

CLIENT: Atlanta Metal Products, Inc.
5700 Riverview Industrial Drive
Mableton, Georgia 30059

MATERIALS: A roof test section was mounted to the top face of a 8' x 10' x 30" test chamber, located at the Knudson Mfg. facility in Broomfield, Colorado.

Installation and testing of the roof test section was performed by Mr. Leonard Karr of SSR Concepts, Inc.. Mr. Rod McKeever of Hauser Laboratories witnessed the installation and testing of the test section.

The roof assembly specifications are as follows:

1. Roof Panels - 16 in., 24 ga "AMP Lok", 2 in. standing 45° bend seam, hot dipped galvalum surface treatment as identified by the client. Panel sheet thickness was measured to be 0.026 in. A drawing of the panel profile is presented as Figure 1.
2. Purlins - Metal Sales 16 ga., 8", "Z" purlins mounted on a 5' center spaced centrally to the 8' dimension of the test chamber. The purlins were mounted $\frac{3}{8}$ in. lower than the edge of the test chamber to accommodate the thickness of the clips used so that the panels would mount flush with the chamber. Purlin steel thickness was measured to be 0.067 in.
3. Clips - "CFI" 2 screw clips mounted one clip per seam per purlin. Drawings of the clip are presented in Figure 2.
4. Clip screws - Alliance Fastening Systems, Inc. #12 x $\frac{3}{4}$ HWH self drilling screws.

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5. Sealant - A $\frac{1}{4}$ " diameter (approximate) bead of SikaCalk® 501 Sealant was extruded into the entire length of the female bend of the panel during the formation of the panel profile (ref. Figure 1).

6. Edge fasteners - Alliance Fastening Systems, Inc. #10 x 1" Unslot Hex Washer screws on 3" centers were used to fasten the perimeter of the roof to the test chamber. Additionally, 2 $\frac{1}{4}$ " beads of SikaCalk 501 sealant were applied to the mating surface of the periphery of the chamber where the panels were to be fastened.

TESTS:

Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen, ASTM E 283-91. The rate of air leakage through the roof specimen was tested at 1.57, 2.86, 6.28, and 15 psf of pressure difference.

Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference, ASTM E 331-93. The water penetration of the roof specimen was tested at 2.86, 6.28, 15, and 41.3 psf of pressure difference.

APPARATUS:

The apparatus consisted of the test chamber connected to a constant velocity vacuum blower by a PVC pipe supply line. Instrumentation included a flowmeter (King Instrument Co. item 75202106C-01, 40 scfm range, 2 scfm graduation, $\pm 4\%$) to measure air infiltration rate, and a manometer (Dwyer Instruments, Inc. Dual Range Inclined Manometer, Cat. No. 1227, 0-2.6" w.c. range, 0.02" w.c. graduation, and 0-16" w.c. range, 0.2" w.c. graduation) to measure pressure differential.

The testing apparatus used for the water penetration test was the same as detailed for the air infiltration testing with the addition of the water spray system, and water supply flowmeter (King Instrument Co. item 7205-0161-3, 0-10 gpm range, 2 gpm graduation, $\pm 3\%$). The water spray system was calibrated on the test day using a 4 section parallelogram and was found to conform to the requirements of ASTM E 331-93 for a greater than 5 gpm/sq. ft. water spray. This rate is equivalent to a water spray accumulation in excess of 8.0 inches per hour.

RESULTS:

Testing was performed at the Knudson Manufacturing facility on June 20, 1995. Following are the results of that testing.

Air Infiltration Test:

The edges of the test section were sealed, and excluded from the test.

The roof seams were initially taped shut to establish extraneous chamber air leakage. Extraneous leakage was measured at each test pressure differential prior to any of the air leakage tests. The tape was then removed and total air leakage was measured at each of the desired pressure differentials. Air leakage of the roof test section is the difference between the measured total air leakage, and the extraneous chamber air leakage. The air flow direction with respect to the test section was infiltration.

The following table presents the results of this testing.

Table 1
 Summary of Results, Air Infiltration

Pressure Differential	Air Leakage CFM/Sq. Ft.	Air Leakage CFM/Ft. of Seam
1.57 psf	≤0.01	≤0.01
2.86 psf	≤0.01	≤0.01
6.28 psf	≤0.01	≤0.01
15.00 psf	≤0.01	≤0.01

Water Penetration Test:

The edges of the test section were sealed and excluded from the test. The test assembly was tested flat for all but the last pressure differential which was tested at a 1:2 slope. Water spray was applied at a rate of approximately 5 gal/sq ft/hr to the entire 8' x 10' exposed surface of the test section in the flat orientation. The spray system covered the lower 7' x 10' of the test section when raised to the 1:2 slope. The air direction with respect to the test section was infiltration.

Table 2 presents a summary of the water penetration results obtained.

Table 2
 Summary of Results, Water Penetration

Pressure	Observations
2.86 psf	No water penetration observed
6.28 psf	4 water drops observed with associated 2 cc pool (approximately) at one roof clip location.
15.00 psf	Same 4 drops and 2 cc pool observed. No increase in water volume observed.
41.30 psf	Only water penetration observed is at same location as previously mentioned. Only 3 drops observed at this time.

A relationship between wind load on a structure at particular velocity, and the resultant uniform static air pressure difference impressed on that structure is presented in ANSI A58.1, Building Codes Requirements for Minimum Design Loads in Buildings and Other Structures. The relationship detailed is:


$$\Delta P = 0.00256 V^2$$

where: ΔP = uniform static air pressure difference (psf)

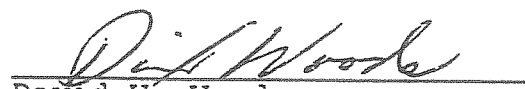
V = wind velocity (mph)

As such, the wind velocity associated with a uniform static air pressure difference of 41.3 psf would be approximately 127 mph.

Testing Witnessed By:


Rodney B. McKeever, P.E.
Chief Engineer

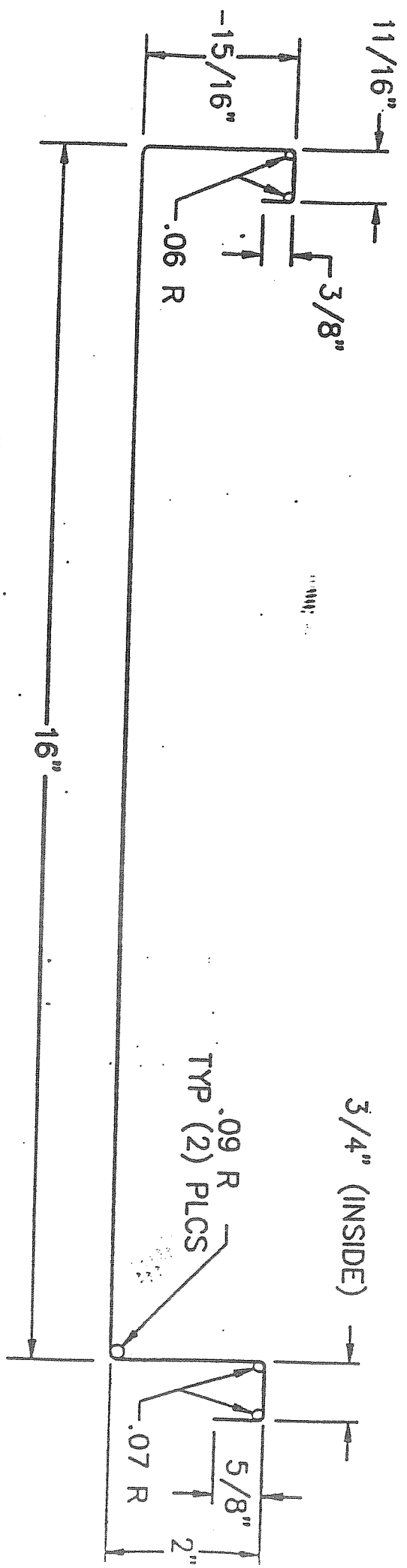
Report Reviewed By:


David W. Woods
Director, Engineering Services

"ATLANTA METAL PRODUCTS, INC."

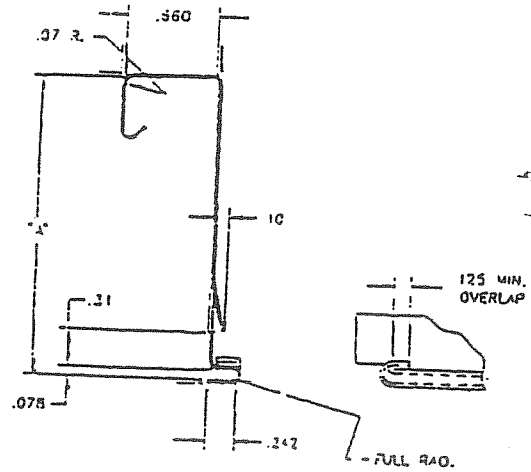
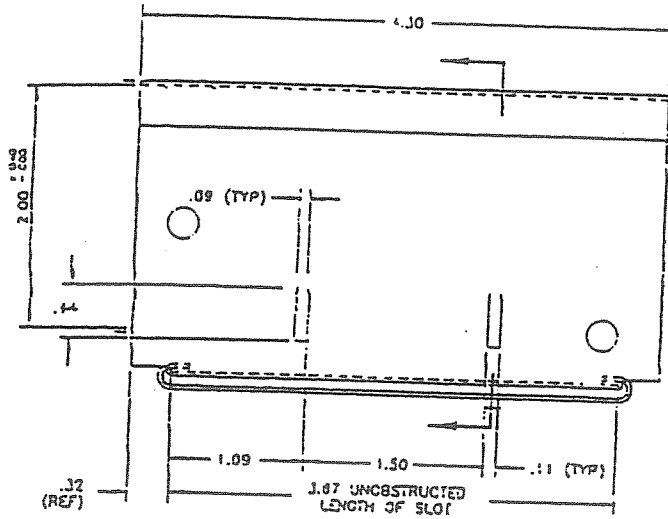
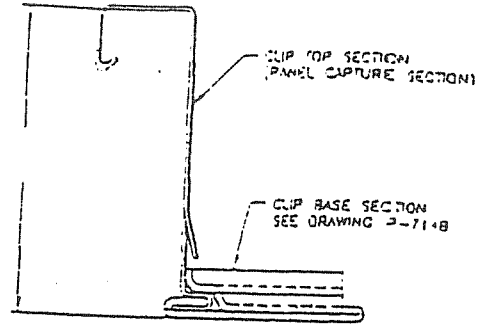
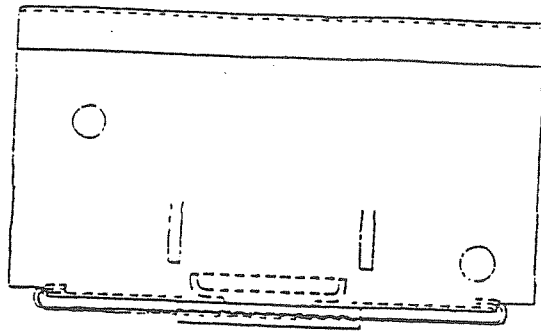
"AMP LOK"

SCALE 2:1

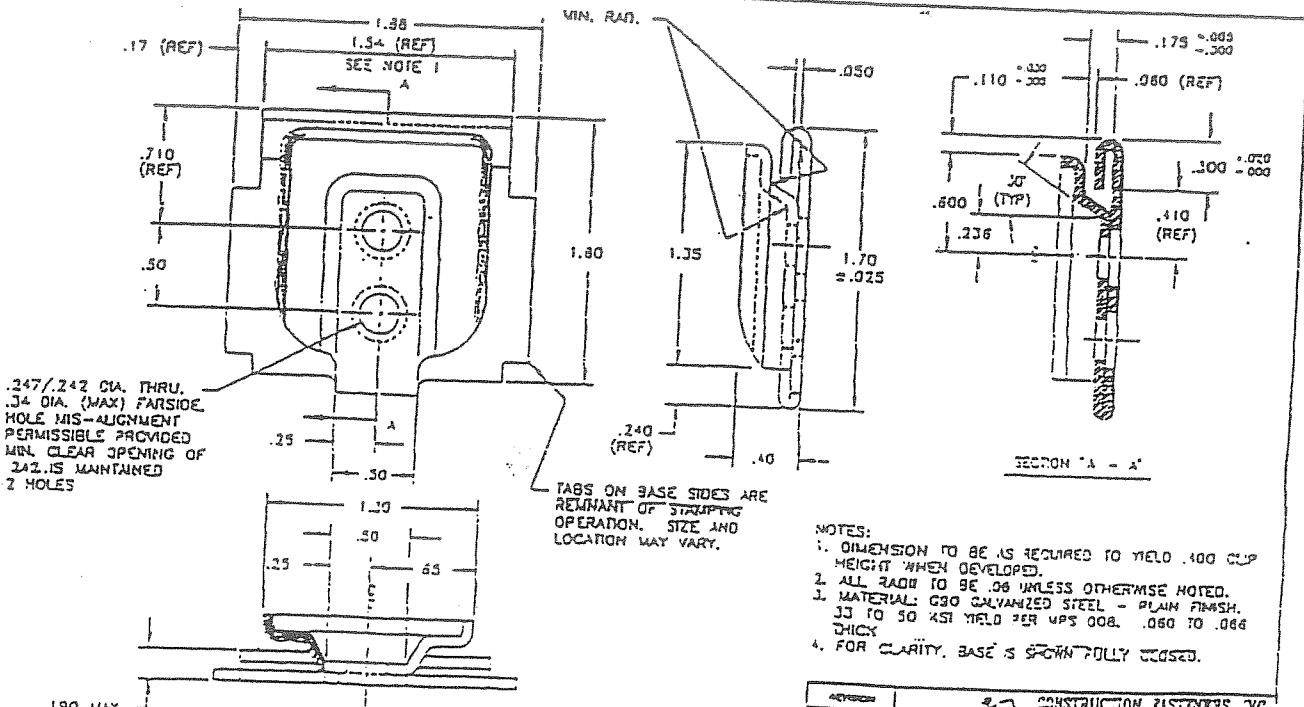


MIN. YIELD STRENGTH
50,000 P.S.I.

NOTE: ±10% ON ALL DIMENSIONS



- NOTES:
 1. MATERIAL: G-90 GALVANIZED STEEL - PLAIN FINISH. 33 TO 50 KSI YIELD PER WPS-008, .030 TO .034 THICK.
 2. FOR BASE DETAILS, SEE DRAWING P-7148
 3. ALL RADII TO BE .040 UNLESS NOTED



- NOTES:
 1. DIMENSION TO BE AS REQUIRED TO YIELD .100 CLIP HEIGHT WHEN DEVELOPED.
 2. ALL RADII TO BE .08 UNLESS OTHERWISE NOTED.
 3. MATERIAL: C80 GALVANIZED STEEL - PLAIN FINISH. 33 TO 50 KSI YIELD PER WPS-008, .060 TO .066 THICK.
 4. FOR CLARITY, BASE IS SHOWN FULLY WELDED.

APPROVED	CONSTRUCTION FASTENERS, INC.
FILE NO.	PA 08 489
CITY	PHILADELPHIA, PA. 19104
HIERARCHY	BASE DETAILS FOR TWO PIECE SLOTTING CLIP
DATE	11-16-94
DRAWN BY	P-7148

CPI PART NO. M0412

FIGURE 2
 BASE DETAILS