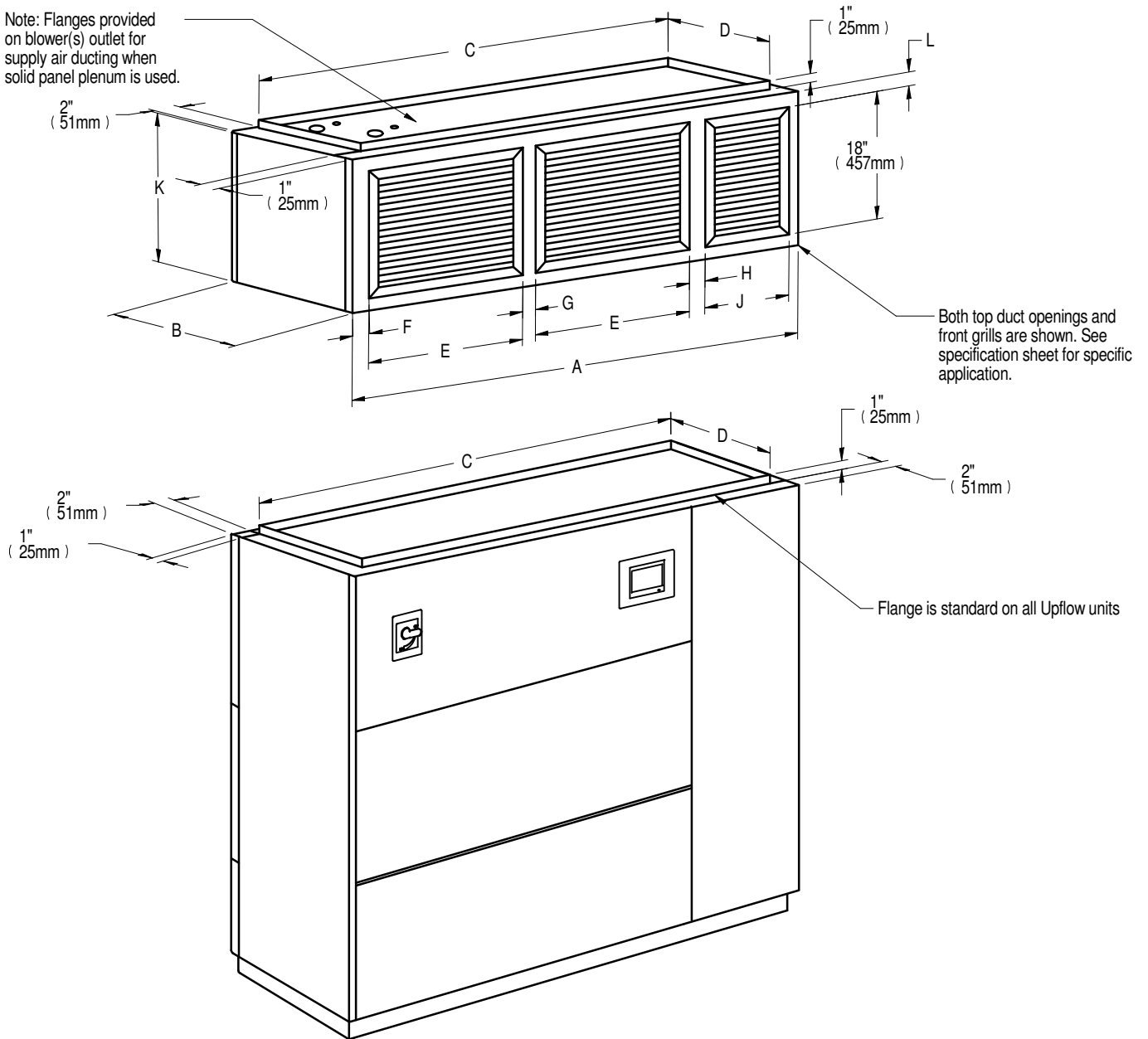
Plenum Dimensional Data in. (mm)							Grill Free Area Sq. Ft (Sq. Meters)
Model	A	B	C	D	E	F	
CW038, CW041	50 (1270)	34 (864)	46 (1168)	32 (813)	44 (1118)	3 (76)	4.29 (.40)
CW051, CW060	74 (1880)		70 (1778)		60 (1524)	7 (178)	5.85 (.54)
CW076, CW084	99 (2515)		95 (2413)		70 (1778)	14-1/2 (368)	6.83 (.63)

Plenum Height in. (mm)	
H	J
20 (508)	1 (25)
22-3/4 (578)	2-3/8 (60)
34-3/4 (883)	

PLENUM DIMENSIONAL DATA

UPFLOW MODELS CW106 - CW114 W/ FORWARD CURVED BLOWERS

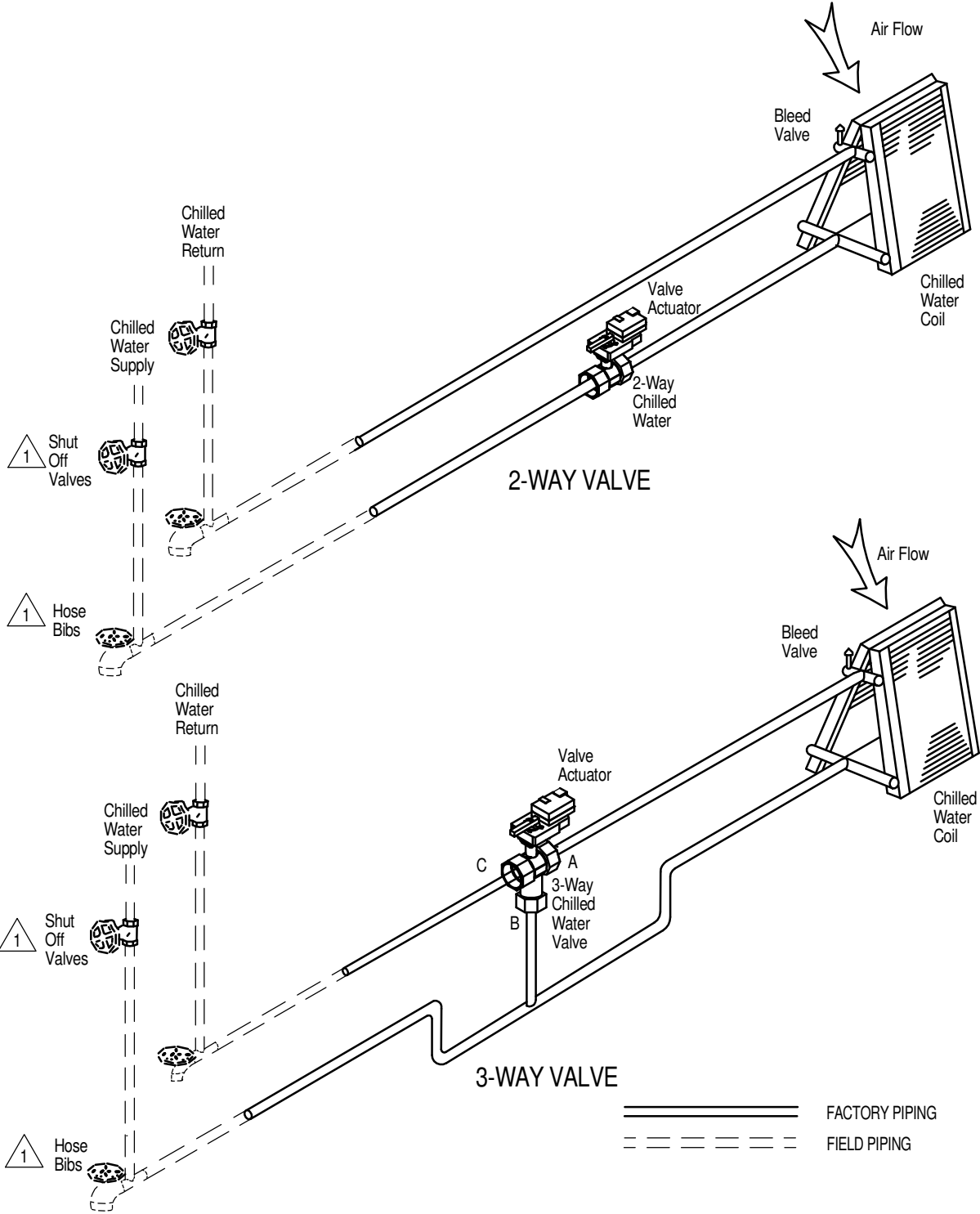
Note: Flanges provided on blower(s) outlet for supply air ducting when solid panel plenum is used.



Plenum Height in. (mm)	
K	L
20 (508)	1 (25)
22-3/4 (578)	2-3/8 (60)
34-3/4 (883)	

Plenum Dimensional Data in. (mm)									Grill Free Area Sq. Ft. (Sq. Meters)
A	B	C	D	E	F	G	H	J	
122 (3099)	34 (864)	118 (2997)	32 (813)	44 (1118)	3-1/2 (89)	4 (102)	7 (178)	16 (406)	10.14 (0.94)

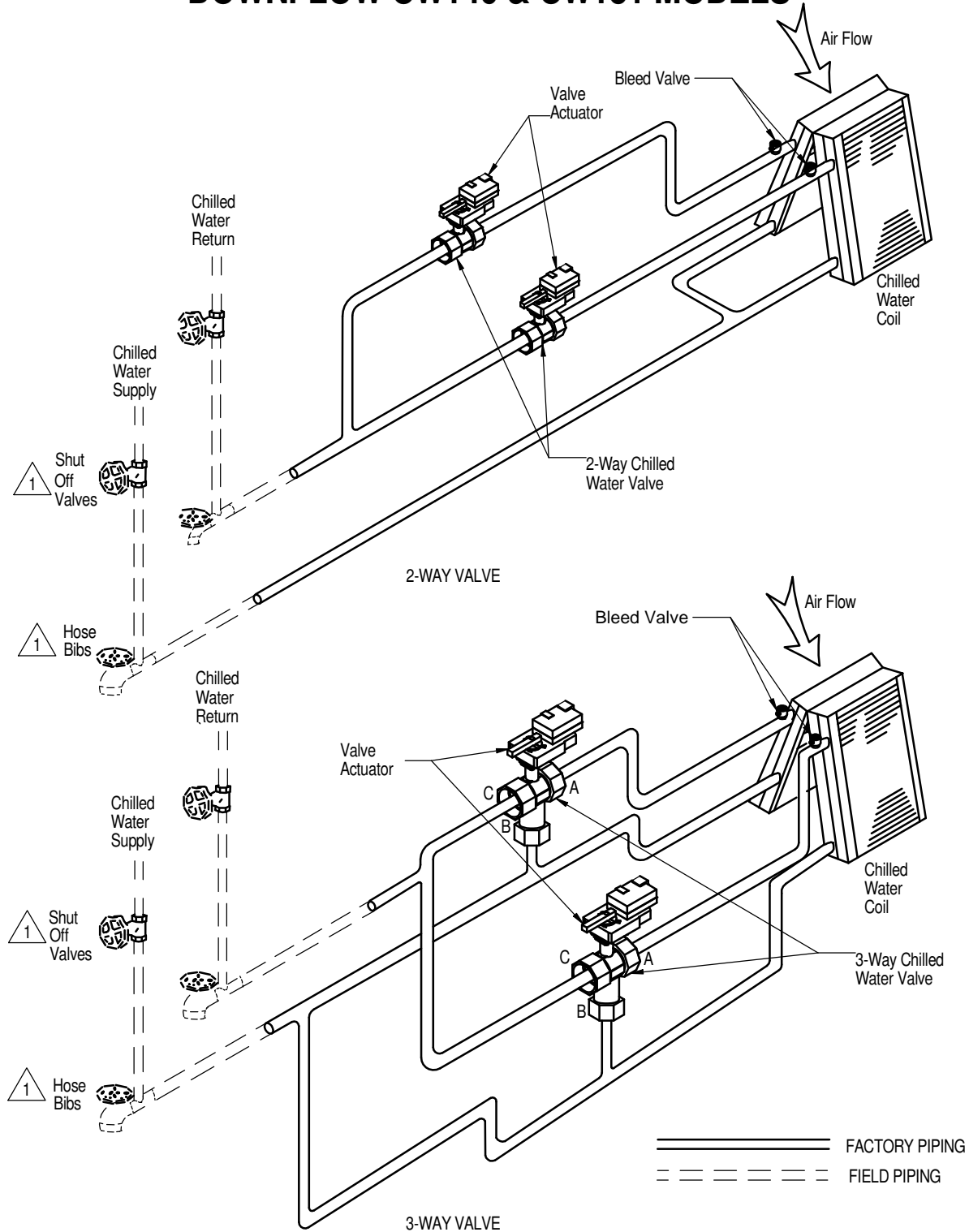
GENERAL ARRANGEMENT DIAGRAM DOWNFLOW CW038 - CW114 MODELS



Notes:

- 1. Components are not supplied by Vertiv, but are required for proper circuit operation and maintenance.

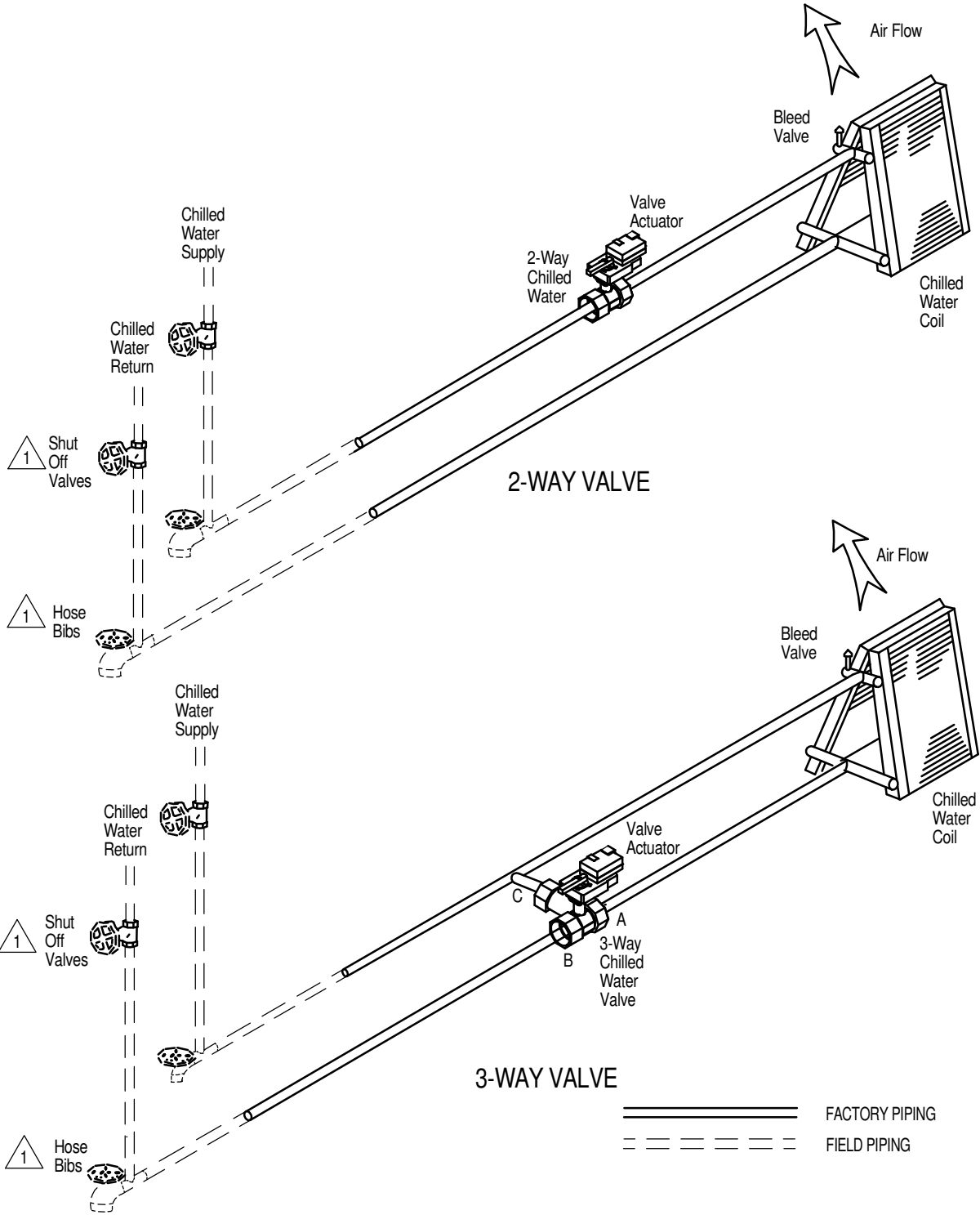
GENERAL ARRANGEMENT DIAGRAM DOWNFLOW CW146 & CW181 MODELS



Notes:

- 1. Components are not supplied by Vertiv™, but are required for proper circuit operation and maintenance.

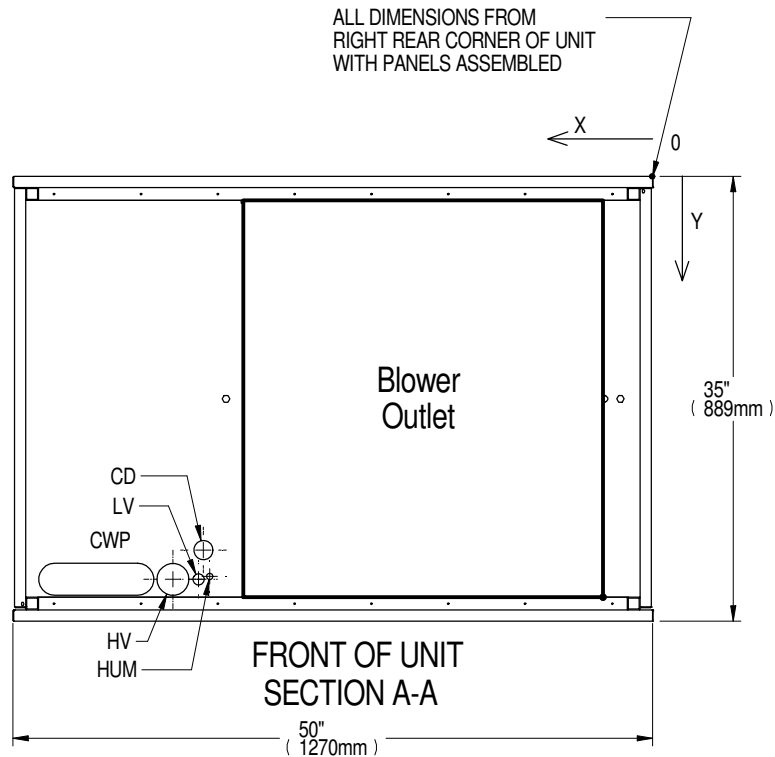
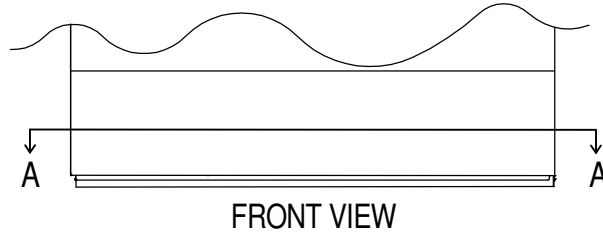
GENERAL ARRANGEMENT DIAGRAM UPFLOW CW038 - CW084, CW106 - CW114 MODELS



Notes:

- 1. Components are not supplied by Vertiv, but are required for proper circuit operation and maintenance.

PRIMARY CONNECTION LOCATIONS DOWNFLOW MODELS CW038 & CW041 W/ EC FANS



POINT	DESCRIPTION	X	Y	CONNECTION SIZE / OPENING
CD	CONDENSATE DRAIN ²	35 1/16" (891mm)	29 5/16" (745mm)	3/4" (19mm) NPT Female
	W/ OPTIONAL CONDENSATE PUMP ³			1/2" (13mm) O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	34 9/16" (878mm)	31 3/8" (797mm)	1/4" (6mm) O.D. Cu
CWP	CHILLED WATER PIPING SLOT (CENTER)	43 7/16" (1104mm)	31 5/8" (803mm)	9" (229mm) X 2 1/2" (64mm)
	SUPPLY & RETURN PIPING DIAMETER	N/A		CW038: 1 3/8" (32mm) CW041: 1 5/8" (41mm)
HV	HIGH VOLT ELECTRICAL CONNECTION	37 7/16" (951mm)	31 5/8" (803mm)	2 1/2" (64mm)
LV	LOW VOLT ELECTRICAL CONNECTION	35 7/16" (900mm)		7/8" (22mm)

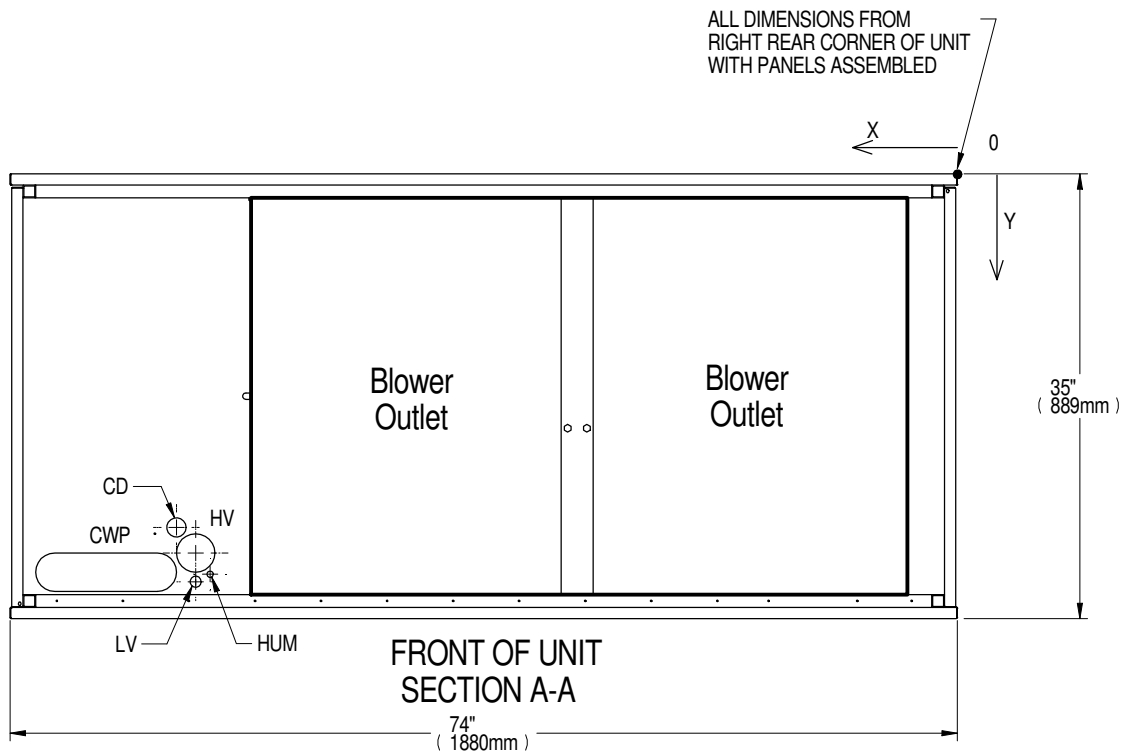
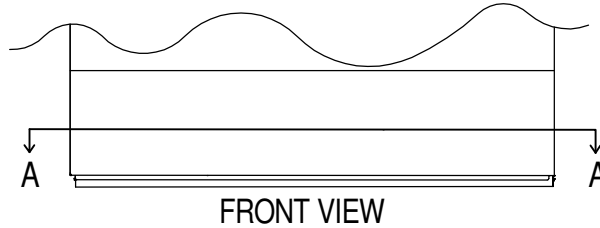
Notes:

1. Drawing not to scale. Tolerance on all piping dimensions is $\pm (13\text{mm}) 1/2"$.

². Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.

³. Optional Condensate Pump to be installed under unit.

PRIMARY CONNECTION LOCATIONS DOWNFLOW MODELS CW051 & CW060 W/ EC FANS



POINT	DESCRIPTION	X	Y	CONNECTION SIZE / OPENING
CD	CONDENSATE DRAIN ²	61" (1550mm)	27 3/4" (705mm)	3/4" (19mm) NPT Female
	W/OPTIONAL CONDENSATE PUMP ³			1/2" (13mm) O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	58 3/8" (1484mm)	31 7/16" (799mm)	1/4" (6mm) O.D. Cu
CWP	CHILLED WATER PIPING SLOT (CENTER)	66 1/2" (1690mm)	31 1/4" (794mm)	11" (279mm) X 3" (76mm)
	SUPPLY & RETURN PIPING DIAMETER	-	-	CW051: 1 5/8" (41mm) CW060: 2 1/8" (54mm)
HV	HIGH VOLT ELECTRICAL CONNECTION	59 1/2" (1512mm)	29 3/4" (756mm)	3" (76mm)
LV	LOW VOLT ELECTRICAL CONNECTION	59 1/2" (1512mm)	32" (813mm)	7/8" (22mm)

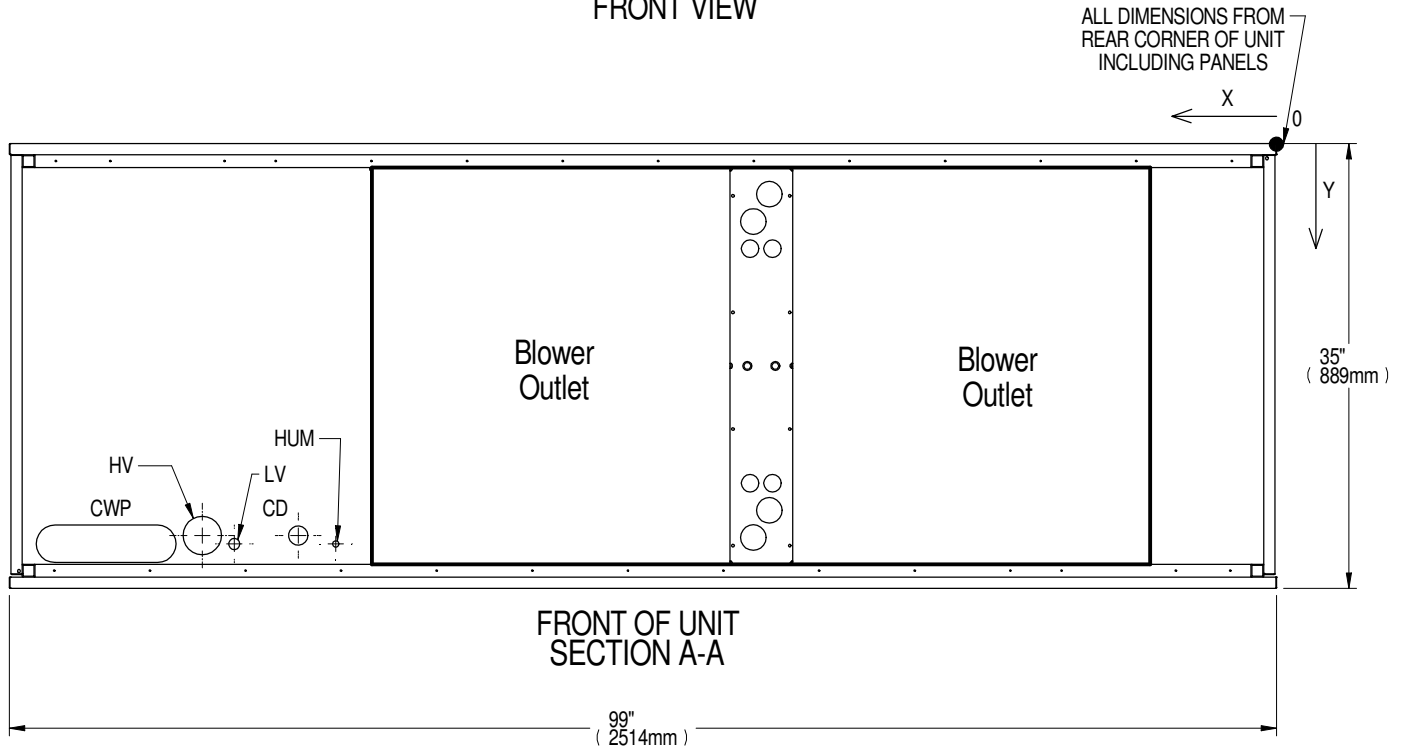
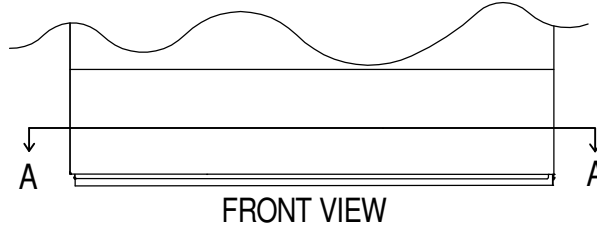
Notes:


1. Drawing not to scale. Tolerance on all piping dimensions is $\pm (13\text{mm}) 1/2"$.

² Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.

³ Optional Condensate Pump to be installed under unit.


PRIMARY CONNECTION LOCATIONS DOWNFLOW MODELS CW076 & CW084 W/ EC FANS



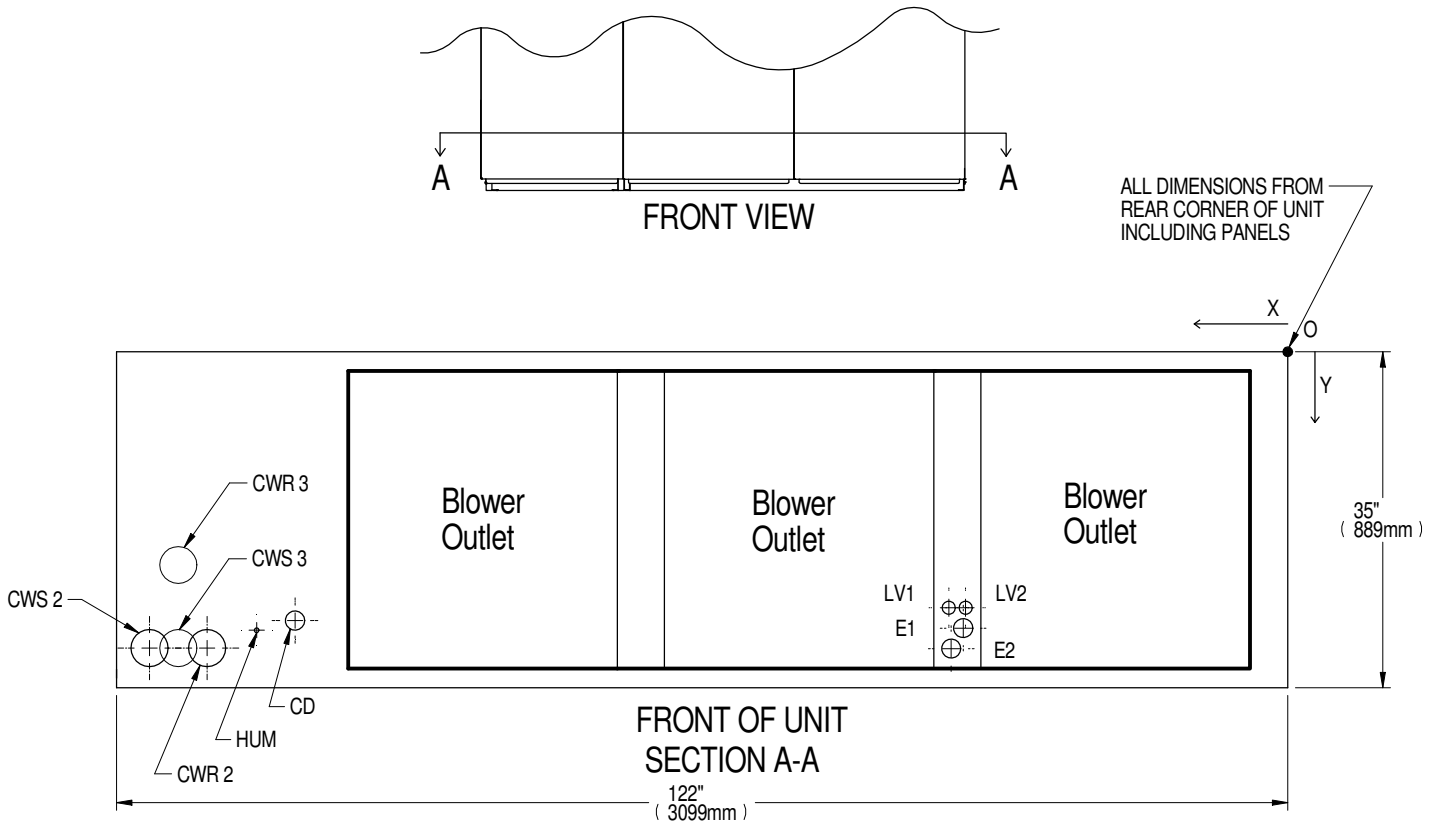
POINT	DESCRIPTION	X	Y	CONNECTION SIZE / OPENING
CD	CONDENSATE DRAIN 	76 3/8" (1940mm)	30 7/8" (784mm)	3/4" (19mm) NPT Female
	W/OPTIONAL CONDENSATE PUMP	76 3/8" (1940mm)	30 7/8" (784mm)	1/2" (13mm) O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	73 7/16" (1865mm)	31 7/16" (799mm)	1/4" (6mm) O.D. Cu
CWP	CHILLED WATER PIPING SLOT (CENTER)	91 3/8" (2321mm)	31 3/8" (797mm)	101 5/16"(277mm) X 2 15/16"(74mm)
	SUPPLY & RETURN PIPING DIAMETER	-	-	2 1/8" (54mm)
HV	HIGH VOLT ELECTRICAL CONNECTION	83 7/8" (2130mm)	30 7/8" (784mm)	3" (76mm)
LV	LOW VOLT ELECTRICAL CONNECTION	81 3/8" (2067mm)	31 7/16" (799mm)	7/8" (22mm)


Notes:

1. Drawing not to scale. Tolerance on all piping dimensions is \pm (13mm) 1/2".

 2. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.


PRIMARY CONNECTION LOCATIONS DOWNFLOW CW106 & CW114 W/EC FANS MODELS



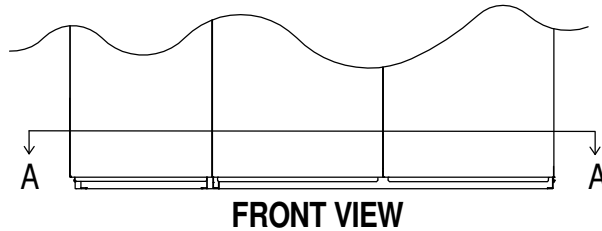
POINT	DESCRIPTION	X	Y	CONNECTION SIZE / OPENING
CD	CONDENSATE DRAIN 	103-1/2" (2629mm)	28" (711mm)	1-1/4" NPT Female
	W/ OPTIONAL PUMP	103-1/2" (2629mm)	28" (711mm)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	107-1/2" (2731mm)	29" (737mm)	1/4" O.D. Cu
CWS 2	2-WAY CHILLED WATER SUPPLY	118-1/2" (3010mm)	31" (787mm)	CW106: 2-1/8"; CW114: 2-5/8"
CWS 3	3-WAY CHILLED WATER SUPPLY	115-1/2" (2934mm)	31" (787mm)	CW106: 2-1/8"; CW114: 2-5/8"
CWR 2	2-WAY CHILLED WATER RETURN	112-1/2" (2858mm)	31" (787mm)	CW106: 2-1/8"; CW114: 2-5/8"
CWR 3	3-WAY CHILLED WATER RETURN	115-1/2" (2934mm)	22" (559mm)	CW106: 2-1/8"; CW114: 2-5/8"
E1	ELECTRICAL CONN. (HIGH VOLT)	35" (889mm)	31" (787mm)	2"
E2	ELECTRICAL CONN. (HIGH VOLT)	34" (864mm)	29" (737mm)	2"
LV1	ELECTRICAL CONN. (LOW VOLT)	35.5" (902mm)	26-1/2" (673mm)	1-3/8"
LV2	ELECTRICAL CONN. (LOW VOLT)	33.5" (851mm)	26-1/2" (673mm)	1-3/8"

Notes:

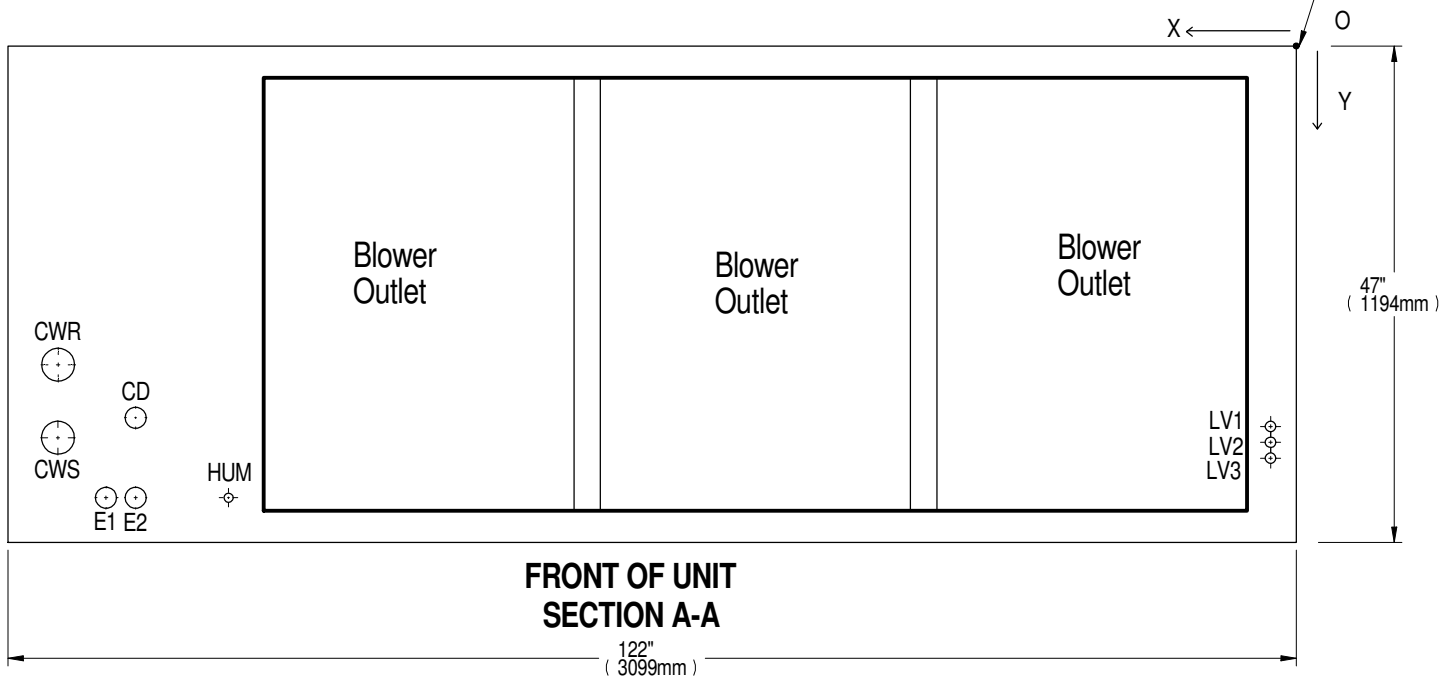
1. Drawing not to scale. Tolerance on all piping dimensions is \pm (13mm) 1/2".


 2. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.

PRIMARY CONNECTION LOCATIONS CW146 & CW181 DOWNFLOW MODELS W/ EC FANS




ALL DIMENSIONS FROM
REAR CORNER OF UNIT
INCLUDING PANELS



POINT	DESCRIPTION	X	Y	CONNECTION SIZE / OPENING
CD	CONDENSATE DRAIN 	110" (2794mm)	35" (889mm)	1-1/4" NPT Female
	W/ OPTIONAL PUMP	110" (2794mm)	35" (889mm)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101" (2565mm)	43" (1092mm)	1/4" O.D. Cu
CWS	2-WAY CHILLED WATER SUPPLY	117" (2972mm)	37" (940mm)	3-1/8"
	3-WAY CHILLED WATER SUPPLY	117" (2972mm)	37" (940mm)	3-1/8"
CWR	2-WAY CHILLED WATER RETURN	117" (2972mm)	30" (762mm)	3-1/8"
	3-WAY CHILLED WATER RETURN	117" (2972mm)	30" (762mm)	3-1/8"
E1	ELECTRICAL CONN. (HIGH VOLT)	113" (2870mm)	43" (1092mm)	2"
E2	ELECTRICAL CONN. (HIGH VOLT)	110" (2794mm)	43" (1092mm)	2"
LV1	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	36" (914mm)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	37-1/2" (953mm)	7/8"
LV3	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	39" (991mm)	7/8"

Notes:

1. Drawing not to scale. Tolerance on all piping dimensions is $\pm (13\text{mm}) 1/2"$.

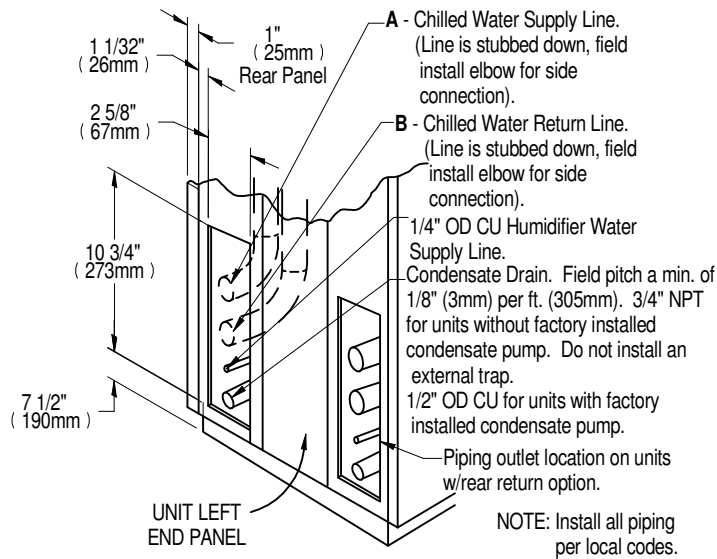
 2. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.

UNIT PIPING CONNECTION LOCATIONS

CW038 - CW084 UPFLOW MODELS W/ FORWARD CURVED BLOWERS

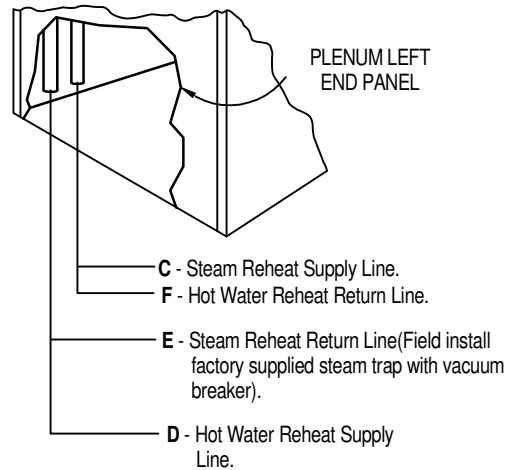
UNIT FIELD PIPING LOCATIONS

Piping stubbed out inside unit end compartment for field connection through 2 5/8" x 10 3/4" (66 x 273mm) opening as shown. Piping may also exit through bottom or top of end compartment by field cutting an opening in a suitable location (except bottom return air units).

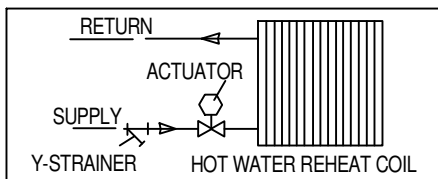


PLENUM FIELD PIPING LOCATIONS

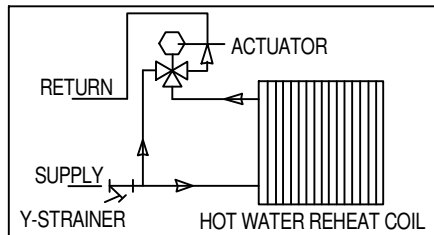
For separate steam or hot water plenum in UPFLOW units, piping may exit through bottom, top or sides by field cutting an opening in a suitable location. Steam or hot water plenum piping connections are located at the left side of the plenum.



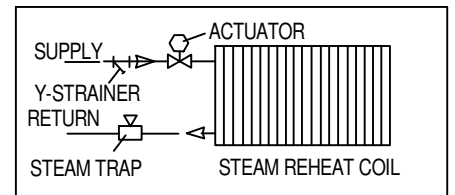
OPTIONAL PLENUM REHEAT SCHEMATICS



OPTIONAL HOT WATER REHEAT (2-WAY VALVE)



OPTIONAL HOT WATER REHEAT (3-WAY VALVE)



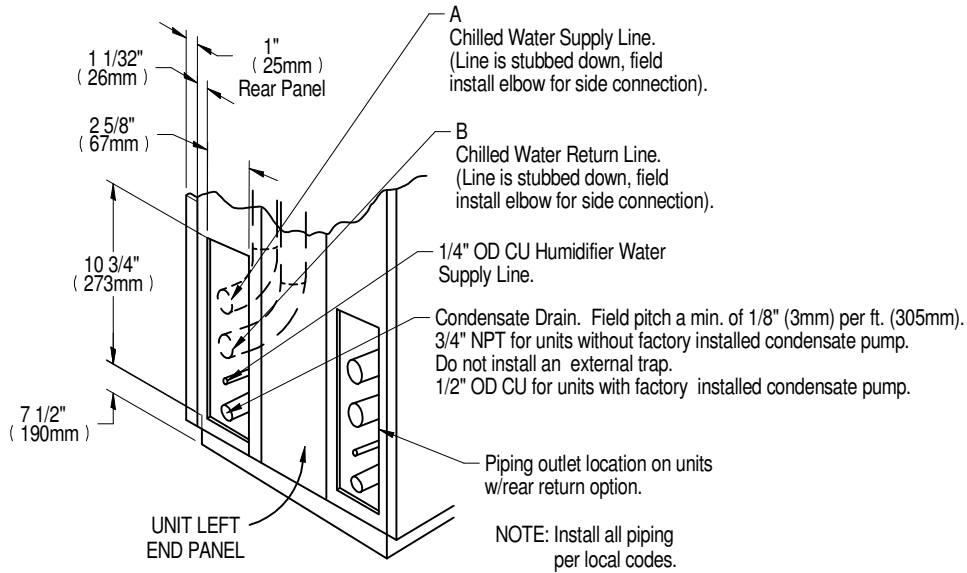
OPTIONAL STEAM REHEAT

Factory Provided Piping Connection Sizes in.						
MODELS	A OD CU	B OD CU	C NPT FEMALE	D OD CU	E NPT FEMALE	F OD CU
CW038	1 3/8	1 3/8	1/2	5/8	1/2	5/8
CW041	1 5/8	1 5/8				
CW051			3/4	7/8	3/4	7/8
CW060						
CW076	2 1/8	2 1/8				
CW084						

UNIT PIPING CONNECTION LOCATIONS CW038 - CW084 UPFLOW MODELS W/ EC FANS

UNIT FIELD PIPING LOCATIONS

Piping stubbed out inside unit end compartment for field connection through 2 5/8" x 10 3/4" (66 x 273mm) opening as shown. Piping may also exit through bottom or top of end compartment by field cutting an opening in a suitable location (except bottom return air units).

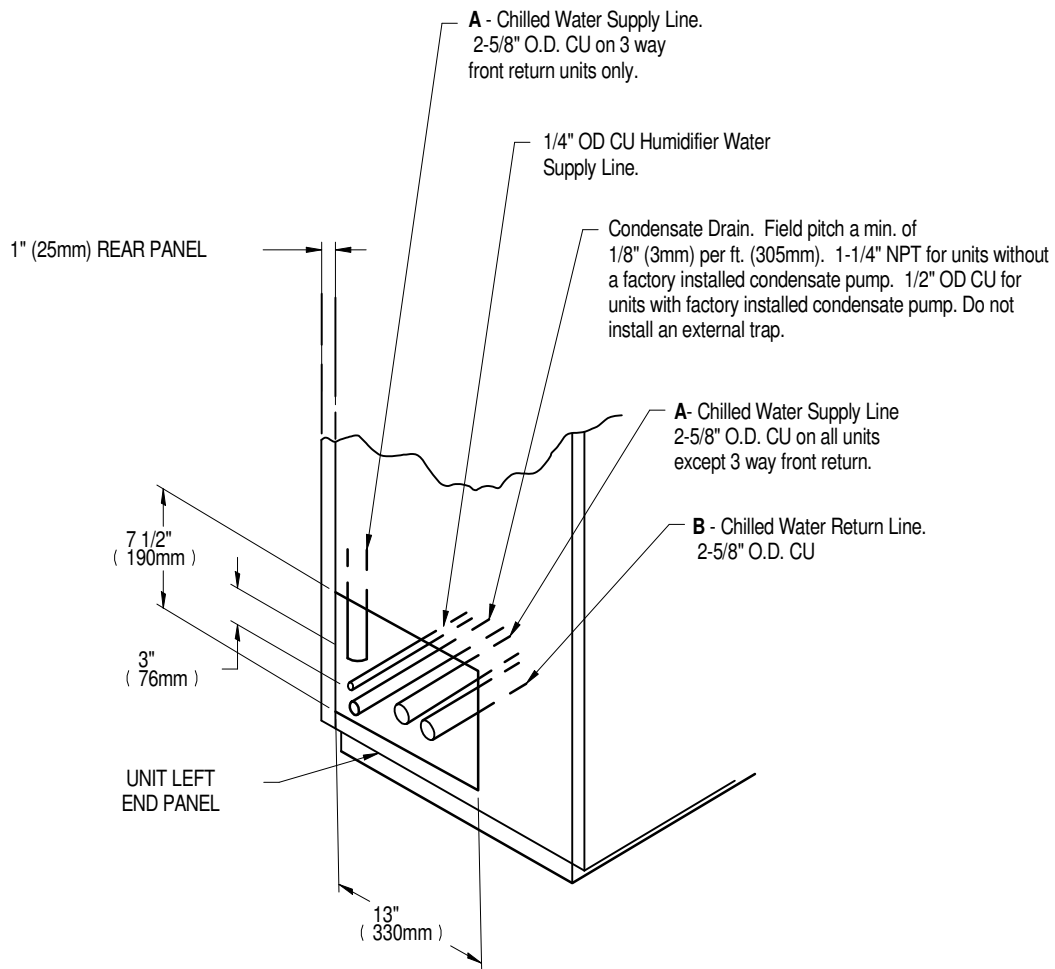


Factory Provided Piping Connection Sizes in.		
MODELS	A OD CU	B OD CU
CW038	1 3/8	1 3/8
CW041	1 5/8	1 5/8
CW051		
CW060	2 1/8	2 1/8
CW076		
CW084		

UNIT PIPING CONNECTION LOCATIONS CW106 & CW114 UPFLOW MODELS

UNIT FIELD PIPING LOCATIONS

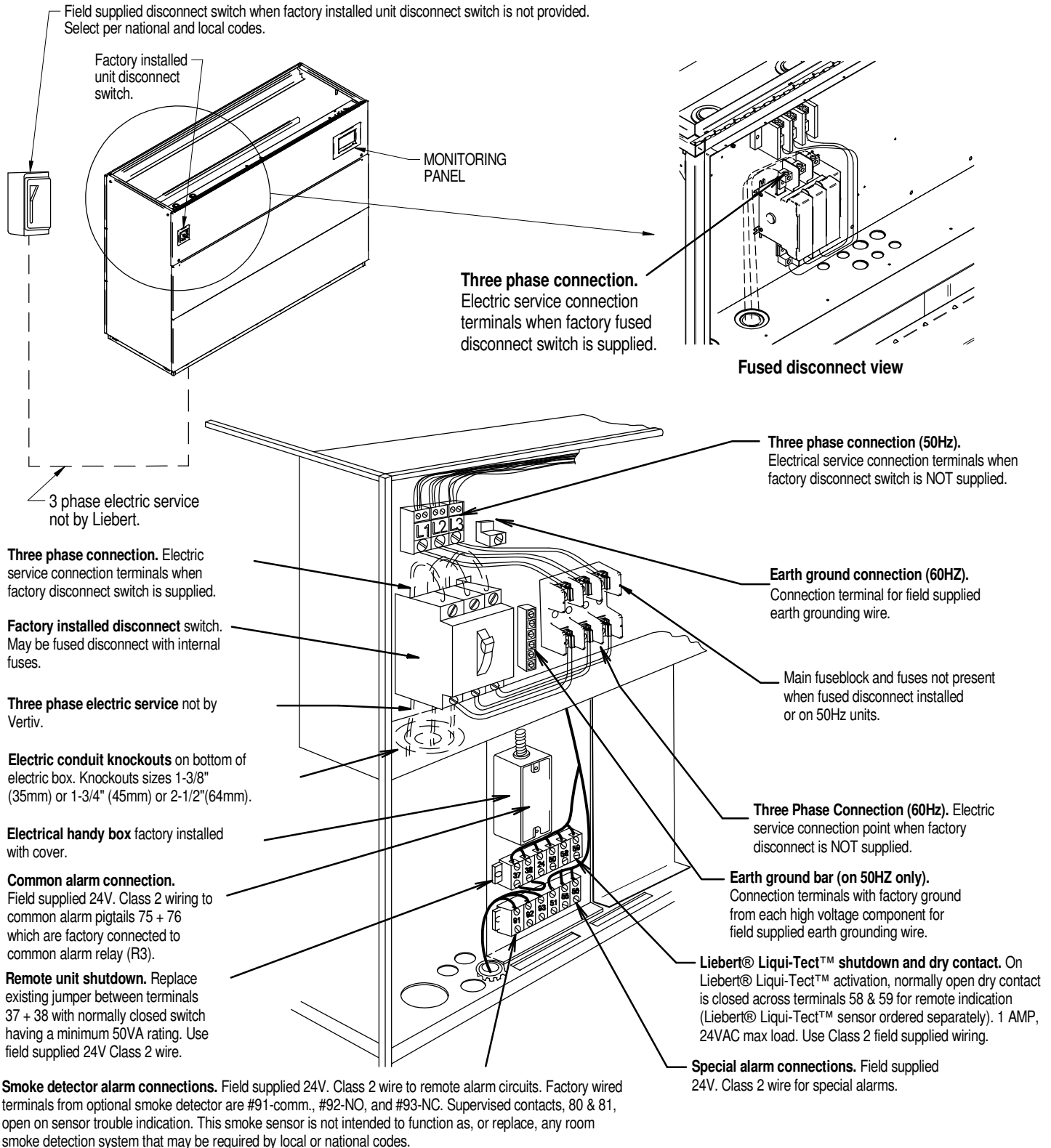
Piping stubbed out inside unit end compartment for field connection through 13" x 6-1/2" (330 x 165mm) opening as shown. Piping may also exit through bottom of end compartment by field cutting an opening in a suitable location.



Notes:

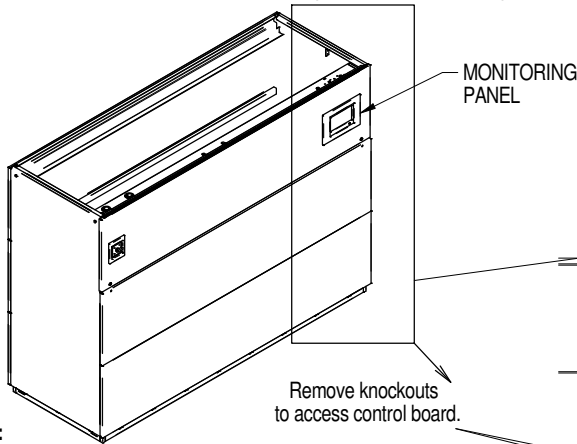
1. Install all piping per local codes.

ELECTRICAL FIELD CONNECTIONS DOWNFLOW MODELS CW038 - CW084



NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

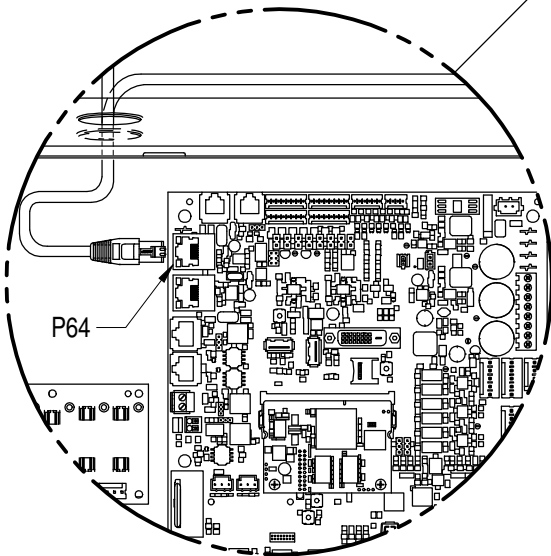
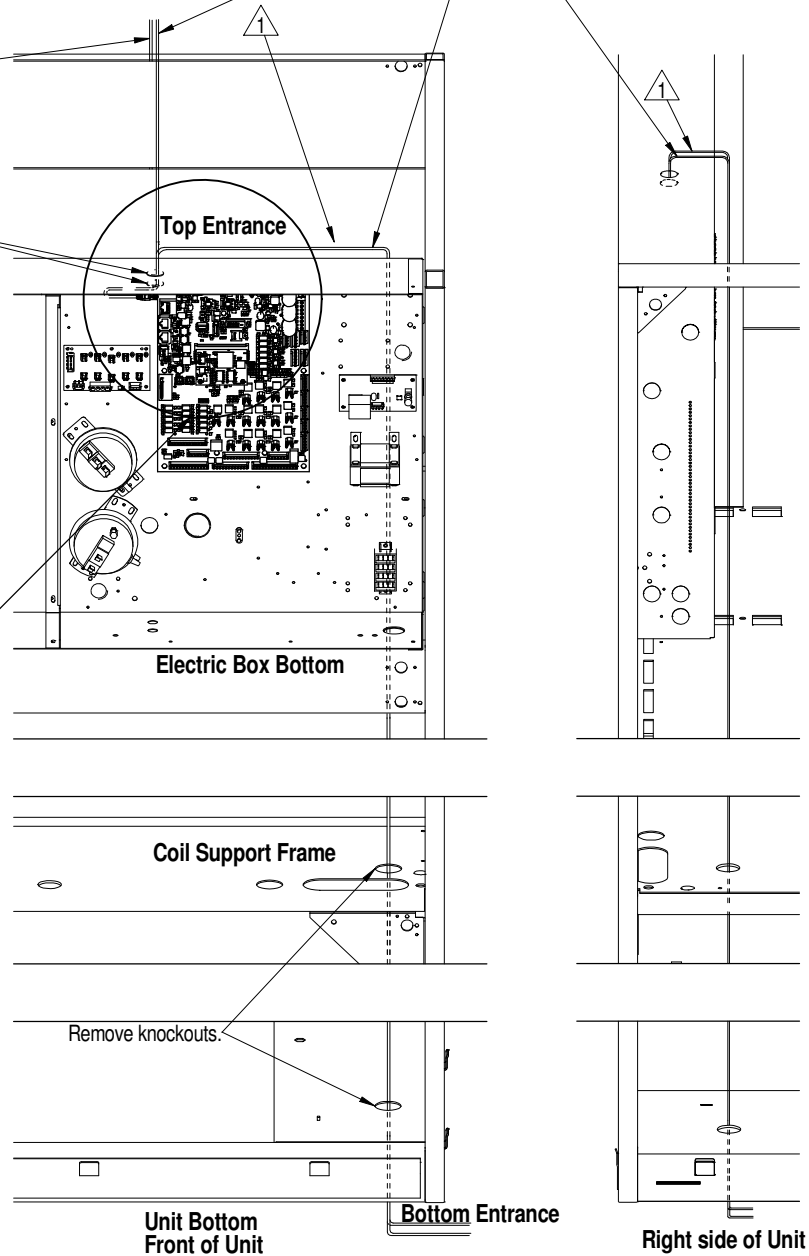
ELECTRICAL FIELD CONNECTIONS DOWNFLOW MODELS CW038 - CW084 FOR NETWORK ETHERNET CONNECTIONS



Notes:

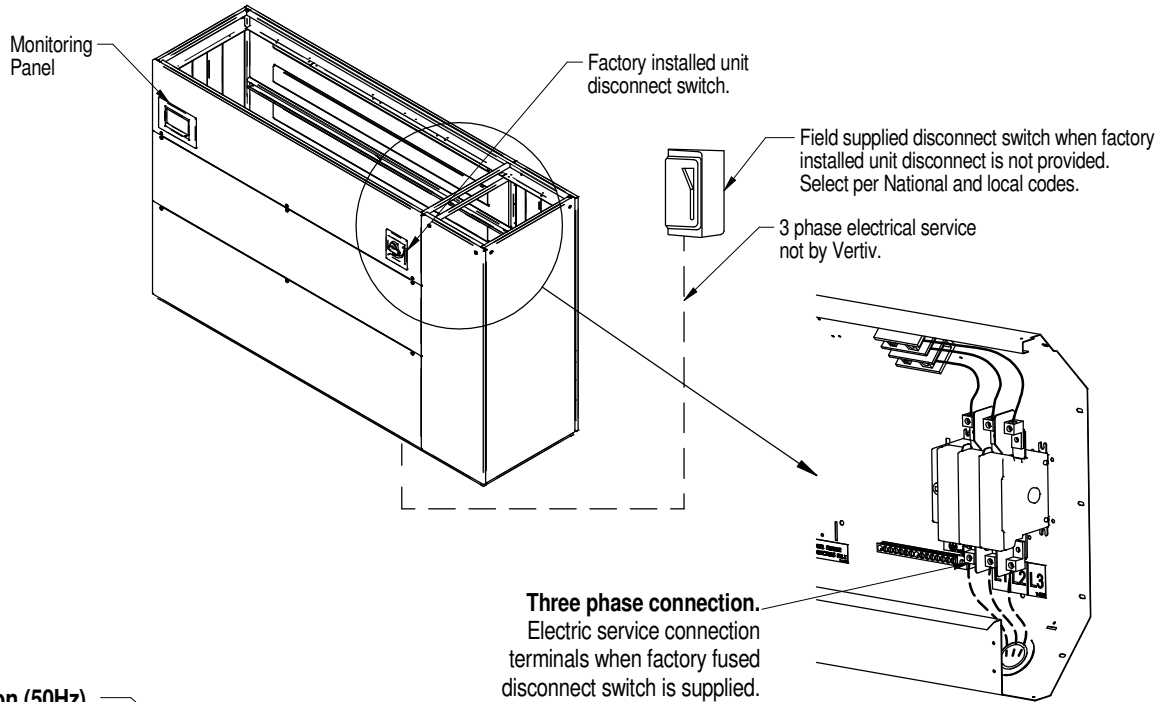
1. To provide unit to unit (U2U) networking, the customer must first connect an Ethernet cable from P64 on the Liebert® iCOM™ control board, to a network switch.

Low Voltage Communication Wiring
CAT5E Ethernet connections – field installed
Avoid routing near high voltage wiring.
Secure wiring to prevent damage and use bushing or edge guard to avoid sharp edges.



NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

**ELECTRICAL FIELD CONNECTIONS
DOWNFLOW MODELS CW106 & CW114**



Fused Disconnect View

Three phase connection (50Hz). Electric service connection terminals when factory disconnect switch is NOT supplied.

Earth ground connection (60 HZ). Connection terminal for field supplied earth grounding wire.

Three phase connection (60Hz). Electric service connection terminals when factory disconnect switch is NOT supplied.

Earth ground bar (optional). Connection terminals with factory ground from each high voltage component for field supplied earth grounding wire.

Three phase connection. Electric service connection terminals when factory disconnect switch is supplied.

Three phase electric service. Not provided by Vertiv.

Electric conduit knockouts. Bottom of electric box. Knockout sizes 1 3/8" (35mm) or 1 3/4" (45mm) or 2 1/2" (64mm).

Disconnect switch. Factory installed.

Main fuseblock and fuses not present when fused disconnect installed or on 50Hz units.

Common alarm connection. Field supplied 24V, Class 1 wiring to common alarm terminals 75 + 76 which are factory connected to common alarm relay (R3).

Smoke detector alarm connections. Field supplied 24V, Class 1 wire to remote alarm circuits. Factory wired terminals from optional smoke detector are #91-comm., #92-NO, and #93-NC. Supervised contacts, 80 & 81, open on sensor trouble indication. This smoke sensor is not intended to function as, or replace, any room smoke detection system that may be required by local or national codes.

Customer alarm connections. Field supplied 24V, Class 1 wire for customer alarm terminals 24, 50, 51, 55, 56.

Remote unit shutdown. Replace existing jumper between terminals 37 + 38 with normally closed switch having a minimum 50VA rating. Use field supplied, 24V Class 1 wire.

Liebert® Liqui-Tect™ shutdown and dry contact. On Liebert® Liqui-Tect™ activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (Liebert® Liqui-Tect™ sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

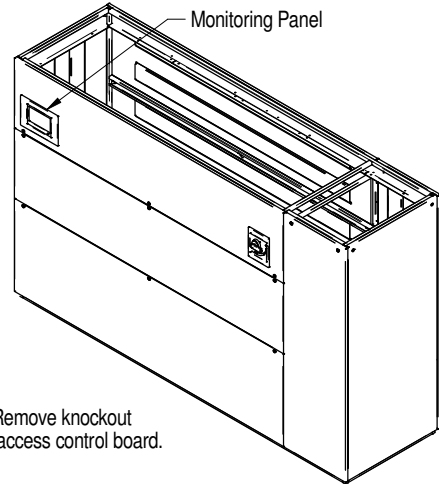
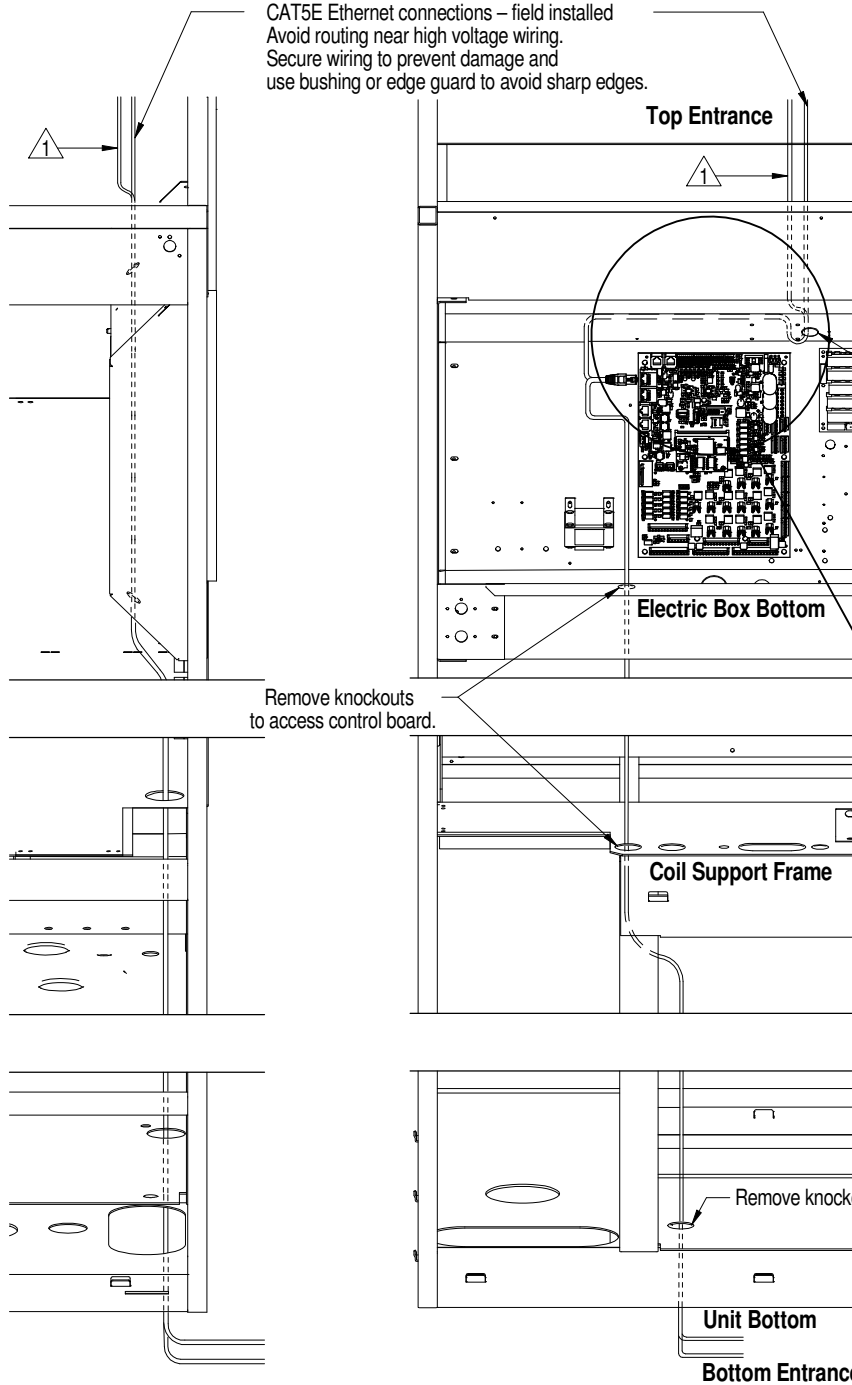
Temperature and Humidity Sensor

NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

ELECTRICAL FIELD CONNECTIONS DOWNFLOW MODELS CW106 & CW114

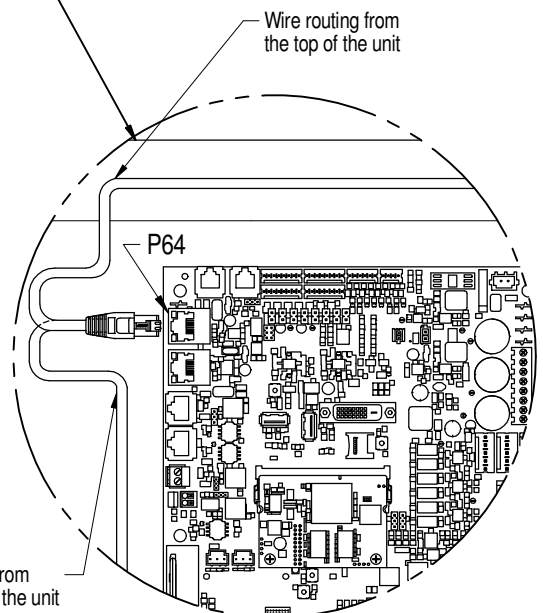
Low Voltage Communication Wiring

CAT5E Ethernet connections – field installed
Avoid routing near high voltage wiring.
Secure wiring to prevent damage and
use bushing or edge guard to avoid sharp edges.



Notes:

1. To provide unit to unit (U2U) networking, the customer must first connect an Ethernet cable from P64 on the Liebert® iCOM™ control board, to a network switch.



NOTE: Refer to specification sheet for full load amp and wire size amp ratings.



ELECTRICAL FIELD CONNECTIONS DEFINITIONS & LOCATIONS DOWNFLOW CW146 & CW181 MODELS W/ EC FANS

STANDARD ELECTRICAL CONNECTIONS

- 1) **Primary high voltage entrance** - 2" (51 mm); 1.375" (35mm) diameter concentric knockouts located in bottom of box.
- 2) **Primary low voltage entrance** - Quantity (3) 1.375" (35mm) diameter knockouts located in bottom of box.
- 3) **Three phase electrical service** - Terminals are on main fuse block (disregard if unit has optional disconnect switch). Three phase service not by Vertiv.
- 4) **Earth ground** - Terminal for field supplied earth grounding wire.
- 5) **Remote unit shutdown** - Replace existing jumper between terminals 37 & 38 with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
- 6) **Customer alarm inputs** - Terminals for field supplied, normally open contacts, having a minimum 75VA, 24VAC rating, between terminals 24 & 50, 51, 55, 56. Use field supplied Class 1 wiring. Terminal availability varies by unit options.
- 7) **Common alarm** - On any alarm, normally open dry contact is closed across terminals 75 & 76 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 8) **Unit factory installed disconnect switch, Fuse Block and Main Fuses** – Type of disconnect switch available – “Locking”. The “Locking Type” consists of a non-automatic molded case switch operational from the outside of the unit. Access to the high voltage electric panel compartment can be obtained only with the switch in the “off” position. The molded case switch disconnect models contain separate main fuses. Units with fused disconnect have main fuses within the disconnect.

OPTIONAL ELECTRICAL CONNECTIONS

- 9) **Secondary disconnect switch and earth ground** – Fuses are included in the 65KAIC SCCR fused disconnect switch models.
- 10) **Three phase electrical service** - Terminals are on top of disconnect switch. Three phase service not by Liebert.
- 11) **Smoke sensor alarm** - Factory wired dry contacts from smoke sensor are 91-common, 92-NO, and 93-NC. Supervised contacts, 80 & 81, open on sensor trouble indication. This smoke sensor is not intended to function as, or replace, any room smoke detection system that may be required by local or national codes. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 12) **Reheat and humidifier lockout** - Remote 24VAC required at terminals 82 & 83 for lockout of reheat and humidifier.
- 13) **Condensate alarm** (with condensate pump option) - On pump high water indication, normally open dry contact is closed across terminals 88 & 89 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 14) **Remote humidifier** - On any call for humidification, normally open dry contact is closed across terminals 11 & 12 to signal field supplied remote humidifier. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 15) **Reversing Starter Power Supply Notification** – Normally open contact terminals 106 and 107 will close when Power Supply 1 is engaged; 110 and 111 will close when Power Supply 2 is engaged.

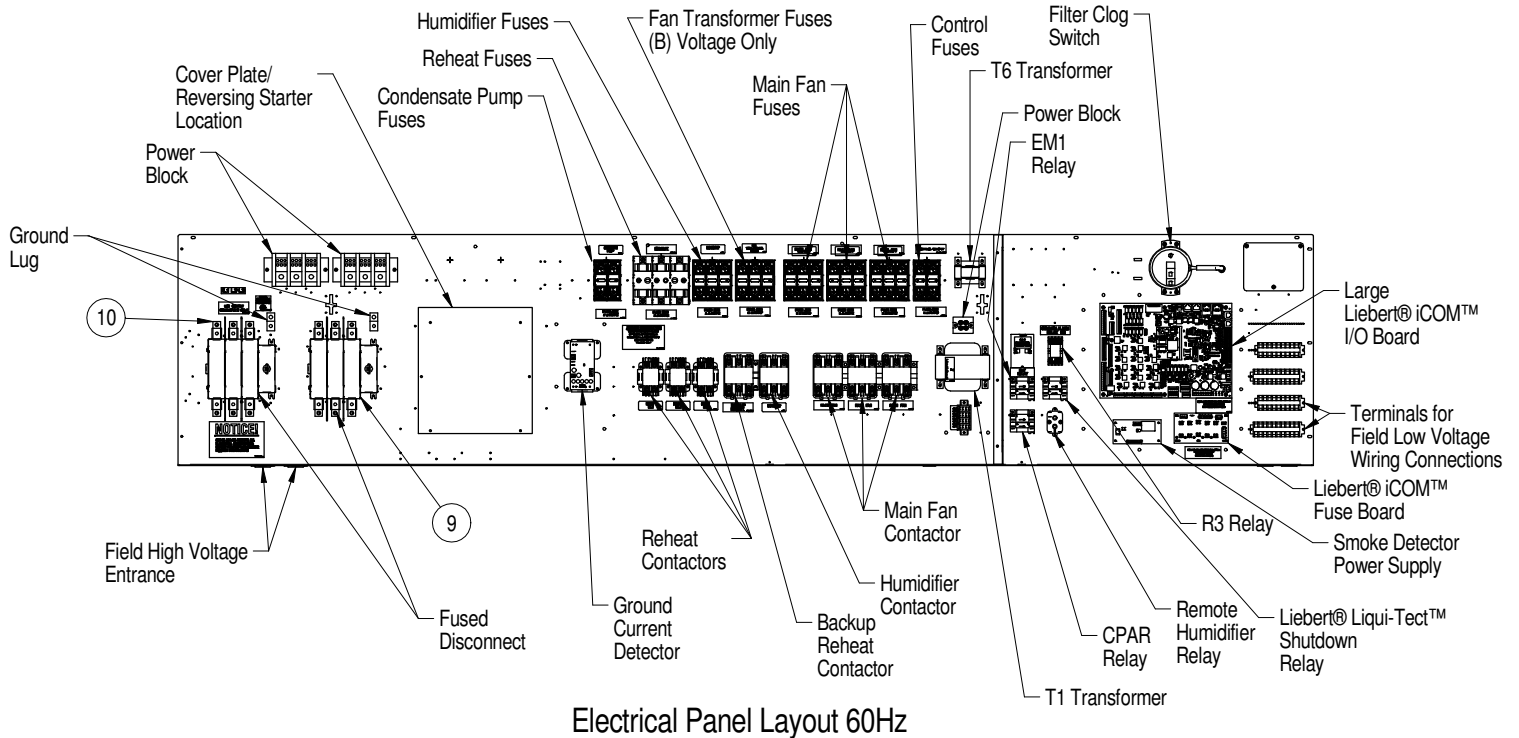
OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

- 16) **Remote unit shutdown** - Two additional contact pairs available for unit shutdown (labeled as 37B & 38B, 37C & 38C). Replace jumpers with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
- 17) **Common alarm** - On any alarm, two additional normally open dry contacts are closed across terminals 94 & 95 and 96 & 97 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 18) **Main fan auxiliary switch** - On closure of main fan contactor, normally open dry contact is closed across terminals 84 & 85 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
- 19) **Liebert® Liqui-Tect™ shutdown and dry contact** - On Liebert® Liqui-Tect™ activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (Liebert® Liqui-Tect™ sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

OPTIONAL COMMUNICATION CONNECTIONS

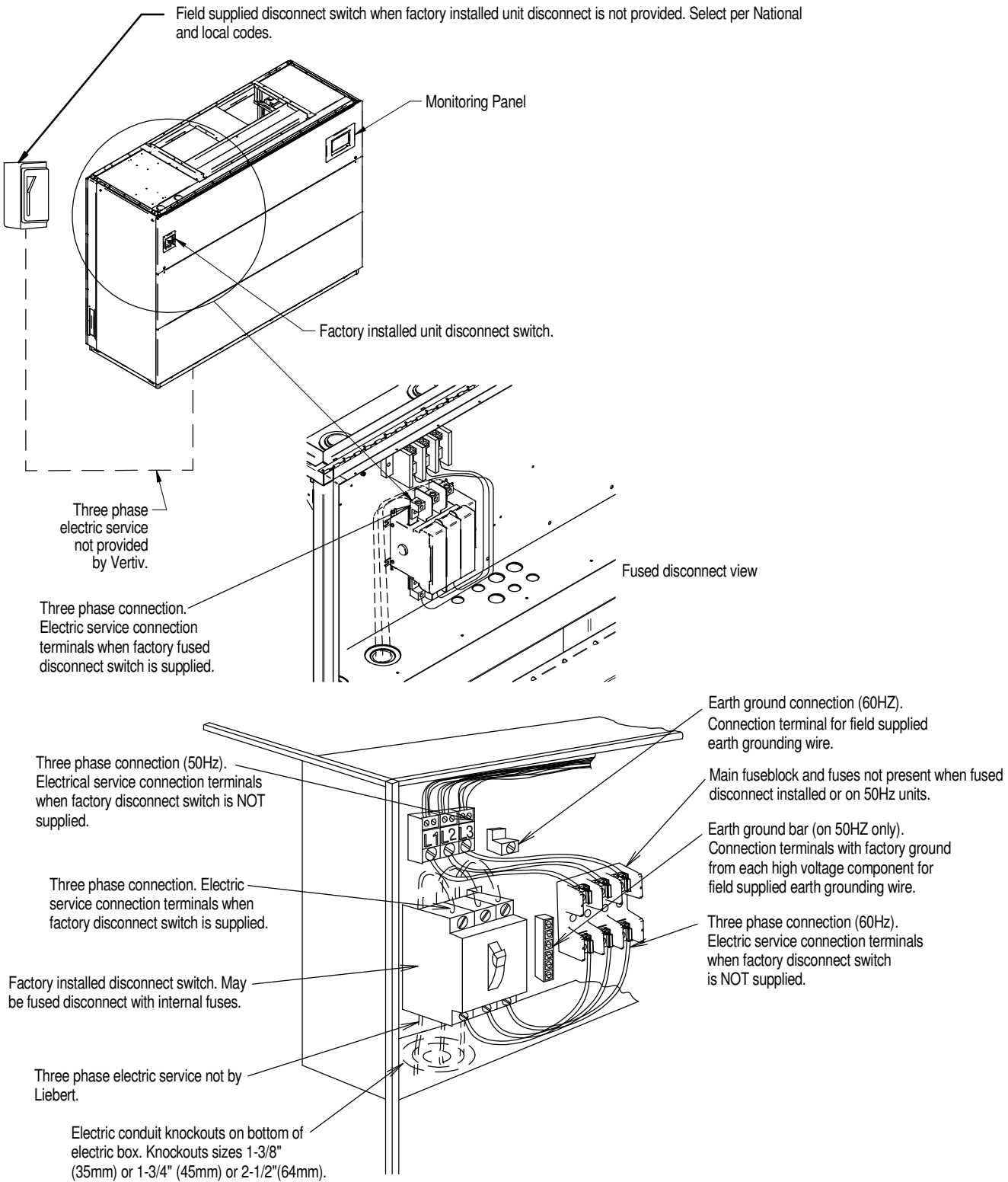
- 20) **Unit-To-Unit** - Plug 64 is reserved for U2U communication.
- 21) **Site and BMS** - Plug 74 and terminal block 3 are reserved for Site and BMS connections. Plug 74 is an eight pin RJ45 for a Cat 5 cable. Terminal block 3 is a two position screw terminal block for use with twisted pair wires.

ELECTRICAL FIELD CONNECTIONS DEFINITIONS & LOCATIONS DOWNFLOW CW146 & CW181 MODELS W/ EC FANS



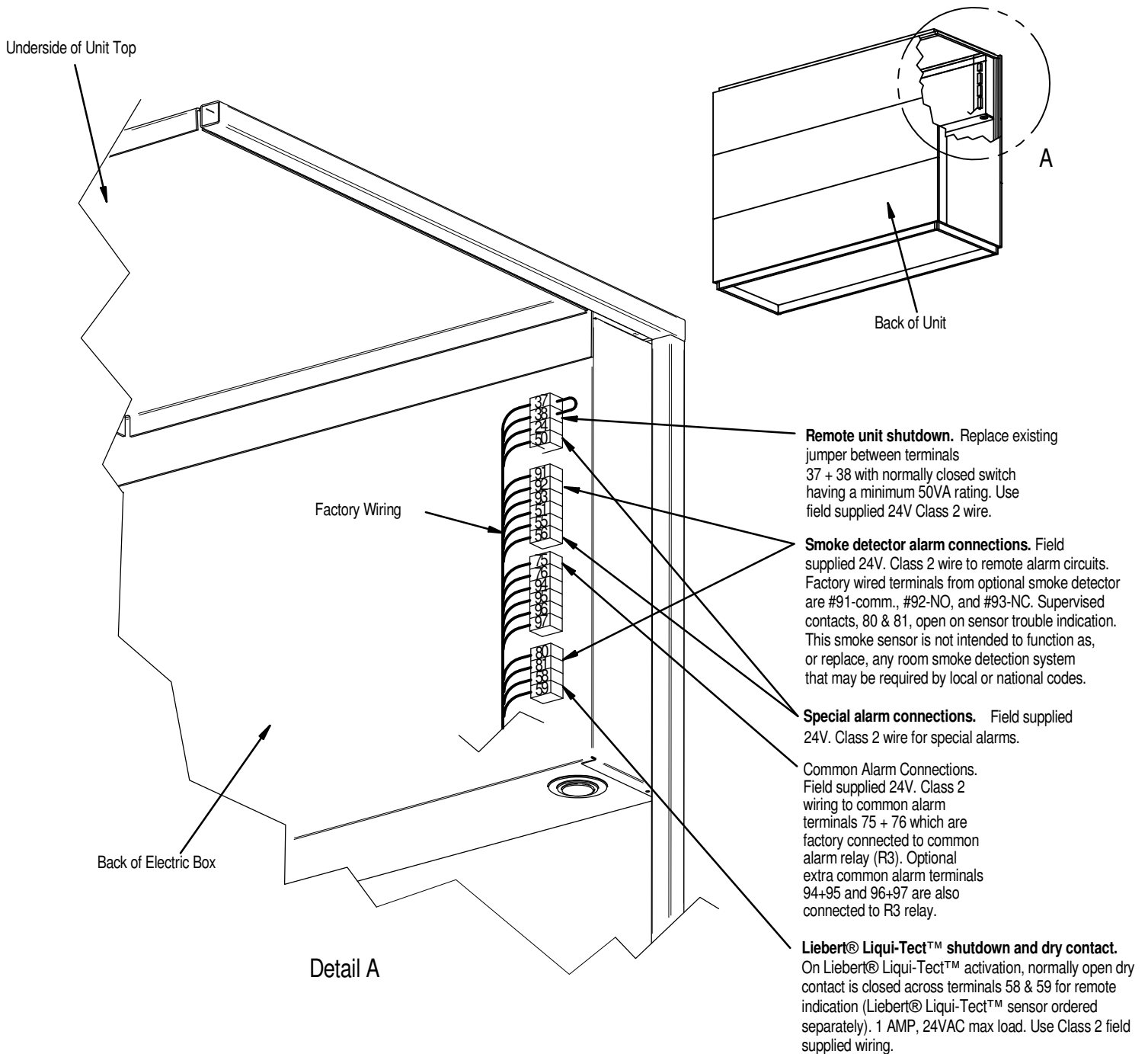
Typical Arrangement for Dual Fused Disconnect Switches

ELECTRICAL FIELD CONNECTIONS UPFLOW MODELS CW038 - CW084 HIGH VOLTAGE



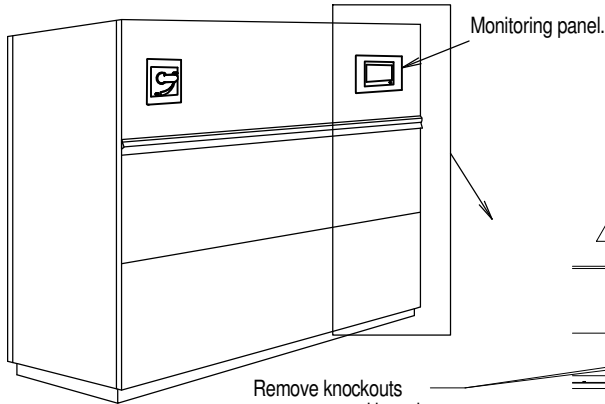
NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

ELECTRICAL FIELD CONNECTIONS UPFLOW MODELS CW038 - CW084 LOW VOLTAGE

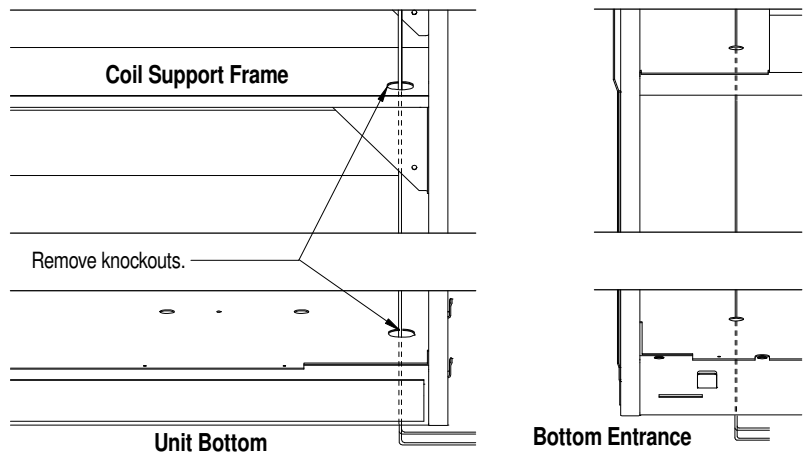
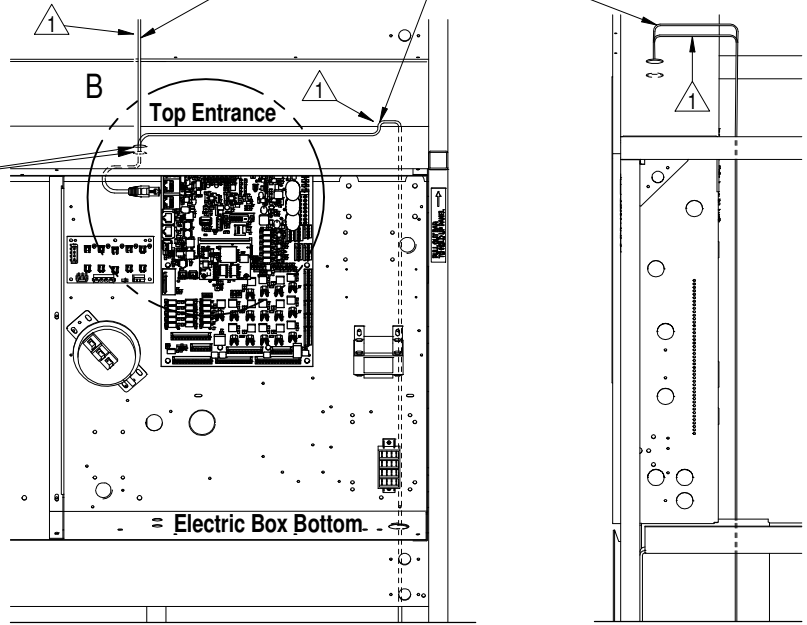


NOTE: REFER TO SPECIFICATION SHEET FOR FULL LOAD
AMP. AND WIRE SIZE AMP. RATINGS

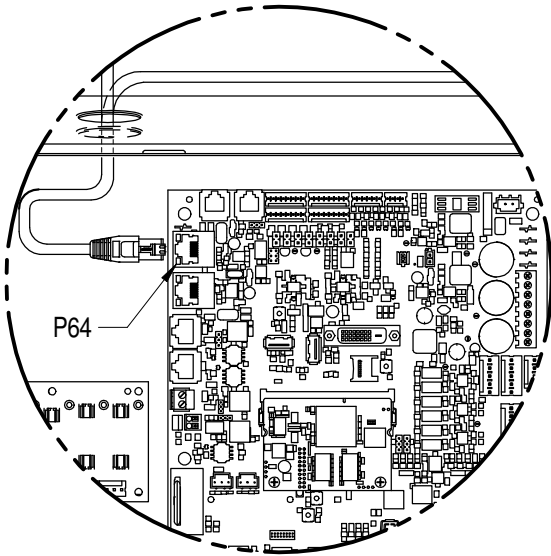
ELECTRICAL FIELD CONNECTIONS UPFLOW MODELS CW038 - CW084 LOW VOLTAGE



Low Voltage Communication Wiring
CAT5E Ethernet connections – field installed
Avoid routing near high voltage wiring.
Secure wiring to prevent damage and
use bushing or edge guard to avoid sharp edges.



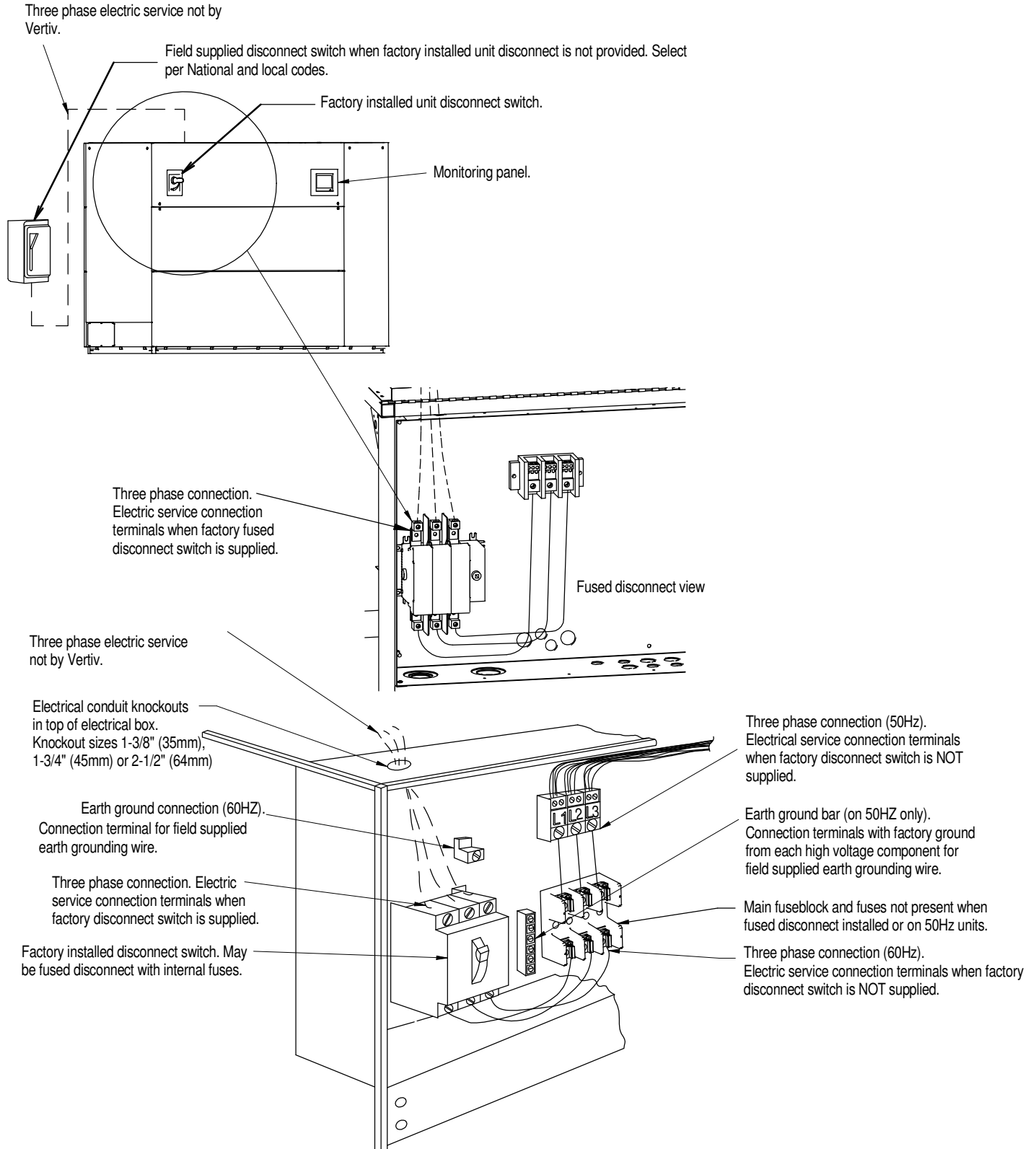
- Notes:**
- 1. To provide unit to unit (U2U) networking, the customer must first connect an Ethernet cable from P64 on the Liebert® iCOM™ control board, to a network switch.



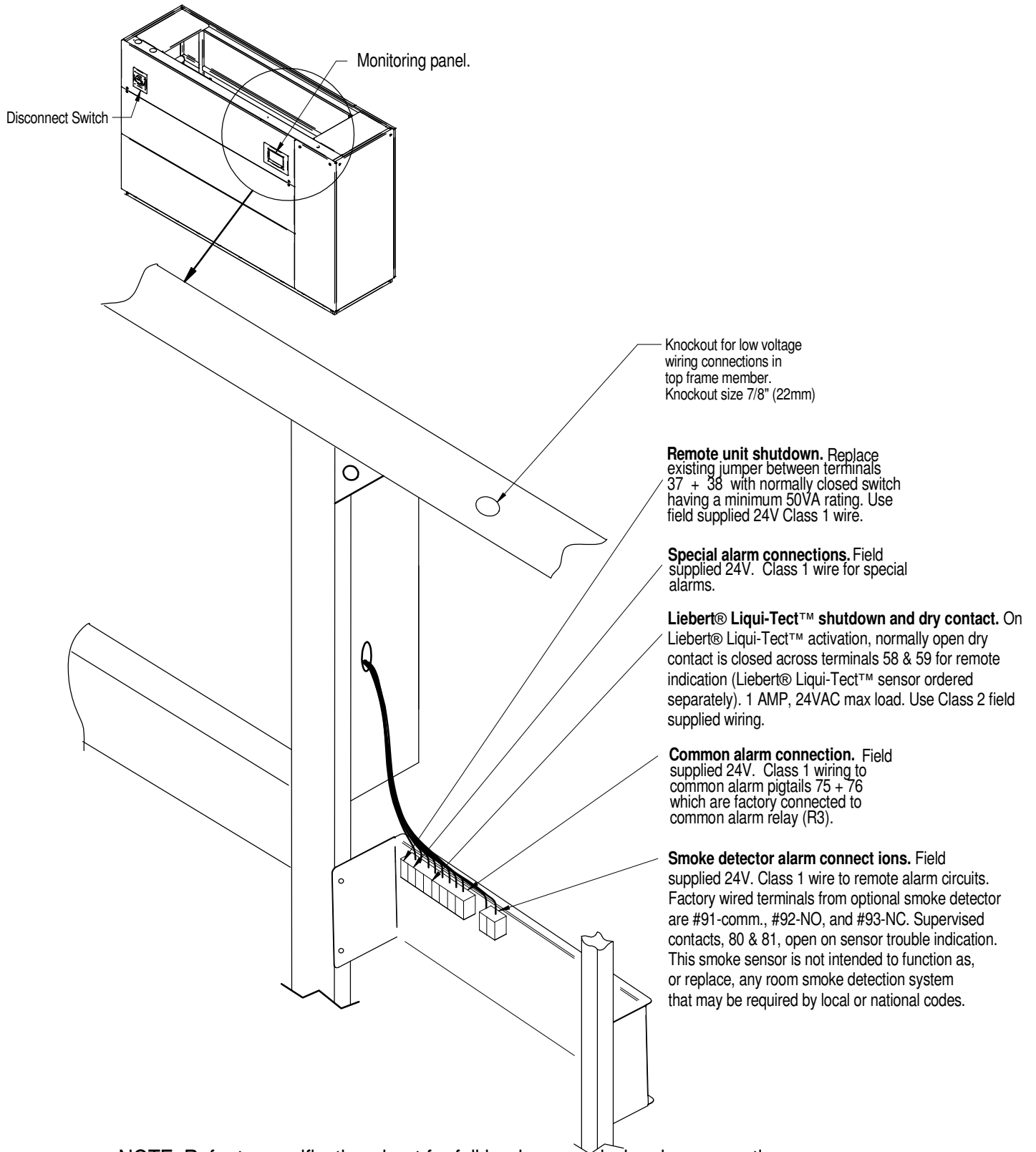
Detail B

NOTE: REFER TO SPECIFICATION SHEET FOR FULL LOAD
AMP. AND WIRE SIZE AMP. RATINGS

**ELECTRICAL FIELD CONNECTIONS
UPFLOW MODELS CW106 - CW114 HIGH VOLTAGE**



**ELECTRICAL FIELD CONNECTIONS
UPFLOW MODELS CW106 & CW114 LOW VOLTAGE**

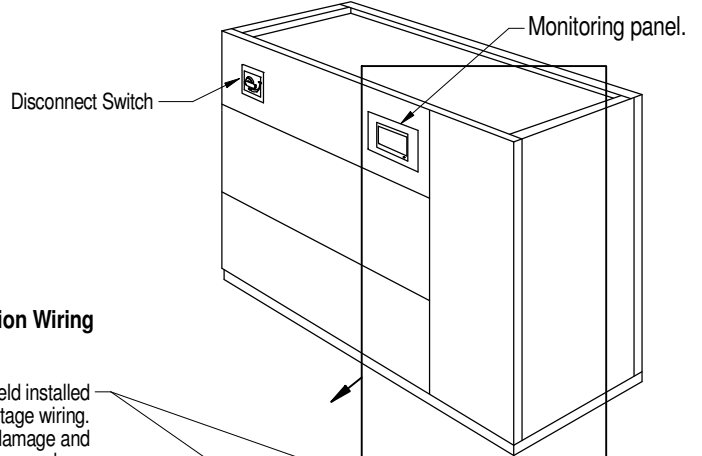


NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

ELECTRICAL FIELD CONNECTIONS UPFLOW MODELS CW106 & CW114 LOW VOLTAGE

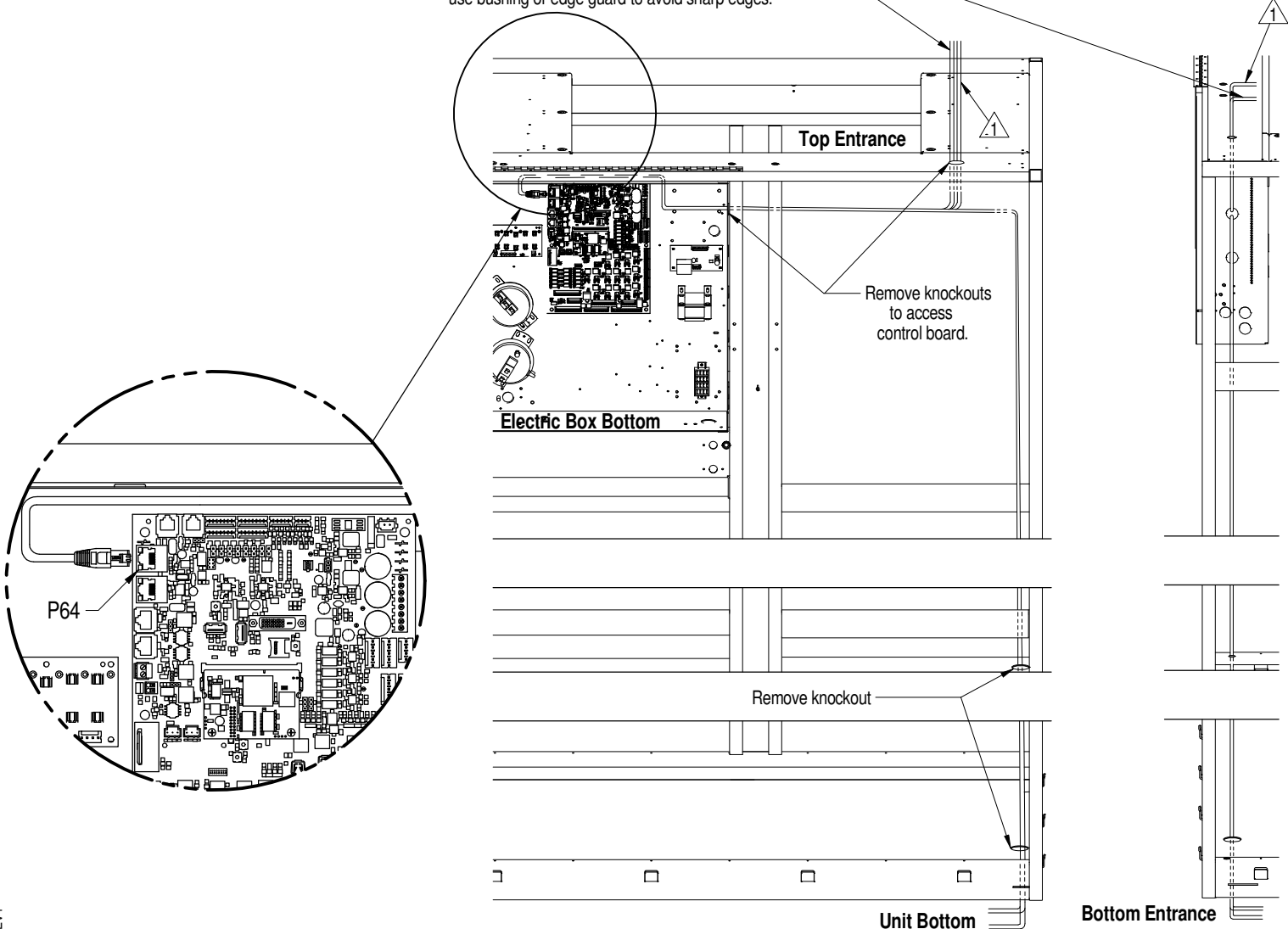
Notes:

1. To provide unit to unit (U2U) networking, the customer must first connect an Ethernet cable from P64 on the Liebert® iCOM™ control board, to a network switch.



Low Voltage Communication Wiring

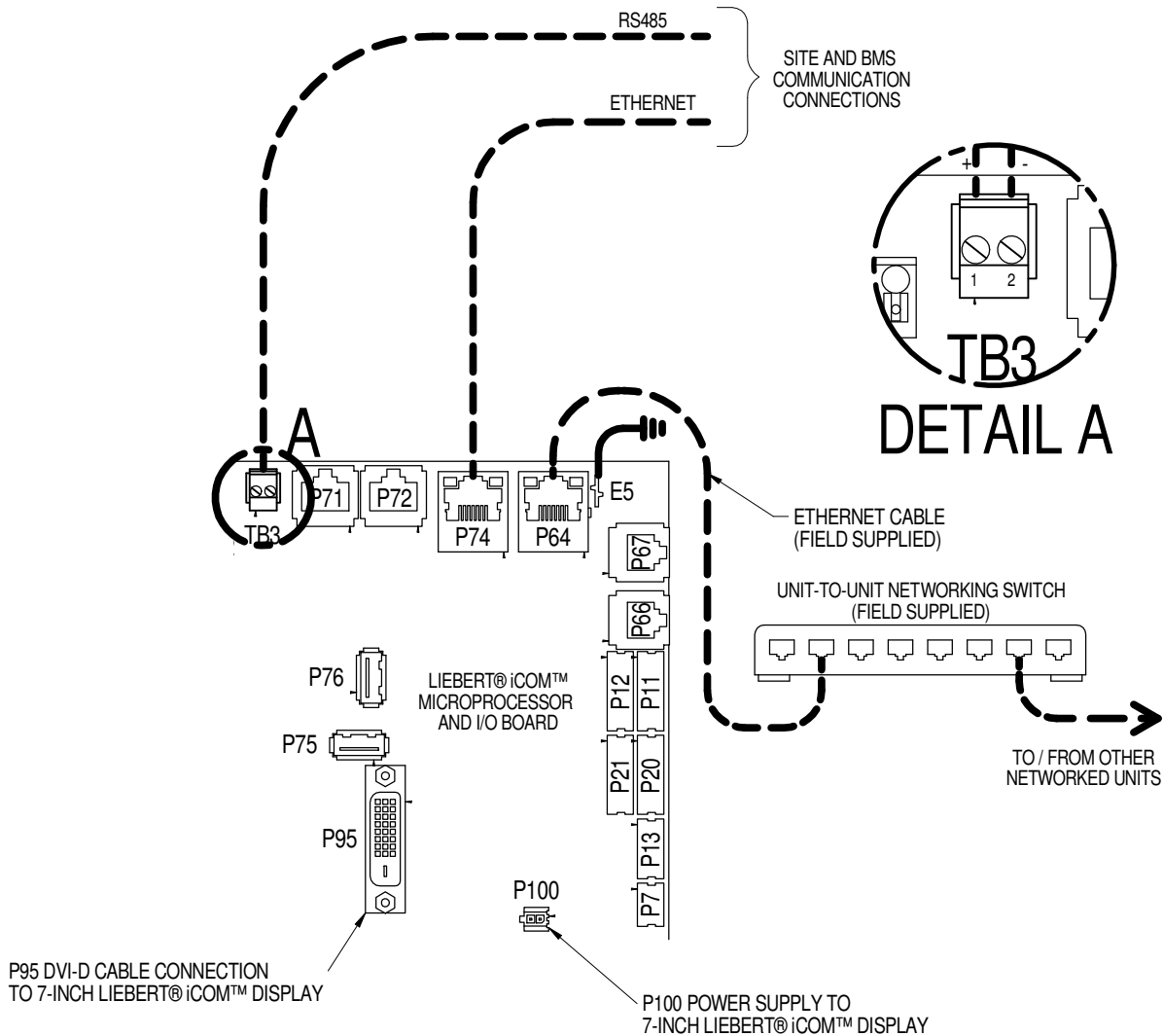
CAT5E Ethernet connections – field installed
Avoid routing near high voltage wiring.
Secure wiring to prevent damage and
use bushing or edge guard to avoid sharp edges.



NOTE: Refer to specification sheet for full load amp and wire size amp ratings.

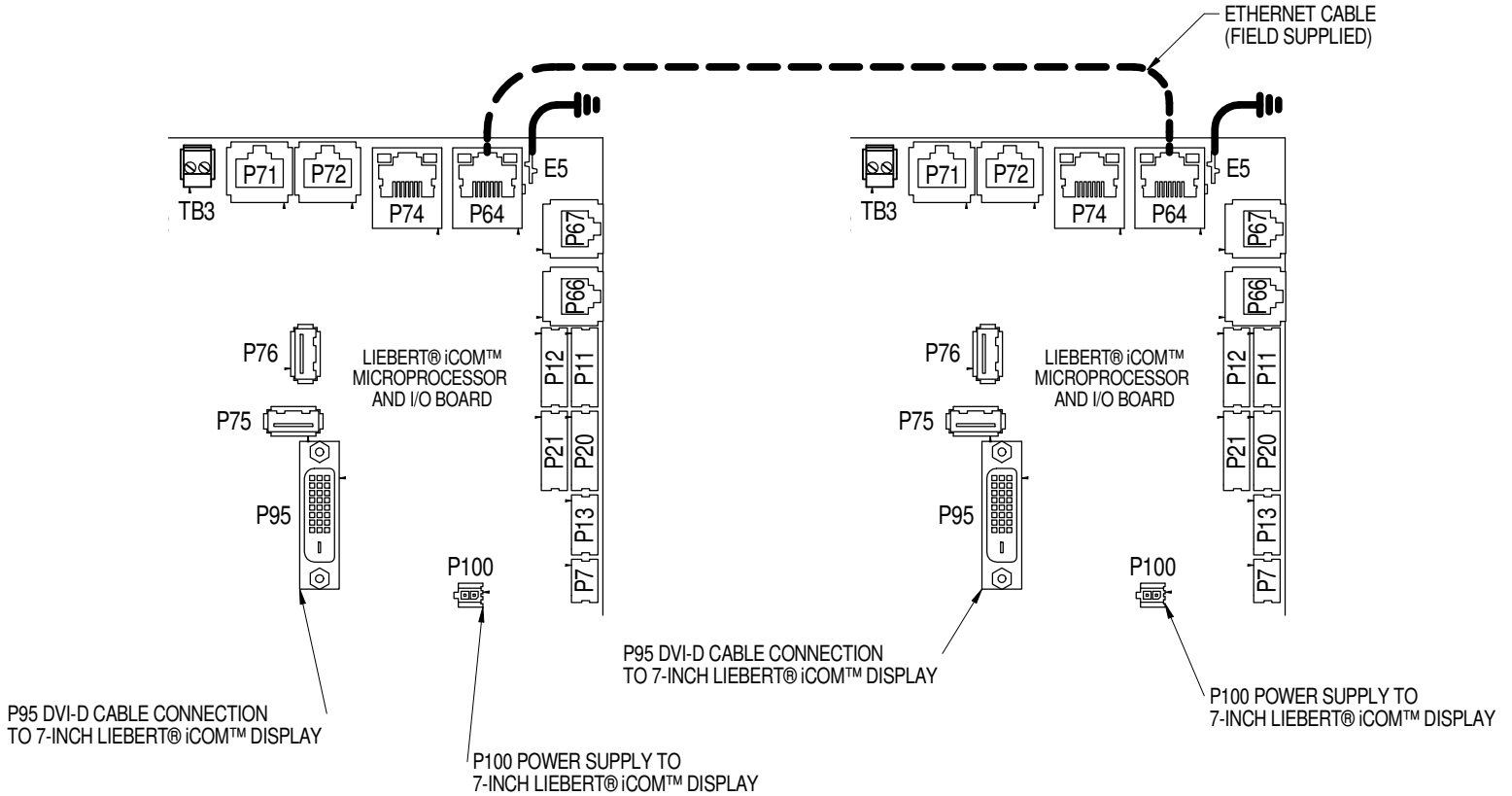
UNIT TO UNIT NETWORK CONNECTIONS

LIEBERT® CW, LIEBERT® CWA, LIEBERT® DS, LIEBERT® DSE,
LIEBERT® PDX, LIEBERT® PCW



UNIT TO UNIT NETWORK CONNECTIONS

LIEBERT® CW, LIEBERT® CWA, LIEBERT® DS, LIEBERT® DSE,
LIEBERT® PDX, LIEBERT® PCW



NOTE* For dual-unit network configurations only



LIEBERT® CW

SEISMIC APPLICATION ASSUMPTIONS AND REQUIREMENTS

The International Code Council's International Building Code (IBC) has become the primary code document for the design and installation of building systems. Vertiv has conducted analytical modeling and dynamic shake table testing of the Liebert® CW product to provide an option for those systems requiring seismic certification of compliance. This certification goes beyond the equipments. In critical applications the equipment must be capable of performing its primary function after a seismic event within the limit of certification.

Certification Criteria

The Liebert® CW certification is based on a maximum mapped spectral response acceleration, S_s , of 3.0g adjusted by the soil site coefficient to Soil Site Class D as the default when the site soil properties or final equipment installation location is not known. The certification maximum spectral response coefficient S_{ds} value of 2.0g including Soil Class and Seismic Use group corrections. Soil Classes A, B, C, D, E, and Seismic Design Categories A, B, C, D, E, and F are all covered under this certification, limited by the S_{ds} value stated above. A seismic importance factor, I_p , of 1.5 applies to this certification to include essential facility requirements and life safety applications for post event functionality.

Requirements for Anchorage

Anchors

1. Mounting requirement details such as brand, type, embedment depth, edge spacing, anchor spacing, concrete strength, wall bracing, and special inspection must be outlined and approved by the project Structural Engineer of Record.

Anchorage Surface

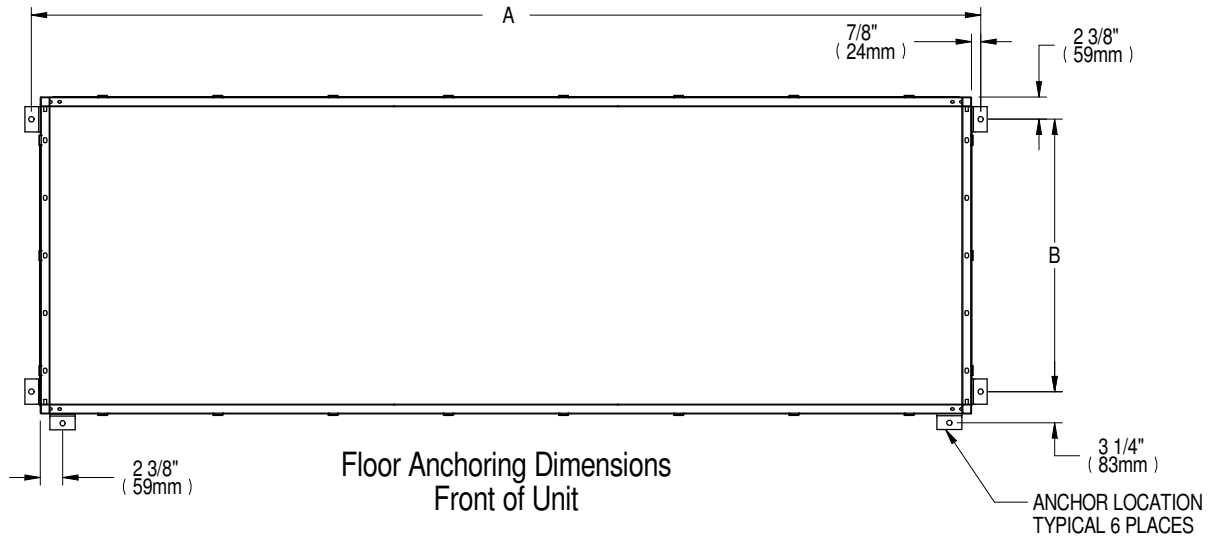
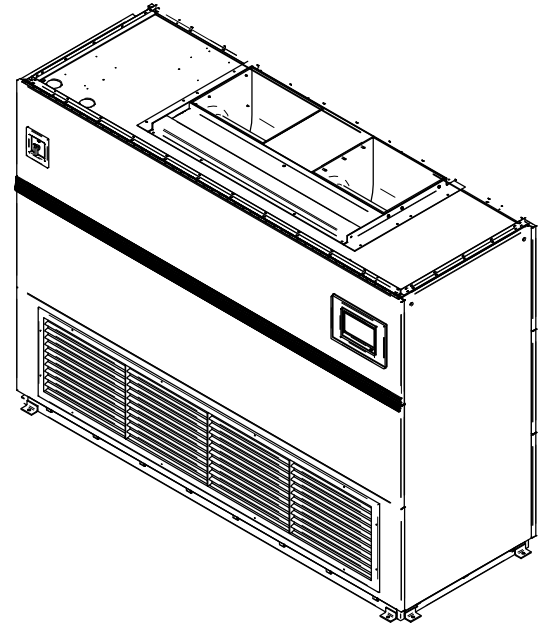
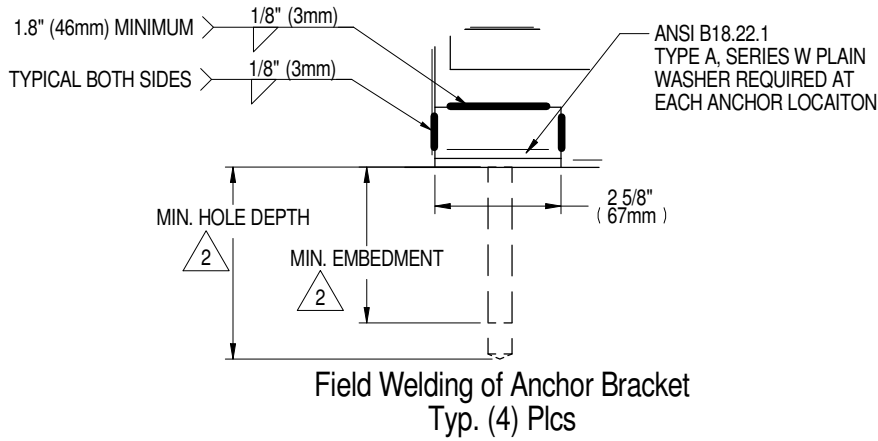
2. Structural floors, and housekeeping pads must also be seismically designed and approved by the project Structural Engineer of Record to withstand the seismic anchor loads as defined on the installation drawings. The installing contractor is responsible for the proper installation of all anchors and mounting hardware, observing the mounting requirement details outlined by the Engineer of Record. Contact the Manufacturer's Representative if a detailed Seismic Installation Calculation Package is required.

Connections to Unit

3. Electrical wiring, conduit, and/or other connections to the equipment is the responsibility of others. Data and recommendations are supplied here and in the unit installation supplement for seismic installation.


DIMENSIONAL DATA

SEISMIC ANCHORAGE UPFLOW UNITS W/ FORWARD CURVED BLOWERS



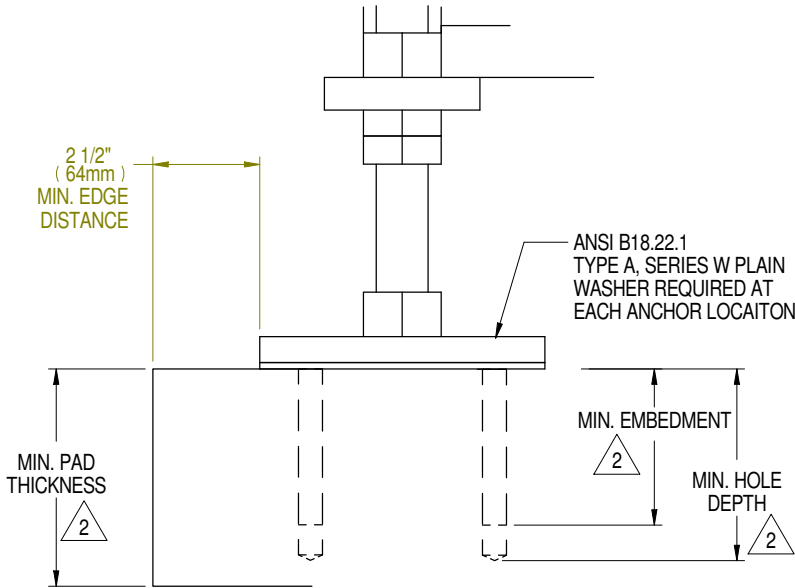
Notes:

1. Anchor Bolt sized per Hilti Kwik Bolt TZ Carbon and Stainless in concrete, ICC ESR-1917. Alternates are subject to review by Vertiv or Engineer of Record.
2. Specified by Engineer of Record.

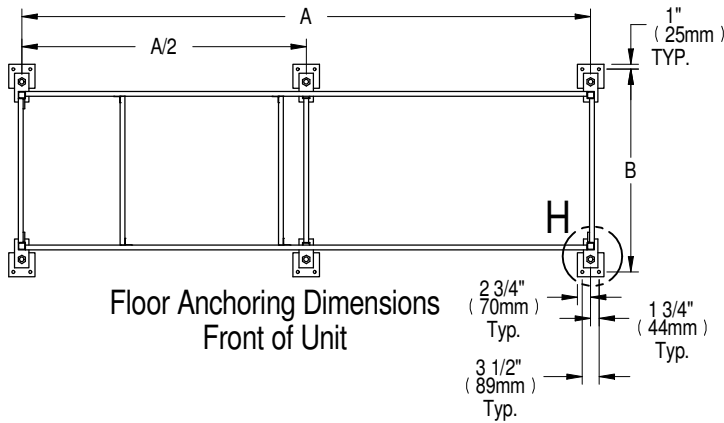
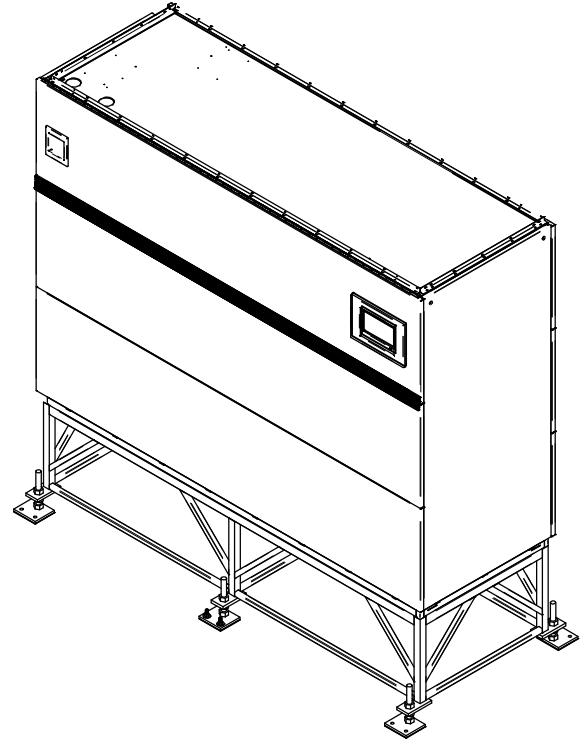
UPFLOW MODEL NUMBER	DIMENSIONAL DATA inches (mm)		ANCHOR SIZE 
	A	B	
CW038, CW041	50 (1270)	29 (37)	1/2"
CW051, CW060	74 (1880)		
CW076, CW084	99 (2515)		
CW106, CW114	122 (3099)		

DIMENSIONAL DATA

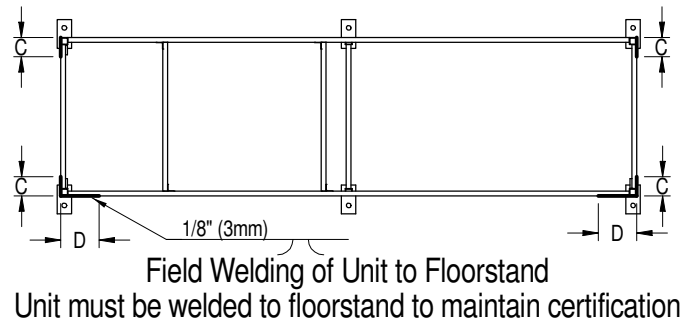
SEISMIC ANCHORAGE RIGID FLOORSTAND W/ EC FANS



Anchor Detail
Typ (6) Plcs



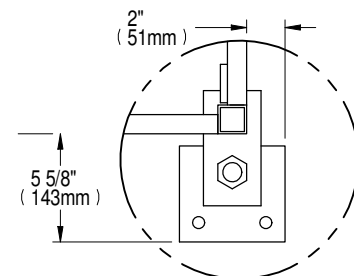
Floor Anchoring Dimensions
Front of Unit



Notes:

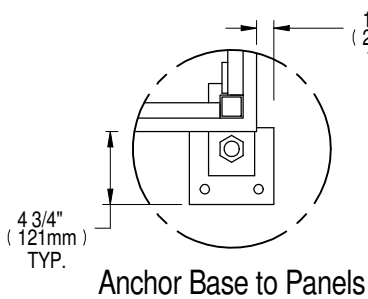
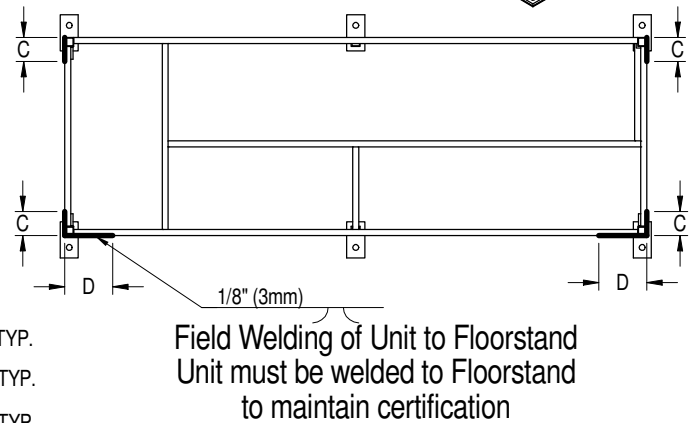
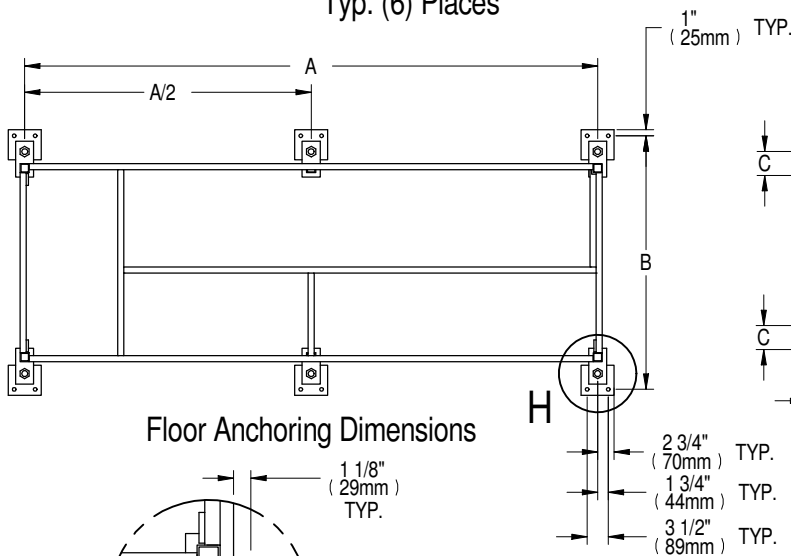
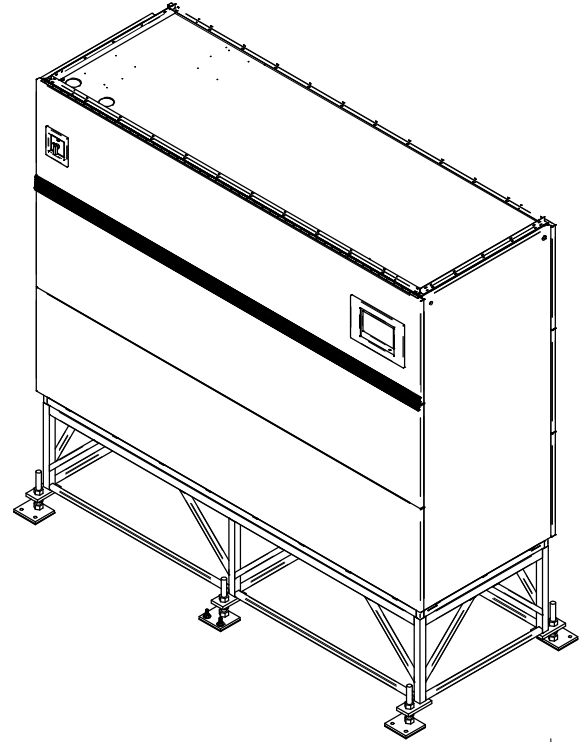
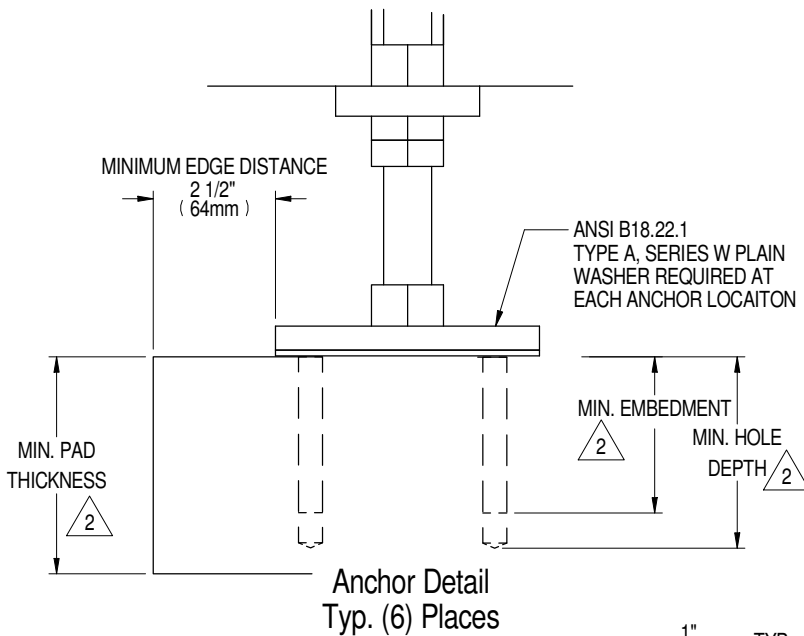
1. Anchor Bolt sized per Hilti Kwik Bolt TZ Carbon and Stainless in concrete, ICC ESR-1917. Alternates are subject to review by Vertiv or Engineer of Record.
2. Specified by Engineer of Record.

MODEL NUMBER	ANCHOR SIZE Δ	DIMENSIONAL DATA inches (mm)			
		A	B	C	D
CW038, CW041	1/2"	46-1/2 (1181)	42-5/16 (1074)	3 (76)	4 (102)
CW051, CW060		70-1/2 (1791)			
CW076, CW084		95-1/2 (2426)			
CW106, CW114	1/2"	118-1/2 (3010)	54-5/16 (1379)	4 (102)	6 (152)
CW146, CW181				6 (152)	8 (203)



Dimensions are from
Anchor Base to Panels

DIMENSIONAL DATA SEISMIC ANCHORAGE RIGID FLOORSTAND W/ FORWARD CURVED BLOWERS



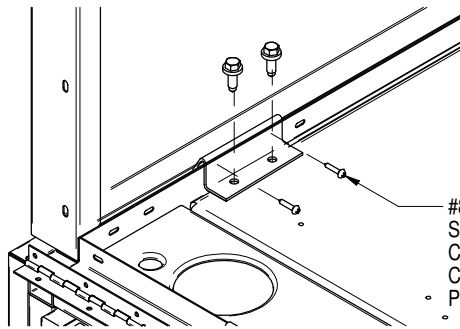
MODEL NUMBER	ANCHOR SIZE Δ	DIMENSIONAL DATA inches (mm)			
		A	B	C	D
CW038, CW041	1/2"	46.5 (118)	42.3 (1073)	3.0 (76)	4.0 (102)
CW051, CW060		70.5 (1791)			
CW076, CW084		95.5 (2426)		6.0 (152)	
CW106, CW114		118.5 (3010)	54.3 (1378)	4.0 (102)	
CW146, CW181				6.0 (152)	8.0 (203)

Notes:

1. Anchor Bolt sized per Hilti Kwik Bolt TZ Carbon and Stainless in concrete, ICC ESR-1917. Alternates are subject to review by Vertiv or Engineer of Record.
2. Specified by Engineer of Record.

SEISMIC DATA PLENUM MOUNTING FOR UPFLOW UNITS W/ FORWARD CURVED BLOWERS

BOTH TOP DUCT OPENING AND FRONT GRILL ARE SHOWN.
SEE SPECIFICATION SHEET FOR SPECIFIC APPLICATION.

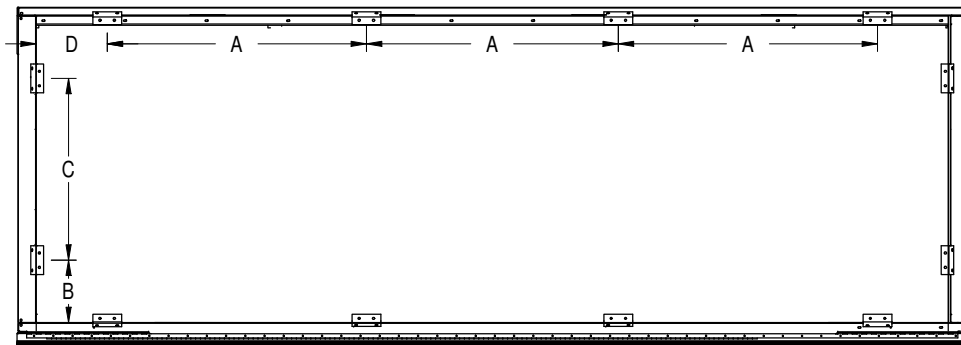
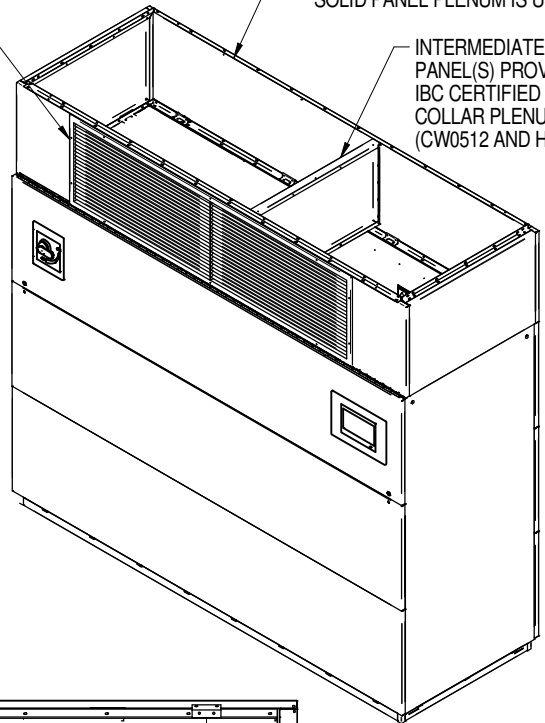


#8 SELF DRILLING
SCREWS THROUGH
CLIP, UNIT DUCT
COLLAR AND PLENUM
• PANEL FLANGE

Plenum Hold-Down Clip Detail
(Front Panel removed for clarity)
All clips & fasteners are required
to maintain IBC certification of conformity

NOTE: FLANGES PROVIDED
ON BLOWER(S) OUTLET FOR
SUPPLY AIR DUCTING WHEN
SOLID PANEL PLENUM IS USED.

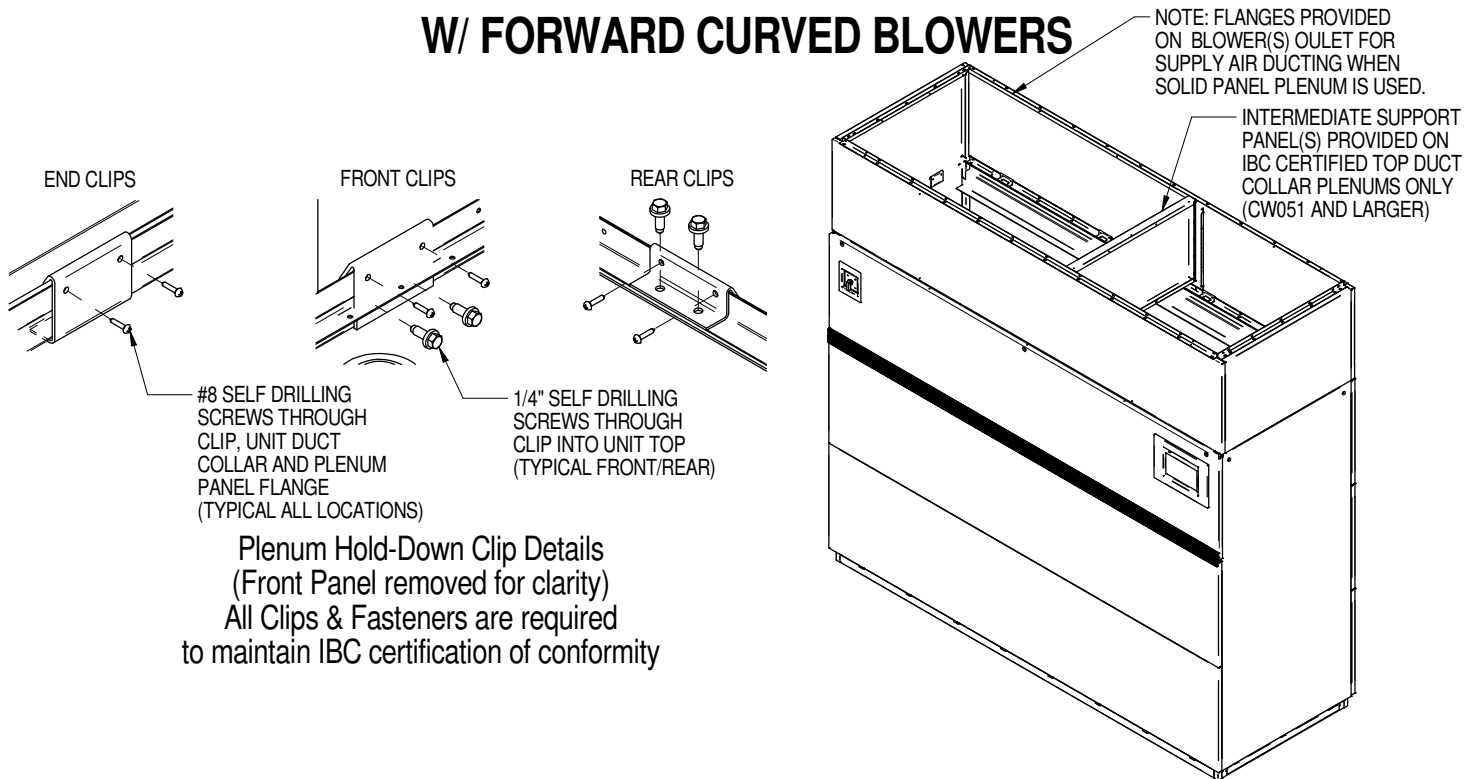
INTERMEDIATE SUPPORT
PANEL(S) PROVIDED ON
IBC CERTIFIED TOP DUCT
COLLAR PLENUMS ONLY
(CW0512 AND HIGHER).



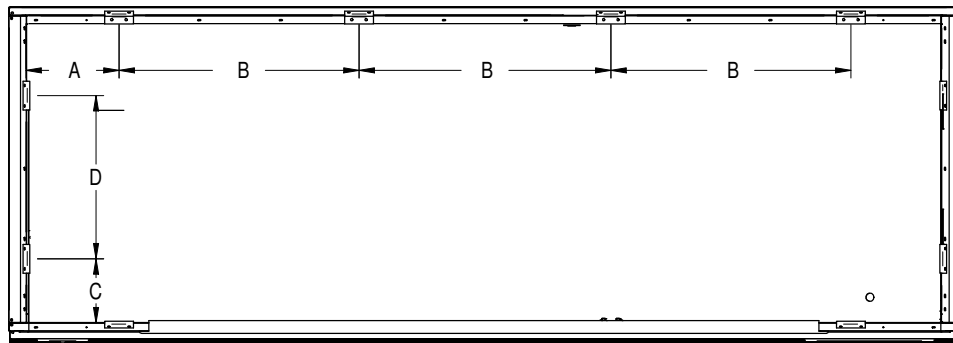
Plenum Hold-Down Clip Dimensions
Front of Unit

MODEL NUMBER	CLIPS REQUIRED			APPROXIMATE LOCATION in. (mm)			
	END	FRONT/REAR	TOTAL	A	B	C	D
CW038	2	2	8	31-3/16 (792)	6-1/2 (165)	19 (483)	7-3/8 (187)
CW041							
CW051		3	10	27-9/16 (701)			
CW060							
CW076							
CW084		4	12	26-11/16 (679)			
CW106							
CW114				34-3/8 (874)			

SEISMIC DATA PLENUM MOUNTING FOR UPFLOW UNITS W/ FORWARD CURVED BLOWERS



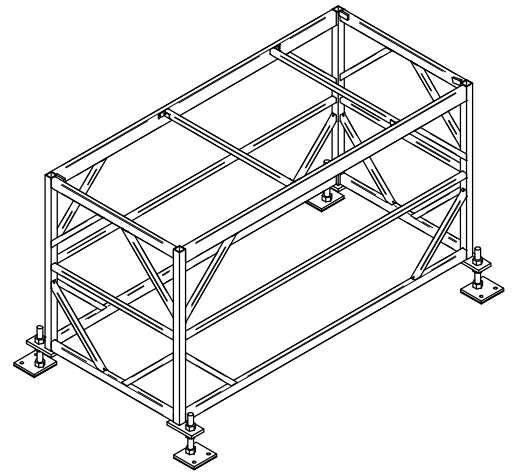
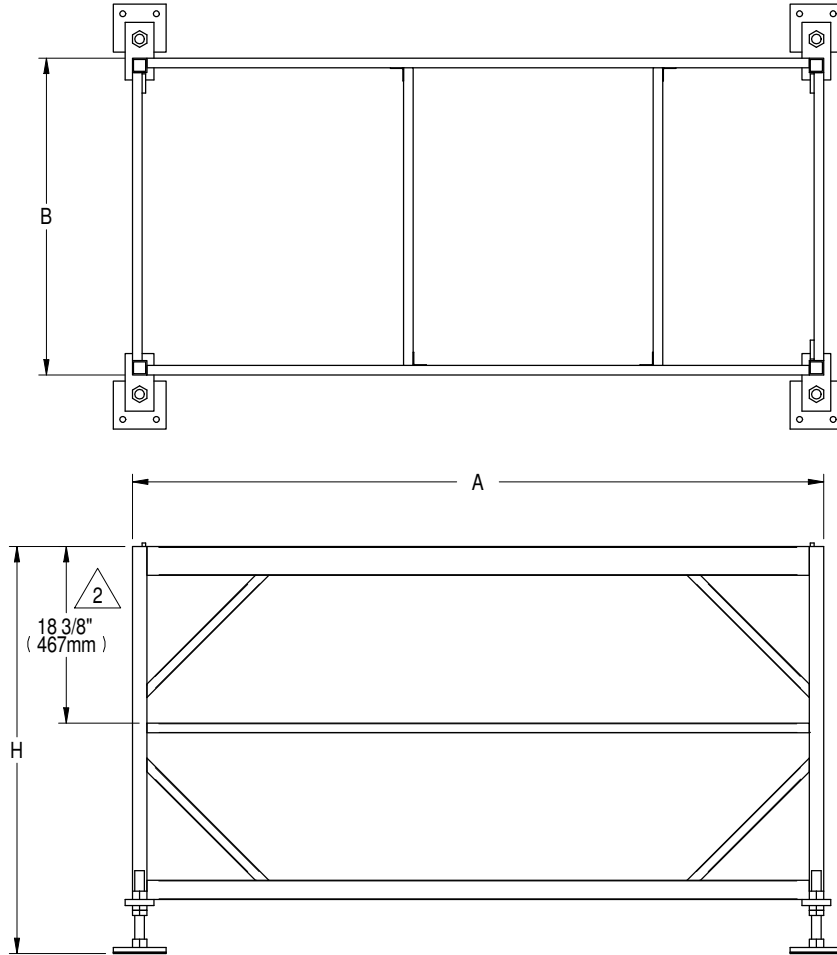
Plenum Hold-Down Clip Details
(Front Panel removed for clarity)
All Clips & Fasteners are required
to maintain IBC certification of conformity



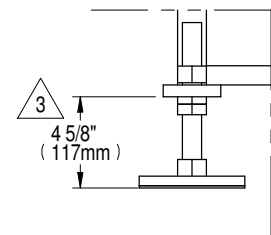
Plenum Hold-Down Clip Dimensions
Front of Unit

MODEL NUMBER	CLIPS REQUIRED			APPROXIMATE LOCATION inches (mm)			
	END	FRONT/REAR	TOTAL	A	B	C	D
CW038	2	2	8	7-3/8 (188)	31-3/16 (792)	6-1/2 (165)	19 (483)
CW041		3	10		27-9/16 (701)		
CW051		4	12		26-11/16 (679)		
CW060		4	12		34-3/8 (874)		
CW076		4	12				
CW084		4	12				
CW106		4	12				
CW114		4	12				

**SEISMIC DATA
FLOORSTAND MOUNTING FOR DOWNFLOW CW038 - CW114 MODELS
W/ EC FANS**



JACK



Foot Detail

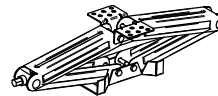
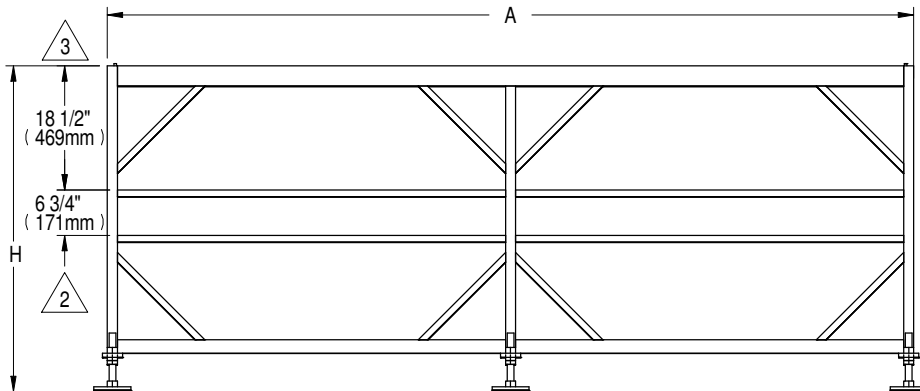
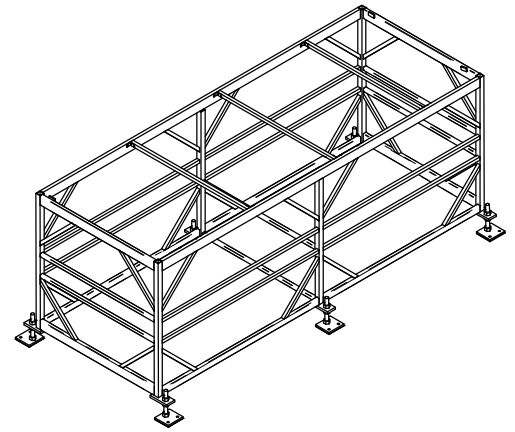
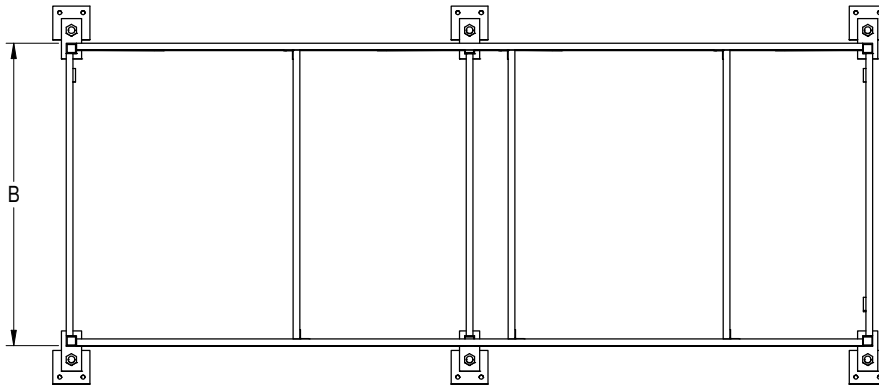
NOTE:

1. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical to lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.

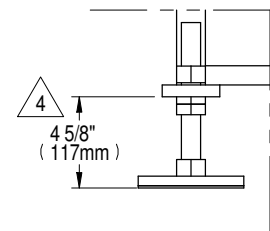
2. Not applicable to 24" & 30" tall floorstands.
3. Foot provides ±1.5" (38mm) adjustment from nominal height H

DIMENSIONAL DATA in. (mm)			
MODEL	OVERALL WIDTH	A	B
CW038, CW041	50 (1270)	48 (1219)	33 (838)
CW051, CW060	74 (1880)	72 (1829)	
CW076, CW084	99 (2515)	97 (2464)	
CW106, CW114	120 (3048)	118 (2997)	

SEISMIC DATA FLOORSTAND MOUNTING FOR DOWNFLOW CW146 - CW181 MODELS W/ EC FANS



JACK



Foot Detail

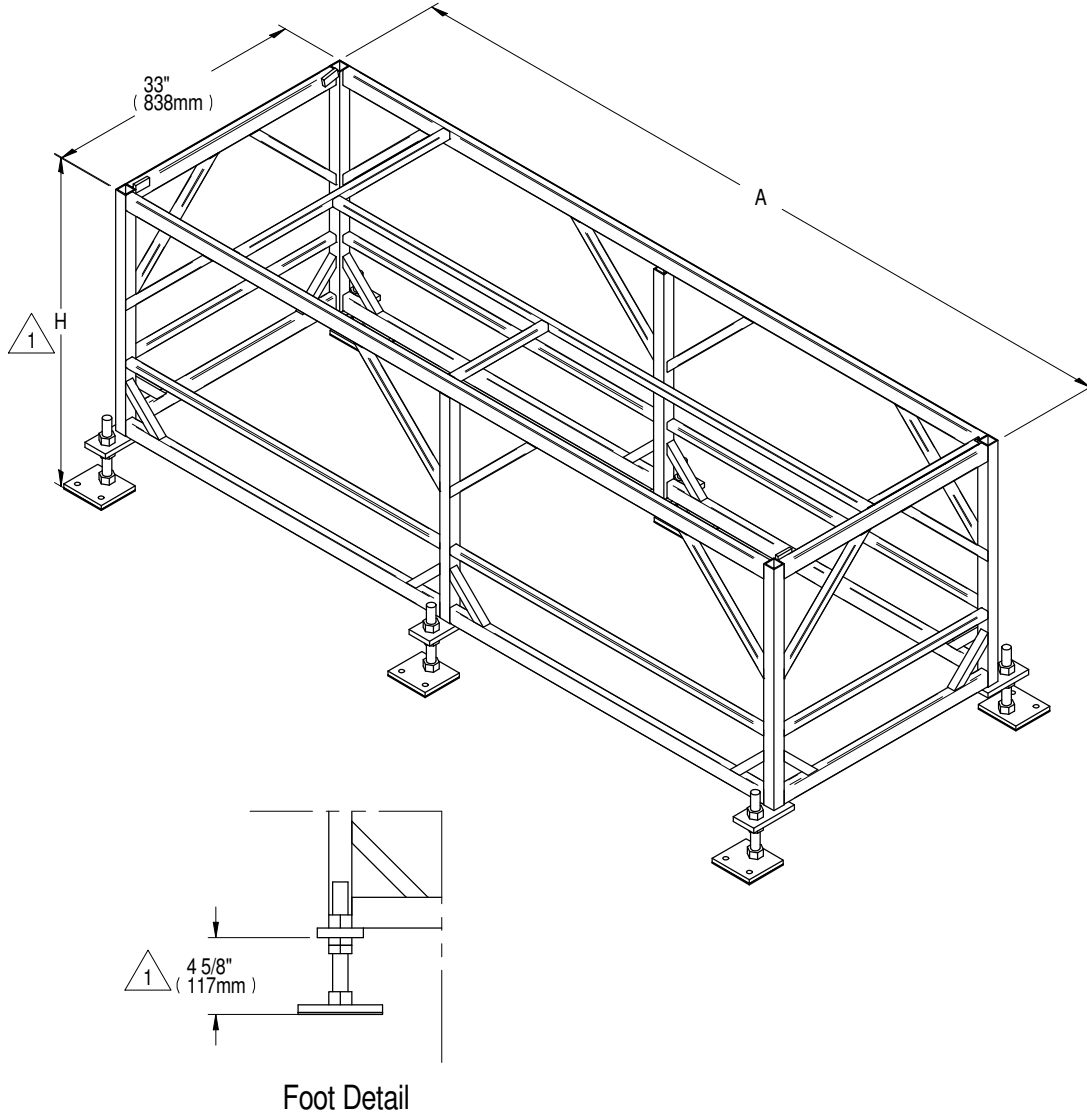
NOTE:

1. The floor stand used with EC units is not symmetrical and its orientation to the Liebert® CW is critical to lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floor stand.

- 2. Applicable only to 48" tall floorstand.
- 3. Not applicable to 24" & 30" tall floorstands.
- 4. Foot provides ±1.5" (38mm) adjustment from nominal height H

DIMENSIONAL DATA in. (mm)			
MODEL	OVERALL WIDTH	A	B
CW146, CW181	120 (3048)	118 (2997)	45 (114)

DIMENSIONAL DATA
SEISMIC RIGID FLOORSTAND W/ FORWARD CURVED BLOWERS



DIMENSIONAL DATA in. (mm)		
MODEL	OVERALL WIDTH OF UNIT	A
CW038, CW041	50 (1270)	48 (1219)
CW051, CW060	74 (1880)	72 (1829)
CW076, CW084	99 (2515)	97 (2464)
CW106, CW114	120 (3048)	118 (2997)

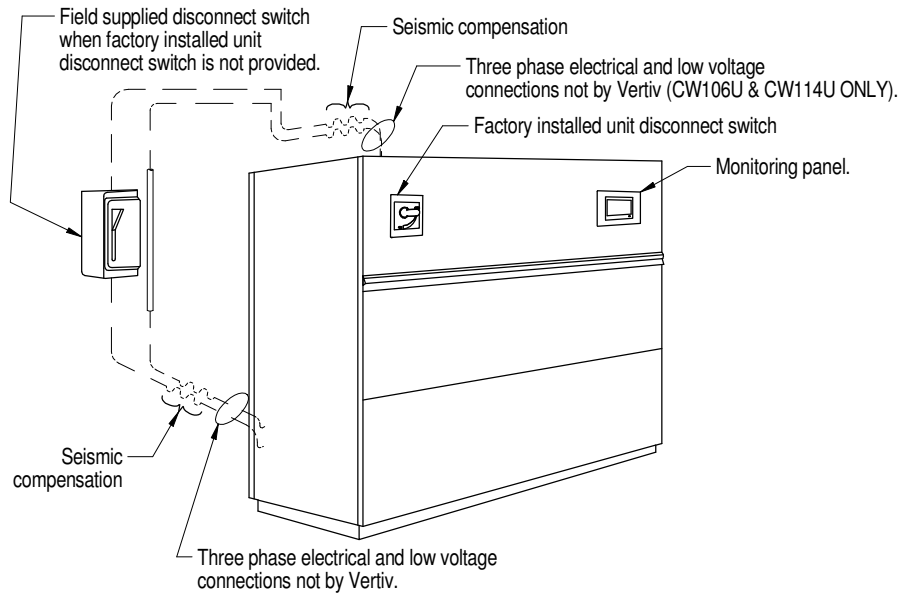
HEIGHT in. (mm)
"H" NOMINAL \triangle
12 (305)
15 (381)
18 (457)
21 (533)
24 (610)
30 (762)
36 (914)
48 (1219)

Notes:

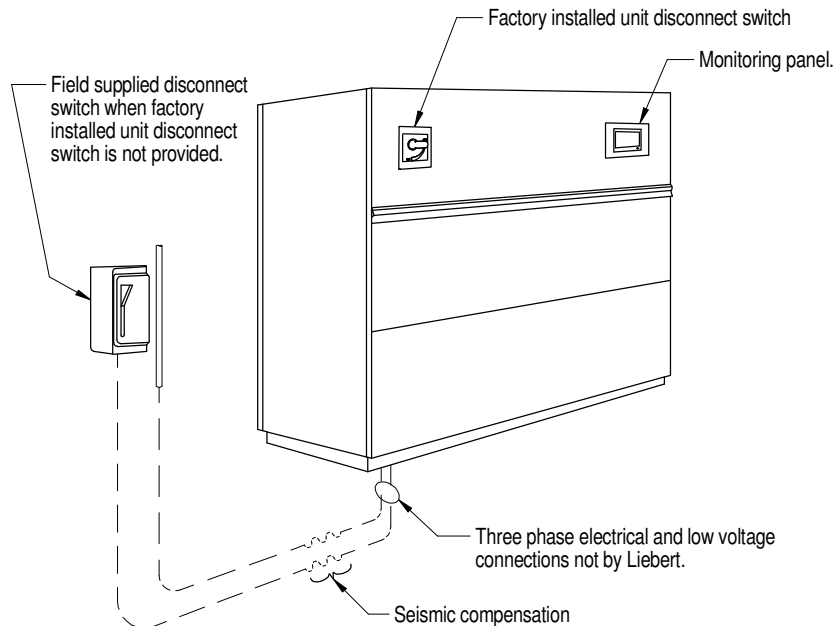
1. Foot provides $\pm 1-1/2"$ (38mm) adjustment from nominal height "H".

SEISMIC DATA

ELECTRICAL FIELD CONNECTIONS W/ FORWARD CURVED BLOWERS



Upflow Models

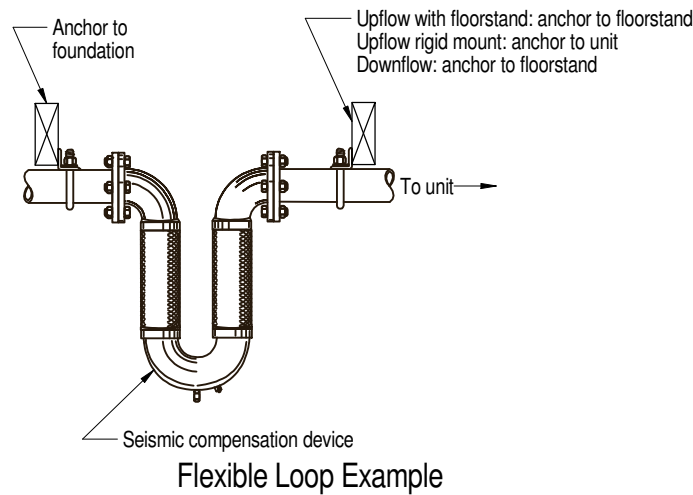
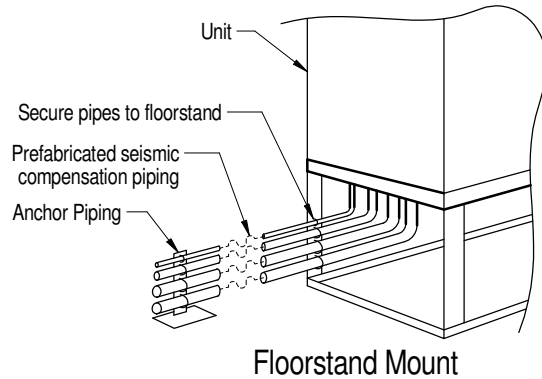
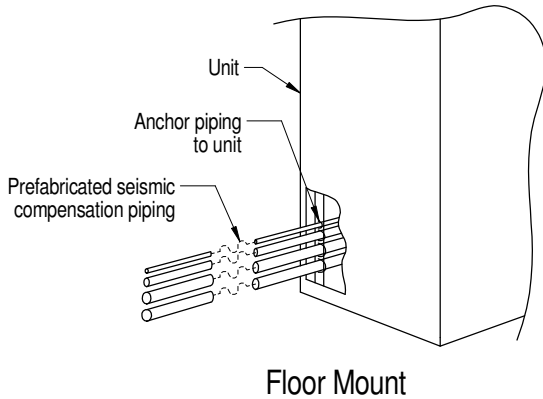


Downflow Models

Notes:

1. Flexible conduit and conductors must be provided to allow for movement of the unit in three dimensions during a seismic event.
The flexible conduit shall have at least one bend between the rigid connection at the unit cabinet and the connection to rigid conduit or foundation.
2. Monitoring panel and disconnect are switched on CW106U, CW114U, CW106D & CW114D.

SEISMIC DATA PIPING FIELD CONNECTIONS



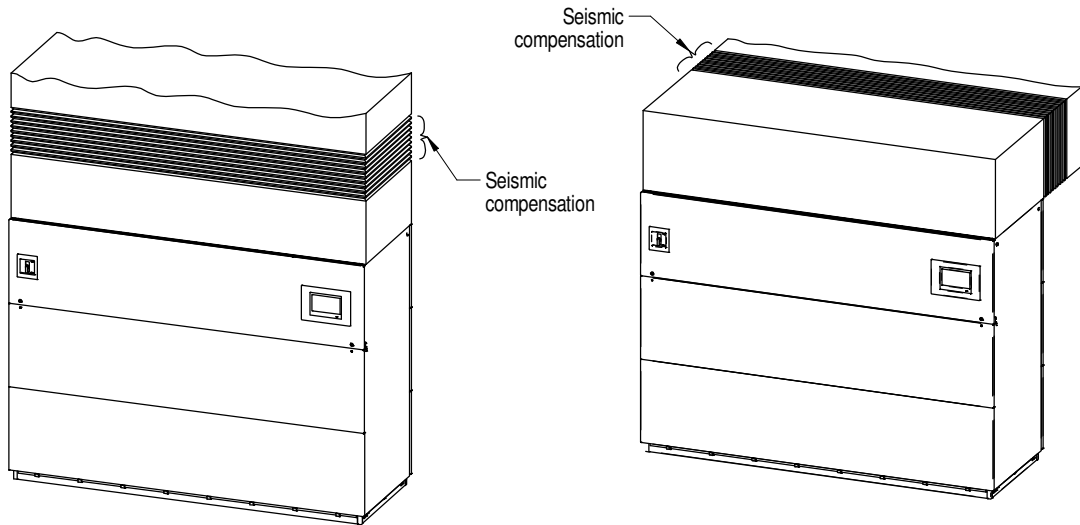
Notes:

1. Flexible Loops:

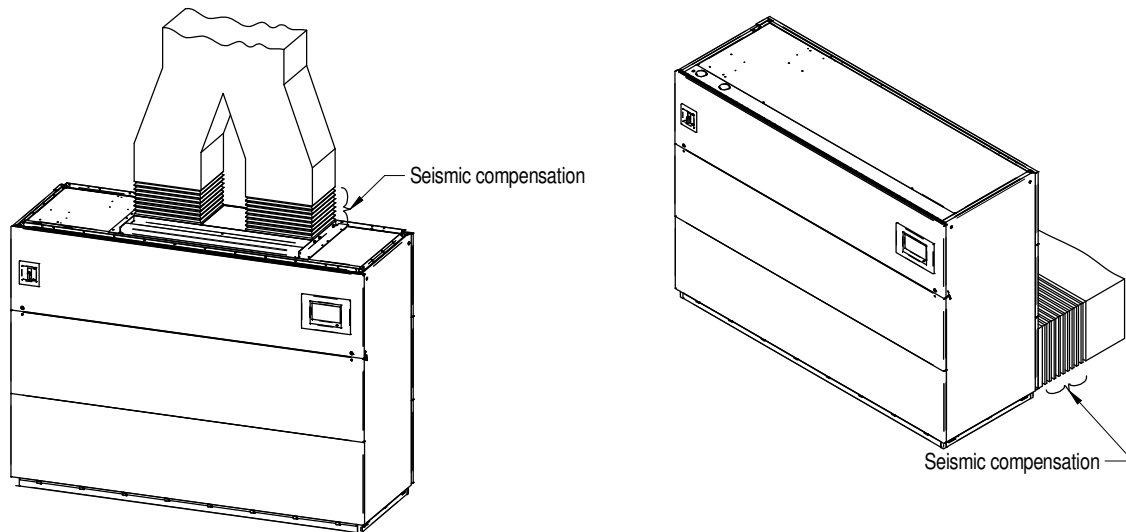
All units, either rigidly mounted or mounted on vibration isolators, shall be attached to the piping system using flexible loops designed for seismic movement. Flexible loops shall be capable of movement in the three axes and must completely isolate the equipment from the piping.

The loops shall be suitable for an operating pressure and temperature of the system, refer to Vertiv installation instructions. This includes 1/4" copper humidifier supply, condensate drainage, and chilled water supply and return. Follow manufacturer's installation instructions for proper seismic application of flexible loops.

SEISMIC DATA
DUCT CONNECTION CONSIDERATIONS W/ FORWARD CURVED BLOWERS



Downflow Model Examples



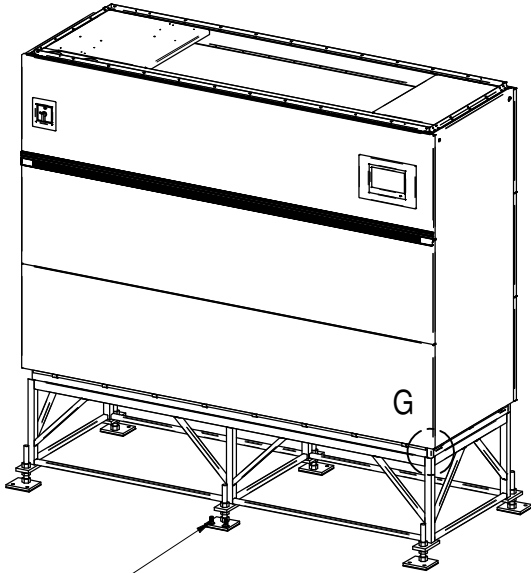
Upflow Model Examples

Notes:

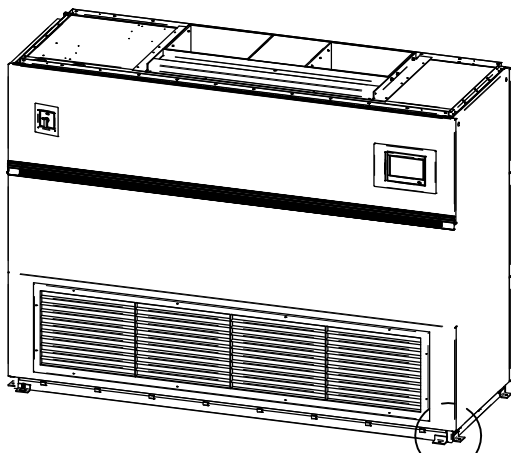
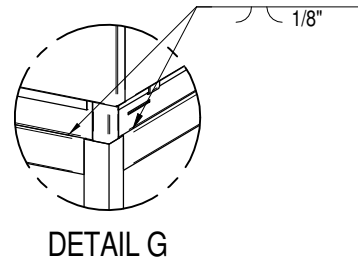
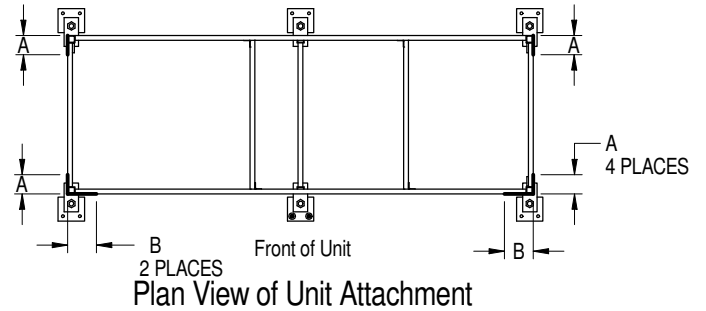
1. All ducted units, either rigidly mounted or mounted on vibration isolators, shall be attached to the ducting system using flexible duct designed for seismic movement. Flexible loops shall be capable of movement in the three axes and must completely isolate the equipment from the duct work. Refer to Vertiv installation instructions for ducting requirements. Follow manufacturer's installation instructions for proper seismic application of flexible ducts.

CONNECTION DETAIL AS TESTED FOR SEISMIC CERTIFICATION

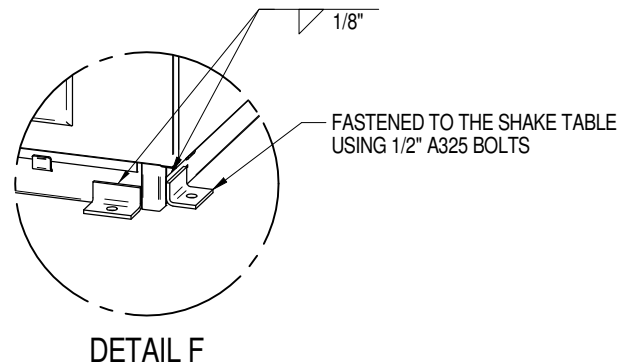
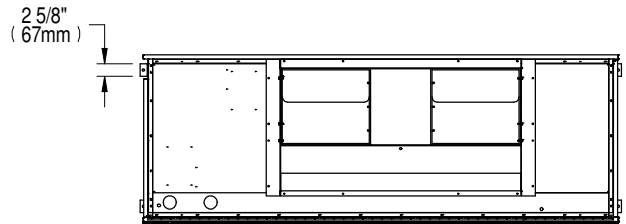
MODEL NUMBER	WELD LENGTH		QTY SUPPORTS	FLOORSTAND HEIGHT (in)
	A (in)	B (in)		
CW114DC1	4	6	6	36
CW181DC1	6	8		



TOTAL 'C' - 7/8" GRADE 7 THREADED RODS WITH 1/8" THICK NEOPRENE PAD.
Floorstand Supported Anchorage



Floor Mounted Anchorage (CW114UCS)



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