



U.S. Department
of Transportation
**Federal Highway
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

December 28, 2004

In Reply Refer To: HSA-10/B-132

Mr. Heath E. Valentine
Valentine & Company
3925 Roosevelt Blvd
Middletown, Ohio 45044

Dear Mr. Valentine:

In May of this year, you requested the Federal Highway Administration's (FHWA) acceptance of a truss-core aluminum F-shape bridge rail and of a symmetrical aluminum F-shape median barrier. These barriers are 34-inch tall F-shape designs consisting of base plates and posts made from 6061-T6 aluminum alloy, and upper and lower interlocking truss-core panels and top cap made from 6063-T6 aluminum alloy. Drawings of the two designs are enclosed. To support your request, you also submitted a report entitled "Design Analysis of an Aluminum F-shape Bridge Railing and Median Barrier" by Ray and Oldani at Worcester Polytechnic Institute dated May 10 that concluded, through finite element analysis, that the barrier would perform acceptably at the National Cooperative Highway Research Program (NCHRP) Report 350 test levels 3 and 4 (TL-3 and TL-4).

Staff at the George Washington University's National Crash Analysis Center reviewed this report and their three concerns were relayed to you. Briefly, these included lack of model validation, predicted localized stress failures, and the possible consequences of the predicted impact deflection at the top of the barrier. Dr. Ray's July 12 response to these concerns satisfactorily addressed the last item, partially addressed the second, but did not fully satisfy the need for model validation. It was subsequently agreed that the computer model could be accepted if it was shown to approximate the behavior of a representative barrier panel that was instrumented and statically loaded. The satisfactory results of this second analysis, in a study entitled "Slow-rate Load Test and Finite Element Simulation of an Aluminum New Jersey Barrier Upper Truss Core Panel", by Ray et al., were sent to Mr. Richard Powers of my staff on November 18.

Since the concrete F-shape barrier is a fully acceptable design, you needed essentially to show that the same profile made from truss-core aluminum would withstand TL-3 and TL-4 impact forces. The conclusions you reached through finite element analysis and validation of the computer model through limited component testing appear to be reasonable. Therefore, I will agree that your aluminum bridge rail and median barrier, as described above and shown in the enclosure, may be considered acceptable for use on the National Highway System (NHS) as NCHRP Report 350 TL-4 designs, with the following conditions:



- These barriers will be fabricated with the same materials and to the same dimensions used in the finite element analysis, except that the traffic-side base plate bolts for the bridge rail will be increased from 1-inch diameter A325 galvanized steel to 1.125-inch diameter A325 galvanized steel and the field side bolts will be increased from 5/8-inch diameter A307 bolts to 3/4-inch diameter bolts. These modifications are shown on the enclosed drawings.
- Any changes that may adversely influence the assumed crashworthiness of the barriers will require a new acceptance letter.
- Should the FHWA discover that the analysis presented was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version described herein, we reserve the right to modify or revoke this acceptance.
- You will be expected to supply potential users with sufficient information on design requirements for any bridge deck to which the barrier is connected to ensure proper barrier performance and to eliminate or reduce damage to the deck in a crash.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance.
- To prevent misunderstanding by others, this letter of acceptance, designated as number B-132 shall not be reproduced except in full. This letter, and the documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- These aluminum barriers may be patented or include patented components and if so are considered "proprietary." When proprietary devices are *specified by a highway agency* for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable non-patented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

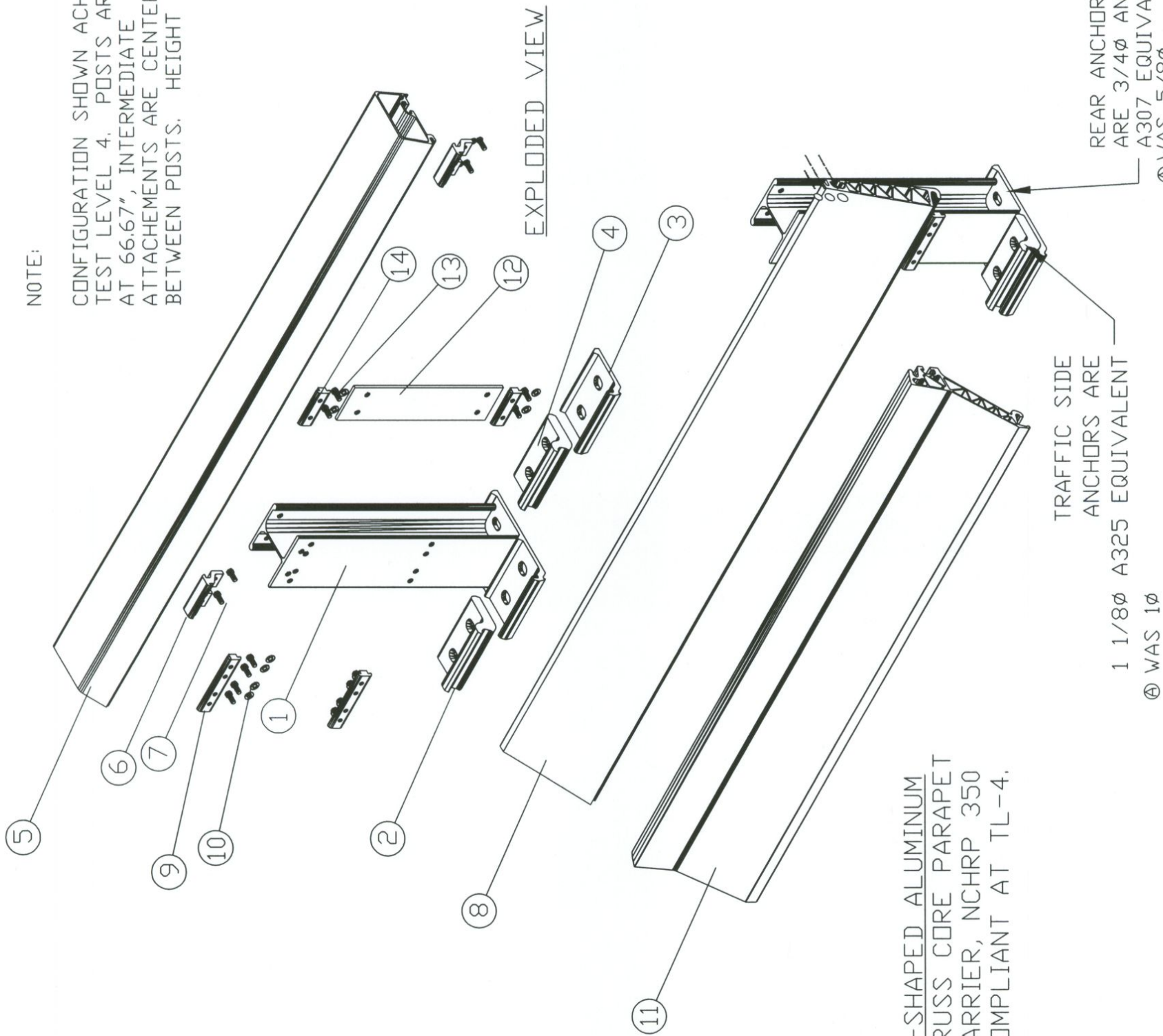
/Original Signed by/

John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

Enclosure

NOTE:

CONFIGURATION SHOWN ACHIEVES
TEST LEVEL 4. POSTS ARE SPACED
AT 66.67", INTERMEDIATE
ATTACHMENTS ARE CENTERED
BETWEEN POSTS. HEIGHT = 34".

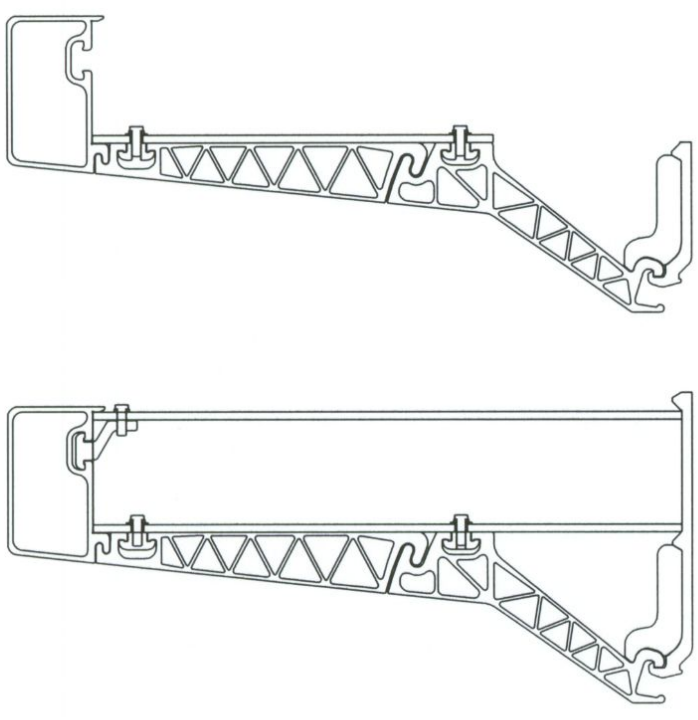


EXPLODED VIEW

F-SHAPED ALUMINUM
TRUSS CORE PARAPET
BARRIER, NCHRP 350
COMPLIANT AT TL-4.

TRAFFIC SIDE
ANCHORS ARE
1 1/8" A325 EQUIVALENT
Ⓐ WAS 1"Ø

REAR ANCHORS
ARE 3/4"Ø AND
A307 EQUIVALENT
Ⓐ WAS 5/8"Ø



SECTION AT POST

SECTION INTERMEDIATE

| I.D. No. | DESCRIPTION | DWG. No. | ALLOY |
|----------|---|------------|---------|
| 14 | CLAMP BAR, SMALL | 2172- | 6061-T6 |
| 13 | 1/2"Ø CAP SCREW WITH LK WSHR 1 3/8" LG. | 308-01 | 18-8 SS |
| 12 | PLATE BACKER FOR PANELS | STK 309 | 6061-T6 |
| 11 | PANEL, LOWER | 301 | 6063-T6 |
| 10 | 1/2"Ø CAP SCREW WITH LK WSHR 1 3/8" LG. | STK 308-02 | 18-8 SS |
| 9 | CLAMP BAR, POST | 312 | 6061-T6 |
| 8 | PANEL, UPPER | STK 310 | 6063-T6 |
| 7 | 1/2"Ø CAP SCREW WITH LK WSHR 1 3/8" LG. | 313 | 18-8 SS |
| 6 | CLAMP, TOP RAIL RETAINER | STK 314-1 | 6061-T6 |
| 5 | TOP RAIL | 305-2 | 6061-T6 |
| 4 | TOE CLIP INTERMEDIATE | 314-2 | 6061-T6 |
| 3 | BASE, INTERMEDIATE | 205-1 | 6061-T6 |
| 2 | TOE CLIP, POST | | |
| 1 | POST ASSEMBLY | | |

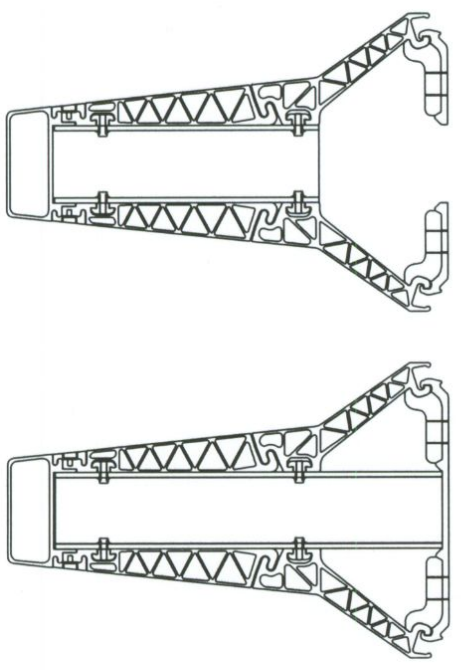
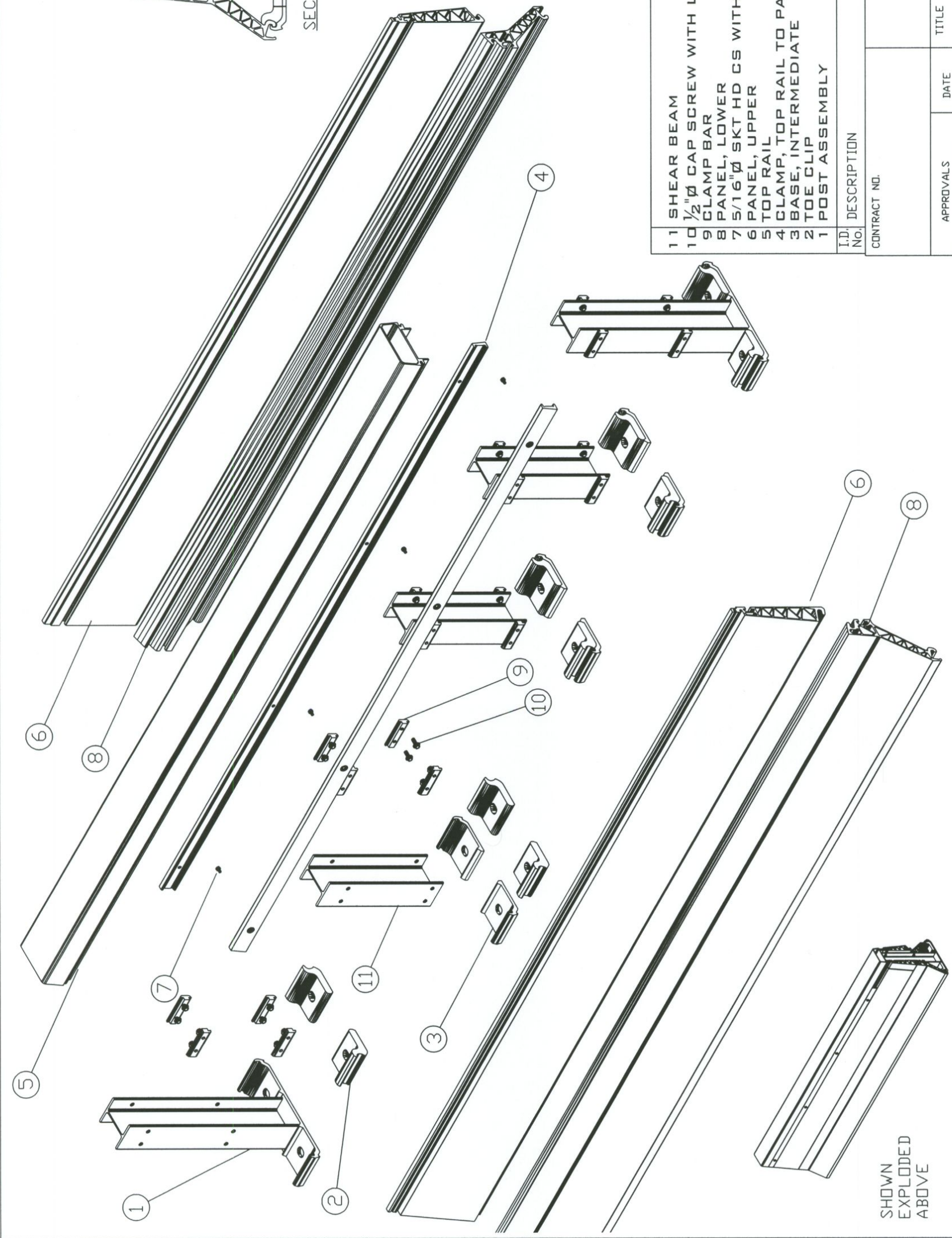
| APPROVALS | DATE | TITLE |
|------------|----------|--------------|
| DRAWN PB | 5/22/04 | F350-PARAPET |
| CHECKED HV | 12/15/04 | |
| ISSUED | | |

| | | | |
|--------------|------|--------------------------|-------|
| CONTRACT NO. | | VALENTINE & COMPANY | |
| | | 3925 Roosevelt Boulevard | |
| | | Middletown, Ohio 45044 | |
| SCALE | NONE | DWG. NO. | 2540 |
| | | SIZE | B |
| | | CODE | 0K828 |
| | | REV. | A |
| | | SHEET | |

KNOWN SOURCE OF SUPPLY IS:
VALENTINE & COMPANY
DESIGN, ENGINEERING & MANUFACTURING SERVICES
3925 ROOSEVELT BOULEVARD
MIDDLETOWN, OHIO 45044
CALL: 513 422 1055 FAX: 513 422 9227

PROPRIETARY AND PRIVILEGED INFORMATION
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1 2 3 4



SECTION AT POST SECTION AT SHEAR BEAM

NOTE:
 SHOWN AT TL-4
 CONFIGURATION.
 POSTS ARE 120" OC,
 SHEAR BEAMS SPACED AT
 30". HEIGHT = 34".

SHOWN
 EXPLODED
 ABOVE

| I.D. No. | DESCRIPTION | DWG. No. | ALLOY |
|----------|--|------------|---------|
| 11 | SHEAR BEAM | 2172- | 6061-T6 |
| 10 | 1/2" Ø CAP SCREW WITH LK WSHR 1 3/8" LG. | 306 | 18-8 SS |
| 9 | CLAMP BAR | STK 308-03 | 6061-T6 |
| 8 | PANEL, LOWER | 301 | 6063-T6 |
| 7 | 5/16" Ø SKT HD CS WITH LK WSHR 5/8" LG. | STK 302 | 18-8 SS |
| 6 | PANEL, UPPER | 303 | 6063-T6 |
| 5 | TOP RAIL | 315 | 6061-T6 |
| 4 | CLAMP, TOP RAIL TO PANEL, UPPER | 305-2 | 6061-T6 |
| 3 | BASE, INTERMEDIATE | 314-3 | 6061-T6 |
| 2 | TOE CLIP | 205-5 | 6061-T6 |
| 1 | POST ASSEMBLY | | |

| | | | |
|---|----------|-------------|----------|
| CONTRACT NO. | | TITLE | |
| VALENTINE & COMPANY 3925 Roosevelt Boulevard Middletown, Ohio 45044 | | F350-MEDIAN | |
| APPROVALS | DATE | SIZE | DWG. NO. |
| DRAWN PB | 5/22/04 | B | 2541 |
| CHECKED HV | 12/15/04 | CODE | |
| ISSUED | | SCALE | |
| REV. | | SHEET | |
| A | | 1 | |

NOTE:
 ANCHORS SHALL BE
 1 1/8" Ø A325 EQUIVALENT.
 ⊕ NOT PREVIOUSLY
 SPECIFIED.

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