

2021-04-WZ

Project Title:	Portable sign supports for aluminum signs with variation on mounting height.
Project Synopsis:	There is a need to place temporary signs within channelizing devices so they are visible for the traveling public. This requires a minimum sign height of 5 ft measured from the top of pavement to the bottom of the sign. MASH testing will be conducted to aide in the development of a crashworthy sign stand for temporary applications.
Project Goal(s):	Develop a design for a sign stand for rigid signs that can be placed within channelizing devices at a mounting height of 5' or greater (7' is preferred). Sign size needs to range from 2' x 2' (4 square feet) to 4' x 4' (16 square feet).
Project Background:	<p>In work zones, when signs are placed among channelizing devices, they can be visually blocked. Currently, there is not a tested sign stand that can hold a rigid (aluminum) sign at a height necessary to be placed among channelizing devices, only roll-up signs. A sign stand that can place the sign above these devices is needed to provide appropriate sight distance and decision time.</p> <p>See attached figures for proper and improper placement at the bottom of the page.</p>
Proposed Work Plan:	<p><u>Tasks:</u></p> <ol style="list-style-type: none"> 1. Literature Review 2. Engineering Analysis 3. Construction and Demolition 4. MASH TL-3 Full-Scale Crash Testing and Reporting

Deliverables:	Compile summary report to document research effort, including literature review, CAD details, crash testing, and recommendations for further research in the event of the system failing testing criteria.
Urgency and Expected Benefit:	Successful MASH evaluation of a temporary sign stand will improve safety in work zones and allow for the installation of signs among channelizing devices that can be seen with adequate time for decision making.
Problem Funding and Research Period:	\$210,000 and 14 months.
Developer(s) of the Problem Statement:	<p>Name: Shawn Debenham / Justin Wilstead / Brian Crossley / Michelle Moser</p> <p>Email: sdebenham@utah.gov / jwilstead@utah.gov / bcrossley@pa.gov / michelle.moser@state.mn.us</p> <p>Phone: 801-971-9575 / 801-910-2507 / 717-265-7562</p>

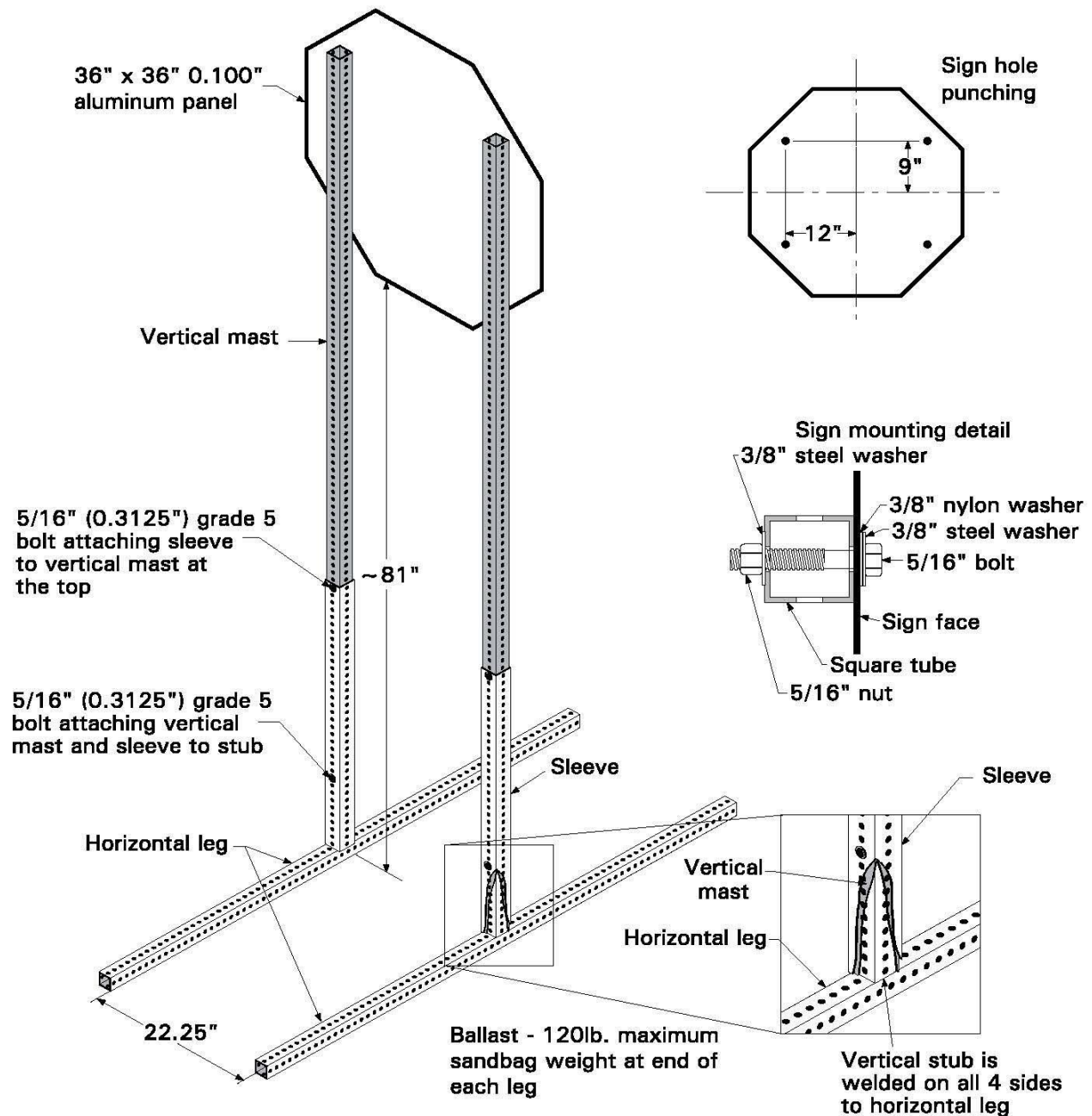


Figure 1. Improper sign height among channelizing devices.



Figure 2. Proper sign height among channelizing devices.

Temporary Sign Stand Examples



Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 2" x 2" x 108" long.

(2) Sleeves - 2.25" x 2.25" x 36" long.

(2) Horizontal legs - 1.75" x 1.75" x 72" long.

(2) Legs, vertical stubs - 1.75" x 1.75" x 12" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

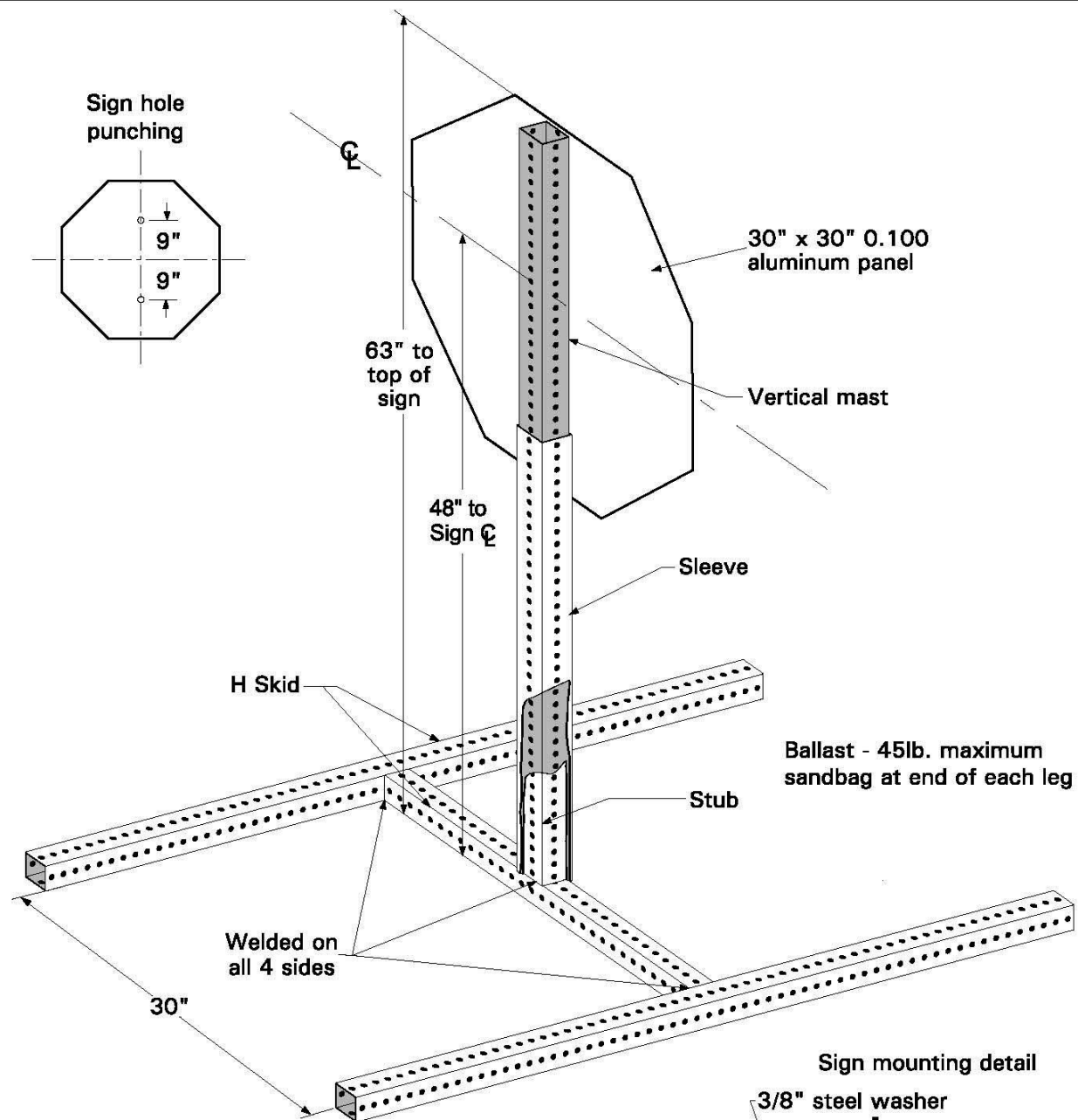
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12/1/05

DATE OF REV.

**NCHRP 350 COMPLIANT
TALL PORTABLE SIGN STAND
FOR 36" X 36" STOP**





Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) H skid, horizontal legs - 2" x 2" x 60" long.

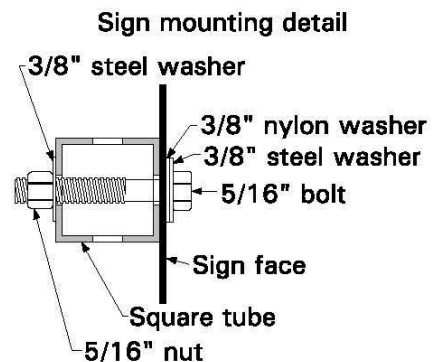
(1) H skid, cross bar - 2" x 2" x 30" long.

(1) H skid, vertical stub - 2" x 2" x 12" long.

(1) Vertical mast - 2.25" x 2.25" x 60" long.

(1) Sleeve - 2.5" x 2.5" x 36" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

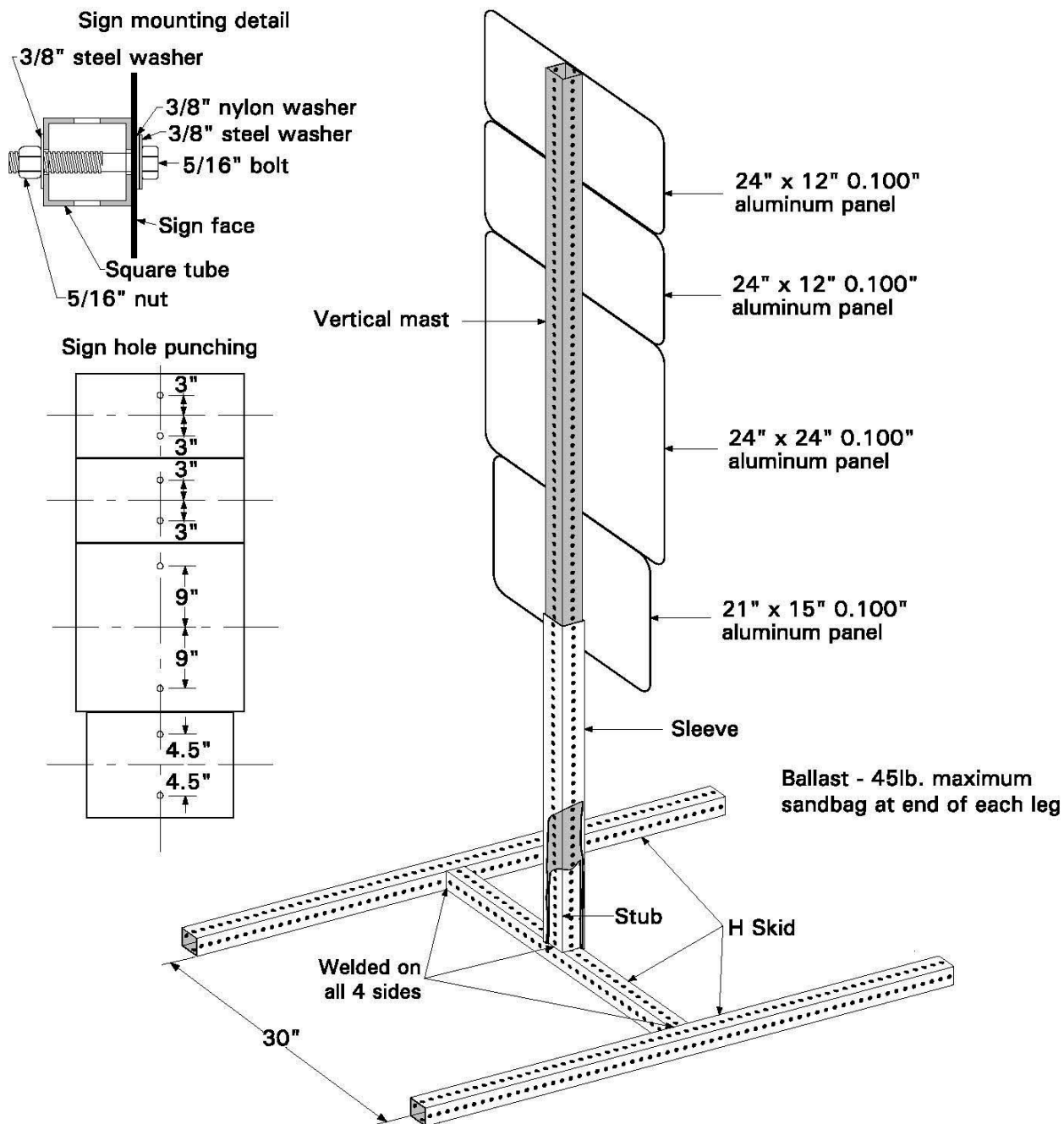


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**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR 30" X 30" STOP SIGN**





Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) H skid, horizontal legs - 2" x 2" x 60" long.

(1) H skid, cross bar - 2" x 2" x 30" long.

(1) H skid, vertical stub - 2" x 2" x 12" long.

(1) Vertical mast - 2.25" x 2.25" x 96" long.

(1) Sleeve - 2.5" x 2.5" x 36" long.

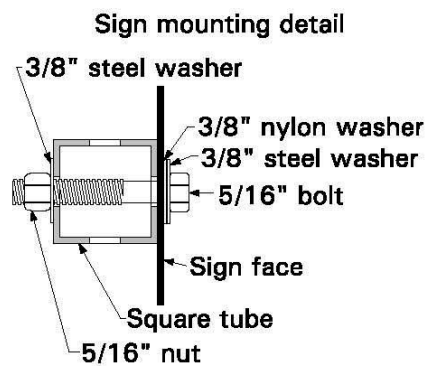
Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

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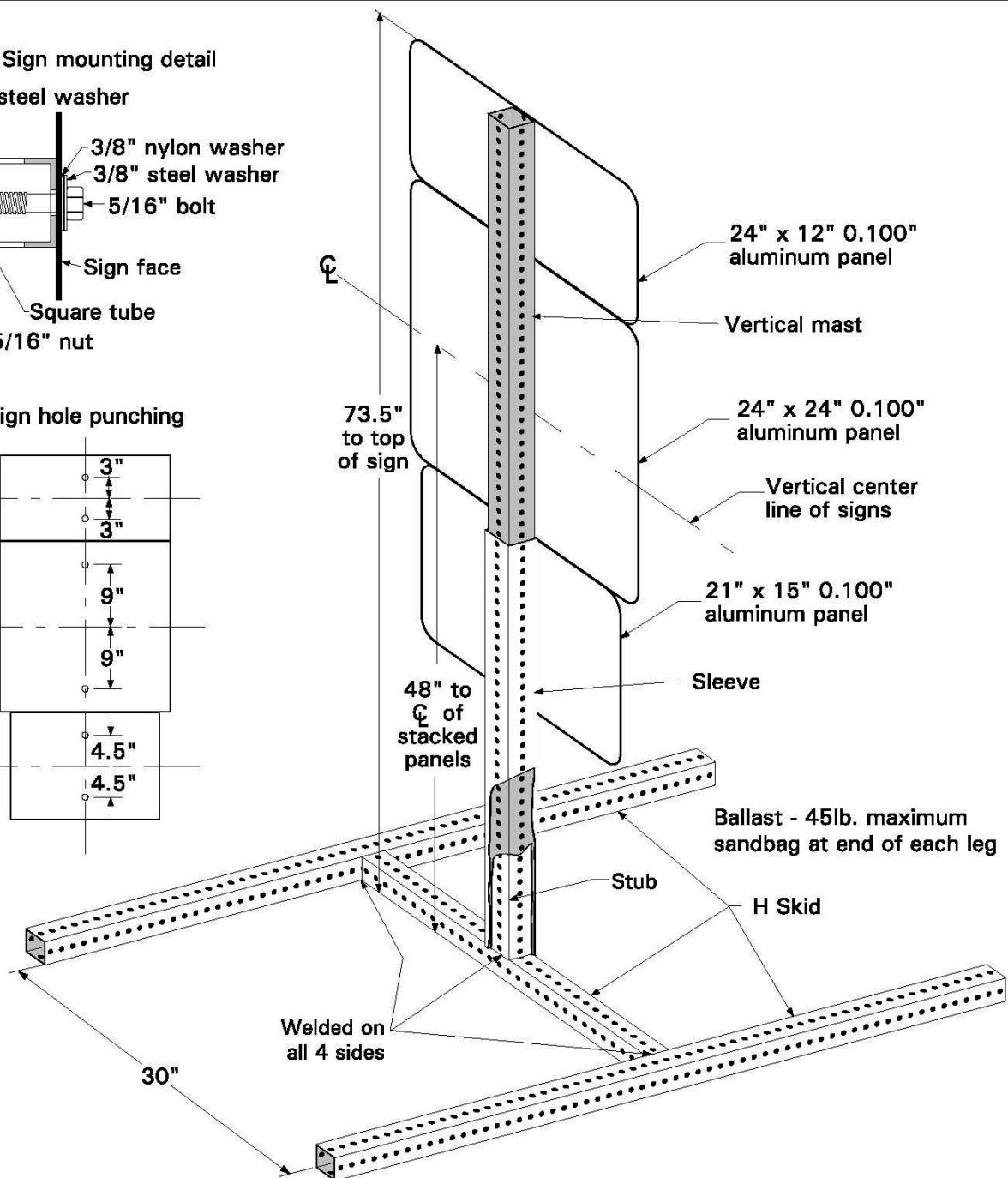
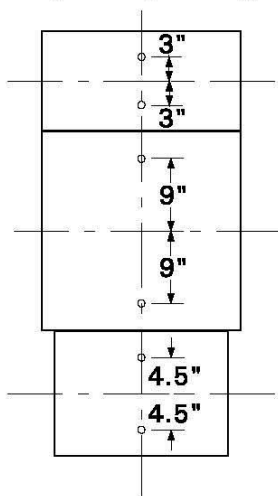
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**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND FOR
DETOUR ASSEMBLY WITH 8' MAST**





Sign hole punching



Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) H skid, horizontal legs - 2" x 2" x 60" long.

(1) H skid, cross bar - 2" x 2" x 30" long.

(1) H skid, vertical stub - 2" x 2" x 12" long.

(1) Vertical mast - 2.25" x 2.25" x 72" long.

(1) Sleeve - 2.5" x 2.5" x 36" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

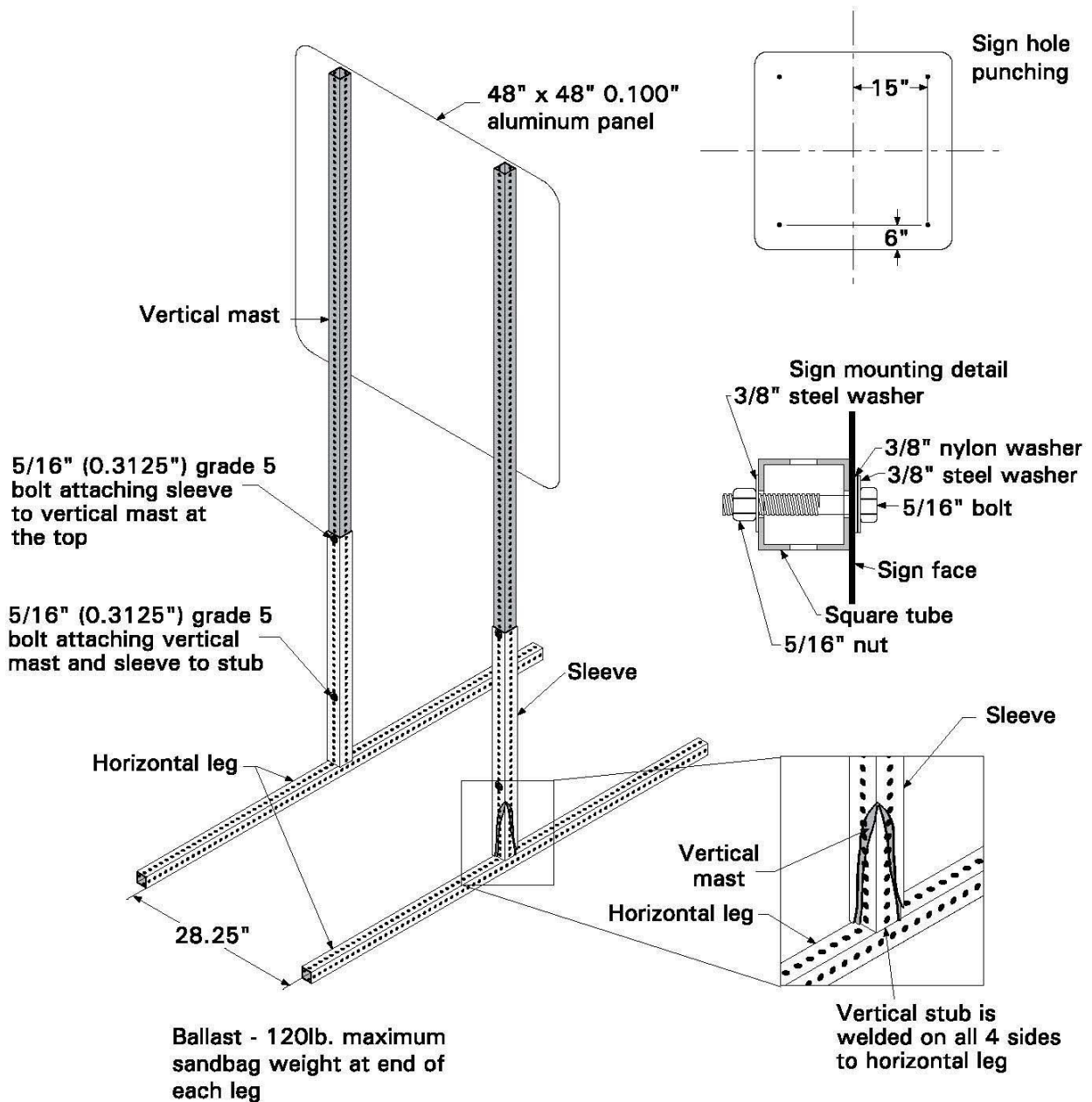
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**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR DETOUR ASSEMBLY**





Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 2" x 2" x 108" long.

(2) Sleeves - 2.25" x 2.25" x 36" long.

(2) Horizontal legs - 1.75" x 1.75" x 72" long.

(2) Legs, vertical stubs - 1.75" x 1.75" x 12" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

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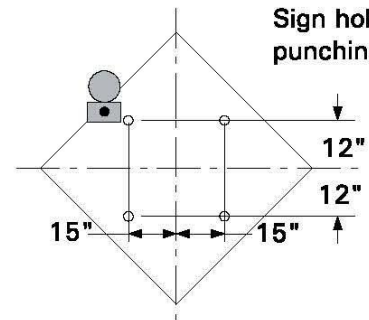
**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR 48" X 48" EXIT PANEL**



Optional lightweight amber flashing light is mounted to aluminum panel and against vertical mast to prevent spin

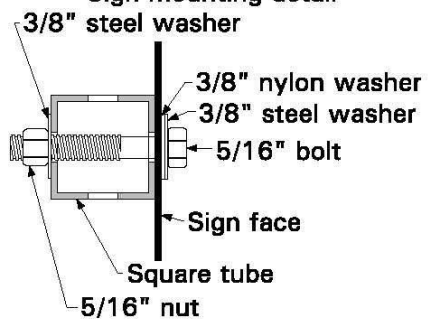
48" x 48" 0.100" aluminum panel

Sign hole punching



Vertical mast

Sign mounting detail



5/16" (0.3125") grade 5 bolt attaching sleeve to vertical mast at the top

61.75"

5/16" (0.3125") grade 5 bolt attaching vertical mast and sleeve to stub

Sleeve

Horizontal leg

28.25"

Ballast - 120lb. maximum sandbag weight at end of each leg

Sleeve

Vertical mast

Horizontal leg

Vertical stub is welded on all 4 sides to horizontal leg

Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 2" x 2" x 108" long.

(2) Sleeves - 2.25" x 2.25" x 36" long.

(2) Horizontal legs - 1.75" x 1.75" x 72" long.

(2) Legs, vertical stubs - 1.75" x 1.75" x 12" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

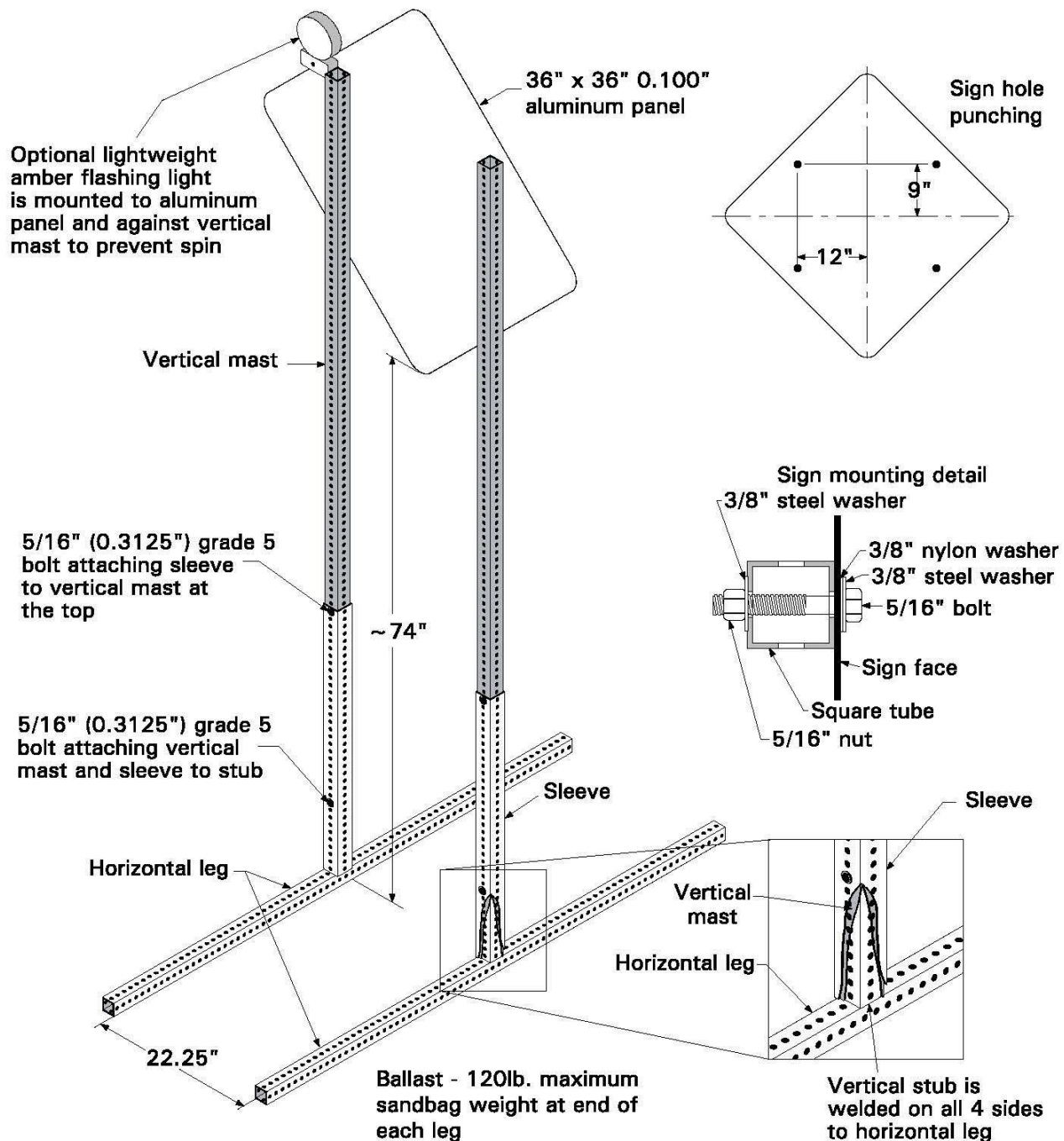
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**NCHRP 350 COMPLIANT
5 FEET PORTABLE SIGN STAND
FOR 48" X 48" DIAMOND**





Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 2" x 2" x 108" long.

(2) Sleeves - 2.25" x 2.25" x 36" long.

(2) Horizontal legs - 1.75" x 1.75" x 72" long.

(2) Legs, vertical stubs - 1.75" x 1.75" x 12" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

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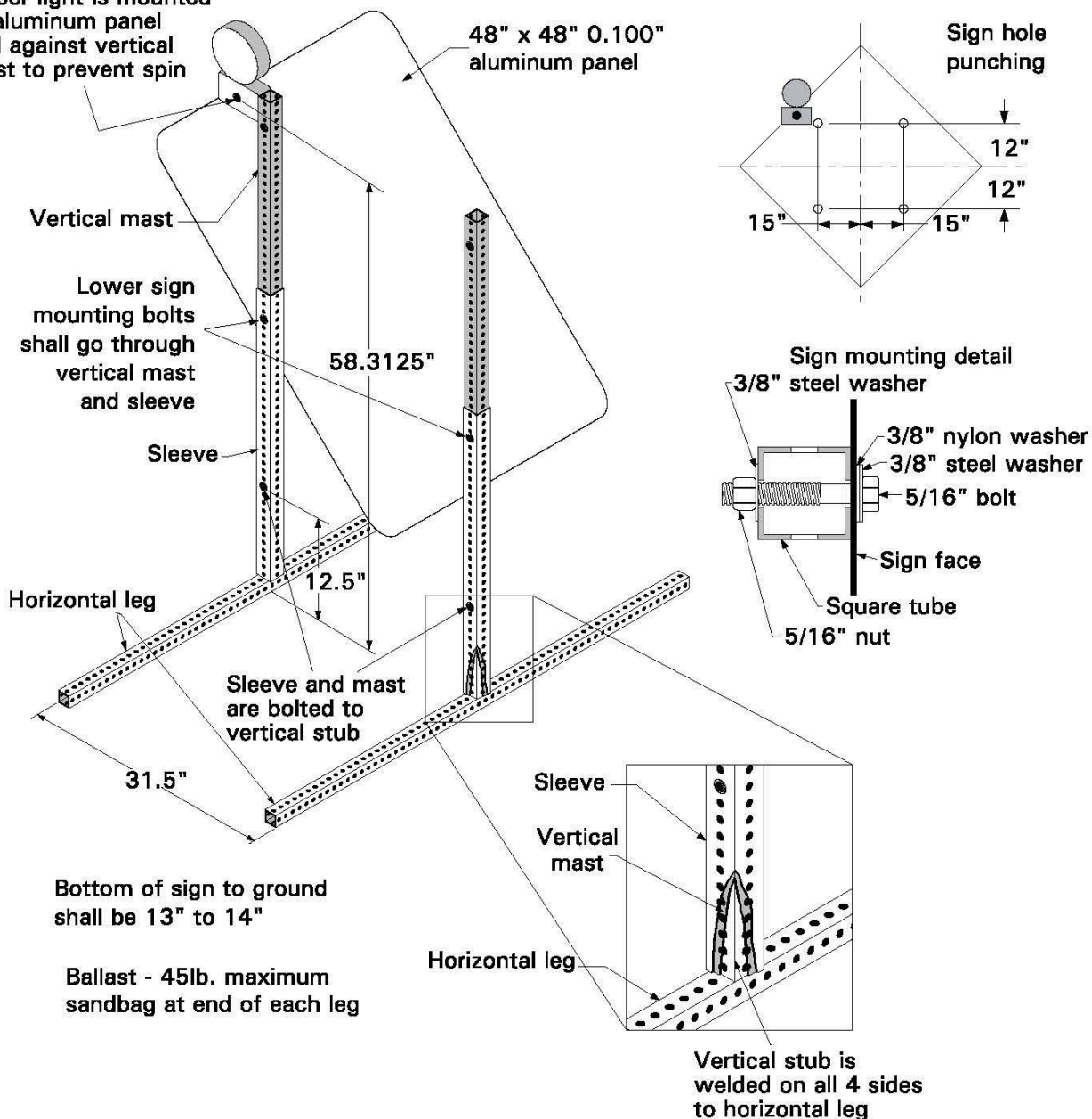
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**NCHRP 350 COMPLIANT
TALL PORTABLE SIGN STAND
FOR 36" X 36" DIAMOND**



Optional lightweight flashing
amber light is mounted
to aluminum panel
and against vertical
mast to prevent spin



Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 1.75" x 1.75" x 60" long.

(2) Sleeves - 2" x 2" x 36" long.

(2) Horizontal legs - 1.5" x 1.5" x 60" long.

(2) Legs, vertical stubs - 1.5" x 1.5" x 12" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

(1) Optional flashing warning light attached to sign panel.

FHWA Reference HSA-10/WZ-133

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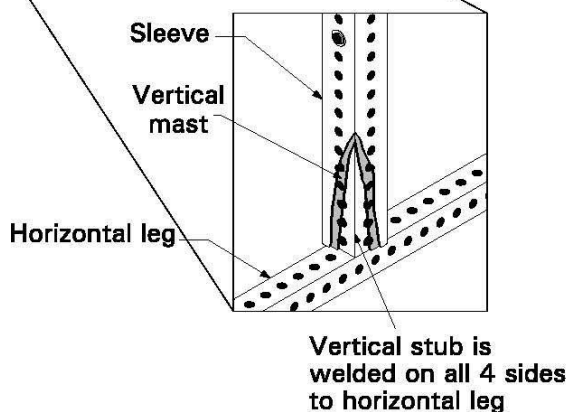
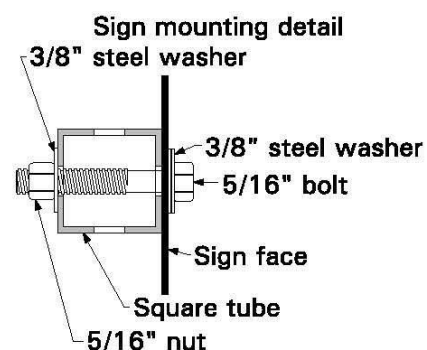
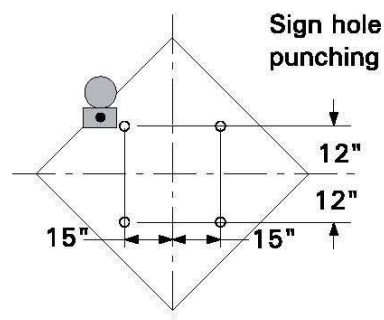
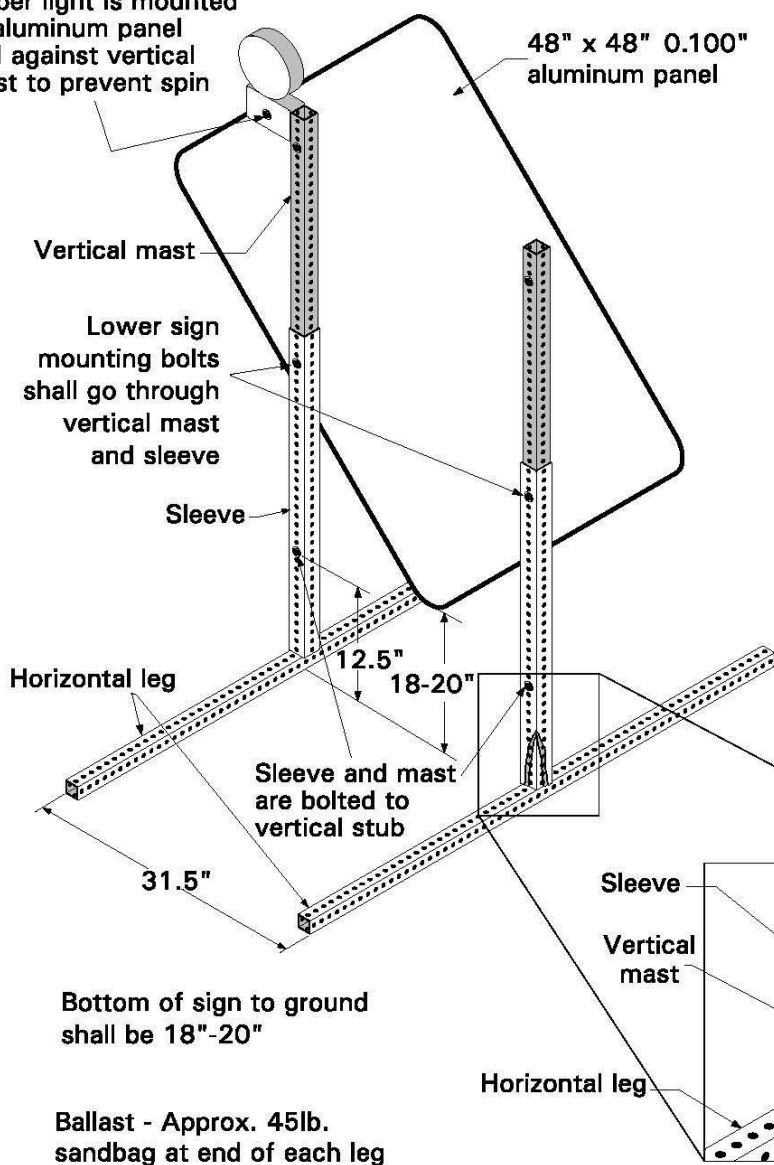
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DATE OF REV.

**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR 48" X 48" DIAMOND**



Optional lightweight flashing
amber light is mounted
to aluminum panel
and against vertical
mast to prevent spin



Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 1.75" x 1.75" x 72" long.

(2) Sleeves - 2" x 2" x 36" long.

(2) Horizontal legs - 1.5" x 1.5" x 48" long.

(2) Legs, vertical stubs - 1.5" x 1.5" x 6-12" long.

Fastening hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nuts, and nylon washers.

(1) Optional flashing warning light attached to sign panel.

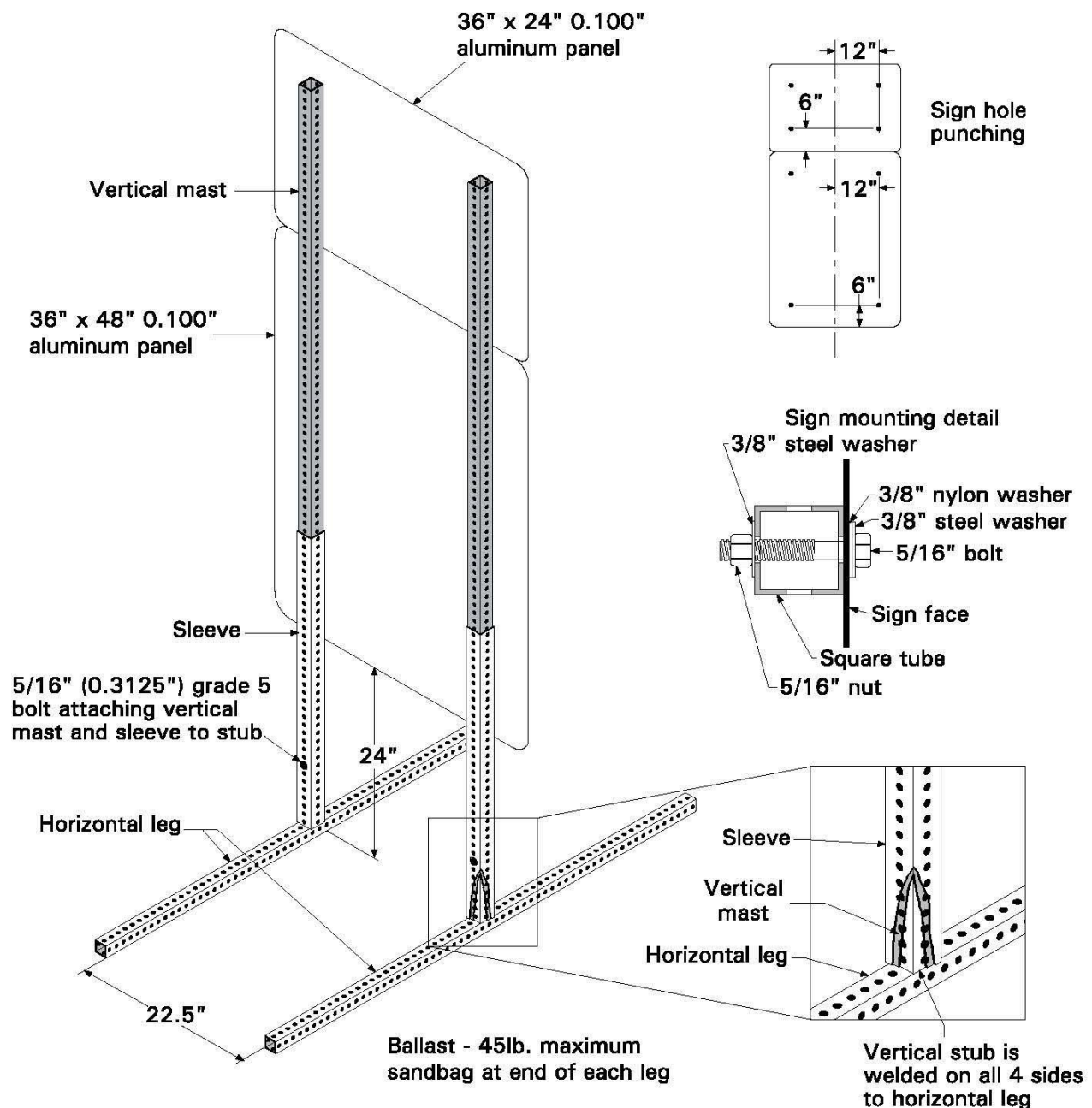
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PORTABLE SIGN STAND FOR 48" X 48" DIAMOND





Parts List:

All square tube 12 gauge galvanized steel with 0.4375" holes on either 1" centers or drilled as needed.

(2) Vertical masts - 1.75" x 1.75" x 90.5" long.

(2) Sleeves - 2" x 2" x 36" long.

(2) Horizontal legs - 1.5" x 1.5" x 60" long.

(2) Legs, vertical stubs - 1.5" x 1.5" x 12" long.

Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

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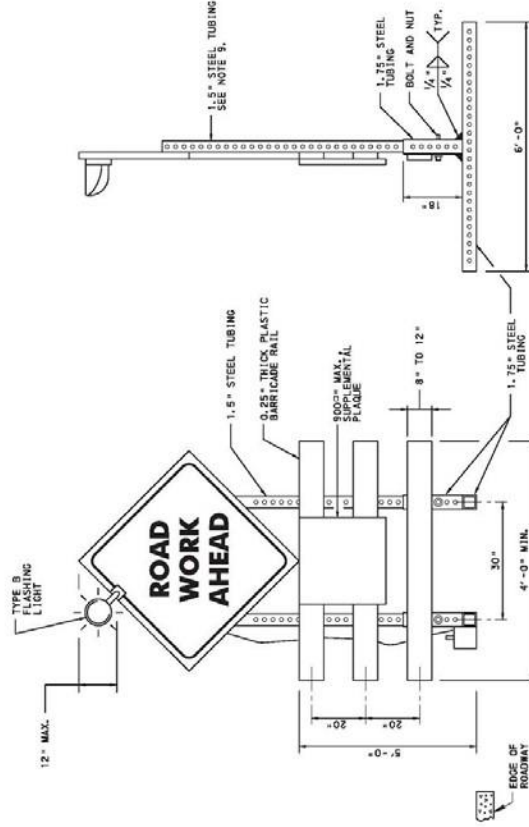
DATE OF REV.

**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR WORK ZONE SPEED LIMIT**



NOTES:

1. PROVIDE SIGN MATERIALS MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 1103.4.
2. DIAMOND, RECTANGULAR, OCTAGONAL AND TRIANGULAR SIGNS ARE PERMITTED, WHILE HAVING NO MAXIMUM AREA, THE MAXIMUM WEIGHT OF THE SIGN MAY NOT EXCEED 25 LB.
3. MINIMUM MOUNTING HEIGHT TO TOP OF ALL SIGNS IS 128".
4. SUPPLEMENTAL PLAQUE IS TO BE MOUNTED AS SHOWN.
5. BATTERY CASE MUST BE PLACED EITHER ON THE GROUND OR ATTACHED TO MAXIMUM ABOVE THE GROUND TO THE POST OR CASE LEG.
6. SIGN SUBSTRATE MAY BE PLYWOOD, ALUMINUM, FLEXIBLE (ROLL-UP) OR POLYETHYLENE.
7. SANDRAG BALLAST SHALL BE PLACED ON THE END OF EACH LEG TO PROVIDE STABILITY.
8. SIGNS AND RAILS ARE TO BE ATTACHED WITH BOLTS AND NUTS.
9. IF TURNED 90°, RETROREFLECTIVE SHEETING MUST BE PLACED ON THE SIGN SO THAT THE BARRICADE IS CLEARLY VISIBLE TO APPROACHING DRIVERS.
10. MAXIMUM OF TWO TYPE B WARNING LIGHTS ON ALL SIGNS ARE ALLOWED WITH 24" SEPARATING LIGHTS ON ROAD CLOSED SIGNS.
11. FLASHING LIGHTS ARE OPTIONAL. WHEN USED, LIGHTS SHALL BE ATTACHED AS SHOWN AND LOCATED ON THE SIDE OF THE SIGN WHICH IS NEAREST TO TRAFFIC.
12. SIGNS SHALL REMAIN IN THE VERTICAL POSITION WHEN LOCATED WITHIN THE HIGHWAY RIGHT-OF-WAY.



SKID-MOUNTED METAL SIGN SUPPORT

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE AND OPERATIONS

TRAFFIC CONTROL SIGNING TYPE III BARRICADE

RECOMMENDED JUN. 13, 2013	RECOMMENDED JUN. 13, 2013	SHT. 1 OF 1
BY: <i>[Signature]</i>	BY: <i>[Signature]</i>	TC-8716
FOR: <i>[Signature]</i>	FOR: <i>[Signature]</i>	
DESIGNED BY: <i>[Signature]</i>	DESIGNED BY: <i>[Signature]</i>	
CHECKED BY: <i>[Signature]</i>	CHECKED BY: <i>[Signature]</i>	
IN CHARGE: <i>[Signature]</i>	IN CHARGE: <i>[Signature]</i>	
PROJECT: <i>[Signature]</i>	PROJECT: <i>[Signature]</i>	
DATE: <i>[Signature]</i>	DATE: <i>[Signature]</i>	
SCALE: <i>[Signature]</i>	SCALE: <i>[Signature]</i>	
REVISIONS: <i>[Signature]</i>	REVISIONS: <i>[Signature]</i>	
APPROVED: <i>[Signature]</i>	APPROVED: <i>[Signature]</i>	
DATE: <i>[Signature]</i>	DATE: <i>[Signature]</i>	

PLAN

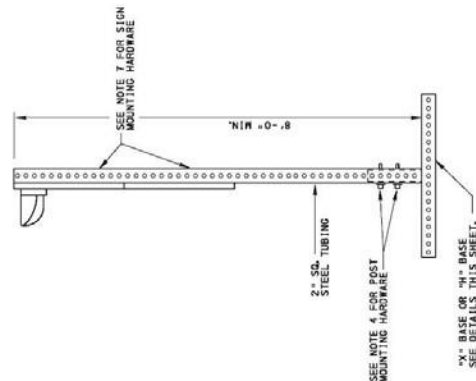
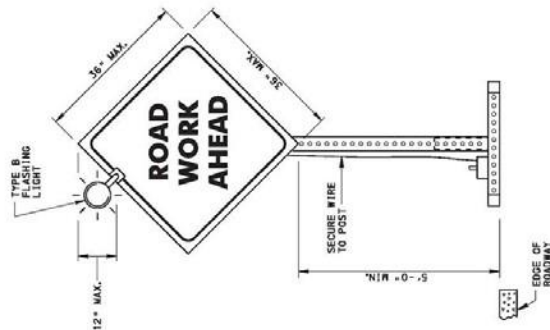
ELEVATION

PLAN

ELEVATION

"H" BASE DETAIL

"X" BASE DETAIL



NOTES:

1. PROVIDE SIGN MATERIALS MEETING THE REQUIREMENTS OF PUBLICATION 408 "SECTION 1103.4."
2. DIAMOND, RECTANGULAR, OCTAGONAL AND TRIANGULAR SIGNS ARE PERMITTED. THE MAXIMUM SIGN AREA SHALL NOT EXCEED 144"
3. SIGN PANELS MAY BE PLACED EITHER ON THE GROUND OR ATTACHED 20" MAXIMUM ABOVE THE GROUND TO THE POST OR BASE LEG.
4. SIGN SUBSTRATE MAY BE PLYWOOD, ALUMINUM, ALUMINUM / PLASTIC COMPOSITE, POLYESTER, POLYPROPYLENE OR POLYETHYLENE. MAX. WEIGHT 150 LBS.
5. POST, 2" STEEL TUBING SLIDES OVER BASE POST, 1.75" STEEL TUBING FASTENED WITH 3/4" DIAMETER 2 1/4" LONG STAINLESS STEEL OR GRADE 5 ZINC PLATED BOLTS AND NYLON INSERT WASHERS UNDER BOTH THE STEEL AND NYLON WASHERS. THE BOLT AND NUT SHALL BE PLACED ON THE END OF EACH LEG TO ENSURE STABILITY.
6. SIGN PANEL IS PLACED ON THE VERTICAL SIGN POST WITH TOP EDGE ALIGNED WITH POST TOP END AND FASTENED WITH 3/4" DIAMETER 2 1/4" LONG NYLON 6/6 FULLY THREADED HEX HEADED BOLTS AND NYLON INSERT WASHERS UNDER BOTH THE BOLT AND NUT. THE BOLT AND NUT SHALL BE PLACED ON THE END OF EACH LEG TO ENSURE STABILITY.
7. MAXIMUM OF TWO (2) BURNING LIGHTS OR ALL SIGNS ARE ALLOWED WITH 24" SEPARATING LIGHTS ON ROAD CLOSED SIGNS.
8. NCHRP 350 TEST LEVEL 3 CRASH TESTED AND APPROVED.
9. SLASH NO LIGHTS ARE REQUIRED WHEN USED. LIGHTS SHALL BE ATTACHED AS CLOSE TO THE SIGN AS POSSIBLE.
10. SIGNS SHALL REMAIN IN THE VERTICAL POSITION WHEN LOCATED WITHIN THE HIGHWAY RIGHT-OF-WAY.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE AND OPERATION

TEMPORARY PORTABLE
SIGN POST

"H" BASE AND "X" BASE

RECOMMENDED JUN. 13, 2013 <i>John C. Rowe</i> CHIEF, TRAFFIC ENGINEERING AND	RECOMMENDED JUN. 13, 2013 <i>Richard J. Lawrence</i> CHIEF, HIGHWAY SAFETY AND	SHT. 1 OF 1 TC-8717
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