Precision Cooling
For *Business-Critical Continuity™*

Liebert® CW™

IBC Seismic Supplemental User Manual, 26-181kW, Upflow and Downflow

EMERSON
Network Power

TABLE OF CONTENTS

FIGURES

TABLES

IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety and installation instructions not included in the Liebert CW user manual (SL-18057). The information in this manual is not a substitute for the data in the Liebert CW user manual, but provides additional information required for units equipped with the seismic option. The information in this manual should be read carefully and used to ensure compliance with the International Building Code. Special inspection per IBC Section 1704 is required during all installations. Read this document and the Liebert CW user manual, SL-18057, thoroughly before attempting to install or operate this unit.

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

Adhere to all warnings, cautions and installation, operating and safety instructions on the unit, in the Liebert CW user manual (SL-18057) and in this manual. Follow all operating and user instructions.

SAVE THESE INSTRUCTIONS

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

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™ 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.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high-voltage. With disconnect off, check for voltage on load side.

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 high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate upflow units without installing a plenum, ductwork or guard 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.

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation.

WARNING

Risk of seismic event. Can cause equipment damage, injury or death.

Unit must be welded to the floor stand and anchored to the floor or housekeeping pad. If not mounted on a floor stand, the unit must be anchored to the floor or housekeeping pad.

CAUTION

Risk of sharp edges, splinters and exposed fasteners. Can cause injury.

Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move the unit, lift it, remove packaging or prepare the unit for installation.

CAUTION

Risk of hazardous fumes. Can cause injury or death.

Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. Use adequate ventilation.

NOTICE

Risk of overhead interference. Can cause unit and/or building damage.

The unit may be too tall to fit through a doorway while on the skid. Measure the unit and doorway heights and refer to the installation plans to verify clearances prior to moving the unit.

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 Liebert CW upright, indoors and protected from dampness, freezing temperatures and contact damage.

NOTICE

Risk of leaking water. Can cause equipment and building damage.

This unit requires a water drain connection. It 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 severe property damage and loss of critical data center equipment.

Do not install this unit above equipment or machines that could be damaged by leaking water. Do not install equipment or machines that could be damaged by leaking water below this unit.

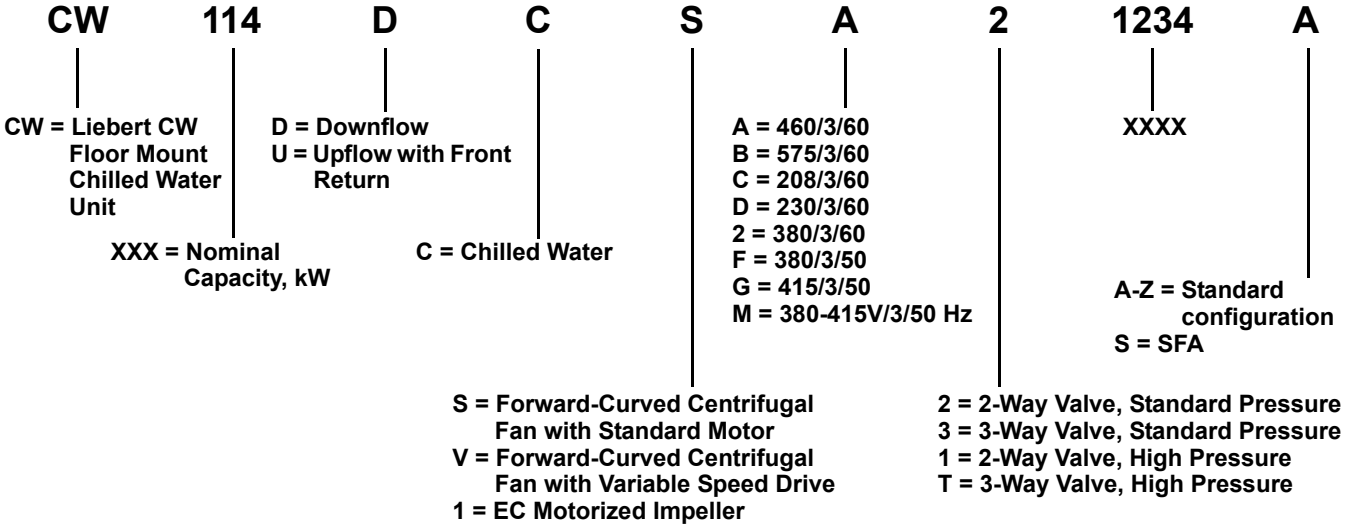
Emerson recommends installing leak detection equipment for unit and supply lines.

NOTICE

Risk of structural damage. Drilling holes all the way through the floor or housekeeping pad may cause damage to the structure and can result in damage to lower floors.

Drilling holes that penetrate either the floor or the housekeeping pad must be properly filled and sealed.

1.0 LIEBERT CW NOMENCLATURE



2.0 INTRODUCTION

2.1 Background

The International Code Council's International Building Code (IBC) is the primary code document for the design and installation of building systems. This has brought about increased scrutiny of mechanical and electrical equipment that is used in the operation of facilities, particularly those buildings designated as "essential facilities." Previously, codes focused only on preventing equipment from breaking free from anchoring and becoming projectiles, and did not consider its structural integrity. These new codes, depending on the Use Group and Importance Factor of the building, may require equipment to function after a seismic event.

IBC-2000, 2003, 2006 has made the manufacturer of mechanical and electrical equipment responsible for designing, testing and certifying systems. Emerson, through a recognized Approved Agency, has conducted analytical modeling and dynamic shake-table testing of the Liebert CW to provide an option for those systems requiring seismic certification of compliance. The seismic shake-table testing was conducted in accordance with ICC-ES AC-156. This certification goes beyond the equipment's ability to withstand seismic forces. The IBC system approach includes the equipment, equipment anchoring and the connections to the equipment (power, water supply and return and ducting). In essential applications the equipment must be capable of performing its primary function after a seismic event within the limit of certification.

NOTE

An approved agency is defined by IBC section 1702 as: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

2.2 Determining Whether a Unit is IBC-Compliant

The catalog Liebert CW unit is **NOT** IBC-compliant. To be IBC-compliant, units must be ordered with the factory-installed seismic bracing option. Liebert CW units with the seismic bracing option will have:

- Certification label—near the unit nameplate, behind the front panel
- Certificate of compliance—included in the customer envelope with this manual
- Factory-installed seismic bracing components

NOTE

Factory-installed seismic bracing components are painted red and must not be removed.

2.3 Certification Criteria

Liebert CW units equipped with the seismic option are certified to a maximum S_s of 2.89g (2.89 times the force of gravity), adjusted by the soil site coefficient to Soil Site Class D as the default when neither the site soil properties nor the final equipment installation location is known. The certification maximum S_{ds} value of 1.93g includes Soil Class and Seismic Use group corrections. Soil Classes A, B, C, D, E, Seismic Use groups I, II, III, IV 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 the Liebert CW system's functionality after a seismic event.

Shake-table testing conducted in accordance with ICC-ES AC-156 enveloped a required response spectrum (RRS) defined by a maximum flexible region acceleration (A_{FLEX}) of 3.08g and a zero period acceleration (A_{RIG}) of 2.32g.

Table 1 Comparison of certification criteria, 2000-2006

IBC 2006	IBC 2003	IBC 2000
S_{ds} <=1.93	S_{ds} <=1.93	S_{ds} <=1.93
I_p <=1.5	I_p <=1.5	I_p <=1.5
ap/R_p <=1.25	ap/R_p <=1.0	ap/R_p <=1.0
z/h <=1.0	z/h <=1.0	z/h <=1.0

The Liebert CW, as described above, is approved for seismic application as a system when properly installed in the following configurations:

- Liebert CW Unit, with factory-installed seismic option, attached directly to a housekeeping pad using the anchoring system defined in this seismic installation instruction.
- Liebert CW Unit, with factory-installed seismic option and with factory-supplied plenum. Plenums must be flexibly attached to the duct system (if applicable). Unit and plenum must be anchored as defined in this seismic installation instruction.
- Liebert CW Unit, with factory-installed seismic option, installed on an Emerson-supplied, IBC-certified floor stand and attached securely to the building structure. The floor stand and mounting system must be Emerson catalog items, purchased from Emerson. The system must be anchored as specified in this seismic installation instruction.
- The certification excludes all non-Emerson supplied accessories, including but not limited to floor stands, isolators and restraints. Use of non-Emerson accessories will void IBC certification of the Liebert CW system.

3.0 SITE REQUIREMENTS OF SEISMIC INSTALLATION

All floor and housekeeping pads must be approved by the structural engineer of record to resist the added seismic loads from components being anchored as specified in **8.0 - Anchor and Load Requirements of Seismic Installation**. The concrete floor slab and concrete housekeeping pads must be minimum 4000 psi compressive strength, normal-weight concrete. Concrete aggregate must comply with *ASTM C33*. The floor and housekeeping pads must be designed and rebar-reinforced for seismic applications in accordance with *ACI 318*. When anchoring the Liebert CW to a floor, rebar interference must be considered.

The minimum housekeeping pad thickness must be the thickness required by the qualification report for the selected post-installed anchor or 1.5 times the depth the anchor is embedded, whichever is greater.

All housekeeping pads must be dowelled or cast into the building structural floor slab for seismic application per *ACI 318*. When attaching the Liebert CW to the housekeeping pad, rebar interference must be considered.

NOTE

Structural engineer of record is defined as: The registered design professional responsible for the design of the designated seismic systems on the building construction documents.

NOTICE

Installation in structural, lightweight concrete is not permitted unless otherwise approved by the structural engineer of record.

Contact your Emerson representative if a detailed Seismic Installation Calculation Package is required. The information required to perform the calculations should include (but not be limited to):

Floor Data:	• Concrete compressive strength and aggregate content • Slab or lightweight concrete over metal deck • Thickness • Type of reinforcement (rebar, wire mesh or none)
Housekeeping Pad:	• Concrete compressive strength and aggregate content • Length, width and thickness • Type of reinforcement (rebar, wire mesh or none) • Doweled to floor or integrated

4.0 FLOOR AND FLOOR STAND SEISMIC MOUNTING

Whether floor-mounted or installed on a floor stand, the Liebert CW must be anchored to the floor or housekeeping pad. Field welding is required for seismic installations. In addition to the clearances specified in the Liebert CW user manual, SL-18057, clearance is required behind the unit to prevent damage to the equipment or building structure in a seismic event. Clearance requirements are dependent on the system mounting. Refer to **4.1 - Anchoring Systems Without Floor Stand** and **4.2 - Anchoring Systems With Floor Stand** for recommendations.

The post-installed anchors used for unit anchoring must be pre-qualified for seismic applications in accordance with *ACI 335.2* and documented in a report by a reputable testing agency, such as the *Evaluation Service Report* issued by the International Code Council. Anchors must be installed to the torque specifications recommended by the anchor manufacturers to ensure maximum loading. Wide washers, sized to match the nominal diameter of the specified anchors, must be used at each anchor location. For tension load distribution the washer is to be placed between the anchor head and the connected equipment. The washers are to be Type A, Series W plain washers per *ANSI B18.22.1 - 1965, R1975*.

The floor or housekeeping pad must be rebar-reinforced structural concrete that is seismically designed and approved by the structural engineer of record to resist the added seismic loads from components being anchored to the floor (see **3.0 - Site Requirements of Seismic Installation**). When installing anchors, rebar interference must be considered.

The installing contractor is responsible for the proper installation of all anchors and mounting hardware, observing the mounting requirement details outlined by the structural engineer of record.

NOTE

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.

4.1 Anchoring Systems Without Floor Stand

Anchor brackets provided with the seismic option are to be welded to the base of the unit, flush to the floor, at four locations. These brackets are included in the box of parts shipped with the Liebert CW.

WARNING

Risk of high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate upflow units without installing a plenum, ductwork or guard 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.

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation.

CAUTION

Risk of arc flash and infrared exposure during welding.

Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and eye protection should be welding.

CAUTION

Risk of hazardous fumes and gases from welding equipment. Can cause choking and respiratory-system injury or distress.

Only properly trained and qualified personnel wearing protective clothing, gloves, visor and helmet should perform welding operations. Use adequate ventilation.

Clearances behind the unit of floor-mounted systems require only enough space to access the system anchoring points.

4.1.1 Floor-Anchoring Requirements for Seismic Installations

- Unit directly mounted to structure:
  - Four (4) half-inch diameter concrete expansion anchors
  - Four (4) half-inch Type A, Series W plain washers
- Anchor selection must meet or exceed IBC 2000, 2003 and 2006 compliance requirements.
- All anchors listed and any housekeeping pad must be installed to meet compliance.
- Anchors must be installed per ICC ESR instructions.
- Special inspection per *IBC Section 1704* is required on all installations.

See **Figure 1** for anchor bracket weld and floor-anchoring details. Also see instructions provided with the box of parts shipped with the Liebert CW unit, *Seismic Part Package Field Installation Instructions for Liebert CW* [195800].

NOTICE

Risk of structural damage. Drilling holes all the way through the floor or housekeeping pad may cause damage to the structure and can result in damage to lower floors.

Drilling holes that penetrate either the floor or the housekeeping pad must be properly filled and sealed.

4.2 Anchoring Systems With Floor Stand

Units installed on floor stands must be welded to the floor stand as specified herein. Emerson provides a floor stand and mounting systems as selectable items that are IBC-certified and matched to the Liebert CW.

The unit certification is valid only with the Emerson, IBC-certified, matched floor stand.

Clearances behind the unit of floor stand-mounted systems require space for access to the system anchoring points and clearance for unit movement during a seismic event. The minimum space provided must be as indicated by dimension "Y" of **Figure 11** for top of unit or top of plenum, depending on the system configuration.

4.2.1 Floor Stand Anchoring Requirements for Seismic Installations

- **48- and 72-inch width units:**
  - Eight (8) concrete expansion anchors
  - Eight (8) Type A, Series W plain washers
- **97- and 120-inch width units:**
  - Twelve (12) concrete expansion anchors
  - Twelve (12) Type A, Series W plain washers
- Anchor selection must meet or exceed IBC 2000, 2003 and 2006 compliance requirements.
- All anchors listed and any housekeeping pad must be installed to meet compliance.
- Anchors must be installed per ICC ESR instructions.
- Special inspection per *IBC Section 1704* is required on all installations.

NOTICE

Risk of structural damage. Drilling holes all the way through the floor or housekeeping pad may cause damage to the structure and can result in damage to lower floors.

Drilling holes that penetrate either the floor or the housekeeping pad must be properly filled and sealed.

NOTE

The seismic floor stand is not symmetrical, and its orientation to the Liebert CW unit is critical. Unless the floor stand is installed in the correct position, features such as turning vane and EC plug fans may not function properly.

4.2.2 Rigid and Rubber Isolated Floor Stand Anchoring

See **Figures 2** and **3** for weld and anchoring details.

1. Check the proposed finished floor height.
2. Turn the floor stand over and screw the feet/rubber isolator into the welded nut on the bottom until the measurement from the bottom of the foot/isolator to the top surface of the upper tube equals the finished floor height.
3. Turn the floor stand right side up.
4. If provided with turning vane, notch vane as required and attach it to the stand with #10 self-drilling screws at 12" (30.5mm) centers. Spot welding is an acceptable alternative.
5. Place the floor stand in the final location in the correct orientation.

NOTE

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.

6. Level the stand by turning the foot/isolator up or down as necessary. Make sure all feet/isolators are firmly resting on the floor.
7. Tighten foot/isolator jam nuts to prevent movement.
8. Mark foot/isolator hole locations on the floor or housekeeping pad. Remove floor stand and set floor stand aside.
9. Drill holes and install anchors according to the manufacturer's recommendations.
10. Set the floor stand into position over the anchor studs and tighten all hardware to the manufacturer's torque specifications.
11. Position the unit on the floor stand and weld the unit base to the floor stand gussets using a 1/8" (3mm) continuous weld. See **Figures 2** and **3**.

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation.

CAUTION

Risk of arc flash and infrared exposure during welding. Can cause injury.

Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and eye protection should be welding.

CAUTION

Risk of hazardous fumes and gases from welding equipment. Can cause choking and respiratory-system injury or distress.

Only properly trained and qualified personnel wearing protective clothing, gloves, visor and helmet should perform welding operations. Use adequate ventilation.

4.2.3 Spring-Isolated Floor Stand Anchoring

See **Figure 4** for weld and anchoring details.

1. Check the proposed finished floor height.
2. Measure from the bottom of the floor stand isolator mounting location to the top surface of the upper tube and add the spring isolator operating height, 7.13" (181mm). The finished floor height should be no greater than this measurement. The floor stand height can be adjusted up no more than 1/2" (12.5mm) by adding washers on the isolator studs above the adjusting nut before placing the floor stand on the isolators. Adjustment down by no more than 1/8" (3mm) may be done in **Step 11**.
3. If provided with a turning vane, notch the vane as required and attach it to the stand with #10 self-drilling screws at 12" (30.5mm) centers. Spot welding is an acceptable alternative.
4. Place the isolators in the final location per **Figure 4**.
5. Remove the jam nuts from the isolators and set them aside.
6. Set the floor stand into position over the isolator studs in the correct orientation. Place the jam nuts on studs; do not tighten.

NOTE

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.

7. Mark the isolator hole locations on the floor or on the housekeeping pad. Remove the floor stand and set it aside.
8. Drill the holes and install the anchors according to the manufacturer's recommendations.
9. Set the floor stand into position over the anchor studs and tighten all hardware to the manufacturer's torque specifications.
10. Position the unit on the floor stand.
11. Adjust each isolator, turning the nut below the jam nut one full turn counterclockwise, in sequence, until the isolator operating clearance of 1/4" (6mm) is achieved. See **Figure 4** for adjustment sequence.
12. Check to ensure that the equipment is level and adjust the isolators as required.
13. Tighten the jam nuts.
14. Weld the unit base to the floor stand gussets using a 1/8" (3mm) continuous weld. See **Figure 4**.

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation.

CAUTION

Risk of arc flash and infrared exposure during welding. Can cause injury.

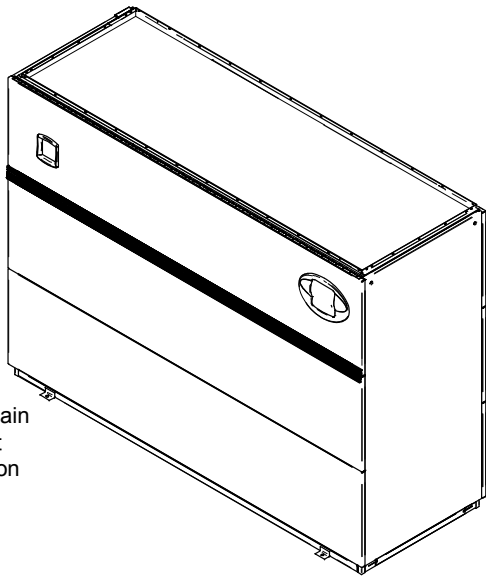
Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and eye protection should be welding.

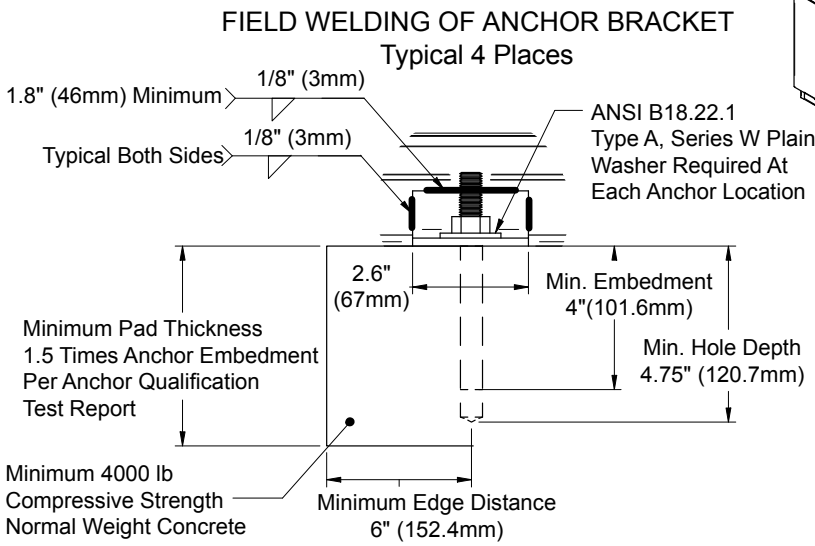
CAUTION

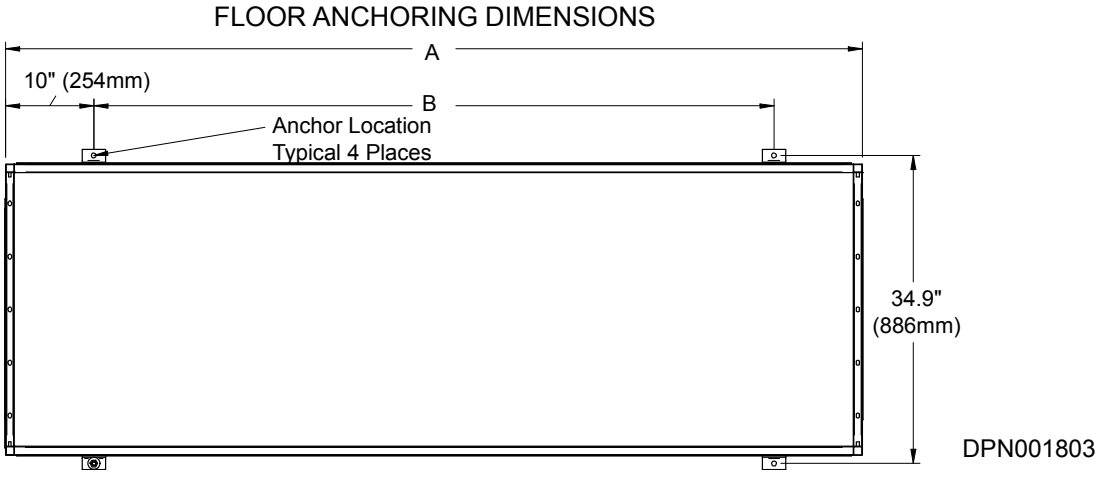
Risk of hazardous fumes and gases from welding equipment. Can cause choking and respiratory-system injury or distress.

Only properly trained and qualified personnel wearing protective clothing, gloves, visor and helmet should perform welding operations. Use adequate ventilation.

Figure 1 Dimensional data—seismic anchoring



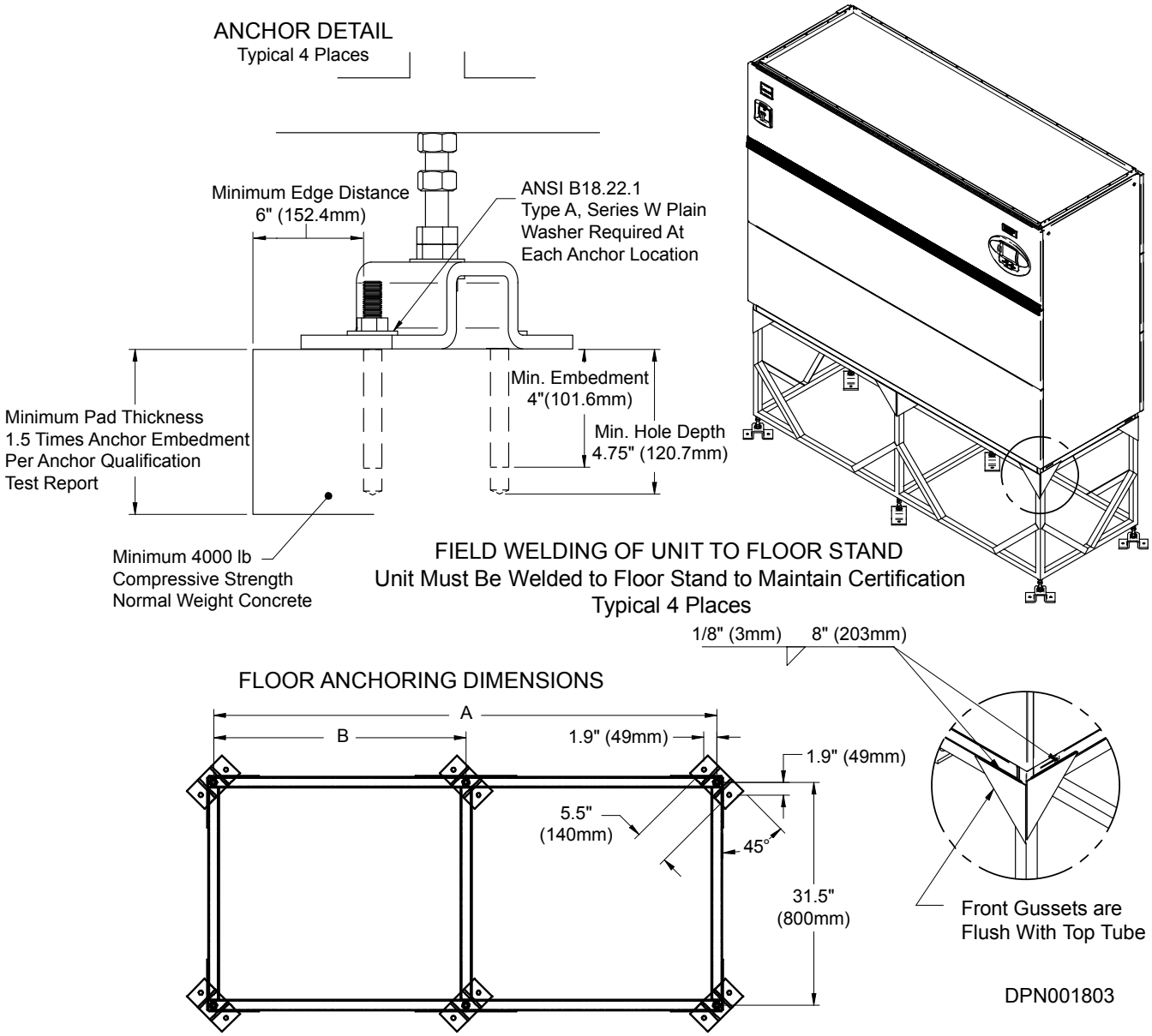




Model Number	Dimensional Data, in. (mm)		Anchor Size
	A	B	
CW026	48 (1219)	28 (711)	1/2"
CW038			
CW041			
CW051	72 (1829)	52 (1321)	1/2"
CW060			
CW076	97 (2464)	77 (1956)	1/2"
CW084			
CW106	120 (3048)	100 (2540)	1/2"
CW114			

Anchor bolt sized per Hilti Kwik Bolt TZ carbon and stainless in concrete, ICC ESR-1917.
Alternates are subject to review by Emerson or structural engineer of record.

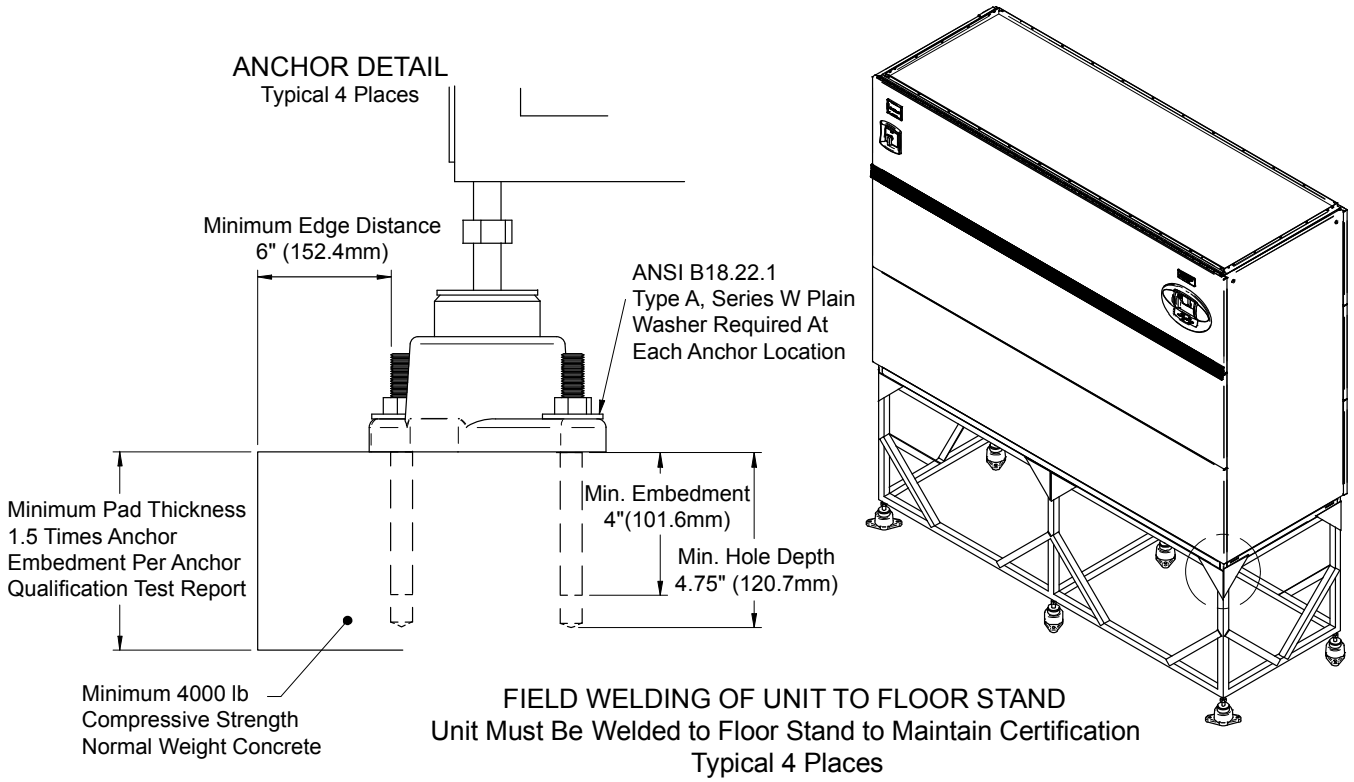
Figure 2 Dimensional data—seismic anchoring of rigid floor stand

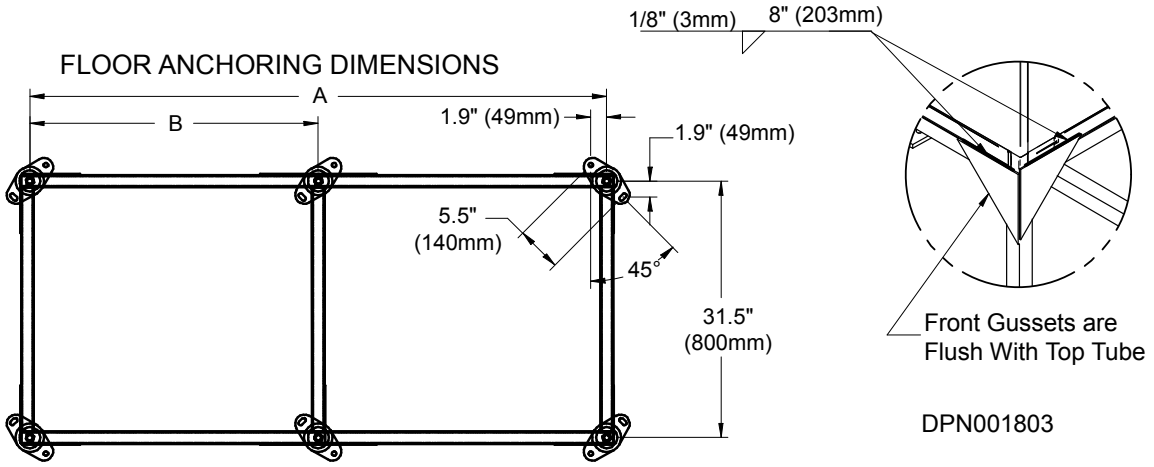


Model Number	Dimensional Data, in. (mm)		Anchor Size
	A	B	
CW026	46.5 (1181)	—	1/2"
CW038			
CW041			
CW051	70.5 (1791)	—	1/2"
CW060			
CW076	95.5 (2426)	47.8 (1213)	1/2"
CW084			
CW106	118.5 (3010)	31.5 (800)	1/2"
CW114			

Anchor bolt sized per Hilti Kwik Bolt TZ carbon and stainless in concrete, ICC ESR-1917.
Alternates are subject to review by Emerson or structural engineer of record.

Figure 3 Dimensional data—seismic anchoring of rubber-isolated floor stand

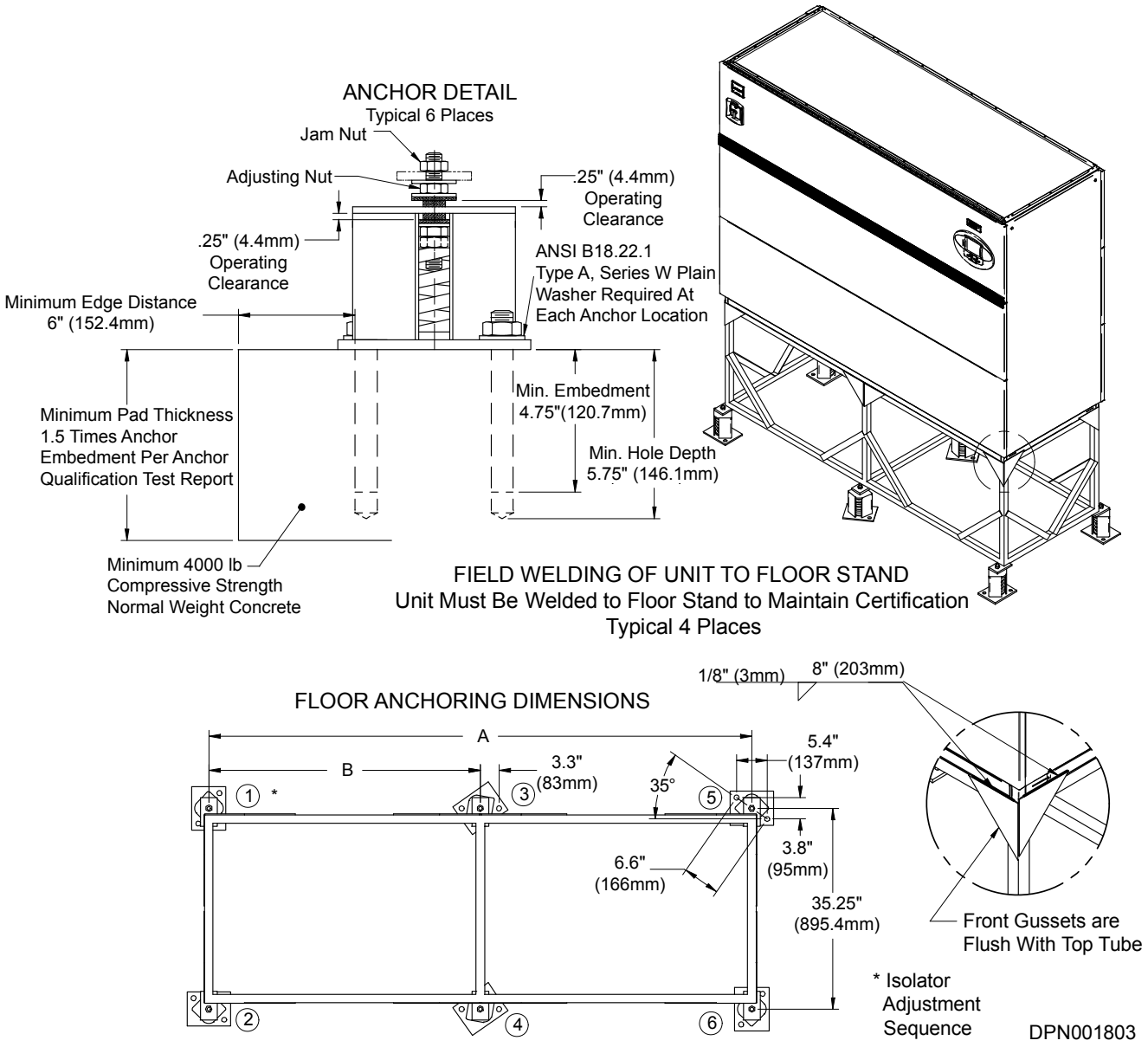




Model Number	Dimensional Data, in. (mm)		Anchor Size
	A	B	
CW026	46.5 (1181)	—	1/2"
CW038			
CW041			
CW051	70.5 (1791)	—	1/2"
CW060			
CW076	95.5 (2426)	47.8 (1213)	1/2"
CW084			
CW106	118.5 (3010)	31.5 (800)	1/2"
CW114			

Anchor bolt sized per Hilti Kwik Bolt TZ carbon and stainless in concrete, ICC ESR-1917.
Alternates are subject to review by Emerson or structural engineer of record.

Figure 4 Dimensional data—seismic anchoring of spring-isolated floor stand



Model Number	Dimensional Data, in. (mm)		Anchor Size
	A	B	
CW026	46.5 (1181)	—	3/4"
CW038			
CW041			
CW051	70.5 (1791)	—	3/4"
CW060			
CW076	95.5 (2426)	47.8 (1213)	3/4"
CW084			
CW106	118.5 (3010)	31.5 (800)	3/4"
CW114			

Anchor bolt sized per Hilti Kwik Bolt TZ carbon and stainless in concrete, ICC ESR-1917.
Alternates are subject to review by Emerson or structural engineer of record.

5.0 ELECTRICAL CONSIDERATIONS OF SEISMIC INSTALLATION

Input power and control wiring connections to the Liebert CW must be flexible and able to withstand movement in three dimensions. Relative motion caused by a seismic event must be absorbed to prevent damage to the unit, building structure and wiring. It is recommended that all connections to the unit be made as low as possible. The flexible connection should include at least one bend between the unit connection location and the first clamping point at the foundation or structure. It must be of sufficient length to makeup for the maximum displacement indicated in **Figure 5**.

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

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™ 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.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high-voltage. With disconnect off, check for voltage on load side.

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 high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate upflow units without installing a plenum, ductwork or guard 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.

WARNING

Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, injury or death.

Installation and service should be done only by personnel who have been properly trained and qualified in the installation of air conditioning equipment.

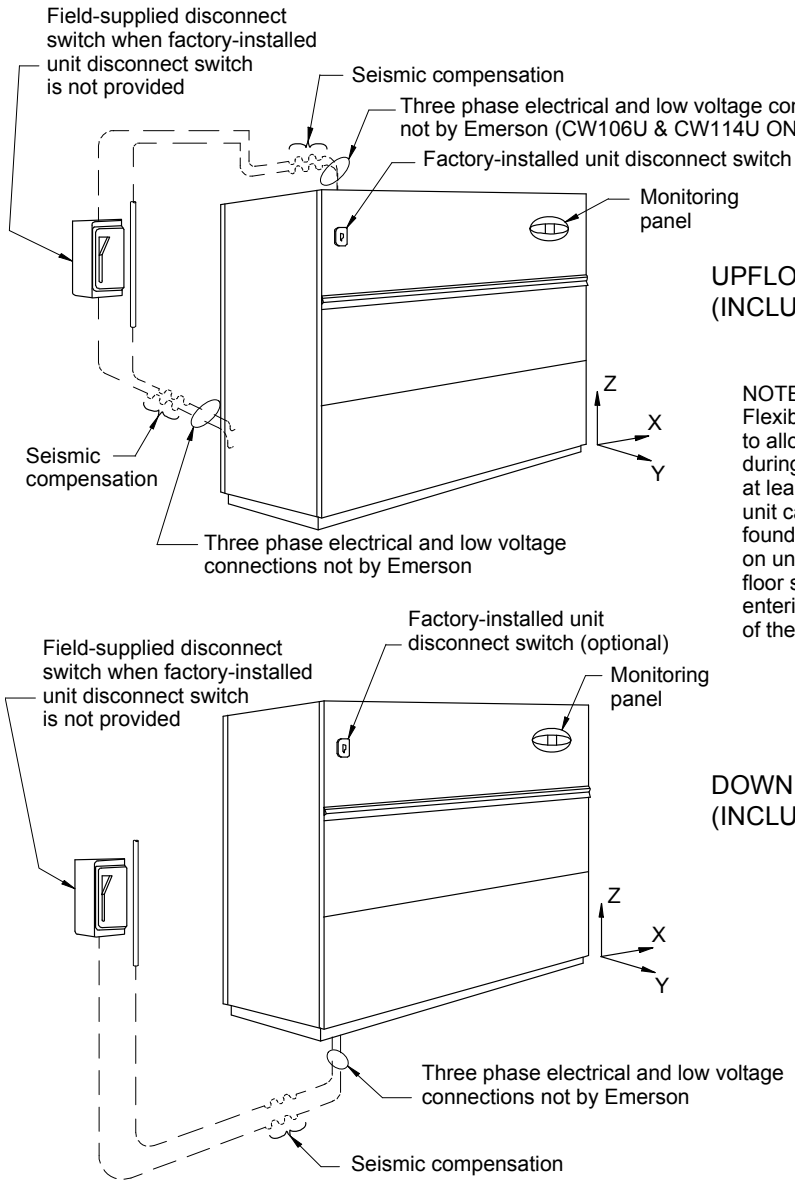
NOTICE

Risk of improper electrical supply connection. Can cause equipment damage during a seismic event.

NOTICE

Risk of overheated terminals. Can cause wiring and component damage. Use copper wiring only. Make sure that all connections are tight.

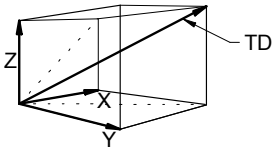
Figure 5 Electrical wiring—seismic considerations



UNIT DISPLACEMENT	Unit base		Above base 24 in. (610mm)		Top of unit	
	in.	mm	in.	mm	in.	mm
Total Displacement	±3.3	±85	±4.8	±122	±9.5	±241
X	±1.7	±43	±2.5	±64	±5.0	±127
Y	±2.7	±69	±4.0	±102	±8.0	±203
Z	±1.0	±25	±1.0	±25	±1.0	±25

Displacements are for unit mounted on 36 in. (914mm) spring-isolated floor stand.

TOTAL DISPLACEMENT (TD)
[Vector sum of X, Y, Z displacements]



6.0 PIPING CONSIDERATIONS OF SEISMIC INSTALLATION

All fluid connections to the unit must be flexible and able to withstand movement in three dimensions. Relative motion caused by a seismic event must be absorbed to prevent damage to the unit, building structure and piping. It is recommended that all connections to the unit are made as low as possible. The flexible connection should of sufficient length to make up for the maximum displacement indicated in **Figure 8** and be securely clamped at the foundation or structure and the unit.

6.1 Fluid Connections

NOTICE

Risk of water leaks. Can cause unit and/or building damage. This unit requires a water drain connection and an external water supply to operate.

Improper installation, application and service practices can result in water leakage from the unit.

Do not install this unit above equipment or machines that could be damaged by leaking water.

Do not install equipment or machines that could be damaged by leaking water below this unit. Emerson recommends installing leak detection equipment for unit and supply lines.

6.1.1 Condensate Piping—Field-Installed

CAUTION

Risk of boiling water. Can cause personal injury.

The unit requires a drain line that may contain boiling water. Only properly trained and qualified personnel wearing appropriate safety equipment should service the drain line or work on parts near or connected to the drain line.

Whether supplied with 3/4" NPT gravity drain connection or 1/2" copper sweat connection from a factory-installed condensate pump, the drain line of the unit will require a flexible element to permit movement. When selecting a suitable flexible element consider the following:

- The drain line may contain boiling water.
- Drain is trapped internally. Do not trap external to the equipment.
- Gravity drain line must be sized for 2 gpm (7.61 l/m) flow.
- Condensate pump discharge sized based on available head.
- Drain line must comply with all applicable codes.

6.1.2 Humidifier Supply Water—Optional Infrared or Steam Generating Humidifier

When selecting a suitable flexible element, permitting movement in three dimensions of sufficient length to make up for the maximum displacement, consider the following:

- The humidifier supply connection is 1/4" copper line with a maximum water pressure of 150 psi (1034kPa).
- Size the supply line for 1 gpm (3.8 l/m), with a minimum water pressure of 20 psi (138kPa).

6.2 Chilled Water Piping

The chilled water connections of the Liebert CW product, as with all connections, require a flexible element permitting movement in three dimensions to avoid damage to the unit, structure or piping system. Unlike the other fluid connections, the chilled water supply and return lines pose a unique problem because of the sizes involved. Line sizes can be as large as 2-5/8" OD copper. For these connections, Emerson recommends flexible expansion loops. Loops typically consist of two flexible sections of convoluted stainless or bronze metallic hose with braided cover, two elbows and 180° return section with or without support bracket. These loops minimize the seismic loads to the piping system anchor points. Depending on the manufacturer, the connections to the loop are available in female copper sweat, NPT thread, flange or grooved. Maximum displacements are indicated in **Figure 8**.

Figure 6 Horizontal expansion loop

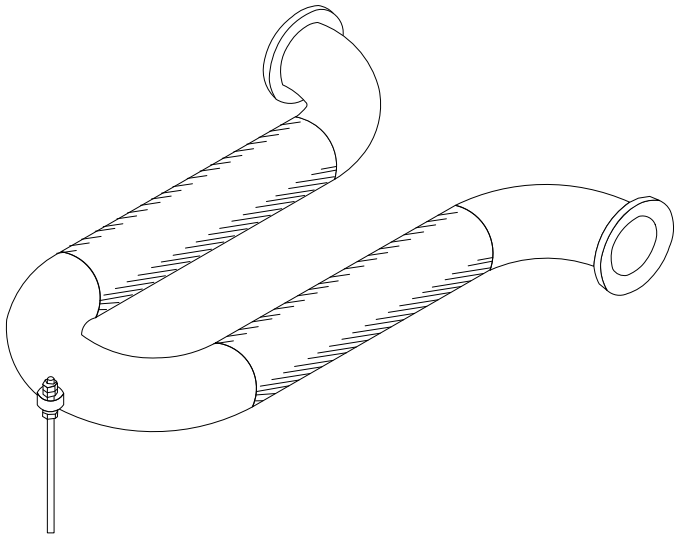
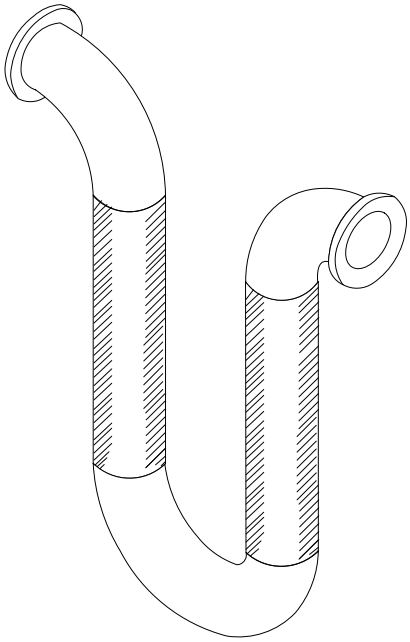
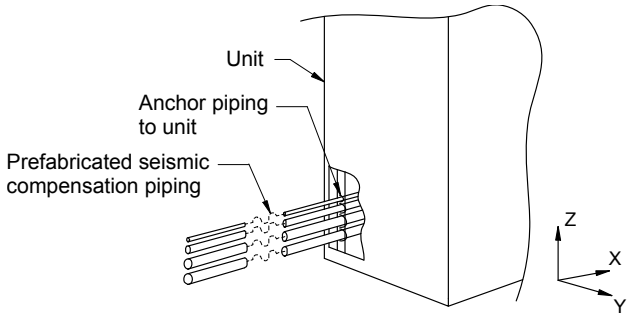


Figure 7 Vertical expansion loop

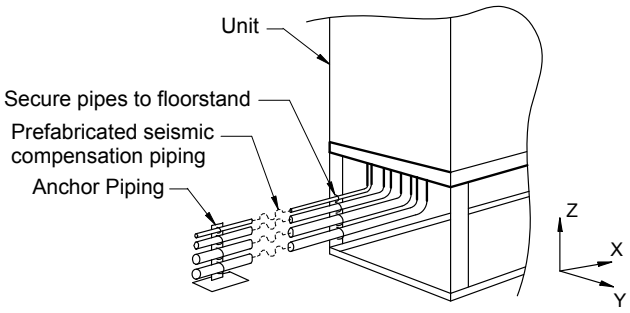


Manual shutoff valves should be installed at the supply and return lines to each unit. This provides for routine service and emergency isolation of the unit. To prevent water damage, install a water detection system, such as a Liebert Liqui-tect® or floor drains with wet traps.

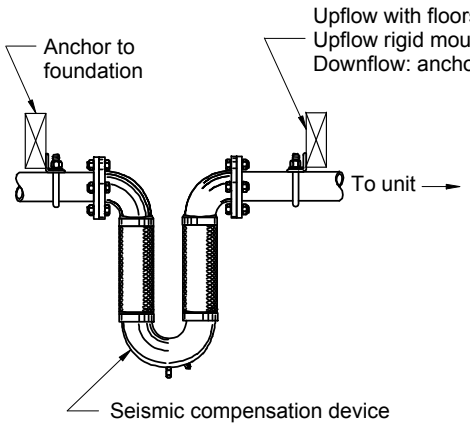
Figure 8 Piping—seismic considerations



FLOOR MOUNT



FLOOR STAND MOUNT



FLEXIBLE LOOP EXAMPLE

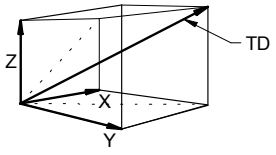
Flexible Loops:
All units, either rigidly mounted or mounted on vibration isolators, shall be attached to the piping system using flexible loops designed for seismic movement. Flexible loops shall be capable of movement in the ±X, ±Y, and ±Z planes and must completely isolate the equipment from the piping. The loops shall be suitable for an operating pressure and temperature of the system, refer to Emerson 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.

DPN001803

UNIT DISPLACEMENT	Above base 24 in. (610mm)		Unit base	
	in.	mm	in.	mm
Total Displacement	±4.8	±122	±3.3	±85
X	±2.5	±64	±1.7	±43
Y	±4.0	±102	±2.7	±69
Z	±1.0	±25	±1.0	±25

Displacements are for unit mounted on 36 in. (914mm) spring-isolated floor stand.

TOTAL DISPLACEMENT (TD)
[Vector sum of X, Y, Z displacements]



7.0 PLENUM AND DUCTING CONSIDERATION OF SEISMIC INSTALLATION

7.1 Plenum Installation

Liebert front/rear return plenums provided by Emerson are certified as part of the Liebert CW product. Seismic installations requiring top duct collar (TDC) plenums on Liebert CW051 and larger units must use plenums specifically designed for the certified application. These plenums have additional internal structure to meet the system's IBC certification criteria.

Seismic-certified installation of Liebert plenums requires the addition of plenum hold-down clips to secure the plenum on top of the unit. These clips must be installed inside the plenum and are included in the box of ship-with parts provided with the Liebert CW unit.

1. Assemble the plenum following the assembly instructions provided with the plenum.
2. With the unit power OFF, lift the plenum and position it on top of the unit over the duct collar provided.
3. See **Figure 9** for clip installation details and **Figure 10** for the number of clips and their approximate fastening locations. Removal of the front/rear grill improves access for the installation of plenum hold-down clips. Also see instructions provided with the box of parts shipped with the Liebert CW unit, *Seismic Part Package Field Installation Instructions for Liebert CW* [195800].
4. From inside the plenum, fasten the base of plenum to the top and top duct collar of the Liebert CW unit using the appropriate clips for each side.
5. Hook the clip over the unit top duct collar and plenum edge and fasten in place as shown in **Figure 9**. Install 1/4" self-drilling screws before the #8 screws.
6. Repeat **Step 5** for the remaining clips (up to 12 locations).

WARNING

Risk of improper plenum mounting. Can cause equipment damage, injury or death in a seismic event.

WARNING

Risk of high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate upflow units without installing a plenum, ductwork or guard 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.

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation.

NOTICE

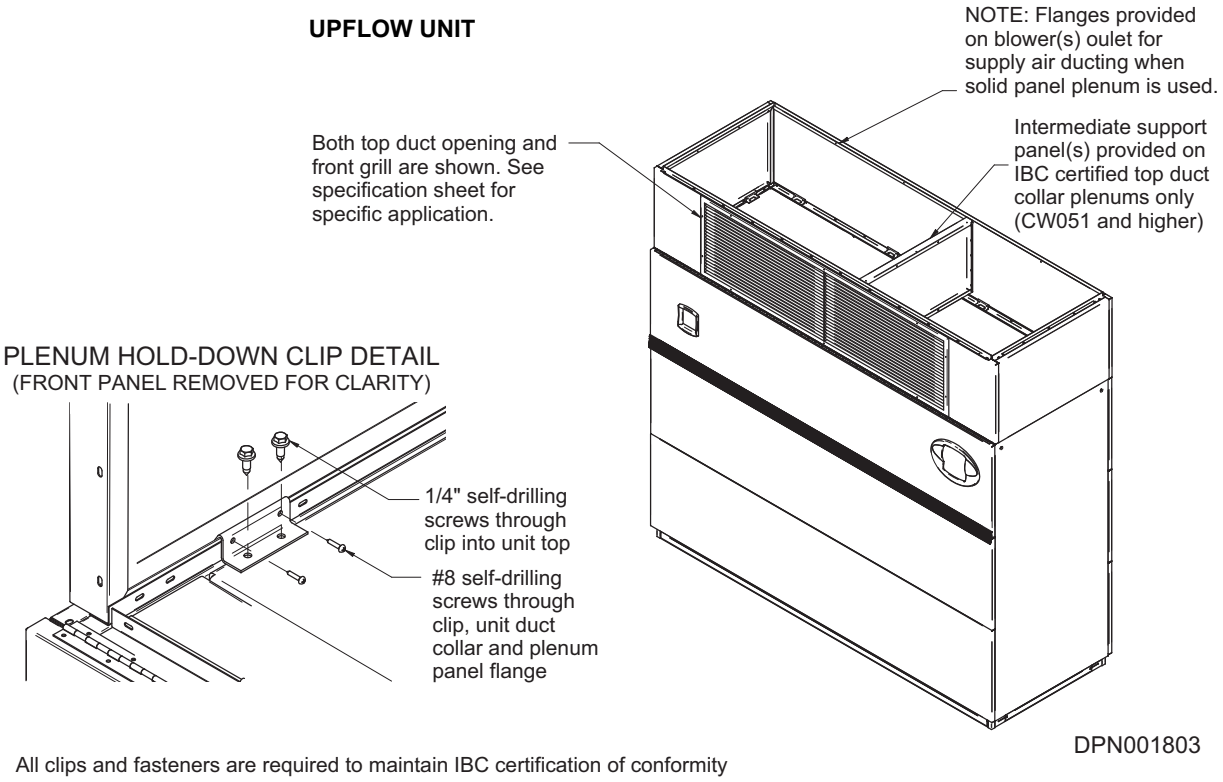
All clips and fasteners are required to maintain IBC certification of conformity.

7.2 Duct Connections

Duct connections made to the unit or unit-mounted plenum must be connected with a flexible transition that will not transfer damaging loads to the unit or plenum. Connection must be sized to permit movement of no less than the maximum displacement listed in the table of **Figure 11**.

NOTE
Special inspection per IBC section 1704 may be required on ductwork installation.

Figure 9 Seismic mounting data—upflow and downflow plenums



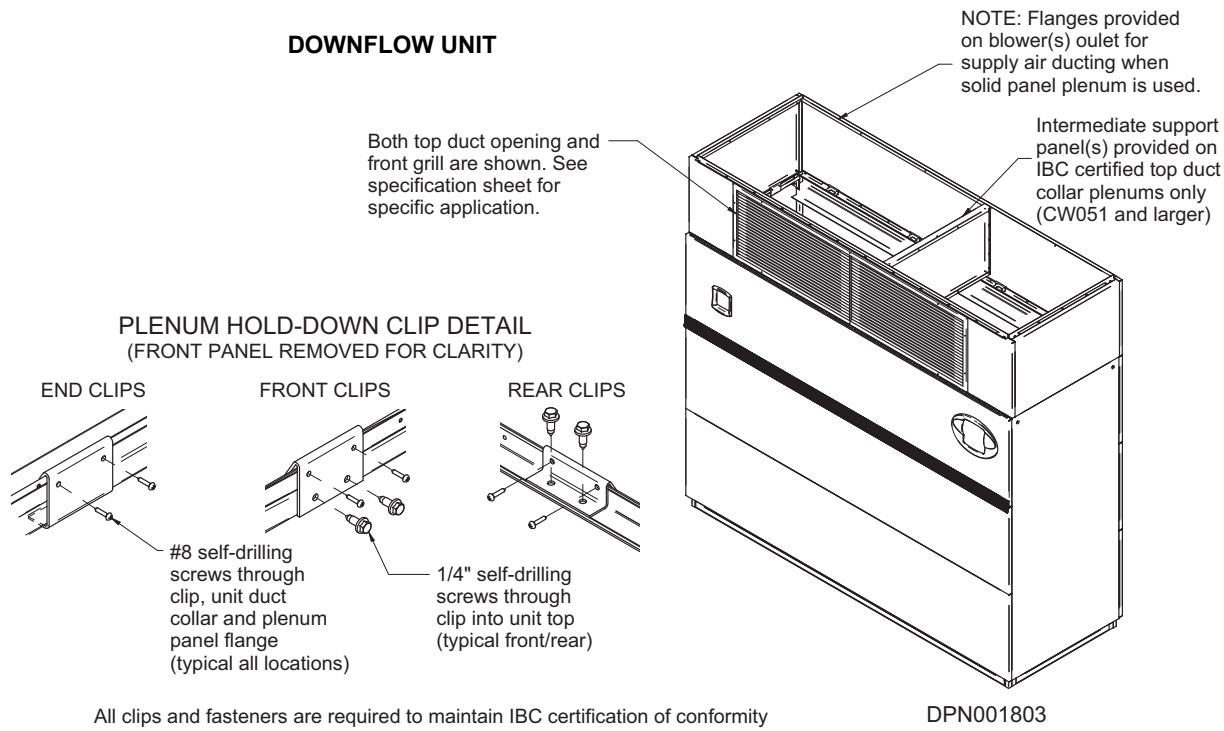
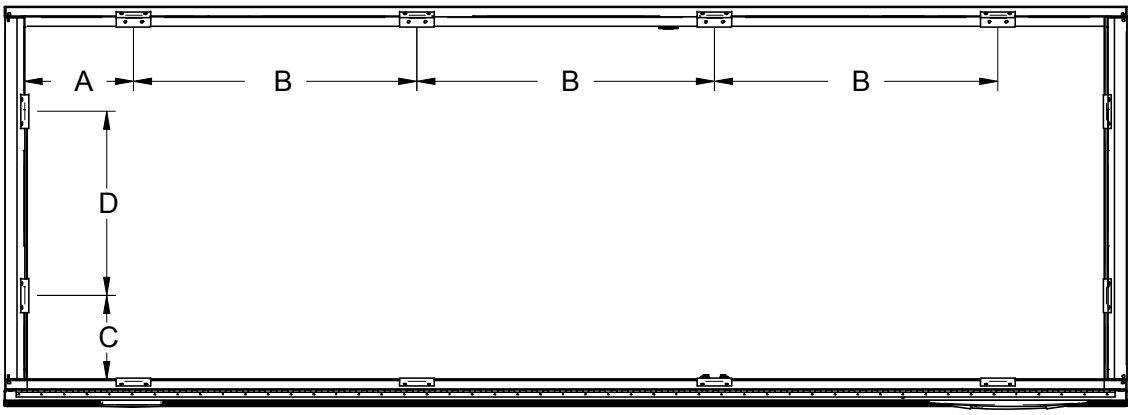


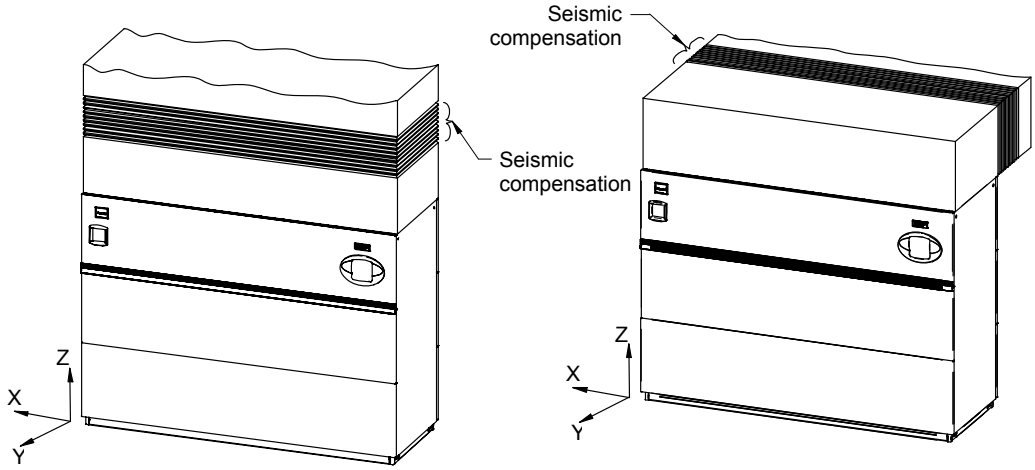
Figure 10 Plenum hold-down clip dimensions



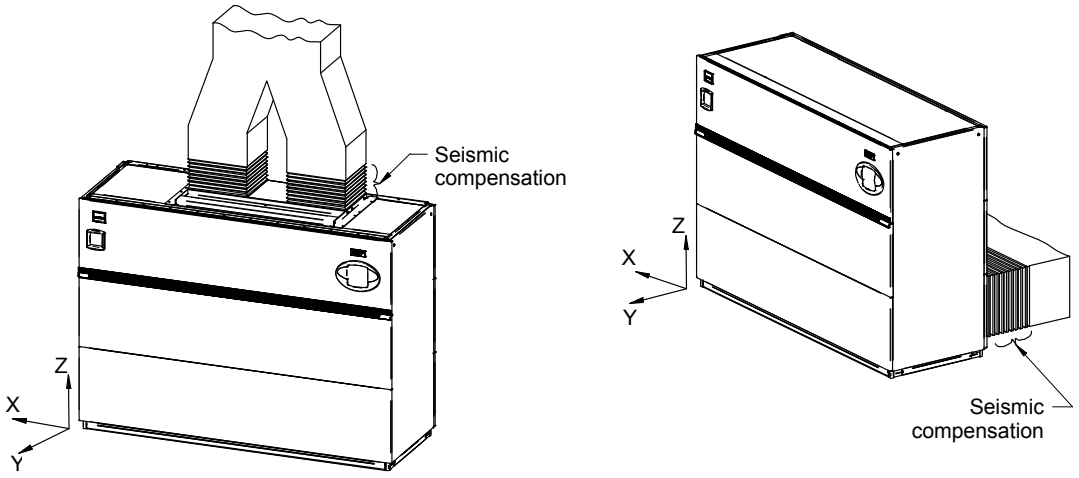
	Number of Clips Required			Approximate Location, inches (mm)			
Model #	**End**	**Front/Rear**	**Total**	**A**	**B**	**C**	**D**
CW026	2	2	8	7.4 (188)	31.2 (792)	6.5 (165.1)	19.0 (483)
CW038							
CW041							
CW051	2	3	10	7.4 (188)	27.6 (70.1)	6.5 (165.1)	19.0 (483)
CW060							
CW076	2	4	12	7.4 (188)	26.7 (679)	6.5 (165.1)	19.0 (483)
CW084							
CW106	2	4	12	7.4 (188)	34.4 (874)	6.5 (165.1)	19.0 (483)
CW114							

All clips and fasteners are required to maintain IBC certification of conformity.

Figure 11 Seismic duct connection considerations



DOWNFLOW DUCTING EXAMPLE FOR SEISMIC APPLICATIONS



UPFLOW DUCTING EXAMPLE FOR SEISMIC APPLICATIONS

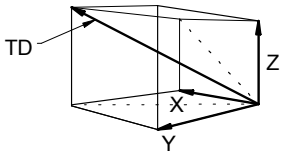
All ducted units, either rigidly mounted or mounted on vibration isolators, shall be attached to the ducting system using flexible duct designed for seismic movement. Flexible loops shall be capable of movement in the ±X, ±Y, and ±Z planes and must completely isolate the equipment from the duct work. The amount of seismic movement is listed in the chart below. Refer to Liebert installation instructions for ducting requirements. Follow manufacturer's installation instructions for proper seismic application of flexible ducts.

DPN001803

UNIT DISPLACEMENT	Above base 24 in. (610mm)		Top of unit		Top of plenum	
	in.	mm	in.	mm	in.	mm
Total Displacement	±4.8	±122	±9.5	±241	±13.1	±333
X	±2.5	±64	±5.0	±127	±7.0	±178
Y	±4.0	±102	±8.0	±203	±11.0	±279
Z	±1.0	±25	±1.0	±25	±1.0	±25

Displacements are for unit mounted on 36 in. (914mm) spring-isolated floor stand.

TOTAL DISPLACEMENT (TD)
[Vector sum of X, Y, Z displacements]



8.0 ANCHOR AND LOAD REQUIREMENTS OF SEISMIC INSTALLATION

All floor and housekeeping pads must be approved by the structural engineer of record to resist the added seismic loads from components being anchored as defined in this section. Data is presented by system configuration. The maximum system loads are given for each loading location or floor stand foot. The maximum load at the anchor is provided for proper sizing of the anchors (not provided by Emerson).

NOTE

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.

NOTE

Load interactions must be considered when selecting anchors.

Table 2 Downflow Liebert CW models on 36" floor stand without plenum

Downflow Liebert CW	Operating Mass*	Restraint Locations	Non-Isolated Floor Stand					Rubber - Isolated Floor Stand					Spring - Isolated Floor Stand				
			Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location
			Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear	
CW026D	899	4	508	250	397	125	2	1631	751	1341	375	2	1537	751	1866	375	2
CW038D	934	4	531	259	413	130	2	1702	778	1395	389	2	1605	778	1939	389	2
CW041D	984	4	571	270	440	135	2	1824	810	1479	405	2	1721	810	2044	405	2
CW051D	1261	4	618	339	503	169	2	2012	1016	1717	508	2	1892	1016	2431	508	2
CW060D	1326	4	667	353	535	176	2	2160	1058	1821	529	2	2034	1058	2563	529	2
CW076D	1479	6	504	272	407	136	2	1637	815	1389	407	2	1542	815	1961	407	2
CW084D	1665	6	567	306	458	153	2	1844	917	1564	458	2	1737	917	2208	458	2
CW106D	2064	6	706	377	568	188	2	2257	1130	1920	565	2	2129	1130	2716	565	2
CW114D	2204	6	771	399	614	200	2	2461	1197	2069	599	2	2324	1197	2912	599	2

* Operating Mass includes the operating water volume and floor stand

Table 3 Downflow Liebert CW models on 36" floor stand with plenum

Downflow Liebert CW With Plenum	Operating Mass*	Restraint Locations	Non-Isolated Floor Stand					Rubber - Isolated Floor Stand					Spring - Isolated Floor Stand				
			Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location
			Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear	
CW026D	1054	4	1269	290	800	145	2	3930	869	2573	434	2	3819	869	3179	434	2
CW038D	1089	4	1315	299	828	149	2	4071	896	2663	448	2	3957	896	3288	448	2
CW041D	1139	4	1389	309	871	155	2	4294	928	2796	464	2	4174	928	3443	464	2
CW051D	1482	4	1621	397	1037	198	2	5042	1191	3354	595	2	4901	1191	4190	595	2
CW060D	1547	4	1709	411	1089	206	2	5308	1233	3517	617	2	5161	1233	4383	617	2
CW076D	1739	6	1281	313	819	157	2	3985	939	2650	470	2	3873	939	3309	470	2
CW084D	1925	6	1421	347	909	174	2	4423	1042	2941	521	2	4299	1042	3673	521	2
CW106D	2398	6	1762	435	1129	218	2	5447	1305	3637	653	2	5298	1305	4556	653	2
CW114D	2538	6	1883	458	1203	229	2	5818	1373	3870	686	2	5660	1373	4836	686	2

* Operating Mass includes the operating water volume, floor stand and plenum
** Plenum height 36" Top Duct Collar (TDC) or Front/Rear Discharge

Table 4 Direct mount to concrete

Upflow Liebert CW	Operating Mass*	Restraint Locations	Floor Mount Loads		
			Maximum Load/Anchor		Anchors Per Location
			Tension	Shear	
CW026U	811	4	727	226	1
CW038U	846	4	755	235	1
CW041U	896	4	798	247	1
CW051U	1152	4	812	330	1
CW060U	1217	4	853	346	1
CW076U	1393	4	857	385	1
CW084U	1493	4	915	411	1
CW106U	1891	4	1236	534	1
CW114U	2031	4	1336	568	1

* Operating Mass includes the operating water volume

Table 5 Direct mount to concrete with plenum

Upflow Liebert CW With Plenum	Operating Mass*	Restraint Locations	Floor Mount Loads		
			Maximum Load/Anchor		Anchors Per Location
			Tension	Shear	
CW026U	967	4	1060	265	1
CW038U	1002	4	1089	274	1
CW041U	1052	4	1131	286	1
CW051U	1372	4	1170	395	1
CW060U	1437	4	1211	411	1
CW076U	1653	4	1245	456	1
CW084U	1753	4	1303	482	1
CW106U	2226	4	1716	621	1
CW114U	2366	4	1815	655	1

* Operating Mass includes the operating water volume and plenum
** Plenum height 36" Top Duct Collar (TDC) or Front/Rear Discharge

Table 6 Upflow Liebert CW models on 36" floor stand without plenum

Upflow Liebert CW	Operating Mass*	Restraint Locations	Non-Isolated Floor Stand					Rubber - Isolated Floor Stand					Spring - Isolated Floor Stand				
			Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location
			Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear	
CW026U	907	4	1055	245	668	122	2	3260	734	2144	367	2	3165	734	2656	367	2
CW038U	942	4	1098	255	695	127	2	3391	764	2230	382	2	3292	764	2763	382	2
CW041U	992	4	1161	268	733	134	2	3582	803	2353	401	2	3478	803	2912	401	2
CW051U	1269	4	1387	351	894	176	2	4289	1054	2882	527	2	4168	1054	3625	527	2
CW060U	1334	4	1460	368	940	184	2	4511	1103	3027	551	2	4384	1103	3804	551	2
CW076U	1552	6	1122	287	725	143	2	3468	861	2337	430	2	3367	861	2942	430	2
CW084U	1652	6	1198	304	773	152	2	3700	913	2489	456	2	3593	913	3131	456	2
CW106U	2070	6	1538	395	995	197	2	4739	1185	3199	592	2	4610	1185	4037	592	2
CW114U	2210	6	1656	417	1066	209	2	5101	1252	3427	626	2	4963	1252	4311	626	2

* Operating Mass includes the operating water volume and floor stand

Table 7 Upflow Liebert CW models on 36" floor stand with plenum

Upflow Liebert CW With Plenum	Operating Mass*	Restraint Locations	Non-Isolated Floor Stand					Rubber - Isolated Floor Stand					Spring - Isolated Floor Stand				
			Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location	Maximum Load/Location		Maximum Load/Anchor		Anchors Per Location
			Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear		Tension	Shear	Tension	Shear	
CW026U	1062	4	1407	284	866	142	2	4329	852	2761	426	2	4217	852	3355	426	2
CW038U	1097	4	1450	294	893	147	2	4460	882	2848	441	2	4345	882	3462	441	2
CW041U	1147	4	1512	307	931	153	2	4651	921	2970	460	2	4530	921	3611	460	2
CW051U	1489	4	1836	414	1155	207	2	5658	1243	3699	621	2	5517	1243	4574	621	2
CW060U	1554	4	1910	431	1201	215	2	5880	1292	3844	646	2	5733	1292	4754	646	2
CW076U	1812	6	1485	335	934	168	2	4573	1005	2990	503	2	4455	1005	3697	503	2
CW084U	1912	6	1561	352	982	176	2	4805	1057	3142	529	2	4681	1057	3886	529	2
CW106U	2405	6	1986	453	1252	227	2	6104	1360	4004	680	2	5954	1360	4965	680	2
CW114U	2545	6	2104	476	1324	238	2	6466	1427	4232	714	2	6307	1427	5239	714	2

* Operating Mass includes the operating water volume, floor stand and plenum
** Plenum height 36" Top Duct Collar (TDC) or Front/Rear Discharge

9.0 MAINTENANCE

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

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™ 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.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high-voltage. With disconnect off, check for voltage on load side.

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 high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate upflow units without installing a plenum, ductwork or guard 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.

9.1 Seismic Bracing

Liebert CW units supplied with the seismic option can be easily identified once the panels are removed. All seismic bracing is painted red and is factory-installed. Seismic bracing should not be removed except when absolutely necessary. If any bracing is removed for service access, reinstall it immediately after servicing unit.

9.1.1 Temporary Service Access

WARNING

Risk of unit collapse. Can cause injury or death.

Braces are required for seismic certification. If removed for service access, reinstall brace after servicing unit.

Seismic bracing is fastened to the unit frame with 1/4" self-drilling screws or bolts requiring a 3/8" (10mm) wrench for removal. Units with plenums use #8 Phillips head, self-drilling screws in addition to 1/4" self-drilling screws. Any bracing removed for service must be reinstalled and the 1/4" fasteners must be tightened to 10 ft-lb. If a screw is stripped out, install a replacement at a new location within 1/2" (12mm) of the original location.

9.2 Inspection of System Connections

Check all connections to the system during routine maintenance and take appropriate action to correct any issues. System maintenance schedules must be established and performed.

9.3 Post-Seismic Inspection

Many areas of the country that are subject to seismic activity are working to draft local and national guidelines and procedures for evaluating earthquake-damaged buildings and equipment. In 1989, with funding from the California Office of Emergency Services, California Office of Statewide Health Planning and Development and the Federal Emergency Management Agency, the Applied Technology Council (ATC) published the *ATC-20 Procedures for Post Earthquake Safety Evaluation of Buildings*. Inspections outlined in the document, may be required by areas that have adopted ATC-20 and must be performed by a qualified individual.

The Liebert CW seismic certification of conformity is an assurance that the system will withstand a seismic event occurring within the defined limits of **2.3 - Certification Criteria** and continue to perform the primary function of cooling. Emerson requires an inspection of the system structure and connections by a registered professional engineer with five years of experience in anchorage design after any significant seismic event greater than a magnitude 6.5 on the Richter Scale. This inspection will apply to equipment within a 100 mile radius of the seismic event. If evidence of structural cracks, yielding or loosening of structural members is found, the system must be replaced or restored to the original design configuration.

NOTES

Ensuring The High Availability Of Mission-Critical Data And Applications.

Emerson Network Power, the global leader in enabling business-critical continuity, ensures network resiliency and adaptability through a family of technologies—including Liebert power and cooling technologies—that protect and support business-critical systems. Liebert solutions employ an adaptive architecture that responds to changes in criticality, density and capacity. Enterprises benefit from greater IT system availability, operational flexibility and reduced capital equipment and operating costs.

Technical Support / Service
Web Site
www.liebert.com
Monitoring
800-222-5877
Liebert.monitoring@emerson.com
Outside the US: 614-841-6755
Single-Phase UPS
800-222-5877
upstech@emersonnetworkpower.com
Outside the US: 614-841-6755
Three-Phase UPS
800-543-2378
powertech@emersonnetworkpower.com
Environmental Systems
800-543-2778
Outside the United States
614-888-0246

Locations
United States
1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229
Europe
Via Leonardo Da Vinci 8
Zona Industriale Tognana
35028 Piove Di Sacco (PD) Italy
+39 049 9719 111
Fax: +39 049 5841 257
Asia
7/F Dah Sing Financial Centre
108 Gloucester Road
Wanchai
Hong Kong
852 2572 2201
Fax: 852 2519 9210

SL-18058 _REV0_07-09

Emerson Network Power.

The global leader in enabling *Business-Critical Continuity*.

- AC Power
- Connectivity
- DC Power
- Embedded Computing
- Embedded Power
- Monitoring
- Outside Plant
- Power Switching & Controls
- **Precision Cooling**
- Racks & Integrated Cabinets
- Services
- Surge Protection

EmersonNetworkPower.com