

WZ-39



U.S. Department
of Transportation
Federal Highway
Administration

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

JUN 29 2000

Refer to: HSA-1

Mr. Peter Speer
Davidson Plastics Corporation
3110 70th Avenue East
Tacoma, Washington 98424

Dear Mr. Speer:

Thank you for your letters of December 15, 1999, March 15, March 22, and May 3, 2000, requesting Federal Highway Administration (FHWA) acceptance of your company's T3B Plastic Type III Barricade as crashworthy traffic control devices for use in work zones on the National Highway System (NHS). Accompanying your letters were a report from E-TECH Testing Services, Inc., detailed descriptions and drawings of each device, and videos of the crash tests. You requested that we find this barricade, with T3B 25.4 mm x 210 mm hollow plastic panels and plastic vertical members, acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features." You also requested that your T3B panels be accepted as part of type III barricades using perforated square steel tube (PSST) vertical members already found acceptable.

The FHWA guidance on crash testing of work zone traffic control devices is contained in two memoranda. The first, dated July 25, 1997, titled "Information: Identifying Acceptable Highway Safety Features," established four categories of work zone devices: Category I devices were those lightweight devices which could be self-certified by the vendor, Category II devices were other lightweight devices which needed individual crash testing, Category III devices were barriers and other fixed or massive devices also needing crash testing, and Category IV devices were trailer mounted lighted signs, arrow panels, etc. The second guidance memorandum was issued on August 28, 1998, and is titled "INFORMATION: Crash Tested Work Zone Traffic Control Devices." This later memorandum lists devices that are acceptable under Categories I, II, and III.

The **T3B Barricade** is a plastic, lightweight, portable Type III barricade. The T3B 25.4 mm x 210 mm hollow plastic barricade panels are made from a specially formulated polyolefin plastic, and the vertical uprights are 44.5 mm square thermoplastic tubing extrusions. The support legs are 14 ga, SO.8 mm square perforated galvanized mild steel tubing. One 150 mm tall PSST stub is welded to each support leg, and the vertical uprights are inserted into them. The T3B is available in widths between 1219 mm and 3658 mm and heights between 1524 mm and 1829 mm. Testing of your 2438 mm (8 foot) wide version of this barricade is discussed below. The fasteners used were 7.94 mm (5/16") bolts with Nylock nuts and steel washers to attach panels to the uprights.

The **Perforated Square Steel Tube Barricade using T3B** panels is a Type III barricade using your plastic panels mounted on perforated square steel tube (PSST) vertical uprights instead of your square thermoplastic vertical members. This is discussed following the discourse below regarding the T3B barricade.

Full-scale automobile testing was conducted on your company's T3B barricade. Two stand-alone examples of the device were tested in tandem, one head-on and the next placed 6 meters downstream turned at 90 degrees, as called for in our guidance memoranda. The complete devices as tested are shown in the Enclosure 1.

The crash test is summarized in the table below:

| | |
|-----------------------------|---|
| Test Article | Davidson Plastics T3B Plastic Barricade |
| Height to Top of Rails | 1575 mm |
| Width of Barrier unit | 2438 mm |
| Flags or lights | None |
| Test Article Mass (each) | 21.4 kg |
| Vehicle Inertial Mass | 827 kg |
| Impact Speed, Head-on | 102.5 km/hr |
| Impact Speed, 90 Deg. | 99.7 km/hr |
| Velocity Change | 0.78 m/s (after striking the first barricade) |
| Velocity Change | 0.75 m/s (after striking the second barricade) |
| Vehicle crush | None: superficial damage to grill and hood only |
| Occupant Compart. Intrusion | None measurable |
| Windshield Damage Head-on | Significant local cracking along the bottom of the windshield |
| Windshield Damage 90 Deg. | No contact with windshield |

The test articles did not show potential for penetrating the occupant compartment. The windshield cracking was not extensive enough to impair the driver's vision, nor did it cause a hole through the glass. The results of this testing met the FHWA requirements and, therefore, the Davidson Plastics T3B Plastic Barricade is acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a State.

As mentioned earlier, the fasteners used to attach the panels were 7.94 mm (5/16") bolts, nuts, and washers. You also requested that 9.52 mm (3/8") hardware also be acceptable. Although some panels separated from the vertical members in the 90-degree test, it does not appear that the separation of the panels was necessary for the proper crashworthy performance of the barricade. Therefore, 7.94 mm or 9.52 mm fastener hardware may be used.

The Perforated Square Steel Tube Barricade using T3B panels is a Type III barricade using your plastic panels on perforated square steel tube vertical uprights. Various versions of this Type III barricade have been crash tested by others. The first to be accepted by FHWA used 38 mm square perforated steel tube vertical uprights and support legs. A splice plate at the base includes small bolts designed to fail in shear upon impact, permitting the vertical uprights to rotate downward about a 9.5 mm connection bolt. A Type III barricade supporting a 1212 mm x 1212 mm plywood sign panel was also successfully tested at the Texas Transportation Institute and found acceptable by our letter WZ-40 dated June 6, 2000. In that memorandum we included the following:

Additional discussion of PSST Type III barricades:

Numerous tests have been run on Type III barricades using PSST as horizontal skids and uprights. Wood or plastic rail elements have been used in the mostly head-on tests. These tests, some of which are covered in our FHWA Acceptance Letter WZ-3, dated August 28, 1998, show acceptable performance. Some individuals have expressed concern that an end-on test was not conducted on this class of barricade. (New York State DOT ran an informal end on test in the 1980's and reported acceptable results.) The test [detailed in acceptance letter WZ-40] shows that the PSST Type III barricade is crashworthy per Report 350 when struck head-on and at 90 degrees, at least when the horizontal barricade rails are 1219 mm (4 feet) long. We now consider the barricade to be acceptable with or without the sign, however the vertical wood elements to the outside of the PSST uprights may be necessary to ensure that the barricade structure remains intact during a crash. Secure connections of the panels to the uprights using bolts with washers are important and necessary for the crashworthy performance of Type III barricades.

Longer rail elements are used on Type III barricades by many agencies. In the PSST test reported [in WZ-40], the occupant impact velocity was close to the maximum allowable limit of 5 m/s. Therefore, we cannot allow PSST Type III Barricade/Sign supports wider than the one tested. However, if the sign and its supports are not present, the PSST Type III barricade with rails up to 2440 mm (8 feet) long will also be acceptable. We consider that the performance of the barricade would be similarly acceptable if rigid polyolefin or other similar rigid plastic panels were used for the horizontal rail elements fastened in place with 7.94 mm diameter hardware or better. Frangible plastic rails may not be used as they may separate or fracture and penetrate the windshield.

Please note the following standard provisions which apply to FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- 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, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number WZ- 39, shall not be reproduced except in full.
- Davidson Plastic Corporation's barricades are patented products and considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are selected by the contractor for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are specified for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented 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, a copy of which is enclosed.

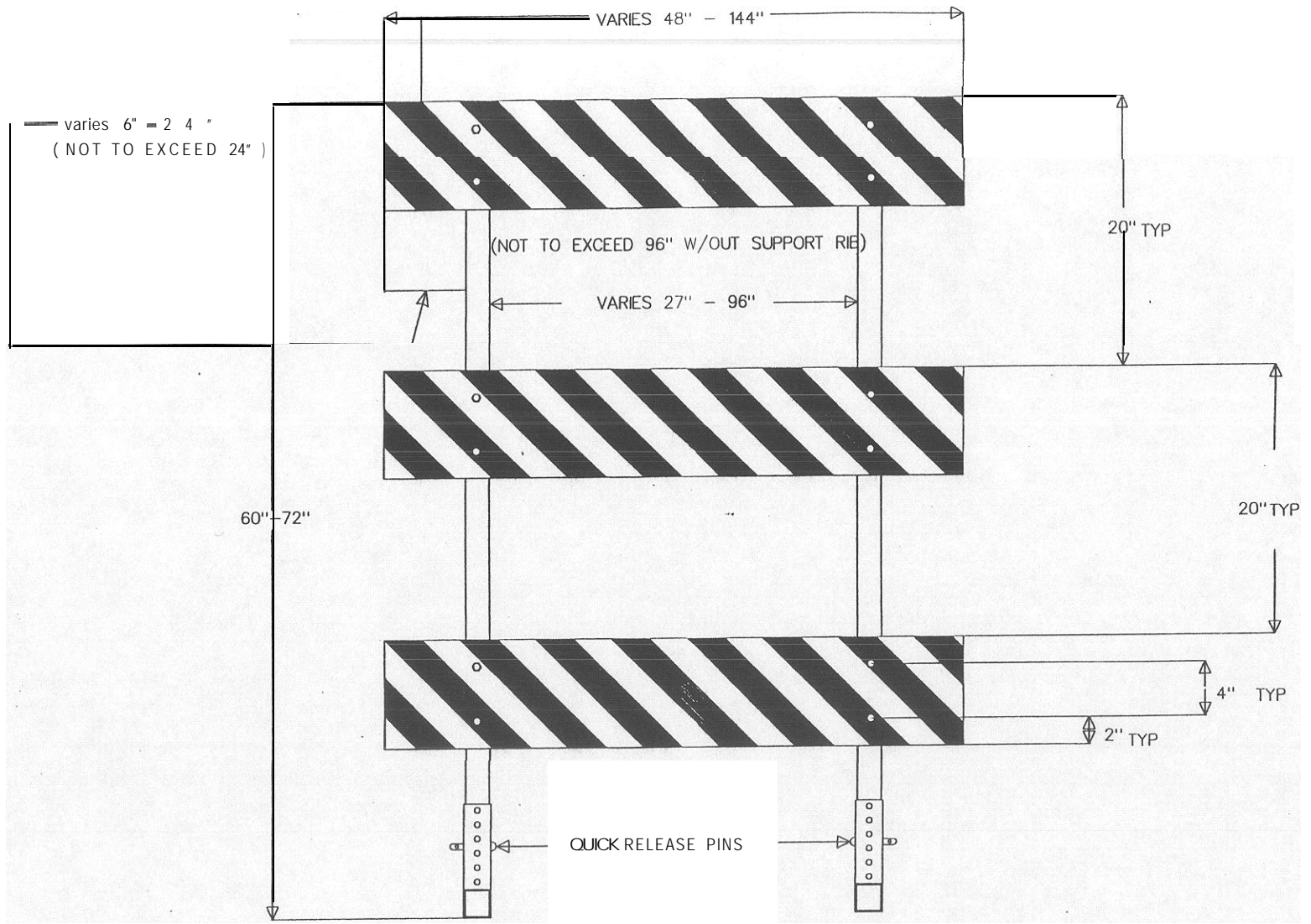
Sincerely yours,



Frederick G. Wright, Jr.
Program Manager, Safety

2 Enclosures

FHWA:HSA-1:NArtimovich:db:x61331:6/20/00
cc: Reader - HSA-1, Chron File - HSA-1
NArtimovich - HSA-1
davidsonjune.wpd



FRONT VIEW

| | | |
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| DEPT. HEAD | ENGINEERING MANAGER | DATE |
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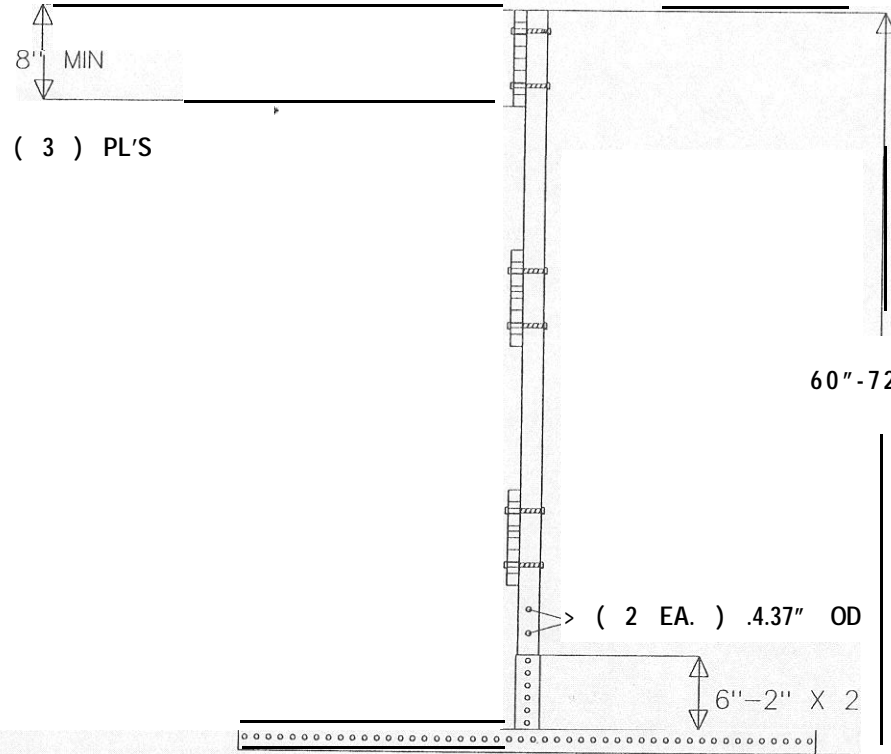
REVISIONS



Davidson Plastics Corporation
 3110 70th. Ave. East (425) 251-8140
 Tacoma, Washington 98424 Fax(425) 251-8303

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| DIE NUMBER | | PART NAME | |
| | | T3B BARRICADE COMPLETE | |
| MATERIAL | DATE | DRN BY | LAST REV. |
| | 12/3/99 | PHOUMA | |

BOLT PANELS TO X-TUBE UPRIGHTS USING:



- . 1ea. 5/16" DIA. BOLT
- >1ea 5/16" NYLOCK NUT
- >2ea 5/16" STEEL WASHERS
- (4 BOLTS PER PANEL)

(3) PL'S

60"-72" - 1.75"X1.75" PLASTIC X-TUBE

(2 EA.) .437" OD

IIA. BREAKAWAY HOLE

6"-2" X 2"

PERF SQ. STEEL TUBE (WELDED)

SIDE VIEW

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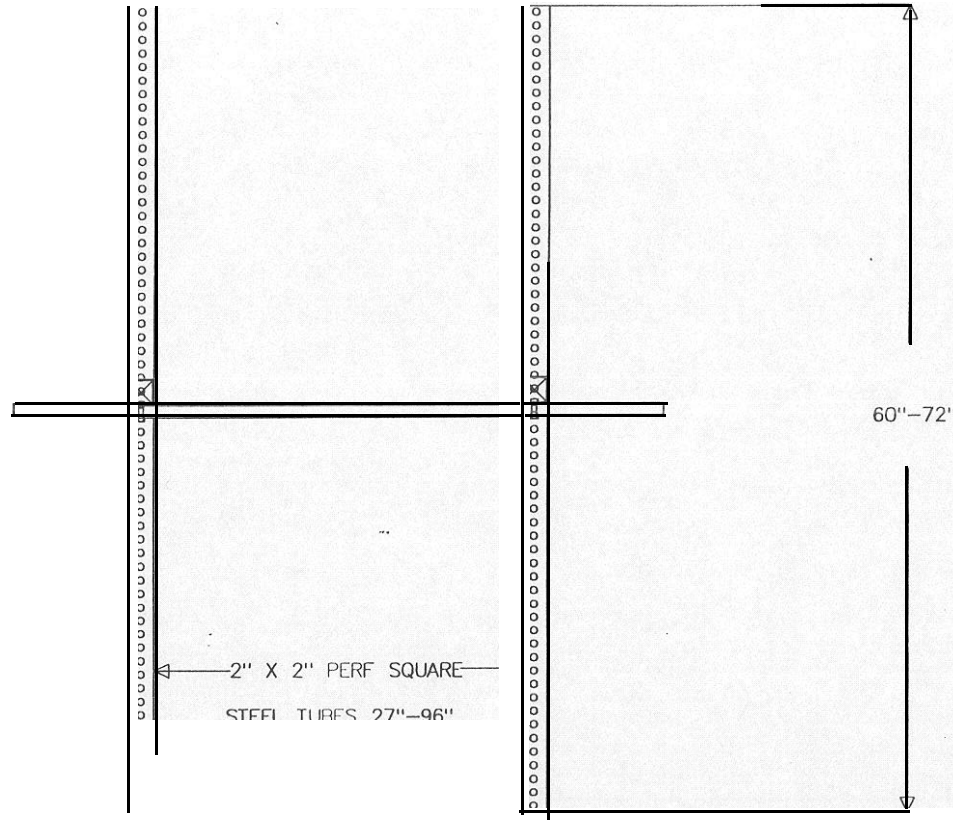
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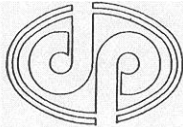
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| | | T3B BARRICADE COMPLETE | |
| MATERIAL | DATE | DRN BY | LAST REV. |
| | 12/3/99 | PHOUMA | |



TOP VIEW

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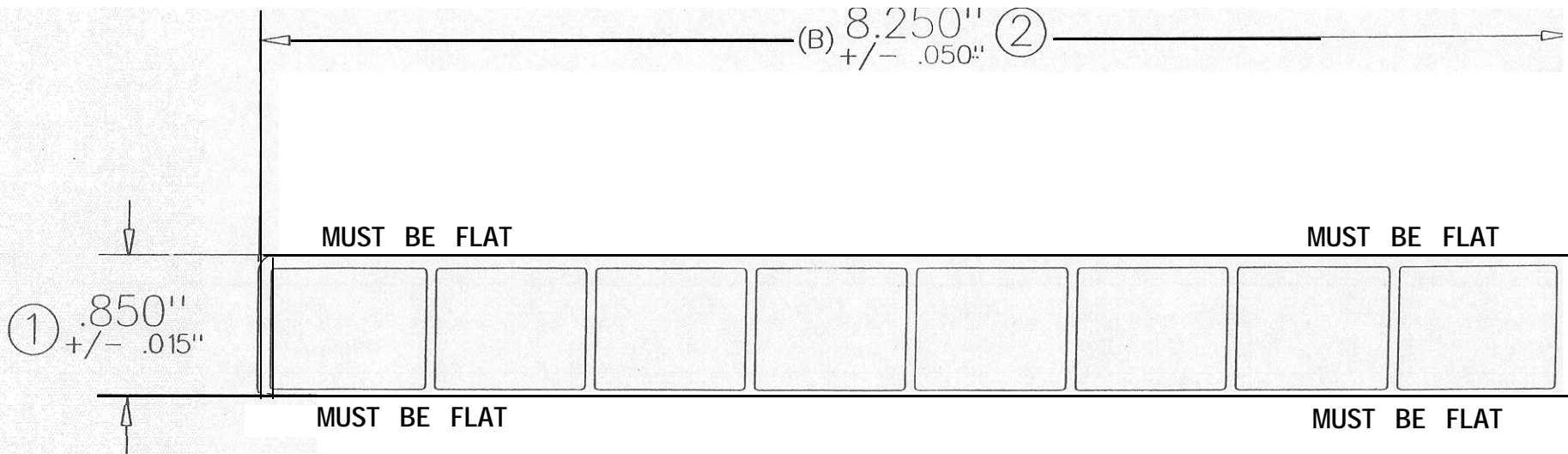


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| DIE NUMBER | | PART NAME | |
| | | T3B BARRICADE COMPLETE | |
| MATERIAL | DATE | DRN BY | LAST REV. |
| | 12/3/99 | PHOUMA | |

FOOT NOTES:

1. TOP & BOTTOM MUST BE FLAT
2. .066" +/- .005" OUTER WALLS
3. .050" +/- .005" INNER WALLS
4. DO NOT DISASSEMBLE DIE WHEN REMOVING FROM EXTRUDER (A)
5. MUST HAVE 8" OF FLAT ON TOP AND BOTTOM



| | | |
|--|---------------------|---------------|
| CUT LENGTH | | TYP. WALL |
| + ONLY | | SEE ABOVE |
| REEL LENGTH | | BOW TOLERANCE |
| N/A | | 1/16" / FT. |
| DEPT. HEAD | ENGINEERING MANAGER | DATE |
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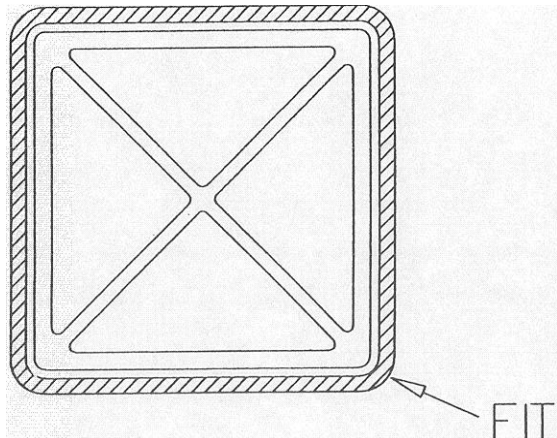
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| E | | |
| D | | |
| C | PART REDIMENSIONED | 7-6-99 CS |
| B | REDESIGNED PART | 7-6-99 CS |
| A | ADDED NOTES | 4-1-99 rb |
| REV | DESCRIPTION | DATE |
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| | | | |
|------------|----------|--------------------|-----------|
| DIE NUMBER | | PART NAME | |
| 7624 | | 8" BARRICADE PANEL | |
| MATERIAL | DATE | DRN BY | LAST REV. |
| HDPE | 12/15/97 | RAY B | 9-7-99 rb |

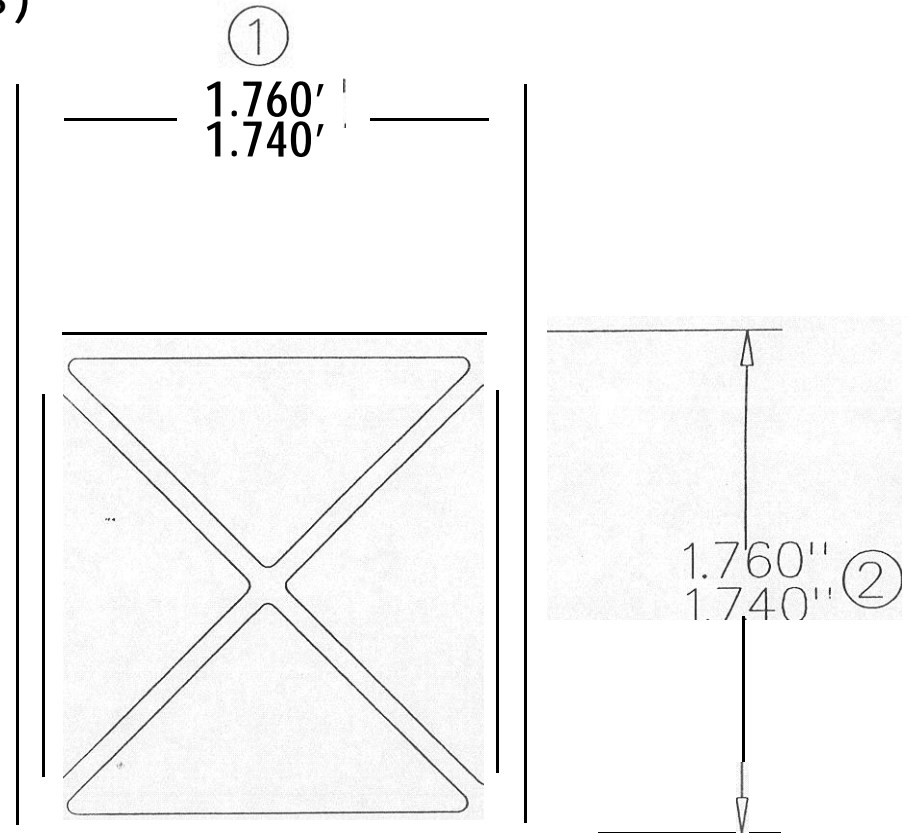
TYP WALL .085" TO .095" (OUTSIDE WALLS)

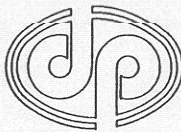
TYP WALL .065" TO .075" (INSIDE WALLS)



FIT TO

2" O.D. GALVANIZED SQUARE TUBE



| | | | | | | | | |
|--|----------------|-----------|-------------|------|---|----------------------|--------------|-----------|
| CUT LENGTH TOL | BOW/ TOLERANCE | | | |  Davidson Plastics Corporation 3110 70th. Ave. East (425) 251-8140 Tacoma, Washington 98424 Fax(425) 251-8301 | | | |
| ????? | 1/16" / FT. | E | | | | | | |
| CUSTOMER APPROVAL | DATE | D | | | | | | |
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| | | REV | DESCRIPTION | DATE | MATERIAL | DATE | DRN BY | LAST REV. |
| | | REVISIONS | | | RPVC | 12-23-98 | STEVE | |