

NHTSA FRONTAL MOBILE DEFORMABLE FULL BARRIER FACE V2015

1.0 INTRODUCTION

The NHTSA Frontal Mobile Deformable Full Barrier Face V2015 deformable barrier is an assembly of two layers of deformable aluminum honeycomb core. Both deformable cores (300 mm thick in the impact direction T) are designed to provide a constant load in depth, they are adhesively bonded together with different aluminum sheets forming a ready to use deformable barrier to be fixed on a moving trolley.

2.0 BARRIER COMPONENTS

The components of the barrier face are listed below and shown in Figure 1 and Figure 2. The dimensions of the individual components of the barrier are listed separately below.

- (1) Rear honeycomb block
- (2) Front honeycomb block
- (3) Backing sheet
- (4) Intermediate sheet
- (5) Contact sheet
- (6) Upper cladding
- (7) Lower cladding
- (8) Blind rivets
- (9) Adhesive (10)
- Left end cap
- (11) Right end cap
- (12) Upper left strap
- (13) Upper right strap
- (14) Lower left strap
- (15) Lower right strap
- (16) Cover sheet

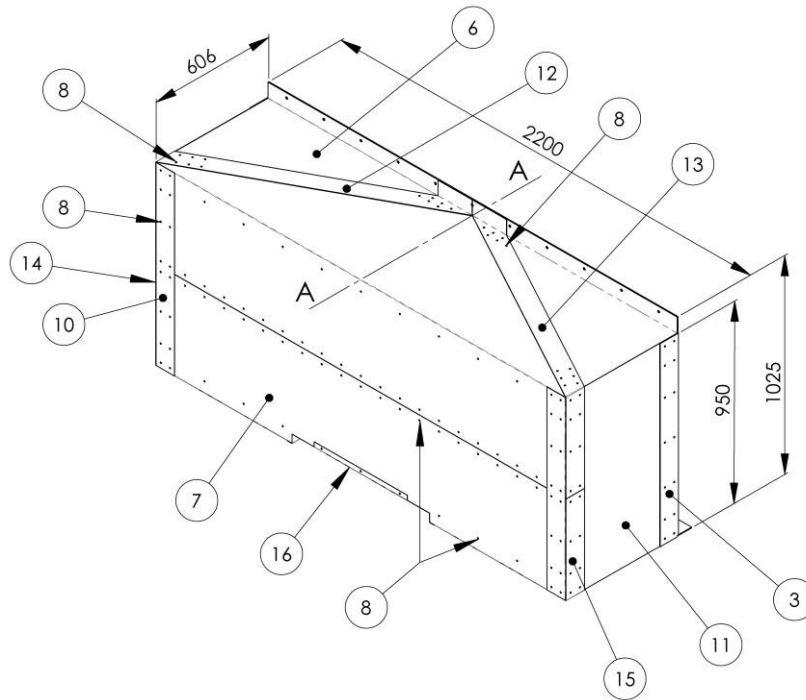


Figure 1. Outer Components of the Barrier

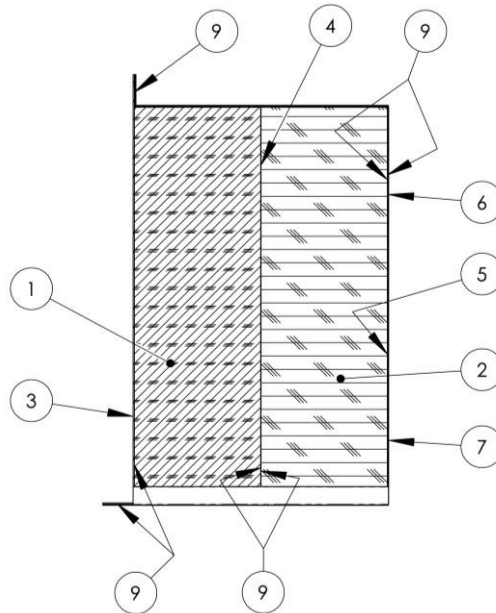


Figure 2. Cross-Section A-A - Interior Components of the Barrier

3.0 MATERIAL SPECIFICATIONS & OVERALL DIMENSIONS

3.1 REAR HONEYCOMB BLOCK

Dimensions:

Height (L): 950 ± 5 mm (in direction of honeycomb ribbon axis)
Width (W): 2200 ± 5 mm
Depth (T): 300 ± 1 mm (in direction of honeycomb cell axes)
Material: Aluminum 3003
Cell Size: 6.35 mm ± 20 percent
Crush Strength: 1.711 MPa +0 percent -10 percent¹

3.2 FRONT HONEYCOMB BLOCK

Dimensions:

Height (L): 950 ± 5 mm (in direction of honeycomb ribbon axis)
Width (W): 2200 ± 5 mm
Depth (T): 300 ± 1 mm (in direction of honeycomb cell axes)
Material: Aluminum 5052
Cell Size: 6.35 mm ± 20 percent
Crush Strength: 0.724 MPa +0 percent -10 percent¹

3.3 BACKING SHEET

Dimensions:

Height: 1095 mm ± 2.5 mm
Width: 2400 mm ± 2.5 mm
Thickness: 3.0 mm ± 0.25 mm
Material: Aluminum Series AlMg2 to AlMg3 with hardness between 50 and 67 HBS

3.4 INTERMEDIATE SHEET

Dimensions:

Height: 944 mm ± 2.5 mm
Width: 2196 mm ± 2.5 mm
Thickness: 0.5 ± 0.1 mm
Material: Aluminum 5251 H24 or Aluminum 5052 H32

¹ In accordance with the certification procedure described in US Department of Transportation, NHTSA Laboratory Test Procedure for FMVSS No. 214 "Dynamic" Side Impact Protection, TP214D Appendix C (TP214D-07 C-1).

3.5 CONTACT SHEET

Dimensions:

Height: 944 mm \pm 2.5 mm
Width: 2196 mm \pm 2.5 mm
Thickness: 1.6 mm \pm 0.07 mm
Material: Aluminum 5251 H24 or 5052 H34

3.6 UPPER CLADDING

Dimensions:

Height: 1150 mm \pm 2.5 mm
Width: 2200 mm \pm 2.5 mm
Thickness: 0.8 mm \pm 0.1 mm
Material: Aluminum 5754 H22 or 5052 H34

3.7 LOWER CLADDING

Dimensions:

Height: 1151 mm \pm 2.5 mm
Width: 2200 mm \pm 2.5 mm
Thickness: 0.8 mm \pm 0.1 mm
Material: Aluminum 5754 H22 or 5052 H34

3.8 BLIND RIVETS

Type: Blind rivet
Diameter: 6.3 mm
Material: Aluminum

3.9 ADHESIVE

The adhesive to be used throughout should be a Polyurethane adhesive or equivalent, with a minimum bonding strength of 0.6 MPa.²

² In accordance with the certification procedure described in ASTM C 297, using 100x100x15 mm honeycomb representative of that in the impactor, bonded to a back plate material.

3.10 END CAPS

Dimensions:

Height: 950 mm \pm 2.5 mm
Width: 700 mm \pm 1 mm
Thickness: 0.8 mm \pm 0.1 mm
Material: Aluminum 5754 H22 or 5052 H34

3.11 UPPER LEFT STRAP

Dimensions:

Length: 1576 mm \pm 2.5 mm
Width: 100 mm \pm 1 mm
Thickness: 2 mm \pm 0.1 mm
Material: Aluminum 5251 H22 or 5052 H34

3.12 UPPER RIGHT STRAP

Dimensions:

Length: 1576 mm \pm 2.5 mm
Width: 100 mm \pm 1 mm
Thickness: 2 mm \pm 0.1 mm
Material: Aluminum 5251 H22 or 5052 H34

3.13 LOWER LEFT STRAP

Dimensions:

Length: 1132 mm \pm 2.5 mm
Width: 100 mm \pm 1 mm
Thickness: 2 mm \pm 0.1 mm
Material: Aluminum 5251 H22 or 5052 H34

3.14 LOWER RIGHT STRAP

Dimensions:

Length: 1132 mm \pm 2.5 mm
Width: 100 mm \pm 1 mm
Thickness: 2 mm \pm 0.1 mm
Material: Aluminum 5251 H22 or 5052 H34

3.15 COVER SHEET

Dimensions:

Depth: 872mm \pm 2.5 mm
Width: 630 mm \pm 1 mm
Thickness: 0.8 mm \pm 0.1 mm
Material: Aluminum 5754 H22 or 5052 H34

4. BASIC COMPONENT DIMENSIONS

Figures 3, 4, 5, 6, 7 and 8 show the basic dimensions of the backing sheet, upper cladding, lower cladding, end caps, cover sheet and honeycomb cut-out.

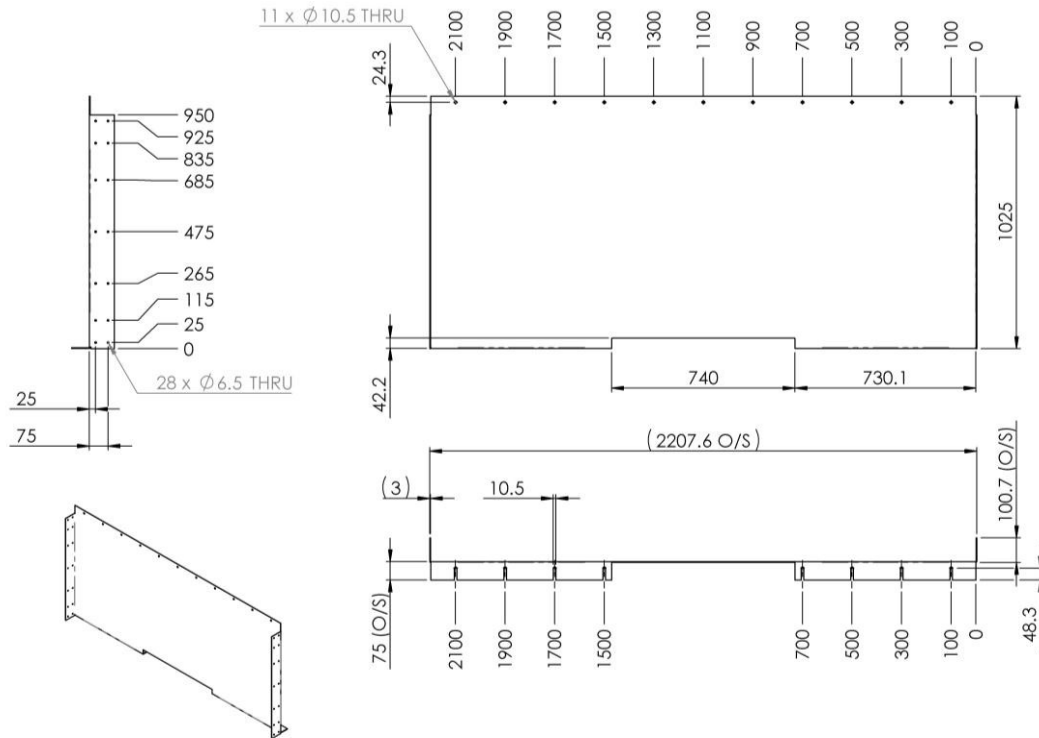


Figure 3. Backing Sheet

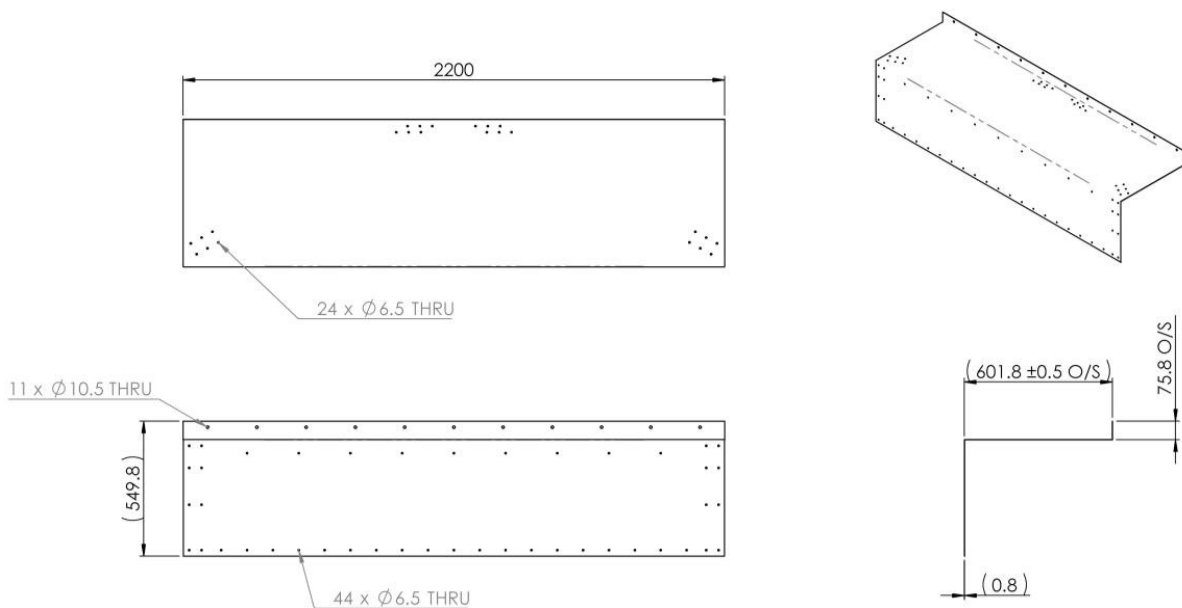


Figure 4. Upper Cladding

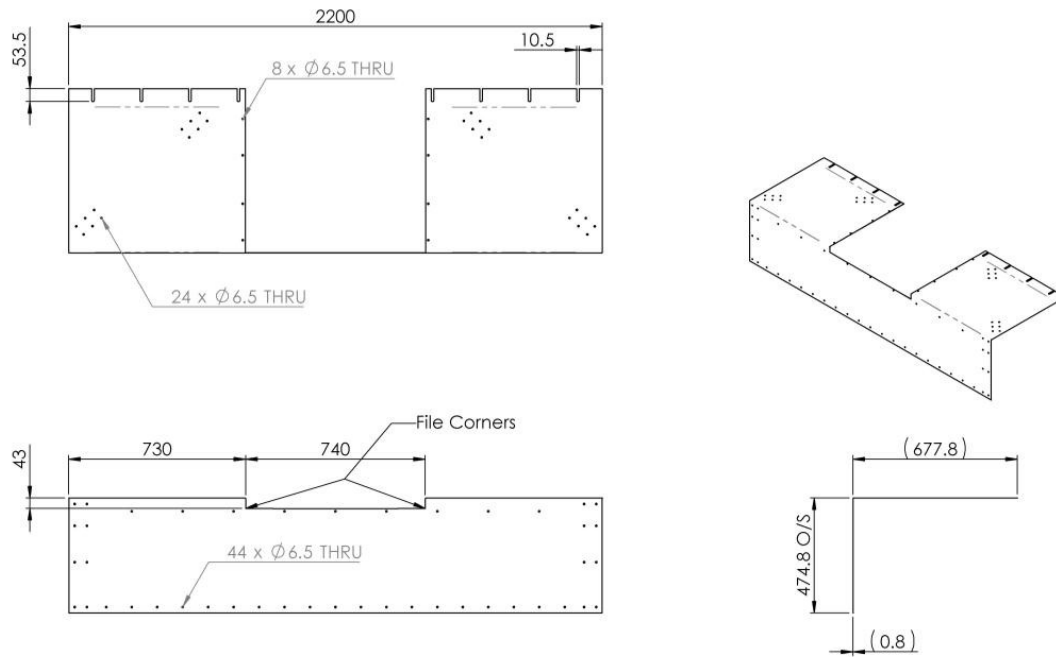


Figure 5. Lower Cladding

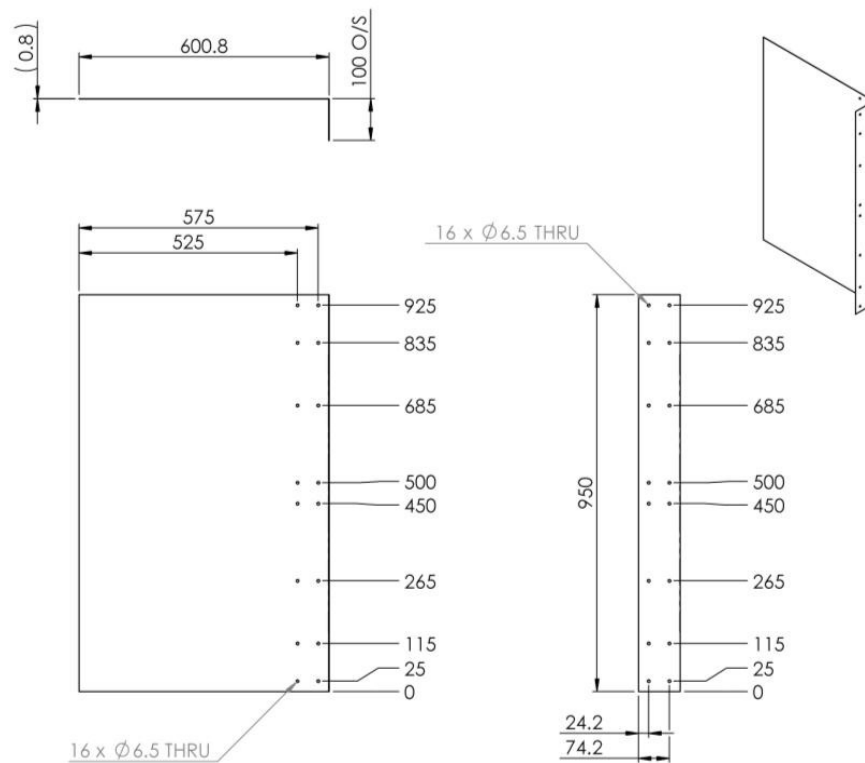


Figure 6. End Cap

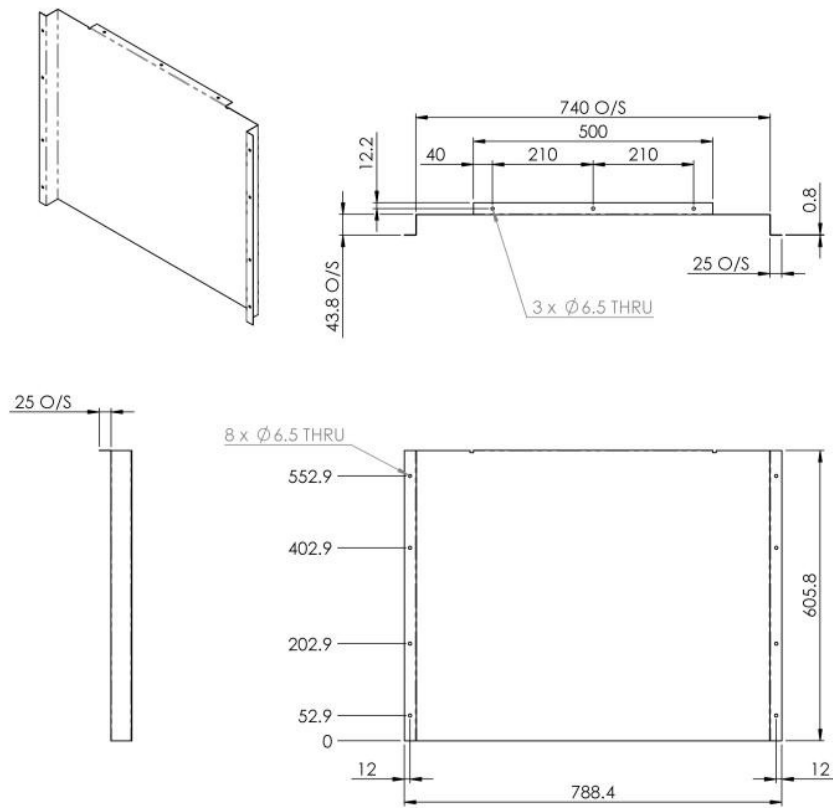


Figure 7. Cover Sheet

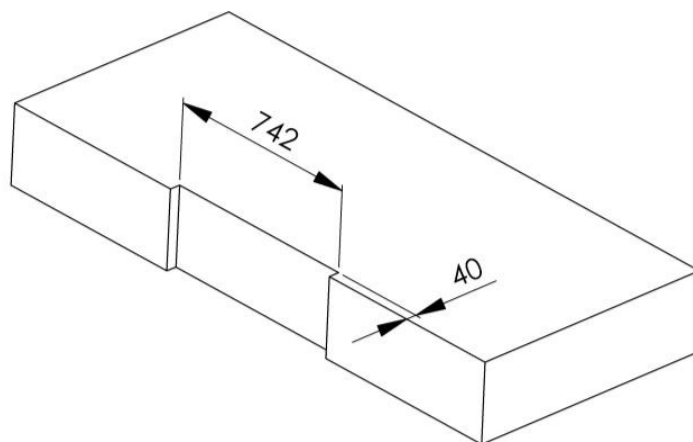


Figure 8. Honeycomb Cut-Out

5. ADHESIVE BONDING PROCEDURE

Prior to bonding, all aluminum sheets shall be degreased and prepared to provide optimal adhesion performance. The adhesive is only applied to the aluminum sheet surfaces when bonding aluminum sheets to honeycomb surfaces.

When bonding the cladding sheet to the backing sheet and when bonding the contact sheet to the cladding sheet, the adhesive is applied to one surface only.

A maximum of 0.5 kg/m² must be applied evenly over the surface, giving a maximum film thickness of 0.5 mm. Care should be taken to assure adhesive does not run into the honeycomb cells causing an increase in crushing strength of the honeycomb core.

6. CONSTRUCTION

6.1 STEP 1

The main part of the barrier face shall be assembled according to Figure 9. The rear honeycomb block shall be adhesively bonded to the backing sheet such that the cell axes are perpendicular to the backing sheet. The intermediate sheet shall be adhesively bonded to the rear and front honeycomb blocks. The cell axes of the front honeycomb block shall be perpendicular to the intermediate sheet. The contact sheet shall be adhesively bonded to the front honeycomb block. The outer cladding shall be adhesively bonded to the contact sheet. The top and bottom surfaces of the cladding sheet shall not be adhesively bonded to the main honeycomb block but should be positioned closely to it. The cladding sheet shall be adhesively bonded to the backing sheet at the mounting flanges.

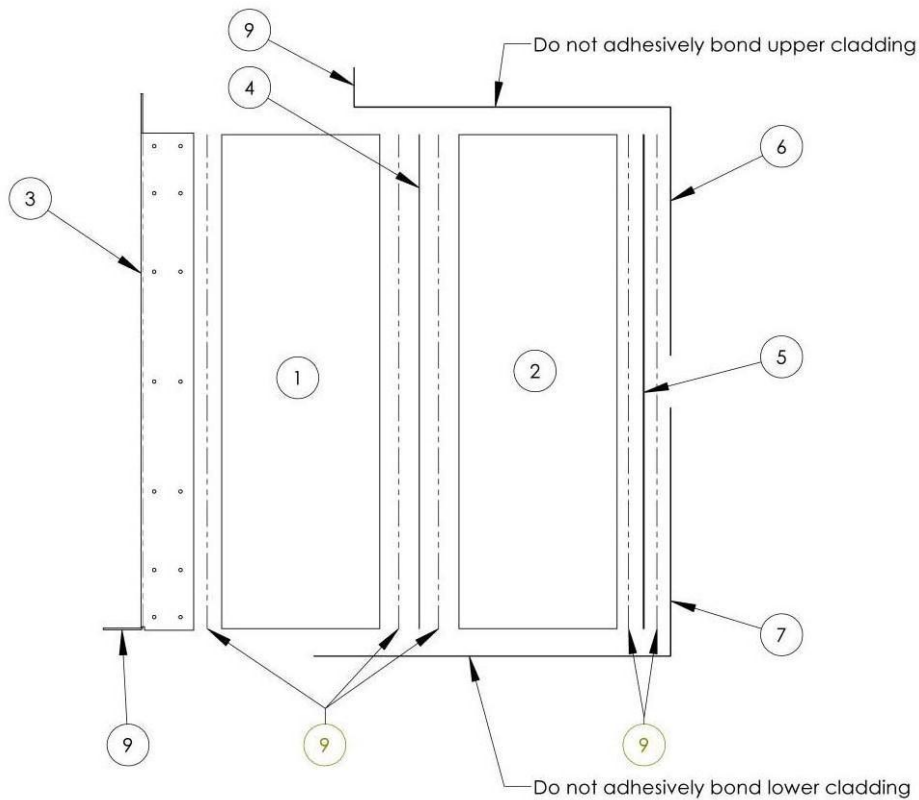


Figure 9. Main Body Assembly of the Barrier

6.2 STEP 2

Apply adhesive on the front and back flange of the left and right end caps and apply the end caps to the front and back of the barrier (Figure 10).

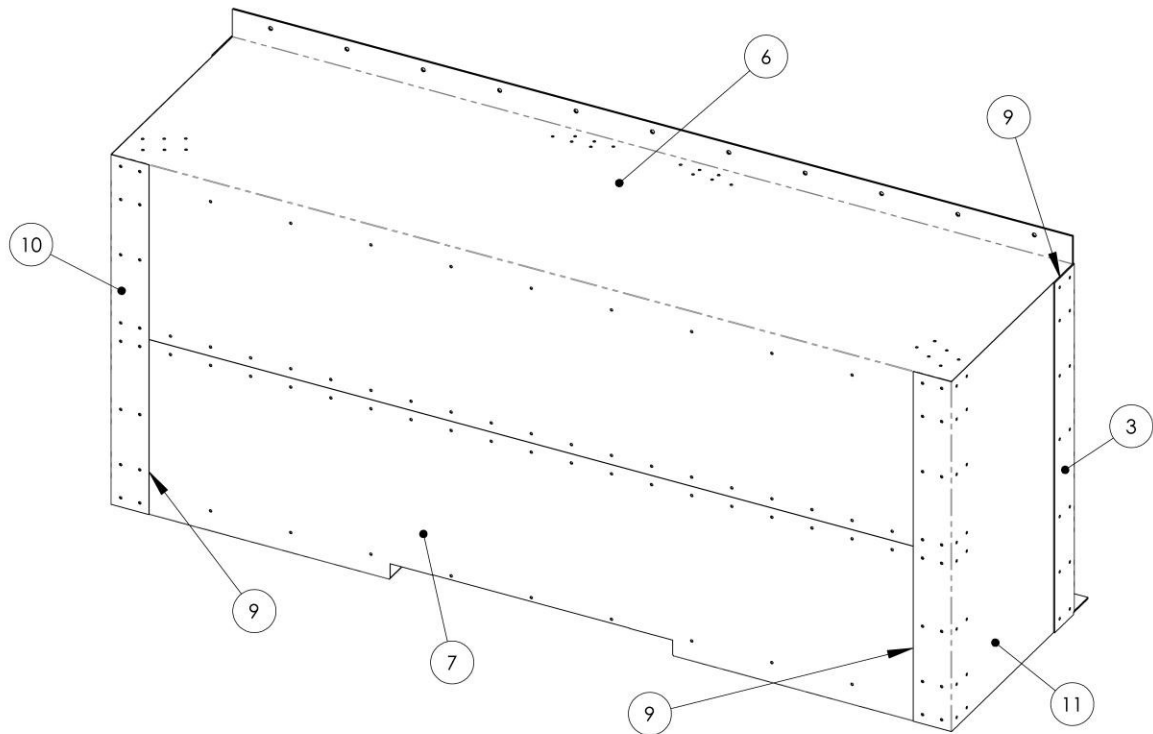


Figure 10. Assembly of Left and Right End Caps

6.3 STEP 3

Attach the straps as shown in Figure 11 and adhesively bond the straps. The strap goes from the top flange to the bottom flange. The strap shall be cut out of sheet metal.

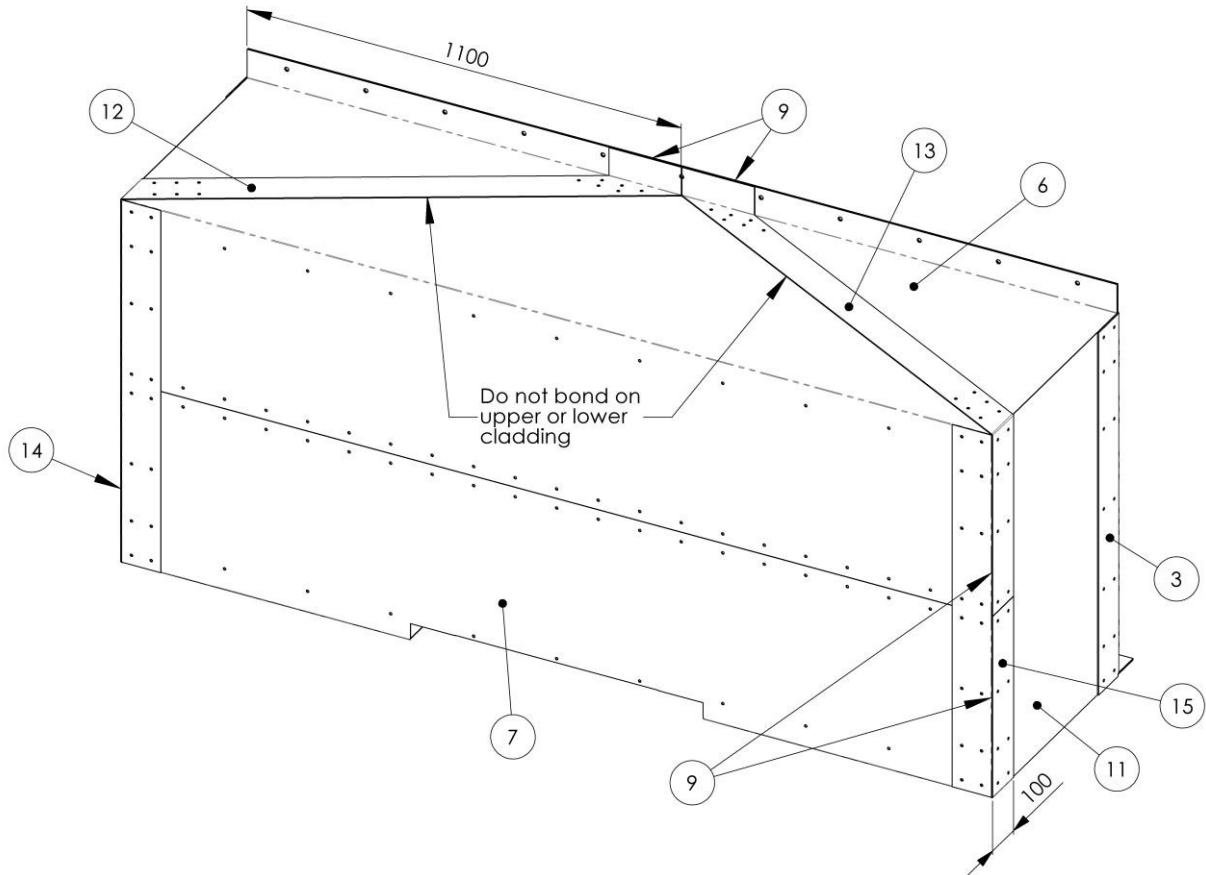


Figure 11. Assembly of Left and Right Straps

6.4 STEP 4

Insert blind rivets into the front of the barrier according to figure 12.

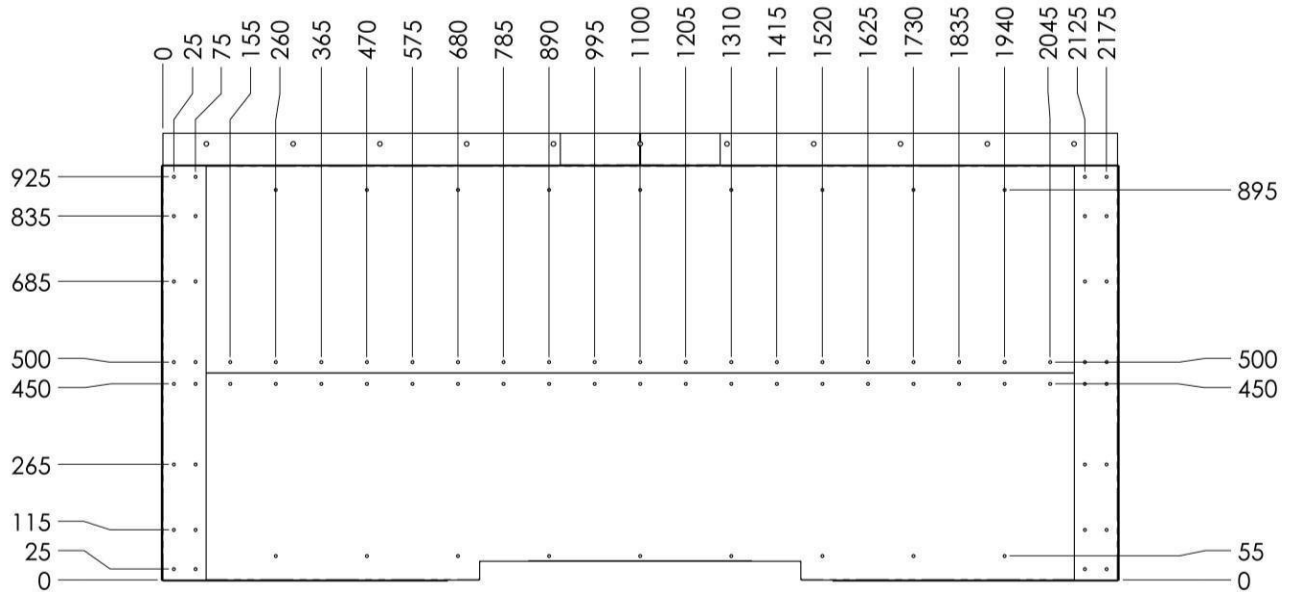


Figure 12. Placement of Blind Rivets in Front of Barrier

6.5 STEP 5

Insert blind rivets into left and right straps according to Figures 13, 14, 15, and 16.

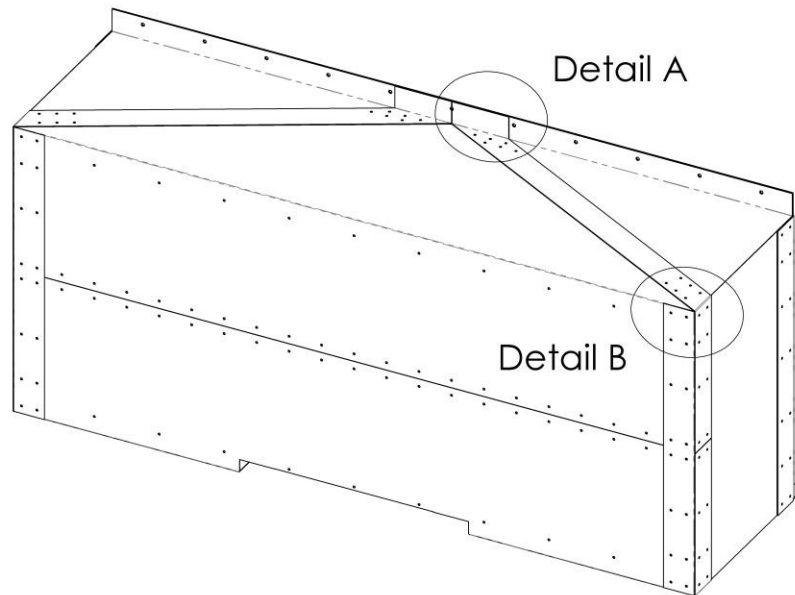


Figure 13. Placement of Rivets in the Rest of the Barrier

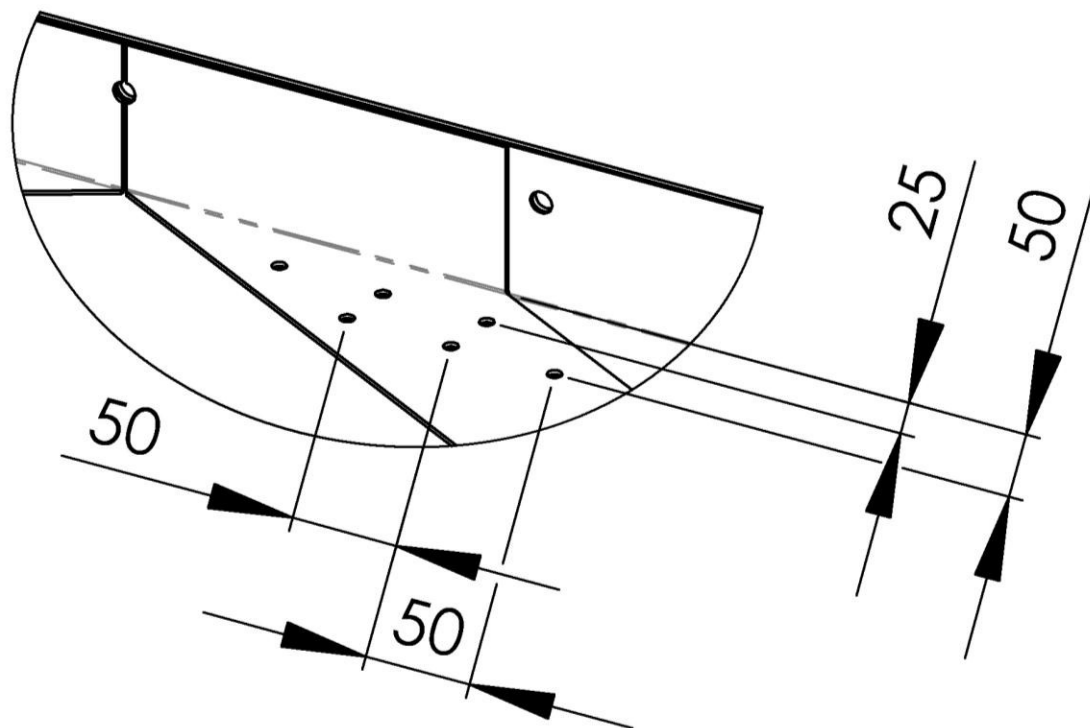


Figure 14. Detail A: Placement of Blind Rivets

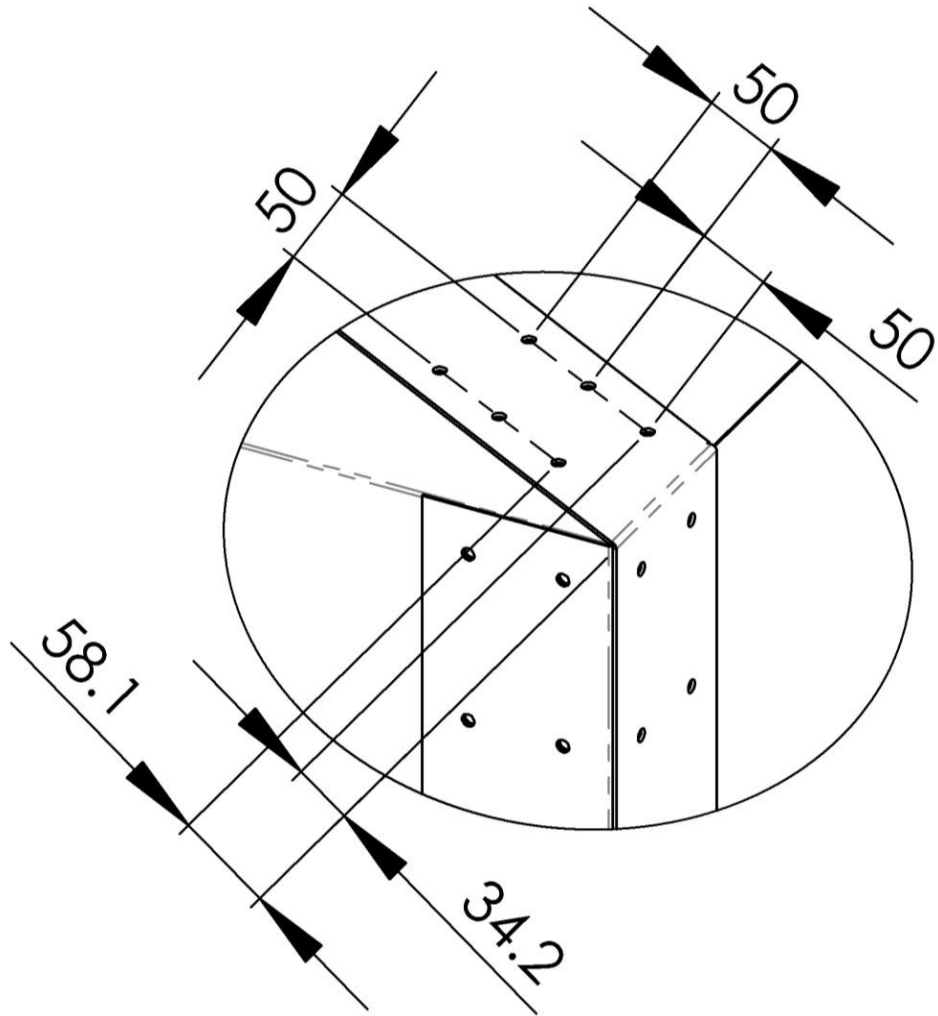


Figure 15. Detail B: Placement of Blind Rivets

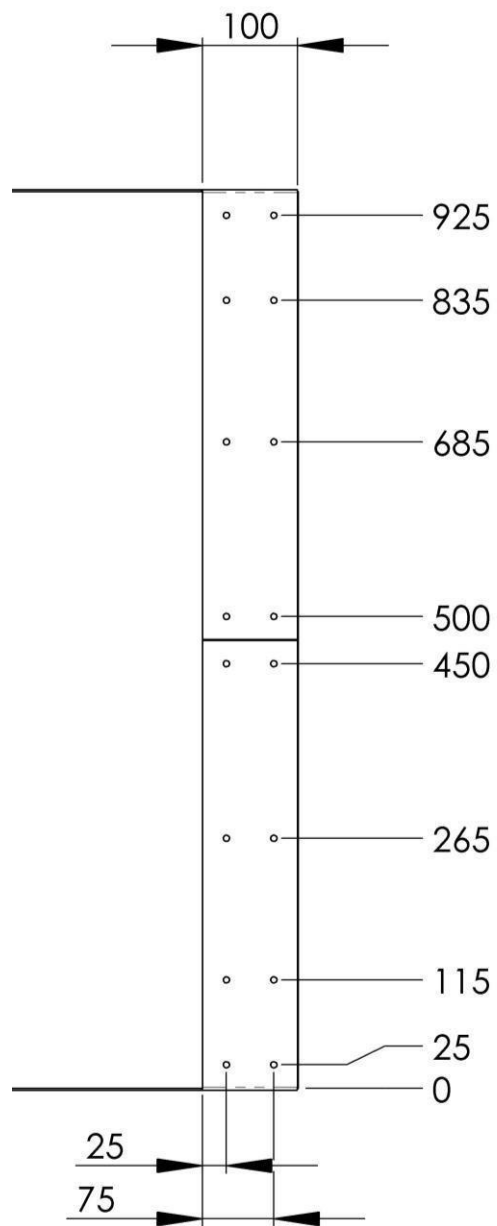


Figure 16. Left Side View of Left Straps

6.6 STEP 6

Insert blind rivets into backing sheet according to Figure 17.

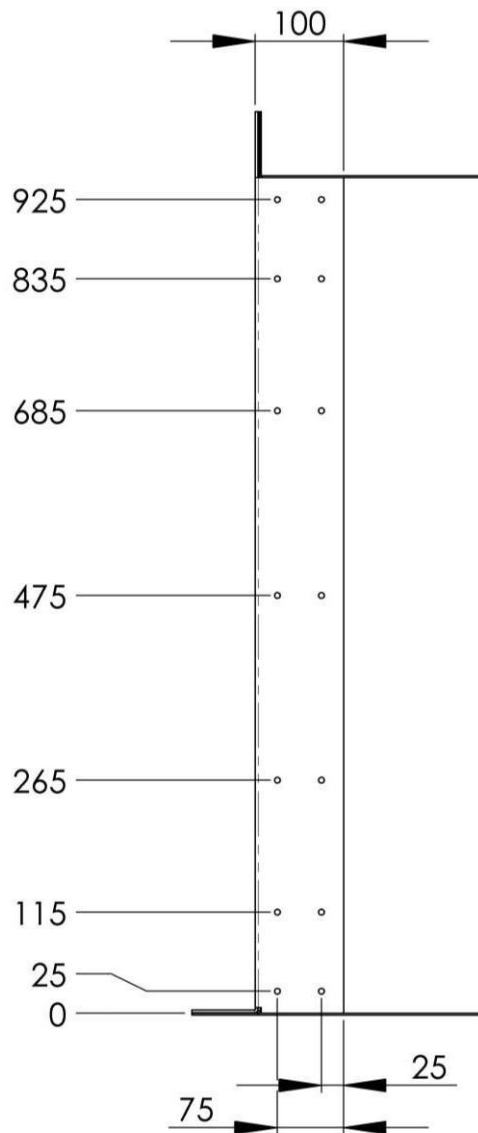


Figure 17. Left Side View of Backing Sheet

6.7 STEP 7

Clearance holes and slots for mounting of the barrier are to be drilled in the mounting flanges. The holes shall be of 10.5mm diameter. Eleven holes shall be drilled in the top flange at a distance of 24.3mm from the top edge of the flange and eleven slots in the bottom flange at a distance of 48.3mm from the bottom edge of that flange. The holes shall be at 100mm, 300mm, 500mm, 700mm, 900mm, 1100mm, 1300mm, 1500mm, 1700mm, 1900mm, and 2100mm from either edge of the barrier. All holes shall be drilled to ± 1 mm of the nominal distances. See Figures 18 & 19.

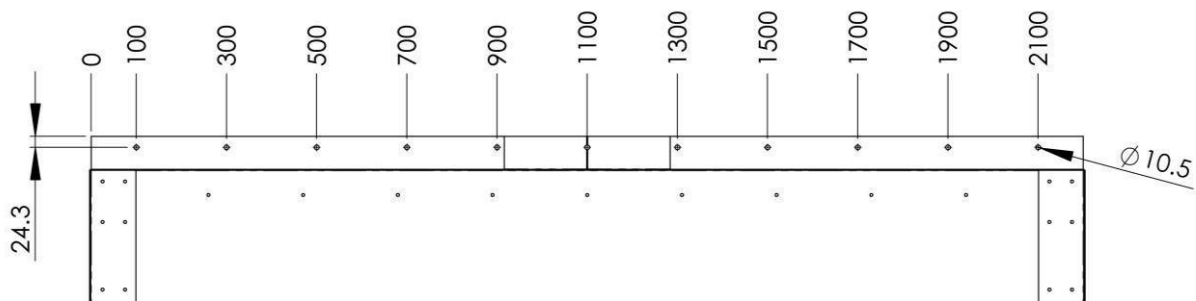


Figure 18. Top Flange Mounting Holes

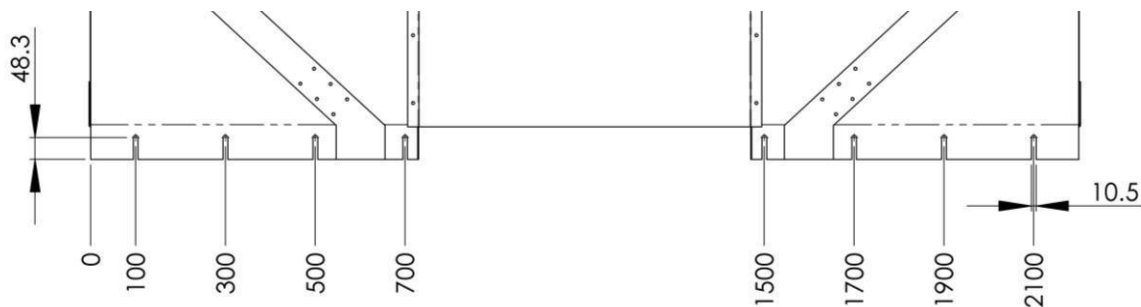


Figure 19. Bottom Flange Mounting Slots

6.8 STEP 8

Attach cover sheet with rivets as shown in Figure 20.

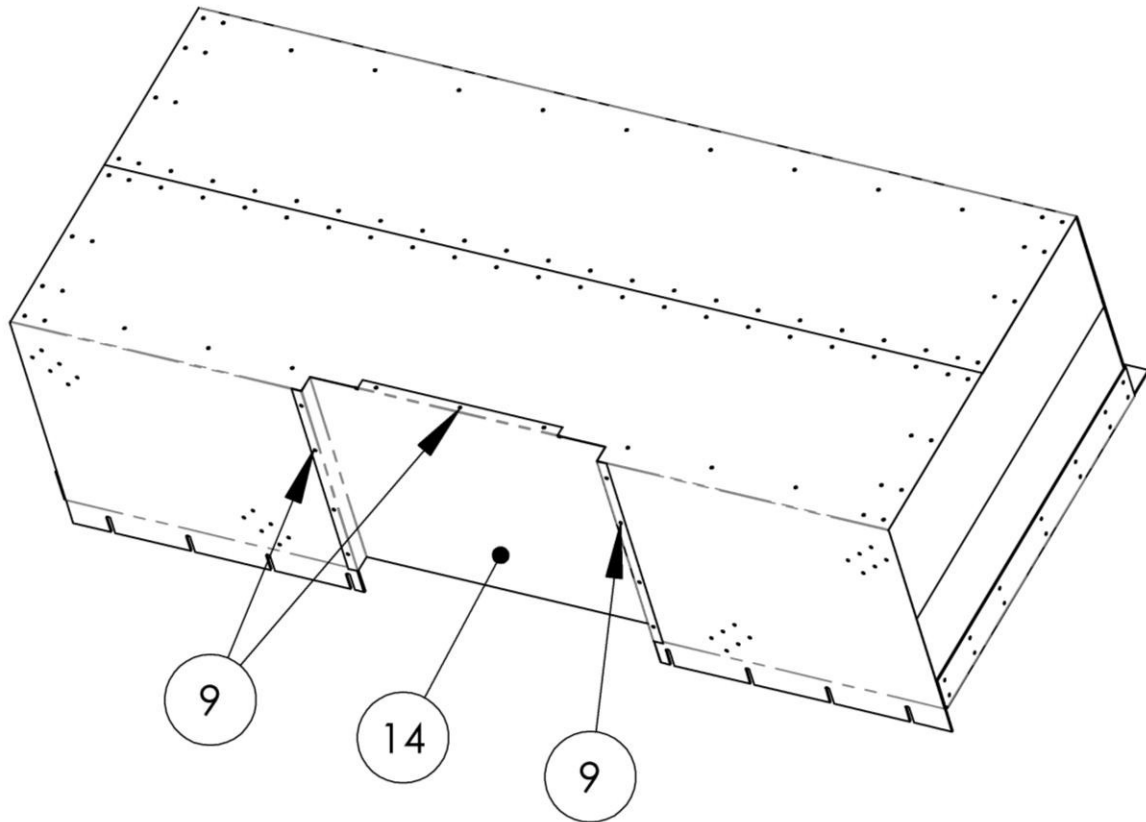


Figure 20. Attachment of Cover Sheet