

Tray Installation Manual 350

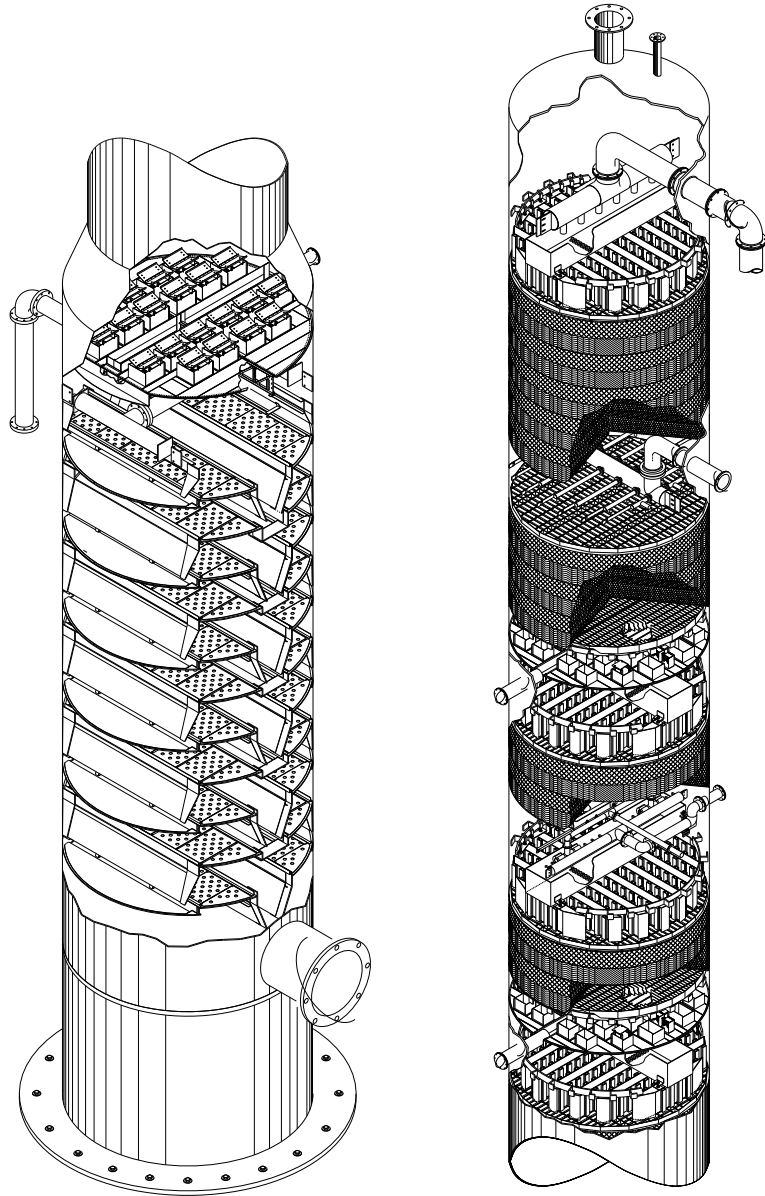


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Intention of This Installation Manual

This manual was developed to assist field crews with the installation of trays and other tower internals and to provide recommended standards for field welding of tower attachments. This manual is intended to give general guide lines. Mapesa. drawings are specific for each tower and they take precedence over this manual regarding layout and erection of trays and other tower internals. In case of any unforeseen difficulty (and certainly prior to attempting to modify any parts) please contact Mapesa Immediately.



Typical Trayed Tower Section

Typical Packed Tower Section

Important

Any modification made on any tray part without prior authorization from Mapesa Automatically invalidates any responsibility as far as the mechanical characteristics of the trays are concerned. It may furthermore jeopardize Mapesa. guarantee of tray hydraulics.

General Considerations for Installation

Documents Needed:

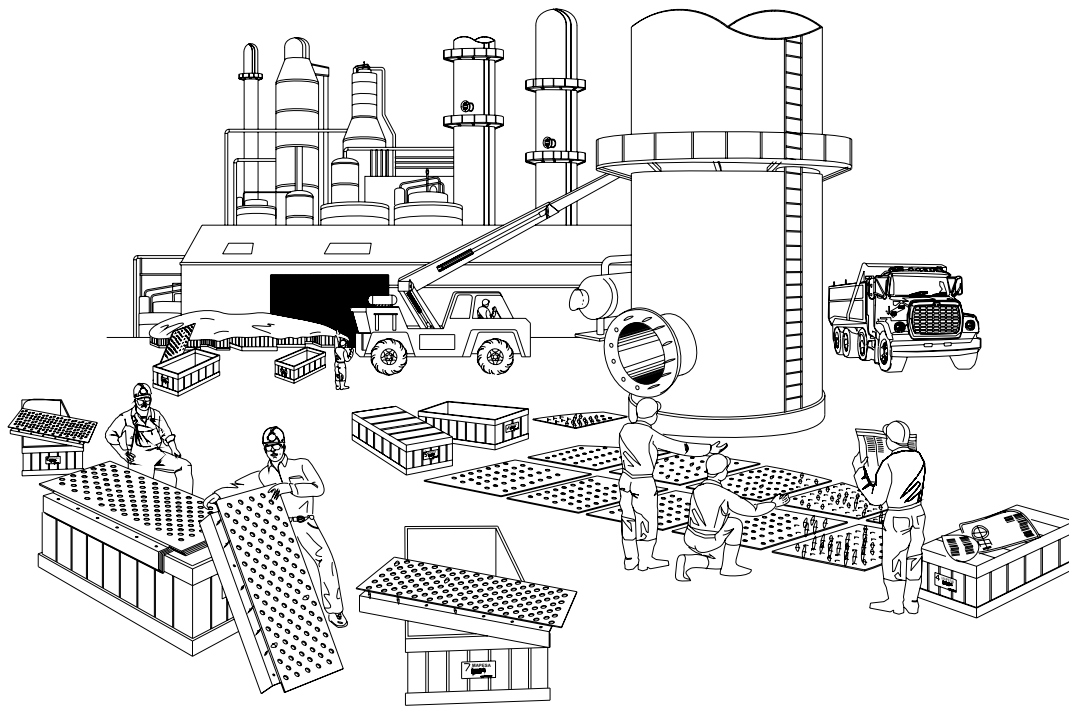
- Tray installation drawings
- Tower Attachment drawings
- Parts/Hardware List
- Packing Lists
- Mapesa Hardware and Assembly Bulletin 325

Space Requirements:

- Sorting-out area of approximately 3,000 square feet near the base of the column.
- Storage area is to be as near as possible to the sorting-out area.

Handling of Crates and Boxes:

- Inventory is to be taken by utilization of packing lists.
- Crates and boxes to be under cover during storage period.
- Boxes are not to be stacked on top of each other.
- Opening to be undertaken in sorting-out just prior to installation.



Material Handling:

- Parts ready for installation should be supported in a vertical position (never left laying flat on the ground).
- Modifications should be made only if unavoidable, then before installation and always with prior authorization by Mapesa.

Installation:

- Sequence of installation should be from the bottom tray to the top tray.
- Systematic inspections should be made throughout installation to avoid, for example that loose hardware should be left at the bottom of the vessel.

How to Locate the Different Parts in the Crates

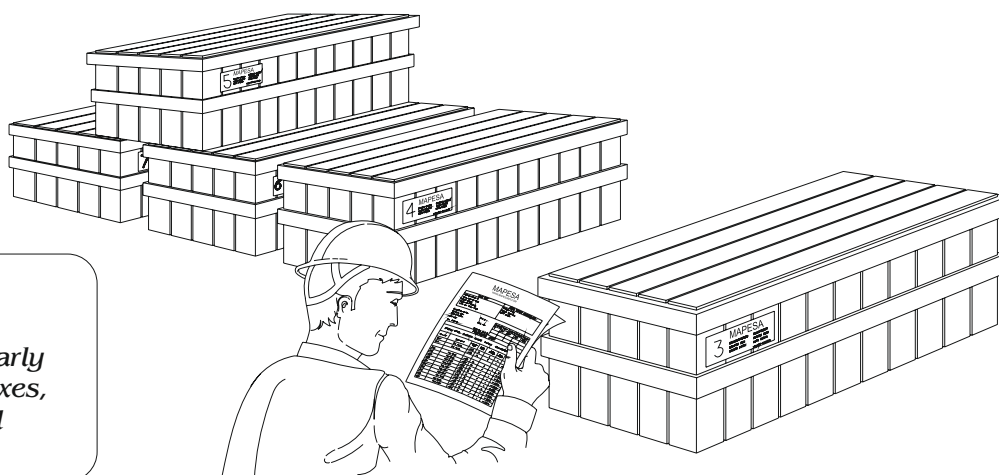
The reading of the Mapesa Tray drawing will allow the identification of each part by its reference number which corresponds to a series of trays of a given column.

Looking for Crates

Out of packing lists take the one on which you find the reference number of the part you need. Each of these lists indicates the number of the crate as well as gives a detailed listing of the contents of

Important

In the case of a particularly extensive number of boxes, an additional listing will



Looking for Parts

Each part is marked with its reference number.
Take only the part needed, leaving all others in the box.

Important

Avoid unnecessary opening and/or emptying of boxes either at random or whose number does not cross-check



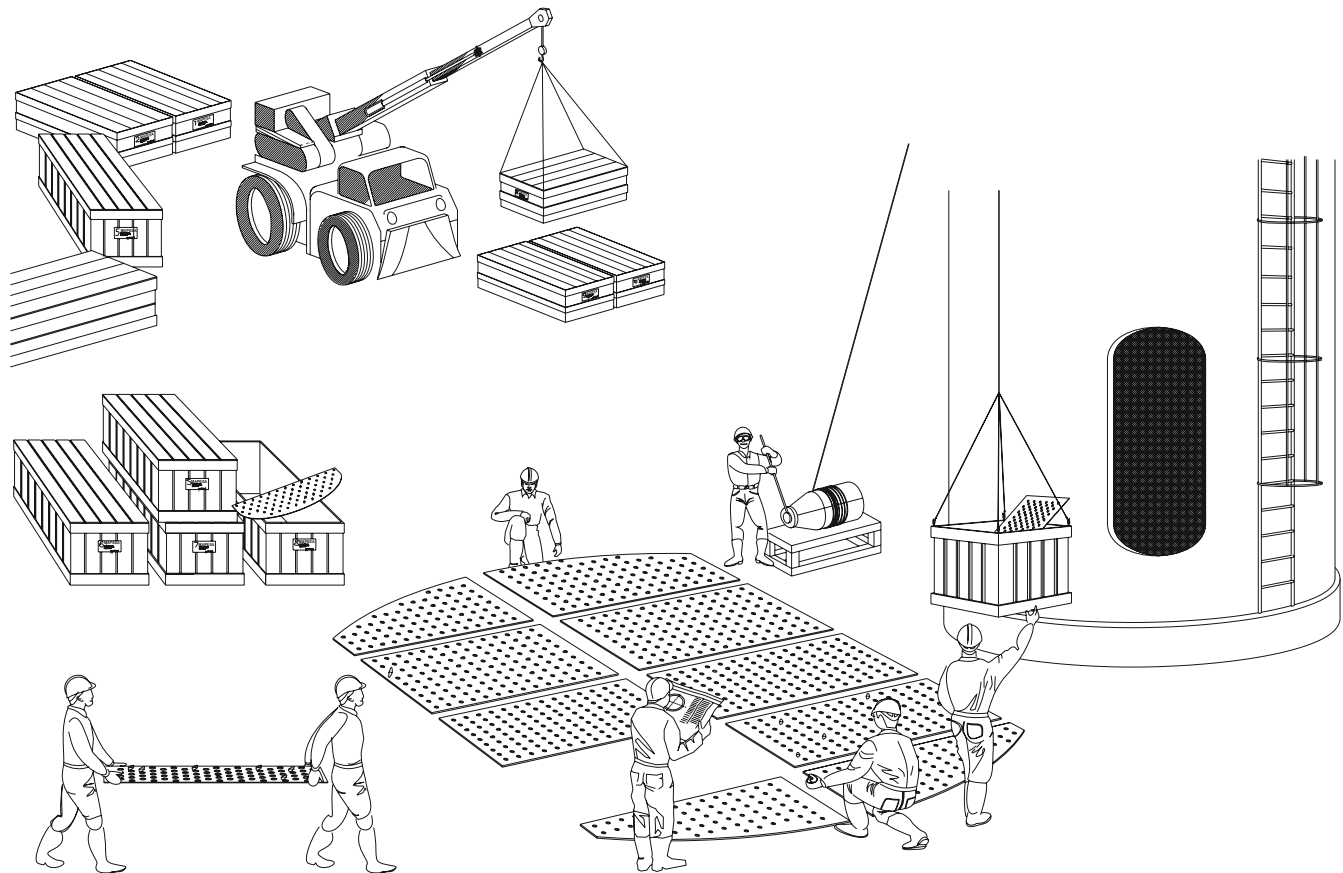
Preparing for Actual Tray Installation

1 In sorting-out area select only those boxes which contain the required parts.

2 Lay out boxes so as to match sequence of parts installation.

3 Take out parts gradually only as needed.

4 On the ground adjacent to the column, make an actual mock-up tray of each series according to its applicable drawing.



Important

The tray mock-up on the ground will allow installation personnel to:

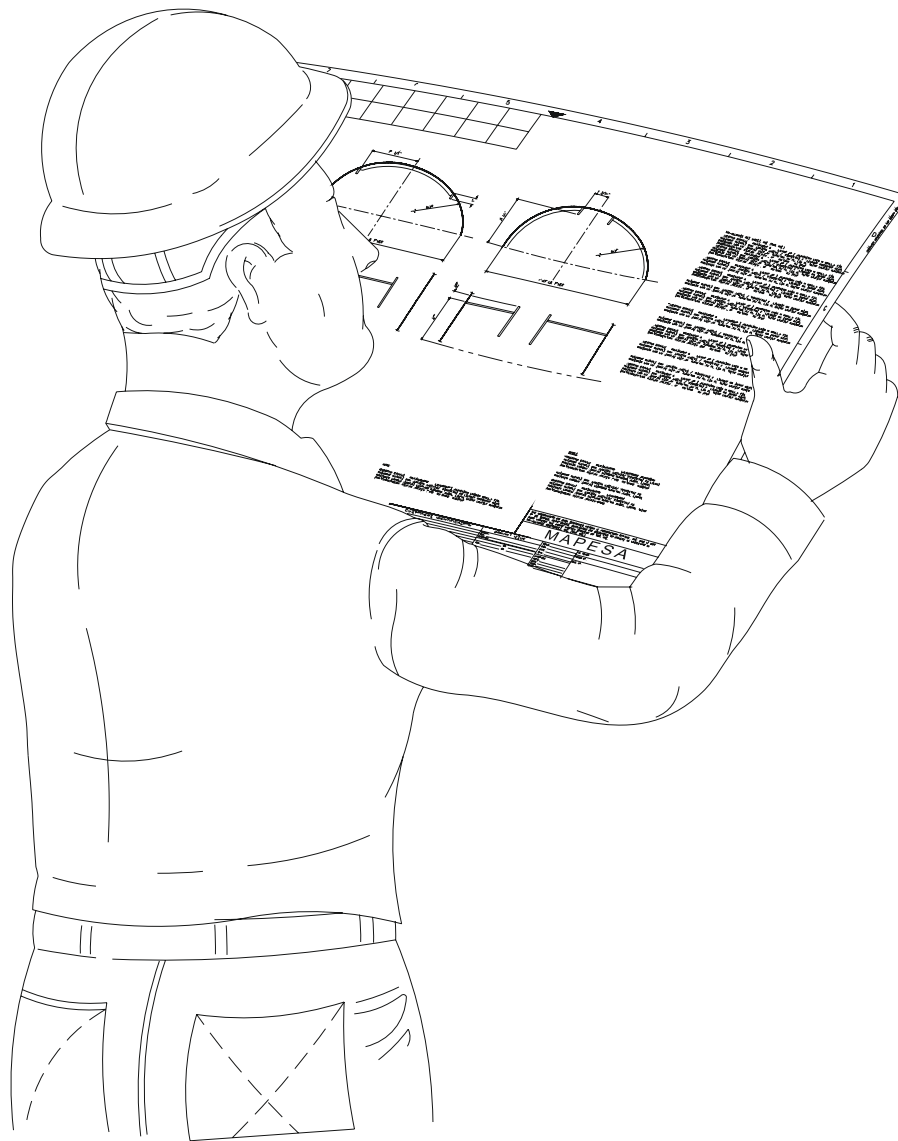
- Get familiar with Mapesa Drawings.
- Identify the relative arrangement of various parts with the help of reference marks painted on each
- Get used to the precautions to be observed when handling.
- Perform a pre-check for those items, which must be checked after installation.

Even if the layout of a mock-up may at first appear as a loss of time, extensive experience has proven that contrary is true.

Checking Prior to Installation of Trays

Utilize Mapesa tray support drawings (and not Mapesa tray drawings)

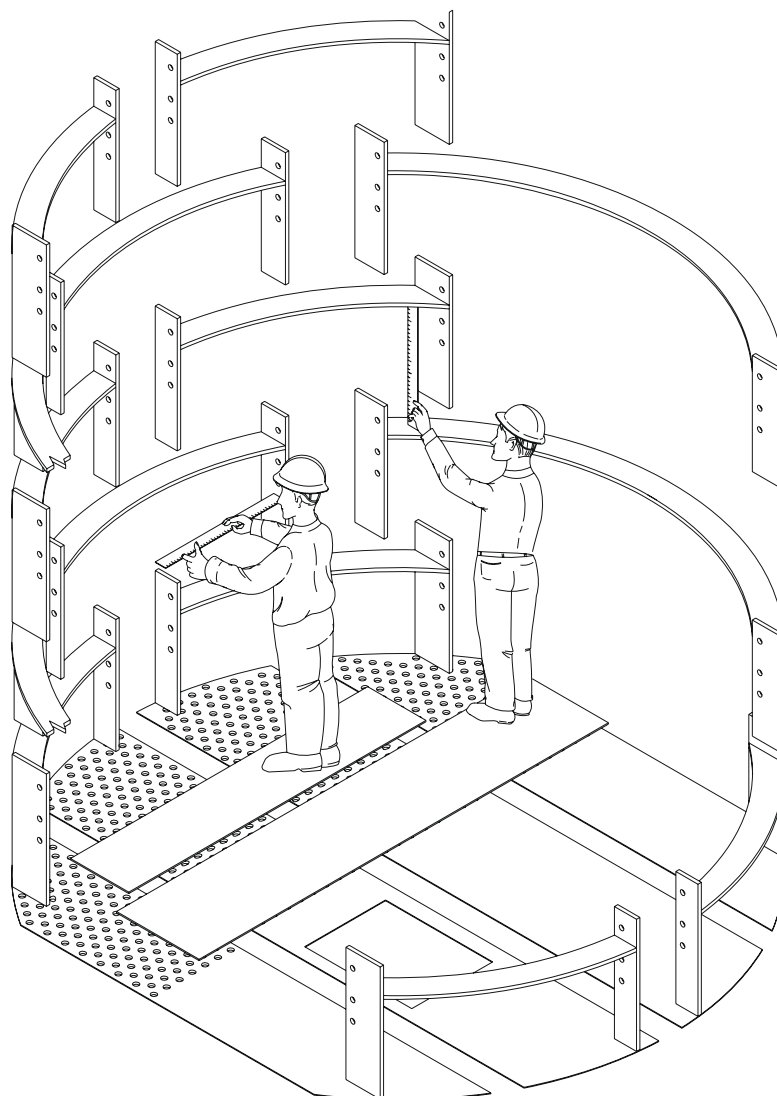
*These drawings are automatically supplied by **Mapesa** to the customer, whom we expect to transmit them to the job site. Be sure they are on hand.*



Checking Prior to Installation of Trays (cont'd)

Inside the Tower

Check that welded-in supports are in conformance with Mapesa Tray support drawings. From a practical standpoint, these checks should be undertaken tray support by tray support, prior to installing tray parts. (Note: Refer to a later section of this brochure for recommended field attachment of vessel weldments.)



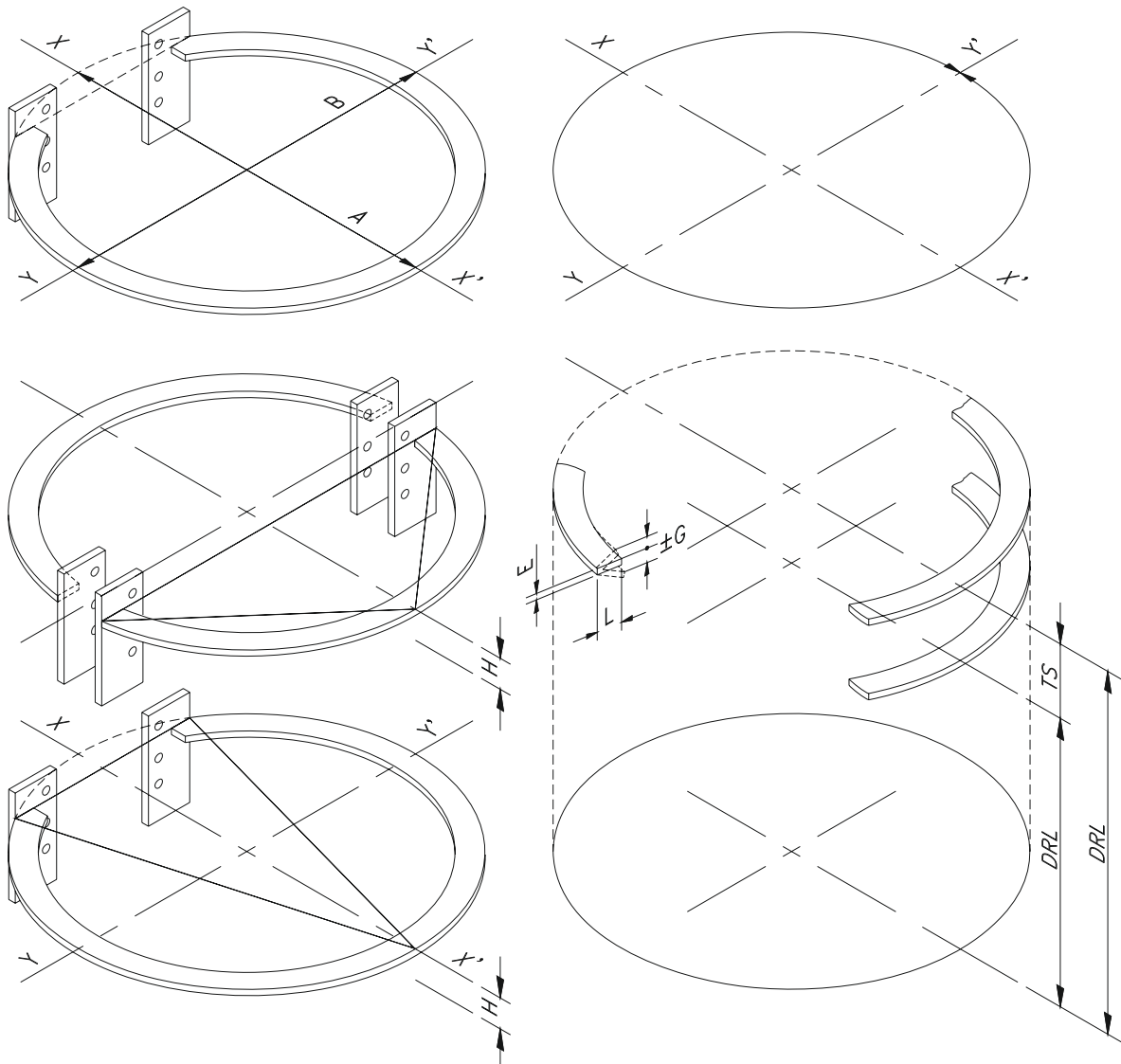
Important

These checks will avoid bringing parts in and out where difficulties or impossibilities may arise due to deviations of tray supports. Take advantage that the trays are not as yet installed to check that the main horizontal axes (XX'YY') are actually marked on the inside of the shell: (four vertical lines on the inside of the shell connecting the extremities of axes XX' YY').

Checking Prior to Installation of Trays (cont'd)

Checking support rings

- Out of roundness (A-B).
- Inside circumference of the shell.
- Horizontality (H).
- Dimensions of the welded ring, thickness (E), width (L).
- Vertical distance between two consecutive support rings (TS).
- Elevation of each support ring (DRL).
- Ring out of levelness (G).



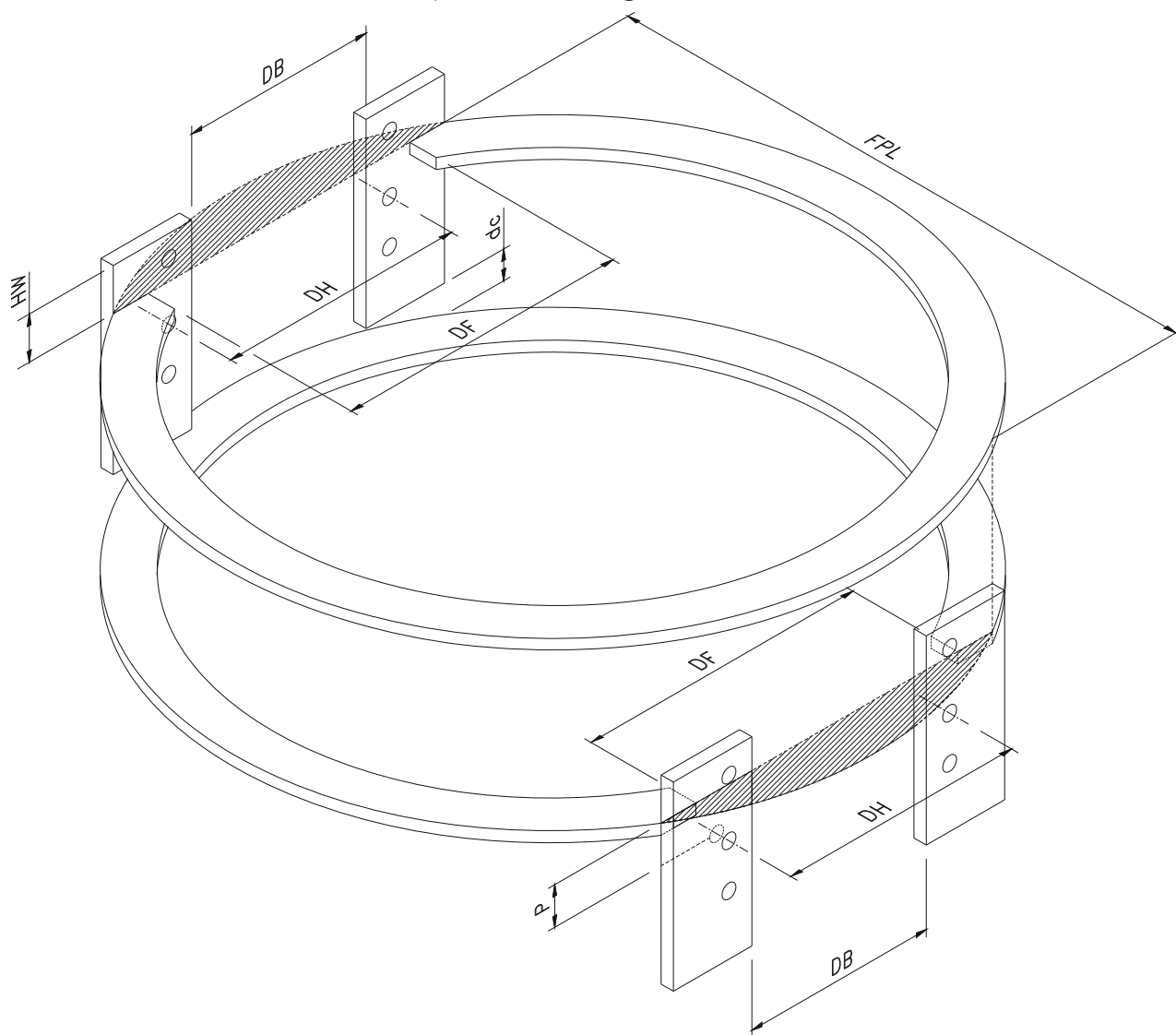
Important

Lines indicate where required dimensions or data must be measured. Dimensions themselves are either shown on Mapesa Tray support drawings or deduced therefrom.

Checking Prior to Installation of Trays (cont'd)

Checking downcomer bars for one pass trays

- Distance between bars (DB).
- Distance between holes from bar to bar (DH).
- Positioning of hole with respect to upper face of support ring (P).
- Distance between ends of support ring (DF).
- Height of outlet weir (HW).
- Downcomer clearance (dc).
- Horizontal distance between bars of consecutive trays (FPL).



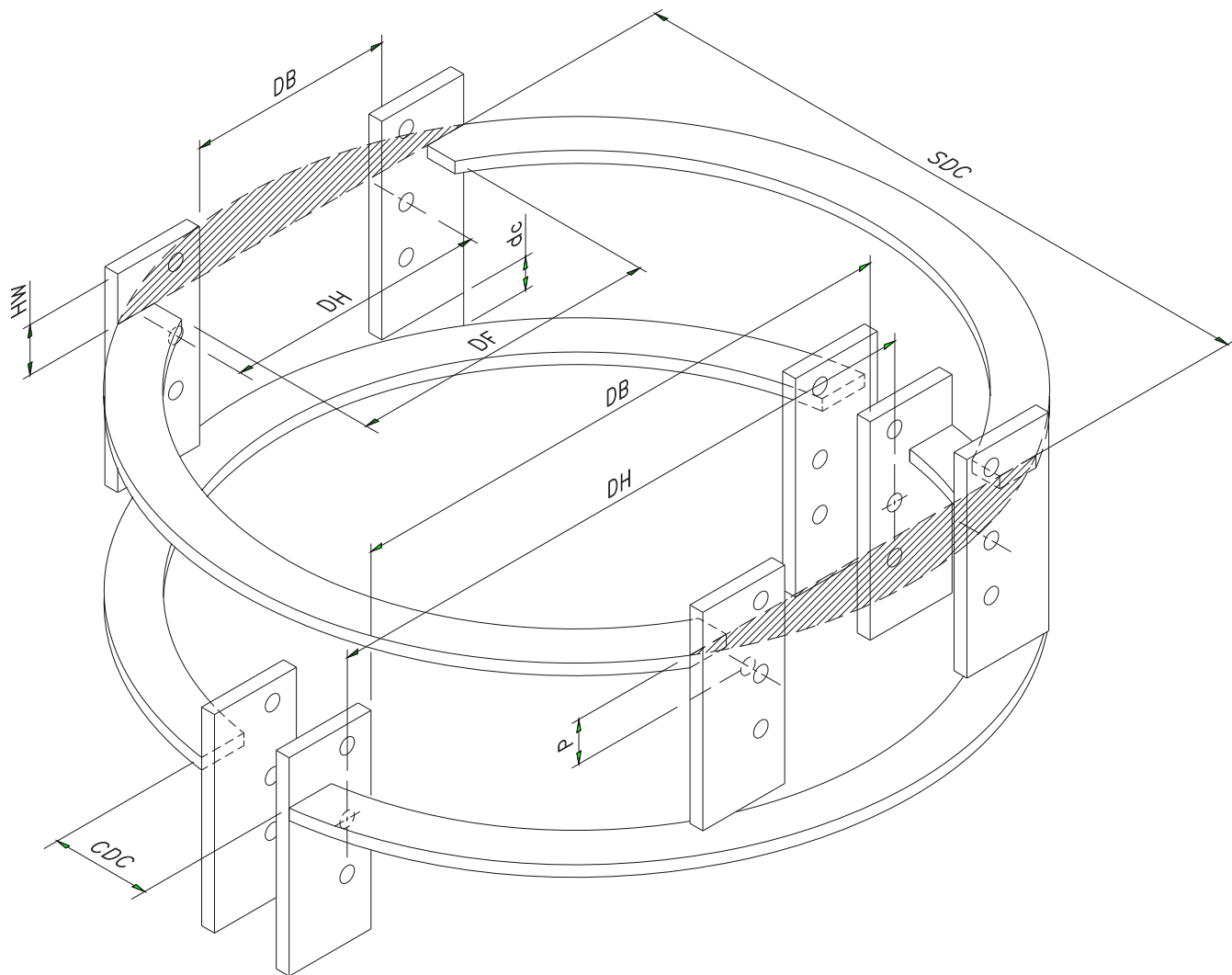
Important

Lines indicate where required dimensions or data must be measured. Dimensions themselves are either shown on Mapesa Tray support drawings or deduced therefrom.

Checking Prior to Installation of Trays (cont'd)

Checking downcomer bars for two pass trays

- Distance between bars (DB).
- Distance between holes from bar to bar (DH).
- Positioning of hole with respect to upper face of support ring (P).
- Distance between ends of support ring (DF).
- Height of outlet weir (HW).
- Downcomer clearance (dc).
- Distance between side downcomer bars (SDC)



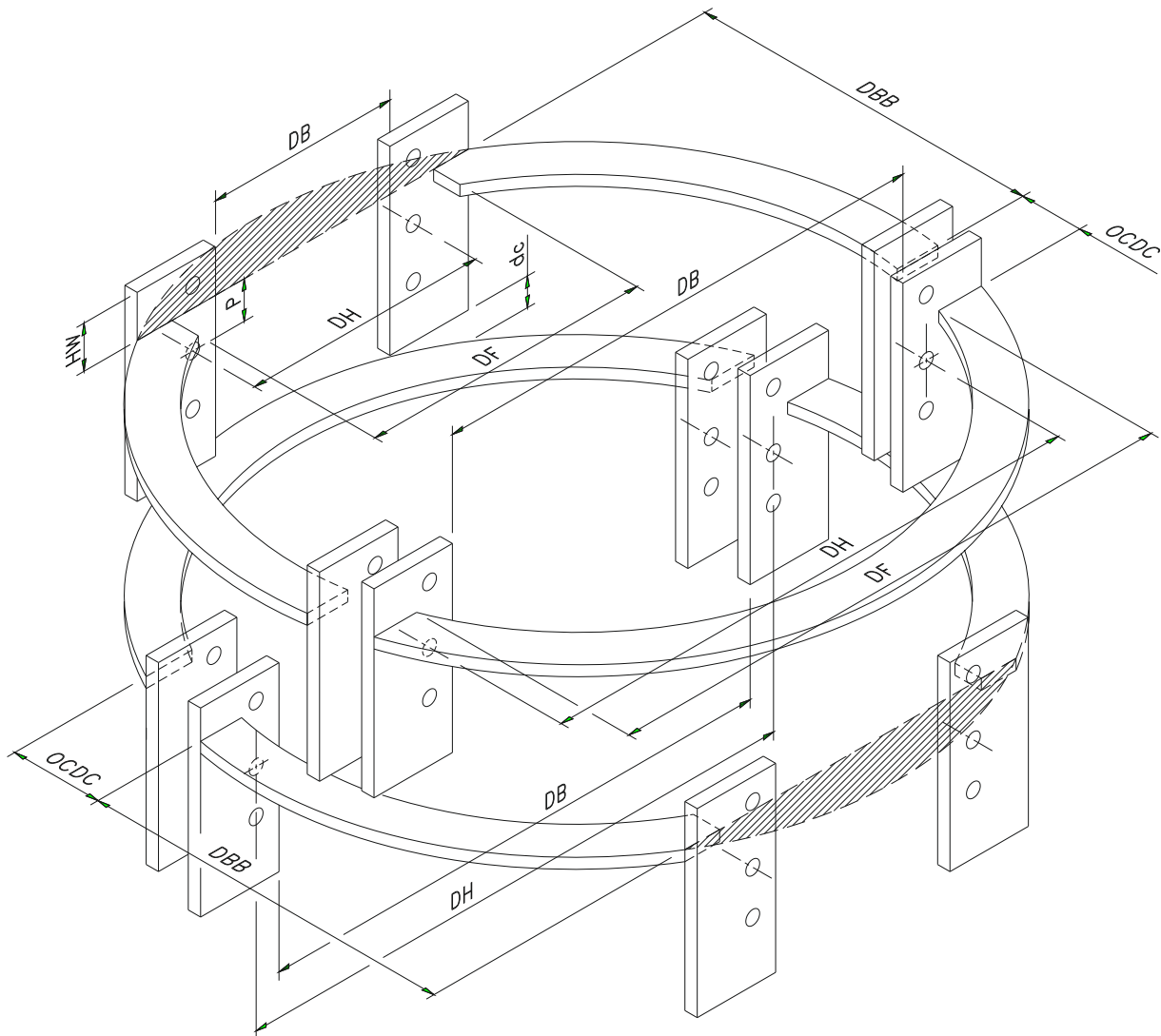
Important

Lines indicate where required dimensions or data must be measured. Dimensions themselves are either shown on Mapesa Tray support drawings or deduced therefrom.

Checking Prior to Installation of Trays (cont'd)

Checking downcomer bars for three pass trays

- Distance between bars (DB).
- Distance between holes from bar to bar (DH).
- Positioning of hole with respect to upper face of support ring (P).
- Width of intermediate downcomer (OCDC)
- Distance between ends of support ring (DF).
- Height of outlet weir (HW).
- Downcomer clearance (dc).
- Distance between side dc bar and off-center bar (DBB)



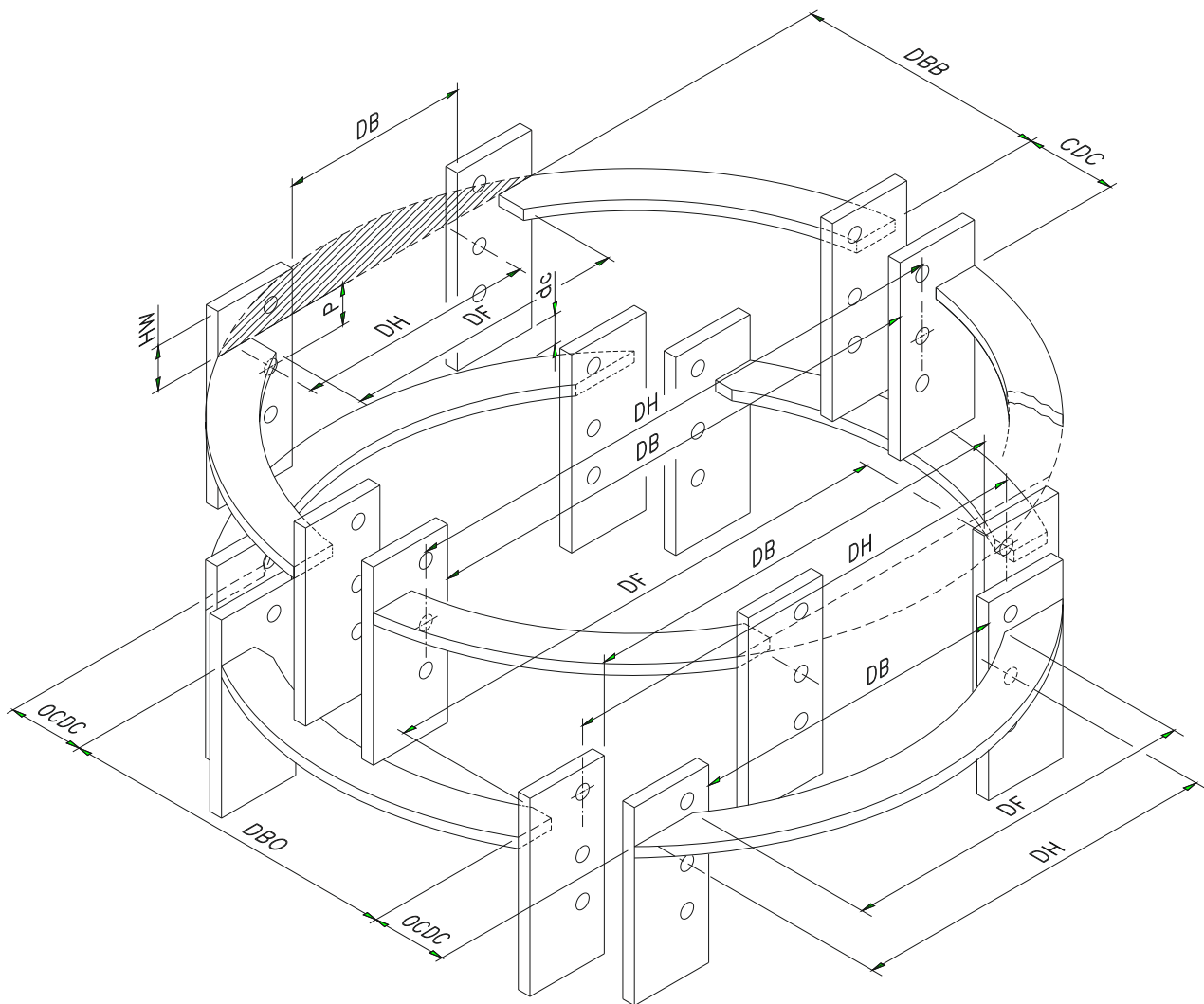
Important

Lines indicate where required dimensions or data must be measured. Dimensions themselves are either shown on Mapesa Tray support drawings or deduced therefrom.

Checking Prior to Installation of Trays (cont'd)

Checking downcomer bars for two pass trays

- Distance between bars (DB).
- Distance between holes from bar to bar (DH).
- Positioning of hole with respect to upper face of support ring (P).
- Width of center downcomer (CDC).
- Width of intermediate downcomer (OCDC).
- Distance between ends of support ring (DF).
- Downcomer clearance (dc).
- Distance between side downcomer bar and center dc bar (DBB).
- Distance between off-center dc bars (DBO).



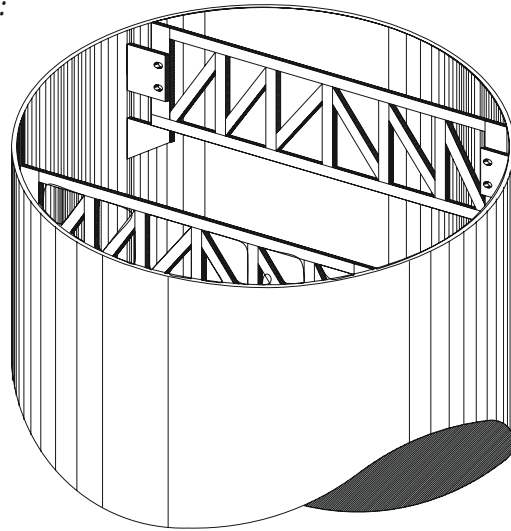
Important

Lines indicate where required dimensions or data must be measured. Dimensions themselves are either shown on Mapesa Tray support drawings or deduced therefrom.

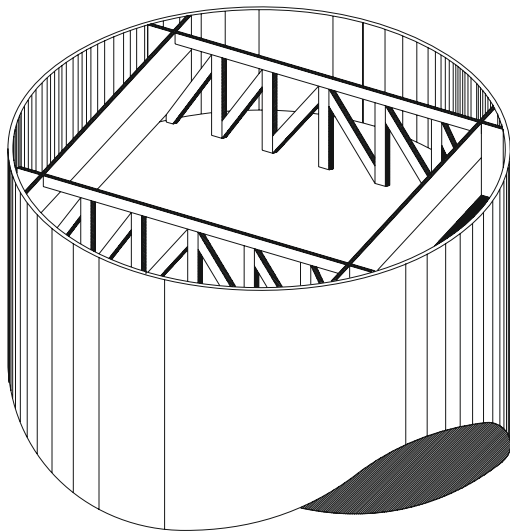
Installation Sequence

The Standard installation sequence for a tray is as follows:

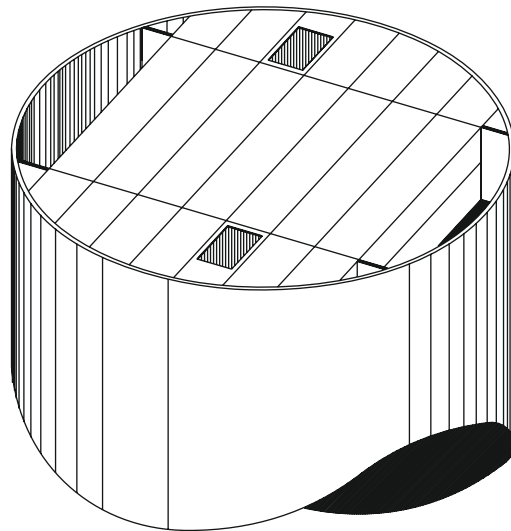
1. Beams or lattice trusses.
(for large trays).
2. Downcomer trusses and downcomer.
3. The tray decks.
(Beginning with the inlet panels)



Lattice Trusses Installed



Downcomers Installed



**Tray Decks Installed
(Manway to be Installed Last)**

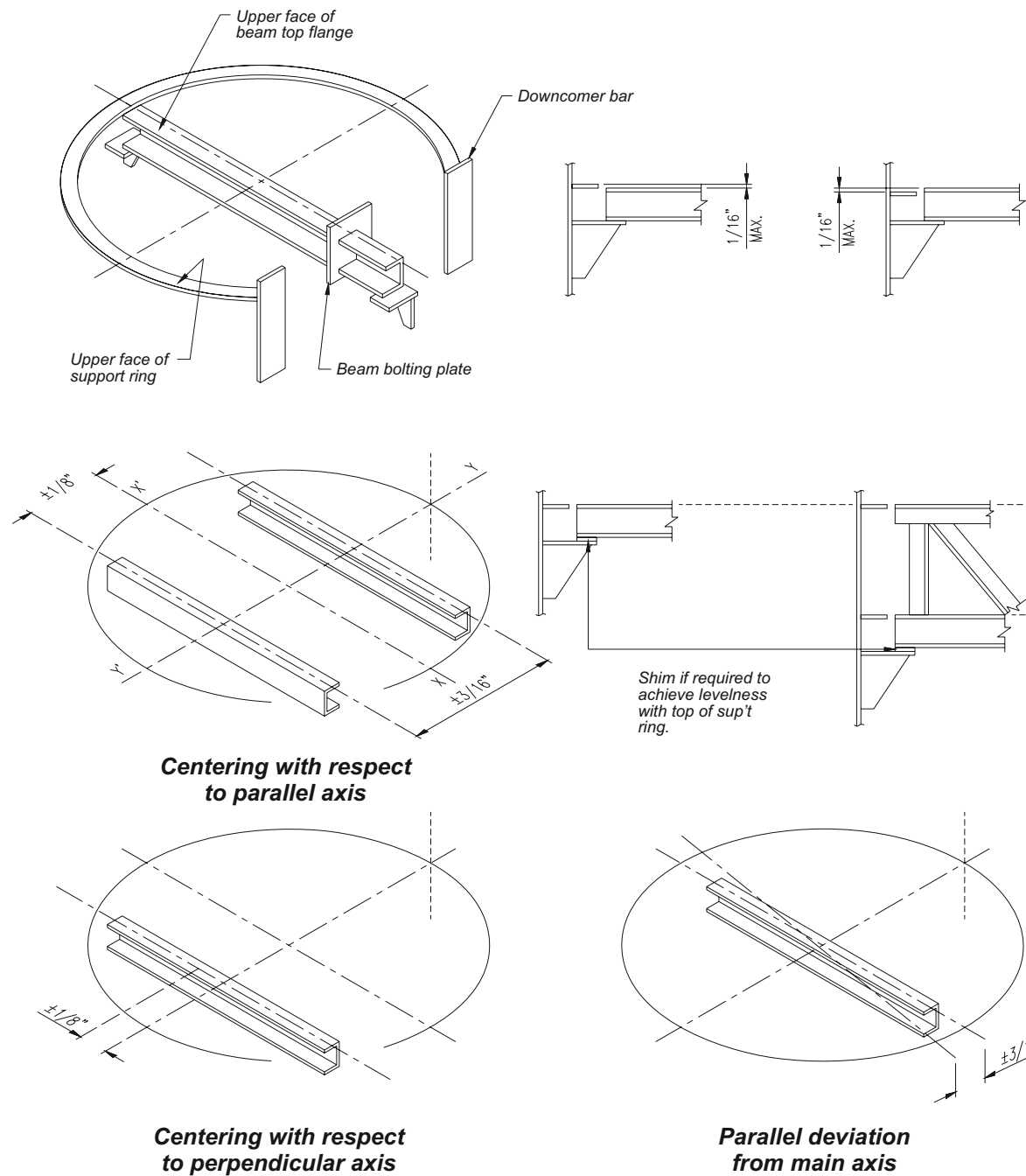
Important

Any inversion of the sequence herewith indicated involves a risk; that is the reason we highly recommend that the sequence called for in the parts list indicated on the Mapesa tray drawings be closely followed.

Installation Sequence (cont'd)

Major beam or lattice trusses

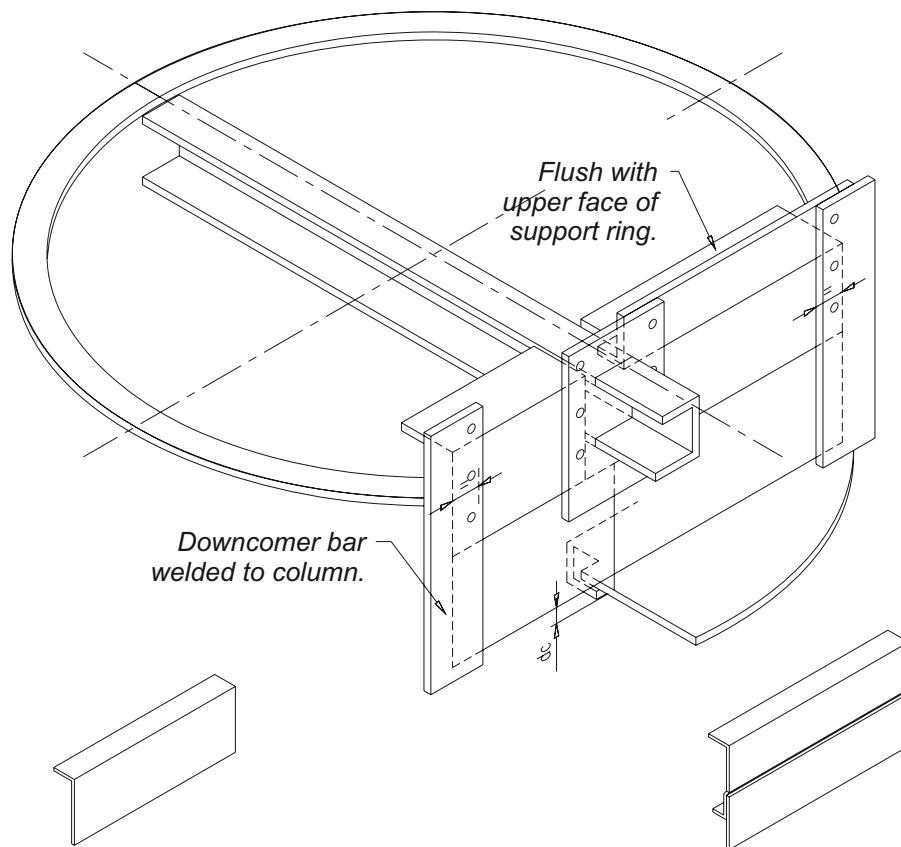
1. Where main axes XX' YY' intersect the inside of the shell make a mark and run four vertical lines on the shell connecting these marks.
2. The upper face of the beam and the upper of the support ring must be in the same horizontal plane.



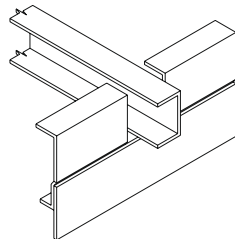
Installation Sequence (cont'd)

Downcomer trusses and downcomer panels

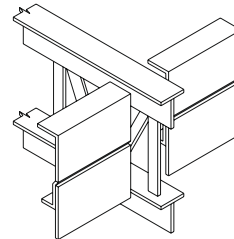
1. Start with positioning d.c. truss (upper piece)
2. Continue with lower piece. Make sure that clearance (dc) indicated on the applicable Mapesa. tray drawing is properly maintained.
3. Place intermediate panels, if applicable.



- One piece downcomer without crossing of main beam.



- Multi-piece downcomer without crossing of main beam.

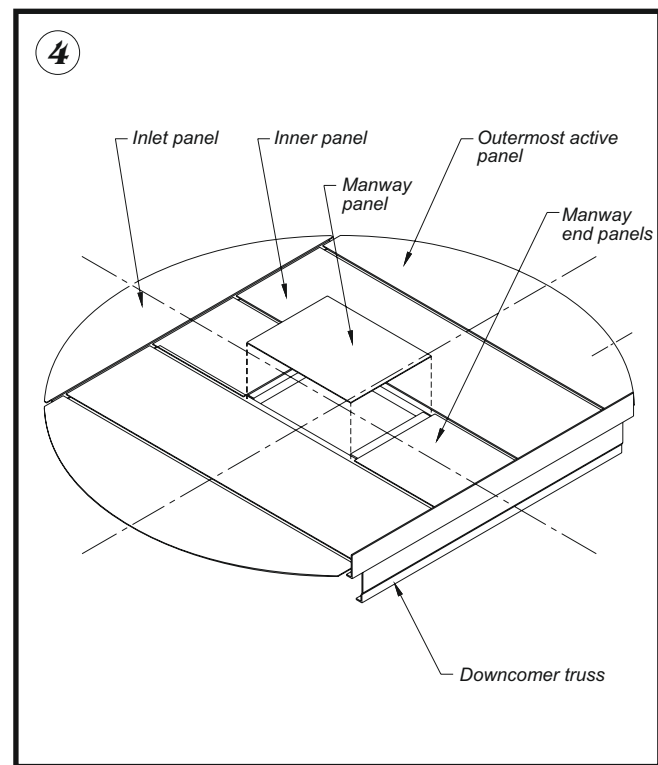
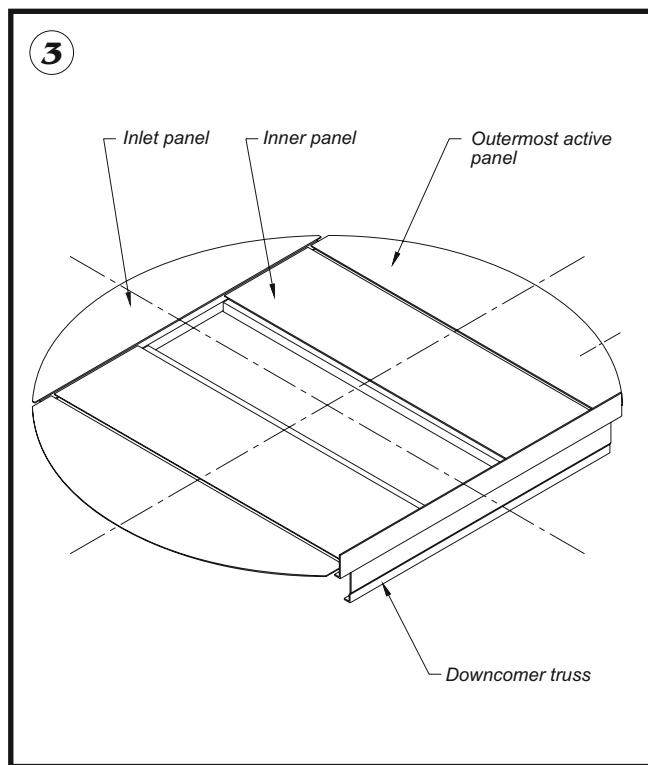
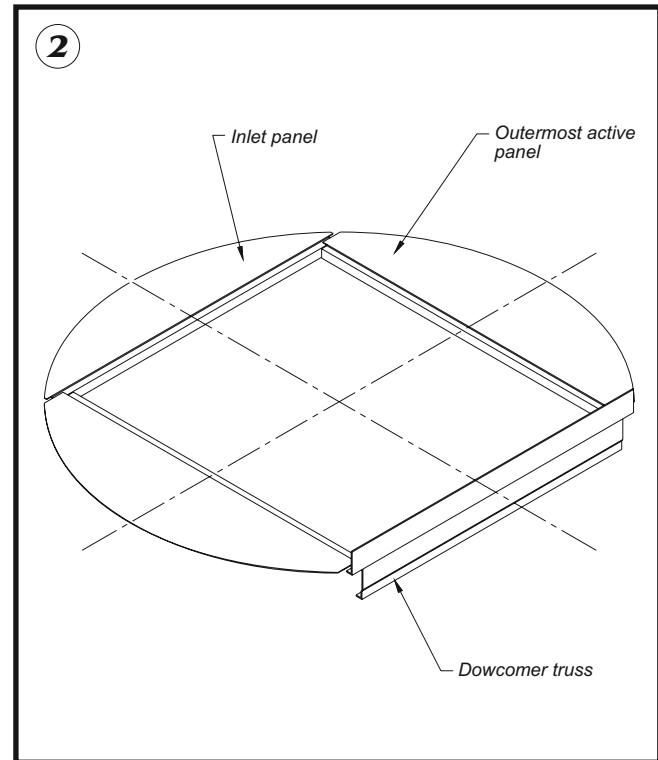
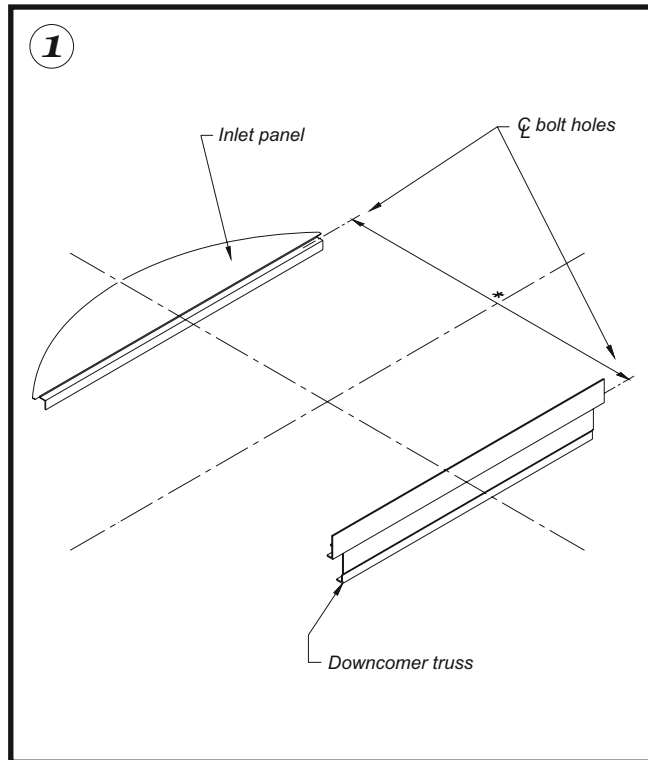


- Multi-piece downcomer, with beam crossing at downcomer truss only.

- Multi-piece downcomer, crossing of beam.

Installation Sequence (cont'd)

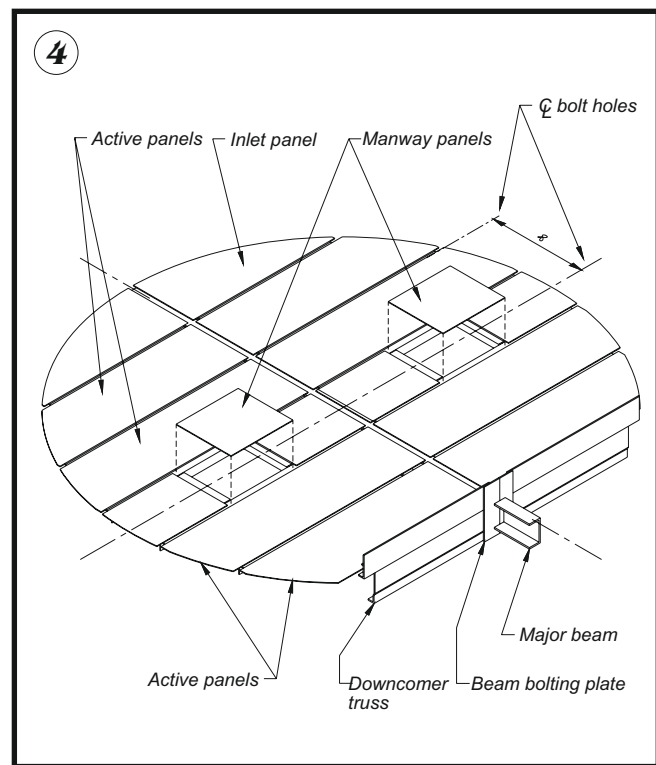
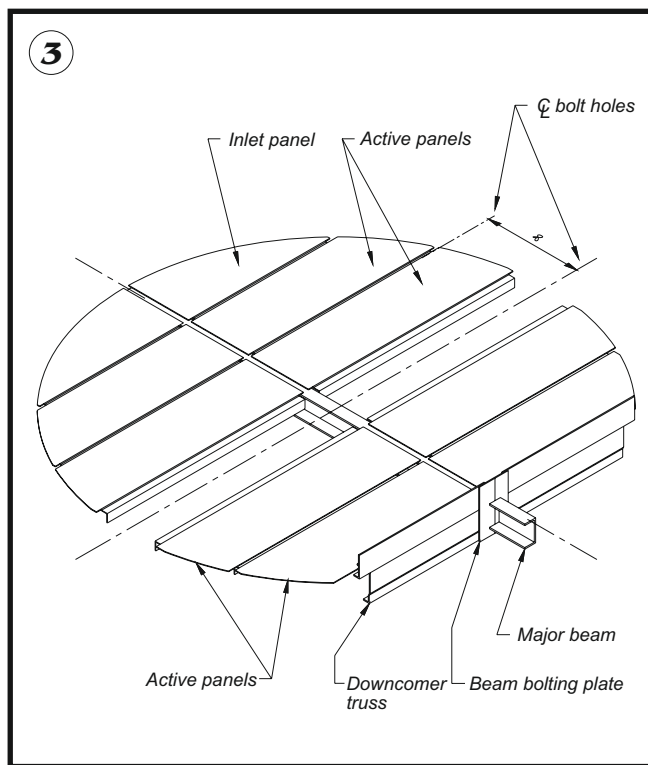
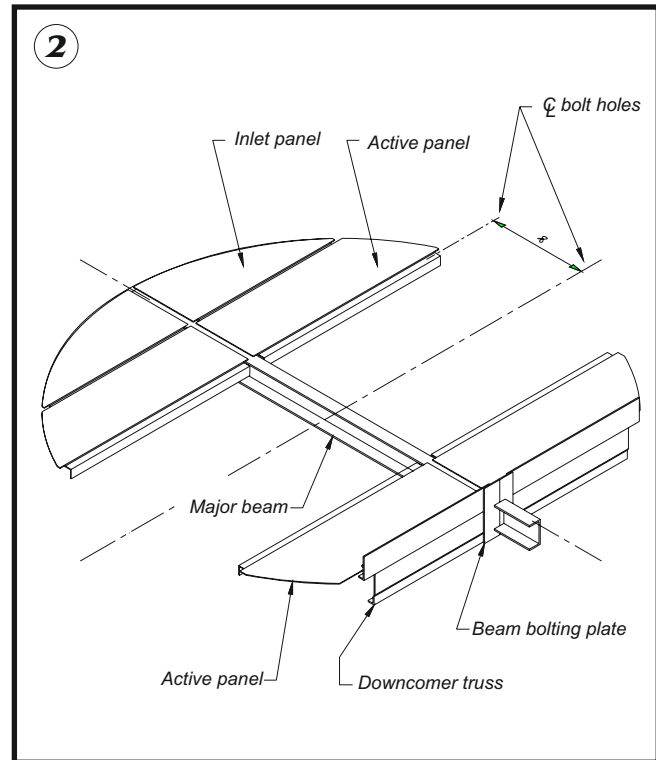
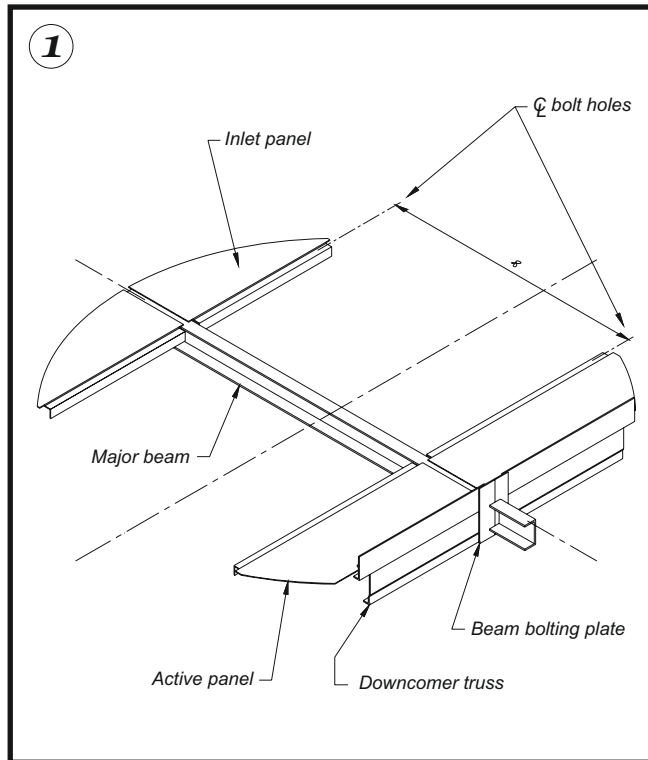
Tray decks for one pass tray without major beam



* Position during installation to follow dimensions given on Mapesa Tray layout drawings.

Installation Sequence (cont'd)

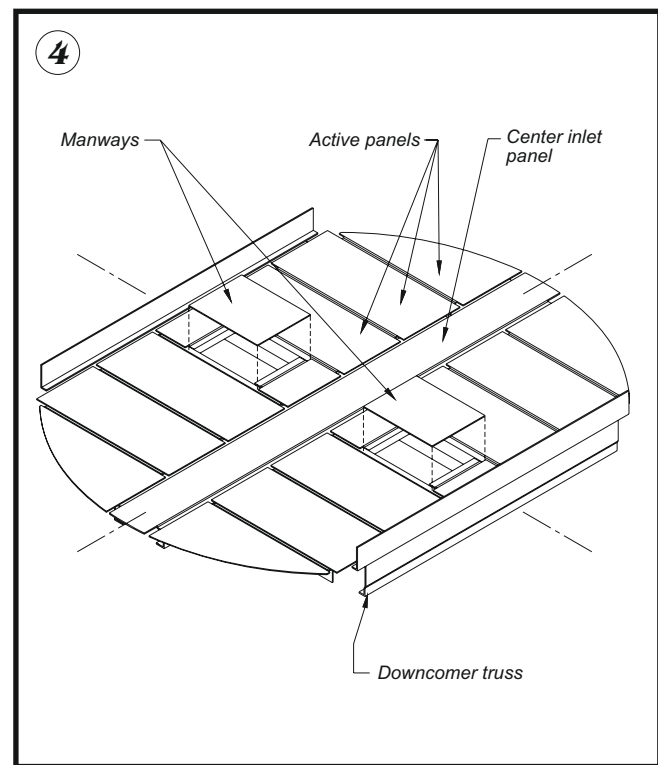
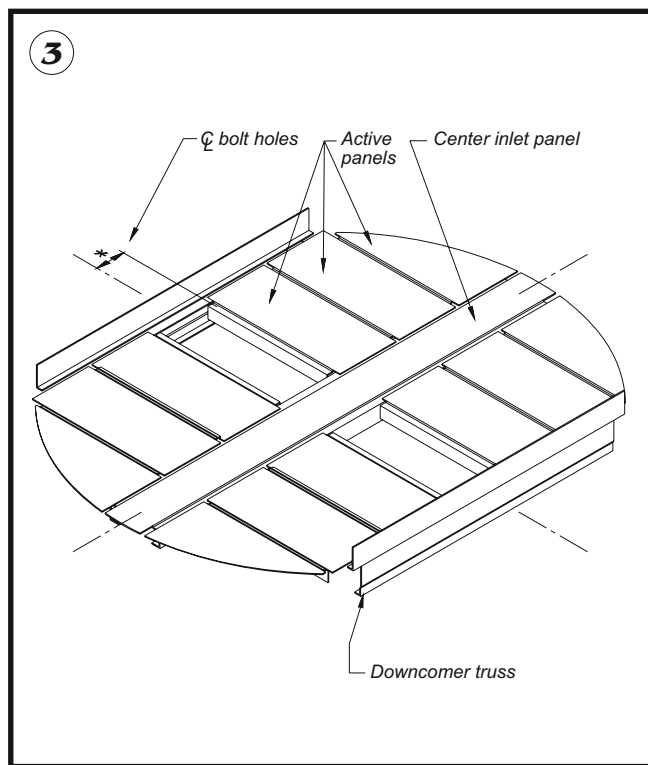
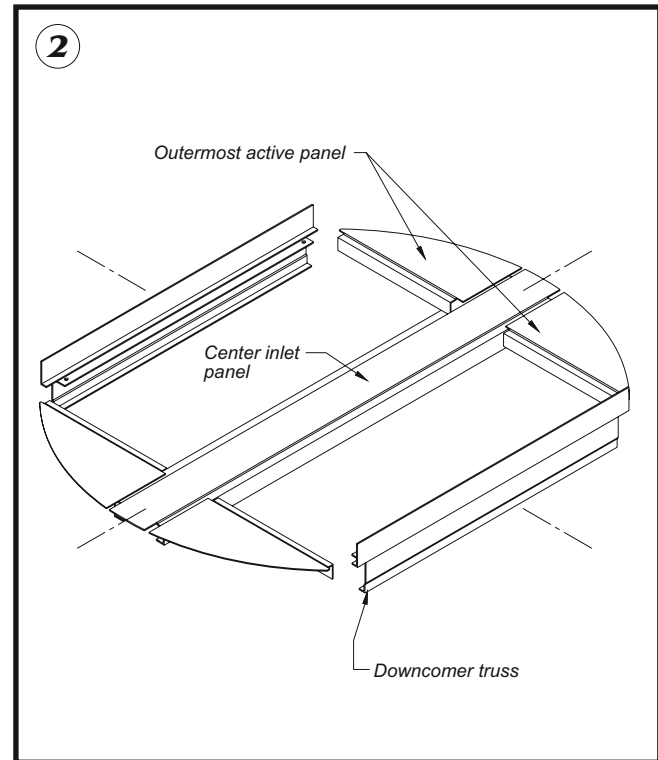
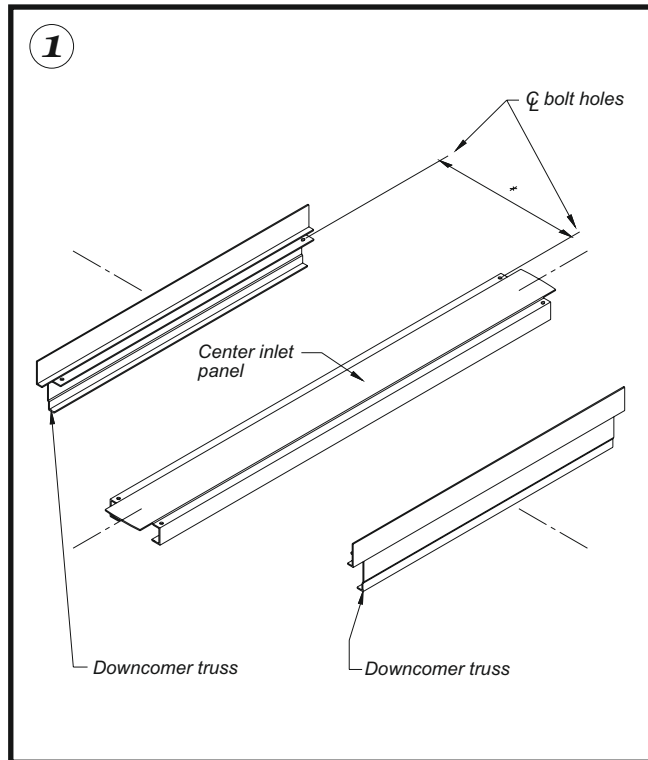
Tray decks for one pass tray with major beam



* Position during installation to follow dimensions given on Mapesa Tray layout drawings.

Installation Sequence (cont'd)

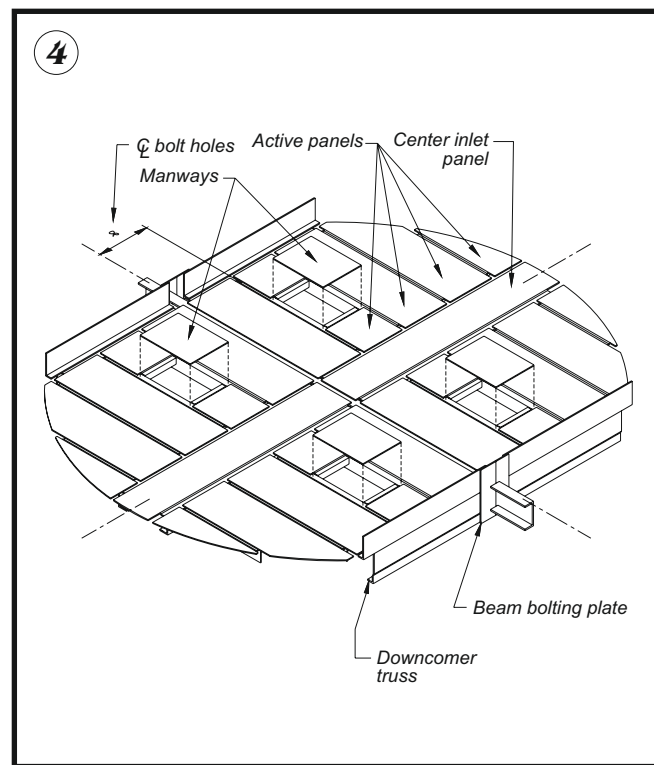
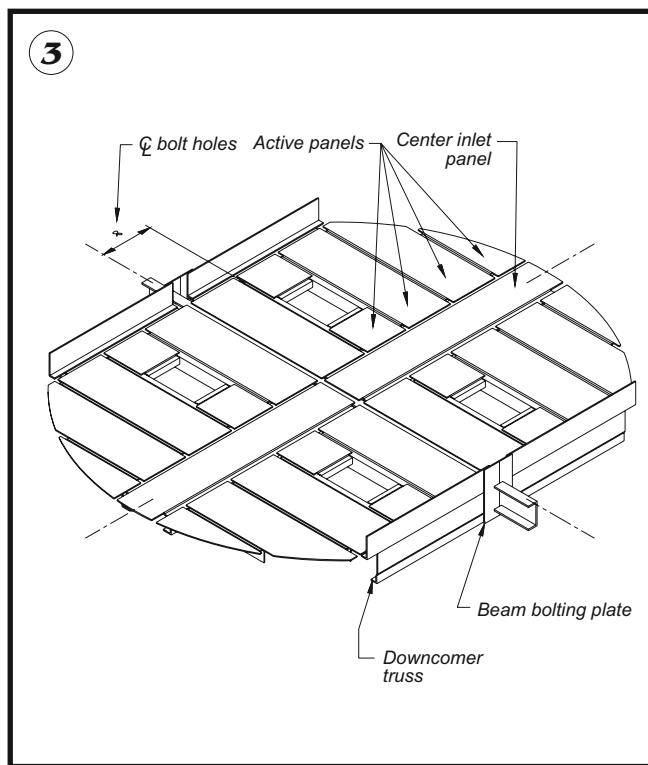
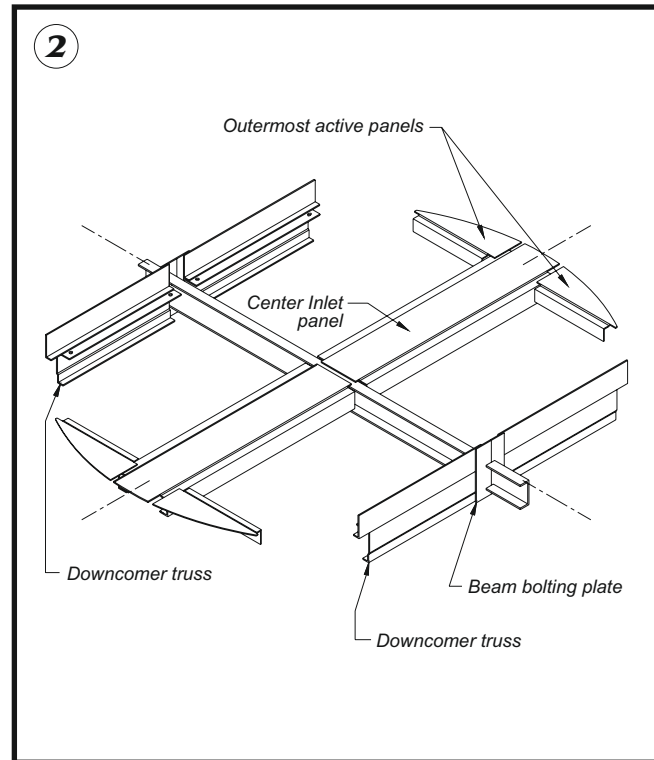
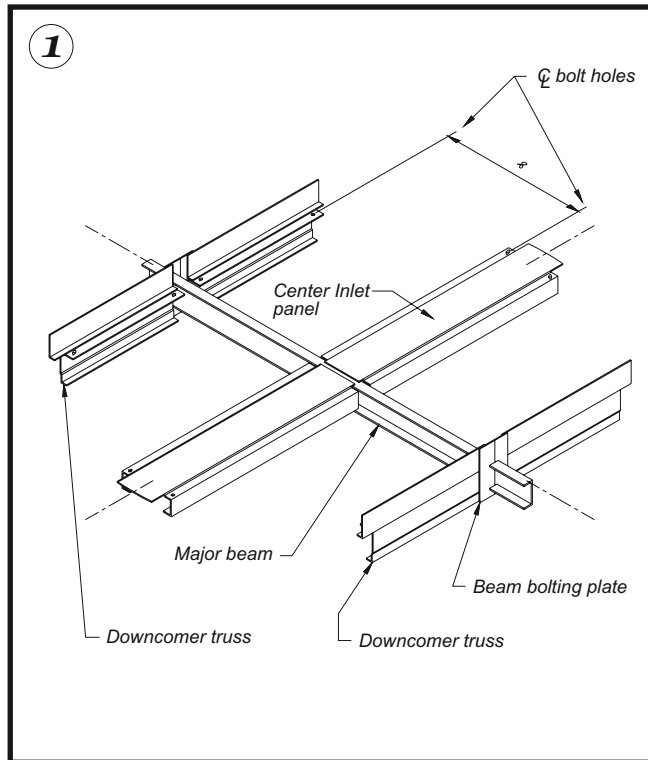
Tray decks for two pass tray without major beam



* Position during installation to follow dimensions given on Mapesa Tray layout drawings.

Installation Sequence (cont'd)

Tray decks for two pass tray with one major beam



Bolting and Hardware Assemblies

Hardware items are indicated on the parts list of drawings.

Please refer to the Mapesa. Hardware and Assembly Bulletin 325 for identification of hardware.

Bottom Tray Clamps

BTC-24 Series
(BTC-24 CLAMP WITH 3/8" WELDED NUT)

BTC-26 Series
(BTC-26 CLAMP WITH 3/8" WELDED NUT)

BTC-27 Series
(BTC-27 CLAMP WITH 3/8" WELDED NUT)

BTC-28 Series
(BTC-28 CLAMP WITH 3/8" WELDED NUT)

BTC-29 Series
(BTC-29 CLAMP WITH 3/8" WELDED NUT)

BTC-30 Series
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BTC-31 Series
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BTC-32 Series
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BTC-97 Series
(BTC-97 CLAMP WITH 3/8" WELDED NUT)

BTC-98 Series
(BTC-98 CLAMP WITH 3/8" WELDED NUT)

BTC-99 Series
(BTC-99 CLAMP WITH 3/8" WELDED NUT)

BTC-100 Series
(BTC-100 CLAMP WITH 3/8" WELDED NUT)

Bottom Tray Clamps

BTC-50
(BTC-50 CLAMP WITH 3/8" WELDED NUT)

BTC-51
(BTC-51 CLAMP WITH 3/8" WELDED NUT)

BTC-52
(BTC-52 CLAMP WITH 3/8" WELDED NUT)

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(BTC-53 CLAMP WITH 3/8" WELDED NUT)

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(BTC-68 CLAMP WITH 3/8" WELDED NUT)

BTC-69
(BTC-69 CLAMP WITH 3/8" WELDED NUT)

BTC-70
(BTC-70 CLAMP WITH 3/8" WELDED NUT)

BTC-71
(BTC-71 CLAMP WITH 3/8" WELDED NUT)

BTC-72
(BTC-72 CLAMP WITH 3/8" WELDED NUT)

BTC-73
(BTC-73 CLAMP WITH 3/8" WELDED NUT)

BTC-74
(BTC-74 CLAMP WITH 3/8" WELDED NUT)

BTC-75
(BTC-75 CLAMP WITH 3/8" WELDED NUT)

BTC-76
(BTC-76 CLAMP WITH 3/8" WELDED NUT)

BTC-77
(BTC-77 CLAMP WITH 3/8" WELDED NUT)

BTC-78
(BTC-78 CLAMP WITH 3/8" WELDED NUT)

BTC-79
(BTC-79 CLAMP WITH 3/8" WELDED NUT)

BTC-80
(BTC-80 CLAMP WITH 3/8" WELDED NUT)

BTC-81
(BTC-81 CLAMP WITH 3/8" WELDED NUT)

BTC-82
(BTC-82 CLAMP WITH 3/8" WELDED NUT)

BTC-83
(BTC-83 CLAMP WITH 3/8" WELDED NUT)

BTC-84
(BTC-84 CLAMP WITH 3/8" WELDED NUT)

BTC-85
(BTC-85 CLAMP WITH 3/8" WELDED NUT)

BTC-86
(BTC-86 CLAMP WITH 3/8" WELDED NUT)

BTC-87
(BTC-87 CLAMP WITH 3/8" WELDED NUT)

BTC-88
(BTC-88 CLAMP WITH 3/8" WELDED NUT)

BTC-89
(BTC-89 CLAMP WITH 3/8" WELDED NUT)

BTC-90
(BTC-90 CLAMP WITH 3/8" WELDED NUT)

BTC-91
(BTC-91 CLAMP WITH 3/8" WELDED NUT)

BTC-92
(BTC-92 CLAMP WITH 3/8" WELDED NUT)

BTC-93
(BTC-93 CLAMP WITH 3/8" WELDED NUT)

BTC-94
(BTC-94 CLAMP WITH 3/8" WELDED NUT)

BTC-95
(BTC-95 CLAMP WITH 3/8" WELDED NUT)

BTC-96
(BTC-96 CLAMP WITH 3/8" WELDED NUT)

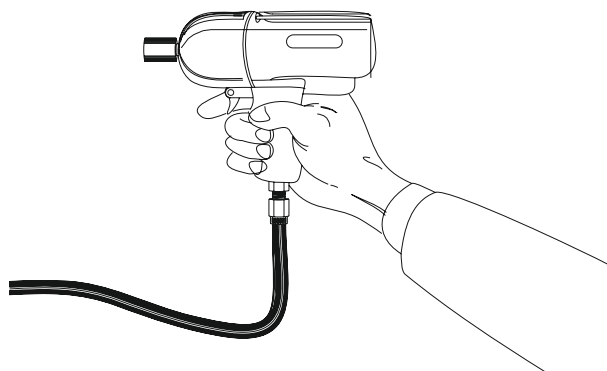
BTC-97
(BTC-97 CLAMP WITH 3/8" WELDED NUT)

BTC-98
(BTC-98 CLAMP WITH 3/8" WELDED NUT)

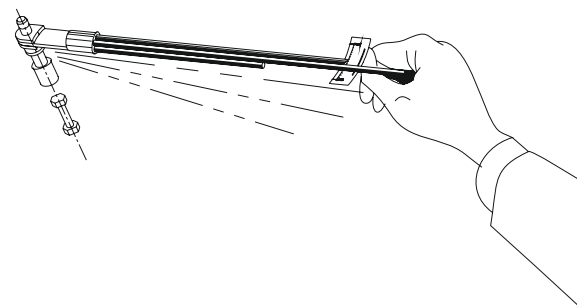
BTC-99
(BTC-99 CLAMP WITH 3/8" WELDED NUT)

BTC-100
(BTC-100 CLAMP WITH 3/8" WELDED NUT)

Use a pneumatic bolting machine with torque limiting device to automatically stop when reaching desired tightness.



To control tightness, use a dynamically balanced wrench.



Important

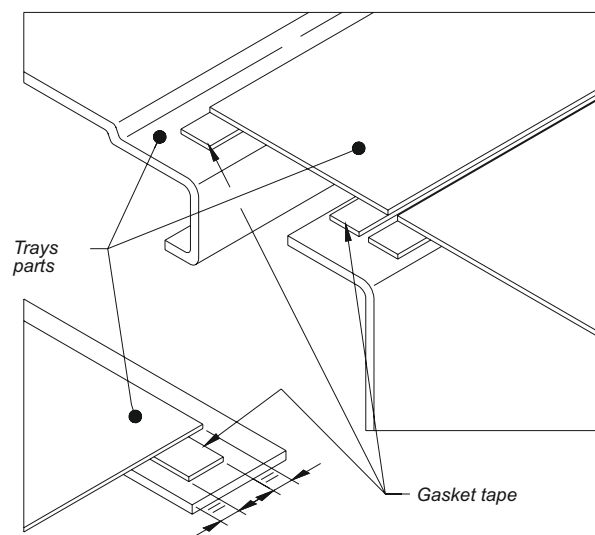
It is advisable to lubricate all bolts and nuts in order to speed-up installation work. The use of bolting machines or wrenches with automatic torque limiting device will help achieve the optimum tightness.

Gasket Installation

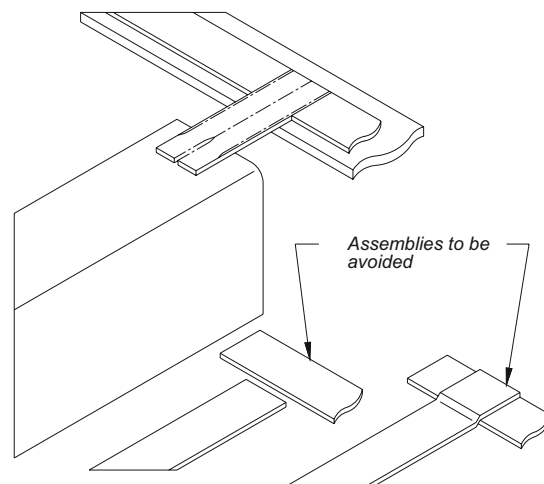
General notes on the applicable Mapesa tray layout drawing will indicate whether trays are to be assembled and installed with or without gaskets.

If gaskets are required, they must be put in place with extreme care. Trays assembled without gaskets may actually leak less than trays with improperly installed gaskets.

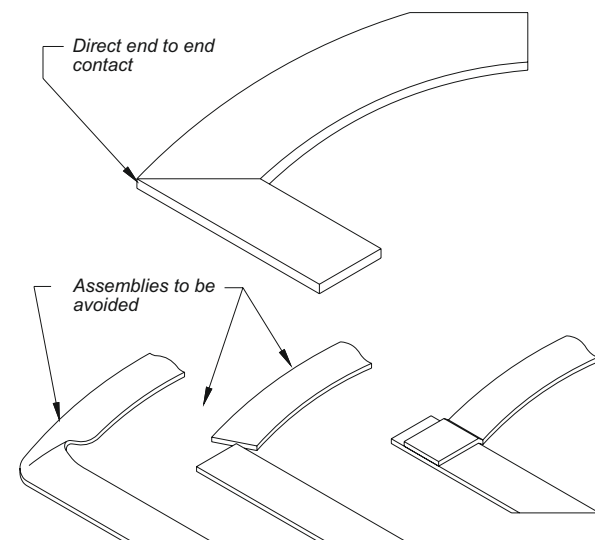
Positioning of gasket tape



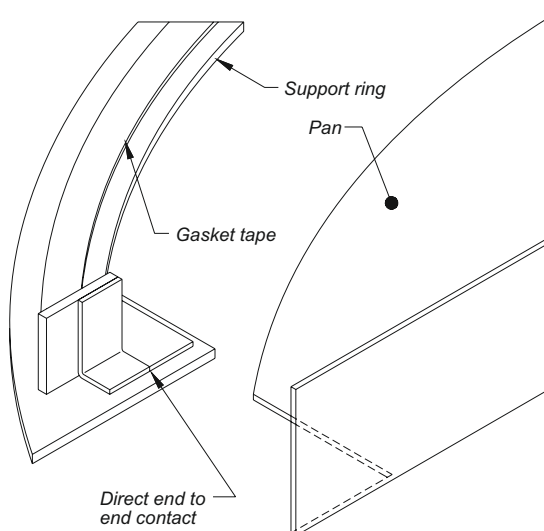
Intersecting gasket tape



Angular turn of gasket tape

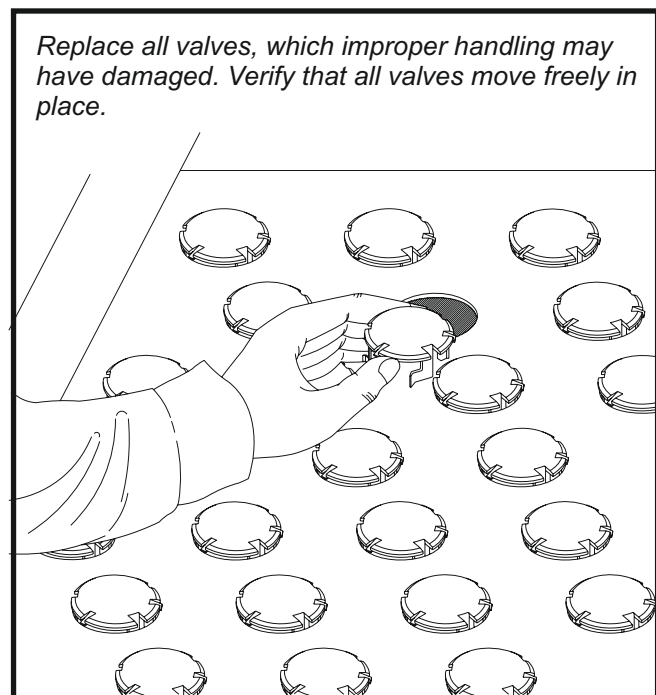
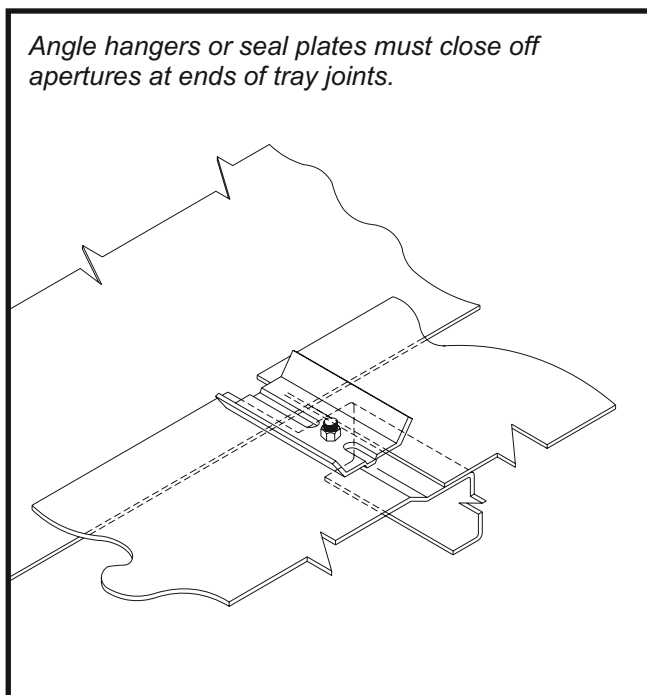
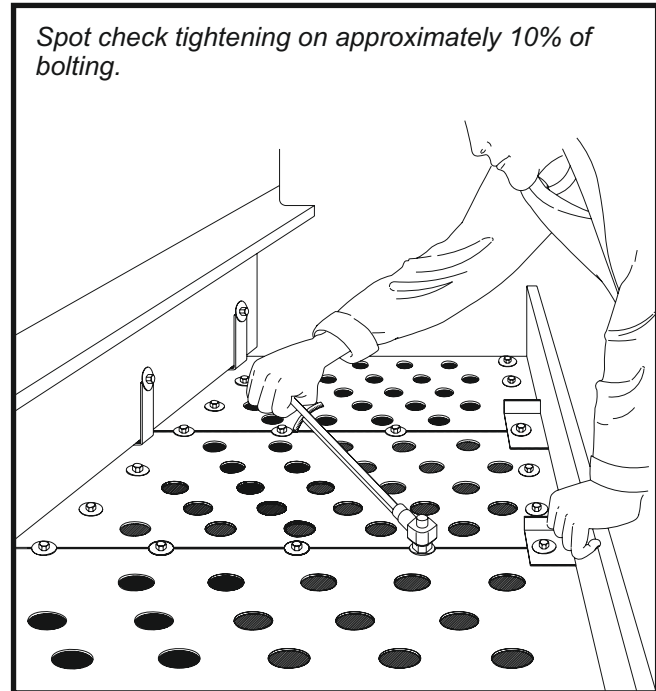
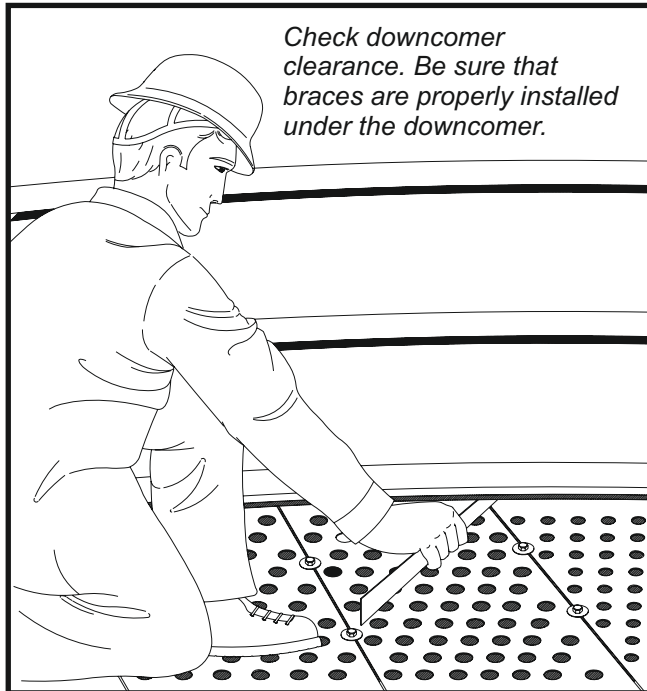


Seal pan requiring gasket tape



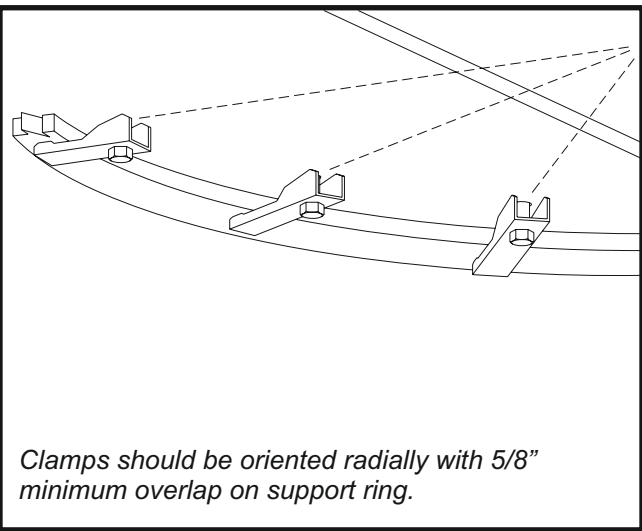
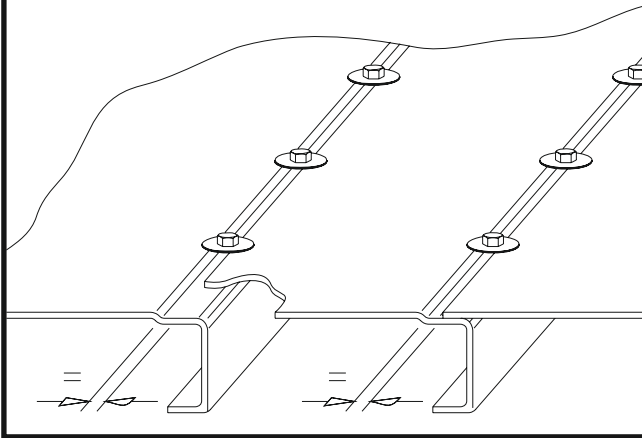
Inspection Pointers

A final check before installation of manways is necessary. Based on previous experience, the following points should be carefully observed:



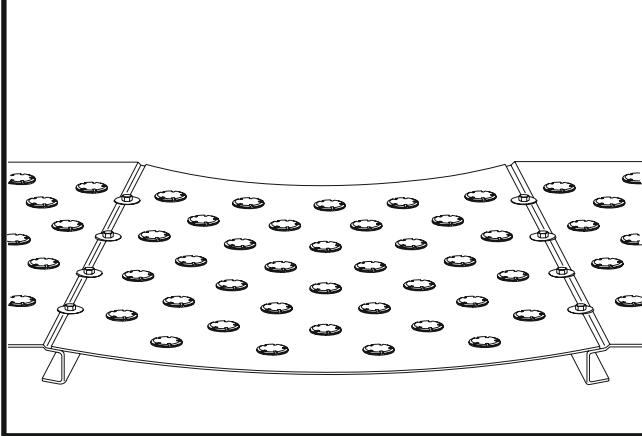
Inspection Pointers (cont'd)

Ensure balanced distribution of gaps between tray panels.

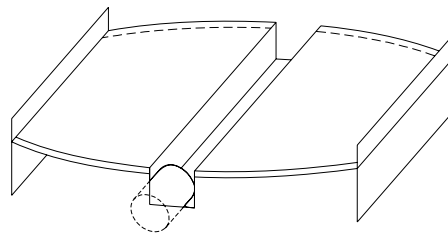


Clamps should be oriented radially with 5/8" minimum overlap on support ring.

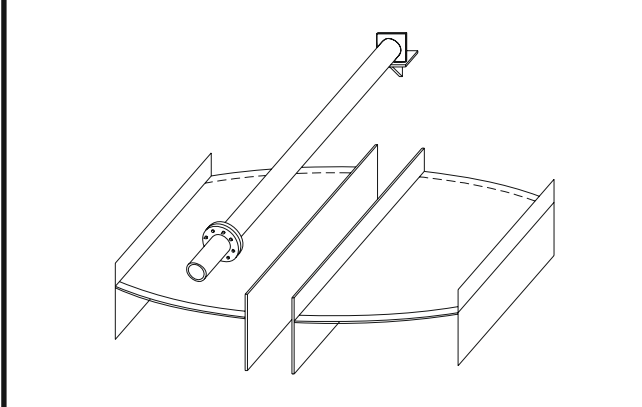
Levelness of trays should not deflect due to work during installation.



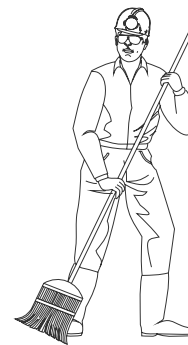
Ensure that sumps are properly installed, that downflow troughs and/or draw-off pans face corresponding nozzle openings and that notches in the seal pan weirs direct liquid flow into appropriate areas.



Trays must not be used as a support for internal piping, unless so indicated by applicable Mapesa Drawings.



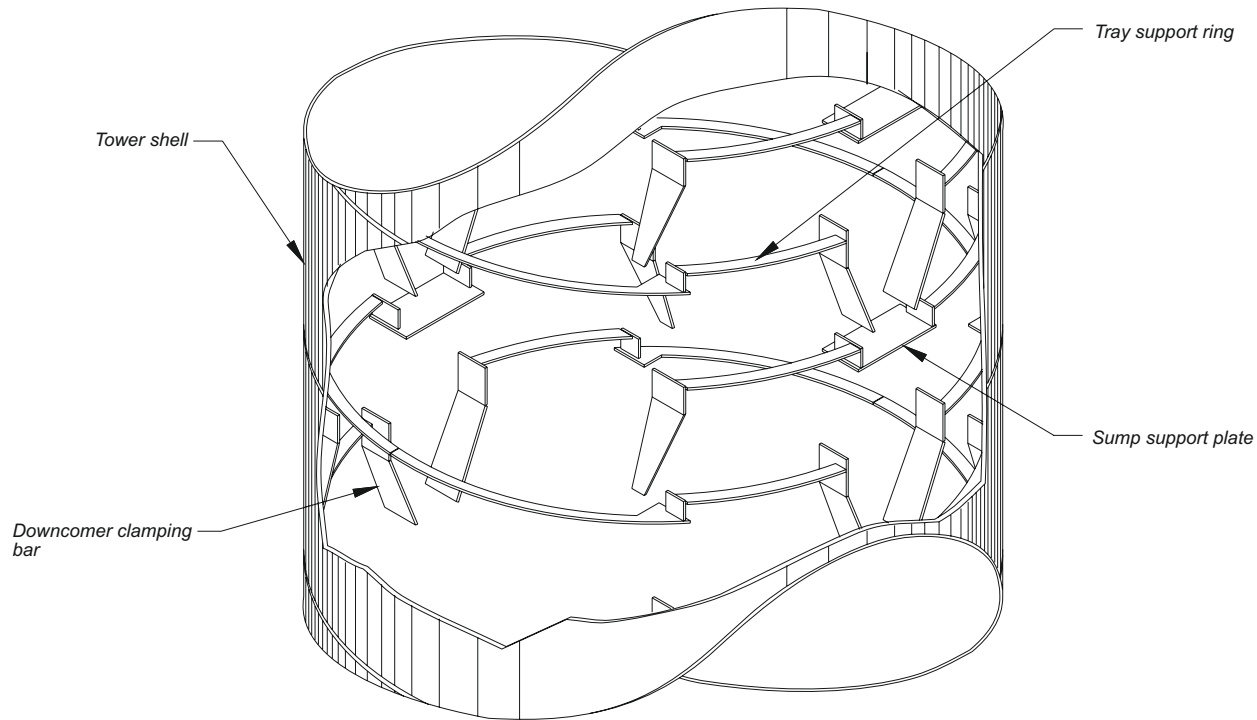
Trays must be cleared of any and all loose matter (hardware, surplus gasketing, goggles, protection masks, tools, etc.) Which may have adverse effects on tray performance.



General Information Concerning Tower Attachments

Purpose:

This section of this brochure defines the standards and methods used by the field to install attachments to the inside of vessels by means of welding.



Typical Tower Section Depicting Installed Tower Attachments Prior to Tray Installation

Definitions:

Tower Attachments: Any weldment that is installed on the inside of a vessel, tank, or tower. Examples of tower attachments addressed in this specification are tray support rings, downcomer clamping bars, beam seats, bolting clips, etc.

Clad Vessel: A vessel or vessel section that is constructed of a roll bond clad material. The cladding is an integral part of the vessel wall. For purposes of this specification, overlay shall be considered to be equivalent to cladding.

Lined Vessel: A vessel or vessel section that has a strip lining or other type of liner installed on the parent metal. The liner is not necessarily an integral part of the vessel wall.

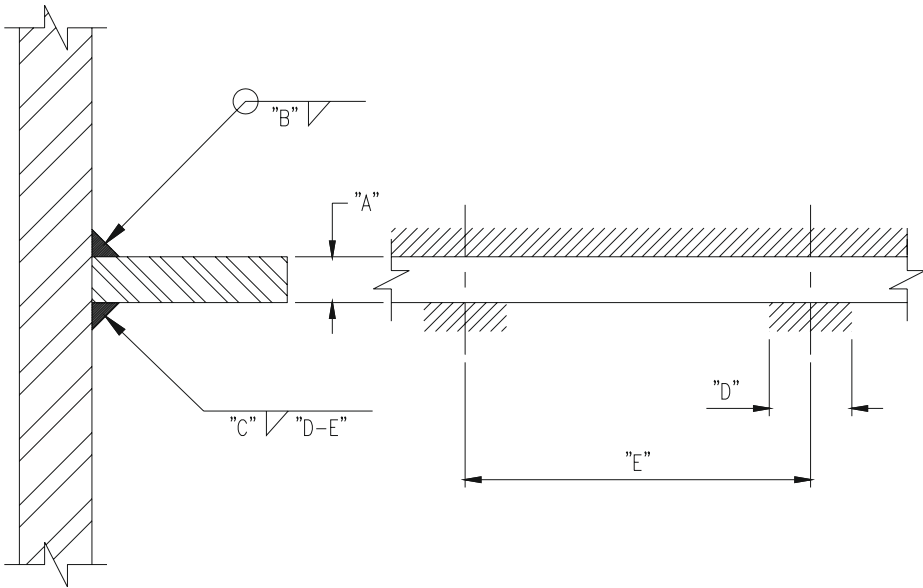
Alloy: A material other than mild carbon steel. Examples of materials considered by this specification to be alloys are monel, hastelloy, stainless steel, nickel, etc.

Tray Support Ring Attachment

Support rings shall be minimum seal welded on top and stitch welded on the bottom in accordance with sketch below. Weld sizes shall be in accordance with those listed in the table below, for various corrosion allowances that may apply. In general, tray rings constructed of alloy materials shall be considered to have no corrosion allowance.

For installation on vessels that are lined, the liner shall be removed and the ring shall be attached to the vessel base metal. The liner shall be removed the minimum amount required to perform the welding: In areas where the existing liner is removed, the liner must be repaired by seal welding to the base metal. The gap between the ring and the liner shall be repaired by weld rod deposit. Refer to page no. 28 of this brochure for this type of installation.

For installations on vessels that are clad, this type of attachment may be welded directly to the clad in accordance to the methods described above.



1/4" Corrosion				
"A"	"B"	"C"	"D"	"E"
5/8"	3/8"	7/16"	2"	8"
3/4"	3/8"	7/16"	2"	8"
7/8"	3/8"	1/2"	2"	8"
1"	3/8"	1/2"	2"	8"
1 1/8"	3/8"	9/16"	2"	6"
1 1/4"	7/16"	5/8"	3"	8"

1/8" Corrosion				
"A"	"B"	"C"	"D"	"E"
3/8"	1/4"	5/16"	2"	8"
1/2"	1/4"	5/16"	2"	8"
5/8"	1/4"	3/8"	2"	8"
3/4"	1/4"	3/8"	2"	8"
7/8"	1/4"	7/16"	2"	6"
1"	5/16"	1/2"	3"	8"

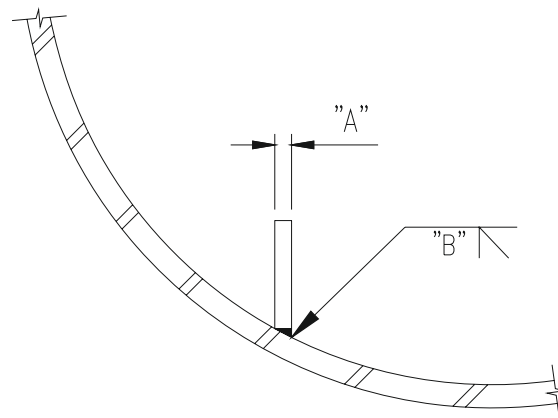
Alloy—No Corrosion				
"A"	"B"	"C"	"D"	"E"
1/8"	1/8"	3/16"	2"	8"
3/16"	1/8"	3/16"	2"	8"
1/4"	1/8"	3/16"	2"	8"
5/16"	1/8"	3/16"	2"	8"
3/8"	1/8"	1/4"	2"	8"
7/16"	1/8"	1/4"	2"	8"
1/2"	1/8"	1/4"	2"	8"
9/16"	1/8"	5/16"	2"	6"
5/8"	1/8"	5/16"	2"	6"
11/16"	3/16"	3/8"	3"	8"
3/4"	3/16"	3/8"	3"	8"
13/16"	3/16"	7/16"	4"	8"
7/8"	3/16"	7/16"	4"	8"
1"	3/16"	1/2"	4"	8"

Downcomer Clamping Bar Attachment

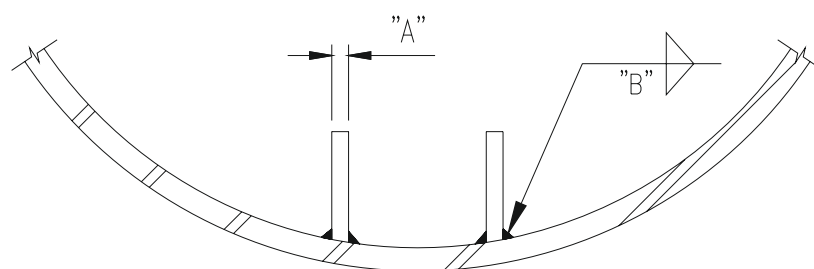
Downcomer clamping bars shall be installed in accordance with sketches below. Center downcomer clamping bars shall be seal welded on both sides. Weld sizes shall be in accordance with those listed in table shown on page 26 of this brochure for various corrosion allowances.

For installation on vessels that are lined, the liner shall be removed and the bar shall be attached to the vessel base metal. The liner shall be removed the minimum amount required to perform the welding. In areas where the existing liner is removed, the liner must be repaired by seal welding to the base metal. The gap between the bar and the liner shall be repaired by weld rod deposit. Refer to page 28 of this brochure for this type of installation.

For installations on vessels that are clad, this type of attachment may be welded directly to the clad in accordance to the methods described for tray ring supports.



Side Downcomer Bar Attachment

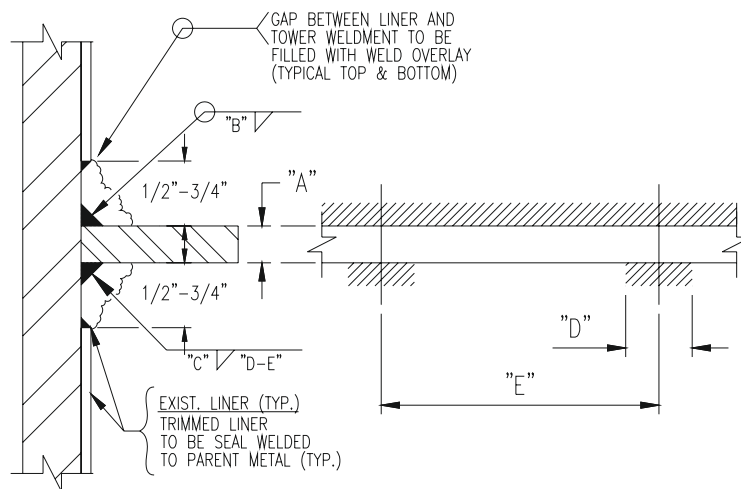


Center Downcomer Bar Attachment

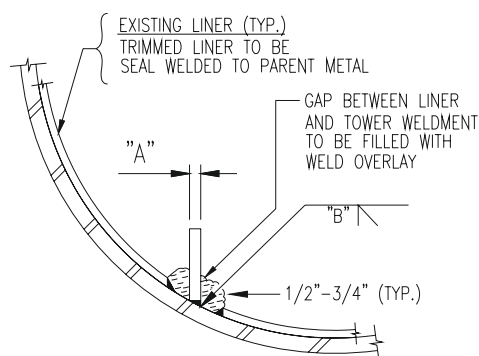
Note:

For weld sizes, see table for support rings on page 26.

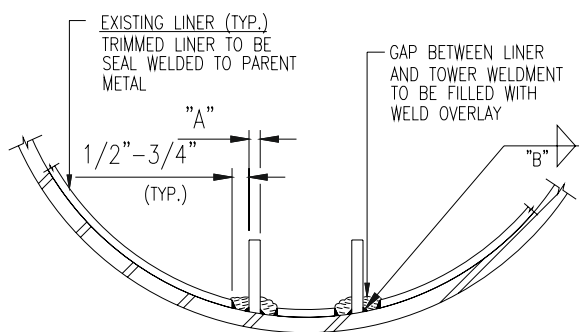
Tower Attachments for Lined Vessels



Tray Support Ring Attachment



Side Downcomer Bar Attachment



Center Downcomer Bar Attachment

Note:

For weld sizes, see table for support rings on page 26.

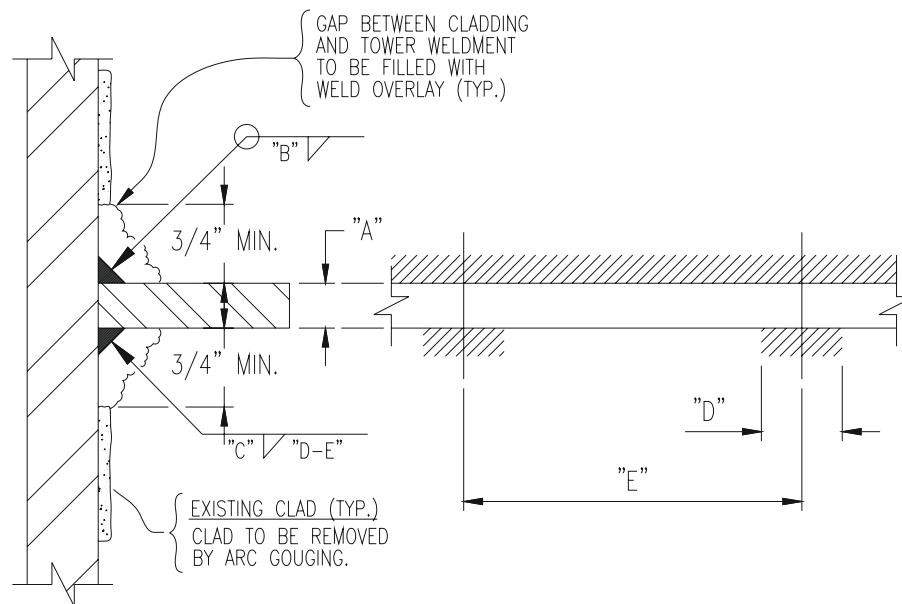
Beam Bolting Plate and Footrest Attachment

These types of attachments shall be welded as shown in sketch on page 26. Weld sizes shall be in accordance with those listed in table on page 26 for various corrosion allowances.

For installations on vessels that are lined, the liner shall be removed and the attachment shall be attached to the base metal. The liner shall be removed the minimum amount necessary to perform the welding. In areas where the liner is removed, the liner must be repaired by seal welding to the base metal. The gap between the attachment and the liner shall be repaired by weld rod deposit. Refer to page 28 of this brochure for this type of installation.

For installations on vessels that are clad, the clad shall be removed by air arc gouging and the attachment shall be seal welded to the vessel base metal. The cladding to be removed shall be the minimum amount required to perform the welding (3/4" minimum, see sketch below).

After installation of the attachment, the cladding shall be repaired by weld rod deposit.



Tower Attachment Requiring Clad Removal

Note:

For weld sizes, see table for support rings on page 26.

General Installation Instructions for Structured Packing

Structured packing provided by Mapesa is fabricated and dimensionally tested to fit a column with the inside diameter specified on a given order. The column diameter should be checked at several points and elevations to verify that tolerances do not exceed those allowed by ASME code. Mapesa should be contacted if the tower out-of-roundness does exceed these acceptable tolerances.

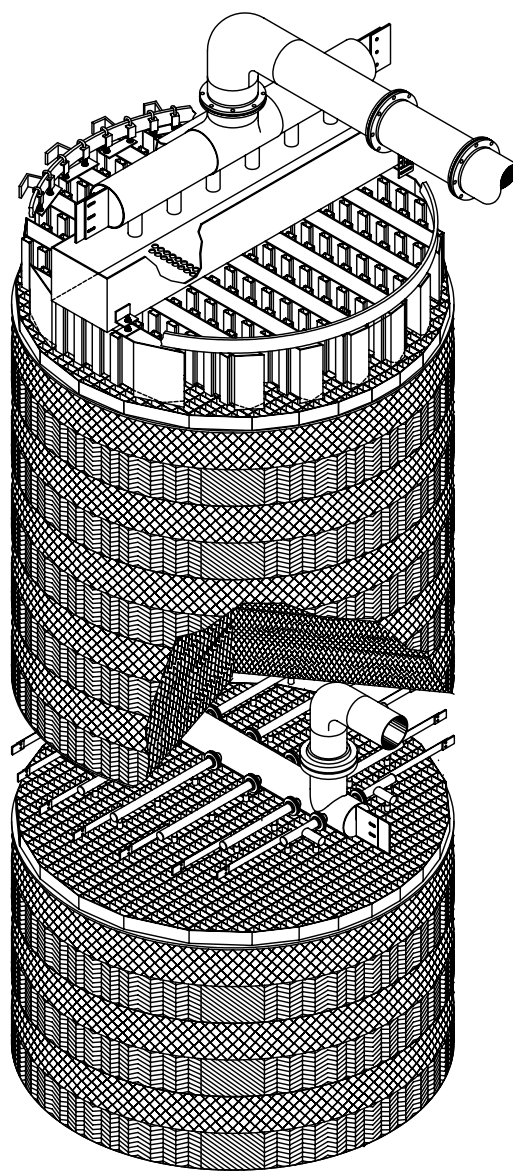
The interior of the column should be prepared such that it is free of any obstructions in the area of the structured packing such as weld spatter or dirt. Circumferential welds should be flush with the column wall and preferably ground smooth. This is important since the structured packing is manufactured from sheets which have been enhanced by crimping, perforating and lancing to provide optimum surface area, but they are easily caught or snagged on any projections from the column wall. Also, weld beads around nozzles and couplings and longitudinal welds should be ground smooth.

In some cases where a column has been revamped to remove trays, a portion of the existing support rings will remain. Mapesa will fabricate the structured packing to accommodate this condition and will specify on the appropriate installation drawing.

At start-up, a residue of stearate or water base lubricant may be observed (even though the packing is fabricated relatively free of dirt and oil). The column may be flushed with a caustic solution or steam cleaned for total removal of residue if deemed necessary.

Structured Packing sections can be prepared for thermowells by drilling perpendicular to the leaves. Should packing orientation require insertion of the thermowells parallel to the unit layers, the following procedures are to be followed:

- Use the thermowell nozzles in the column as a template.
- Work a hole nearly the size of the thermowell, using a drift pin (sharp pointed awl), into the packing that is already installed in the column.
- Insert the thermowell into the packing. Only a slight amount of pressure should be required if the hole in the packing (which was worked with a drift pin) is big enough and deep enough.



Tower Section With Structured Packing Installed

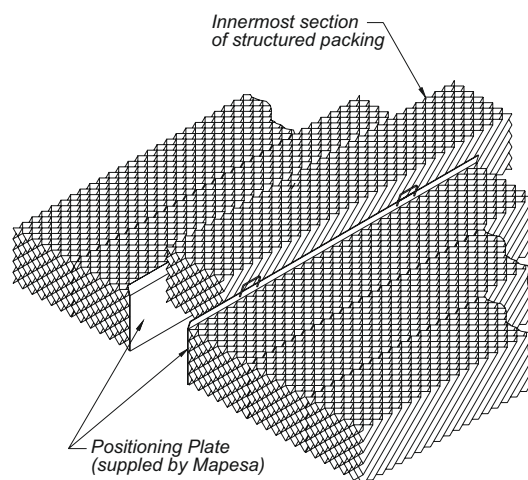
Installation of Sectional Structured Packing

Segmented structured packing consists of approximately 12" wide multiple sections cut with a radius on peripheral pieces to conform with the tower wall. Each section is fabricated from parallel layers (leaves) of structured packing material with opposing angles of corrugations which are held securely together to form a rigid brick. In order to prevent damage, special care should be taken while handling the sections.

Note: An installation tool is provided with the order of packing. It is to be used as a positioning plate to allow the adjacent structured packing pieces to slide into place.

The installation positioning plate is an inverted "L"-shaped light gauge metal piece, slightly shorter in length than the segments chord length. Its sides form a 10" high x 2" wide angle. To hold the positioning plate snug against the packing section, the top is equipped with handles.

Supplied on a Mapesa drawing is a diagram of the installation sequence. The peripheral segments are the first sections to be installed on the support grid. Place the first piece on the support grid and slide firmly up against the tower wall. Place the positioning plate against this section and then tap it horizontally along its length to secure the piece in place. Remove the positioning plate, place the next section against the first and repeat around the tower installing outer sections, working inward to the center of the tower. A gap of approximately 2" to 3" will remain between the last two rows of installed sections. Fill this remaining void with single leaves of structured packing. Sandwich these leaves between positioning plates on each side of the gap to facilitate installation and avoid damage.



Inner Sections of Structured Packing to be Installed by Utilization of Positioning Plates

Each layer of packing is designed to compensate for normal tower out-of-roundness. If tower diameter is on the negative side, it is possible the gap described in the previous paragraph will be eliminated. Should this occur, secure the positioning plates against the last sections installed before sliding the final section into place. As each final section is centered over its space, compress the lower edge inward with finger pressure sufficient enough to slide against the positioning plates. If after the first inch of insertion, the section is very tight, place a plywood plate on top of the section and apply body weight to set the section without deforming the structured packing. After the final sections are in place, remove the positioning plates and plywood before installing the next unit.

Parallel layers of adjacent structured packing units must be rotated 90° to each other. The supplied "Elevation/Orientation" drawing for complete Mapesa packing systems will provide further details.

While packing the column, eliminate the accumulation of debris by checking the top of each layer of packing across the entire area of the tower before commencing with the installation of the next layer. Any abandoned tools, gloves, etc. could create a significant detrimental effect on the desired overall performance.

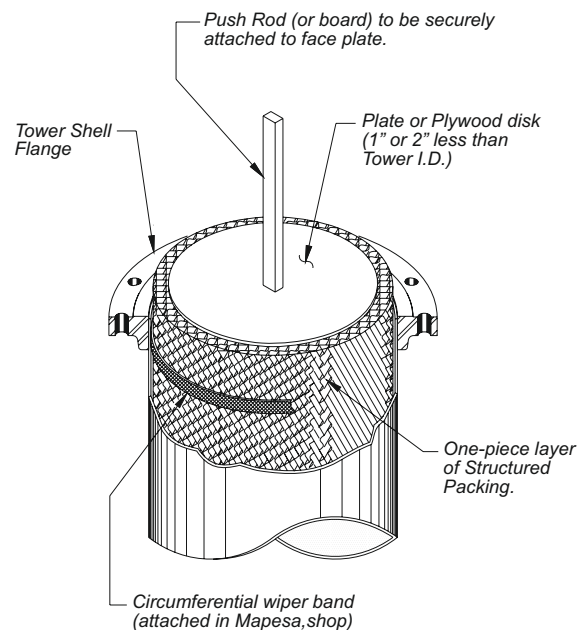
Installation of One-piece Layers of Structured Packing

One-piece layers of structured packing are generally used for columns with an inside diameter of 24" or less. In preparation for the installation of one-piece layers of structured packing, an installation tool consisting of a push rod welded (or otherwise securely attached) to a face plate (or plywood disk) should be prepared. The face plate should be approximately 1" or 2" less than the column inside diameter. The handle of the push rod tool should be long enough to travel the necessary distance to push the bottom layer against the support grid. Verify that the push rod travels freely down the column and does not encounter interference by weld slag, nozzle internal projections or any tower deformities.

Clip the topside of each circumferential band. As each unit is installed, bend the clipped portion out horizontally to prevent liquid and vapor by-passing at tower shell. The bottom band is wrapped under the unit and indicates the bottom side of the unit.

Place a unit, holding it carefully to prevent it from falling, at the top of the column and work the bottom of the unit into the column using the edge or flat of the hand to center the unit. Push the unit carefully and slowly into the column, being sure not to snag or tear bands loose from the unit. Use the push rod assembly when the unit is fully in the column, to move the unit to the support grid or last unit installed. When reaching the bottom, gently tap the unit to seat it in place. With the aid of a straight edge placed on the flange face, make a mark on the push rod to indicate the distance remaining. It will be possible to determine, by carefully checking from mark to mark, that the units are properly seated without using excessive force on the push rod. Continue this process until all units have been installed. Be certain that no foreign matter enters the column between units. Check the elevation after installation of each unit.

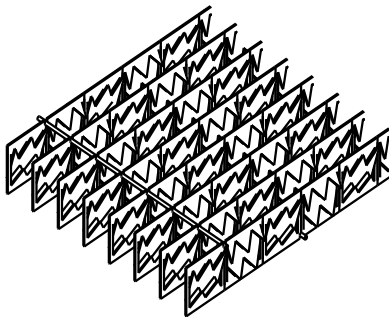
The use of positioning plate tools and filler leaves may be required if the structured packing is furnished as two piece units. If this occurs these items will be furnished by Mapesa with the structured packing.



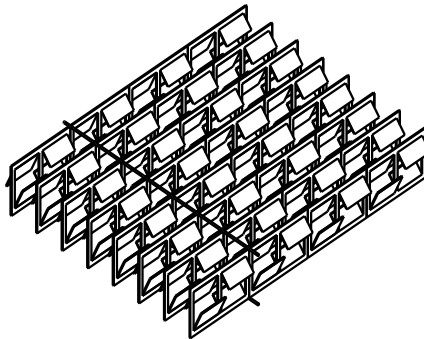
One-piece Structured Packing Unit to be Installed by Utilization of Installation Tool

Installation of Structured Grid

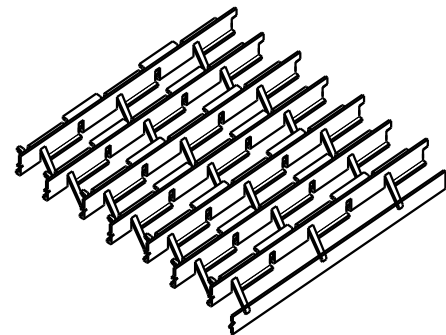
Typical structured grid is provided in pre-fabricated panels which are usually approximately 2 1/8" high x 15" wide X 60 3/8" long and 2 3/4" High X 16" Wide X 60" long. The outer panels are sized to fit closely with the contour of the tower shell. The individual strips of these panels are securely attached by resistance or stitchwelding of perpendicular spacer rods or small integral strips which are bent at an angle and shop welded to the adjacent strips. Two of the many types of structured grid panels available are depicted below.



Type 2 Grid



Type 3 Grid



Type 25A Grid

Each layer of grid in a bed is referred to as a tray. These grid trays are numbered from bottom to top. The orientation and position of grid panels shown in the plan view of layout drawing supplied by Mapesa is for the bottom tray (no.1). Remainder of trays are to be rotated 45 degrees clockwise to tray immediately below. As each layer is installed, the peripheral sections are to be installed first and are to be pushed outward to make contact with the tower shell. The inner panels are to be equally spaced such that the gaps between each section is approximately equal.

In some instances a holddown grid is provided, in which case, specific installation instructions including bolting assemblies will be provided on the Mapesa drawing. If a separate holddown grid is not to be installed, the top three grid trays are to be held together with a "J" bolt assembly and a rectangular bolting plate. Two "J" bolt assemblies per panel of top grid are to be used.

In some cases, especially for deep grid beds, a specially designed support grid will be installed under the grid bed, in which case, specific installation instructions including bolting assemblies will be provided on the Mapesa drawing. If the support grid is of similar design to the remainder of the grid in the bed, it will usually be heavier gauge and may be banded at periphery. Method of attachment of support grid panels to the tray support ring and support beams (when reqd.) will be specifically defined on Mapesa Layout drawing.

Installation of Cartridge Trays

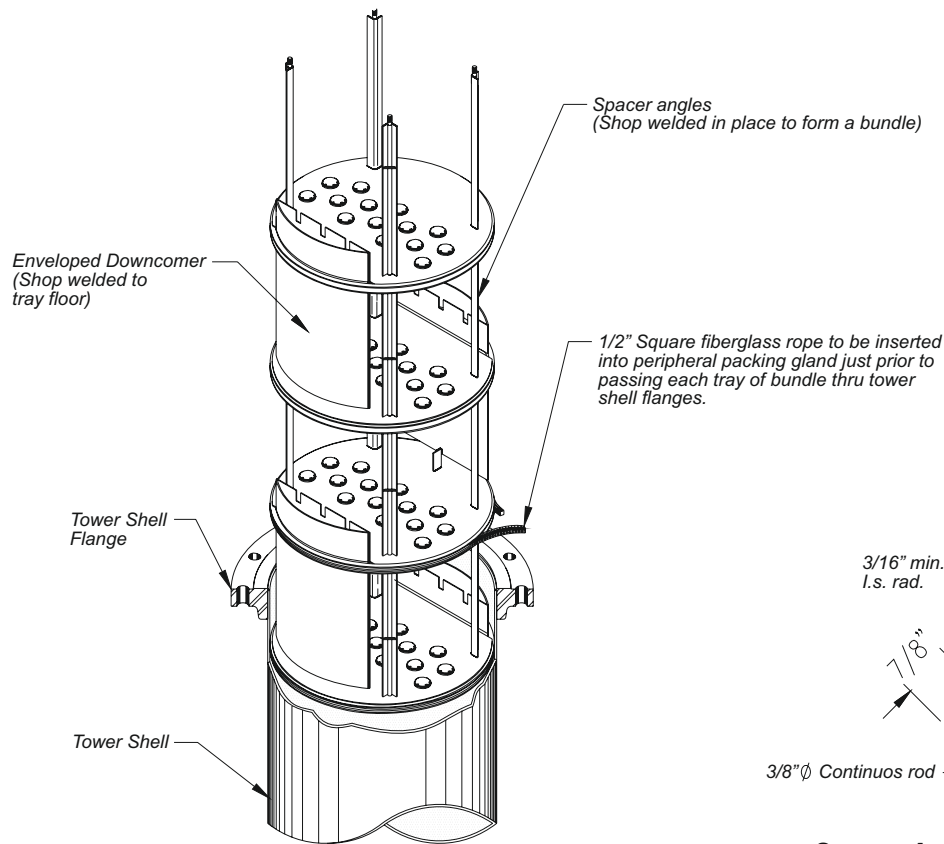
Cartridge trays (which are shop pre-assembled into bundles of four or five trays each, equipped with enveloped downcomers, peripheral packing glands and spacer rods) allow easy installation and removability of trays for towers which are too small for workmen passage. These towers are normally less than 2'-6" inside diameter.

Cartridge tray bundles are to be installed into the tower through shell flanges located above the tray bundle (see assembly drawing at right). As specified on the Mapesa tower attachment drawing, footrests or support angles will be welded to the tower shell below the bottom tray or seal pan. Due to the close fit of the peripheral packing glands of the cartridge trays, no internal protrusions or weld slag can be allowed between the tower attachments and the shell flanges through which the bundles will be passed. Care should be taken that the inside surface of the column is smooth so that the peripheral packing will not be damaged or pulled out of position when the bundle is being pushed into place.

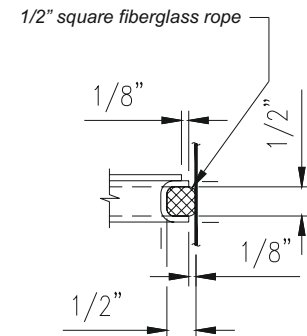
Each bundle of cartridge trays is held together with three or four sets of spacer angles and thru-rods. These angles are secured above the top tray of the bundle with shop welded cross braces which may be used as a lifting lug for raising the bundle assembly above the tower shell flange for installation into the tower. The bundle should be oriented into the correct position and carefully lowered into place. The 360 degree peripheral packing gland should be checked just prior to passing each tray of the bundle thru the shell flange to be sure the 1/2" square rope is in position tightly against the packing channel. The excess packing should be trimmed in such a way that there is no gap between the ends.

The tray bundle should be carefully pushed all the way down so that the bottom tray rests on the tower attachment angles. In some cases the column will be equipped with a flat top head or a blind flange which bolts to the shell flange. If this is the case, the top head can be used as a bearing surface for holding down the bundle assembly. Holddown angles are usually required above the shell flanged section of the tower. These angles are welded to the tower shell as specified on Mapesa tower attachment drawing. After the cartridge tray bundle is in place, the adjustable angles are to be installed at the top of the threaded rods as shown in the typical holddown assembly depicted at right. A 3/8" hex nut is to be installed onto the threaded rod to serve as a lock nut against the shop welded nut on the adjustable angle. Appropriate measurements should be taken to be sure the top of the holddown angles bear on the top head or the holddown angles welded to the shell, prior to reinstallation of upper portion of vessel.

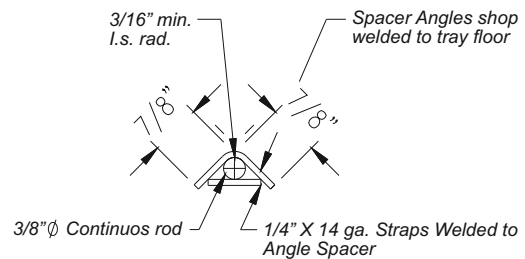
Installation of Cartridge Trays (cont'd)



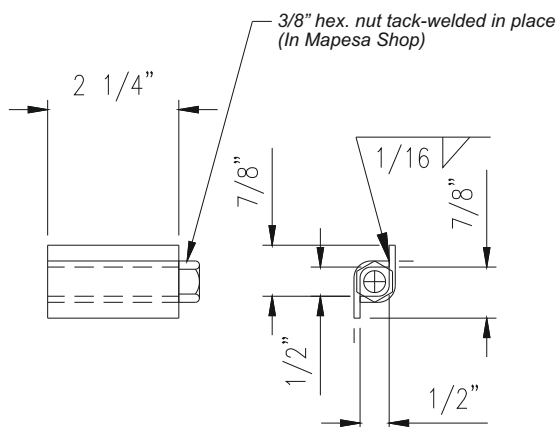
**Cartridge Tray Bundle
(Being Installed Thru Tower Shell Flange)**



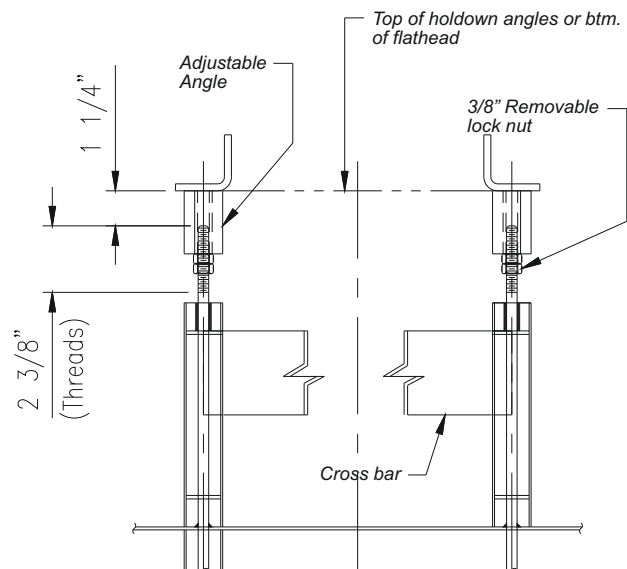
**Typical Cartridge Tray
Packing Gland**



Spacer Angle/Rod Assembly



**Typical Adjustable Angle to be
Used at Top of Spacer Rods**



Typical Holddown Assembly at Top of Bundle



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