

2021-04-WZ

Project Title:	Portable sign supports for rigid 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 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. A State-of-Practice Survey 3. Engineering Analysis and/or Simulation 4. Construction and Demolition 5. 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:	\$205,000 and 15 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

36" x 36" 0.100"
aluminum panel

Vertical mast

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

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

Horizontal leg

22.25"

-81"

Sleeve

Horizontal leg

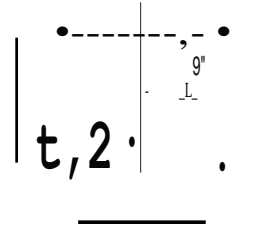
Ballast - 1201b. maximum
sandbag weight at end of
each leg

Vertical
mast

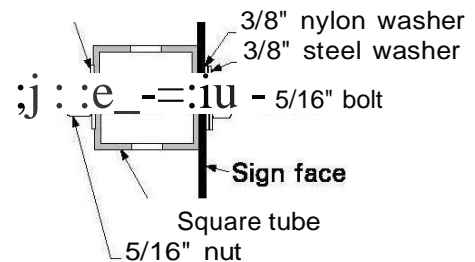
Sleeve

Vertical stub is
welded on all 4 sides
to horizontal leg

Sign hole
punching



Sign mounting detail
3/8" steel washer



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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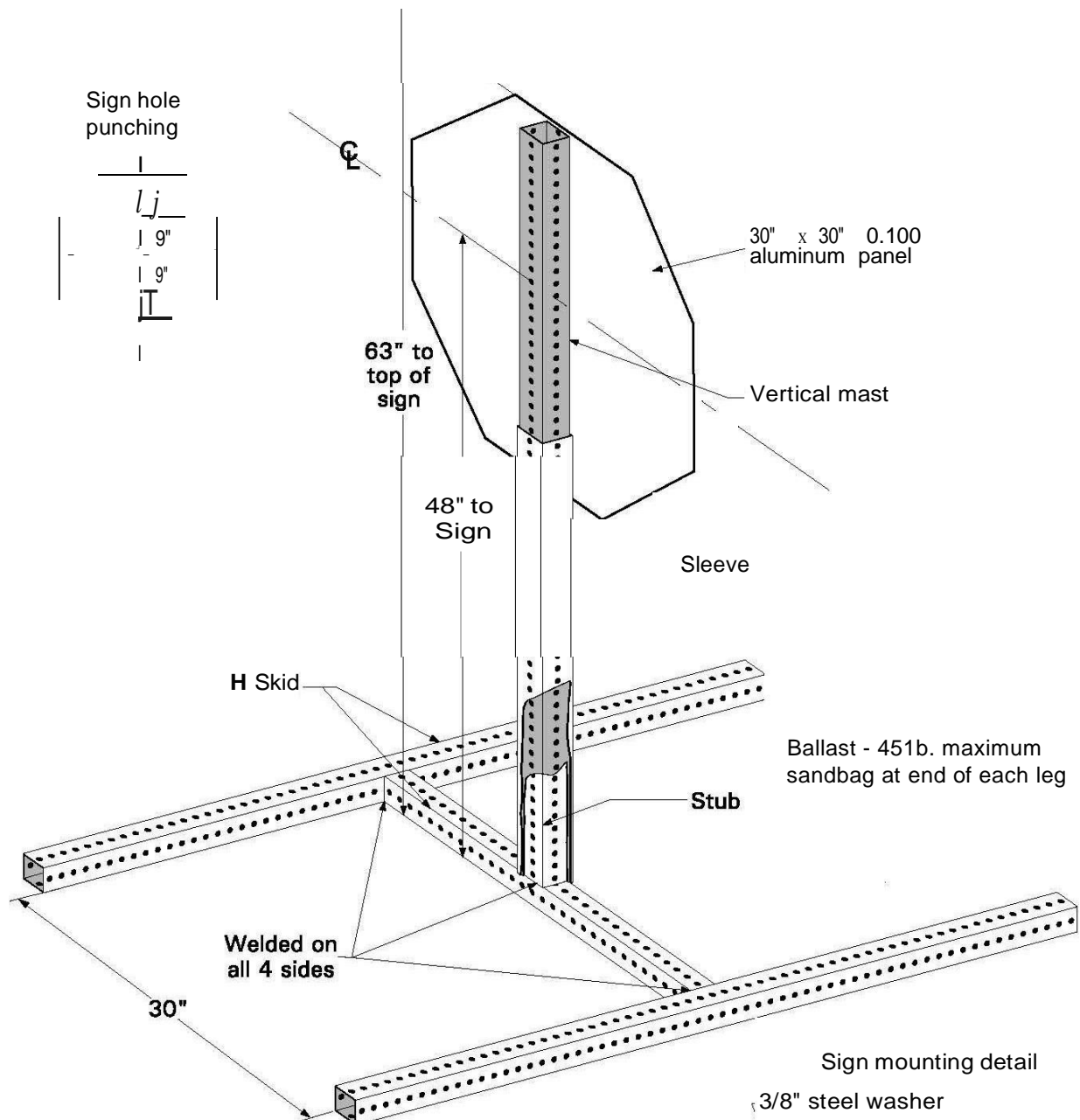
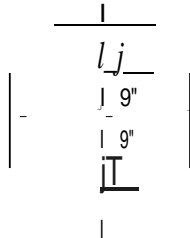
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DATE OF REV.

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



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.

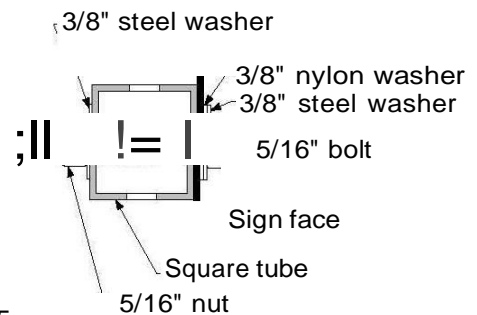
(1) H skid, vertical stub - 2" x 2" x 12" long.

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

Sign mounting detail



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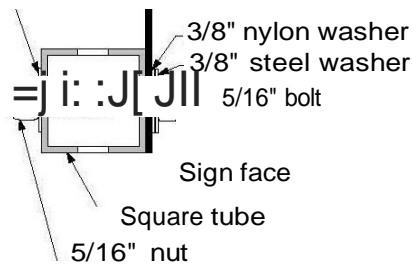
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**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR 30" X 30" STOP SIGN**

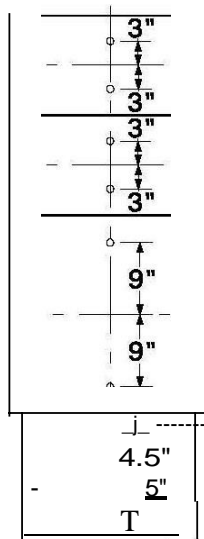


Sign mounting detail

3/8" steel washer



Sign hole punching



Vertical mast

24" x 12" 0.100" aluminum panel

24" x 12" 0.100" aluminum panel

24" x 24" 0.100" aluminum panel

21" x 15" 0.100" aluminum panel

Sleeve

Ballast - 451b. maximum sandbag at end of each leg

Stub

H Skid

Welded on all 4 sides

30"

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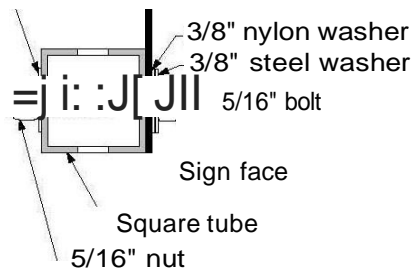
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NCHRP 350 COMPLIANT
PORTABLE SIGN STAND FOR
DETOUR ASSEMBLY WITH 8' MAST

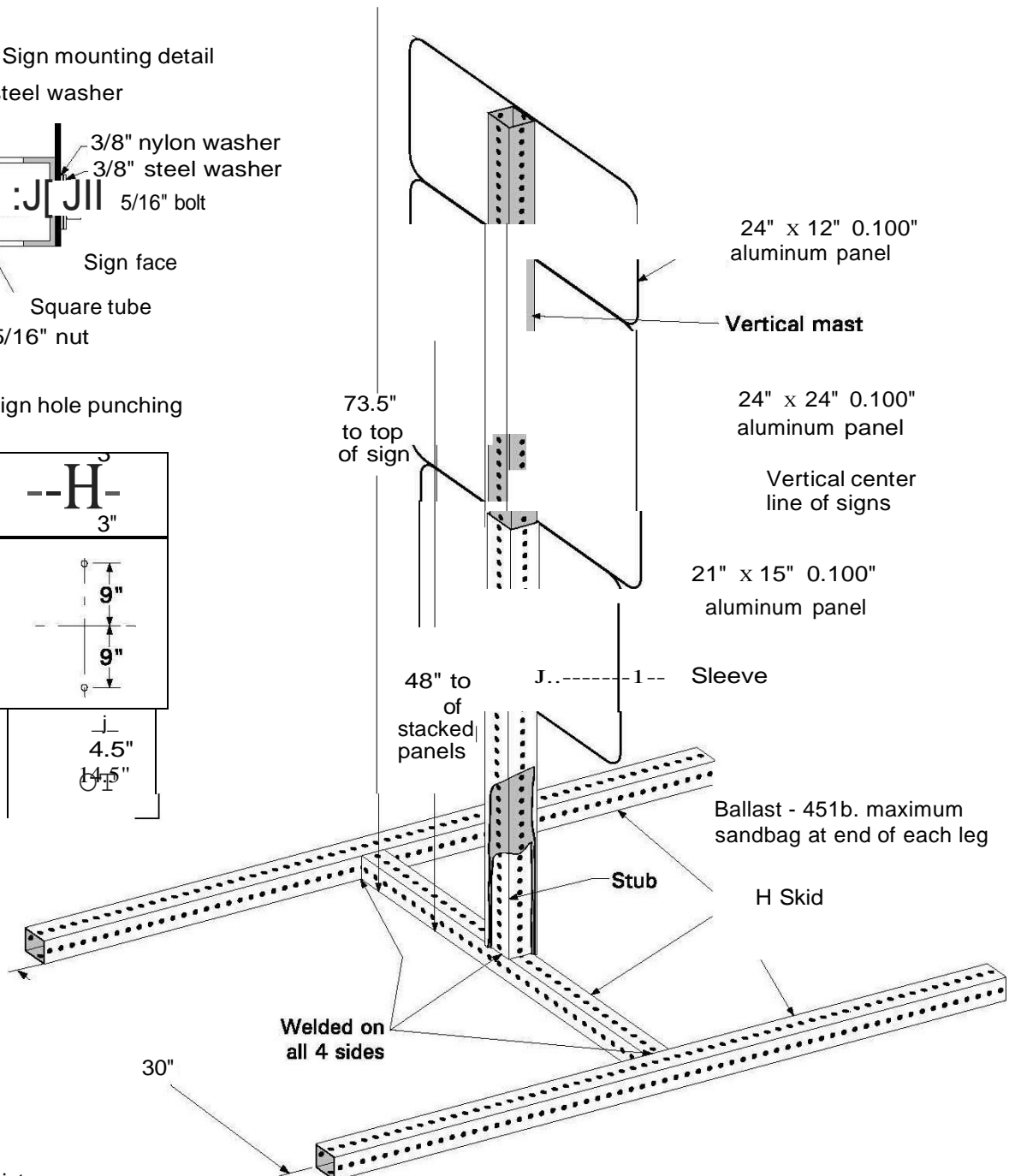
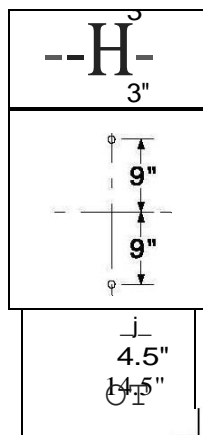


Sign mounting detail

3/8" steel washer



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.

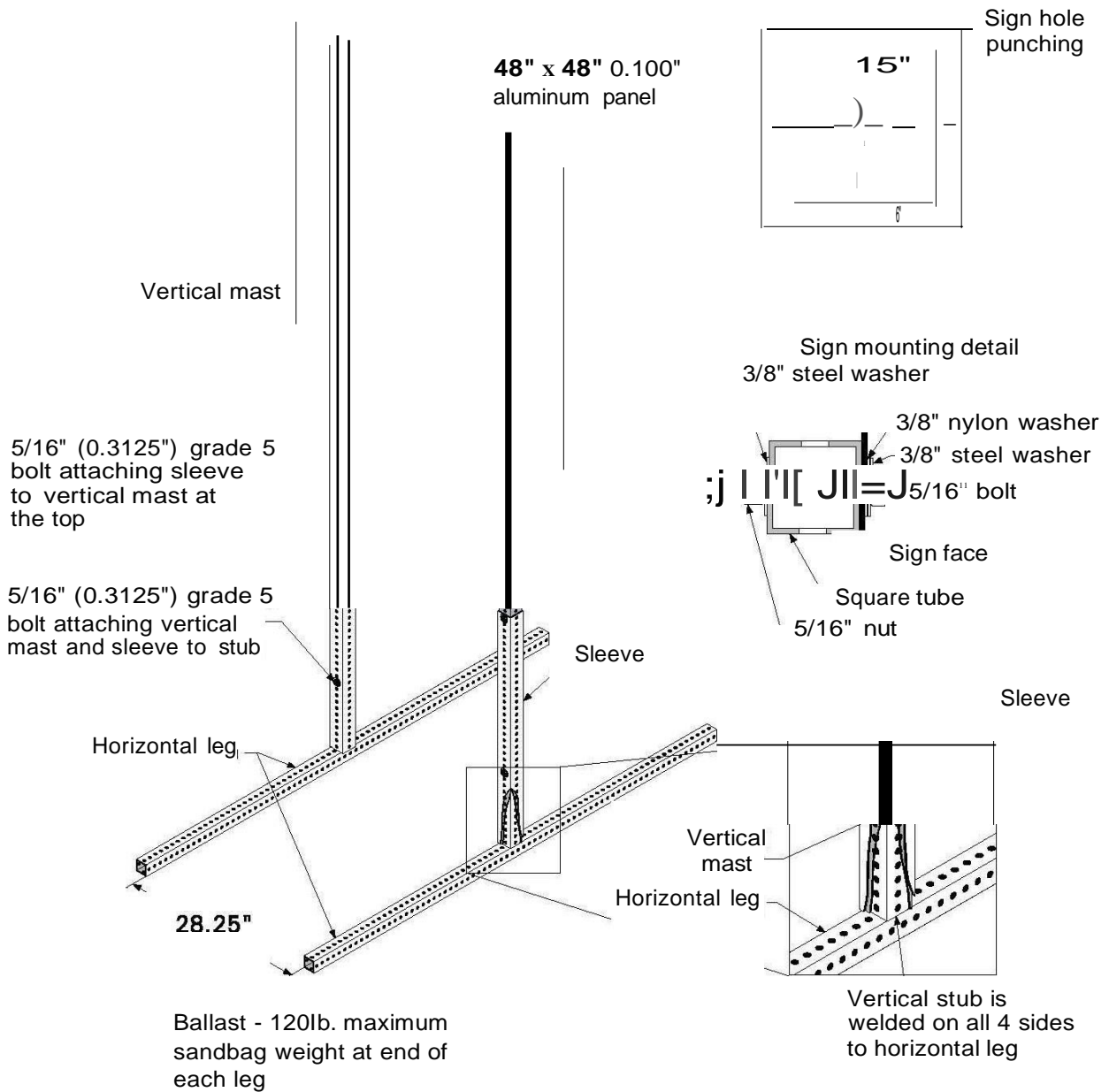
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NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR DETOUR ASSEMBLY





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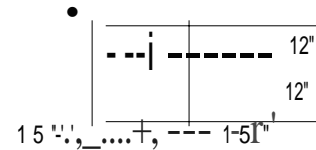
**NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR 48" X 48" EXIT PANEL**



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

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

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

61.75"

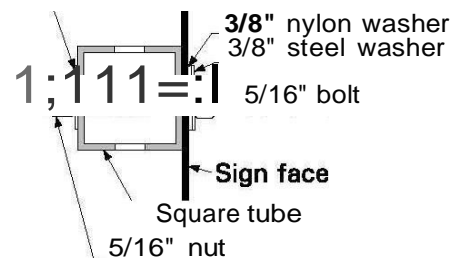
Sleeve

Horizontal leg

28.25"

Ballast - 1201b. maximum sandbag weight at end of each leg

Sign mounting detail
3/8" steel washer



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.

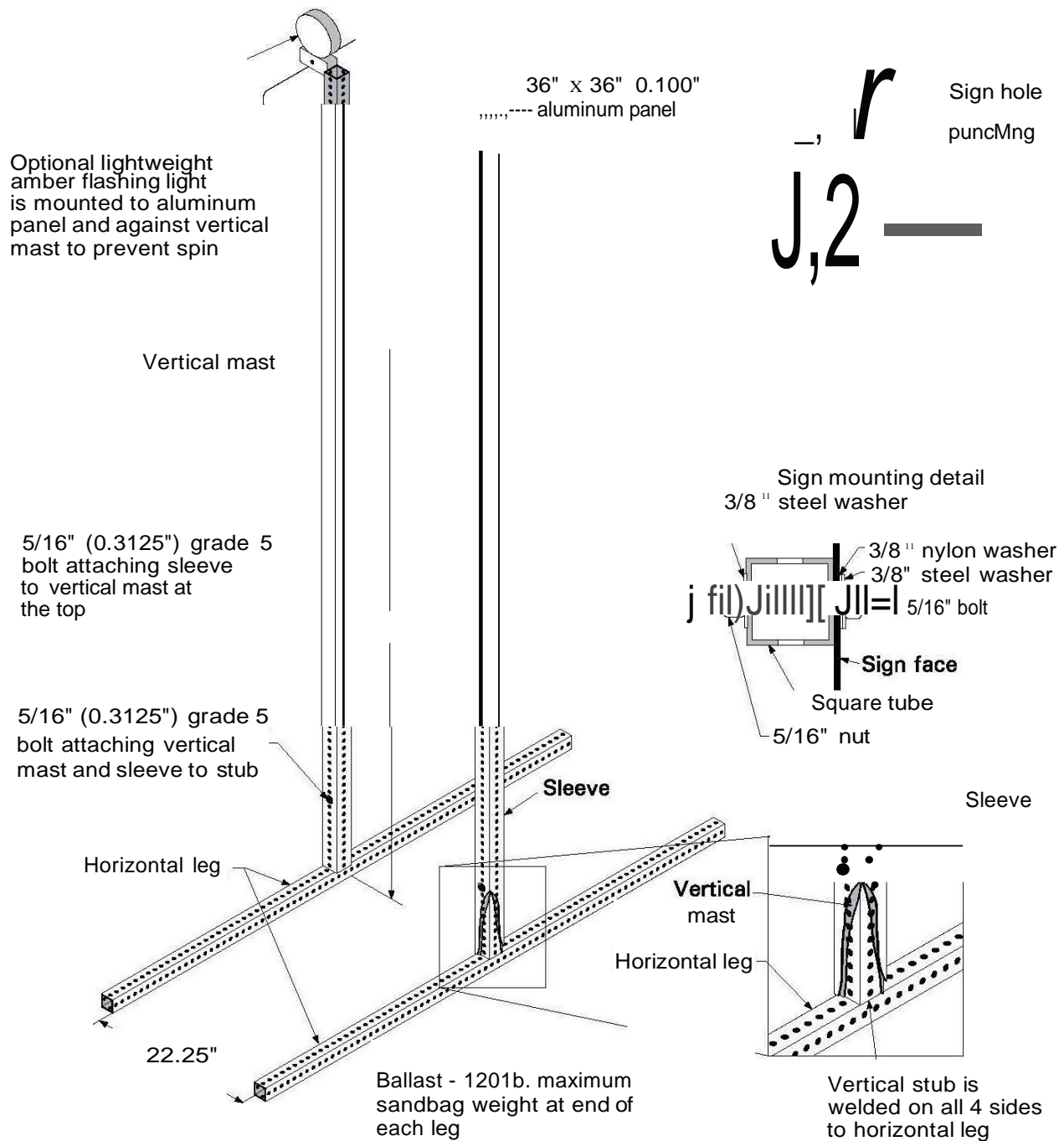
Sign mounting hardware: 5/16" (0.3125") stainless steel or grade 5 zinc plated bolts and washers, nylon insert lock nut, and nylon washers against sign face.

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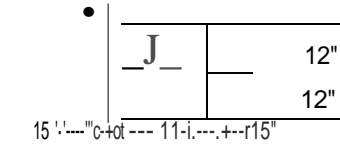
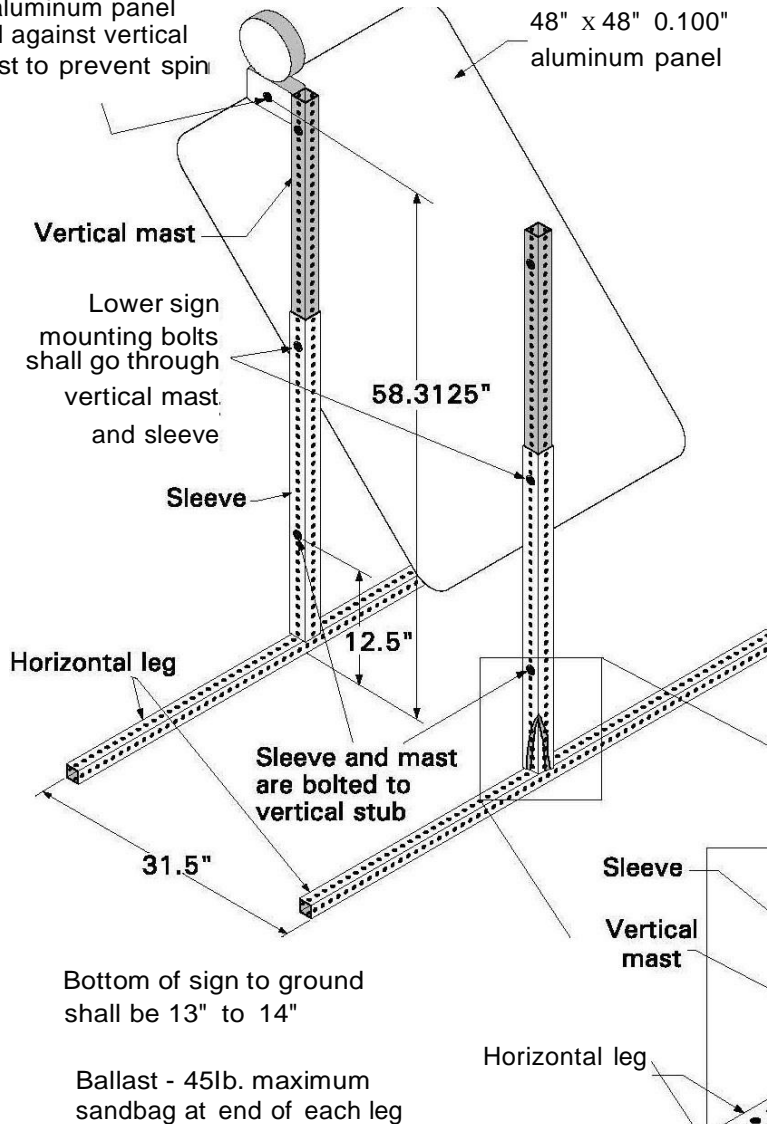
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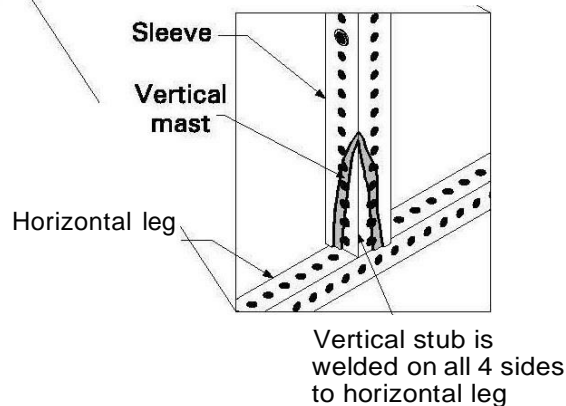
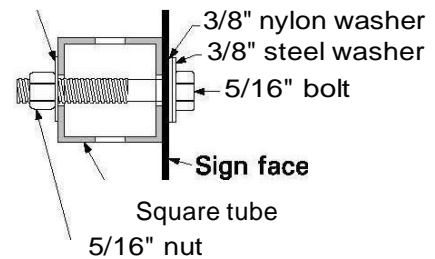
**NCHRP 350 COMPLIANT
TALL PORTABLE SIGN STAND
FOR 36" X 36" DIAMOND**



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



Sign mounting detail
3/8" steel washer



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

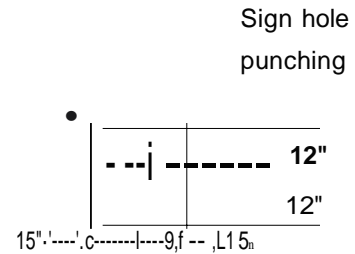
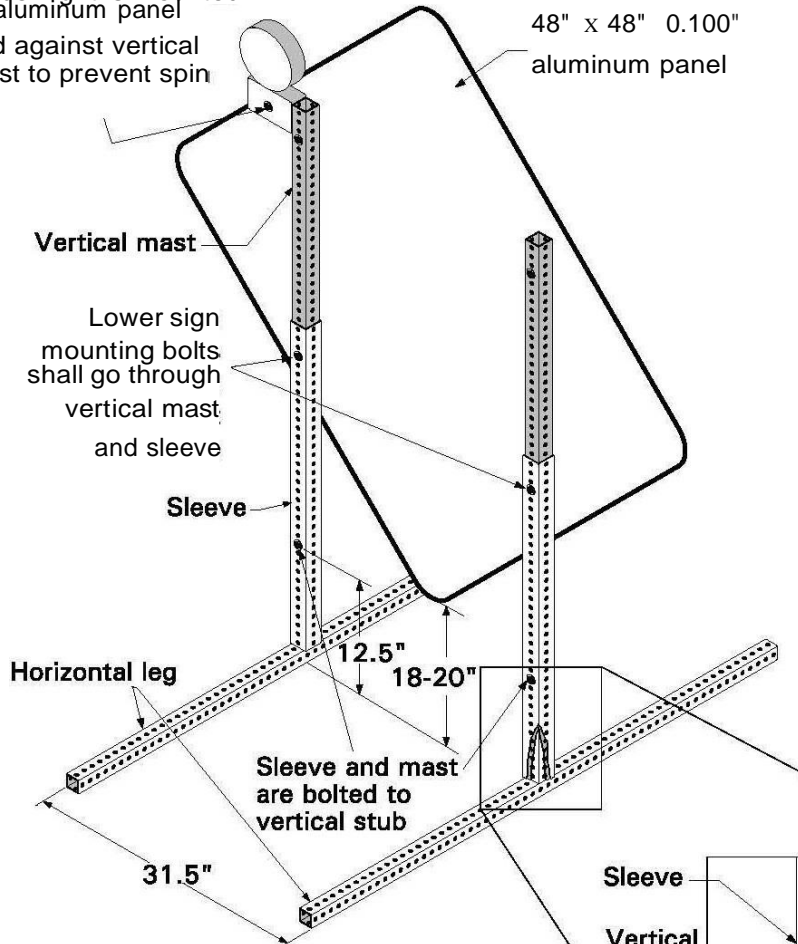
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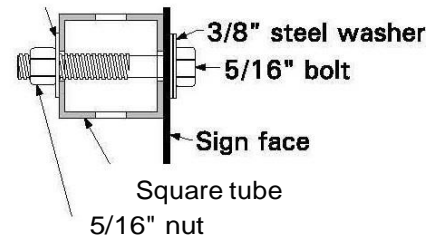
NCHRP 350 COMPLIANT
PORTABLE SIGN STAND
FOR 48" X 48" DIAMOND



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

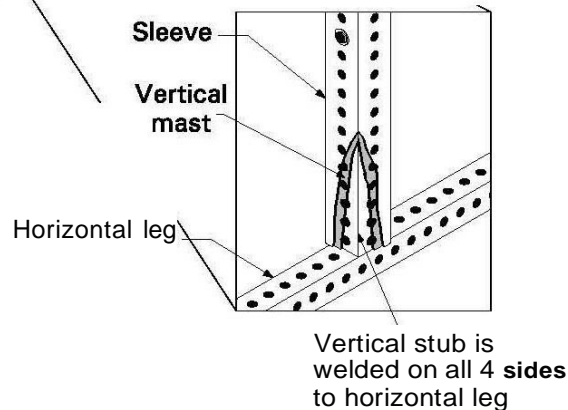


Sign mounting detail
3/8" steel washer



Bottom of sign to ground
shall be 18"-20"

Ballast - Approx. 45lb.
sandbag at end of each 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 - 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.

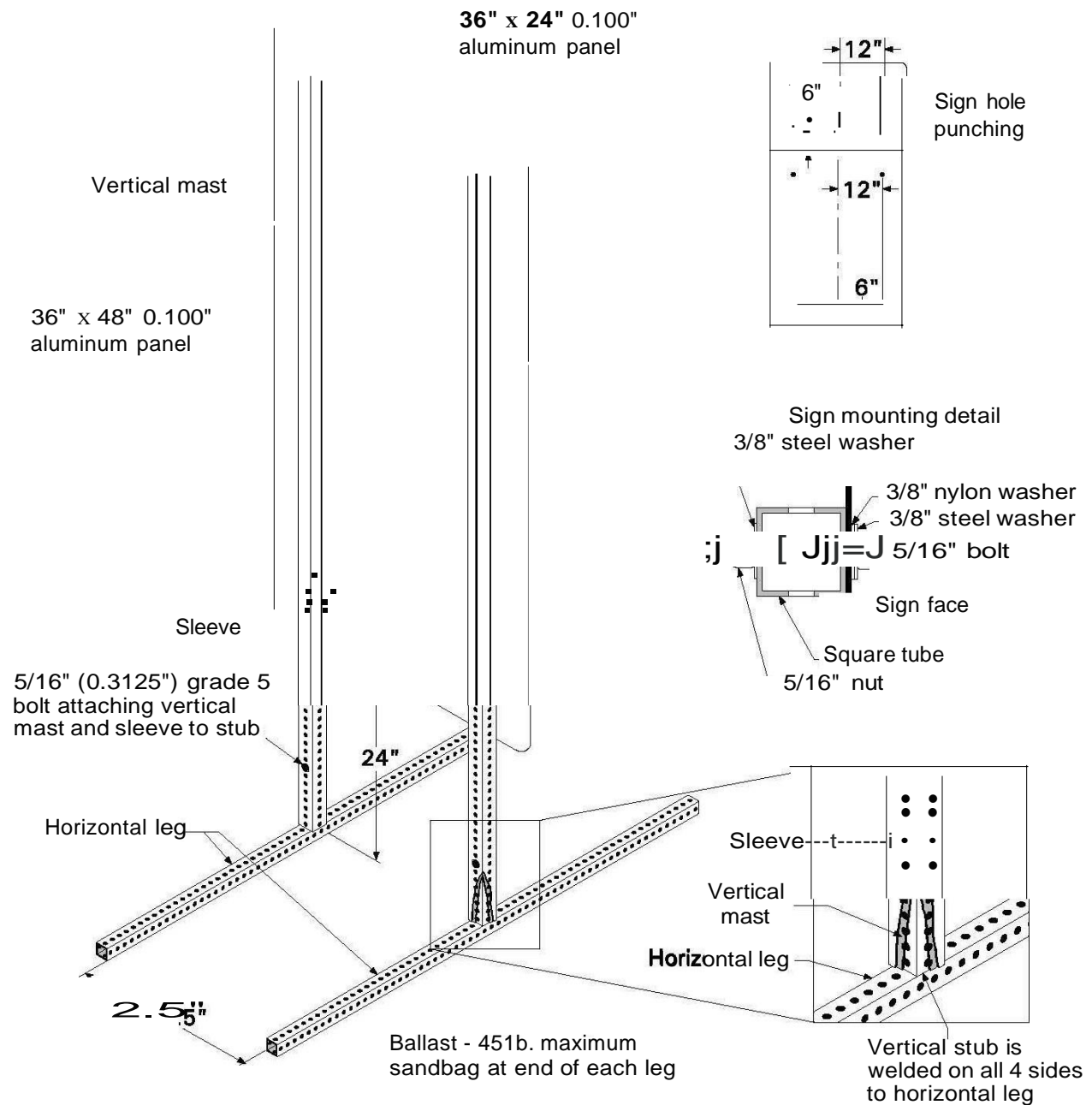
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DATE OF REV.

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.

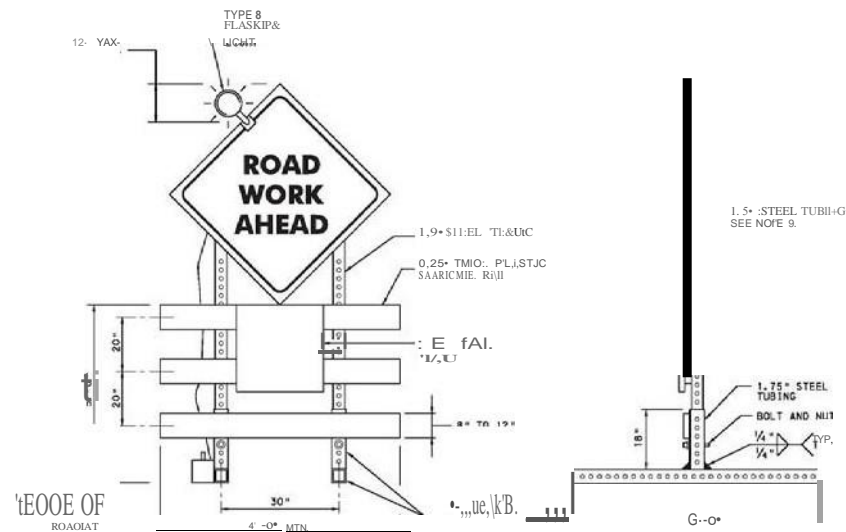
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DATE OF REV.

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





SKID-MOUNTED METAL SIGN SUPPORT

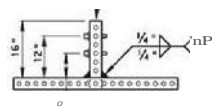
NOTES:

1. PROVIDE SUCH MATERIALS MEETING THE REQUIREMENTS OF PUBLICATION "G-1" SECTION 1101.
2. $f = 10$: $v = 1$ & 0 : $l = 1$: $R = 11$: 1 : $c = H$
OF THE SIGN NOT EXCEED 25 IN.
3. WINDUPL MOUNTING HEIGHT 10 TOP OF SIGN IS 125.
4. SUPPLEMENTAL PLATING TO BE WOUNDED 45 SHOWN.
5. BATTERY CASE MUST BE PROVIDED EITHER "DIE CAST" OR "ATTACHED ZONE" "X" IN 11 ABOVE THE CROWN TO THE POST OR BASE LEG.
6. SIGN SUPPORT WAY BE PITCHED 000. ALL ROLL FLEXIBLE ROLL-UP SPILLAGE PLATE. IN: UNWIND, CURVED POLYPROPYLENE
7. SIGN SUPPORT SHALL BE PLACED ON THE SIDE OF THE ROAD TO PROVIDE SAFETY.
8. SIGN NO. RAILS ARE TO BE ATTACHED "TM" BOLTS AND NUTS.
9. IF TURNED 90°, RETROREFLECTIVE SHEETING MUST BE PLACED ON THE SIDES TO MAKE THE SIGN MORE VISIBLY TO APPROACHING DRIVERS.
10. WINDUPL OF TYPE C FIRMING UP THE SIGN ARE ALL CROD ITM 24" SECTIONS LUGS ON RAILS CLOSE SIGNS.
11. FLASHING LIGHTS ARE OPTIONAL. WHEN USED, LIGHTS SHALL BE ATTACHED SHOWN LOCATED ON THE SIDE OF THE SIGN WHICH IS NEAREST TO TRAFFIC.
12. SIGN SHALL BE IN THE VERTICAL POSITION WHEN LOCATED WITHIN THE HIGHWAY RIGHT-OF-WAY.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS, TOLLS, AND OPERATIONS

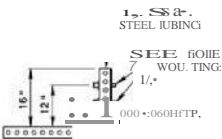
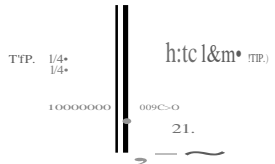
TRAFFIC CONTROL SIGNING
TYPE III BARRICADE

1.1s. siii.
SIR T1J8 INC



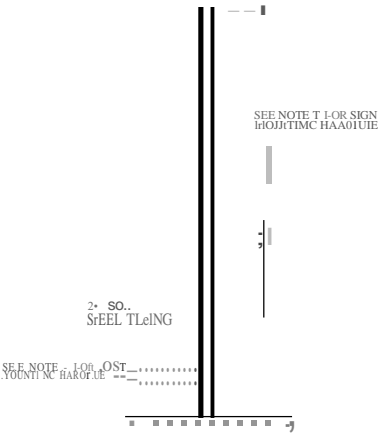
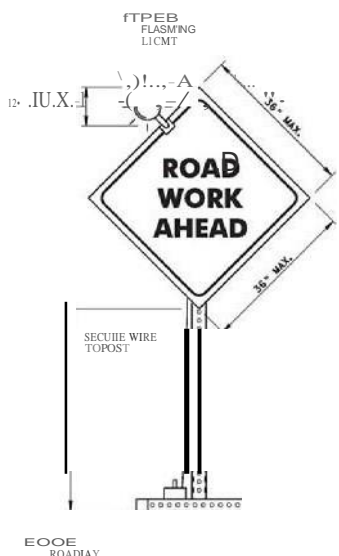
ELEVATION

"H" BASE DETAIL



ELEVATION

"X" BASE DETAIL



X IUSI: at "H" Bot.SE
SEE DETAILS THIS SHUT.

- NOTES:
1. PROVIDE SIGH WATDIALS MEETUNG TIME RIJUD WENTS OF
PUI&ICATICH 408, SECTION 1103.4.
 2. o Ecf 1wu l=he:N Mlrl" t:cl 8Ns ARE
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 3. BATTERY CASE r GE LACEO EITMEIN ON RE CR OIINO OR
UUTCHUWUO 10* UUTCHUWUO THE LROUND TO THE
P-OIST CIA KASE LEC.
 4. ;lw, Ht½f, N=•P||l A |_{Pist1tc}
 5. POST, f. 1A19NIC SLIDES OVSH ASE STUC, ...
STEEL RUBIN1 FASTENED UTH %1 QUITHE 24, ...
SLUESSLESS STEEL OR CRADEI. ZHC LAUD OOTS AND NYL4N u1u1on
UD. MUTS. USE MI• STEEL. uoN LHO SHSERS USDER BOTII
HE BOLT AHO -
 6. SINOBIC SALUSTM.BI.8E P.U.M.EI ON THE OF EACH LEC TO
PROVIDE SUJILITTY. 101
 7. SI PAHA, IS Puce ON THE VEATIC.I \$1(-1 P-05) JITI-1 ECCE
ALJONE O IITH POST TOP EITS, IS FASTENED ITH Y• DU METH
Z4• LONC NIC• ONY P4•LY THREADES• HEXE IDEO BOUS AR
LOW. INSEAT LONC IEND, USE K• SIEL MIOH TION AASH•ERS
USDER BOTII FIE B•AT AND NIST.
 8. MAXIMUM OF NO TYPE 3 UNING U-GMIS ON ALL SIGNS ARE JUI101151
IITH 24" SAFRATINE: LUHTS ON RC7T) CLOSED SIGNS.
 9. N•MIPU 350 IESF L.Evt. I CR6.5H TUTI(O) APPROV.e.o.
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COJOMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF LICENSE, TAX, AND OPERATIONS	
TEMPORARY PORTABLE	
SIGN POST	
"H" BASE AND "XII BASE	
REG. EXPIRATION DATE: 12/31/2013	SH. 1
aTTC-8717	TC-8717