Frick®
INDUSTRIAL REFRIGERATION

Form 140.960-IOM (JUN 2016)
INSTALLATION - OPERATION - MAINTENANCE

File:	SERVICE MANUAL - Section 140
Replaces:	140.960-IOM (JUN 2016)
Dist:	3, 3a, 3b, 3c
Revised:	Jul 2016 - p.20

IDCF & IDC3 Evaporative Condensers

THIS MANUAL CONTAINS RIGGING, ASSEMBLY, START-UP, AND MAINTENANCE INSTRUCTIONS. READ THOROUGHLY BEFORE BEGINNING INSTALLATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH, DAMAGE TO THE UNIT, OR IMPROPER OPERATION.

Table of Contents

INSTALLATION

OPERATION

MAINTENANCE

SAFETY PRECAUTION DEFINITIONS

DANGER — **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

WARNING — **Indicates a potentially hazardous situation or practice which, if not avoided, will result in death or serious injury.**

CAUTION — **Indicates a potentially hazardous situation or practice which, if not avoided, will result in damage to equipment and/or minor injury.**

NOTICE — **Indicates an operating procedure, practice, etc., or portion thereof which is essential to highlight.**

INSTALLATION

INTRODUCTION

Adequate precautions appropriate for the installation and location of these products should be taken to safeguard the equipment and the premises from damage, and the public from possible injury. **The procedures listed in this manual must be thoroughly reviewed prior to rigging, assembly, start-up and unit operation. Read and follow all warnings, cautions and notes.**

When the fan speed of the unit is to be changed from the factory set speed, including the use of a variable speed device, steps must be taken to avoid operating at or near the fan's "critical speed" which could result in fan failure and possible injury or damage. Refer to "Fan Control" section.

⚠ CAUTION

The operation, maintenance, and repair of this equipment shall be undertaken only by personnel authorized and qualified to do so. All such personnel shall be thoroughly familiar with the equipment, the associated system and controls, and the procedures set forth in this manual. Proper care, personal protective equipment, procedures, and tools must be used in handling, lifting, installing, operating, maintaining, and repairing this equipment to prevent personal injury and/or property damage.

SHIPPING

IDCF and IDC3 Evaporative Condensers are factory assembled to ensure uniform quality with minimum field assembly. As standard, models ship in two sections per cell (lower and upper). Optional shipment of three sections per cell and optional containerized shipments are available. Contact your local Frick Representative for more information. For the dimensions and weights of a specific unit or section, refer to the submittal drawings.

PRE-RIGGING CHECKS

When the unit is delivered to the jobsite, it should be checked thoroughly to ensure all required items have been received and are free of any shipping damage prior to signing the bill of lading.

The following parts should be inspected:

- ☐ Sheaves and Belts
- ☐ Bearings
- ☐ Bearing Supports
- ☐ Fan Motor(s)
- ☐ Fan(s) and Fan Shaft(s)
- ☐ Fan Guard(s)
- ☐ Coil Surface
- ☐ Interior/Exterior Surfaces
- ☐ Section Mating Surfaces
- ☐ Float Valve Assembly(s)
- ☐ Louvers
- ☐ Water Distribution System
- ☐ Spray Water Pumps
- ☐ Water Basin Accessories

☐ Miscellaneous Items:

All bolts, nuts, washers, and sealer tape required to assemble sections or component parts are furnished by Frick and shipped with the unit. A checklist inside the envelope attached to the side of the unit marked "Customer Information Packet" indicates what miscellaneous parts are included with the shipment and where they are packed. This envelope will be attached to the side of the unit or located in a box inside the unit.

Unit Weights

Before rigging any unit, the weight of each section should be verified from the unit submittal drawing. Unit print weights include the final assembled unit with all accessories. Accessory weights (found on the respective drawing) can be deducted from the total weight.

Anchoring

Seven-eighths inch (7/8") diameter holes are provided in the bottom flange of the basin section for bolting the unit to the support beams. Refer to the suggested support drawing included in the submittal for location and quantity of the mounting holes. **The unit must be level for proper operation**.

Anchor bolts must be provided by others. The IBC rating is only certified with standard anchorage locations. Using alternate anchorage locations or alternate steel supports will void any IBC wind or seismic ratings. Contact your Frick sales representative for details.

Freeze Protection

These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up. Refer to "Cold Weather Operation" or contact your Frick sales representative for recommended cold weather operation strategies.

Location

All evaporative cooling equipment must be located to ensure an adequate supply of fresh air to the unit air intakes. When units are located adjacent to walls or in enclosures, care must be taken to ensure the warm, saturated, discharge air is not deflected and short-circuited back to the air intakes.

NOTICE

Location must comply with all local codes and regulations.

⚠ CAUTION

Each unit must be located and positioned to prevent the introduction of discharge air into the ventilation systems of the building on which the unit is located and of adjacent buildings.

For detailed recommendation on equipment layout, contact your Frick sales representative.

Warranties

Please refer to the Limitation of Warranties (located in the submittal package) applicable to and in effect at the time of the sale/purchase of these products.

UNIT RIGGING & ASSEMBLY

Refer to Table 1 for the minimum recommended vertical dimension "H" from the lifting device to the spreader bar. The use of a supplemental safety sling may also be required if the lift circumstances warrant its use, as determined by the rigging contractor.

The maximum permissible lift point width "W" should be no more than 1' of listed value.

All standard single cell IDCF and IDC3 products (including models with the optional heavy gauge coil) are designed to be lifted in one assembled piece as shown in Figure 1. A two piece lift is shown in Figures 2 and 3. All sections, with the exception of the lower section, require the use of a spreader bar. The distance between the spreader bar lifting points must be equivalent to the width between the unit lifting ears.

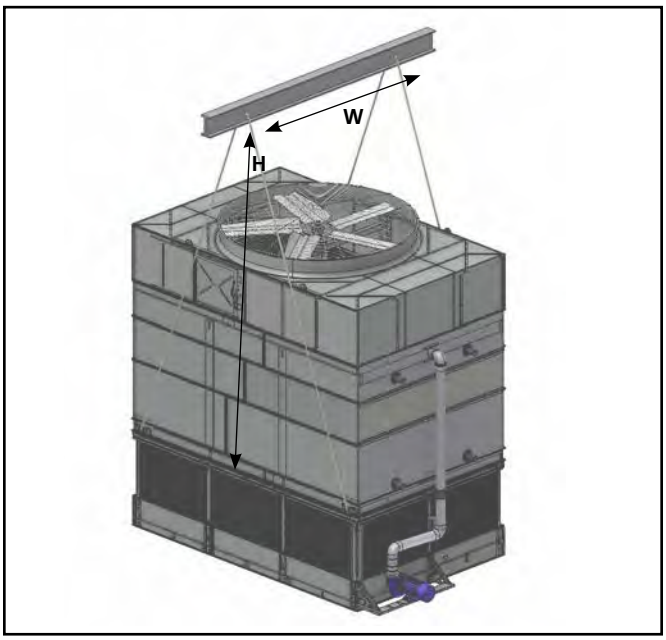


Figure 1 – Single-Piece Lift

⚠ WARNING

Failure to use designated lifting points can result in a dropped load causing severe injury, death, and/or property damage. Lifts must be performed by qualified riggers following Frick published Rigging Instructions, and generally accepted lifting practices. The use of a supplemental safety sling may also be required if the lift circumstances warrant its use, as determined by the rigging contractor.

⚠ CAUTION

Before an actual lift is undertaken, ensure no water, snow, ice, or debris has collected in the basin or elsewhere in the unit. Such accumulations will add substantially to the equipment's lifting weight.

NOTICE

For weight information, refer to the submittal drawing package.

Section Assembly of Two-piece Cells

1. Figures 2 and 3 show the proper rigging of sections for units that ship in two pieces.

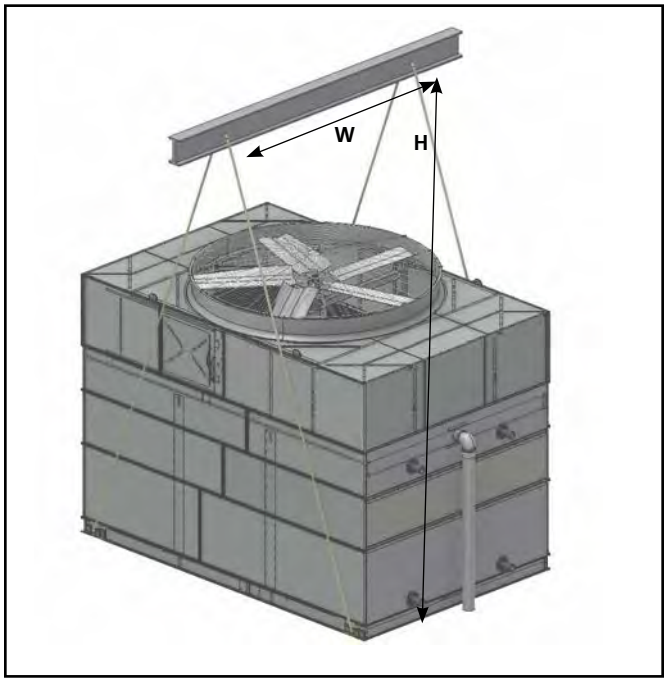


Figure 2 – Upper Section Two-Piece Lift (Casing and Mechanical)

TABLE 1. RECOMMENDED VERTICAL DIMENSION AND SPREADER BAR LENGTH

Model Number	W*	H**					
		Single Piece Lift	Two-Piece Lift		Three-Piece Lift		
			Lower	Middle & Upper	Lower	Middle	Upper
IDCF/IDC3-0406	4'	15'	14'	15'	14'	11'	4'-6"
IDCF/IDC3-0412	4'	15'	16'	15'	16'	11'	4'-6"
IDCF/IDC3-0709	7'-4"	17'	14'	17'	14'	11'	4'-6"
IDCF/IDC3-0718	7'-4"	17'	16'	17'	16'	11'	6'-6"
IDCF/IDC3-1012, 1024, and 2012	10'	19'	16'	19'	16'	11'	6'-6"
IDCF/IDC3-1212, 1224, 2412 and 2424	12'	19'	16'	19'	16'	11'	6'-6"
IDCF/IDC3-1218, 1236, 2418 and 2436	12'	19'	18'	19'	18'	11'	9'
IDCF-1220, IDCF-1240, IDCF-2420 and IDCF-2440	12'	19'	18'	19'	18'	13'	9'

*** W = Distance between lifting points.** **** H = Distance from lift point to lifting device.**

2. Remove any motors or accessories shipped in the lower section.
3. All units ship with alignment pins. Install the pins on the water basin in the locations shown in Figure 4. Secure the alignment pins using the 1/2" hardware provided from the factory.
4. Position the lower section on the steel support and bolt in place.
5. Wipe any moisture or dirt from the top perimeter flange of the lower section.
6. Install flat butyl sealer tape (Part#: BAC554000) supplied with the unit, on the mating flanges of the lower section in a continuous line. At each corner, allow 1" overlap.
7. Lower the hose connection on the pump discharge piping below the elevation of the lower section before rigging the coil casing section.
8. Lower the upper section (coil casing and mechanical) until it is hovering 2-6" above the lower section.

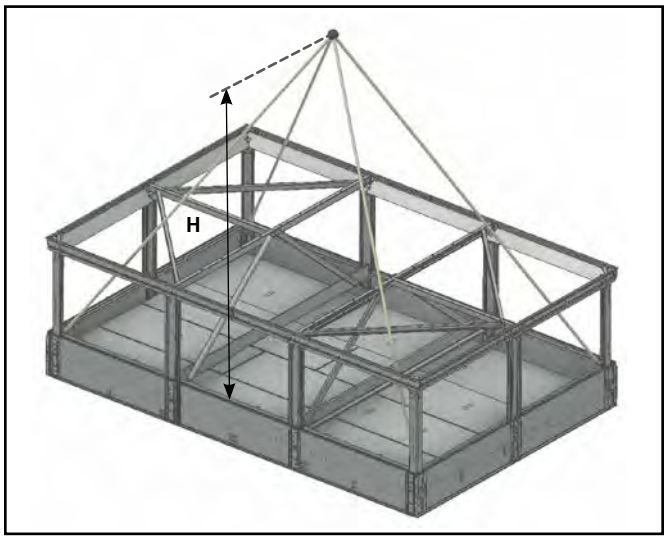


Figure 3 – Lower Section Two-Piece Lift

9. Drift pins are not necessary as the alignment pins ease the assembly process. However, in the case that drift pins are used - insert a drift pin per Figure 5. Start at the corner hole and skip every 3 or 4 holes along the length of the unit. Repeat this process on the other side.
10. Lower the upper section the remaining distance using the alignment pins and drift pins to align the coil casing section and lower section holes.
11. Fasten the hardware between the coil casing and lower section per Figure 6.
12. Position the hose connecting the sections of the pump discharge pipe and secure with the hose clamps provided.

⚠ CAUTION

Any motors or accessories shipped in the water basin must be removed prior to installing the upper (mechanical and coil casing) section.

NOTICE

The IBC Rating is void if the section assembly is not performed as described in this manual.

NOTICE

All pump piping must be restrained to ensure no vertical or horizontal movement. All piping and supports are to be furnished by others. Refer to the submittal drawing for details on piping connection sizes, etc.

⚠ WARNING

Do not lift the mechanical (top) section attached to the coil casing section from the mechanical section lifting ears. Lift both sections from the coil casing lifting ears.

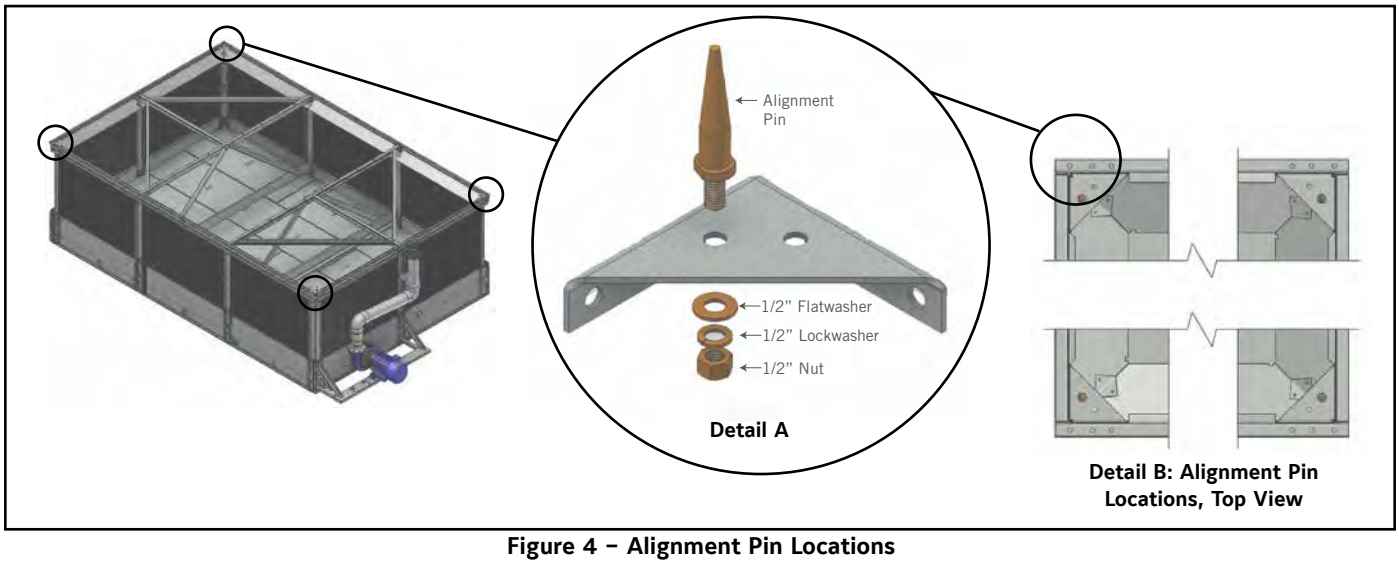


Figure 4 – Alignment Pin Locations

Figure 5 – Drift Pin Alignment

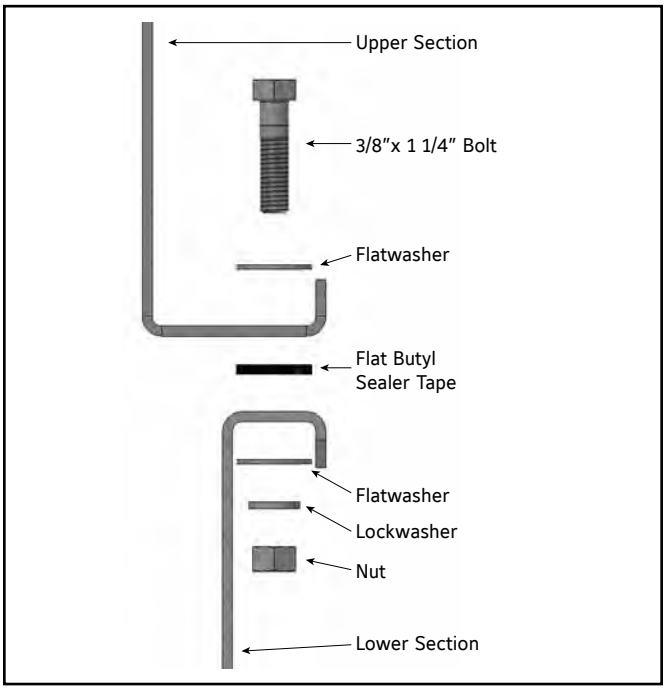


Figure 6 – Coil Casing/Lower Section Bolt Assembly

Section Assembly of Optional Three-Piece Cells

1. Figures 7a, 7b, and 7c show the proper rigging of sections for units that ship in three sections.
2. Remove any motors or accessories shipped in the lower section.
3. Install rigging alignment pins on the water basin in the locations shown in Figure 4. Secure the alignment pins using the 1/2" hardware provided.
4. Position the lower section on the unit support and bolt into place.
5. Lower the hose connection on the pump discharge piping below the elevation of the lower section before rigging the coil casing section.
6. Wipe moisture and dirt from the perimeter of the top flange on the lower section and also from the perimeter of the top flange of the coil casing section.
7. Starting at one end, install flat butyl sealer tape (Part#: BAC554000) supplied with the unit, around the face of the flanges of the lower section in a continuous line. At each corner, allow 1" overlap.
8. Lower the coil section until it is hovering 2-6" above the lower section.
9. When necessary, insert drift pin per Figure 5 on page 6. Start at the corner hole and skip every 3 or 4 holes along the length of the unit. Repeat this process on the other side.
10. Lower the upper section the remaining distance using the alignment pins and drift pins to align the coil casing section and lower section holes.
11. Fasten the hardware between the coil casing section and the lower section per Figure 6.
12. Ensure that moisture and dirt has been wiped from the perimeter of the top flange on the coil casing section, which is now connected to the lower section.
13. On the coil casing section, install a layer of foam tape (Part#: BAC270567) supplied with the unit around the face of the flange over the centerline of the holes. Do not leave any gaps.
14. Lower the mechanical section until it is hovering 2-6" above the coil casing section.
15. When necessary, insert drift pin per Figure 5. Start at the corner hole and skip every 3 or 4 holes along the length of the unit, inserting drift pins to align the mechanical section and coil casing section holes. Repeat this process on the other side.
16. As illustrated in Figure 8, secure the mechanical section to the coil casing section using the 5/16" self-tapping screws provided.
17. Position the hose connecting the sections of the pump discharge pipe and secure with the hose clamps provided.

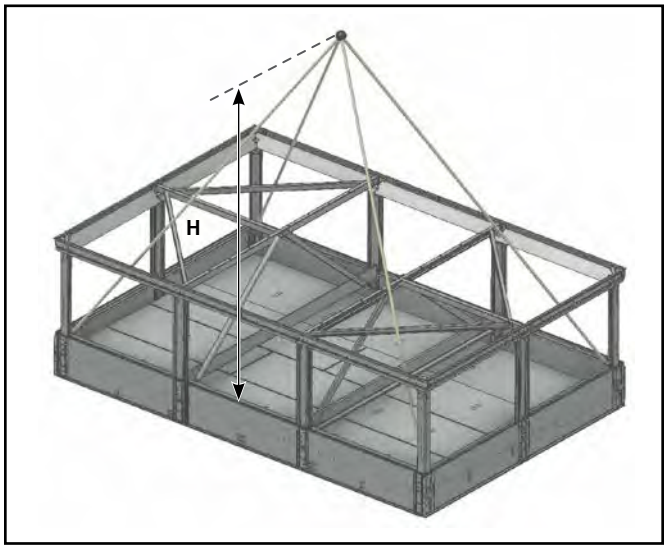


Figure 7a – Lower Section Three-Piece Lift

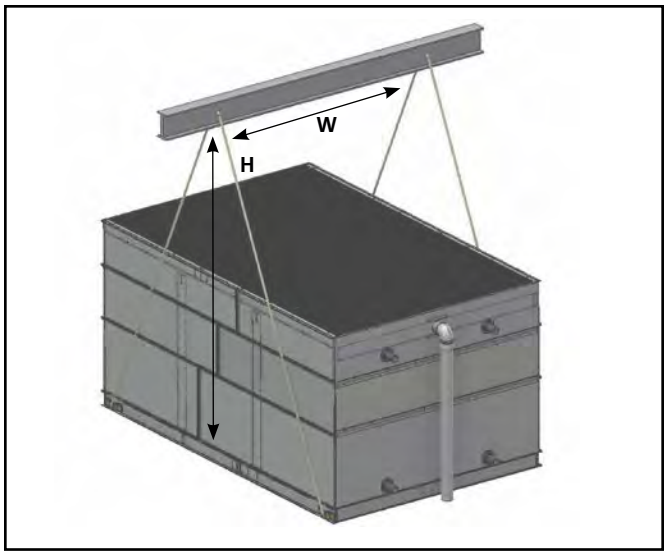


Figure 7b. – Coil Casing Section Three-Piece Lift

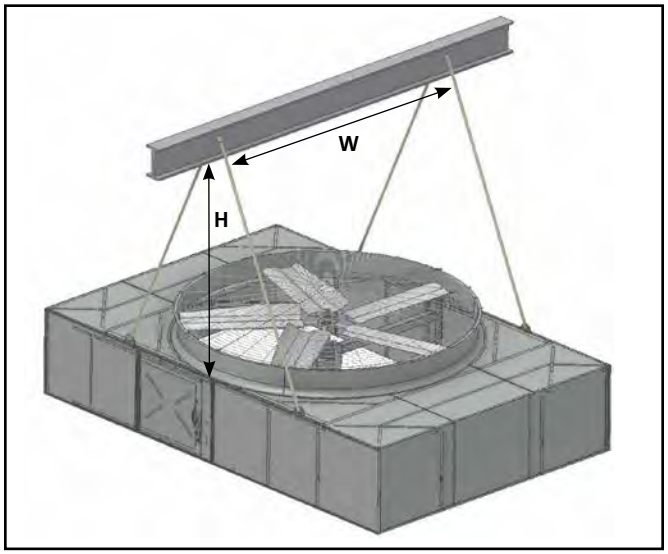


Figure 7c. – Mechanical Section Three-Piece Lift

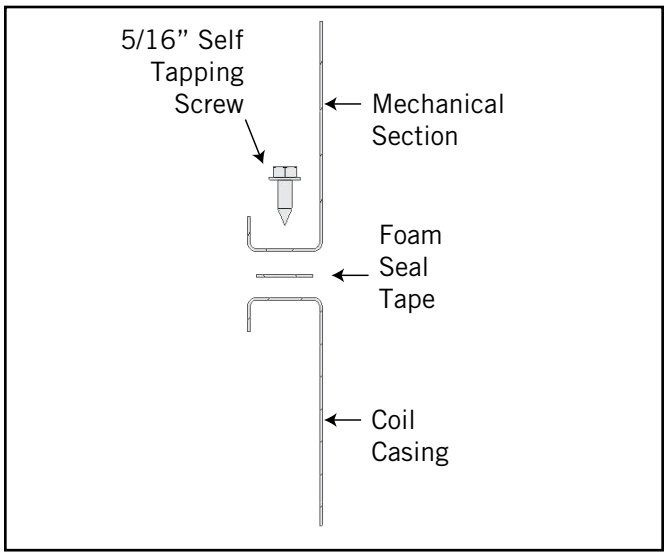


Figure 8 – Mechanical/Coil Casing Assembly for Optional Three-Piece Rigging

Rigging of Containerized Units (0709 and 0718 units)

1. Remove the unit from the container using the pulling lugs as shown in Figure 9.
2. Containerized units ship in two parts within the container, where the mechanical section is bolted to the lower section and the coil casing section is separate. Once the unit is removed from container, remove the bolts holding the mechanical section to the lower section and remove the mechanical section from the lower section.
3. Remove any motors or accessories shipped in the lower section.
4. Install rigging alignment pins on the water basin in the locations shown in Figure 4. Secure the alignment pins using the 1/2" hardware provided.
5. Position the lower section on the unit support and bolt into place.
6. Follow steps 6 – 11 on previous page.
7. The motor for containerized units ships loose. Attach the motor to the fan section per "Motor Installation for External Motors."
8. Follow steps 12 – 16 on previous page.
9. Secure the pump/piping assembly to the basin using the flat butyl sealer tape (Part#: BAC554000) and bolts provided as shown in Figure 10. Apply the sealer tape as shown in Figure 10, Detail B.
10. Secure the pump piping to the pump piping bracket with the U-bolt provided.
11. Position the rubber sleeve connecting the sections of the pump discharge pipe and secure with the hose clamps provided.

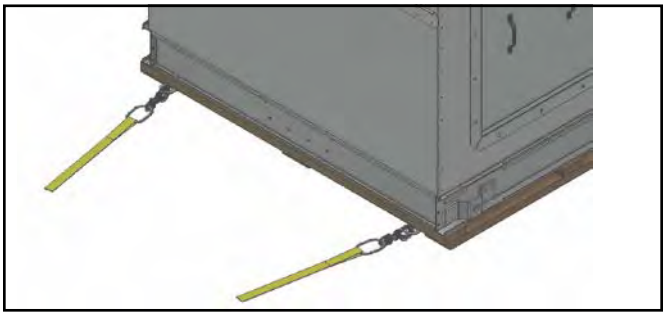


Figure 9 – Removing Unit from Container Using Pulling Lugs

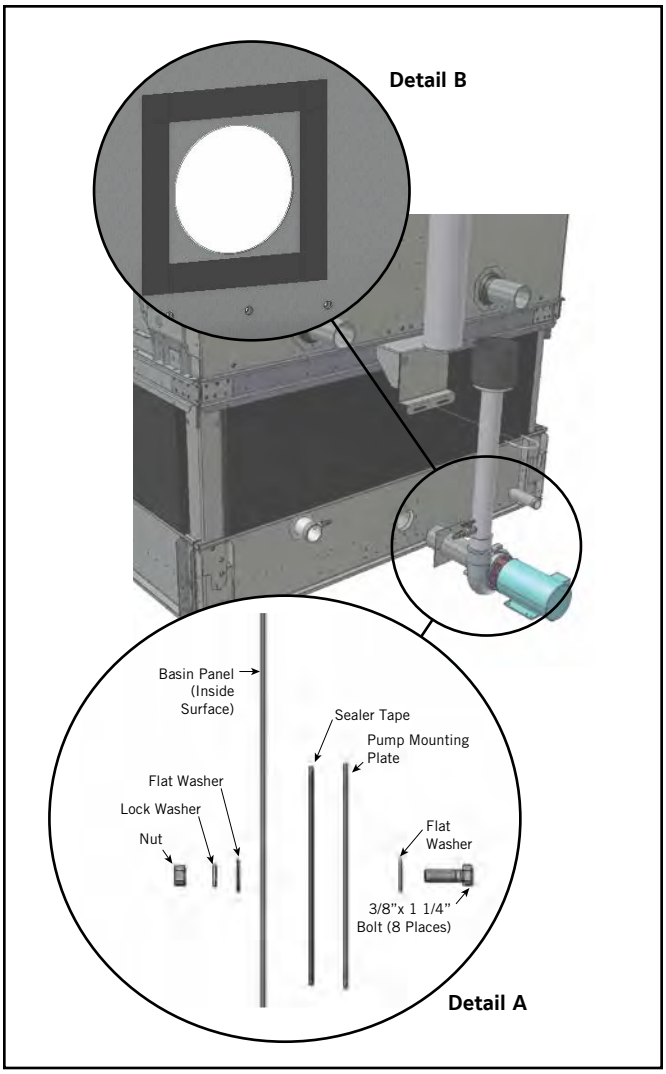


Figure 10 – Bolt/Piping Assembly

Multi-Cell Unit Installation

Refer to the submittal unit print for the proper orientation of each cell. All multi-cell units have the cell number and "face" stenciled on the outer basin wall of each lower section, as well as match marks to show how the cells are to be mated.

MULTI-CELL UNIT ASSEMBLY

1. Attach the first cell's lower section to the support and then fasten the first cell's upper section to the first cell's secured bottom section. For units shipped in two sections per cell, follow the instructions for "Section Assembly of Two-Piece Cells." For units shipped in three sections per cell, follow the instructions for "Section Assembly of Optional Three-Piece Cells."
2. Each subsequent cell should be assembled adjacent to its final location, and then properly positioned next to the previous cell. Ensure spacing between the cells at the bottom flange is 3" on Face A-B, 5" on Face C-C.
3. IDC3 quad cell units come with air bypass panel windows on Face C of the lower section. These windows facilitate removal of the inner most lift shackle after the final cell is installed. The window panels are shipped loose inside the water basins and should be installed using the supplied flat butyl sealer tape (Part#: BAC554000) and 5/16" self-tapping screws after the final cell is in place and the lift shackles are removed.

NOTICE

On quad cell installations, it is suggested that the cells subsequent to the first cell have the upper and lower sections assembled on the support foundation adjacent to the final mounting locations. This will allow space for securing the upper and lower sections of each cell. Move the subsequent cell(s) to their final position using the lifting devices on the casing.

Motor Installation for External Motors

Models with external motors include IDCF/IDC3 -0709 and -0718. All other IDCF and IDC3 models have the fan motor mounted and belt tensioned at the factory.

1. Attach the lifting strap to the motor base eyelets and remove the motor and the motor base assembly from the basin. The motor assembly must remain vertical to maintain proper alignment during installation.
2. Lift the external motor assembly into position next to the access door.
3. Attach the assembly to the unit using the six ½" studs, flat-washers, lock washers, and nuts.
4. Install the power band, check sheave alignment, and tension the power band. For correct sheave alignment and tensioning specifications and procedures, refer to the appropriate sections within this publication.

⚠ WARNING

Ensure that the fan guard is properly installed prior to commencing operation.

NOTICE

Do not remove tappers from the fan section during the installation of the external motor. Removing tappers will cause the interior mechanical system to fall.

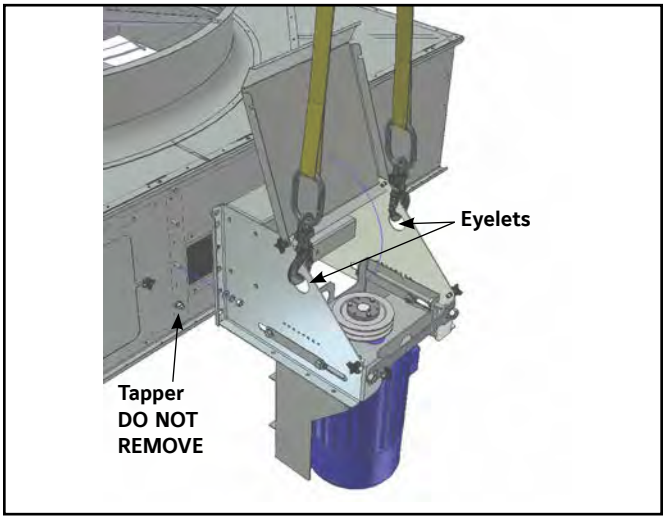


Figure 11a - External Motor Mount Assembly Lift

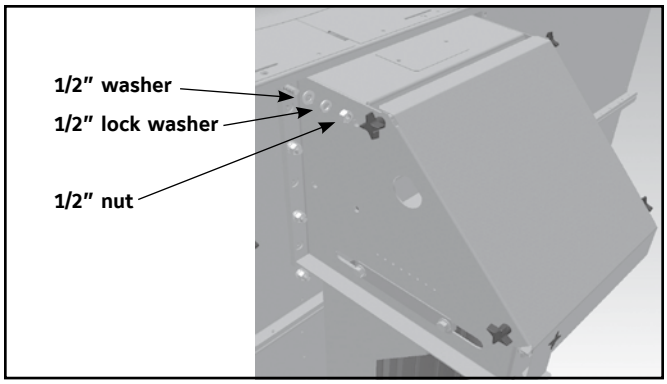


Figure 11b – External Motor Mount Assembly Pattern

FAN GUARD INSTALLATION

Depending on the height of your unit, the fan guard may ship unmounted due to shipping height limitations on specific truck shipments.

ONE-PIECE FAN GUARD

Mount the fan guard to the unit as illustrated in Figure 12, Detail C.

TWO-PIECE FAN GUARD

1. Bolt the two halves together as illustrated in Figure 12, Detail B at the X and Y dimensions shown in Table 2.
2. Mount the fan guard to unit as illustrated in Figure 12, Detail A for the seams where the two halves join together, and Detail C for all others.

TABLE 2. U-BOLT SPACING DIMENSIONS

FAN DIAMETER	X	Y
9′	10″	17″
10′	10″	20″
11′	10″	23″

⚠ CAUTION

Fan guard must be securely in place before the unit is placed in operation. Never step or walk on the fan guard.

NOTICE

Gradually tighten each locknut of the U-Bolt assembly, alternating from one to the other, until 20-25 ft-lb of torque has been achieved.

NOTICE

For X and Y values, refer to Table 2.

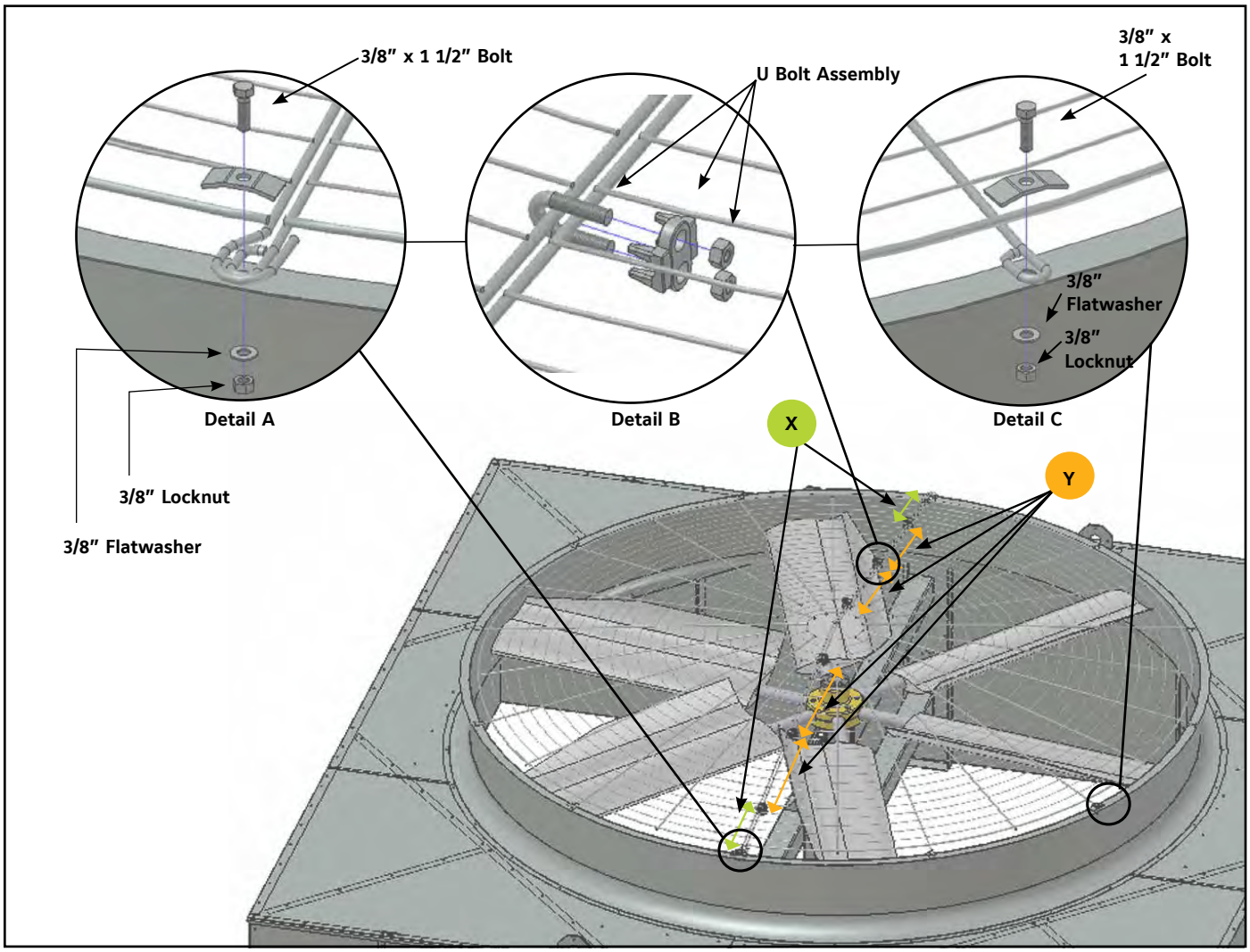


Figure 12 – Two-Piece Fan Guard Assembly

OPTIONAL ACCESSORY INSTALLATION

Bottom Water Outlet

1. The bottom connection seal, Figure 13, is typical for all bottom remote sump outlets, and bypasses. Flange mounting hardware and gasket to be supplied by others.
2. Bottom connection seal kit(s) ship in plastic tubs.

NOTICE

Some parts that ship loose are labeled with unique three key codes for identification purposes. These three key codes are referenced throughout this guide to identify parts to be assembled in the field.

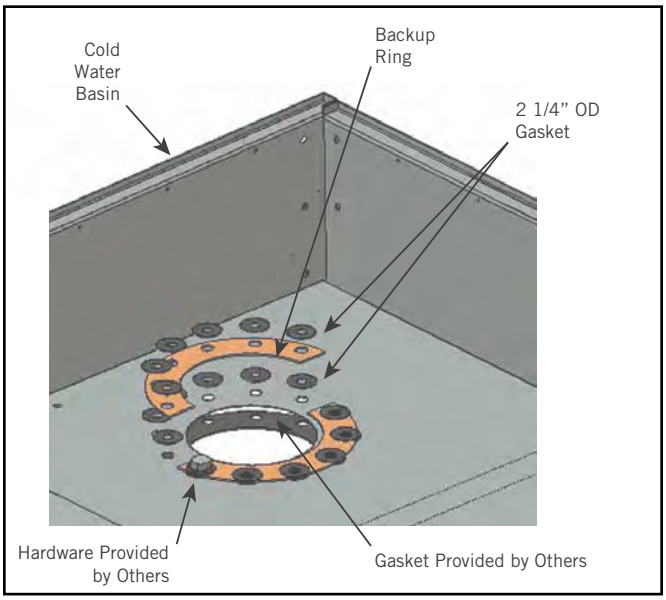


Figure 13 – Bottom Water Outlet

Discharge Sound Attenuation (IDCF Option Only)

1. Verify the mounting frame and clips are factory installed as shown in Figure 14.
2. Lower the attenuator into position by aligning the bolt holes on the attenuator with the pre-existing bolt holes on the mounting clips. Be sure to follow the minimum height restrictions H found in Table 3 between the top of the discharge sound attenuation and the apex of the crane cables supporting the load.

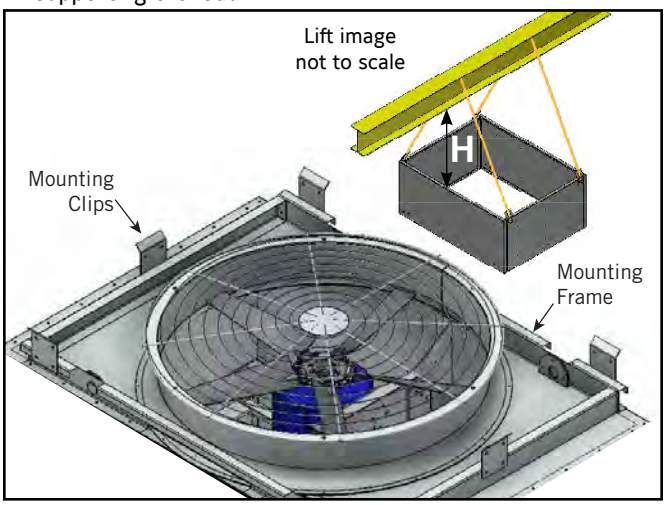


Figure 14 – Sound Attenuation Clip Placement And Lift

TABLE 3. DISCHARGE SOUND ATTENUATION LIFT DIMENSIONS

MODEL NUMBER	H (DISTANCE FROM LIFT POINT TO LIFTING DEVICE)
IDCF-0406	4′
IDCF-0412	6′

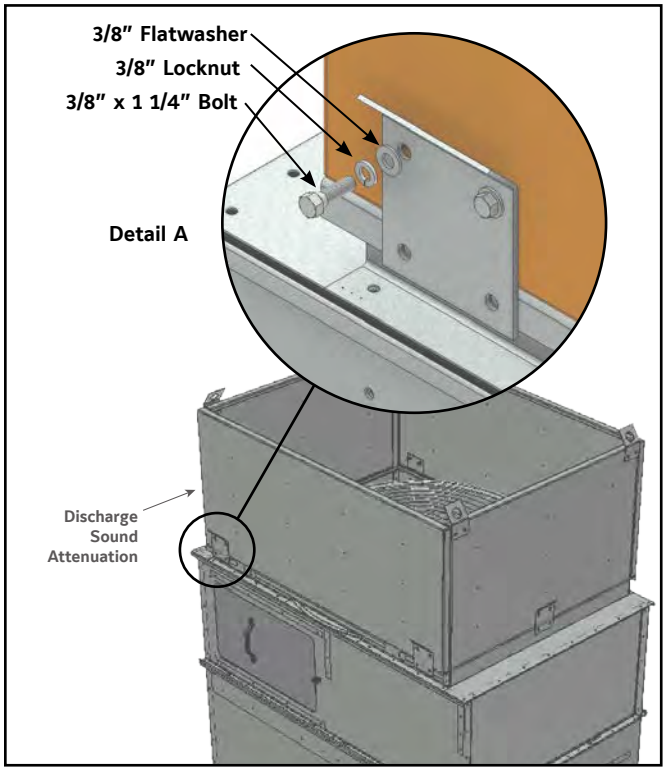


Figure 15 – Discharge Sound Attenuation Installed

NOTICE

Discharge sound attenuation can be added at the time of order or as an aftermarket item.

Fan Cowl Extensions

Each fan cowl extension is 10 1/2" tall and up to four fan cowl extensions may be installed.

1. Fasten the fan cowl extensions through the large diameter pre-punched holes using the provided hardware as shown in Figure 16, Detail A.
2. Follow "Fan Guard Installation" instructions to install the fan guard.

NOTICE

Fan cowl extensions can be added at the time of order or as an aftermarket item.

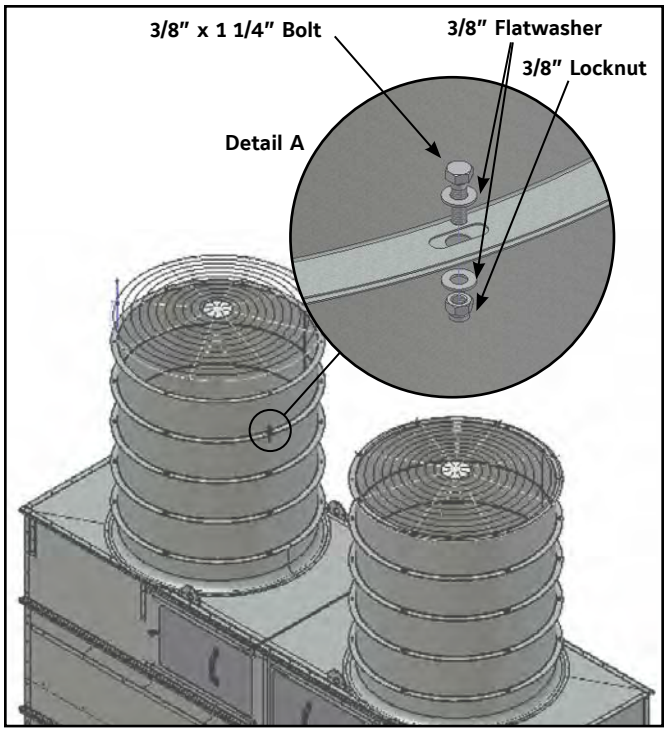


Figure 16 – Fan Cowl Extensions

Motor Removal Davit

IDCF-0709, -0718, and IDC3-7409, -7418 (See Fig. 17)

1. Remove the cover plate from the upper support channel.
2. Rotate the davit assembly to align the bolt head on the davit with the keyway in the upper support channel and lower into position. The davit must pass through the upper and lower support channel and rest on support base.

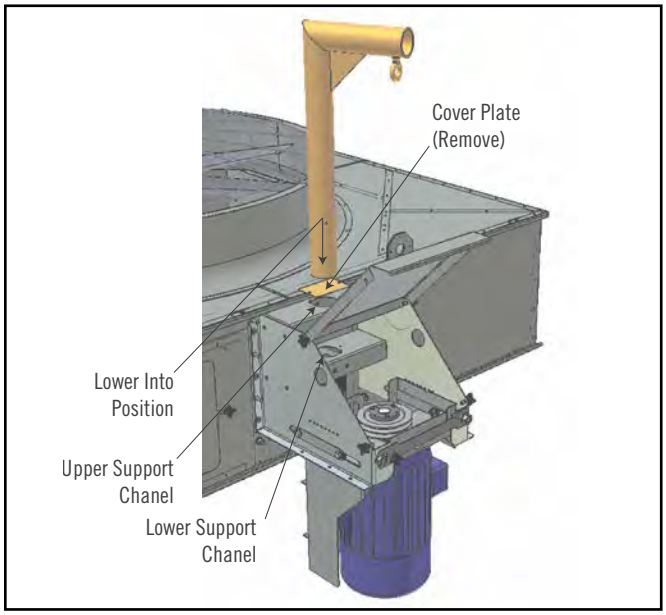


Figure 17 – Motor Removal Davit Installation for IDCF-0709, -0718, and IDC3-7409, -7418

IDCF/IDC3-1012, 1024, 2012, 1212, 2412, 1224, 2424, 1218, 1236, 2418, AND 2436 AND IDC3-1220

1. Verify the davit support is factory installed next to the access door. If not installed, remove the bolts next to the access door (refer to Figure 18b). DO NOT REMOVE TAPPERS. Secure the davit support by re-installing the bolts.
2. Rotate the davit assembly to align the bolt head on the davit with the keyway in the upper support channel and lower into position. The davit must pass through the upper and lower support channels and rest on the support base.

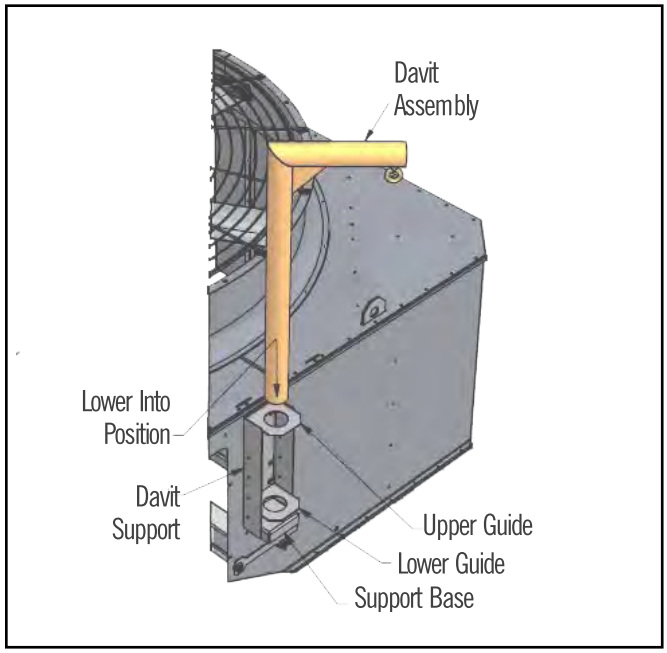


Figure 18a. Motor Removal Davit Installation

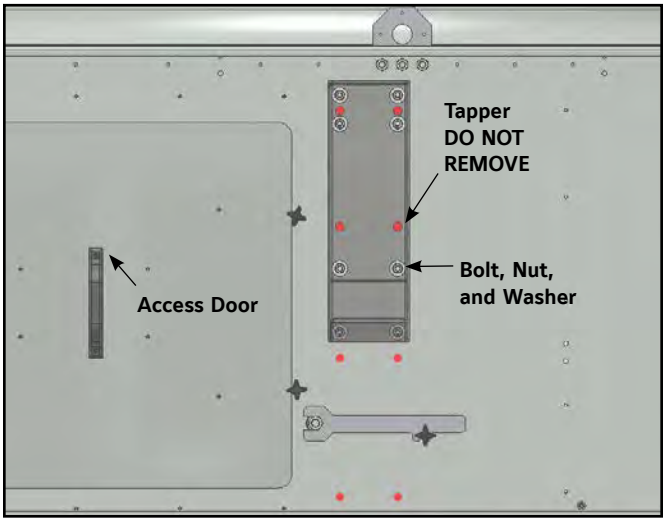


Figure 18b. Davit Support Detail

⚠ CAUTION

Do not remove tappers during installation of motor removal davit support. Removing tappers will cause the interior mechanical system to fall.

MECHANICAL ACCESS PLATFORM

NOTICE

1. **Platforms, ladders, and safety cages can be added at the time of order or as an aftermarket item.**
2. **Safety gates are provided for all guardrail openings. All components are designed to meet OSHA requirements.**

REFER TO FIGURES FOR YOUR PARTICULAR UNIT.

1. Lift the platform module(s) into place and secure to the unit at the locations indicated in Figures 19 to 22, Details A and B using the 3/8" bolts provided.

NOTICE

Not all units receive a mid-support.

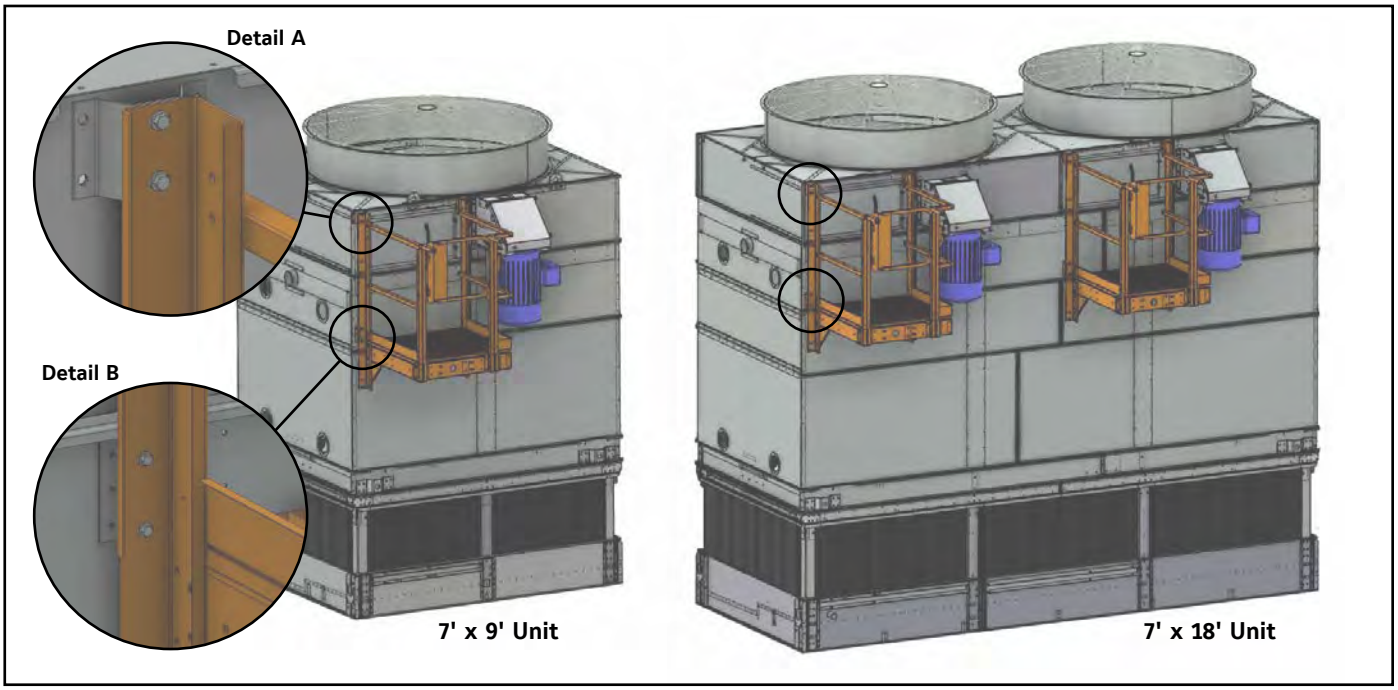


Figure 19 –Mechanical Access Platforms

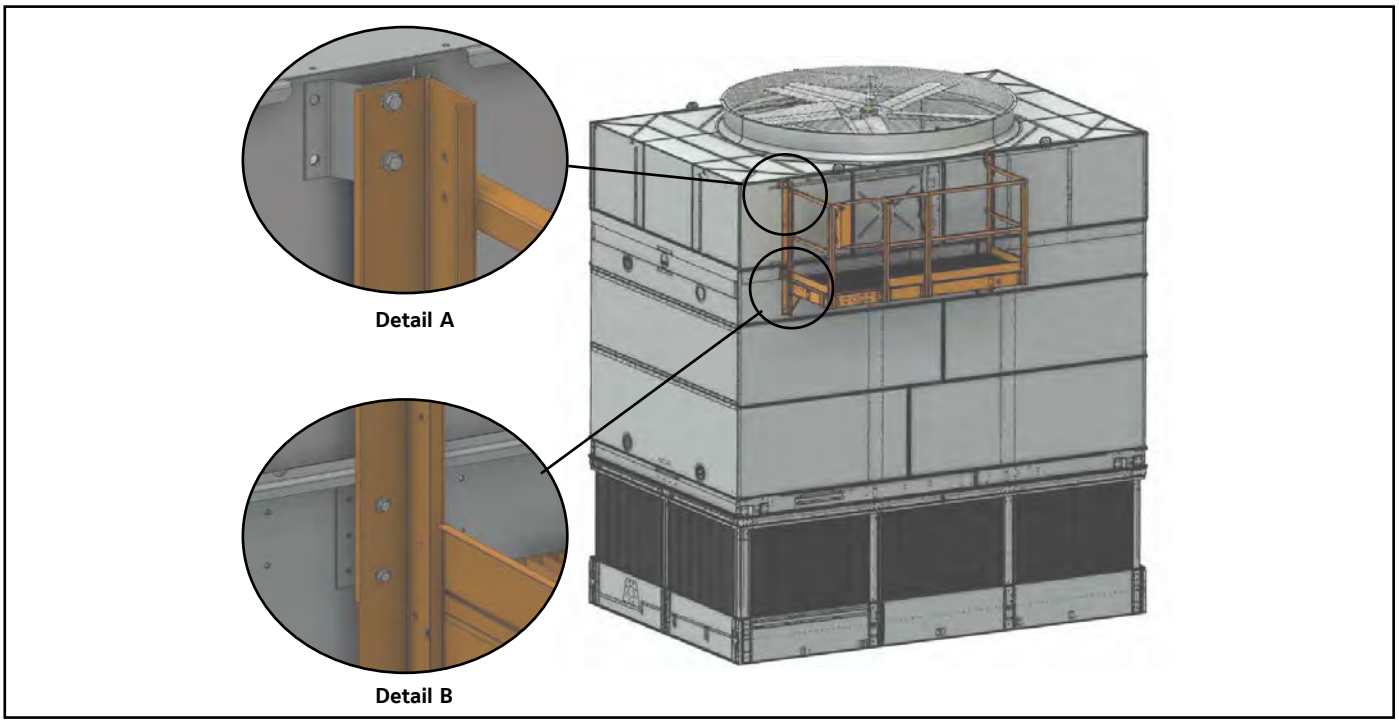


Figure 20 – Mechanical Access Platform – IDCF/IDC3-1012, 1024, 2012, 1212, 1224, 2412, 2424, 1218 IDCF/IDC3-1236 (one fan), 2418 (one fan), 2436 (one fan) and IDC3-1220, 1240, 2420, 2440

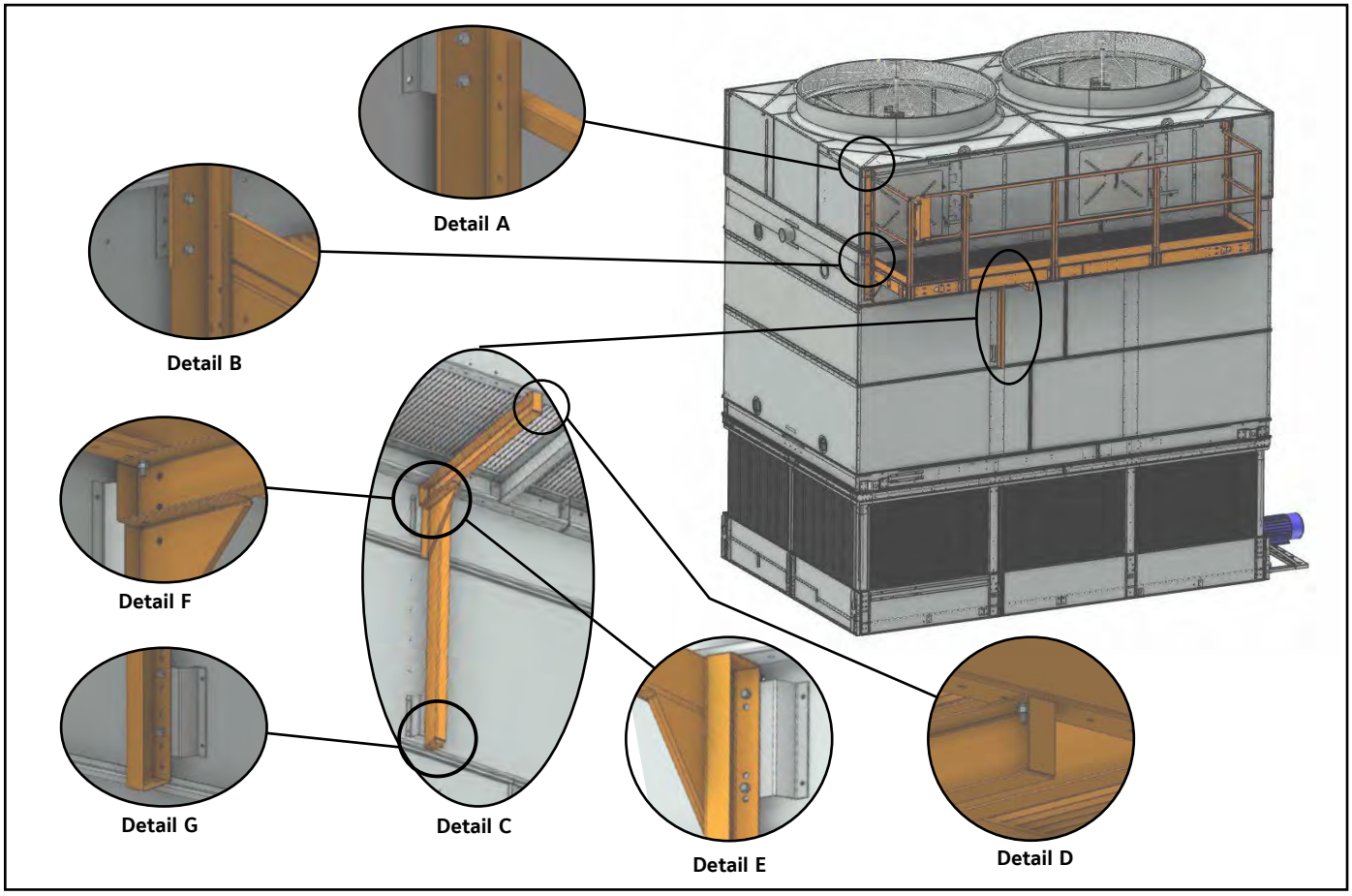


Figure 21 – Mechanical Access Platform – IDCF/IDC3-1218 (two fan), 2418 (two fan)

For the two fan IDCF/IDC3-1218, 1236, 2418 and 2436, install the preassembled mid-platform support(s) using the 3/8" x 1 1/4" bolts provided. See Figure 22, Details C to G - "Mechanical Access Platform for Multi-cell Units (Optional)."

MECHANICAL ACCESS PLATFORM FOR MULTI-CELL UNITS

1. Follow the instructions for the "Mechanical Access Platform."
2. For the two fan **IDCF/IDC3**-1236 and 2436, the Mechanical Access platform spans two cells. See Figure below, Details A to D for the bridging components.
3. Secure the toe board PGP using the 5/16" self-tapping screws provided. See Detail D.
4. Secure the grating bridge plate PCC using the 1/4" x 2" self-drilling screws provided.
5. Install the gap cover channels PIP using the 3/8" x 1 1/4" bolts provided. See Detail B.

NOTICE

The screws pass through openings in the grating and fasten to the frame underneath. See Detail C.

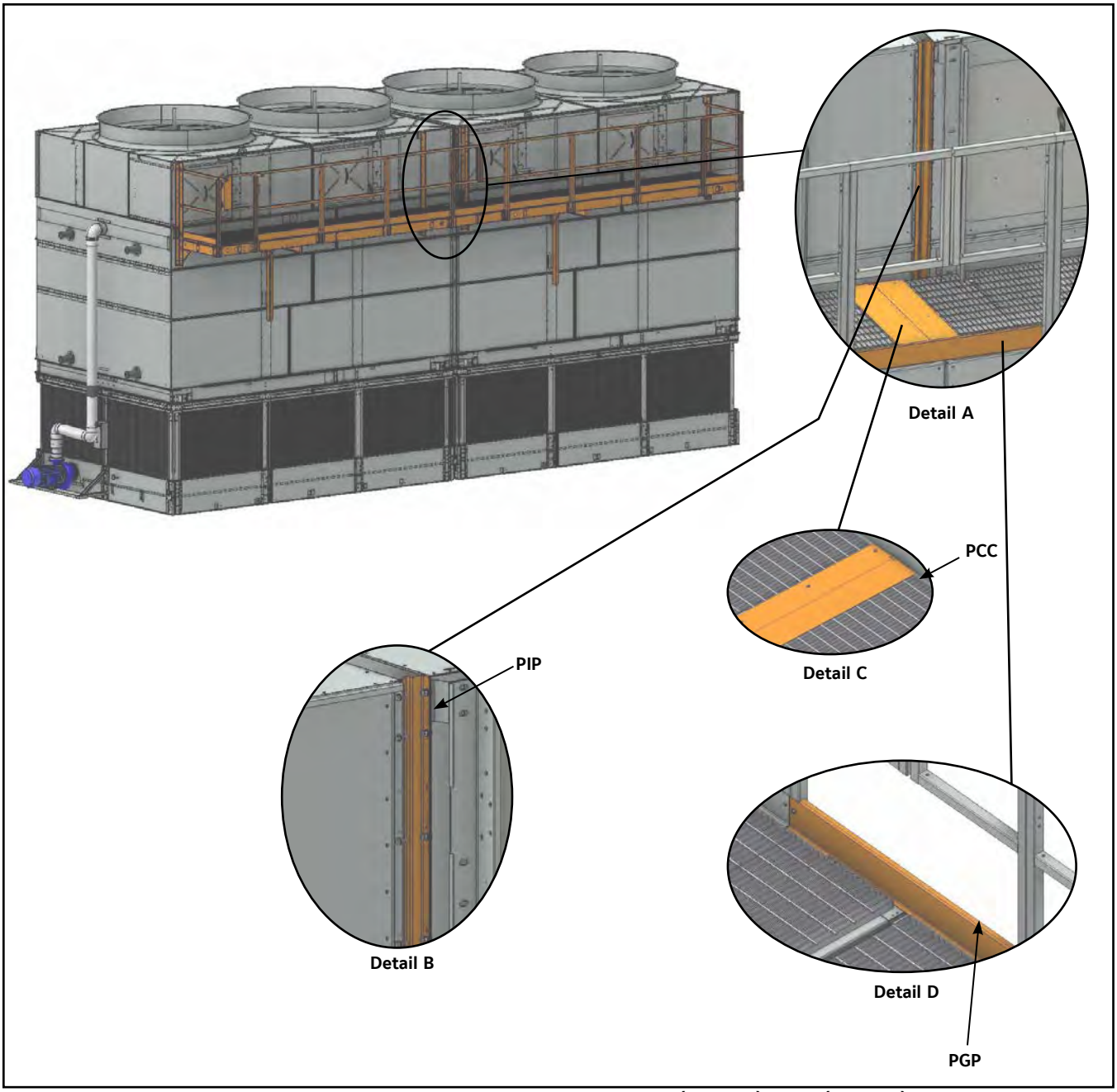


Figure 22. Mechanical Access Platform – IDCF/IDC3-1236 (two fan), 2436 (two fan), 1240

MECHANICAL ACCESS PLATFORM SIDE LADDER

1. Attach the upper ladder supports LA7 to the ladder if not already installed and then attach the ladder assembly to the platform using the 3/8" x 1 1/4"bolts provided. See Figure below, Detail B.
2. Secure the ladder flares to the platform railing posts using the 5/16" x 3 1/3" bolts provided. See Detail A.

NOTICE

Not all units receive a mid-support.

3. Install the mid and lower ladder supports per Figure below, as follows:
   -- Secure the standoff channels PDI to the factory installed support channels using the 3/8" x 1 1/4" bolts provided.
   -- Secure the standoff channels PDI to the ladder with the ladder clamps PDC using the 3/8" x 1 1/4" bolts provided.
   -- Install the cross brace(s) using the 3/8" x 1 1/4" bolts provided.

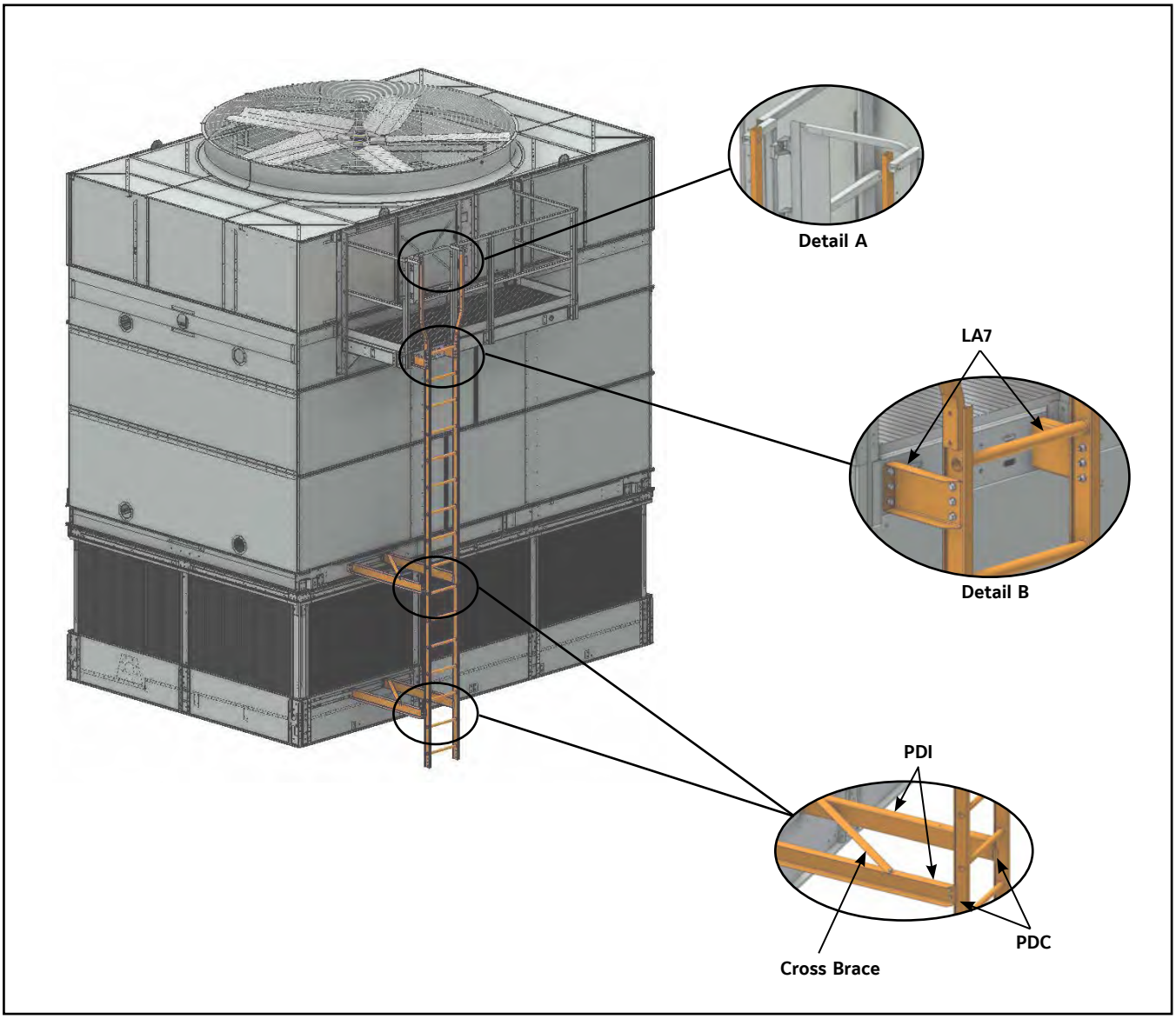


Figure 23 – Mechanical Access Platform Side Ladder – All units

MECHANICAL ACCESS PLATFORM END LADDER

1. Attach the upper ladder supports LA7 and PGZ to the ladder if not already installed and then attach the ladder assembly to the platform using the 3/8" x 1 1/4" bolts provided. See Detail B.
2. Secure the ladder flares to the platform railing posts using the 5/16" x 3 1/2" bolts provided. See Detail A.

NOTICE

Not all units receive a mid-support.

3. Install the mid and lower ladder supports per Detail C, as follows:
   -- Loosely assemble the support channels PHE, PHF, PHG and PHD using the 3/8" x 1 1/4" bolts provided and then loosely attach this assembly to the factory installed channel
   -- Attach the support assembly to the ladder with the ladder clamps PDC and PDB using the 3/8" x 1 1/4" bolts provided.
   -- Tighten all hardware to secure the support.

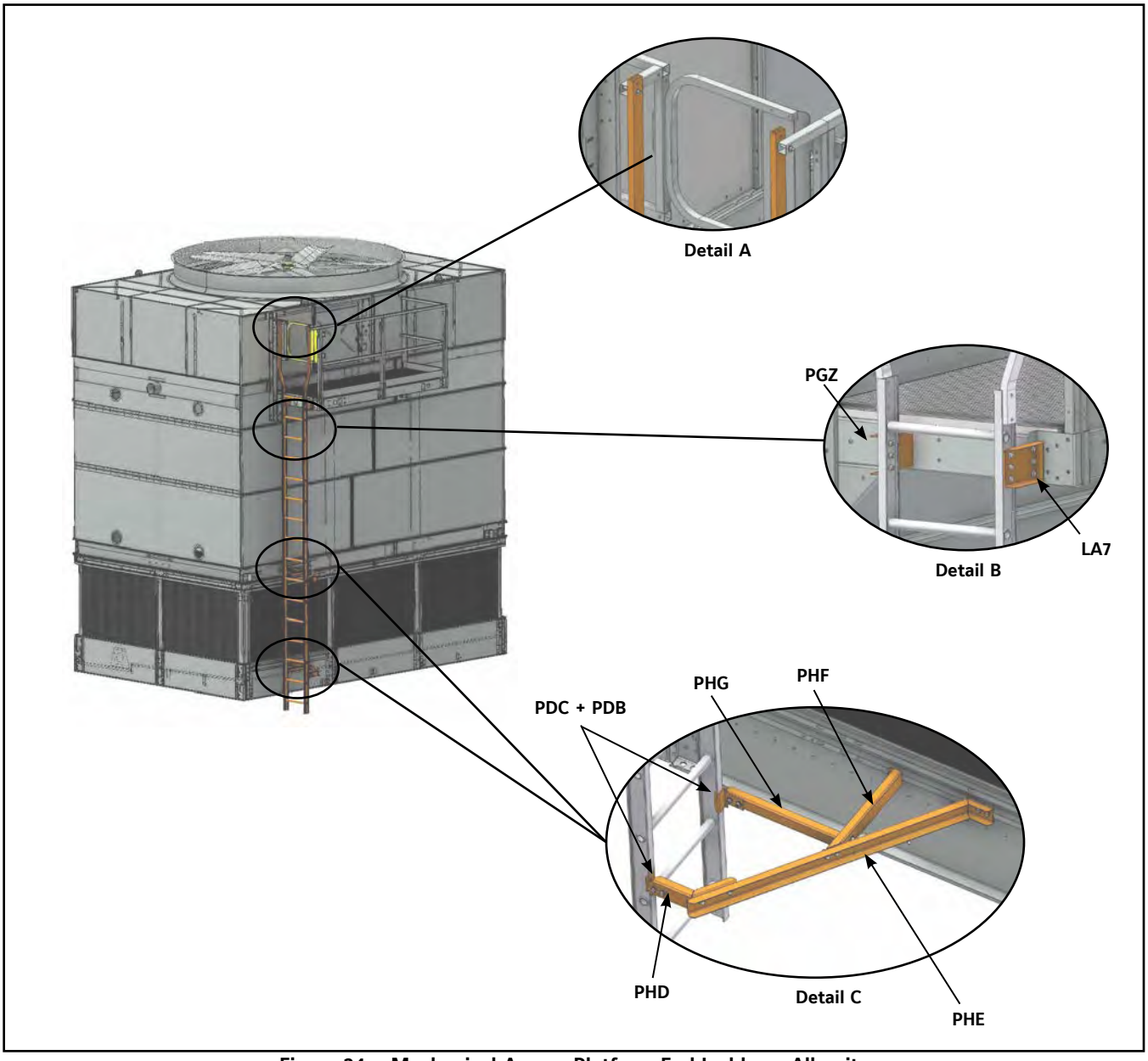


Figure 24 – Mechanical Access Platform End Ladder – All units

FILL ACCESS PLATFORM - IDCF ONLY

REFER TO FIGURES BELOW FOR YOUR PARTICULAR UNIT.

1. For 18′ long platforms, first secure the bolt plates PHN to the factory installed brackets on the casing frame using the 5/16″ self-tapping screws provided. See Figures 27 and 28, Detail F.

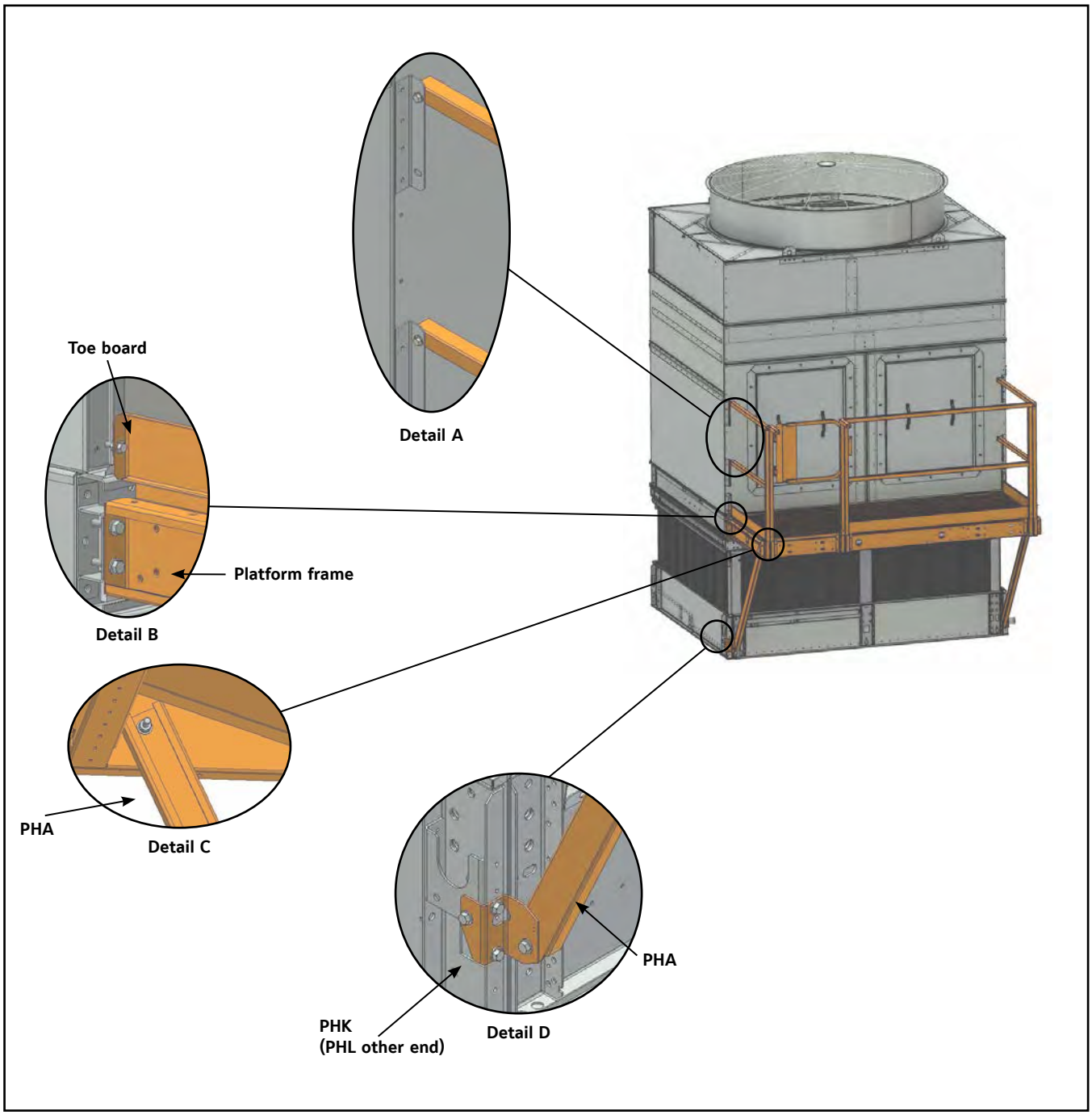


Figure 25 – Fill Access Platform with Side Ladder – IDCF-0709, 1012, 2012, 1212, 2412

2. Lift the platform module into place and secure the platform frame to the factory installed brackets on the casing frame. For 18′ long units, use the 5/16″ hardware provided to secure the platform frame to the center supports. See Figures 27 and 28 Detail G. For all units, use the 1/2″ x 1 1/4″ bolts provided to secure the platform frame to the end supports. See Detail B.
3. Secure the support channels PHA to the platform frame using the 1/2″ x 1 1/4″ bolts provided. See Detail C.
4. Secure the support channels PHA to the basin at the end locations using the adapter brackets PHK and PHL. See Detail D.

NOTICE

Not all units receive a mid-support.

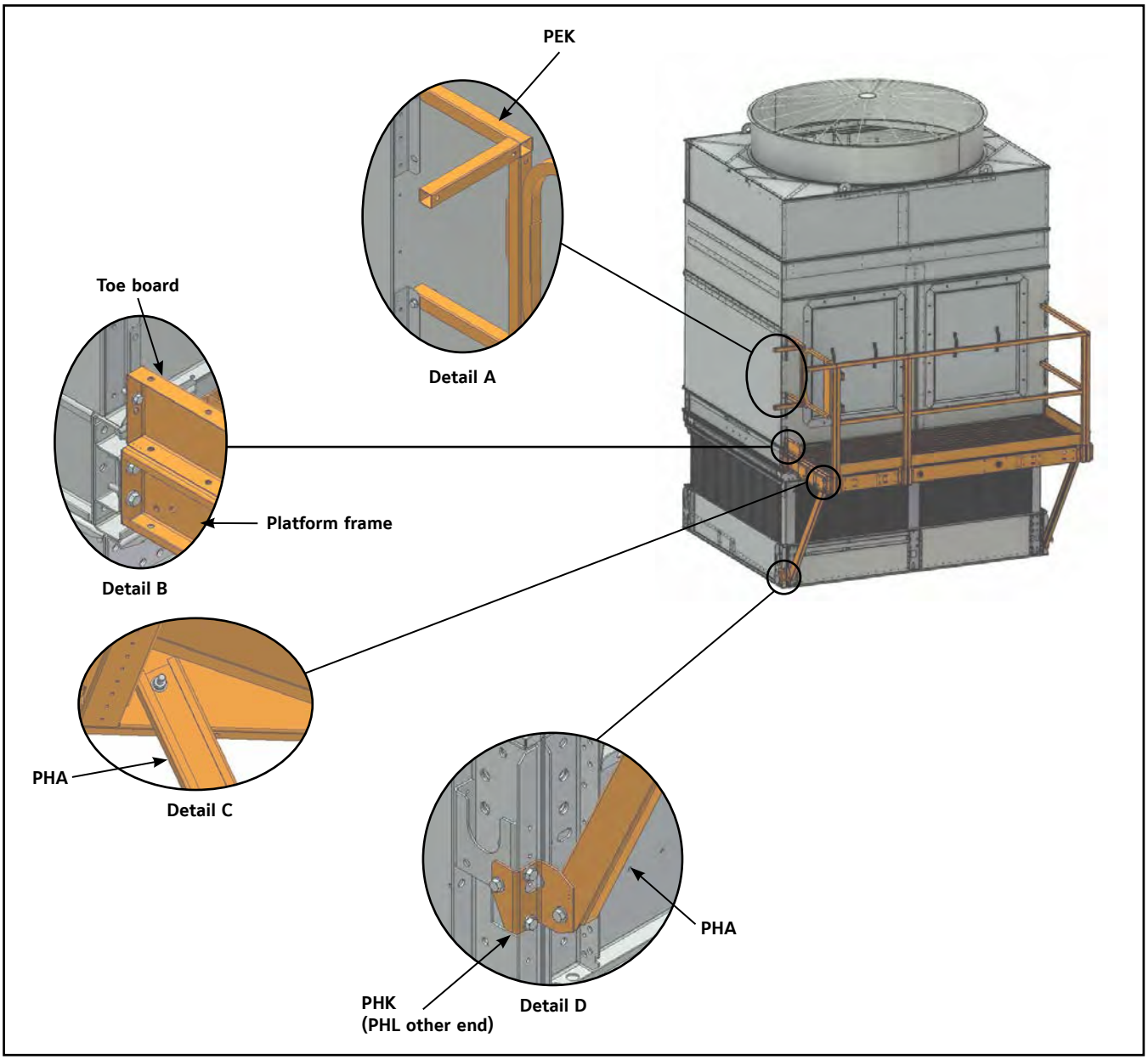


Figure 26 – Fill Access Platform with End Ladder – IDCF-0709, 1012, 2012, 1212, 2412

1. For 18′ and 20' long platforms, secure the support channels PHA to the basin at the center locations using the adapter brackets PHM. See Detail E.

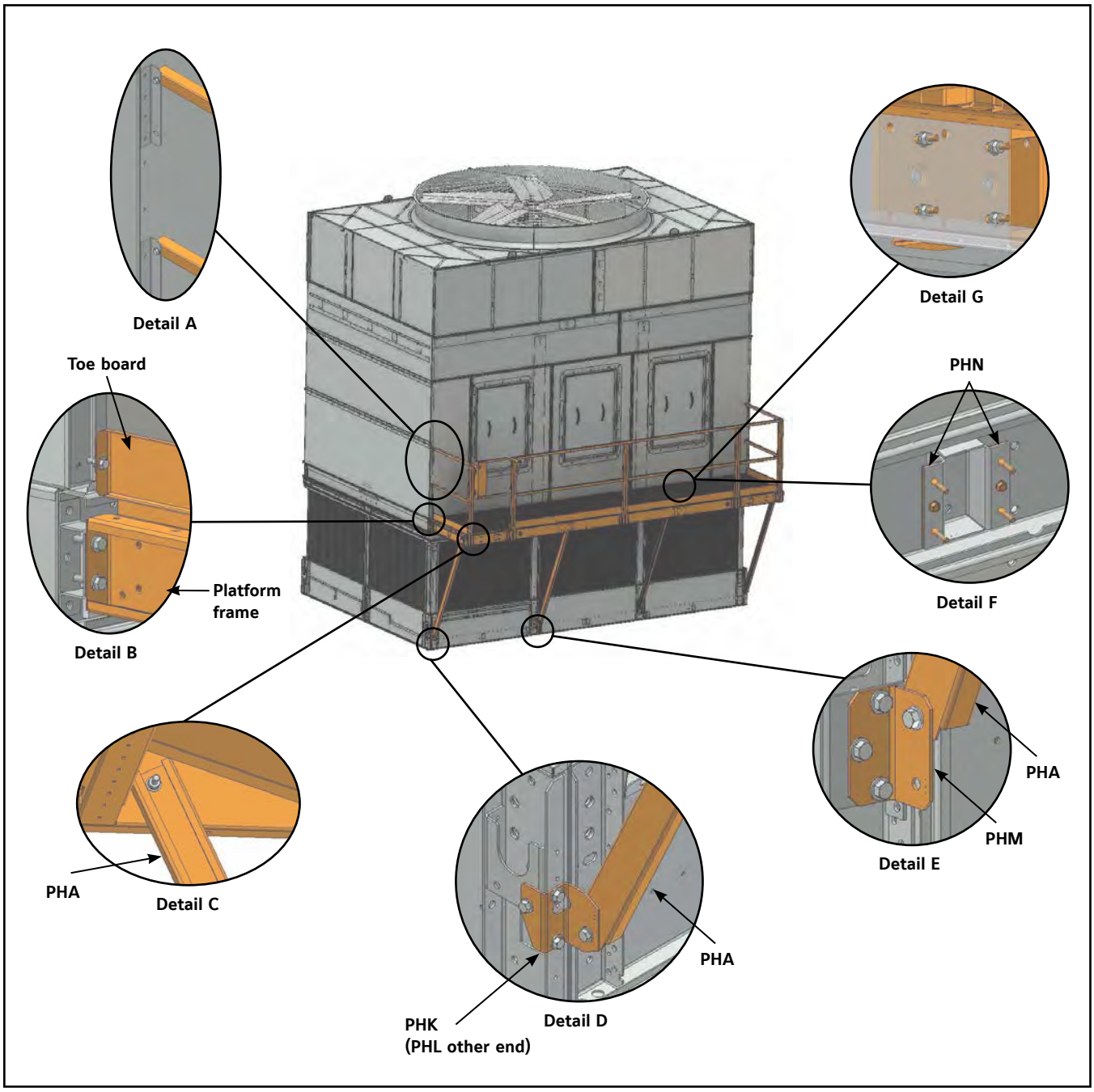


Figure 27 – Fill Access Platform with Side Ladder – IDCF-0718, 1218, 2418, 1220, 2420

2. Secure the end toe boards to the factory installed brackets on the casing using the 3/8" bolts provided. See Detail B.
3. Secure the end rails to the factory installed brackets on the casing using the 3/8" x 2 1/2" bolts provided. See Detail A. For platforms with an end ladder, the end rail assembly PEK ships loose. Secure this rail assembly to the casing using the 3/8" x 2 1/2" bolts provided. See Detail A below.

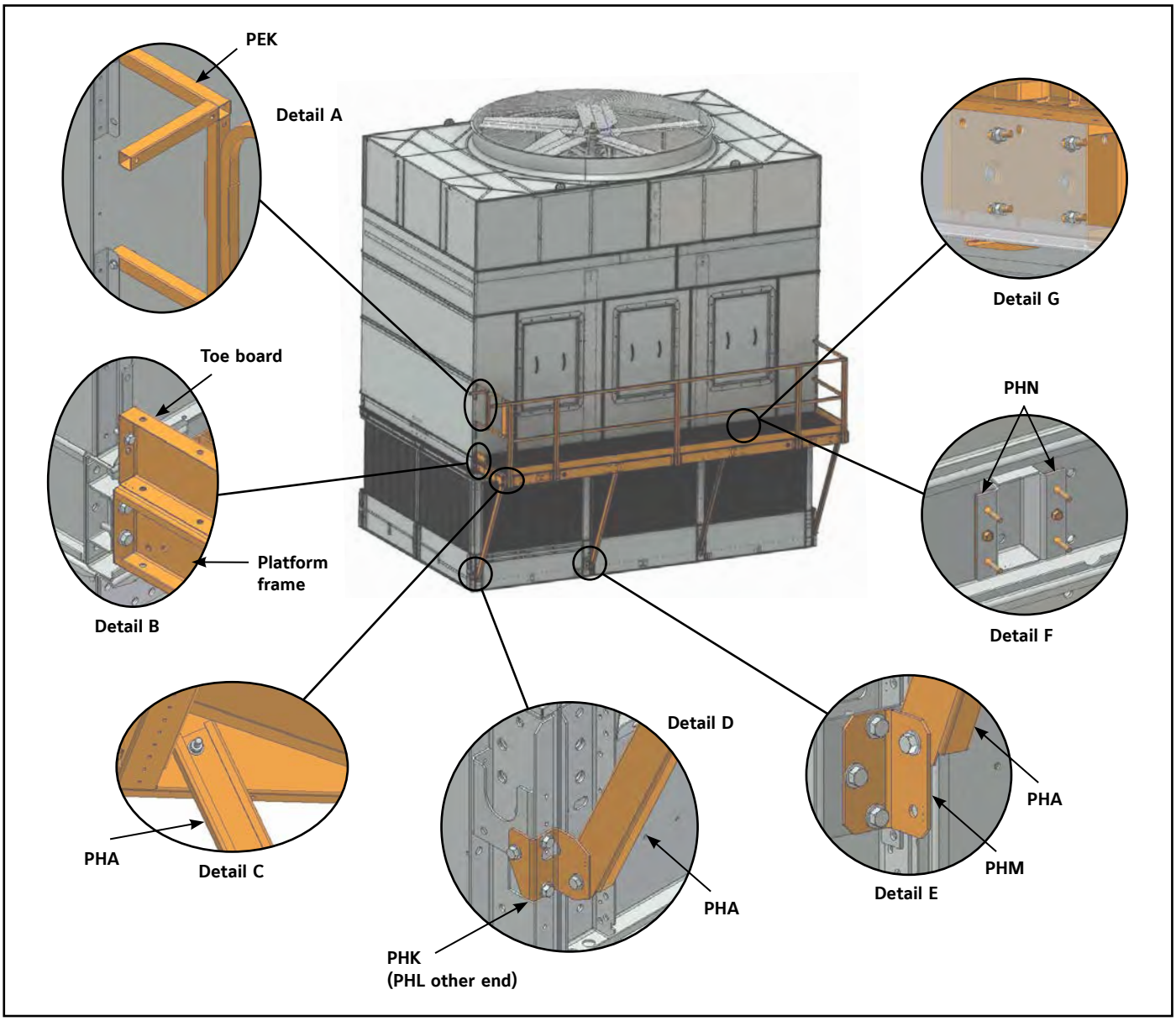


Figure 28 – Fill Access Platform with End Ladder – IDCF-0718, 1218, 2418, 1220, 2420

FILL ACCESS PLATFORM FOR MULTI-CELL UNITS

REFER TO FIGURES BELOW YOUR PARTICULAR UNIT.

1. Follow the instructions for the Fill Access platform on previous pages. For the IDCF-1024, 1224, 2424, 1236, 2436, 1240, 2440 the Fill Access platform spans two cells. See Details A to D for the bridging components.
2. Secure the vertical gap cover PHH to the factory installed brackets on the casing using the 3/8" bolts provided. See Detail B.
3. Install the toe board PCE using the 5/16" self-tapping screws provided. See Detail D.
4. Secure the grating bridge plate PCC to the platform using the 1/4" x 2" self-drilling screws provided. Then secure the grating bridge plate PCC to the bottom of the vertical gap cover PHH using the 5/16" self-tapping screws provided.

NOTICE

The screws pass through openings in the grating and fasten to the frame underneath. See Detail C.

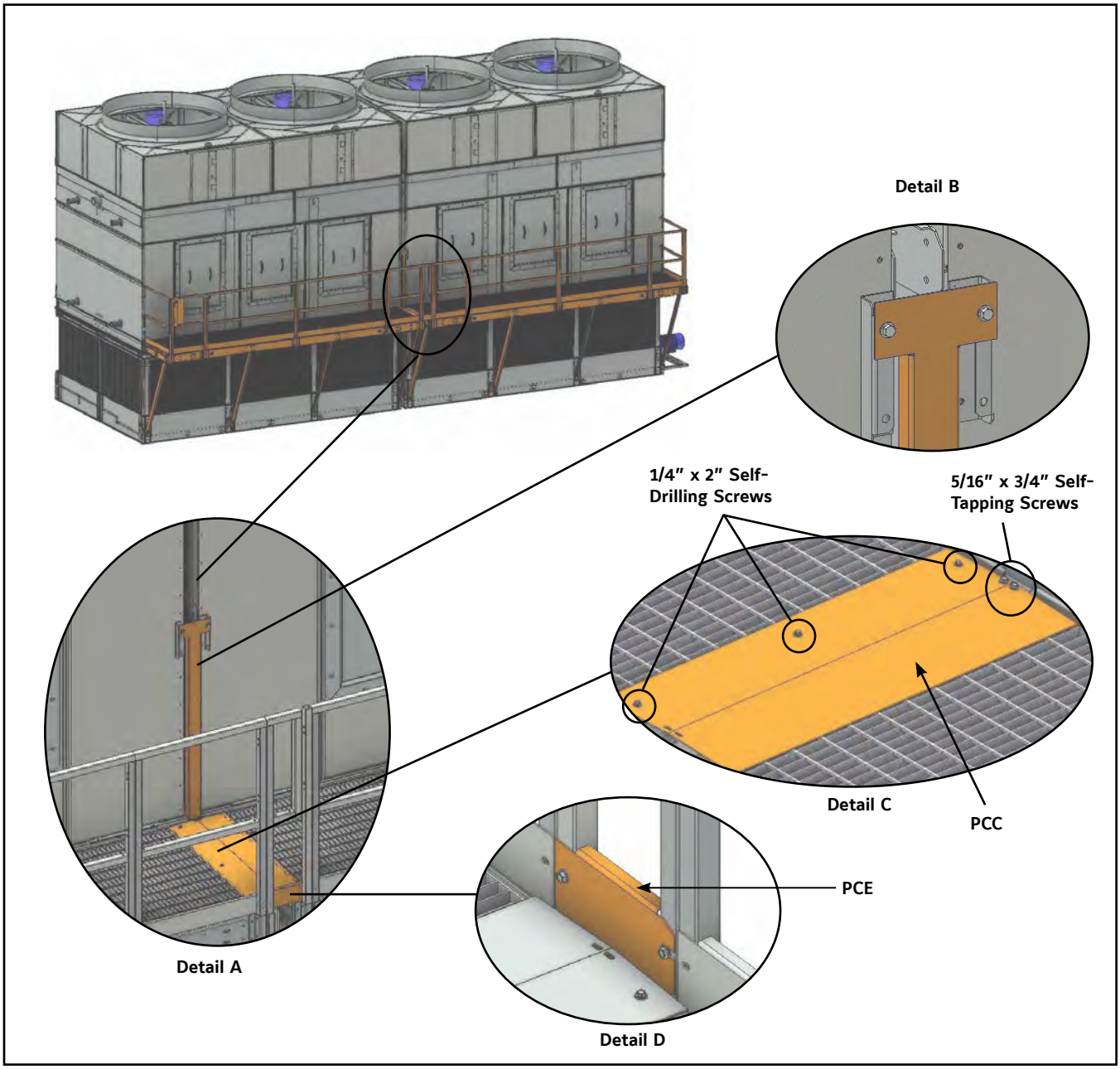


Figure 29 – Fill Access Platform – IDC3-1236, 2436, 1240, 2440

FILL ACCESS PLATFORM SIDE LADDER

1. Attach the upper ladder supports LA7 to the ladder if not already installed and then attach the ladder assembly to the platform using the 3/8" x 2 1/4" bolts provided. See Detail B.
2. Secure the ladder flares to the platform railing posts using the 5/16" x 3 1/2" bolts provided. See Detail A.
3. Install the lower ladder support per Detail C, as follows:
   -- Secure the standoff channels PDI to the factory installed support channel using the 3/8" x 1 1/4" bolts provided.
   -- Secure the standoff channels PDI to the ladder with the ladder clamps PDC using the 3/8" x 1 1/4" bolts provided.
   -- Install the cross brace using the 3/8" x 1 1/4" bolts provided.

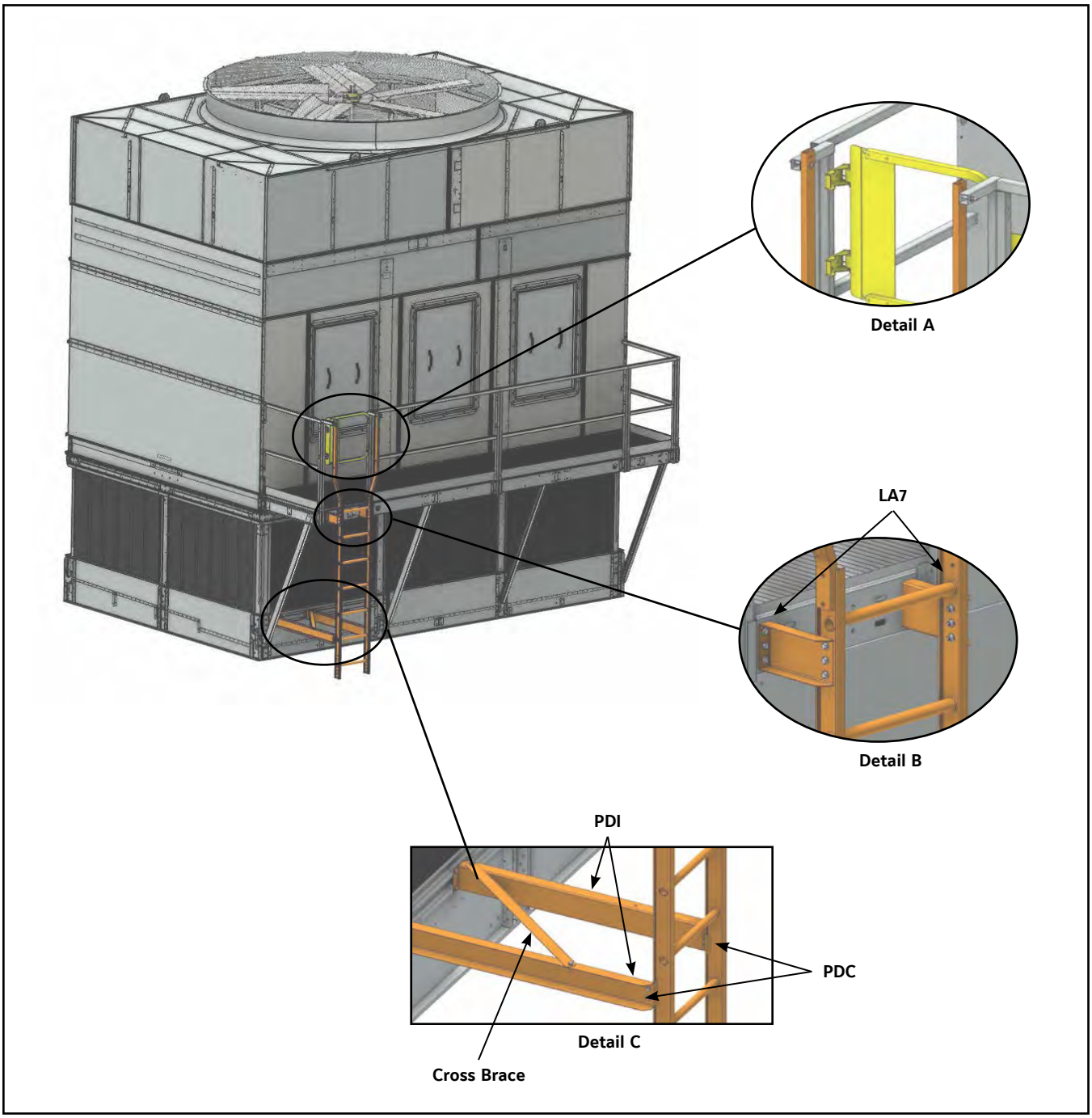


Figure 30 – Fill Access Platform Side Ladder – All units

FILL ACCESS PLATFORM END LADDER

1. Attach the upper ladder supports LA7 to the ladder if not already installed and then attach the ladder assembly to the platform using the 3/8" x 1 1/4" bolts provided. See Detail B.
2. Secure the ladder flares to the platform railing posts using the 5/16" x 3 1/2" bolts provided. See Detail A.
3. Install the lower ladder supports per Detail C, as follows:
   -- Loosely assemble the support channels PHE, PHF, PHG and PHD using the 3/8" x 1 1/4" bolts provided and then loosely attach this assembly to the factory installed channel
   -- Attach the support assembly to the ladder with the ladder clamps PDC and PDB using the 3/8" x 1 1/4" bolts provided.
   -- Tighten all hardware to secure the support.

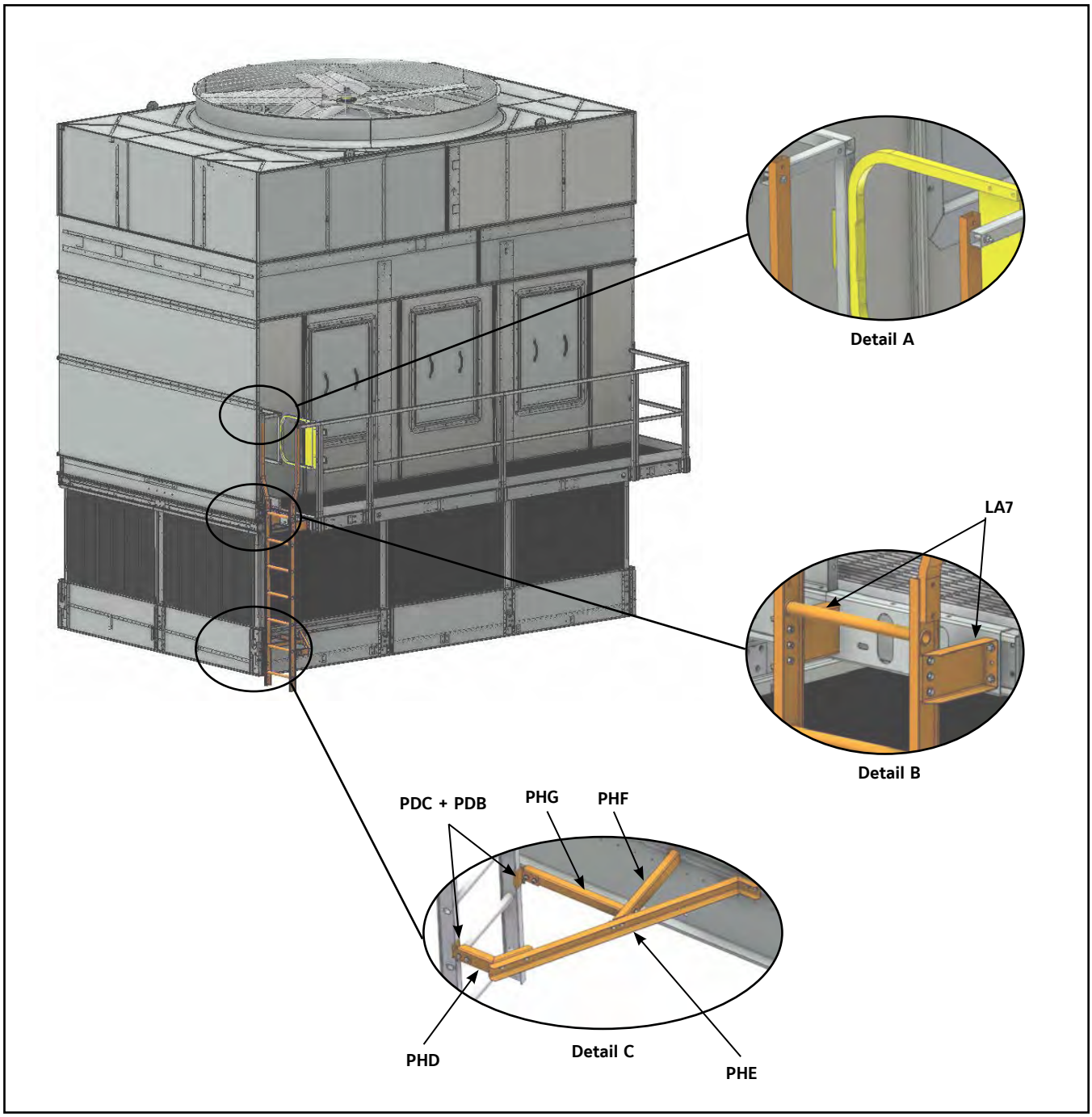


Figure 31 – Fill Access Platform End Ladder – All units

TOP PERIMETER GUARDRAILS

REFER TO INDIVIDUAL FIGURES FOR PARTICULAR UNITS.

1. Secure the individual rail segments to the factory installed post brackets using the 3/8" x 4" bolts provided. See the following Figures and the accompanying rail length tables to determine the correct location for each rail segment. See Figure 32 for the post attachment detail.

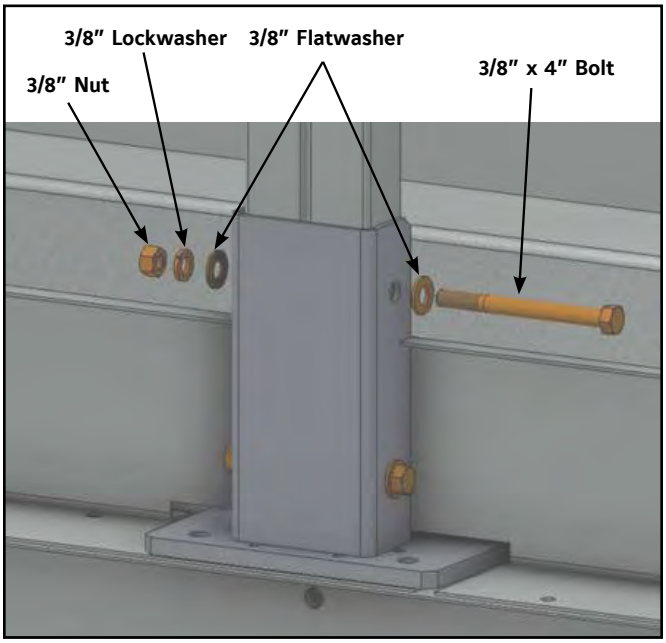


Figure 32 – Top Perimeter Guardrail Post Attachment

2. Secure adjacent rail segments to each other using the 5/16" x 3 3/4" bolts provided. See Figure 33.

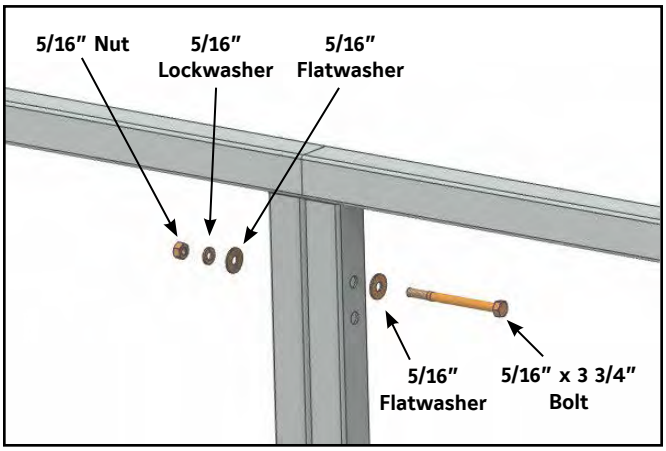


Figure 33 – Top Perimeter Guardrail Segment Attachment

3. For multi-cell units, install the gap plates. Secure plates on one side by re-using the 5/16" self-tapping screws from the fan deck. Secure on the other side using the 1/4" self- drilling screws provided. See Figure 34.
4. Install the toe boards using the 5/16" self-tapping screws provided. See Figure 35.
5. Install the safety gate(s) using the 5/16" x 5" bolts provided. See Figure 36.

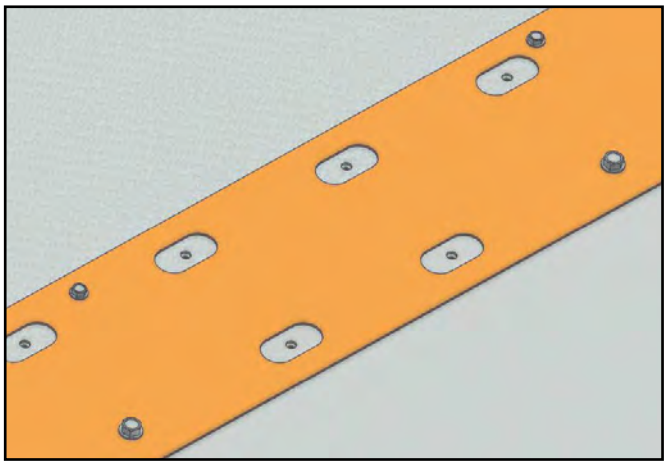


Figure 34 – Top Perimeter Guardrail Gap Plate Attachment

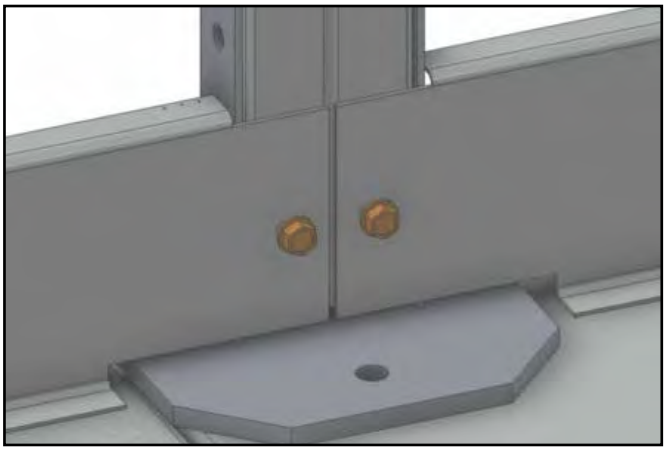


Figure 35 – Top Perimeter Guardrail Toe Board Attachment

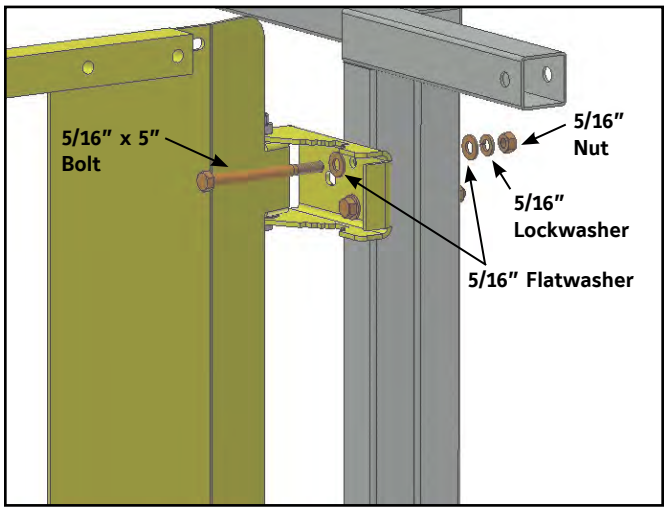
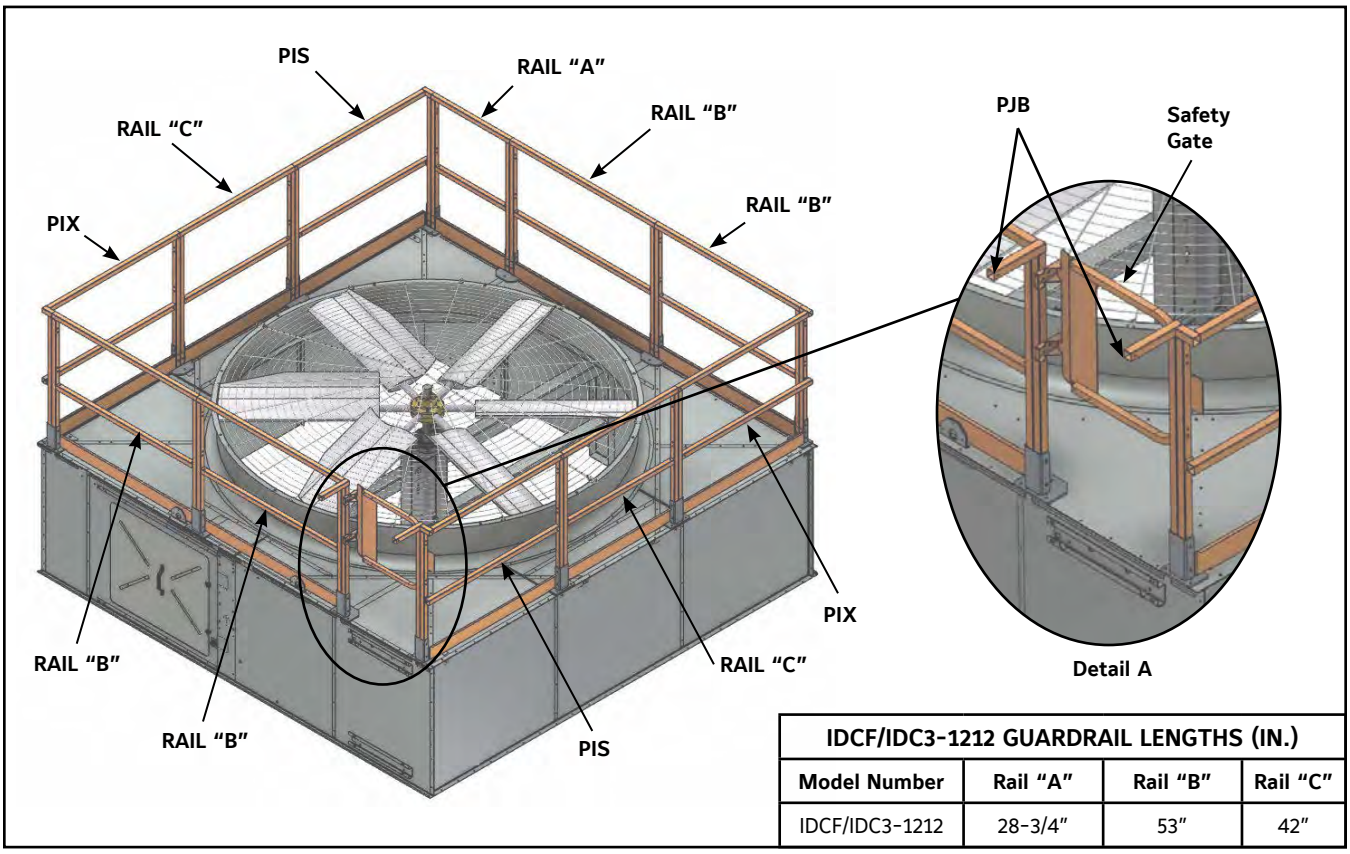


Figure 36 – Top Perimeter Guardrail Safety Gate Attachment

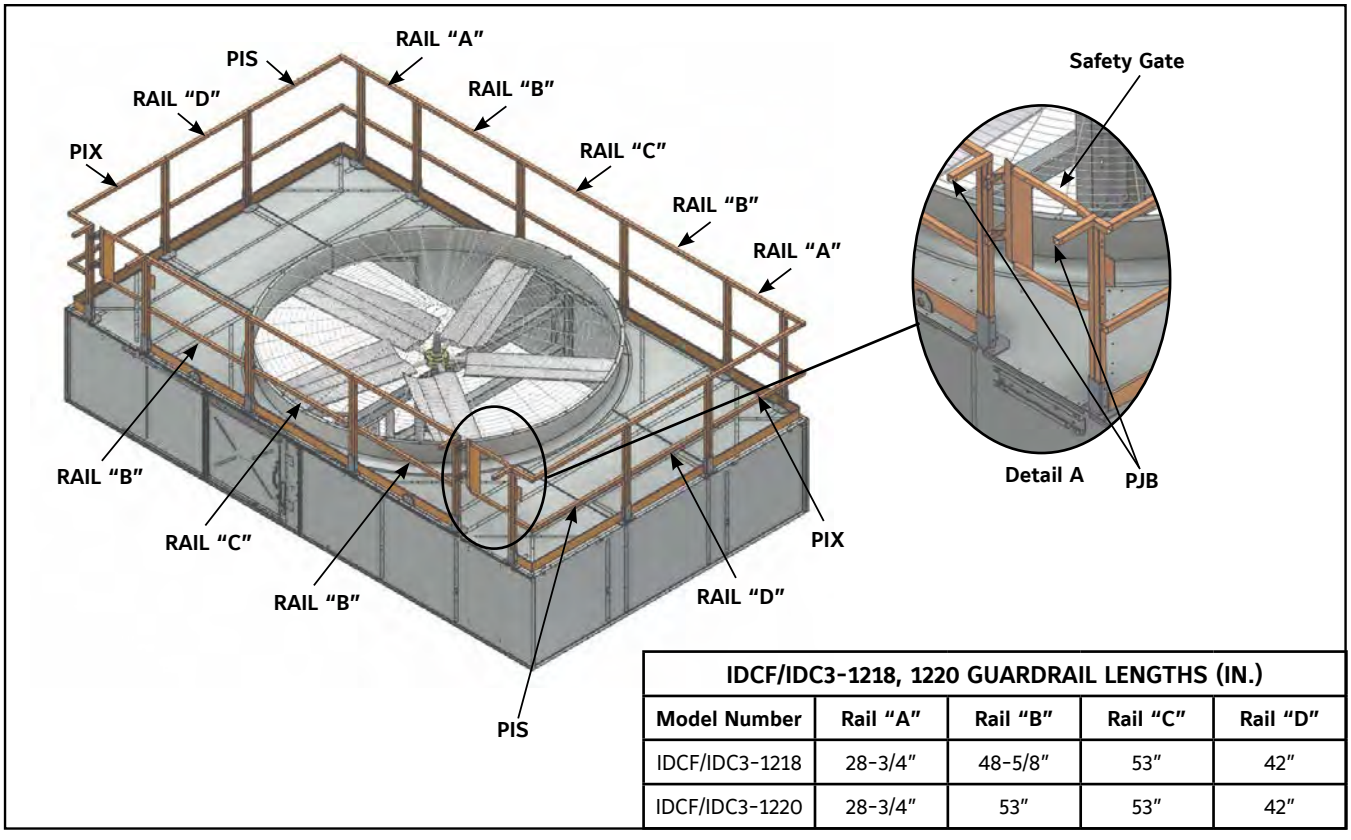
NOTICE

For clarity the basin and coil casing sections are not shown.



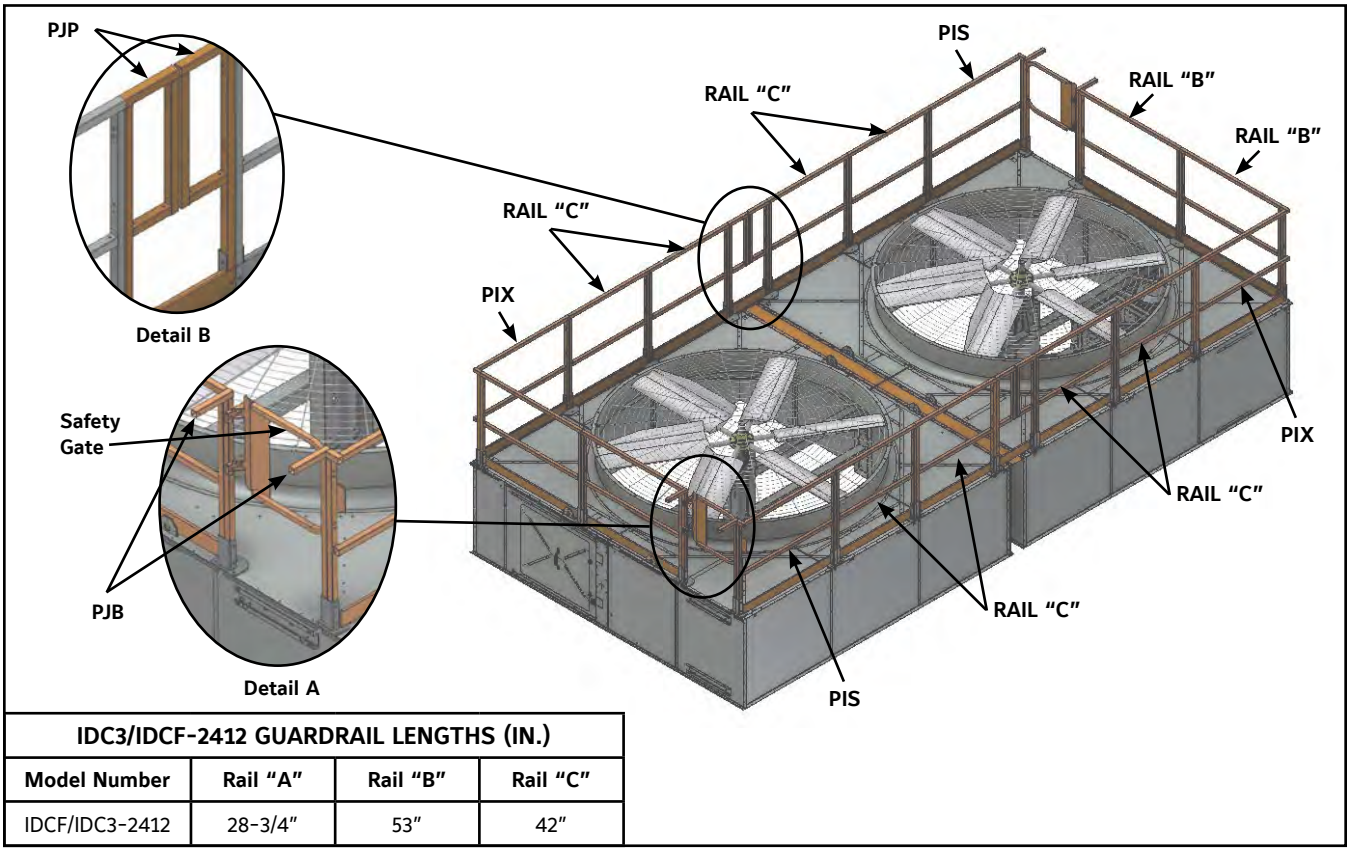
IDCF/IDC3-1212 GUARDRAIL LENGTHS (IN.)			
Model Number	Rail "A"	Rail "B"	Rail "C"
IDCF/IDC3-1212	28-3/4"	53"	42"

Figure 37 – Top Perimeter Guardrails - IDCF/IDC3-1212



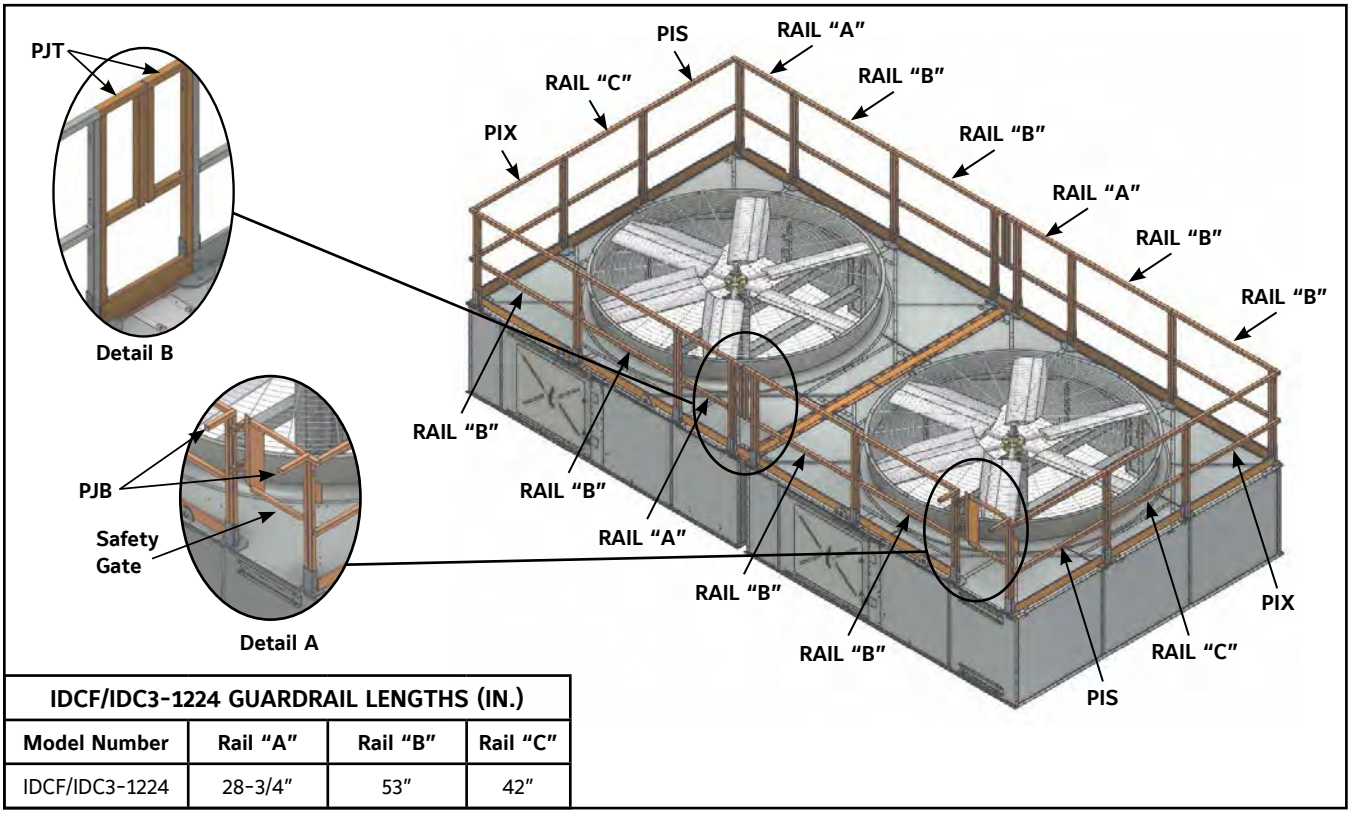
IDCF/IDC3-1218, 1220 GUARDRAIL LENGTHS (IN.)				
Model Number	Rail "A"	Rail "B"	Rail "C"	Rail "D"
IDCF/IDC3-1218	28-3/4"	48-5/8"	53"	42"
IDCF/IDC3-1220	28-3/4"	53"	53"	42"

Figure 38 – Top Perimeter Guardrails - IDCF/IDC3-1218, 1220



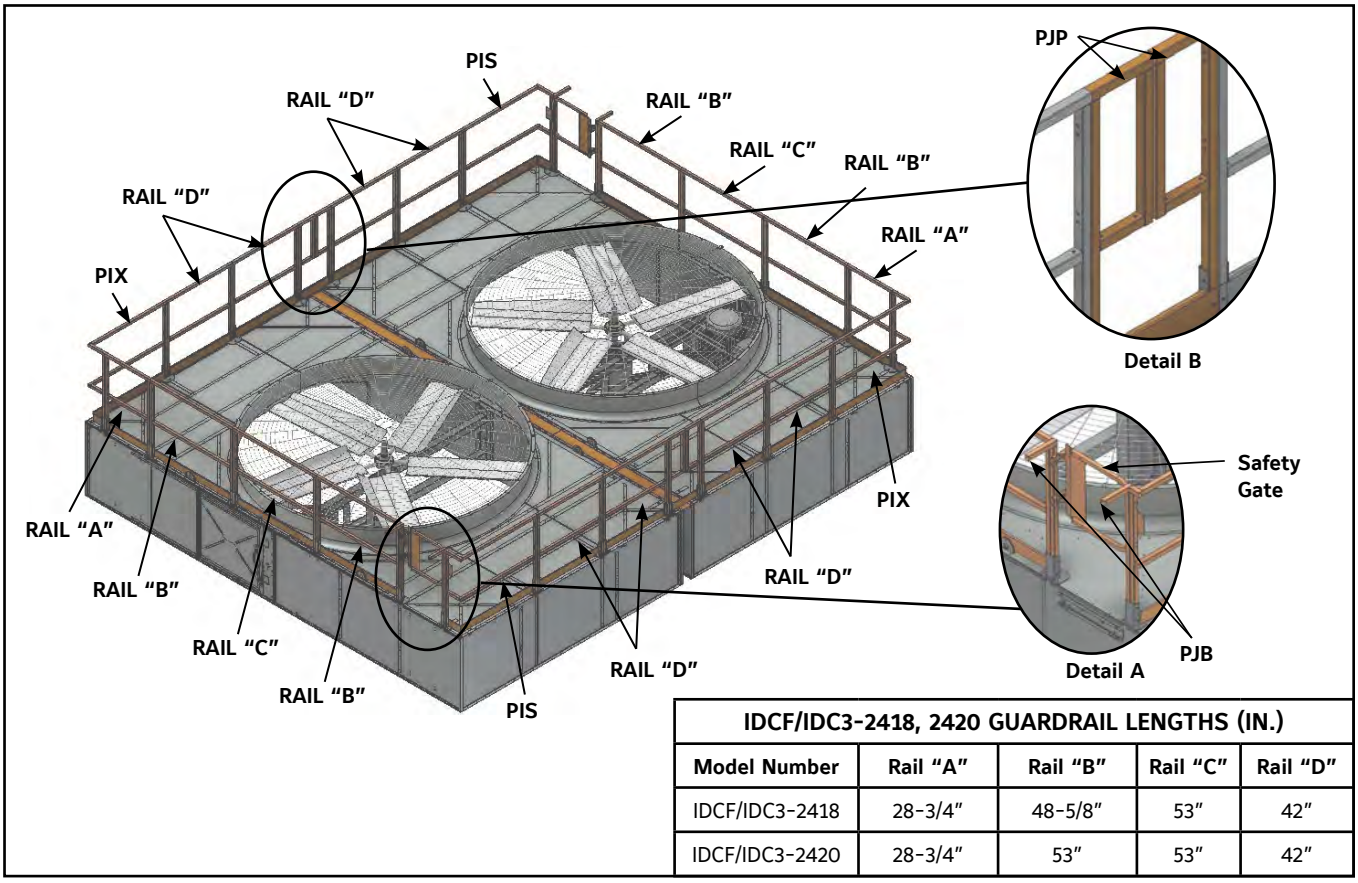
IDC3/IDCF-2412 GUARDRAIL LENGTHS (IN.)			
Model Number	**Rail "A"**	**Rail "B"**	**Rail "C"**
IDCF/IDC3-2412	28-3/4"	53"	42"

Figure 39 – Top Perimeter Guardrails - IDCF/IDC3-2412



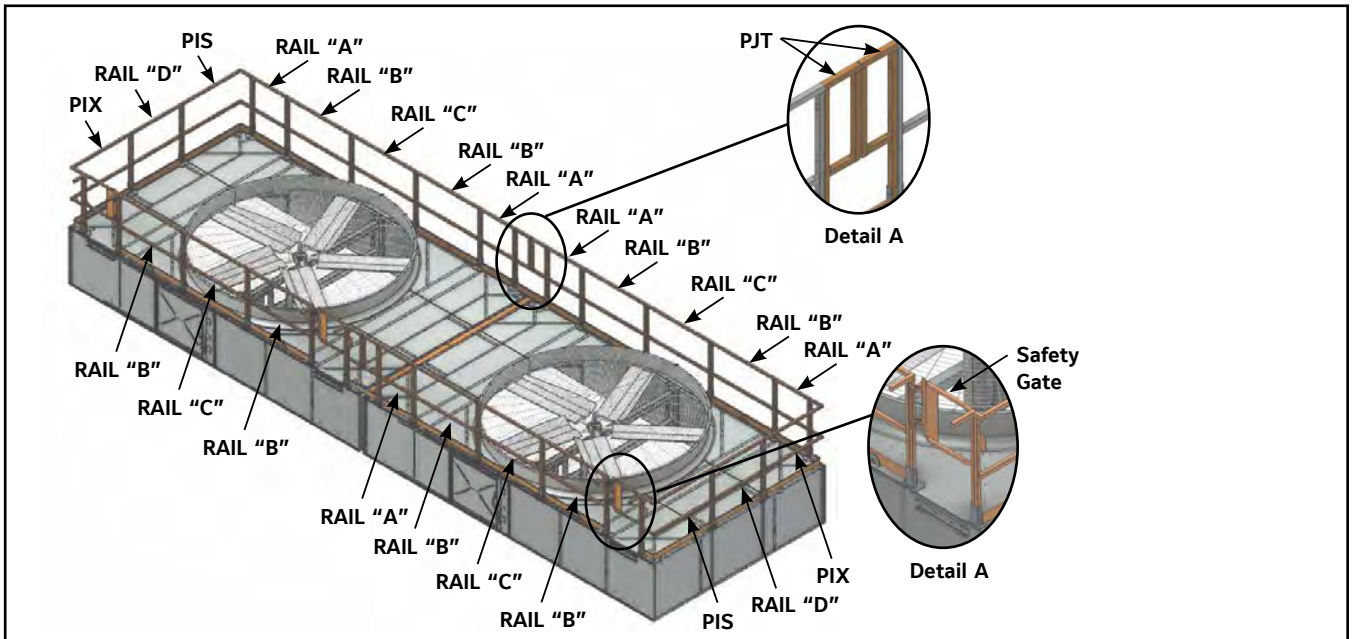
IDCF/IDC3-1224 GUARDRAIL LENGTHS (IN.)			
Model Number	**Rail "A"**	**Rail "B"**	**Rail "C"**
IDCF/IDC3-1224	28-3/4"	53"	42"

Figure 40 – Top Perimeter Guardrails - IDCF/IDC3-1224



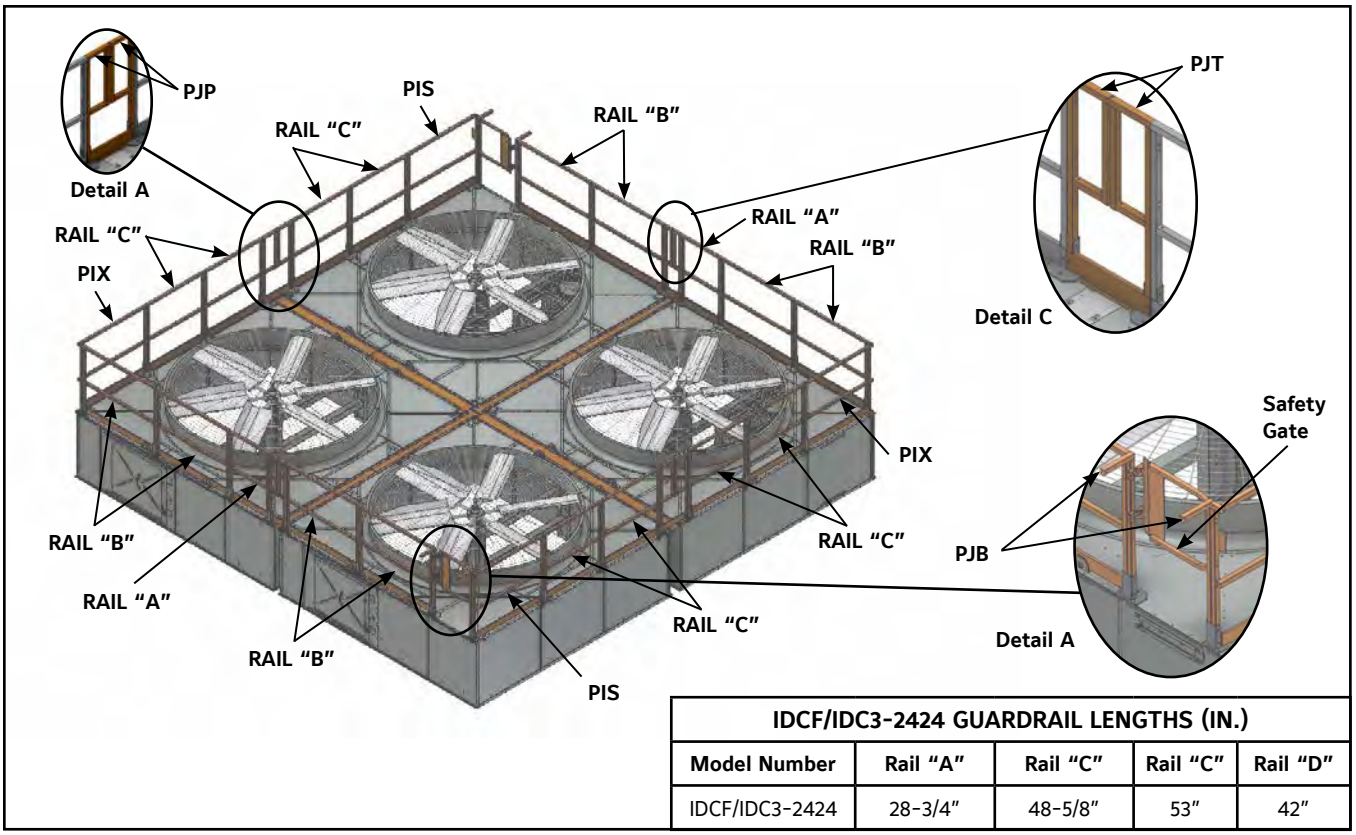
IDCF/IDC3-2418, 2420 GUARDRAIL LENGTHS (IN.)				
Model Number	Rail "A"	Rail "B"	Rail "C"	Rail "D"
IDCF/IDC3-2418	28-3/4"	48-5/8"	53"	42"
IDCF/IDC3-2420	28-3/4"	53"	53"	42"

Figure 41 – Top Perimeter Guardrails - IDCF/IDC3-2418, 2420



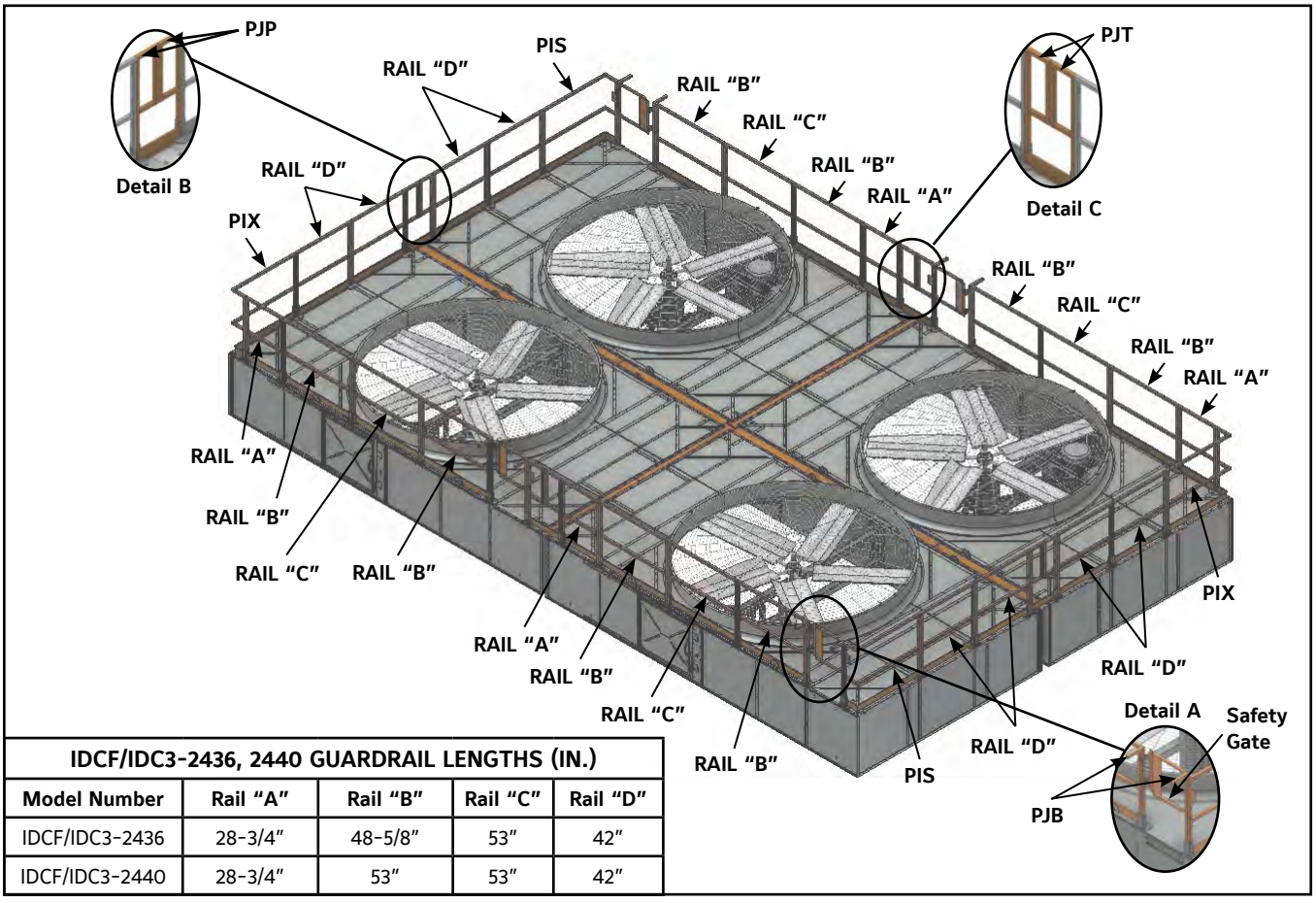
IDCF/IDC3-1236, 1240 GUARDRAIL LENGTHS (IN.)				
Model Number	Rail "A"	Rail "C"	Rail "C"	Rail "D"
IDCF/IDC3-1236	28-3/4"	48-5/8"	53"	42"
IDCF/IDC3-1240	28-3/4"	53"	53"	42"

Figure 42 - Top Perimeter Guardrails - IDCF/IDC3-1236, 1240



IDCF/IDC3-2424 GUARDRAIL LENGTHS (IN.)				
Model Number	Rail "A"	Rail "C"	Rail "C"	Rail "D"
IDCF/IDC3-2424	28-3/4"	48-5/8"	53"	42"

Figure 43 - Top Perimeter Guardrails - IDCF/IDC3-2424



IDCF/IDC3-2436, 2440 GUARDRAIL LENGTHS (IN.)				
Model Number	Rail "A"	Rail "B"	Rail "C"	Rail "D"
IDCF/IDC3-2436	28-3/4"	48-5/8"	53"	42"
IDCF/IDC3-2440	28-3/4"	53"	53"	42"

Figure 44 – Top Perimeter Guardrails - 2436, 2440

TOP PERIMETER GUARDRAIL LADDER TO UNIT BASE

1. Attach the upper ladder supports PJF to the ladder(s) if not already installed and then attach the ladder assembly to the platform using the 3/8" x 1 1/4" bolts provided. See Detail B.
2. Secure the ladder flares to the railing posts using the 5/16" x 3 1/2" bolts provided. See Detail A.
3. Install the lower Mechanical section ladder supports PJG using the 3/8" x 1 1/4" bolts provided. Secure to the ladder(s) using ladder clamps PDC. See Detail C.
4. Install the coil casing section supports PJW or PJG using the 3/8" x 1 1/4" bolts provided. Secure to the ladder (s) using ladder clamps PDC. See Detail D.
5. Install the basin level supports PJG using the 3/8" x 1 1/4" bolts provided. Secure to the ladder(s) using ladder clamps PDC. See Detail E.

NOTICE

Not all units receive supports at this location.

NOTICE

The total quantity of ladders depends on the unit configuration.

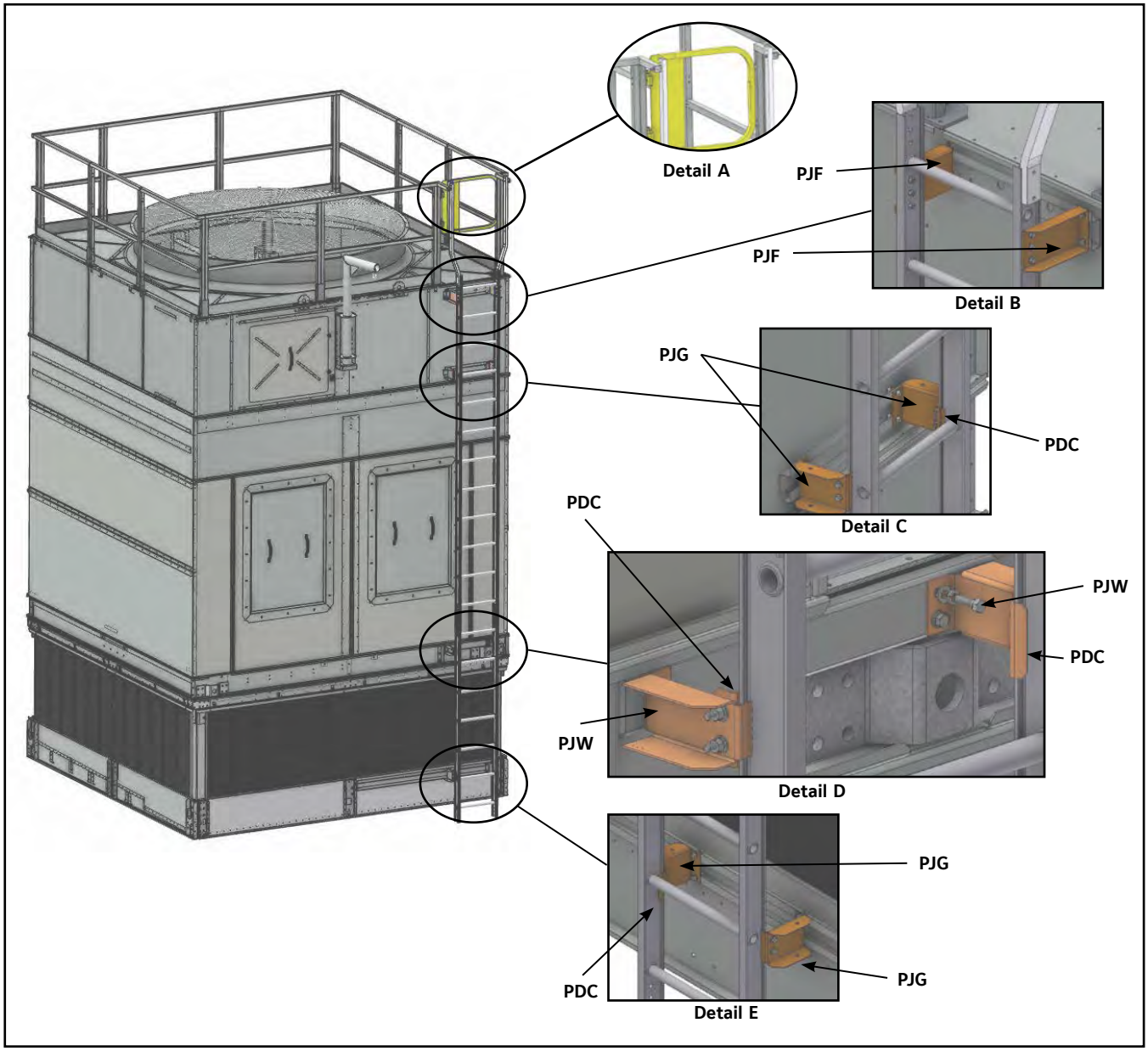


Figure 45 – Top Perimeter Guardrail Ladder - IDCF/IDC3-1212, 1224, 2412, 1218, 1236, 2418, 2436

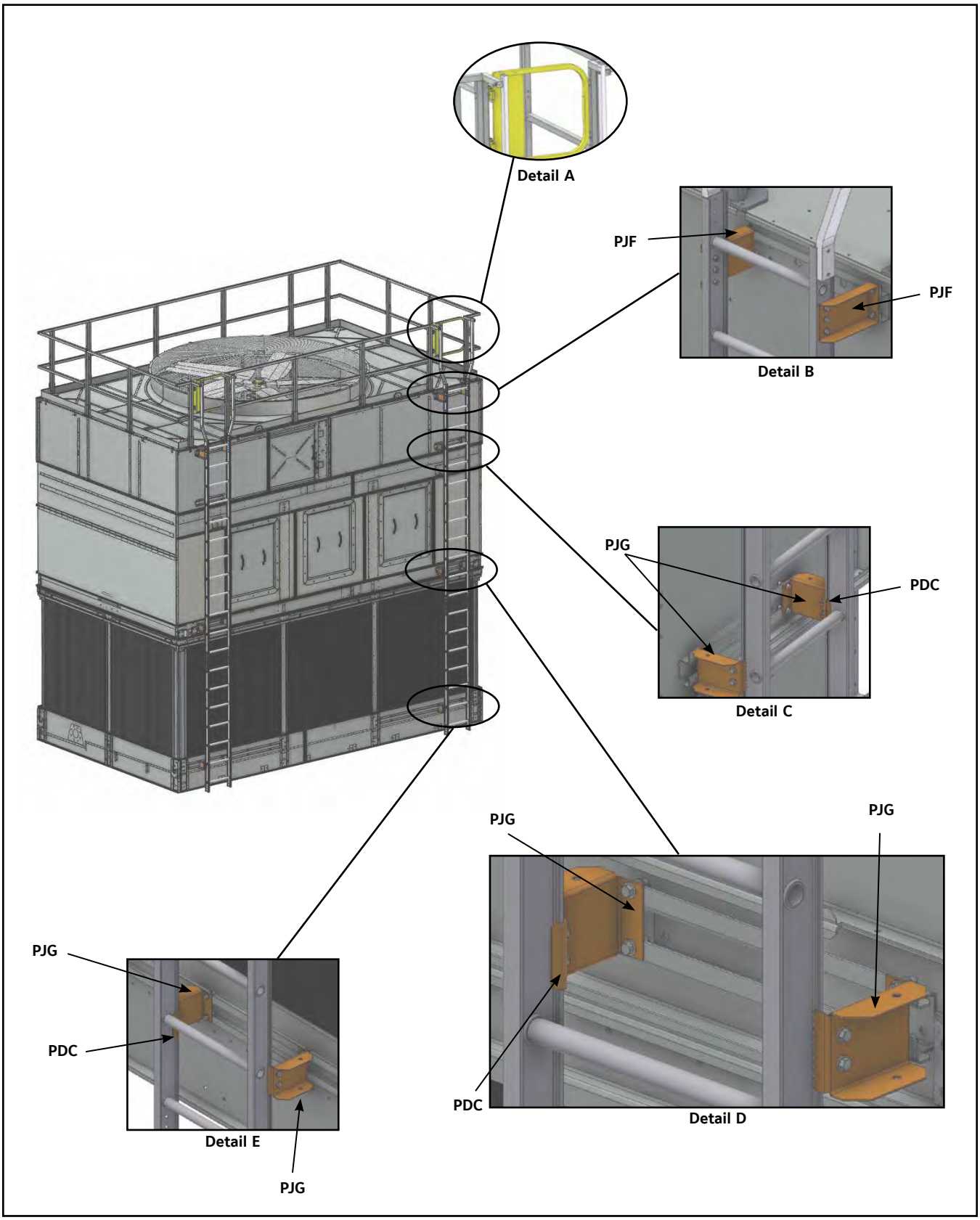


Figure 46 - Top Perimeter Guardrail Ladder - IDC3-1220, 1240, 2420, 2440

TOP PERIMETER GUARDRAIL TO FILL PLATFORM - IDCF ONLY

1. Attach the upper ladder supports PJF to the ladder(s) if not already installed and then attach the ladder assembly to the platform using the 3/8" bolts provided. See Detail B.
2. Secure the ladder flares to the railing posts using the 5/16" bolts provided. See Detail A.
3. Install the lower Mechanical section ladder supports PJG using the 3/8" bolts provided. Secure to the ladder(s) using ladder clamps PDC. See Detail C.
4. Secure the ladder(s) to the factory installed bracket(s) on the Fill Platform with the ladder clamps PDC and PDB. Use the 3/8" bolts provided. See Detail D.

NOTICE

Not all units receive supports at this location.

NOTICE

The total quantity of ladders depends on the unit configuration.

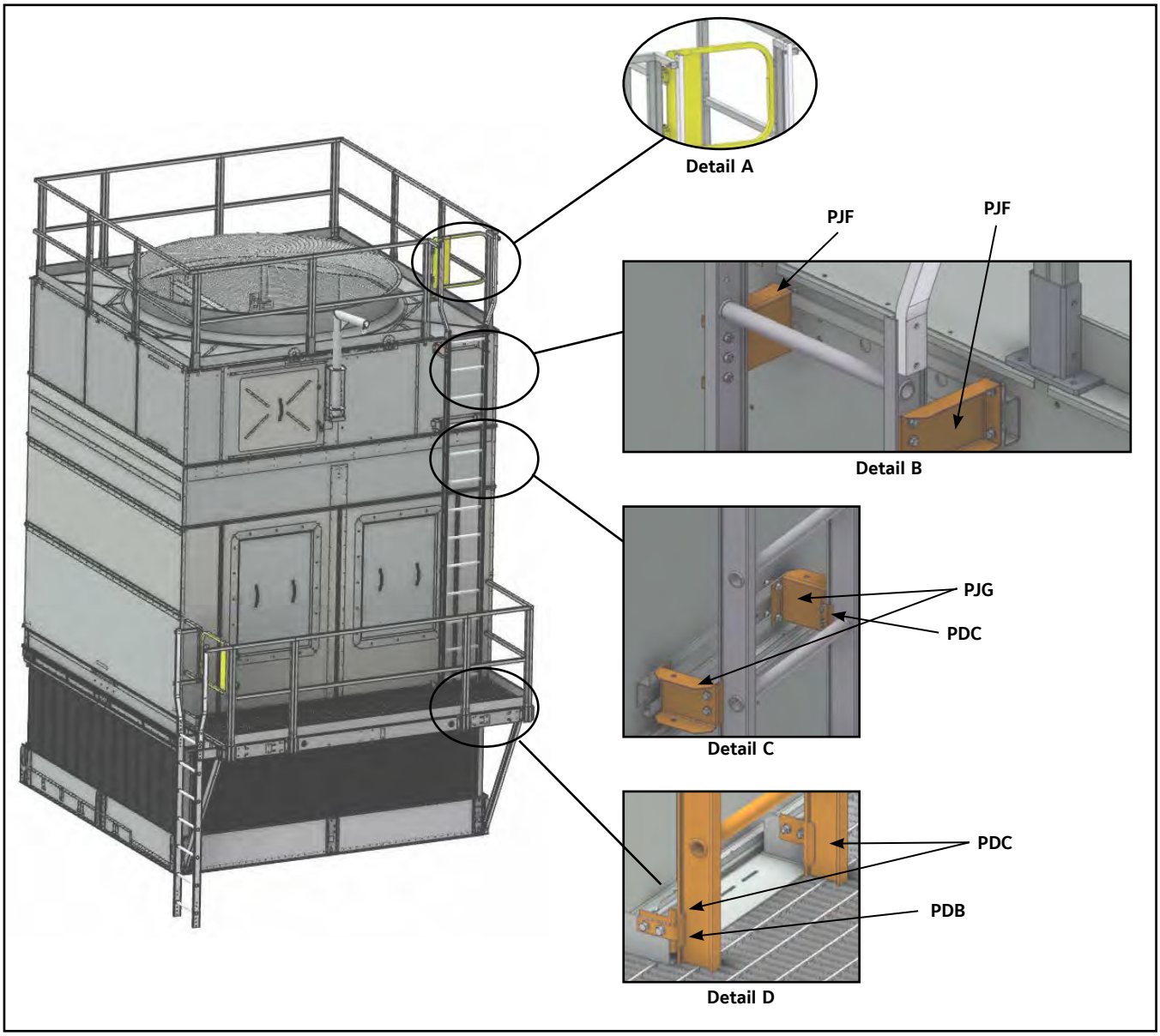


**Figure 47 – Top Perimeter Guardrail Ladder to Fill Platform-
IDCF 1212, 1224, 2412, 2424, 1218, 1236, 2418, 2436, 1220, 1240, 2420, 2440**

LADDER SAFETY CAGE

1. If the safety cage is shipped in multiple pieces, reassemble the safety cage.
2. Bolt the safety cage to the ladder using flatwashers and locknuts. Orient all fasteners with bolt heads inside safety cage. See Figure below and refer to Table 4 for the quantity of bolting locations for different safety cage heights.

NOTICE

Safety gates are provided for all guardrail openings, and all components are designed to meet OSHA requirements.

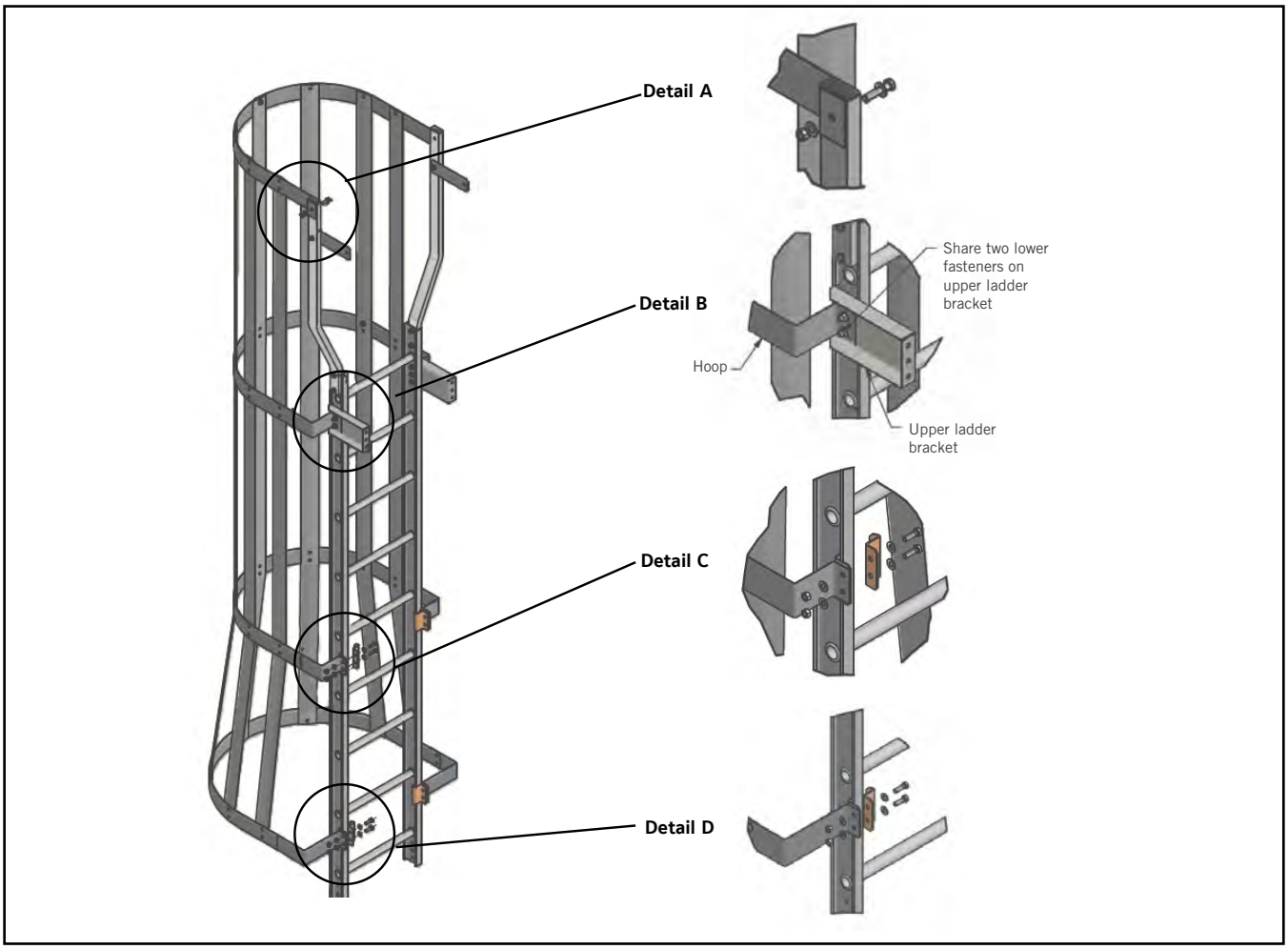


Figure 48 - Safety Cage

TABLE 4. LADDER SAFETY CAGE BOLTING LOCATION AND QUANTITIES

CAGE HEIGHT (FT)	BOLTING LOCATION				CAGE HEIGHT (FT)	BOLTING LOCATION				CAGE HEIGHT (FT)	BOLTING LOCATION			
	A	B	C	D		A	B	C	D		A	B	C	D
4	1	–	–	1	12	1	1	2	1	20	1	1	4	1
5	1	1	–	1	13	1	1	2	1	21	1	1	4	1
6	1	1	–	1	14	1	1	2	1	22	1	1	4	1
7	1	1	–	1	15	1	1	2	1	23	1	1	4	1
8	1	1	–	1	16	1	1	2	1	24	1	1	4	1
9	1	1	1	1	17	1	1	3	1	25	1	1	5	1
10	1	1	1	1	18	1	1	3	1	27	1	1	5	1
11	1	1	1	1	19	1	1	3	1					

AUTOMATIC BEARING GREASERS

1. Verify the mounting brackets are factory installed.
2. Fill the extended lube lines with Frick compatible water resistant grease using a manual grease gun. See the"Fan Shaft Bearings" section of the IDCF and IDC3 Operation & Maintenance Manual.
3. Thread automatic bearing greasers into 3/8" x 1/4" adapters on mounting brackets.
4. For programming, operation, and trouble shooting of the greaser, consult the user manual shipped with the greaser. This manual is also available through your local Frick Representative.

NOTICE

Automatic bearing greasers can be added at the time of order or as an aftermarket item.

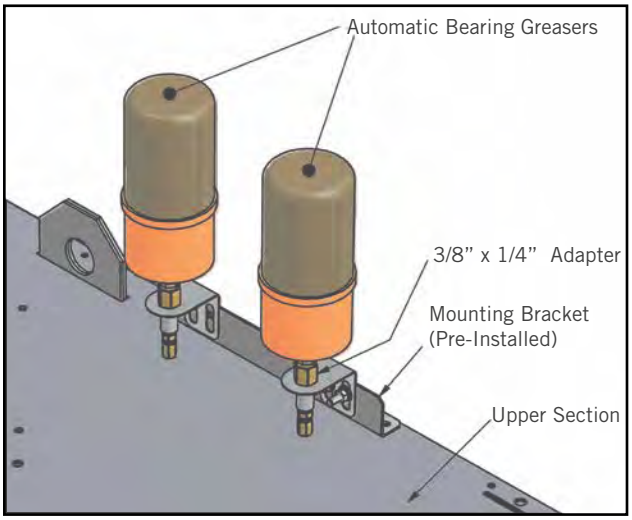


Figure 49 – Automatic Bearing Greasers

BASIN ACCESSORIES

Basin accessories are not factory installed and will be located in a box inside the unit or secured to the interior of the unit. Refer to the submittal drawings for basin accessory installation locations. Utilize an appropriate pipe thread sealant when installing accessories into basin fittings.

NOTICE

Basin accessories can be added at the time of order or as an aftermarket item.

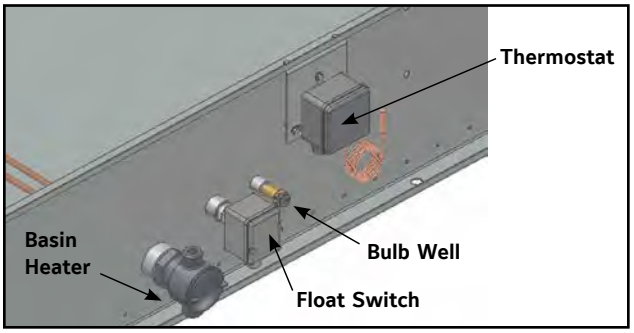


Figure 50 – Basin Accessories

HEATER CONTROL PANEL

1. Carefully plan the location of the control panel. Measure the factory supplied probe cord length. Do not attempt to change the cord length.
2. After selecting the installation site, mount the control panel with four 5/16" (field supplied) bolts through the mounting feet on the enclosure.
3. The main incoming power hub and the main power termination points are sized for wires based on the total nameplate kW and voltage. The actual load for a particular installation may be less. Either compute the actual load on the heater control panel (the total kW of all the heaters connected to it) or use the nameplate rating to determine the wire size required. The field supplied branch circuit disconnect switch and the branch circuit protective devices (fusing or circuit breaker) should be sized per NEC or local code requirements.
4. Connect the incoming power wire conduit to the incoming power hub provided on the control panel. Make sure the connection is water tight and secure. Pull the incoming power wire into the control panel enclosure and make connections per the control panel-wiring diagram.
5. Connect the heater power wire conduit(s) to the heater power wire hub(s) provided on the control panel. Make sure the connection is watertight and secure. Pull the heater power wire into the control panel enclosure and make the connections per the control panel wiring diagram. Conduit connections to multiple heaters should run until the conduit terminates at the last heater. Jumpering from one heater to the next is not recommended.
6. If the heater has a thermal cutoff, wire the cutoff back to the terminal block in the panel per the wiring diagram. This is a Class 1 circuit and can be in the same conduit as the power wiring. If there are two or more heaters, connect the cutoffs in series as shown in the wiring diagram.
7. If alternative conduit hubs are drilled, or if supplied hubs are not used, replace the plastic protective caps inside the hubs with steel plugs.
8. If leakage or condensation is likely to occur in the conduit runs leading to the control panel, install a drain in the bottom of the control panel and form a conduit loop.
9. Verify operation.

NOTICE

Basin accessories can be added at the time of order or as an aftermarket item.

NOTICE

1. **The heater control panel should be within sight of the heater if a disconnect switch option is selected.**
2. **Maintain a water level at least 2″ over the heaters by ensuring proper operation of make-up water level control. Low water may lead to over temperature conditions near the heater.**
3. **All power wiring should have a temperature rating of 167°F (75°C), and be rated for the number of wires in the conduit.**
4. **The wiring should be sized for the quantity of incoming wires in the conduit and the amperage of the branch circuit protective device as directed by the NEC/CEC, or any other local directives.**
5. **If non-metallic conduit is used, provide a circuit grounding conductor that meets NEC/CEC requirements. Ground lugs are provided in the heater control panel.**

FIELD CONNECTION INSTALLATION

The following are installation instructions for adding new field connections (Outlet) on a water basin with the TripleGuard™ Corrosion Protection System.

Provided Supplies	Recommended Supplies
Template for the connection with bolt holes	Stainless steel threaded shoulder bolts
Type 304 stainless steel backing ring with gasket	150 lb flange, weld any piping to the flange prior to installation*
Vulkem® Caulk	Gasket for the outside of the water basin

**For field installed outlet connections, adding a flange connection is recommended. Order the recommended supplies prior to shutdown.*

Field Connection Instructions

1. Use the template provided with the accessory to layout and mark the hole pattern on the exterior of the water basin.
2. Drill a pilot hole from the outside of the water basin to the inside of the water basin.
3. On the inside of the water basin:
   - For connections 3″ or less, score the TripleGuard™ Corrosion Protection System with a hole saw as shown in Figure 52.
   - For connections 3″ or greater, proceed to step 4.

Figure 52 – Scored TripleGuard Corrosion Protection System

4. Cut the hole from the outside of the water basin.
   - Use a hole saw or a step drill bit for smaller connections 3″ or less as shown in Figure 53.
   - Use a reciprocating saw or a Sawzall® for larger connections 3″ or greater.

Figure 53 – Removal Material

5. Position the supplied stainless steel backing ring gasket to the inside of the water basin.
6. Position the flange to the outside of the water basin.
7. Bolt the flange and the stainless steel backing plate together using stainless steel bolts.
8. Seal any exposed galvanized steel of the connection inside the water basin with Vulkem® Caulk as shown in Fig. 54.

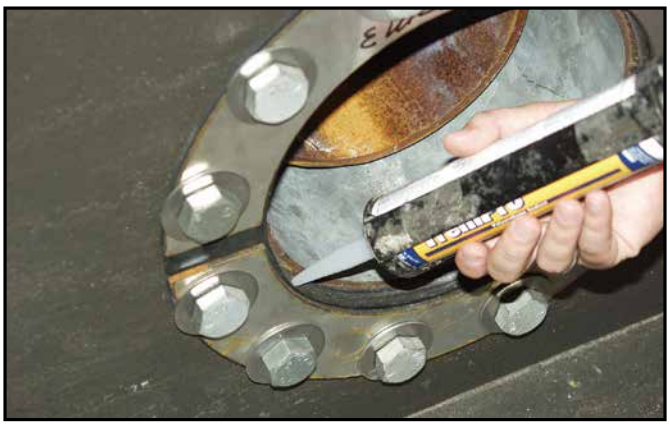


Figure 54 – Caulk Exposed Galvanized Steel

OPERATION

INITIAL AND SEASONAL START-UP

General

- If the unit is mounted on vibration isolators or isolation rails, refer to the vibration isolation manufacturer's guidelines before loading/unloading weight from the unit.
- Verify fan(s) and motors are disconnected, locked out and tagged out.
- Conduct external inspection of the equipment. Check for leaks, corrosion, and any structural damage.
- Inspect piping and connections.

Cleaning

- Drain the water basin with the strainers in place.
- Remove all dirt and debris from the fan guards and combined inlet shields.
- Inspect and clean all spray nozzles.
- Clean all mechanical components, such as the fans and motors.
- Flush the water basin interior to remove any accumulated dirt and debris.
- Remove, clean, and replace the basin strainers.

Inspection

⚠ DANGER

Do not perform any service on or near the fans, motors, drives, or inside the unit without first ensuring that the fans and the pumps are disconnected and locked out. Rotating equipment can cause severe personal injury or death to persons who come in contact.

- Conduct thorough external inspection of the equipment. Check for leaks, corrosion, and any structural damage.
- Conduct thorough internal inspection of the equipment. Check for anything unusual such as structural or mechanical component damage.
- Inspect piping and connections.
- Thoroughly inspect the fan(s) for any mechanical or physical damage.
- At seasonal start-up or after prolonged shutdown, check the motor insulation with an insulation tester prior to the motor start-up.
- Check and adjust the belt tension. The 0406 and 0412 models use direct drive motors and do not require belt tension.

Start-up

Initial Start-up Considerations:

- For units with independent fan control [standard on 0412 and 0718, and optional on 1218, 2418, and 2436], see "Fan Control" section.
- For units with VFDs, see "Variable Frequency Drive" section.
- For units with vibration cutout switches, see "Vibration Cutout Switch (VCOS)" section.

Procedures:

- Prior to seasonal start-up, lubricate the motor base adjusting screw and the fan shaft bearings. At initial start-up, no bearing lubrication is required since the bearings are factory lubricated prior to shipment.
- Apply RUST VETO® to steel shafts.
- Fill the water basin with fresh water to the overflow level via the make-up valve.
- Set the make-up valve float so the water shuts off at the operating level (see Table 1).
- Execute one of the following biocide treatment programs while operating the circulating pump and prior to operating the unit fan(s):
  - Resume treatment with the biocide that was used prior to shutdown. Operate the pump only while maintaining the maximum recommended biocide residual for a sufficient duration (residual and time will vary with the biocide) as recommended by the water treatment supplier. Start the fan only after this treatment period is completed.
  - Check the pH of the circulating water and, if necessary, adjust it to 7.0 – 7.6 pH. Then, running the pump only, treat the system with sodium hypochlorite to maintain a level of 4 to 5 mg/l (ppm) free chlorine (as Cl2) over a six hour period. Test kits for measuring the free residual of chlorine are commercially available. Start the fan only after this treatment period is completed.
- Start the unit pump and check for the proper rotation indicated by the arrow on the pump cover.
- On installations where the unit pump is not furnished, a globe valve should be installed in the pump discharge line and the pump flow rate adjusted to the correct water flow and pressure (2.25 psig at spray header connection).

NOTICE

Spray system pressure greater than 10.0 psig may cause damage to the distribution system.

- Check that the float operated make-up valve is operating freely. Closely monitor the water level and adjust as necessary during the first 24 hours of operation.
- Inspect the nozzles and heat transfer section as described in "Water Distribution and Heat Transfer Section."
- Verify proper fan tip clearance. Refer to Fan "Inspection & Maintenance."
- Open the valve in the unit bleed line, and adjust the bleed by closing or opening the valve until the desired bleed rate is reached.
- For initial start-up, briefly energize the fan motor(s) and note the direction of rotation. The fan should rotate in the direction indicated by the arrow on the fan cowl.

NOTICE

Check to ensure the controls for the fan motor are set to allow a maximum of six on-off cycles per hour to prevent motor overload.

- Run the fan in manual mode for several minutes to check for any unusual noise or vibrations.
- For a 2-speed motor, check to ensure the starter includes a minimum 15 second time delay when switching from high speed to low speed.
- Check the operation of the optional vibration cutout switch.
- Once the unit is operating, check the current and voltage of all three phases (legs) of the fan motor with a heat load on the unit under warm ambient conditions. The current must not exceed the motor nameplate rating.
- Verify combined inlet shield retainers are compressed.

After 24 hours of operation under thermal load, perform the following services:

☐ Check unit for any unusual noises or vibrations
☐ Check operating water level in the water basins
☐ Adjust the make-up valve if necessary
☐ Check belt tension and readjust if necessary
☐ Inspect the spray nozzles and heat transfer section

EXTENDED SHUTDOWN

Perform the following services whenever the evaporative condenser is shut down in excess of three days:

- If the unit is mounted on vibration isolators or isolation rails, refer to the manufacturer's guidelines before loading/unloading weight from the unit.
- Disconnect, lock out, and tag out the fan(s), and pump motors.
- Close the shut-off valve in the make-up water line (supplied by others), and drain the water basin and all exposed water piping. Heat trace and insulate all exposed piping.
- To minimize the risk of biological contamination during shutdown, it is recommended the entire system be drained.

⚠ DANGER

Do not perform any service on or near the fans, motors, drives, or inside the unit without first ensuring that the fans and the pumps are disconnected and locked out. Rotating equipment can cause severe personal injury or death to persons who come in contact.

- Clean all debris, such as leaves and dirt, from the interior and exterior of the unit, including the combined inlet shields.
- Clean and flush the water basin with the basin strainer in place.
- Leave the water basin drain open so rain and melting snow will drain from the unit.
- Remove the bottom drain plug to the spray pump(s). Put the plug(s) in a marked plastic bag and attach to the spray pump(s) for future use.
- Clean the basin strainer and re-install.
- Cover the fan discharge to keep out dirt and debris.
- Lubricate the fan shaft bearings, motor base, and motor base adjusting screw (if applicable).
- Apply RUST VETO® to steel shafts.
- Inspect the protective finish on the unit. Clean and refinish as required. Refer to "Corrosion Protection" for more details.
- Lockout the fan motor starting device in the "OFF" position to ensure personal safety in case of future inspection or service.
- Verify combined inlet shield retainers are compressed.

COLD WEATHER OPERATION

Frick condensers can be operated at subfreezing ambient temperatures provided proper operating methods are established and diligently followed.

Inspection and Maintenance

- Carry out the frequent visual inspections and routine maintenance services during operation in subfreezing weather.
- Ensure all controls for capacity and freeze protection are set properly and functioning normally.
- Prevent excessively high water levels and possible overflow of the water basin due to overpumping, clogged strainers, or make-up valve malfunction.
- Resolve any icing condition that develop which may damage the unit or the supports, impair system performance or create a safety hazard.

Fan Section Icing Protection

There are three basic operational methods which can be used to provide the system's required cooling: Temperature Setting, Fan Control, and Dry Operation. The method of control employed on a given application depends upon the climatic extremes which are expected, the variations in heat load that will be encountered, and the compatibility of the control system with other portions of the installation.

Effective icing control in subfreezing ambient conditions may require a combination of these three methods. Operate each unit with the highest thermal load it can handle, rather than evenly dividing the total heat load across all cells. During prolonged cold weather periods, bypass the idle units and drain the basins.

Fan Control

Reduce the unit capacity by cycling fans thus modulating the airflow through the unit. Rapid on-off cycles can cause the fan motor to overheat. Set the controls to allow a maximum of six (6) on-off cycles per hour. Periodically, cycle the fans off to prevent ice formation and/or to melt ice that accumulates on the combined inlet shields.

Variable Frequency Drives: VFDs offer the most precise method of capacity control by modulating fan motor speed. When using VFDs, avoid operating at or near resonant speeds. Units with VFDs require premium efficient/inverter duty motors.

Fan Cycling: Fan Cycling: Cycle the fan off for five minutes every 15 to 20 minutes for each cell. If ice continues to build on the air intake, decrease the on-time. Observe the air intake of the unit at least every four to eight hours.

Fan Reversal: This procedure should be used only after the other methods of fan control fail. If utilized, the fan(s) should be run in reverse for no longer than 20 minutes and the unit should be observed during this time. Before returning to normal operation, visually inspect the fan blades for ice formation.

NOTICE

Modulating the water flow rate to the unit is NOT a recommended method of controlling cooling capacity.

Dry Operation

One method to prevent icing is dry operation. Dry operation of the unit protects fan(s) from ice formation due to mist and splash from the water basin. The water in the water basin must be drained in dry operation. For dry operation switch points and recommendations, contact your Frick sales representative.

BASIN WATER FREEZE PROTECTION

Water Basin Protection

The basin water could freeze when the unit is shut down and exposed to subfreezing ambient temperatures.

Indoor Sump: The ideal method of protection is a remote sump located in a heated indoor area. When the circulating pump stops, the water in the connecting piping will drain by gravity to this indoor sump.

Basin Heaters: On applications without a remote sump, heat must be provided to the water basin. Electrical immersion heaters can provide the required function. Contact your local Frick Representative for details.

Electric Water Level Control: An electric water level control will maintain the proper water level regardless of the thermal load or variations in make-up water supply pressure. The two-position, slow closing solenoid valve provided in the Frick electric water level control package also minimizes valve freezing problems.

Heat Tracing: Heat trace and insulate all exposed water piping, including pump piping below the overflow level and make-up water lines, with electrical heater tape.

NOTICE

For remote sump applications, the water level in the basin of the equipment is a function of the design flow rate, the quantity, size and location of the remote sump connection and the pipe design between the condenser and the remote sump.

Units installed on remote sump applications are supplied without a make-up connection.

CORROSION PROTECTION

Frick products are constructed of corrosion-resistant materials. Other materials listed below are used in the equipment construction:

Galvanized Steel Components: Inspect the galvanized steel components for blemishes or corrosion. Wire brush and recoat the affected areas with a cold galvanizing compound such as zinc rich compound (ZRC).

Stainless Steel Components: Inspect stainless steel components for signs of blemishes or corrosion. Clean with stainless steel wool as necessary. If more extensive corrosion is prevalent, contact your local Frick Representative.

TripleGuard™ Corrosion Protection System: Inspect components protected with the TripleGuard™ Corrosion Protection System for signs of deep scratches or blemishes, especially in areas with field penetrations. Touch these up with 3M™ Windo-Weld™ Super Fast Urethane (Part#: RK1015).

Water Treatment

A proper water treatment program, administered under the supervision of a competent water treatment specialist, is an essential part of routine maintenance to ensure the safe operation and longevity of evaporative cooling equipment as well as other system components.

In evaporative cooling products, cooling is accomplished by evaporating a small portion of the recirculating water as it flows through the unit. As the water evaporates, the dissolved solids originally present in the water remain behind and if not controlled, the concentration of dissolved solids will increase rapidly. This can lead to corrosion, scale or biological fouling which may negatively affect heat transfer as well as the longevity of system components.

- Corrosion – Red rust on steel components and “white rust” on galvanized surfaces will affect the longevity of the unit.
- Scale Formation – Scale not only reduces heat transfer and system efficiency, but also may lead to under deposit corrosion. If scale is not controlled, it may continue building on critical components such as the fill and severely impact thermal performance.
- Biological Fouling – Slime and algae formations may reduce heat transfer, promote corrosion, and harbor pathogens such as Legionella.

Since the quality of the ambient air and makeup water varies significantly from job site to job site, Frick strongly recommends obtaining the services of a competent water treatment specialist prior to the initial start-up of the evaporative cooling equipment. Additionally, to protect against the risk of Legionella contamination, never operate the cooling equipment without adequate biological control.

Gray Water and Reclaimed Water

The use of water reclaimed from another process as a source of makeup water for evaporative cooling equipment can be considered as long as the resultant recirculating water chemistry conforms to the parameters noted in Table 2.

Using water reclaimed form other processes may increase the potential of corrosion, microbiological fouling, or scale formation. Gray water or reclaimed water should be avoided unless all the associated risks are understood and documented as part of the site specific treatment plan.

Corrosion and Scale Control

- To control corrosion and scale, maintain the water chemistry of the recirculating water within the parameters shown in Table 2. The specific measures required vary from system to system and are dependent on the chemistry of the makeup water, the metallurgy of the piping and heat transfer devices exposed to the recirculating water, and the temperatures at which the system will be operating.

TABLE 5. QUALITY GUIDELINES FOR CHEMICALLY TREATED CIRCULATING WATER

Property of Water	Recommended Level for Various Materials of Construction*		
	Galvanized Steel	304 Stainless Steel	TripleGuard or 316 Stainless
pH	6.5 to 9.0(1)	6.5 to 9.2(1)	6.5 to 9.5(1)
Total Suspended Solids	25 ppm	25 ppm	25 ppm
Total Dissolved Solids (TDS)	1,500 ppm max.	2,050 ppm max.	2,500 ppm max.
Conductivity	2,400 (2)	3,300 (2)	4,000 (2)
Alkalinity as $CaCO_3$	500 ppm max.(3)	600 ppm max.(3)	600 ppm max.(3)
Calcium Hardness as $CaCO_3$	50 to 600 ppm(3)	50 to 750 ppm(3)	50 to 750 ppm(3)
Chlorides (CL)	250 ppm max.	300 ppm max.	750 ppm max.
Sulfates	250 ppm max.	350 ppm max.	750 ppm max.
Silica	150 ppm max.	150 ppm max.	150 ppm max.

NOTES:

1. Galvanized steel units require passivation in order to prevent white rust (refer to passivation section).
2. Measured in micromhos/cm. The conversion factor used to determine conductivity is 0.625 (TDS = 0.625 x Conductivity).
3. Hardness and alkalinity limits may be exceeded under certain circumstances. Consult your water treatment specialist for recommendations.

* These guidelines refer to the materials used in construction. Different combinations of materials may be used on the same unit. Water chemistry will change with operating temperatures - data based on 95˚F water temperature.

- Bleed/blowdown, the continuous flow of a small portion of the recirculating water to a drain, is used to control the concentration of dissolved solids. On rare occasions, this may be adequate to control scale and corrosion. More often, however, chemical scale and corrosion inhibitors are necessary, which raise the allowable level of dissolved solids without the risk of scale and corrosion.
- Keep the chemically treated water within the guidelines given in Table 2. In cases where bleed/blowdown alone is being employed for corrosion and scale control without chemical treatment, your water treatment specialist may recommend more conservative limits than those shown.

Chemical Treatment Requirements

Chemical treatment programs must meet the following requirements:

- The chemicals must be compatible with the unit materials of construction as well as other materials used in the system (pipe, heat exchanger, etc.).
- Acid dosing as a means of scale control is not recommended.
- When chlorine is added to the system, free residual chlorine should not exceed 1 ppm, except as noted in start-up and shutdown section. Exceeding this limit may accelerate corrosion.

Passivation

When new systems are first commissioned, special measures should be taken to ensure that galvanized steel surfaces are properly passivated to provide maximum protection from corrosion. Passivation is the formation of a protective, passive, oxide layer on galvanized steel surfaces.

To ensure the galvanized steel surfaces are passivated, the pH of circulating water should be kept between 6.5 and 8.2 and calcium hardness between 50 and 600 ppm (as CaCO3) for four to eight weeks after start-up, or until new zinc surfaces turn dull gray in color.

If white deposits form on galvanized steel surfaces after the pH is returned to normal service levels, it may be necessary to repeat the passivation process. In case the pH can't be kept below 8.2, a secondary approach is to conduct a chemical passivation using inorganic phosphate or film-forming passivation agents. Consult your water treatment specialist for specific recommendation.

NOTICE

Stainless steel water basins and basins protected by the TripleGuard™ Corrosion Protection System do not require passivation. However, if the upper structure is galvanized steel, passivation is required on the galvanized areas including any Hot Dip Galv. After Fabrication (HDGAF) coils.

BIOLOGICAL CONTROL

- The warm, oxygen and nutrient rich environment inside evaporative cooling equipment provides an ideal environment conducive to the growth of algae, slime, and other micro-organisms. Uncontrolled, this can reduce heat transfer, promote corrosion, and promote the growth of potentially harmful organisms such as Legionella.
- To avoid biological contamination and minimize the risk of Legionella, initiate the biocide treatment program at start-up and continue on a regular basis thereafter in accordance with the treatment supplier's instructions.
- Bleed/blowdown or chemical treatment used for corrosion and scale control alone is not adequate for control of biological contamination.
- Introduce solid or granular biocides through a chemical "pot" feeder installed in parallel with the system circulating pump. Diluted liquid biocides may be added directly to the water basin.

INDEPENDENT FAN CONTROL (OPTIONAL)

Independent fan control is standard on 0412 and 0718 units and optional on 1218, 2418, and 2436 units.

In an operating induced draft unit with independent fan capabilities and no partitions, idle fans tend to windmill in the reverse direction. A windmilling fan poses no threat to the system while turning freely, but can create a large shock load when the fan motor is suddenly powered up. Proper staging of fans when starting from a windmilling condition will prevent excessive stresses on the drive system.

NOTICE

With evaporative cooling, a 15 second fan motor delay will not be noticed when staging up.

There are two control strategy options:

VFD

The recommended control option is to use a variable frequency drive to control all of the motors. VFDs regulate motor speed electronically and start motors with reduced voltage and frequency. The result is a gentle motor start, and therefore reduced stress.

NOTICE

For a unit with a VFD, with a switching frequency of 2.5 kHz, the line lead length cannot exceed 100 feet. If the switching frequency is higher that 2.5 kHz and/or the line lead length exceeds 100 feet, a dV/dT output filter is recommended to protect the motor.

Since the switching frequency and maximum line length requirements vary between VFD and motor suppliers, contact your Frick sales representative to determine if a dV/dT filter is required.

No VFD

- Staging Up: Turn all motors off for 15 seconds. Following the 15 second delay, bring all required fans online. Allow for a 1 second time delay between fan stages to reduce staging current.
- Staging Down: Turn off the fan motor. No need for delays.

VARIABLE FREQUENCY DRIVE

- Applications utilizing variable frequency drives (VFDs) for fan motor control must use inverter duty motors built in compliance with NEMA standard MG-1, Part 31.
- Operation of the unit at a speed which resonates with components of the drive system or support structure may result in vibrations which could damage the components or structure, and/or create objectionable noise. Therefore, these resonant speed ranges should be identified at start-up and locked out to prevent operation of the motor at these resonant speeds. Conduct the following “Resonant Speed Identification Procedure."

NOTICE

The minimum turndown ratio for units with a belt drive is 10:1 (or 6 hz). Units with the oil pump do not have a minimum speed.

- Please refer to the manufacturer’s variable frequency drive recommended start-up procedure for further information or consult with your Frick sales representative for any VFD applications.

RESONANT SPEED IDENTIFICATION PROCEDURE

There are several characteristic frequencies at which vibration levels may resonate with unit structural components. These include fan speed, motor speed, bearing frequency, and blade pass frequency.

Within the overall operating speed range of a unit, it is not unusual for one or more of these characteristic frequencies to excite the structural components over relatively small speed ranges and create an increase in vibration levels. If the vibration levels are excessive at these resonant speeds, they need to be locked out to prevent the VFD from operating the motor at these speeds. The following procedure describes how to identify the lockout speed ranges:

NOTICE

The resonant speed identification procedure must be performed at start-up for units with VFDs.

- Ensure the VFD that controls the fan motor is off, and the power to the motor circuit is locked out.
- Attach the accelerometer (provided by others) onto the box beam as shown in Figure 10. The accelerometer should be located away from the center of the web of the box beam, such that the center line of the accelerometer is about 1 inch from the upper or lower edge, as shown. On IDCF/IDC3-0406 and -0412 units, the accelerometer should be located directly on the motor base.

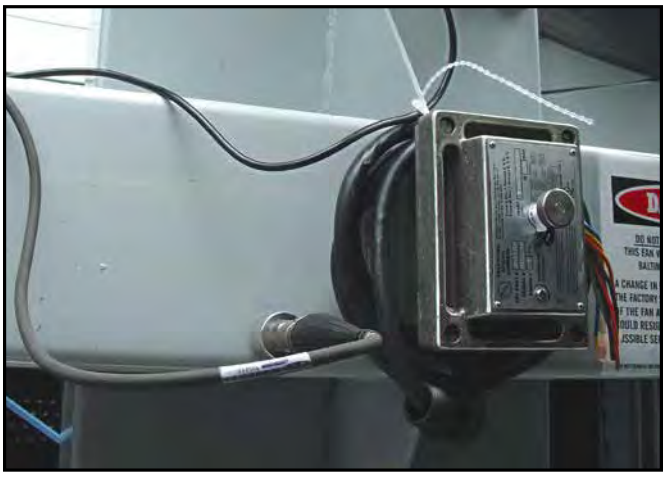


Figure 55 – Accelerometer Location - Belt Drive

- Connect the signal wire from the accelerometer (provided by others) to the vibration analyzer (provided by others). Be sure to route and fasten the wire so that it will not contact any rotating parts inside the unit when the drive system is operational.
- Get out of the unit, and ensure that the drive system is "all clear". Remove the lockout from the motor circuit.
- With the VFD off, record the vibration level indicated on the vibration analyzer, and confirm that it is very low (only picking up ambient vibration). Record this overall vibration level (0-peak) in inches per second (ips). If the ambient vibration level is greater than 0.35 ips, identify and correct the cause of the vibration. It could be vibration transmitted from another source, instrumentation malfunction, radio frequency interference, etc. If the cause is vibration transmitted from another source, and that source cannot be isolated or turned off for the duration of the measurements, note the source and magnitude of the vibration before continuing.
- After it is confirmed that the drive system is "all clear" and the unit access doors are closed, turn the VFD on, and verify that the fan is turning in the correct direction.
- Using the VFD, slowly (about 1 RPM increase every five to ten seconds) adjust the motor speed from the lowest limit to full speed while monitoring the vibration levels. Record the overall vibration levels at regular intervals if desired. uAs stated previously, when adjusting the VFD speed, proceed slowly while monitoring the vibration levels. If the vibration value approaches 0.35 ips (0-peak), slowly "zero in" on the speed where the value equals 0.35 ips, and record the speed at which this occurs as the lower end of the lockout range. Also record the vibration level at this speed.
- Continue to slowly increase the speed while monitoring the vibration level. If this is a resonance, then the value should peak and eventually decrease to a level that is below 0.35 ips as the speed is increased. After the vibration level has peaked and continues to fall, record the speed where the value equals 0.35 ips as the upper end of the lockout range.
- Using this data, a baseline for vibration history can be developed. The vibration levels can be monitored yearly and the trend used to indicate potential wear or the need to replace components in the drive system.
- After the entire speed range has been checked and any resonances identified, ensure the VFD that controls the fan motor is then turned off, and the power to the motor circuit is locked out.
- Enter the unit, and carefully remove the accelerometer, along with any associated wiring from the unit.
- Work with the VFD contractor to enter the lockout speed ranges, if any have been identified, into the VFD, so the unit will not operate at a resonant speed.
- Once it has been verified that the drive system is all clear, return the unit to its normal operating condition.
- Keep a record of any lockout speed ranges for future reference.

ACCESSORY OPERATIONAL CONSIDERATIONS

Basin Heater (Optional)

One or more electric immersion heaters prevent the water basin from completely freezing over and damaging the unit during shutdown or standby. The heaters are sized for the specific unit. The heating element has an enclosure that is suitable for outdoor use. Annually, inspect the basin heater prior to the risk of reaching freezing operating conditions.

Operation: Ensure that the heating element is completely submerged before energizing the main disconnect. For installations that have a Controls Enclosure, please contact your Frick sales representative for support.

NOTICE

The basin heater is not designed to prevent icing during unit operation.

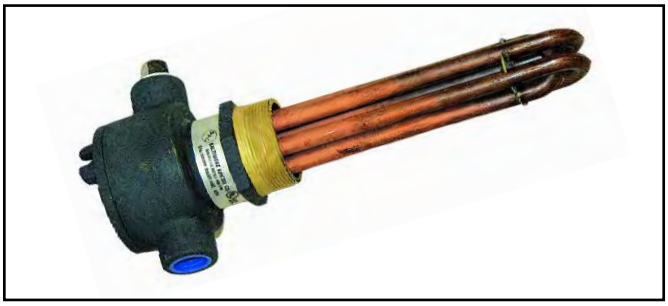


Figure 56 – Basin Heater

Vibration Cutout Switch (VCOS)

The Mechanical Vibration Cutout Switch and the Optional Electronic Vibration Cutout Switch should be tested and field adjusted at start-up and yearly thereafter.

Mechanical Vibration Cutout Switch (Standard)

Set Point Adjustment When Installed:

1. For safety, turn off, then lock and tag-out the electrical supply to the fan motor(s).
2. Turn adjustment screw counterclockwise 1/8 turn at a time until you hear the control trip.
3. Once tripped, rotate adjustment screw ¼ turn clockwise. Push in the manual reset button.
4. Start up the fan(s) to determine if the start-up will cause the cut-out switch to trip.
5. If the VCOS does not trip, start and stop the fan two more times. If the VCOS still does not trip, then calibration is complete.
6. If the VCOS trips, follow the steps in the note to the right.

Electrical Reset and Start-up Lockout (Optional):

1. If rated voltage is continuously applied to the reset circuit at unit start-up, the reset solenoid energizes for a fixed time interval (approximately 30 sec), after which time the solenoid is automatically de-energized by the thermistor. This provides a trip lockout during machine start-up roughness.
2. The voltage must be removed from the reset circuit when the machine is stopped to allow the thermistor to cool off.
3. The switch mechanism can be reset electrically by a momentary application of the reset voltage or it can be reset manually.

Electronic Vibration Cutout Switch (Optional)

Two models of electronic vibration cutout switches are available. The single set point model contains one trip limit for shutdown. The dual set point model contains two independent trip limits; one for alarm and one for shutdown. The shutdown set-point is factory set at 0.45 in/sec. Additional details can be found in the submittal packet.

Testing:

- The test position sets in the minimum set point so that any vibration will cause a trip condition.
- The light will come on immediately, and the trip will occur after the duration of the time delay, proving the complete system is operational.
- If test position is maintained for less than the duration of the time delay, the trip will not occur, thus permitting the system test without shutdown.

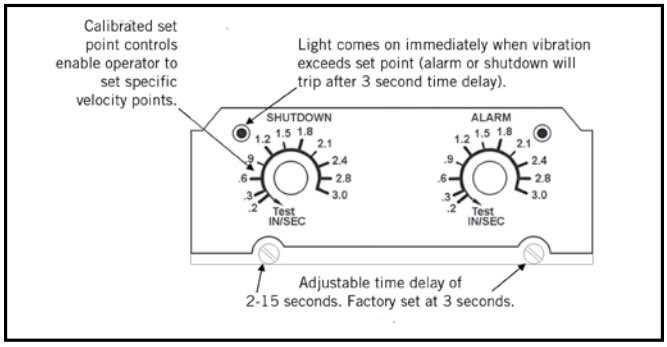


Figure 57 – Electronic VCOS with Alarm Contact

Calibration:

- A light adjacent to the set point control comes on the instant the measured vibration level exceeds the set point.
- The unit can be periodically calibrated on line by turning the set point control down until the light comes on. This setting is then compared with the vibration measured with a portable vibration meter, thus providing a calibration check of the unit.
- I· f the trip setting is maintained, trip will occur after the duration of the time delay.

Remote Reset:

Connection of between terminals 5 and 6 latches triac output in alarm state after set point is exceeded. Opening the connection will reset the output to non-alarm state.

NOTICE

If the VCOS trips, turn off, then lock and tag out the electrical supply to the fan motor(s). Adjust the set point screw an additional 1/4 turn clockwise, and push in the manual reset button.

Start up the fan motor(s) to determine if the start-up will cause the VCOS to trip. Repeat this adjustment process until the VCOS no longer trips when the unit is operated.

Make sure to lock out and tag out the electrical supply to the fan motor(s) before entering the unit or re-setting the switch, each time an adjustment to the VCOS is made.

After the final adjustment has been made, start and stop the fan motor(s) two more times to ensure that the VCOS is properly set.on.

NOTES

MAINTENANCE

WATER BASIN

The water basin is constructed from one of the following materials, and the following maintenance applies to all basin materials of construction:

- Galvanized steel
- TripleGuard™ Corrosion Protection System
- Welded Type 304 stainless steel

Water Levels

TABLE 6: WATER BASIN WATER LEVELS

Product	Model Number	At Overflow Level (in.)	At Operating Level (in.)
IDCF	All models except: 1218, 1236, 2418, 2436	11"	8"
	1218,1236, 2418, 2436	12¼"	8¾"
IDC3	0406, 0412	11"	7"
	0709, 0718, 1012, 1024, 1212, 2412, 2424	12½"	8"
	1218, 1236, 2418, 2436	13"	8½"

**Measured from inside the water basin.*

- The makeup valve controls the operating level, which is maintained at the levels shown in Table 3.
- The operating water level in the water basin will vary with system thermal load (evaporation rate), the bleed rate employed, and the makeup water supply pressure.
- Check the operating water level monthly, and readjust the float when necessary to maintain the recommended operating level.
- Consult "Water Level Control" for information on how to set and maintain the basin operating level.

Inspection and Maintenance

- Inspect the water basin monthly. Remove trash or debris accumulated in the basin or on the strainer.
- Quarterly, or more often if necessary, drain, clean, and flush the entire water basin with fresh water. This will remove the silt and sediment, which normally collects in the basin during operation. If not removed, sediment can become corrosive and cause deterioration of the protective finish of metallic basins.
  - When flushing the basin, leave the strainers in place to prevent the sediment from re-entering the system.
  - Remove the strainers after the basin has been flushed.
  - Clean and replace the strainers before refilling the basin with fresh water.
- Adjust the float to maintain the design operating level. See Table above.

⚠ WARNING

Openings and/or submerged obstructions may exist in the bottom of the water basin. Use caution when walking inside this equipment.

FAN

The IDCF and IDC3 models use axial fans. Thoroughly inspect the fans for damaged or deteriorated fan blades and replace the fan as required.

Inspection and Maintenance

- If the unit is already in operation, while the fans are still running, check for any unusual noise or vibration.
- With the fans off and the motor disconnected, locked out and tagged out, check the general condition of the fans:
  1. Inspect for any loose or missing bolts in the fan shaft bushing, fan hub, and fan shaft bearing(s).
  2. Check if the fan blades are loose, first by twisting the blade by hand; and then, by moving the blade tip up and down. There should be no play or slippage.
  3. Inspect each blade for excessive scale buildup that could cause vibration.
  4. Check each blade, in the area of the shank, for any signs of cracking. If cracking is found, the fan motor should be locked out immediately. Contact your local Frick Representative for assistance.
- **Tip Clearance**: Check the clearance between the tip of the blade and the fan cowl. The clearance should be within 1/8" and 1/2" for all models except IDCF/IDC3 models 0406 and 0412 which should be between 3/32" and 1/4".
- **Drain Holes**: On hollow blades, the drain hole in the blade tip should be unobstructed. TIP: Use a piece of wire to probe the hole.
- **Blade Pitch**: Check to ensure that the blades are all at the same pitch. If uncertain, measure the pitch with an inclinometer. All blades should be within 1/2° of each other.
- **Rotation**: Turn the fan shaft by hand to ensure that the shaft moves freely with no rough spots, binding or other malfunctions that could cause vibration or fan motor overload. While rotating the fan, check the blade tracking. All blades should track within a 1/2" band at any single point around the cowl.
- **Direction of Rotation:** On initial start-up, or if the fan motor has been rewired, briefly energize the fan motor and note the direction of rotation. It should rotate in the direction indicated by the arrow on the fan cowl. On units with independent fan motors, check the rotation of each fan.

NOTICE

Check to ensure the controls for the fan motor are set to allow a maximum of six on-off cycles per hour to prevent motor overload.

- **Operation**: On initial start-up, run the fan in the manual position for several minutes and check for any unusual noises or vibration.

FAN DRIVE SYSTEM

System Descriptions

- Direct Drive Motor (0406 & 0412): Factory mounted direct drive system with premium efficiency totally enclosed motors.
- Externally Mounted Motor (0709 & 0718): A belt drive system with a premium efficiency totally enclosed motor mounted outside the airstream is provided on these units.
- Internally Mounted Motor (1012-2440): A belt drive system with a premium efficiency totally enclosed motor mounted inside the airstream is provided on these units.

Inspection and Maintenance

- **Direct Drive System:** Periodically check the rotation of the fan and motor assembly. No adjustments are necessary.
- **Fortitude Power Train:** These drives require a periodic check of the belt condition and, when necessary, tension adjustment. The recommended service intervals are as follows:
  1. Initial Start-up:
     - Internally mounted motor: The drive has been tensioned and aligned at the factory, however, prior to initial startup, check belt tension (1012 - 2440).
     - Externally mounted motor: The motor base assembly has been pre-aligned at the factory. Mount the motor base assembly to the unit and verify alignment. Install the belt and follow the belt tensioning directions (0709 & 0718).
  2. Seasonal Start-up: Readjust the belt tension.
  3. Operation: After the first 24 hours of operation, readjust the belt tension on a new unit start-up or installation of a new belt. Thereafter, check the belt condition monthly, and adjust tension as necessary. Readjust tension at least once every three (3) months.

Fan Belt Adjustment

To properly adjust the belt tension, position the fan motor so that moderate pressure on the belt midway between the sheaves will produce the deflection shown in Figures 15a and 15b.

- Belt tension check:
  1. Place a straight edge along the belt from sheave to sheave as shown in Figure 15a, or use a tape measure as shown in Figure 15b, to measure belt deflection.
  2. Apply a moderate force by hand (approximately 40 lb/18.1 kg) evenly across the width of the belt in the center of the span between the sheaves.
  3. There is adequate belt tension if the belt deflects between 1/4" and 3/8" as shown in Figures 15a and 15b.
- Belt tension adjustment (if required):
  1. Remove the locking wrench (wrench attached to casing near motor/door) by loosening the plastic thumbscrew.
  2. Using the supplied locking wrench, wrench, or impact gun, turn the motor base adjusting screw (Figures 4a and 4b) clockwise to tension the belt or counterclockwise to relieve belt tension. During adjustment of the belt tension, rotate the drives several times by hand to evenly distribute the tension throughout the belt.
  3. When the belt is properly tensioned, align the adjustment bolt to facilitate replacement of the locking wrench. Replace the locking wrench and tighten the plastic thumbscrew to secure.

NOTICE

If belts are tensioned properly, there should be no "chirp" or "squeal" when the fan motor is started.

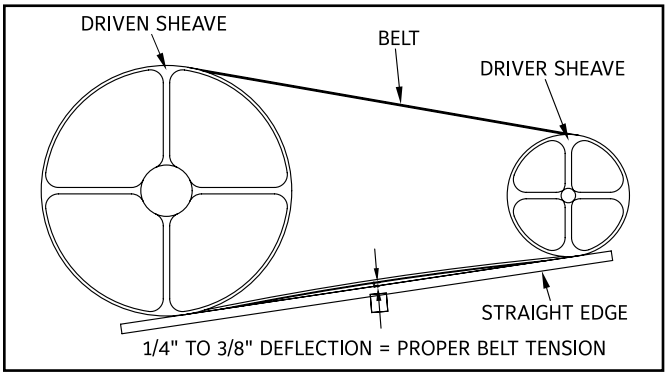


Figure 58a: Checking Belt Tension

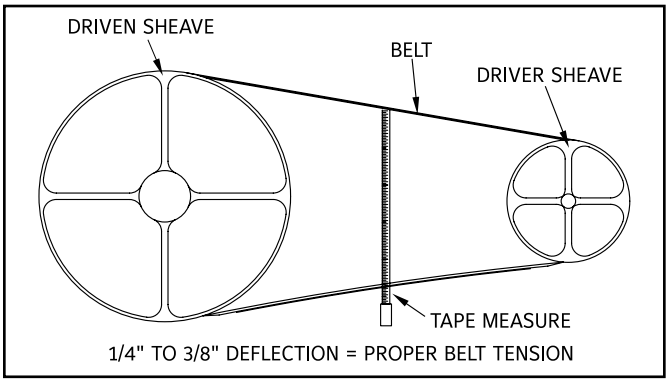


Figure 58b: Checking Belt Tension

Drive Alignment Check And Adjustment

1. Place a straight edge across the driver and the driven sheaves as shown in Figure 16.
2. The straight edge should contact all four points as shown in Figure 16, indicating proper drive alignment.
3. There should be no more than 1/16" deviation from four points of contact.
4. In case of realignment, loosen the motor sheave and align it with the fan sheave. Allow 1/4" for draw-up as the bushing screws are retightened.

- Check the drive alignment annually to ensure maximum belt life.

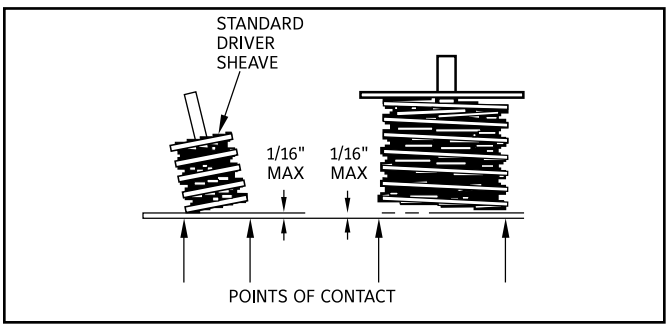


Figure 59 - Standard Drive Alignment

FAN MOTORS

Inspection and Maintenance

- Clean the outside of the motor at least quarterly to ensure proper motor cooling.
- After prolonged shutdowns, check the motor insulation with an insulation tester prior to restarting the motor.
- Check the motor voltage and current following start-up and every three (3) months while in operation.

Adjustable Motor Base

Coat the motor base slides and adjusting screws (see Figure 14 in the Operation section) prior to start-up, every three months while in operation, and following shutdown. Use good quality, corrosion inhibiting grease such as those recommended for lubricating the fan shaft bearings.

FAN SHAFT BEARINGS

For all units except for IDCF/IDC3 0406, two pillow block ball bearings support the fan shaft and are provided with extended lube lines as standard. Each bearing is equipped with a lubrication fitting and a slinger/locking collar to keep out moisture.

Inspection and Maintenance

- Only lubricate the bearings with a manual grease gun or the optional Automatic Bearing Greaser. Do not use high-pressure grease guns since they may rupture the bearing seals.

NOTICE

Only lubricate the bearings with one of the following water resistant inhibited greases which are suitable for ambient temperatures ranging from -65°F (-53.9°C) to 250°F (121.1°C):

Amoco-Rycon Premium#3	MobilGrease®-AW2
Chevron-SRI	Shell-Gadus S2 V100 3
Citgo-Polyurea MP2™	Shell-Gadus S3 T100 2
Conoco-Polyurea 2™	SKF-LGHP2™
Exxon-Polyrex® EM	Unocal76-Unilife Grease™
Exxon-Unirex N™	

- Lubricate the bearings as follows:
  1. Initial Start-up: Normally, no lubrication is required since the bearings have been lubricated at the factory prior to shipment. However, if the unit has been stored at the job site for more than three months, both bearings should be lubricated with new grease before initial operation. When lubricating, purge the old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal on the underside of the bearing.
  2. Seasonal Start-up: Purge the bearings with new grease prior to start-up.
  3. Operation: Purge the bearings with new grease every three (3) months while in operation.
  4. Extended Shutdown: Purge the bearings with new grease prior to any prolonged storage or downtime.

WATER DISTRIBUTION AND HEAT TRANSFER

The water is distributed through a corrosion resistant polyvinyl chloride (PVC) spray distribution system. The drift eliminators are also made of PVC, which requires no protection against rot, decay, rust, or biological attack.

Inspect as follows:

1. Shut off the fan, lock out and tag out the fan and pump motors.
2. Remove the drift eliminators to allow a clear view of the spray distribution system and nozzle patterns.

⚠ CAUTION

Drift eliminators are not designed to support the weight of a person or to be used as a storage or work surface for any equipment or tools. Misuse can result in physical injury and/or equipment damage.

3. Start the recirculating pump. Make sure the fan motor is locked out and tagged out. Check to see if the nozzles are all spraying consistently and producing the spray pattern shown below.
4. Clean any nozzles that are clogged. If necessary, the nozzle and rubber grommet may be removed for cleaning. If additional cleaning is necessary the branch may be removed for cleaning. Tools are not required to remove eliminator support channel or branches.
5. Inspect the coil surface. Any corrosion, damage, or obstructions must be corrected.

With electrical heater tape, heat trace and insulate all exposed water piping, including pump piping below the overflow level and make-up water lines.

The coil is designed for seasonal dry operation followed by seasonal wet operation, and not for frequent cycling of the spray pump. Frequent spray pump cycling may lead to excessive scale buildup.

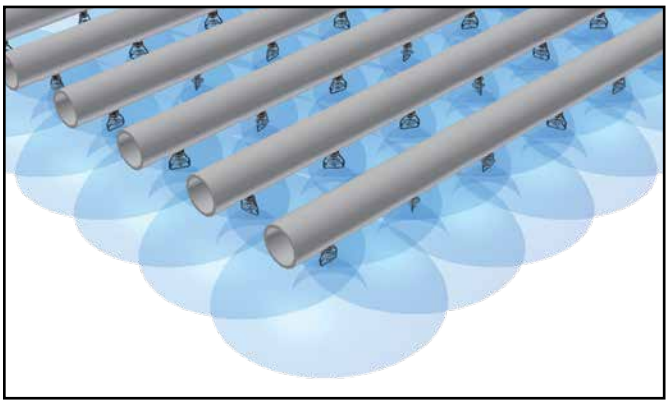


Figure 60 - Nozzle Spray Pattern

⚠ CAUTION

Don't use steam or high pressure water to clean PVC eliminators, fill or materials other than steel.

WATER LEVEL CONTROL

There are two types of water level controls used on IDCF and IDC3 units:

- Mechanical makeup valve assembly
- Optional electric water level control package

Mechanical Makeup Valve Assembly

A float-operated mechanical water makeup assembly is furnished as standard equipment on the unit. The standard makeup assembly consists of a corrosion resistant makeup valve connected to a float arm assembly actuated by a polystyrene-filled plastic float. The float is mounted on an all-thread rod held in place by wing nuts. The water basin operating water level can be adjusted by repositioning the float and all-thread rod using the wing nuts provided.

NOTICE

If the unit has been ordered with the optional electric water level control package or is intended for remote sump application, a mechanical water makeup valve will not be provided.

Inspection and Maintenance

- Inspect the make-up valve assembly monthly and adjust if necessary.
- Inspect the valve annually for leakage. Replace the valve seat if necessary.
- Maintain the make-up water supply pressure between 15 psig and 50 psig for proper operation. A pressure regulator valve (provided by others) is recommended for pressures over 50 psig.
- Set the initial basin water level by adjusting the wing nuts, so that the make-up valve is completely closed when the water level in the water basin is at the operating level as stated in Table 3.
- If the thermal load is less than the design load at the time of unit start-up, the procedure may produce operating levels greater than those shown in Table 3. If operating levels are higher than specified, readjust the float in order to attain the recommended operating level.
- Closely monitor the water level in the water basin and adjust the level if necessary during the first 24 hours of operation.
- Operating at the recommended water level will ensure that the unit basin contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up and provides sufficient excess basin capacity to accept the total system pull-down volume.

Optional Electric Water Level Control Package

As an option, an electric water level control package is available in lieu of the mechanical makeup assembly. The package consists of a probe-type liquid level control assembly and a slow-closing solenoid valve. Stainless steel electrodes, factory-set at predetermined lengths, extend from an electrode holder into the water basin.

Inspection and Maintenance

- Clean the stainless steel electrodes periodically to prevent accumulations of scale, corrosion, sludge or biological growth, which could interfere with the electrical circuit.
- The water level is maintained at the recommended operating level regardless of the system thermal load. Therefore, it is not recommended that the operating level be adjusted.
- During the start-up of units equipped with the electric water level control package, bypass the control unit in order to fill the unit to the overflow connection.

LED Status Codes

- **LED on steady**: Indicates normal operation.
- **Steady one second flashing:** Indicates dirty probes, reading in the capacitance mode. The unit will still operate but will give the following status code of 1 second on, 1 second off (steady 1 second flashing). This status code continues until the probes are cleaned and the power has been reset. Note: No other status codes will be displayed until the dirty probes are cleaned.
- **Two flashes and off for 5 seconds:** Indicates make-up valve ran for more than 1 hour. The unit will continue to fill, with the following status code of 1 second on, 1 second off, 1 second on and then off for 5 seconds before repeating. This status will continue until power has been reset. Possible causes: leaking tank, obstructed fill / defective valve or reduced flow rate.
- **Three flashes and off for 5 seconds:** Indicates shorted probes or highly conductive water. The unit will continue to operate but will give the following status code of 1 second on, 1 second off, 1 second on, 1 second off, 1 second on and then off for 5 seconds before repeating. This status will continue until the water is diluted or the short is removed from the probes and power is reset.
- **Four flashes and off for 5 seconds:** Indicates black probe (P6) reads covered, but white probe (P5) does not read covered (white should also be covered because it is longer than the black). This will cause the fill solenoid valve to short cycle and lead to premature failure of the fill valve. The unit will short cycle and give the status code of 1 second on, 1 second off, 1 second on, 1 second off, 1 second on, 1 second off, 1 second on and then off for 5 seconds before repeating. The unit will continue to short cycle until the condition has been corrected (clean white probe) and the power reset.
- **LED does not come on after power up or resetting power:** Indicates unit inoperative.

SYSTEM CLEANING

Coil Cleaning

Both the inside and outside of the heat exchange coil may require occasional cleaning. The chemicals used must be compatible with the materials being treated. For example, the standard coil outside is galvanized steel. The inside of the coil is black carbon steel. For finned coils, the coil cleaning must be careful not to damage the fins (outside of the coils) and the coils themselves. For specific recommendations on coil cleaning, contact a qualified consultant.

Weld Byproduct Cleaning

The installation and manufacturing processes commonly used for field assembly of steel-piped systems may leave weld byproducts inside coils and connecting piping (especially in refrigeration systems). It is common practice to install filters and/or strainers that remove contaminants during initial system operation. Shortly after system start-up, the filters and/or strainers should be cleaned or replaced.

Long Term Care of Stainless Steel

When the percentage of chromium in steel exceeds 10.5%, it is called stainless steel. The chromium in the steel reacts with the oxygen in the air to form a chromium-oxide surface layer, also called the passivation layer that provides the corrosion resistance in stainless steel.

The Manufacturing Process: Precautions are taken to prevent cross-contamination, processing galvanized and stainless steel parts separately. Also, stainless steel brushes are used to clean welds on stainless parts and care is taken to avoid scratching parts during processing. Organic cleaners are used to clean the finished product prior to shipping.

Jobsite Considerations: While stainless steel itself does not rust so long as the chromium-oxide surface layer is intact, it is not immune to contamination from its surroundings. Some common sources of surface contamination are:

- Dirt and soil
- Shop oil or grease that may carry other contaminants such as metal chips
- Machining or welding galvanized steel at the jobsite may cause debris to impinge itself into the stainless steel

These contaminants can deposit on the surface and scratch the passivation layer or prevent it from re-forming. They can also get trapped underneath the passivation layer and reduce corrosion resistance.

NOTICE

Never use chloride or chlorine based solvents such as bleach or muriatic (hydrochloric) acid to clean stainless steel. It is important to rinse the surface with warm water and wipe with a dry cloth after cleaning.

Stainless Steel Recommended Cleaning Procedure

Stainless steel needs to be cleaned regularly to maintain the corrosion resistance as well as to maintain the overall aesthetics of the stainless steel.

It is fairly simple to clean most contaminants off the surface of stainless steel. Most dirt and soil can be cleaned with a clean cloth, warm water, and mild detergent. For persistent dirt, a little vinegar can be added in the cleaning water. It is important to always rinse the surface with warm water and wipe with a dry cloth after any cleaning, whether mild or aggressive.

- Fingerprints, mild stains or grease spots can be cleaned using organic solvents such as acetone, methyl or ethyl alcohol, or mineral spirits. Stainless steel wipes or glass cleaners commonly available in stores may also be used.
- Occasionally the surface of stainless steel can get iron chips or shavings embedded in it from having galvanized steel machined or welded in the vicinity. The iron chips can start to rust, reducing the corrosion resistance of the stainless steel, and stain the surface giving the impression that the stainless steel is rusting. These types of contaminants require more aggressive cleaning. Mild abrasives such as Scotch-Brite™ products may be used where aesthetic considerations are not important followed by solvent cleaning with organic solvents as described above. It is important to rinse the surface with warm water and wipe with a dry cloth after cleaning.
- If the iron chips are not removed with the Scotch-Brite™ Products, electro-chemical cleaning may be required. In the field, commercially available equipment for electro-chemical cleaning is used. Contact your Frick sales representative for more information.

NOTICE

Long term care of stainless steel information reprinted with permission from "The Care and Cleaning of Stainless Steel"; Specialty Steel Industry of North America; http://www.ssina.com.

BLEED RATE

NOTICE

A proper water treatment program, administered under the supervision of a competent water treatment specialist, is an essential part of routine maintenance to ensure the safe operation and longevity of evaporative cooling equipment, as well as other system components.

In evaporative cooling, evaporation of a small portion of the recirculating spray water as it flows through the equipment causes the cooling effect. As this water evaporates, the impurities originally present remain in the recirculating water. The concentration of the dissolved solids increases over time and can reach unacceptable levels.

In addition, airborne impurities are often introduced into the recirculating water. If these impurities and contaminants are not effectively controlled, they can cause scaling, corrosion, and sludge accumulations that reduce heat transfer efficiency and increase system operating costs, potentially shortening the useful life of the equipment.

The degree to which dissolved solids and other impurities build up in the recirculating water may be defined as the cycles of concentration. Specifically, cycles of concentration is the ratio of the concentration of dissolved solids (for example - chlorides, sulfates, etc.) in the recirculating water to the concentration of the same material in the make-up water.

- In order to optimize heat transfer efficiency and maximize equipment life, "bleed" or "blowdown" a small amount of recirculating water from the system. This controls the cycles of concentration to maintain the quality of the recirculating water within the guidelines given in Table 3, under Corrosion and Scale Control in the OPERATION section.

- Replenish the "bleed" water with fresh make-up water, thereby limiting the buildup of impurities.
- Bleed/Blowdown:
  1. To minimize water usage, accomplish the bleed automatically through a solenoid valve controlled by a conductivity meter. The conductivity meter setpoint is the water conductivity at the desired cycles of concentration and should be determined by a competent water treatment expert.

NOTICE

The solenoid valve and conductivity meter must be supplied by others. Evaporation is proportional to the load and will vary seasonally. Use a conductivity meter to maximize water conservation.

  2. Alternatively, use a bleed line with a valve to continuously bleed from the system. In this arrangement, adjust the rate of bleed using the valve in the bleed line. Measure the rate of bleed by filling a container of known volume while noting the duration. Check the bleed rate and water quality periodically to ensure that adequate control of the water quality is being maintained.

Bleed Line Calculations: Bleed rate is determined by the following formula:

$$\text{Bleed Rate} = B = \frac{E}{(n-1)}$$

Where: B = Bleed Rate (GPM)
E* = Evaporation Rate (GPM) = Q (GPM) x R (°F) x .001
Q = Process Fluid Flow Rate (GPM)
R = Range
n = Number of Cycles of Concentration = CR/CM
CR = Concentration in Recirculating Water
CM = Concentration in Makeup Water

The evaporation rate is dependent on the wet bulb temperature and load. The equation above provides the maximum bleed rate on the design day. Contact your Frick sales representative for an exact calculation based on specific site conditions.

* The evaporation rate "E" can be determined by any one of the following methods:

1. The evaporation rate is approximately 2 GPM per 1 million BTUH of heat rejection.

2. The evaporation rate is approximately 3 GPM per 100 tons of refrigeration.

3. Evaporation Rate = Q (GPM) x R x .001 (as shown in the example).

The following example illustrates a bleed rate calculation:

Given:

- Condenser
- Process Fluid Flow Rate = 800 GPM
- Maximum Allowable Chloride Concentration = 250 ppm
- Concentration of Chlorides in Makeup Water = 45 ppm
- Range = 10°F

Find: Bleed Rate

Solution: So in this case,

$$E = Q \times R \times 0.001 = 800 \times 10 \times 0.001 = 8 \text{ GPM}$$

$$n = \frac{CR}{CM} = \frac{250 \text{ ppm}}{45 \text{ ppm}} = 5.55$$

$$\text{Bleed Rate} = B = \frac{E}{(n-1)} = \frac{8 \text{ GPM}}{(5.55-1)} = 1.75 \text{ GPM}$$

Therefore, in this case we must bleed approximately 1.75 GPM to limit the concentration of impurities.

NOTICE

This example focuses on a single parameter (chloride concentration) of water only. The bleed rate required for a system (when evaluating more than one parameter) is the highest bleed rate required to keep all parameters within recommended limits.

PROLONGED OUTDOOR STORAGE

Storage Preparation

Perform the following when preparing for storage. If the unit is installed, conduct the "Extended Shutdown" procedure beforehand.

- Ensure the water basin is fully drained and the drain is open.
- For storage prior to installation, all components and accessories, which sometimes ship inside the unit and are not a permanent fixture in the basin, should be removed and stored indoors.
- Remove the bottom drain plug to the spray pump(s). Put the plug(s) in a marked plastic bag and attach to the spray pump(s) for future use.
- Remove and store fan belts (if supplied) at room temperature. Tag belts appropriately for future identification.

NOTICE

Covering the unit with a clear plastic tarpaulin during storage can trap heat inside the unit and cause damage to the PVC components. If units must be covered during storage, an opaque, reflective tarp with vents should be used.

- Nitrogen Charge Precautions
  1. Storage Prior to Installation – The coils should be charged with nitrogen at 15 psig at the factory.
  2. Extended Shutdown Periods after Start-Up – The coils should be charged with nitrogen at 15 psig in the field and capped by adding a threaded connection or a welded cap. Upon start-up, the coil connections will require cutting and bevelling.
- Apply a weather-resistant lubricant or heavy grease such as Anti-Seize (Part# 160069) to all exposed threaded or flanged connections and the adjustable motor base threaded rod.
- Insert desiccant bags into the control panel (if supplied) to absorb moisture. Seal the control panel for storage.
- Spray coat electrical component housings (if supplied) with a suitable protective coating, such as Cosmoline® Weathershed, and individually cover them with plastic, taking care to leave openings for free air circulation.
- Inspect the protective finish on the unit. Clean and refinish as required. For more detail, refer to "Corrosion Protection" section.
- Verify combined inlet shield retainers are compressed.

Motor Recommendations

Standard motors are designed for storage at ambient temperatures of -20°F to 104°F (-28.9°C to 40°C). Prolonged periods of exposure above or below these specified conditions could degrade components of the motor and cause malfunction or premature failure.

- Motors should be removed and stored inside whenever possible. When indoor storage is not possible the motors must be covered with a tarpaulin. Do not use plastic or plastic film. This cover should extend below the motor and be secured; however, it should not tightly wrap the motor. This will allow the captive air space to breathe, minimizing formation of condensation.
- Care must also be taken to protect the motor from flooding or from harmful chemical vapors.
- The storage area should be free from ambient vibration. Excessive vibration can cause bearing damage.
- Precautions should be taken to prevent rodents, snakes, birds, or other small animals from nesting inside the motors. In areas where they are prevalent, precautions must also be taken to prevent insects from gaining access to the interior of the motor.
- If not stored indoors in a controlled environment, some form of heating must be utilized to prevent condensation from accumulating in the motor. This heating should maintain the winding temperature at a minimum of 9°F (5°C) above the ambient temperature of the surrounding environment, keeping it from dropping below the dew point where condensation could form inside the motor.

  If space heaters are supplied, they should be energized. Request the required voltage and transformer capacity from your Frick sales representative. A third option is to use an auxiliary heat source and keep the winding warm by either convection or blowing warm air into the motor.
- Rotate the motor shaft monthly to redistribute bearing grease.

General Maintenance Requirements

- Rotate all fan(s) and motor shafts monthly by hand. Hand-turning will ensure that the shafts and bearings are free and will redistribute grease within the bearings.

⚠ DANGER

Do not perform any service on or near the fans, motors, drives, or inside the unit without first ensuring that the fans and the pumps are disconnected and locked out. Rotating equipment can cause severe personal injury or death to persons who come in contact.

- Inspect the water basin monthly to ensure that the drain is open and remove any leaves or debris that may have accumulated in the water basin.
- Inspect the axial fan(s) annually to ensure the blades are tight and there is no obvious corrosion between the hub and the fan blade.
- Inspect the rust preventative coating on all motor external machined surfaces including shaft extensions monthly. If necessary, re-coat the surfaces with RUST VETO®.

Start-Up Preparation After Prolonged Storage

Keep in mind that start-up procedures after long periods of storage are just as important as pre-shutdown procedures.

- Motors should be thoroughly inspected, cleaned, and restored to pre-storage condition.
- Inspect axial fan(s) prior to start-up to ensure that the blades are tight and that there is no obvious corrosion between the hub and the fan blade. Do not energize the fan(s) if there is obvious corrosion of fan components. Loose fan blades could result in fan failure and possible injury or damage.
- Reinstall all fan belts, motors, door gaskets, and drain plugs (as applicable), and remove all protective coverings.
- For units stored prior to installation, conduct rigging procedures as directed in the unit's Rigging and Assembly Instructions.
- Perform an insulation test of motor windings to ensure satisfactory insulation resistance.
- Conduct full start-up procedure as stated in the "Start-Up Procedure." Be especially thorough for cleaning and inspection prior to start-up.

RECOMMENDED MAINTENANCE SERVICES[1]

Type Service	Start-Up	Monthly	Quarterly	Annually	Shutdown
Inspect and clean as necessary:					
Inspect general condition of the unit[2] and check unit for unusual noise or vibration	✔	✔			
Inspect water basin	✔		✔		
Inspect spray nozzles/Flush water distribution system	✔		✔		
Inspect combined inlet shields	✔	✔			
Inspect coil			✔		
Drain basin and piping	✔				✔
Check and adjust water level in basin	✔	✔			
Check operation of makeup valve	✔	✔			
Check and adjust bleed rate	✔	✔			
Verify combined inlet retainers are compressed	✔	✔			
Inspect unit finish				✔	
Mechanical equipment system:					
Check belt condition	✔	✔			
Adjust belt tension[3]	✔		✔		
Lubricate fan shaft bearings	✔		✔		✔
Lubricate motor base adjusting screw	✔		✔		✔
Check drive alignment				✔	
Check motor voltage and current	✔		✔		
Check fan motor exterior	✔		✔		
Check fan motors for proper rotation	✔				
Check general condition of the fan	✔		✔		
Check and unplug fan drain holes (hollow blade fans)			✔		
Check fan for uniform pitch			✔		
Check fan for rotation without obstruction	✔		✔		
Check and recoat steel shafts with RUST VETO	✔		✔		
Check optional basin heater				✔	
Test optional vibration cutout switch	✔			✔	

1. Recommended service intervals are for typical installations. Different environmental conditions may dictate more frequent servicing.
2. When operating in ambient temperatures below freezing, the evaporative condenser should be inspected more frequently. Refer to the "Cold Weather Operation" section for more details.
3. Tension on new belts must be readjusted after the first 24 hours of operation and quarterly, thereafter.

RECOMMENDED SPARE PARTS

Frick parts are the "Perfect Fit" for your condenser. These parts are specifically designed, engineered and manufactured to work in a condenser environment. They are the right parts, at competitive pricing levels, and Frick offers the best deliveries in the industry.

The most common repair and retrofit parts are in stock and can be ordered from Frick. In most cases they can ship overnight. In addition, most Frick Representatives maintain a local inventory of commonly used parts.

Even with this fast delivery capability, it is still recommended that certain essential, emergency repair parts be maintained in your local inventory, to minimize any potential downtime.

Basic Recommended Spare Parts

- Bearing set
- Float valve or repair kit
- Float ball
- Solenoid valve (if unit is equipped with electric water level control)
- Powerband or set of belts
- Spray nozzle kit with grommets
- Basin heater and low water cut out
- Door gasket
- Strainer (inlet and suction)
- Fan and sheave bushings
- Pump seal and gasket kit for coil products
- Automatic bearing greaser refill kit

Parts to Consider if Extended Downtime is a Concern

- Spray pump for coil products
- Fan or fan wheel
- Fan shaft
- Sheave set
- Fan motor

NOTES

July 2016 Form Revisions

p.20 – Updated to singular image for Fill Access Platform End Ladder

Form 140.960-IOM (2016-06) rev (2016-07)
Supersedes: 140.960-IOM (2016-06)
Subject to change without notice
Published in USA • 07/16 • PDF

JOHNSON CONTROLS
100 CV Avenue
Waynesboro, PA 17268-1206 USA
Phone: 717-762-2121 • FAX: 717-762-8624
www.johnsoncontrols.com/frick