

Section 18 – SIGNS AND OVERHEAD STRUCTURES

Temporary Wood Poles

<p>XS Sheet Numbers</p>	<p>xs18-010, xs18-020, xs18-030, xs18-040, xs18-050, xs18-080-1, xs18-080-2, xs18-080-3, xs18-080-4, and xs18-080-5 This users guide version does not apply to sheets approved before July 2014.</p>
<p>Project Development Procedures</p>	<p>These XS-sheets are typically sealed by a Civil Engineer in the District. This Civil Engineer verifies applicability. Typical steps are;</p> <ul style="list-style-type: none"> • Get XS-Sheets and this Users Guide from http://www.dot.ca.gov/hq/esc/techpubs/manual/bridgemanuals/bridge-standard-detail-sheets/index.html • Get specifications (see “Contract Specifications” section below). • Verify that the project conforms to XS-sheets, this Users Guide, and the specifications and determine which sheets are needed. <ul style="list-style-type: none"> ○ For questions on interpretation of the XS-sheets or the User’s Guide, contact the Senior Technical Specialist for Signs and Overhead Structures. ○ For questions on the interpretation of the specifications contact Structure Specification Research and Development Branch. ○ For detailed assistance in verification, fill out a special designs work request form. <p>If elements of the project do not conform, then the fill out a special designs form to request a custom design. In some cases custom design is only needed for a certain portion, in which case XS-sheets might still be sealed by a Civil Engineer in the District for the other portion.</p> <p>XS-sheets sealed by the Civil Engineer in the District typically include certain non-technical changes such as,</p> <ul style="list-style-type: none"> • Sheet numbering • Border • Project information such as project number, Routes, Postmiles, etc. <p>Some details or supported items shown on the needed XS-sheets might not be required by the project scope. It is usually recommended that bidability and constructability be tackled first by providing clarity through the project specific plans rather than through alterations to the XS-sheets. Customized structural design would be a common exception.</p>

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Description of Component	<p>Use for new construction of temporary structural supports for electrical and traffic operations systems such as overhead conductors (including electrical conductors and data conductors), and traffic signals. These structural supports use round timber poles, messenger wires, guy wires, guy wire anchors, tether wires, and related hardware. Use inside or outside of Special Wind Regions. Use inside or outside of Ice Load Region.</p> <p>Certain situations are covered by other standards or would not usually utilize these XS-Sheets as-is.</p> <ul style="list-style-type: none"> • Permanent structures. • Structures which support only the overhead electrical supply equipment of public utilities (whether publically owned or privately owned). For these, the structural design is regulated by California Public Utilities Commission (CPUC) for privately owned public utilities or by locally elected officials (as provided for by state law) for publicly owned public utilities. <p>Lightly loaded poles covered by Section 86-2.12 of the 2010 Standard Specification. For instance poles used for typical electrical service drops or poles that only support a single 6' luminaire mast arm.</p> <ul style="list-style-type: none"> • Non-highway structures such as a wood pole to support a maintenance radio antenna at a remote mountain top.
Standard Drawing Features	<p>xs18-010</p> <ul style="list-style-type: none"> • General notes • Structural data for overhead conductors • Determination of d_p • Overall maximum weight of overhead bundle • Maximum allowed vertical span • Sag requirements • Pole foundation <p>xs18-020</p> <ul style="list-style-type: none"> • Non-guyed pole not carrying overhead bundles • Non-guyed poles carrying overhead bundles (no signal faces/signs on the overhead bundles) • Pole selection table • Horizontal span restrictions

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<p>Standard Drawing Features (continued)</p>	<p>xs18-030</p> <ul style="list-style-type: none"> • Guyed poles carrying overhead bundles (no signal faces/ signs on the overhead bundles) • Pole selection table • Horizontal span restrictions <p>xs18-040</p> <ul style="list-style-type: none"> • Guyed poles carrying overhead bundles (with signal faces/signs on the overhead bundles) • Pole selection table • Horizontal span restrictions <p>xs18-050</p> <ul style="list-style-type: none"> • Non-guyed poles carrying overhead bundles (with signal faces/signs on the overhead bundles) • Pole selection table • Horizontal span restrictions <p>xs18-080-1</p> <ul style="list-style-type: none"> • Messenger wire, guy wire, and tether wire connection details <p>xs18-080-2</p> <ul style="list-style-type: none"> • Guy wire anchorage details <p>xs18-080-3</p> <ul style="list-style-type: none"> • Luminaire arm details <p>xs18-080-4</p> <ul style="list-style-type: none"> • Terminal compartment attachment details (such as used when attaching a signal to a pole) <p>xs18-080-5</p> <ul style="list-style-type: none"> • Details for attaching overhead signals and signs to messenger wires and tether wires.
<p>Other Aids</p>	<p>See attached worksheet dated 11-13-2012</p> <ul style="list-style-type: none"> • Attachment A: Worksheet for determination of d_p. This method is the same as that used on xs-sheet 18-010. The purpose of the worksheet is to assist the Engineer in determining if the xs-sheets are able to provide a buildable solution. <p>The equation used on this worksheet provides an approximation of d_p. For situations involving only a few conductors, it might be unconservative, however, the requirement to round up to the next listed increment of d' resolves this issue since the lowest value of d_p listed is 1". In cases involving a very large number of conductors, the approximation of d_p may be overly conservative.</p>
<p>Design/General Notes</p>	<p>Structural Design Notes:</p> <ul style="list-style-type: none"> • Design: AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, Fifth Edition (LTS-5).

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<p>Design/General Notes (continued)</p>	<ul style="list-style-type: none"> • GROUP LOAD COMBINATIONS: <ul style="list-style-type: none"> ○ I Dead Load ○ II Dead Load + Wind Load ○ III Dead Load + 0.5 (Wind Load) + Ice Load ○ IV Fatigue: Not used • LOADING: <ul style="list-style-type: none"> ○ Wind Loading: 100 mph (3-second gust and 50 year recurrence interval) ○ Wind Recurrence Interval (for adjusting down the wind 50 year wind pressure): 10 years ○ Combined height, exposure, and elevated terrain factor = 1.05 (Exposure C, structure is not located on or over the top half of a ridge, hill, or escarpment more than 33' taller than the surrounding terrain) ○ Ice Loading: 3.0 psf on surfaces, 0.60 in radial thickness of ice at a unit weight of 60 pcf on bundles • BASIC DESIGN VALUES: <ul style="list-style-type: none"> ○ Round Timber Poles: <ul style="list-style-type: none"> ▪ Fb = 1850 psi ▪ Fv = 110 psi ▪ Fcp = 230 psi ▪ Fc = 950 psi ▪ E = 1500 X 10³ psi ○ Design Wire breaking strength: <ul style="list-style-type: none"> ▪ ASTM A475, Utilities Grade, 7 strand, modified by termination efficiency factor of 0.8 • FOUNDATION DESIGN NOTES: <ul style="list-style-type: none"> ○ Maximum slope around pole base 1V:2H ○ Pole embedment depth design is based on Broms' approximate procedure as described in Article 13.6 of AASHTO LTS-5. ○ Embedment depth is calculated based on following soil parameters, <ul style="list-style-type: none"> ▪ Cohesive Soil: <ul style="list-style-type: none"> • Shear strength of soil c = 1500 psf. ▪ Cohesion less Soil: <ul style="list-style-type: none"> • $\phi = 30$ deg, $\gamma = 120$ pcf. ▪ Soil assumed to be unsaturated. ○ An overload factor of 2.0 and an undercapacity factor of 0.7 were used for safety factor of 2.86. <ul style="list-style-type: none"> ▪ Allowable vertical bearing pressure at the end bearing of poles is 3000 psf at 6 feet or more embedment.
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Drawings Needed for PS&E	<p>Project specific plans</p> <ul style="list-style-type: none"> • Show pole locations, supported items, and other information sufficient to supplement the needed XS-sheets for a bidable and constructable set. • Do not require supported items that are not included in the XS-sheets except through appropriate structural design/check or approval. <p>XS Sheets</p> <p>Isolated round timber pole having attachments to the pole (no mast arms)</p> <ul style="list-style-type: none"> • Use sheets 18-010 and 18-020 • Add sheet 18-080-4 if terminal compartment mounted to pole is needed (such as would be used to mount a signal to a pole). • See sheet 18-020 for configuration limitations such as attachment limitations. <p>Round timber poles supporting overhead bundles.</p> <ul style="list-style-type: none"> • Use sheets 18-010 and 18-080-1 • Add sheet 18-020 or 18-030 (with 18-080-2) or both <ul style="list-style-type: none"> ○ Add sheet 18-020 if a non-guyed version is needed. ○ Add sheets 18-030 and 18-080-2 if a guyed version is needed. • Add sheet 18-080-3 if a luminaire mast arm is needed. • Add sheet 18-080-4 if terminal compartment mounted to pole is needed. • See sheet 18-020 and/or 18-030 for primary configuration limitations, such as horizontal span limits and attachment limitations. • See sheet 18-010 for limitations on vertical span limits. <p>Round timber poles supporting overhead bundles plus tether wires, traffic signals, and small sign panels.</p> <ul style="list-style-type: none"> • Use sheets 18-010, 18-080-1, and 18-080-5 • Add sheets 18-040 or 18-050 (with 18-080-2) or both <ul style="list-style-type: none"> ○ Add sheets 18-040 and 18-080-2 if a guyed version is needed ○ Add sheet 18-050 if a non-guyed dead-end version is needed. • Add sheet 18-050-3 if a luminaire mast arm is needed. • Add sheet 18-050-4 if terminal compartment mounted to pole is needed. • See sheet 08-030 and/or 18-040 for primary configuration limitations, such as horizontal span limits and attachment limitations. • See sheet 18-010 for limitations on vertical span limits.
Contract Specifications	<p>Specifications for temporary wood poles is available from the Division of Engineering Services, Structure Specification Research and Development Branch. Email requests to NSSP.Structures@dot.ca.gov. They can also provide additional information on procedures for submitting approval request.</p>

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Restrictions on Use of Standard Drawings	<p>Special Design is needed for:</p> <ul style="list-style-type: none">• Cases where the structure is located on or over the top half of a ridge, hill, or escarpment more than 33' taller than the surrounding terrain.• Cases where the slope near the pole base is greater than 1V:2H.• Cases outside of the limitations shown on the relevant sheets. Some important issues to consider are<ul style="list-style-type: none">○ Horizontal and vertical spans allowed○ Sag allowed○ Maximum d_p and weight allowed for overhead bundles○ Weight or diameters of overhead conductors on sheet 18-010.○ Messenger wire attachment heights allowed○ Clearances needed○ Attachments that are larger or heavier than allowed○ Attachments needed in locations not allowed○ Additional attachments needed○ Problems with required guy wire locations○ Poor soil conditions○ Water table○ Ground profiles○ Conflicts with existing structures○ Conflicts with existing overhead or underground utilities
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Attachment A: Worksheet for Calculation of d_p

Span ID: _____
 Pole ID for start of Span: _____
 Pole ID For End of Span: _____

Project ID: _____
 By: _____
 Date: _____

Item	*Design Diameter d (in)	Number Of Units	Multiplier	Depth Contribution (in)
3/8" Messenger Wire	0.375	x 1	x 1 =	0.375
*		x 1	x 1 =	
		x _____	x 0.3 =	
		x _____	x 0.3 =	
		x _____	x 0.3 =	
		x _____	x 0.3 =	
		x _____	x 0.3 =	
		x _____	x 0.3 =	
		x _____	x 0.3 =	
			x 0.3 =	
			x 0.3 =	
		Total:		
		Round up to next multiple of 0.5". Use this value for the tables on the xs-sheets		

* Use the largest diameter item for this row.

Attachment A: Worksheet for Calculation of d_p

Diameters & Self Weight of Conductors Including Required Insulation		
Conductor or Data Cable Type	Design Diameter d (in)	Weight w (plf)
3 Conductor Signal Cable (3CSC)	0.400	0.0980
5 Conductor Signal Cable (5CSC)	0.500	0.1560
9 Conductor Signal Cable (9CSC)	0.650	0.2760
12 Conductor Signal Cable (12CSC)	0.800	0.3970
28 Conductor Signal Cable (28CSC)	0.900	0.6490
1-#14	0.166	0.0235
1-#12	0.185	0.0330
1-#10	0.210	0.0476
1-#8	0.271	0.0774
1-#6	0.310	0.1130
1-#4	0.359	0.1690
1-#3	0.388	0.2080
1-#2	0.420	0.2560
1-#1	0.498	0.3340
SIC (6-Conductor)	0.350	0.0860
SIC (12-Conductor)	0.500	0.1440
Detector Lean-in Cable (DLC)	0.310	0.0440
12 to 48-Strand Fiber Optic Cable (FO48)	0.424	0.0600
72-Strand Fiber Optic Cable (FO72)	0.484	0.0770
96-Strand Fiber Optic Cable (FO96)	0.535	0.1050
144-Strand Fiber Optic Cable (FO144)	0.670	0.1890
3/8" diameter Messenger Wire	0.375	0.2730

