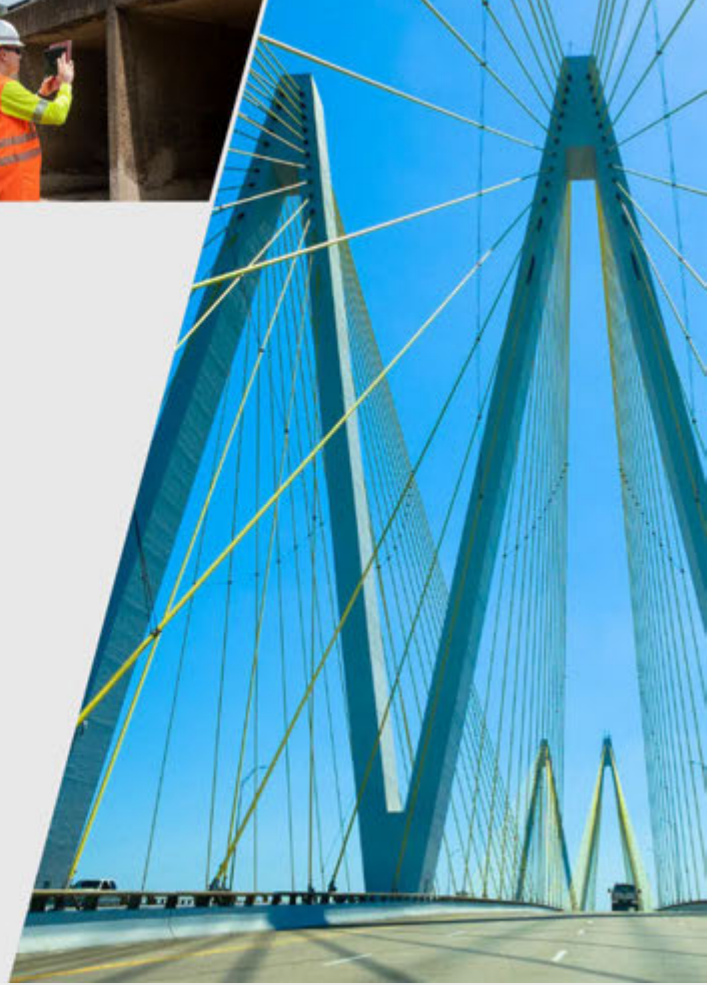
Proper Use of Traffic Standards

Bridge Division



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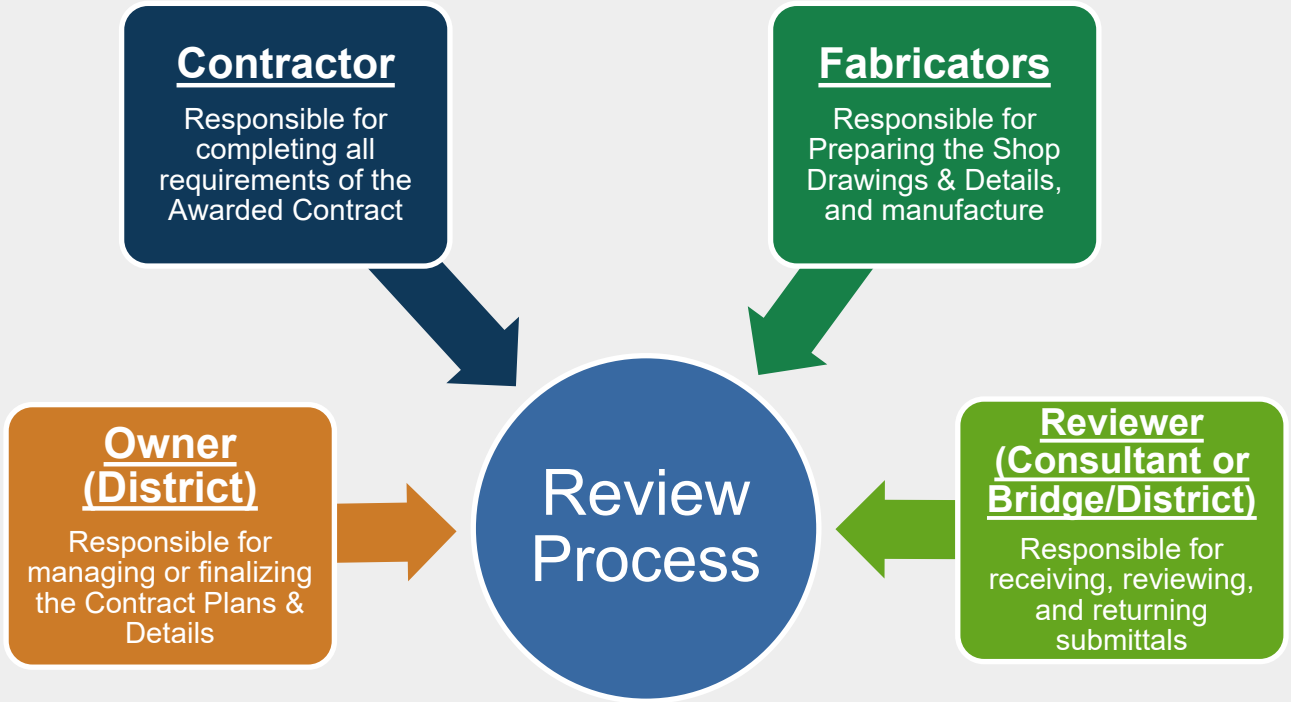
The Review Process

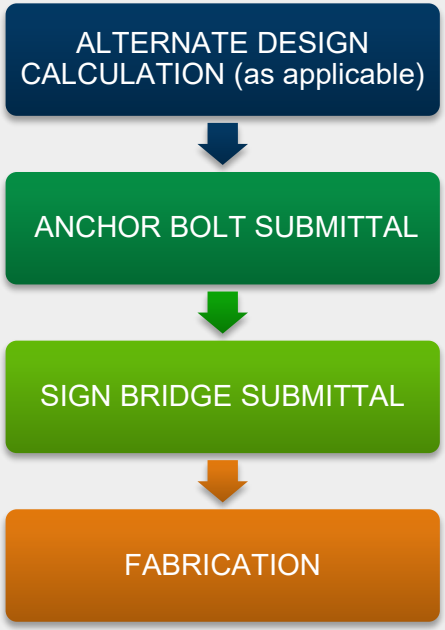
The parties involved with the Review Process:



The Review Process

During the Review Process, the responsibility of Bridge's Shop Drawing Review is to **RECEIVE, REVIEW, and RETURN** submittals within a timely manner. Here is a list of the documents handled in the review process (in descending order):

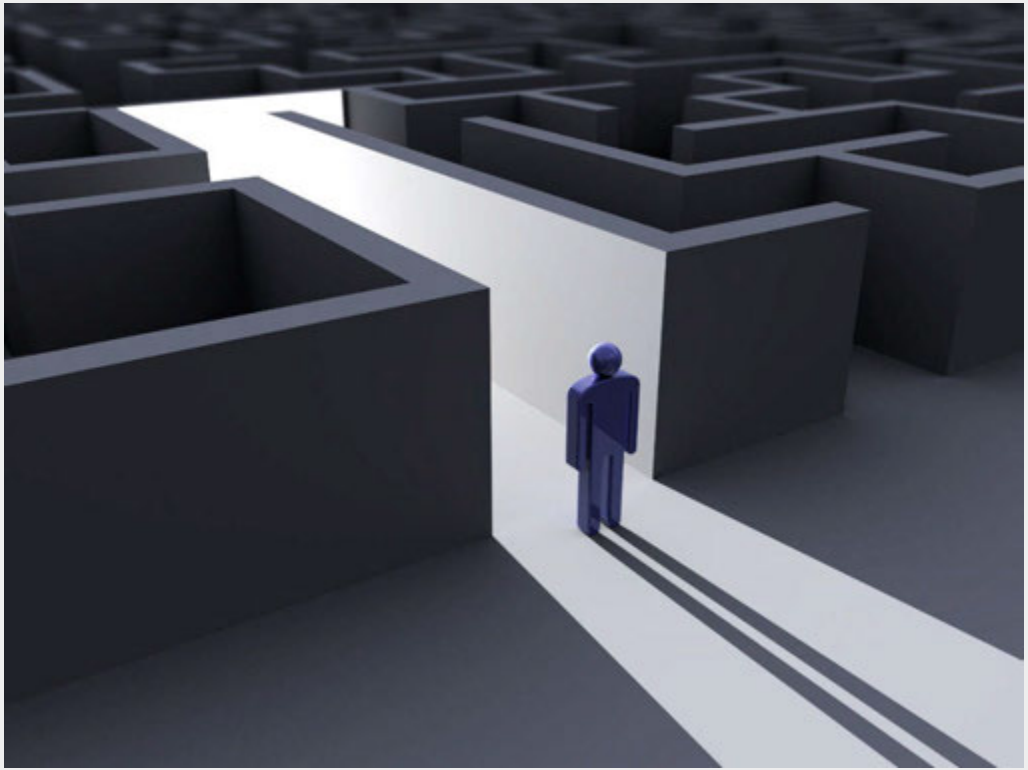
COSS & OSB Structures



RIP Structures

However, completing the review process in a timely manner is not always possible.

Factors that Slow the Process Down



Here are some factors that commonly affect the review process:

- Communication
- The “Hangover Effect”
- Bal-T and DMS
- Substitutions for Special Designs

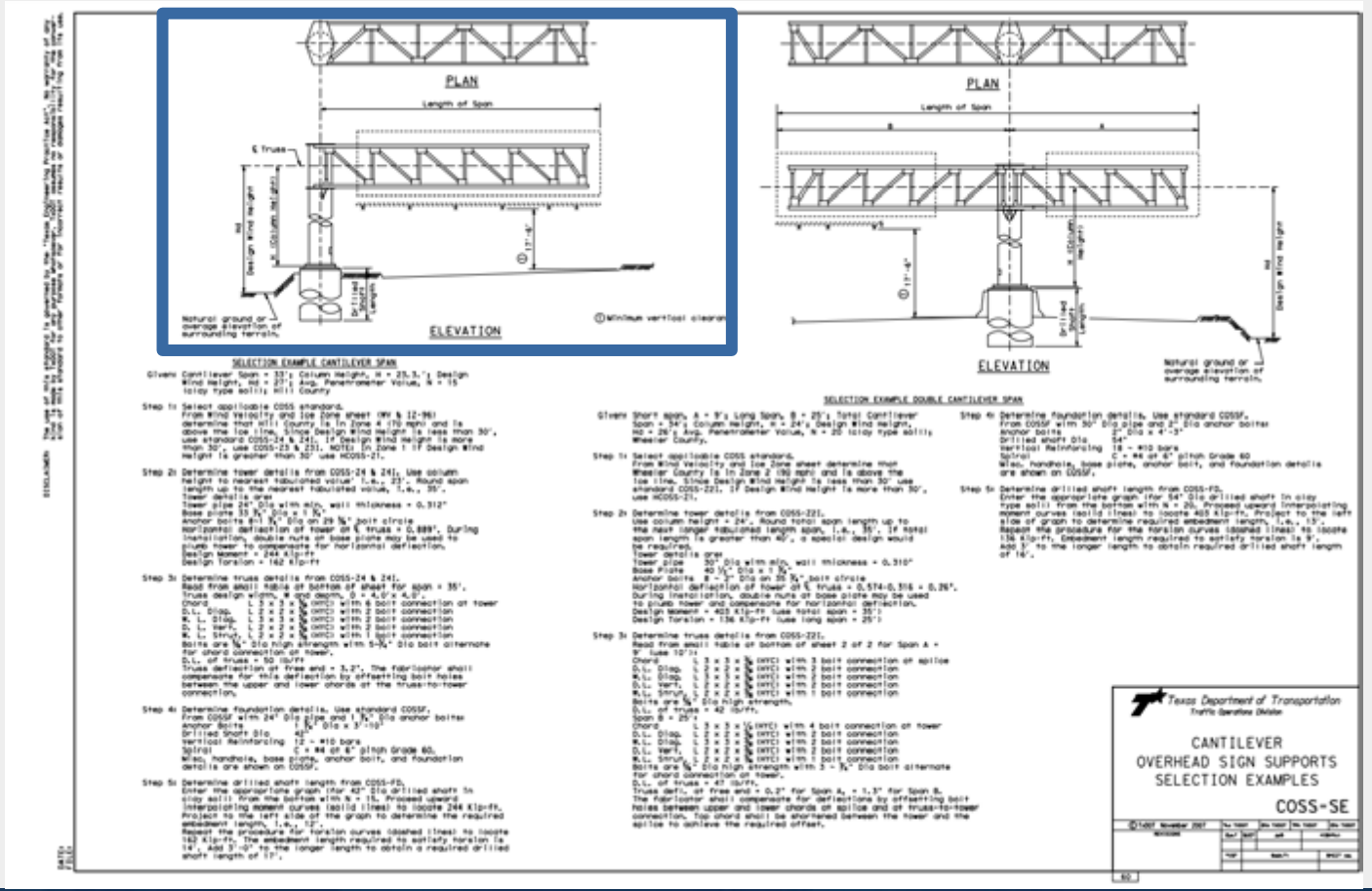
Communication

- All changes to the design of the structure proposed by the Fabricator require the Owner's approval and Contractor's acknowledgment.
  - These changes must be included in the Alternate Calculations and Shop Drawings
- If errors or discrepancies are discovered in the Contract documents by the Contractor or Fabricator, they must be brought to the Owner's attention. They can be communicated through the Request for Information (RFI) process.

Standard Sheets

- Include:
  - Standard structure (e.g. COSS-Z1)
  - Structure Details (COSSD)
  - Wind Zone Map (WV & IZ-14)
  - Foundation Details (COSSF and COSS-FD)
  - Sign Brackets
    - SB(SWL-1)-14 and SMD2 for typical signs
    - DMS-(HZ)-21 or DMS(TM-1)-16 for Dynamic Message Signs (DMS)
  - Elevation View of structure

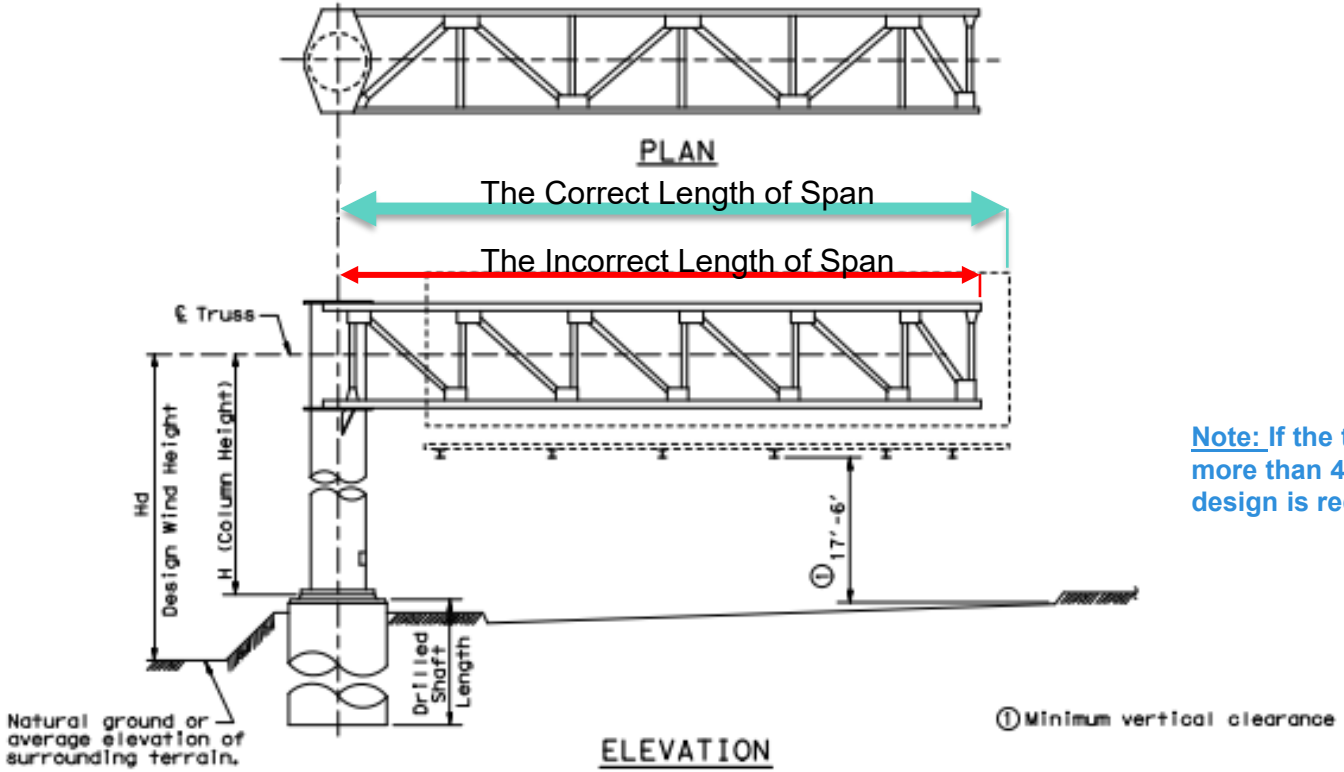
The “Hangover Effect”



The “Hangover Effect”

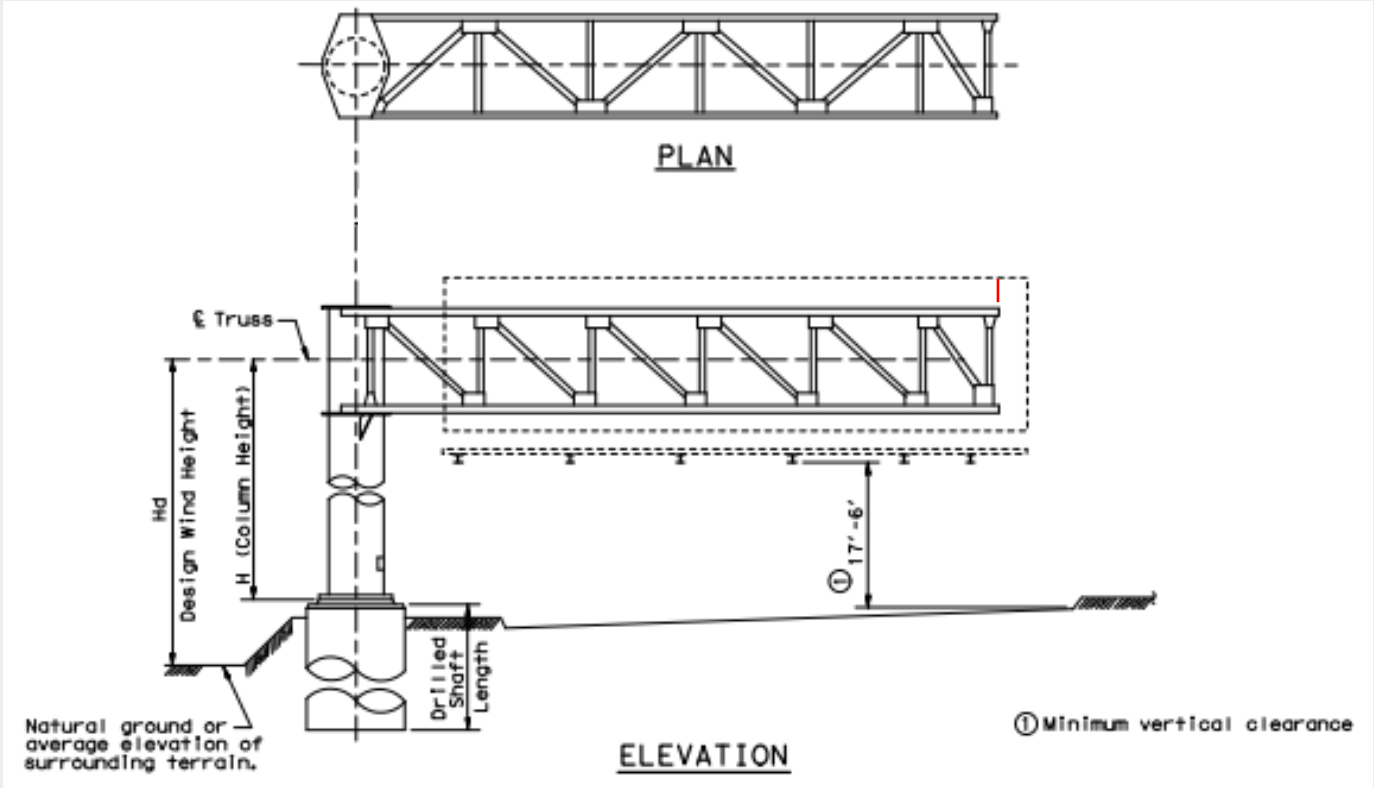
Length of Span

is from the CENTERLINE of the column/tower to the OUTSIDE edge of the sign (which normally overhangs the truss), up to a maximum of 40 feet



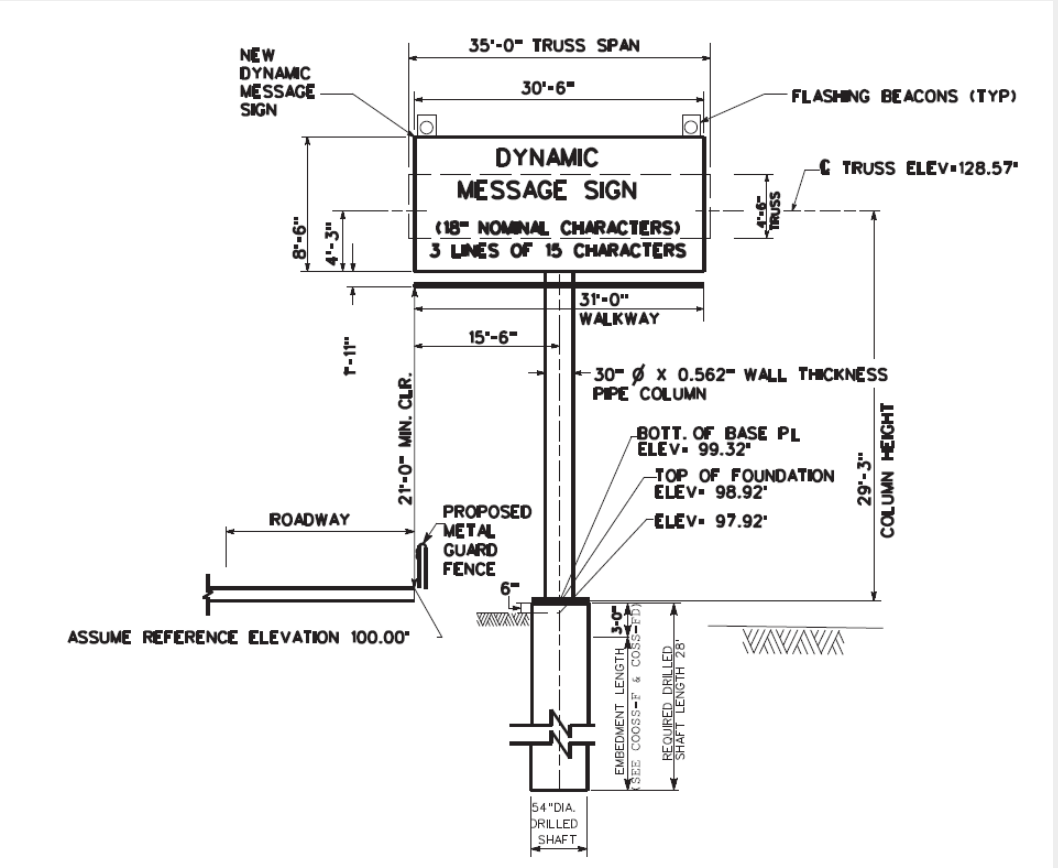
Note: If the total span equals more than 40 feet, a special design is required.

Design Wind Height vs. Column Height



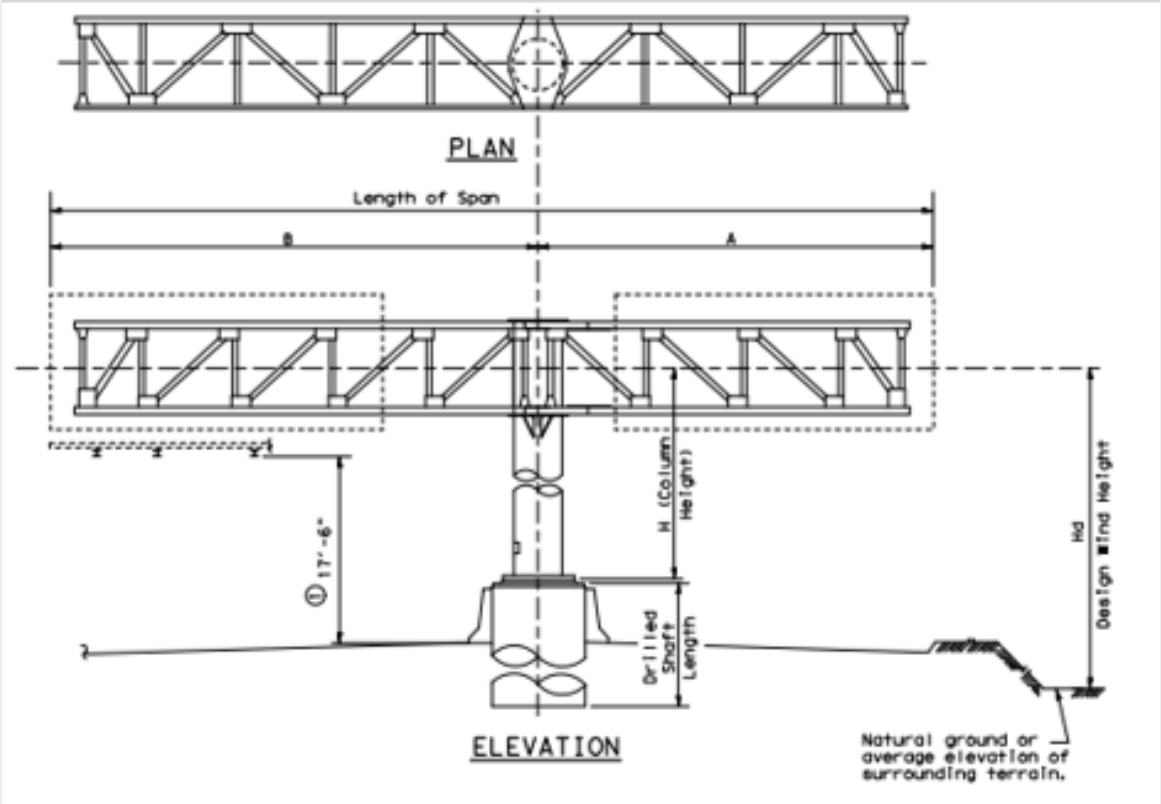
Elevation Sheets

- Include:
  - Truss span length
  - Column height
  - Drilled shaft diameter
  - Embedment length
  - Structure station
  - Structure sign



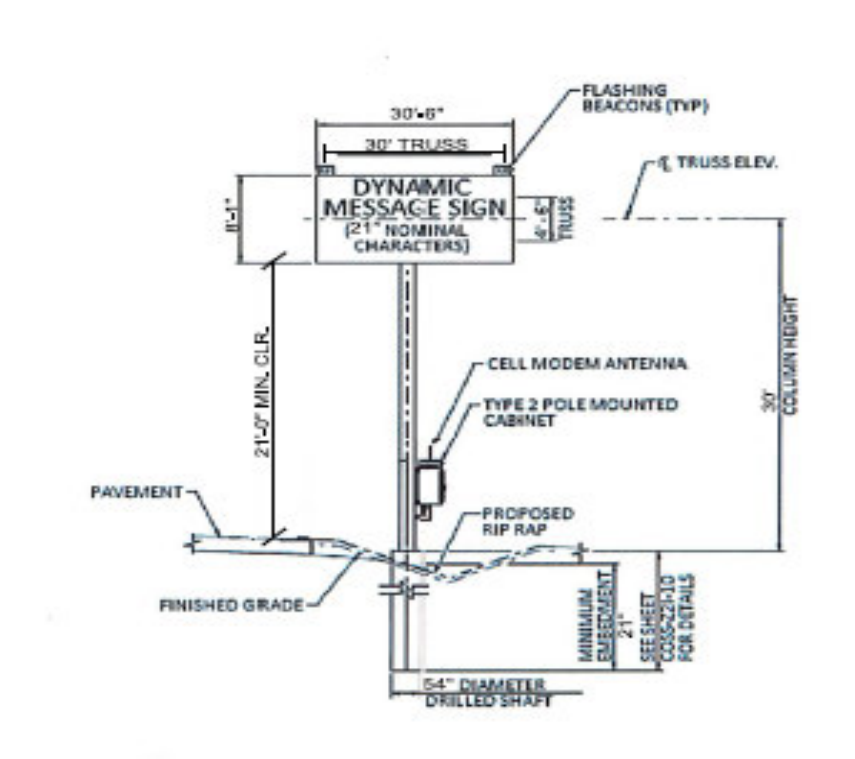
Balanced-T and DMS

- Normally, when dealing with a Double Cantilever Span (or Balanced-T), the following steps are taken:
  1. Select applicable COSS standard based on the location of the project and Design Wind Height. Note: If Design Wind Height is greater than 30', it is recommended to increase the Zone.
  2. Determine tower details. Remember to round the total span length (Span A + Span B) up to the nearest tabulated value.
  3. Determine truss details for Span A and **THEN** Span B.
  4. Determine foundation details.
  5. Determine drilled shaft length.



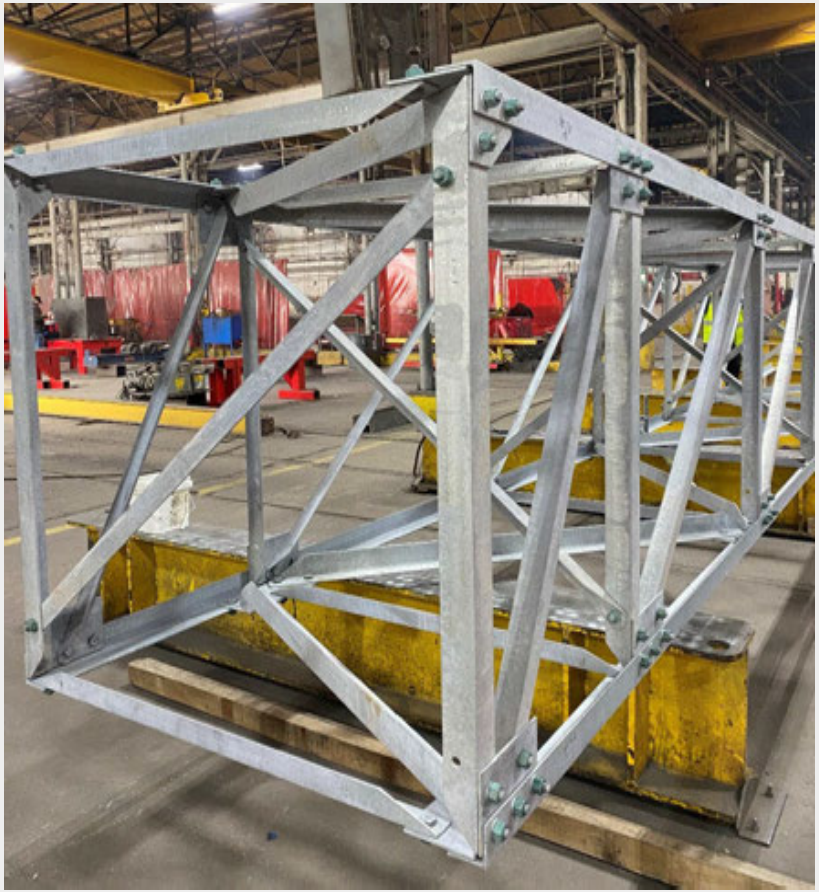
Balanced-T and DMS

However, all COSS traffic standards are designed for conventional signs and does not account for a DMS.



1. Select applicable COSS standard based on the location of the project and Design Wind Height. Note: It recommended to increase the Zone to account for increased loading from the DMS.
2. Determine tower details. Remember to round the total span length (Span A + Span B) up to the nearest tabulated value.
3. Determine truss details for Span A and Span B accounting for the full length of both cantilevers as one.
4. Determine foundation details.
5. Determine drilled shaft length.

Substitution for Special Designs



- There are acceptable changes that Fabricators may make when developing shop drawings.
  - The width of a member may change by up to ½ in and/or the thickness up to 1/16 in.
    - This could be due to
      - Availability of member sizes
      - Tightening Clearances
      - Other reasons as they apply but the reason must be clear in the Drawing for the change
- These changes are acceptable when the Standard COSS & OSB designs are used
  - **When the SZ Standard has been used, the Engineer of Record must be notified and accept these changes.**

Foundation Details

- DMS Structures are special designs
  - Typically a higher wind zone is used to account for increased loading
  - e.g. using zone 3 design for a DMS in zone 4
- Drilled shaft diameter based on pipe diameter and bolt circle
- Drilled shat embedment length based on soil conditions

ZONE 4 WITH AND WITHOUT ICE 70 MPH WIND

35' SPAN

SIGN LOADS		TOWER PIPE			ANCHOR BOLTS			BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIP		
TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	
119.01	134.48	24	0.250	0.406	1 3/4	8	29 3/8"	33 3/4 x 1 1/2	2.6	9.77	161.98	165.20	30	0.250	0
	141.90			0.467					2.7	9.79		173.37			0
	149.44			0.531					2.8	9.81		181.71			0

ZONE 3 WITH AND WITHOUT ICE 80 MPH WIND

35' SPAN

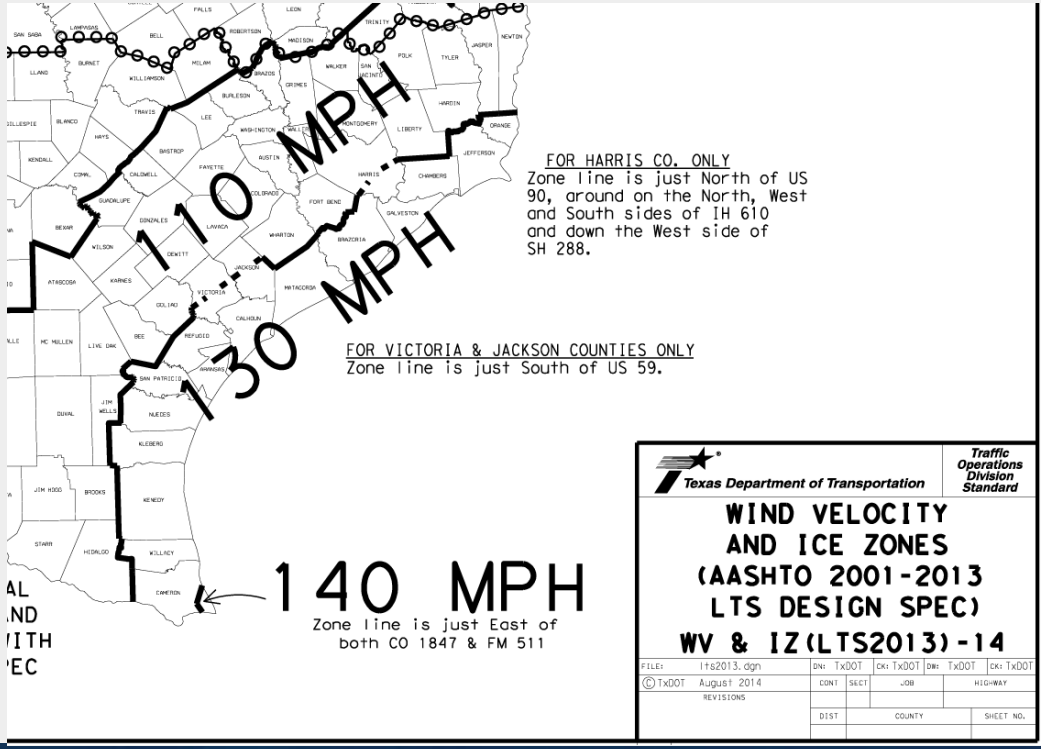
SIGN LOADS		TOWER PIPE			ANCHOR BOLTS			BASE PLATE	TRUSS	DESIGN LOADS			TOWER PI		
TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	
155.44	167.11	30	0.250	0.210	1 3/4	8	35 3/8"	39 3/4 x 1 1/2	1.5	12.87	211.58	202.48	30	0.280	
	177.27			0.241					1.6	12.90		213.97			
	187.54			0.275					1.6	12.93		225.63			

Roadway Illumination Poles (RIP)

- Standard steel pole designs
- Alternates can be aluminum or Steel

Standard Roadway Illumination Pole Limitations

- Poles in wind Zones greater than 110 MPH (Coastal Counties) should be Alternates

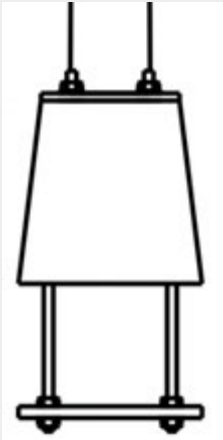


GENERAL NOTES:

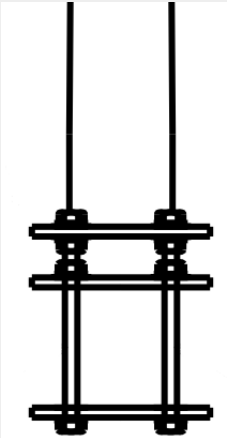
1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals , 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.

Roadway Illumination Pole Bases

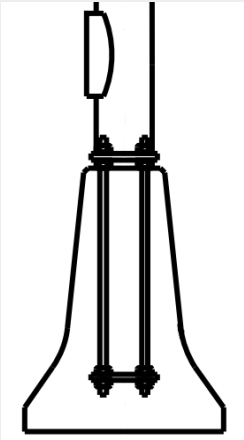
- Transformer Base- breakaway aluminum base for use where vehicle impact is a concern
- Shoe Base- Standard Base for mounting on the ground
- Concrete Traffic Barrier (CTB)- Ovalized base to fit on traffic barriers



Transformer Base



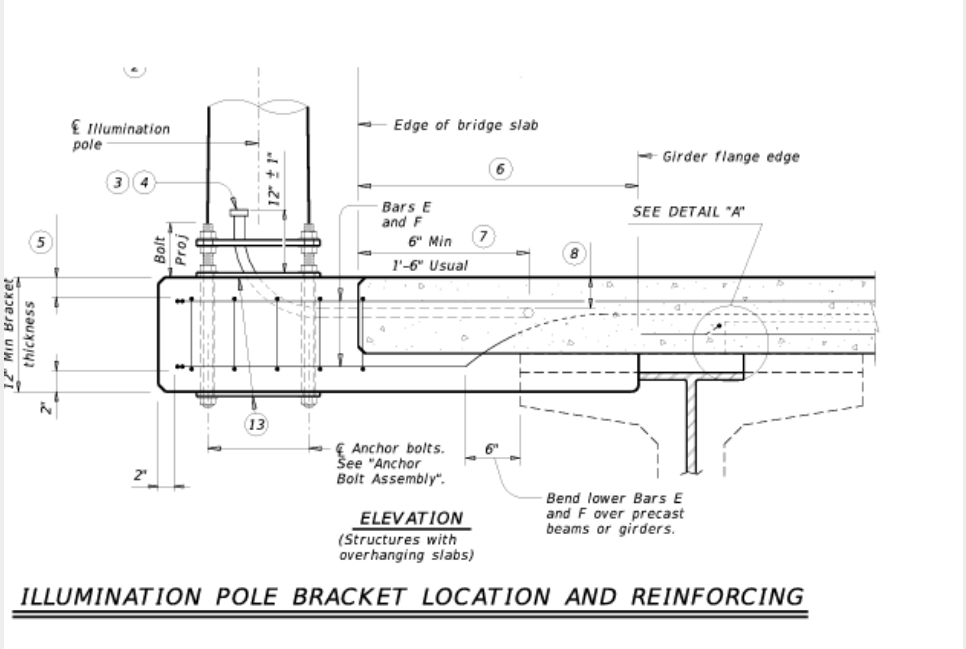
Shoe Base



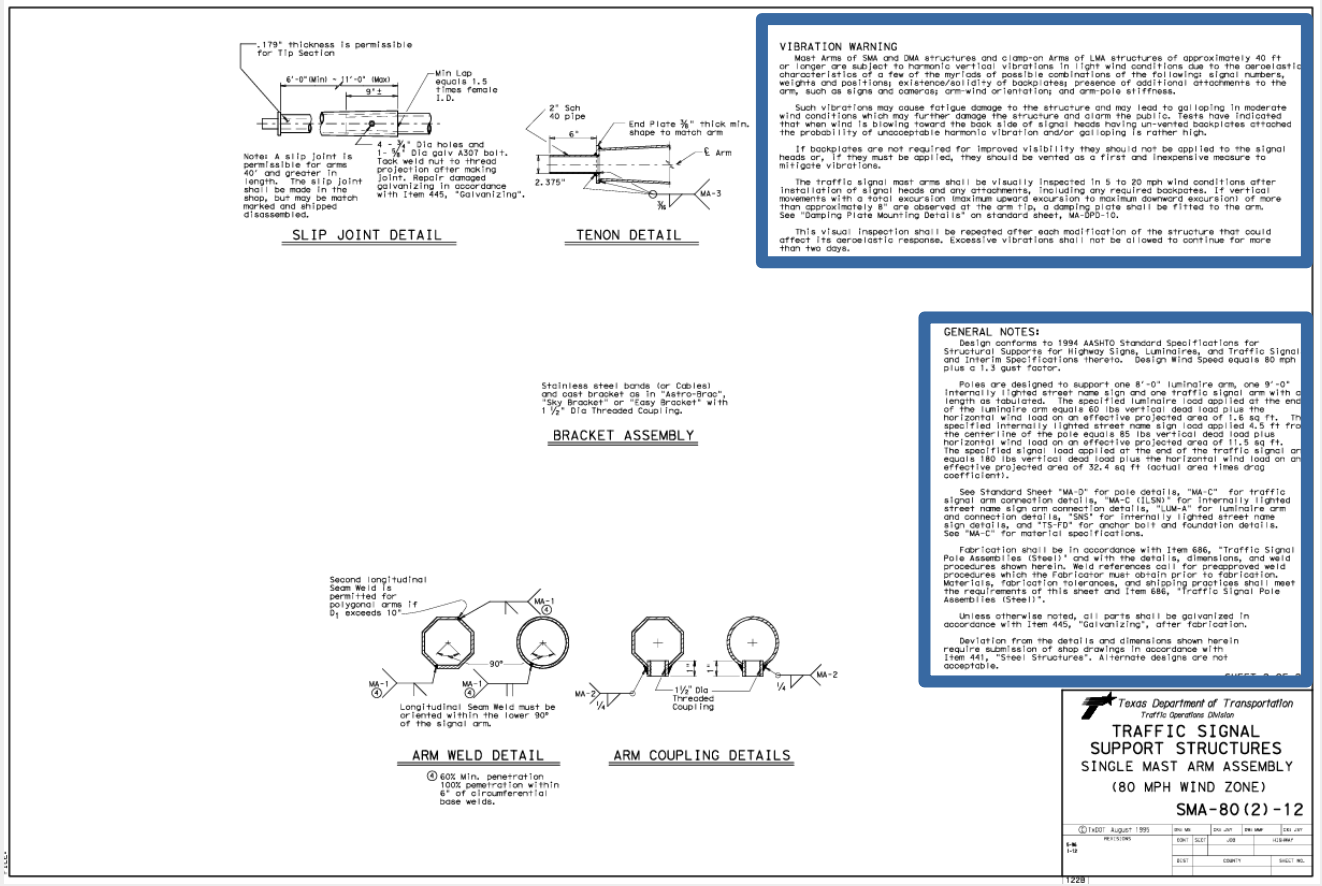
Concrete Traffic Barrier Base

Roadway Illumination Pole Bases

- Bridge Lighting Details (Bridge Standards)
  - MS-BL-19.dgn
  - Bracket for heights up to 100 ft

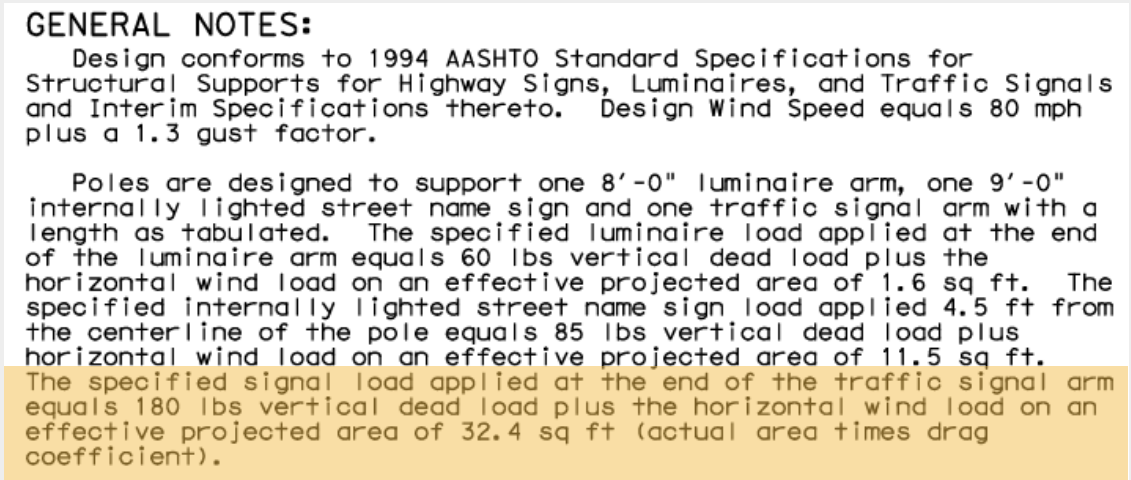


Traffic Signal Poles



Traffic Signal Poles

- Some non-signal use has been observed (small signs)
- Validate Effective Projected Area (EPA) is acceptable
- EPA = Cd*W*H
  - Cd = 1.2 for signs
  - Cd = 1.6 for DMS



GENERAL NOTES:

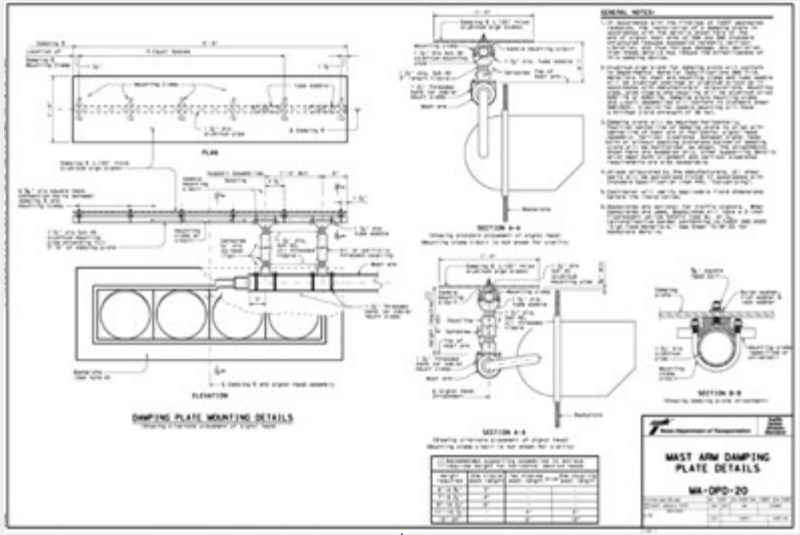
Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft.

The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

Traffic Signal Poles

- After Installation, check for vibration in light wind (5 MPH - 20 MPH)



VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

Questions?

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