OS-299 (7-18)

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.penndot.gov

TRANSMITTAL LETTER

PUBLICATION:

Publication 306

DATE:
2/6/2019

SUBJECT:

Publication 306 – Specifications for Sign Blanks

INFORMATION AND SPECIAL INSTRUCTIONS:

The attached publication provides specifications and dimensions of aluminum and fiberglass sign blanks used for permanent traffic signs and barricade rails used for work zone barricades.

The following is a summary of the changes that have been incorporated into this edition:

Revised document language to be compliant with the Commonwealth's Gender Neutral Policy.

CANCEL AND DESTROY THE FOLLOWING:

Publication 306 – June 1, 2016

ADDITIONAL COPIES ARE AVAILABLE FROM:

☒ PennDOT website - www.penndot.gov
Click on Forms, Publications & Maps

APPROVED FOR ISSUANCE BY:

J. Michael Long, P.E., Acting Director
Bureau of Maintenance and Operations

SPECIFICATIONS FOR SIGN BLANKS

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.penndot.gov

PUB 306 (2-19)

BUREAU OF MAINTENANCE AND OPERATIONS
PUBLICATION 306
SPECIFICATIONS FOR SIGN BLANKS

Table of Contents

A. — ALUMINUM SIGN BLANKS

1. DESCRIPTION

This specification covers the requirements and processing of flat sheet aluminum sign blanks to which a chemical conversion treatment coating has been applied. Size, shape, thickness, and weight shall be in accordance with the drawings found in Appendix A.

2. MATERIALS

2.1 Aluminum. Blanks shall conform to ASTM-B209; Alloy 5052-H38 or 6061-T6. The manufacturer shall on the bid document indicate the specific ASTM Aluminum Alloy on which the bid is based and from which the aluminum sign blanks will be fabricated and furnished. Failure to select one or more of the Aluminum Alloys specified above and to indicate the selected alloy(s) on the bid document shall be cause for rejection of the vendor's bid.

2.2 Chemical Conversion Coating. The chemical conversion coating to be employed in the preparation of aluminum sign blanks shall conform to ASTM B 921 Class 1 or ASTM B 449 Class 1, and the coating material shall be included on the QPL-81706-15 Amendment 3 list or subsequent editions thereto. The chemical conversion treatment shall be completed after the blanks have been fabricated, including the punching of all holes. All procedures used in the conversion coating process must comply with the recommendations of the manufacturers of retroreflective sheeting materials listed in Department Publication 35 Section 1103.02(c).

3. FABRICATION

3.1 General. Blanks shall be a continuous section of the length, width and thickness, with required mounting holes as shown on the drawings. They shall conform to commercial tolerances with regard to length, width, thickness, flatness, hole spacing, hole diameter, corners and corner radii in accordance to ANSI-H35-2 (Tables 2.1, 3.1, 3.2, 3.3, 7.1, and 7.6 through 7.14). Blanks shall be free of buckles, dents and burrs prior to the application of the chemical conversion treatment. All shearing shall be from the same side of the blanks, the sheared side shall be placed and packaged face up.

3.2 Warp. When the aluminum sign blank is resting on a flat, level surface with either side down, all parts of the underside of the sign blank shall be within 1/4-inch of the flat surface without any external pressure.

4. INSPECTION

4.1 During Fabrication. The contractor shall provide sufficient testing and quality control throughout fabrication to ensure an acceptable product. The Engineer or the Engineer's accredited representative shall have access to all parts of the mill and shop during the manufacture and fabrication of the sign blanks.

B. — FIBERGLASS REINFORCED PLASTIC (FRP) SIGN BLANKS

1. SCOPE

1.1 This specification shall define the critical parameters required for the direct replacement of .063" to .100", 5052 and 6061 series aluminum, and/or other equivalent signage panels by a FRP (Fiberglass Reinforced Plastic) panel for use in traffic control and related signage.

1.2 This specification covers general laminate properties, mechanical properties, physical properties, and applicable documents. Industry recommendations for handling and fabrication of the panels are attached.

1.3 The intent of this specification is to define the panel designed to deliver a cost-effective performance replacement to existing traffic control panels.

1.4 To demonstrate the ability of a panel to meet its intended use and proposed benefits in the traffic control sign market, panels shall satisfactorily meet and pass all of the following specifications.

2. GENERAL LAMINATE PROPERTIES

2.1 The traffic control sign panel shall be a fiberglass reinforced thermoset polyester laminate. The panel shall be acrylic modified and UV stabilized for outdoor weatherability.

2.2 The panel shall be stabilized so as to prevent the release of migrating constituents (i.e. solvents, monomers, etc.) over time and shall contain no residue release agents on the surface of the laminate so that neither migrating constituents or release agents will be present in amounts that will interfere with any subsequent bonding operations.

2.3 The panel shall not contain visible cracks, pinholes, foreign inclusions, or surface wrinkles that would affect implied performance, alter the specific dimensions of the panel or otherwise affect its serviceability.

3. MECHANICAL PROPERTIES

3.1 All mechanical properties are stated as minimum requirements. The mechanical properties are measured in both the line direction of the panel and at 90^0 to the line as noted in the appropriate ASTM test referenced.

Mechanical Property	Averaged Minimum Requirement psi	ASTM Test
Tensile Strength	10,000	D 638
Tensile Modulus	1,200,000	D 638
Flexural Strength	20,000	D 790
Flexural Modulus	1,200,000	D 790
Compression Strength	32,000	D 695
Compression Modulus	1,400,000	D 695
Punch Shear	13,000	D 732

4. PHYSICAL PROPERTIES

4.1 Thickness. Panels shall be 0.135" thick with a tolerance of ± 0.005".

4.2 Size (length and width). Dimensions shall be in accordance with Appendix A. Panel tolerance on nominal length and width specified by the purchaser shall be ± 1/8" for dimensions of 10' or less when measured in accordance with ASTM D 3841.

4.3 Squareness. Panels shall be within 1/8" of square per 10' of length when measured in accordance with ASTM D 3841.

4.4 Smoothness. Panels shall be manufactured with smooth surfaces on both the top and bottom of the panel.

4.5 Color. Panels shall be pigmented to a visually uniform white color within the following range using a colorimeter with a Hunter L a b scale:

Criteria	Value	Tolerance
L	88.00	+/- 3.00
a	-2.00	+/- 2.00
b	1.00	+/- 2.00

4.6 Coefficient of Lineal Thermal Expansion. Panels shall have a maximum coefficient of lineal thermal expansion of 1.8×10^{-5} in/in/^{0}F when tested in accordance with ASTM D 696.

4.7 Weather Resistance. Panels shall be classified as to a minimum Grade 1 (weather resistant) panel as specified in ASTM D 3841 following a 3,000±100 hour weatherometer test.

4.8 Fire Resistance. All fiberglass reinforced polyester panels will burn. The traffic control sign panel shall contain additives designed to be less responsive to fire ignition and flame propagation. As such, the extent of burning shall not exceed 1.0" when tested in accordance with ASTM D 635.

4.9 Flatness. Panels shall have a maximum deflection of 0.50" when tested in accordance with TSP-1 found in Appendix B.

4.10 Impact Resistance. Panels shall resist the impact of a 1.18 lb falling ball dropped from 60".

4.11 Thermal Stability. Mechanical properties as specified in 3.1 shall not fall more than 10% of their specified values and impact resistance shall not be visibly affected over a temperature range of 0 F^0 to 120 F^0.

5. APPLICABLE DOCUMENTS

5.1 ASTM STANDARDS

D 3841	Specifications for Glass-Fiber-Reinforced Polyester Plastic Panels
D 638	Test Method for Tensile Properties of Plastics
D 790	Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D 695	Test Method for Compressive Properties of Rigid Plastics
D 635	Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
D 732	Test Method for Shear Strength of Plastics for Punch Tool
D 696	Test Method for Coefficient of Linear Thermal Expansion of Plastics

5.2 SPECIFIED STANDARDS

TSP-1	FRP Traffic Sign Panel Flatness Test (Appendix B)

6. INSPECTION

The contractor shall provide sufficient testing and quality control throughout fabrication to ensure an acceptable product. The Engineer or the Engineer's accredited representative shall have access to all parts of the mill and shop during the manufacture and fabrication of the sign blanks.

C. — PLASTIC BARRICADE RAILS

1. SCOPE

This specification covers plastic barricade rail blanks for use in fabricating barricade rails used within temporary traffic control zones.

2. GENERAL REQUIREMENTS

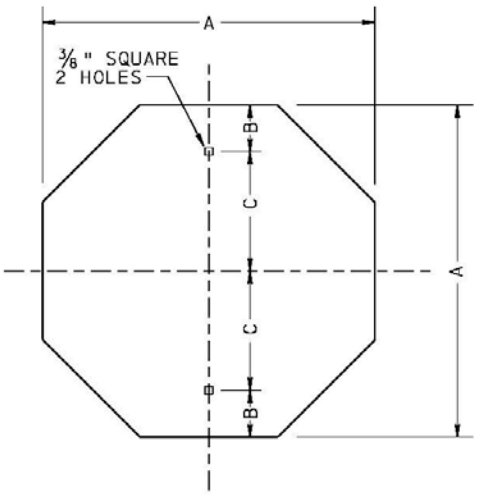
2.1 Blanks shall be made of white high-density polyethylene, honeycombed material, strong, semi-rigid and non-brittle. The rails shall be 72 inches long with a cross section conforming to the attached drawing.

2.2 The barricade rails shall remain strong, semi-rigid and non-brittle, and shall not distort when exposed to any temperature between 0° F to 120° F for a period of at least 4 hours. The material shall conform to the following material specifications:

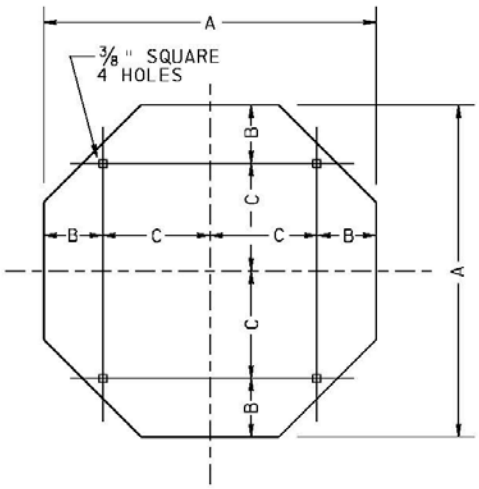
Property	ASTM Test	Results
Specific Gravity (min.)	D 1505	0.95
Hardness (min.)	D 1525	60 D
Tensile Strength, PSI at break (min.) Specimen Type II	D 638	5,000
Elongation at break, percent (min.) Specimen Type II	D 638	800
Flexural Strength, PSI (min.)	D 790	4,600
Low Temperature, Brittleness Point (max.)	D 746	-76°F

2.3 See the figure Appendix C for sizing and dimension details for the barricade rail blanks.

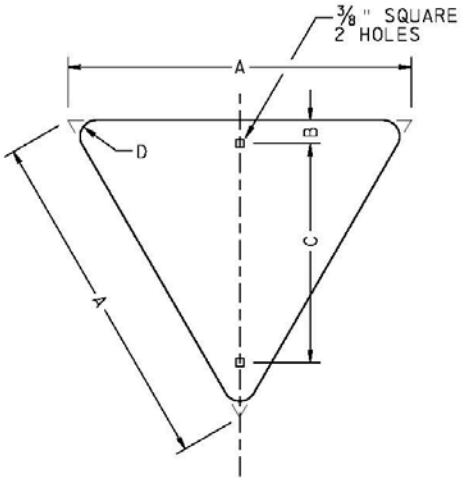
Appendix A



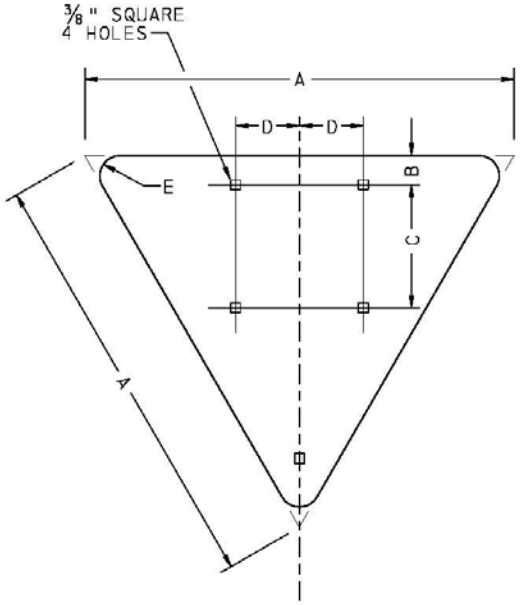
BLANK STD.	A	B	C	THICK.	AREA	WEIGHT
B1-24	24	3	9	0.080	477.17	3.66
B1-30	30	3	12	0.080	745.58	5.73
B1-36	36	3	15	0.100	1073.64	10.31



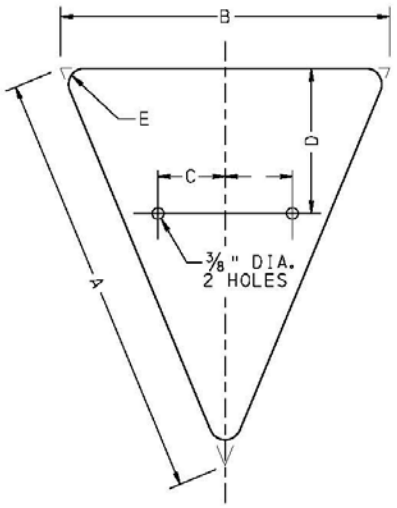
BLANK STD.	A	B	C	THICK.	AREA	WEIGHT
B1-48	48	9	15	0.100	1908.70	18.32



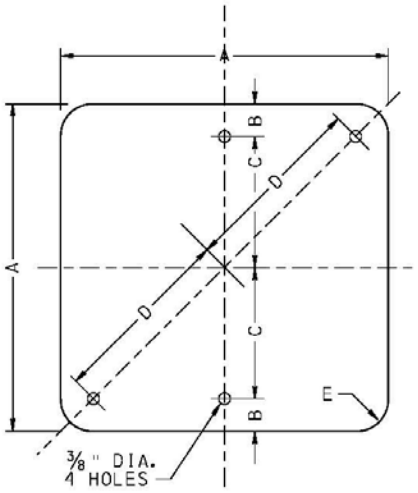
BLANK STD.	A	B	C	D	THICK.	AREA	WEIGHT
B2-36	36	3	21	2	0.080	561.24	4.31
B2-48	48	6	24	3	0.100	997.68	9.58



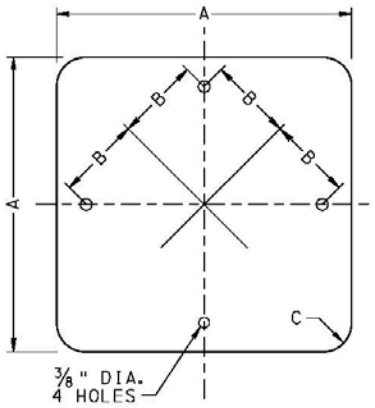
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B2-60	60	3	18	15	4	0.125	1558.80	18.71



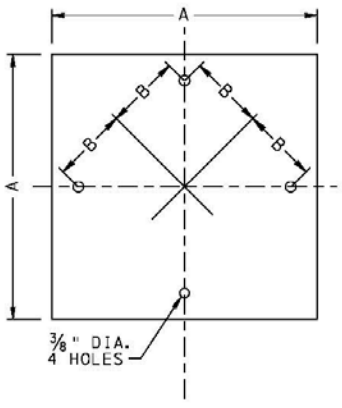
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B2-4836	48	36	9	15	2¼	0.100	801	7.69



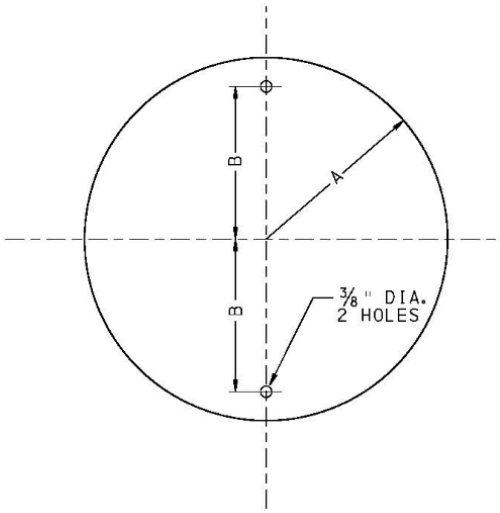
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B3-10	10	1	4	-	1½	0.063	100	0.60
B3-18	18	3	6	9	1½	0.063	324	1.96
B3-24	24	3	9	12	1½	0.080	576	4.42
B3-30	30	3	12	15	1⅞	0.080	900	6.91
B3-36	36	6	12	18	2¼	0.100	1296	12.44



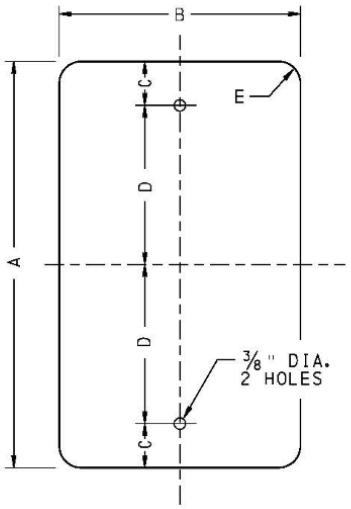
BLANK STD.	A	B	C	THICK.	AREA	WEIGHT
B3-48	48	15	3	0.100	2304	22.12



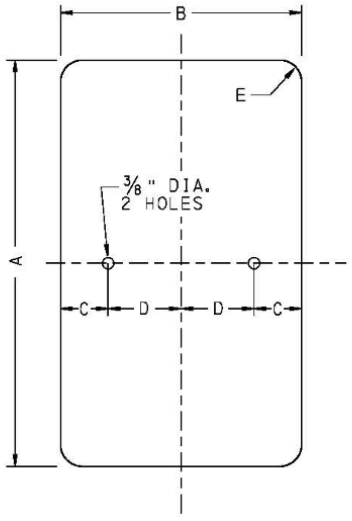
BLANK STD.	A	B	THICK.	AREA	WEIGHT
B3-60	60	18	0.125	3600	43.20



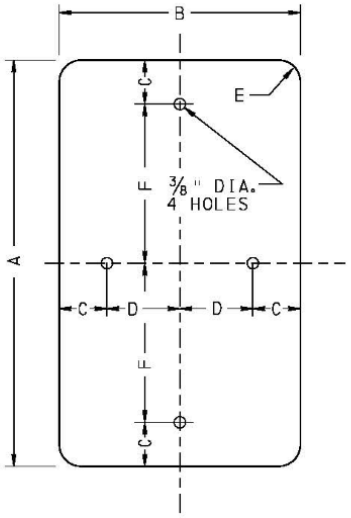
BLANK STD.	A	B	THICK.	AREA	WEIGHT
B4-36	18	15	0.100	1017.88	9.77



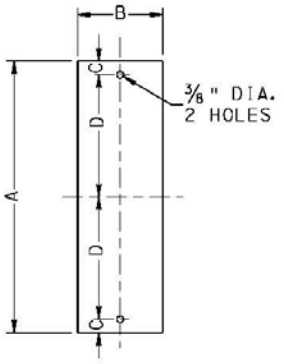
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B5-1006	10	6	1	4	1 1/2	0.040	60	0.23
B5-1236	36	12	6	12	1 1/2	0.100	432	4.15
B5-1248	48	12	9	15	1 1/2	0.100	576	5.53
B5-1260	60	12	12	18	1 7/8	0.100	720	6.91
B5-5418	54	18	3	24	1 7/8	0.100	972	9.33
B5-6018	60	18	4	26	1 7/8	0.100	1080	10.37



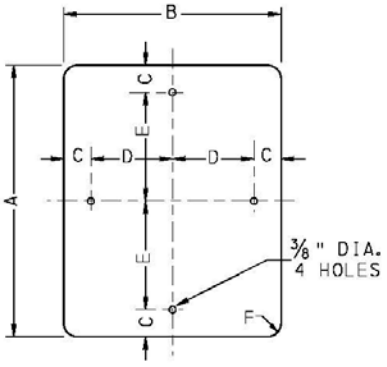
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B5-1206	12	6	1	2	1 1/2	0.063	72	0.44
B5-1806	18	6	1	2	1 1/2	0.080	108	0.83
B5-2115	21	15	1 1/2	6	1 1/2	0.080	315	2.42
B5-2406	24	6	1	2	1 1/2	0.080	144	1.127
B5-3012	30	12	2	4	1 1/2	0.080	360	2.76
B5-3015	30	15	1 1/2	6	1 1/2	0.080	450	3.46
B5-3018	30	18	2	7	1 1/2	0.080	540	4.15



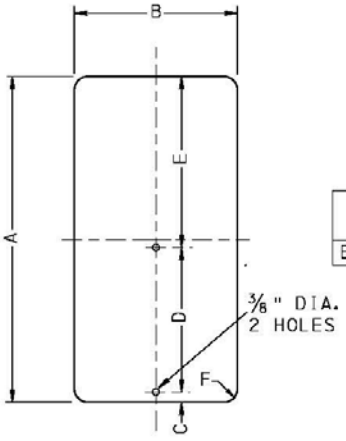
BLANK STD.	A	B	C	D	E	F	THICK.	AREA	WEIGHT
B5-2412	24	12	1 1/2	4 1/2	1 1/2	10 1/2	0.080	288	2.21
B5-2418	24	18	3	6	1 1/2	9	0.080	432	3.32
B5-3612	36	12	1 1/2	4 1/2	1 1/2	16 1/2	0.100	432	4.15



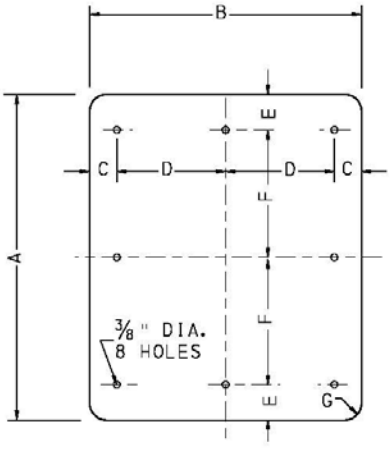
BLANK STD.	A	B	C	D	THICK.	AREA	WEIGHT
B5-3010	30	10	1½	13½	0.080	300	2.30



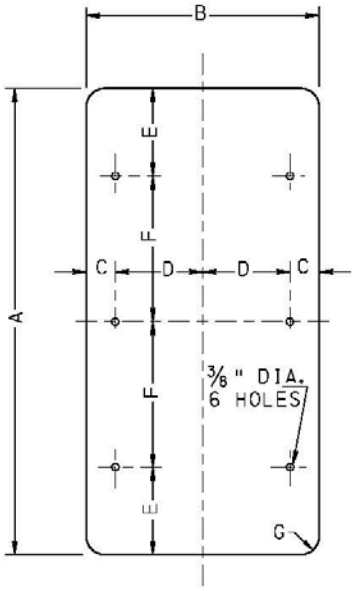
BLANK STD.	A	B	C	D	E	F	THICK.	AREA	WEIGHT
B5-3024	30	24	3	9	12	1½	0.080	720	5.53
B5-1218	18	12	1½	4½	7½	1½	0.063	216	1.31



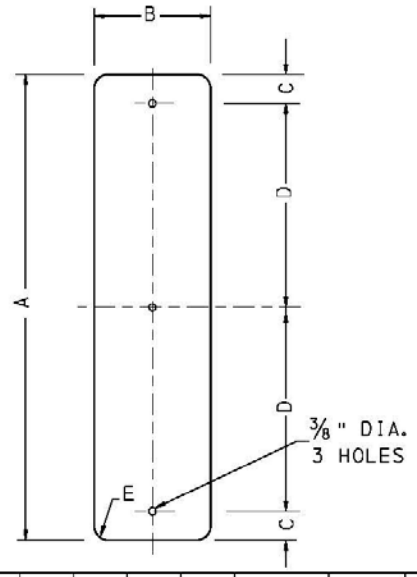
BLANK STD.	A	B	C	D	E	F	THICK.	AREA	WEIGHT
B5-3618	36	18	1	16	19	1½	0.100	648	6.22



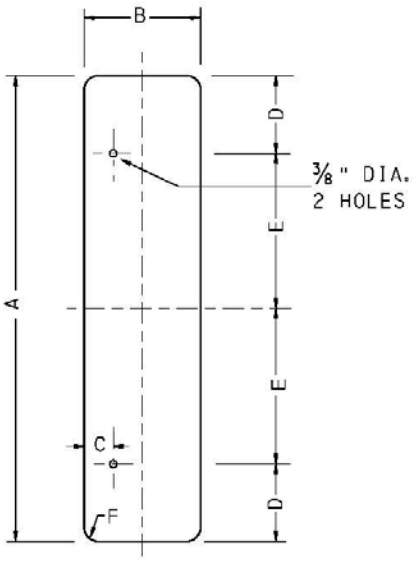
BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B5-3630	36	30	3	12	4	14	1⅞	0.100	1080	10.37



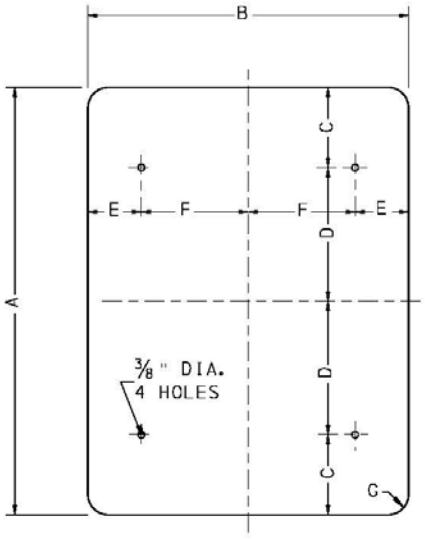
BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B5-3618	36	18	3	6	6	12	1 1/2	0.100	648	6.22
B5-3624	36	24	3	9	6	12	1 1/2	0.100	864	8.29
B5-4818	48	18	3	6	9	15	1 7/8	0.100	864	8.29
B5-4830	48	30	6	9	9	15	1 7/8	0.100	1440	13.82
B5-4860	60	48	9	15	6	24	3	0.125	2880	34.56



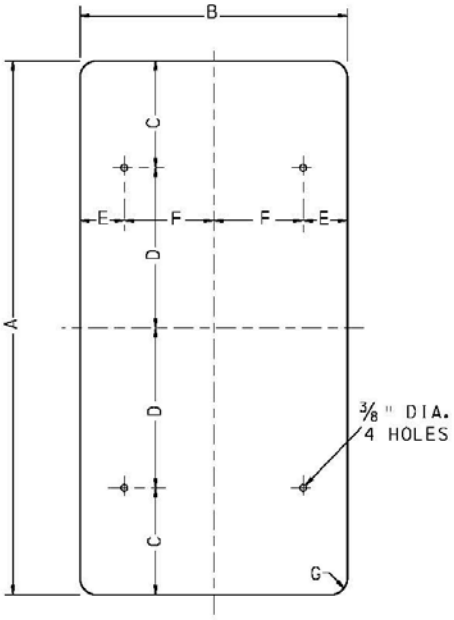
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B5-4812	48	12	4	20	1 1/2	0.080	576	4.42



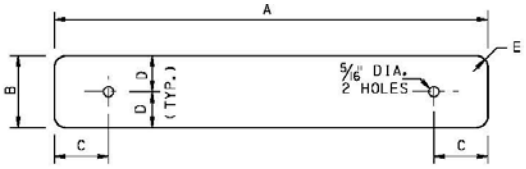
BLANK STD.	A	B	C	D	E	F	THICK.
B5-3608	36	8	2	6	12	1 1/2	0.100



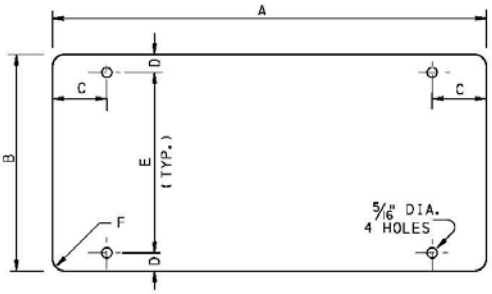
BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B5-4536	45	36	7 1/2	15	6	12	2 1/4	0.100	1620	15.55
B5-3648	48	36	9	15	6	12	2 1/4	0.100	1728	16.56



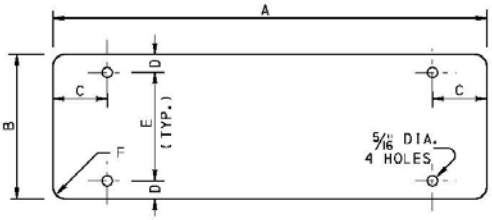
BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B5-6024	60	24	12	18	3 1/2	8 1/2	1 7/8	0.100	1440	13.82
B5-6030	60	30	12	18	3 1/2	11 1/2	1 7/8	0.125	1800	21.60



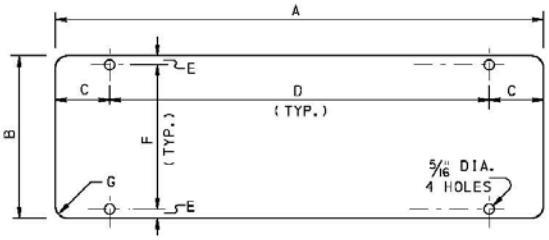
BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B5-4808	48	8	9	4	1½	0.100	384	3.69



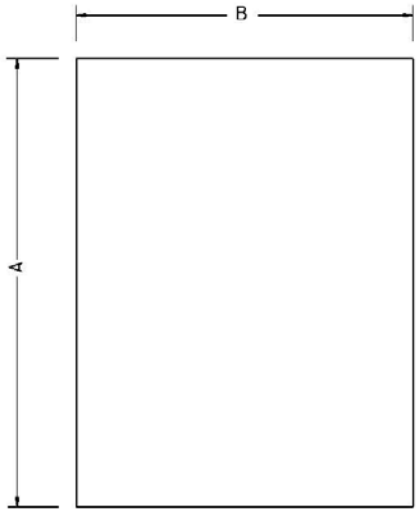
BLANK STD.	A	B	C	D	E	F	THICK.	AREA	WEIGHT
B5-4824	48	24	9	3	18	1⅞	0.100	1152	11.06



BLANK STD.	A	B	C	D	E	F	THICK.	AREA	WEIGHT
B5-4816	48	16	9	3	10	1⅞	0.100	768	7.38

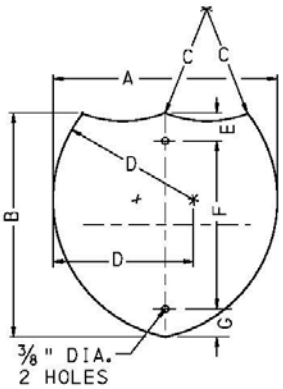


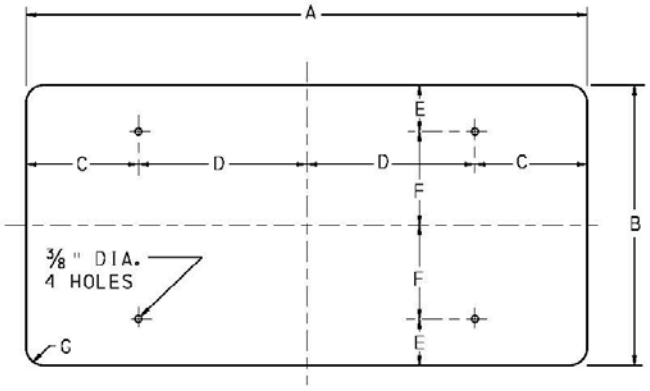
BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B5-7212	72	12	12	48	1	10	1⅞	0.100	864	8.30
B5-7224	72	24	12	48	1	22	1⅞	0.100	1728	16.59
B5-7236	72	36	12	48	1	34	1⅞	0.100	2592	24.88
B5-7824	78	24	12	54	1	22	1⅞	0.100	1872	17.98
B5-8424	84	24	12	60	1	22	1⅞	0.100	2016	19.37
B5-9024	90	24	12	66	1	22	1⅞	0.100	2160	20.75



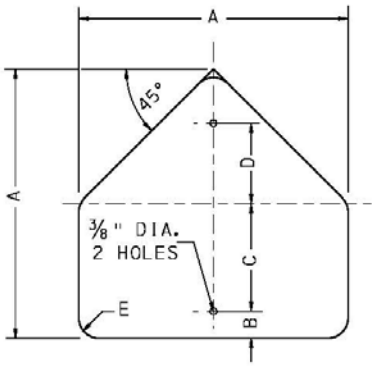
BLANK STD.	A	B	THICK.	AREA	WEIGHT
B5-7260	72	60	0.080	4320	33.18
B5-7860	78	60	0.080	4680	35.94
B5-8460	84	60	0.080	5040	38.71
B5-9660	96	60	0.080	5760	44.24

BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B6-24	24	24	15	15	3	18	3	0.080	469.26	3.60
B6-3024	30	24	24	17	3	18	3	0.080	572.18	4.39
B6-36	36	36	22½	22½	6	24	6	0.100	1108.30	10.64
B6-4536	45	36	36	25½	6	24	6	0.100	1280.42	12.29

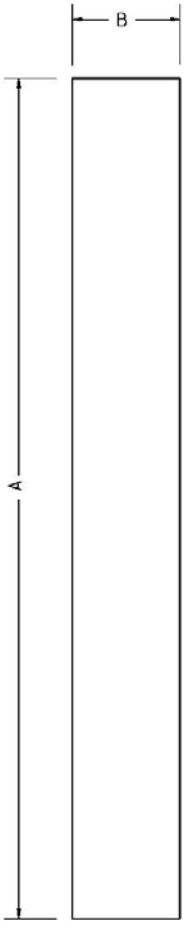




BLANK STD.	A	B	C	D	E	F	G	THICK.	AREA	WEIGHT
B7-3618	36	18	6	12	2	7	1½	0.100	648	6.22
B7-4818	48	18	9	15	2	7	1⅞	0.100	864	8.29
B7-4824	48	24	9	15	2	10	1⅞	0.100	1152	11.06



BLANK STD.	A	B	C	D	E	THICK.	AREA	WEIGHT
B8-30	30	3	12	9	1 7/8	0.080	675	5.18
B8-36	36	3	15	9	2 1/4	0.100	972	9.33



BLANK STD.	A	B	THICK.	AREA	WEIGHT
B10-14430	144	30	0.063	4320	26.13
B10-14436	144	36	0.063	5184	31.35
B10-14448	144	48	0.063	6912	41.80
B11-7248	72	48	0.080	3456	26.54
B11-9648	96	48	0.080	4608	35.39
B11-12018	120	18	0.080	2160	16.59
B11-12024	120	24	0.080	2880	22.12
B11-12030	120	30	0.080	3600	27.65
B11-12036	120	36	0.080	4320	33.18
B11-12048	120	48	0.080	5760	44.24
B11-12060	120	60	0.080	7200	55.30
B11-14418	144	18	0.080	2592	19.90
B11-14424	144	24	0.080	3456	26.54
B11-14430	144	30	0.080	4320	33.18
B11-14436	144	36	0.080	5184	39.81
B11-14448	144	48	0.080	6912	53.08
B11-14460	144	60	0.080	8640	66.36
B11-19218	192	18	0.080	3456	26.54
B11-19224	192	24	0.080	4608	35.39
B11-19230	192	30	0.080	5760	44.24
B11-19236	192	36	0.080	6912	53.08
B11-19248	192	48	0.080	9216	70.78
B12-12036	120	36	0.100	4320	41.47
B12-12048	120	48	0.100	5760	55.30
B12-14436	144	36	0.100	5184	49.78
B12-14448	144	48	0.100	6912	66.36
B11-7208	72	8	0.100	576	5.53
B13-12012	120	12	0.125	1440	17.28
B13-12018	120	18	0.125	2160	25.92
B13-12024	120	24	0.125	2880	34.56
B13-12030	120	30	0.125	3600	43.20
B13-12048	120	48	0.125	5760	69.12
B13-12060	120	60	0.125	7200	86.40
B13-14412	144	12	0.125	1728	20.74
B13-14418	144	18	0.125	2596	31.10
B13-14424	144	24	0.125	3456	41.47
B13-14430	144	30	0.125	4320	51.84
B13-14448	144	48	0.125	6912	82.94
B13-14460	144	60	0.125	8640	103.68

Appendix B

TSP-1 FRP TRAFFIC SIGN PANEL FLATNESS TEST

1. PURPOSE

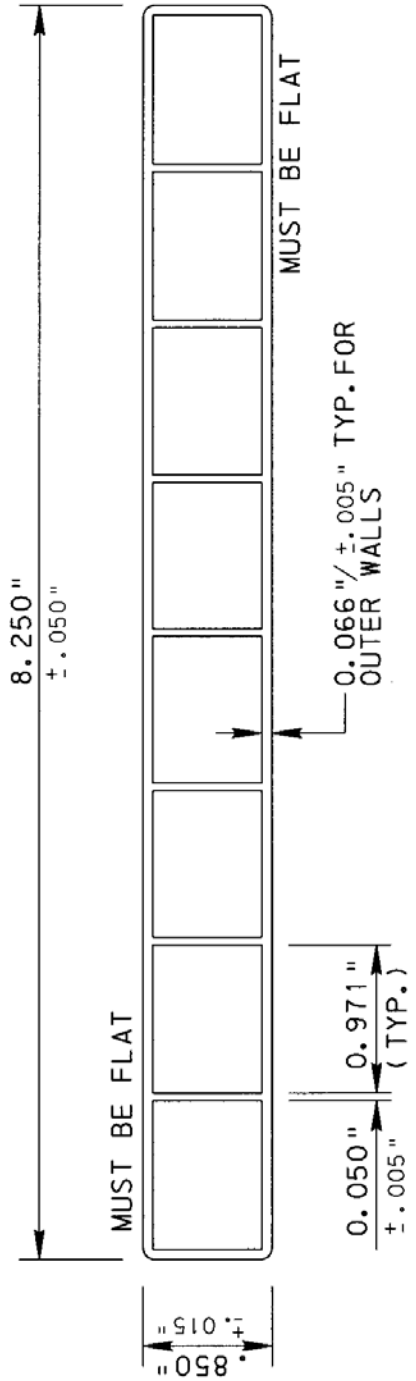
This test is performed to determine the potential for warpage in FRP panels for traffic signs.

2. PROCEDURE

This test requires five 300" x 300" FRP panels. Initial warpage is measured in four directions: 0^0, 45^0, 90^0, and 135^0. To measure warpage, the panel is freely suspended at one corner, and a straight edge is placed along the panel so that the edges of the panel touch the straight edge. Care must be exercised so as not to disturb the dimensional characteristics of the panel. A rule graduated in millimeters (fractional inches) is used to measure the distance from the center of the panel face to the straight edge. That distance is measured to the nearest 1/32 inch in all four directions.

The panels are then freely suspended diagonally in an oven for 48 hours at 180^0F. After 48 hours in the oven, the panels are removed and allowed to cool to room temperature freely suspended. Warpage measurements and corresponding direction are again recorded as described above.

Appendix C



8" BARRICADE PANEL

SCALE: 1"=1'-0"