

**SECTION 00540 - STRUCTURAL CONCRETE**

*(Follow all instructions. If there are no instructions above a subsection, paragraph, sentence, or bullet, then include them in the project. The specifications may be modified to include project specific specifications, but all additions, deletions, or modifications must be sent to the ODOT Technical Resource and Senior Specifications Engineer for review and approval.)*

Comply with Section 00540 of the Standard Specifications modified as follows:

**00540.10 ~~General~~Materials** - In the list of materials, add the following line:

Concrete Surface Retarder ..... 02055

Delete the paragraph that begins "Furnish a concrete surface retarder..."

*(Use the following subsection .80(a-1) when concrete is paid for on the lump sum basis. List by bridge number then by bid item name. Add items as appropriate. Delete what does not apply. Obtain information from the Bridge Designer.)*

**00540.80(a-1) Lump Sum** - Add the following to the end of this subsection:

The estimated quantity of concrete is:

Bridge No. \_\_\_\_\_

Type and Class	Quantity (Cu. Yd.)
Foundation Concrete, Class _____	_____
Deck Concrete, Class _____	_____
General Structural Concrete, Class _____	_____

Bridge No. \_\_\_\_\_

Type and Class	Quantity (Cu. Yd.)
Foundation Concrete, Class _____	_____
Deck Concrete, Class _____	_____
General Structural Concrete, Class _____	_____

*(Include the following falsework design checklist when required by the Bridge Designer.)*

### FALSEWORK DESIGN CHECKLIST

**Instructions** - This checklist was developed to facilitate the design, review, and erection of falsework to be used for Oregon Department of Transportation bridge construction projects. This checklist is intended to act as a reminder to design or check for specific important aspects of this construction. It is not a substitute for plan and/or design criteria or specification requirements.

The Checklist is to be completed and signed by the Falsework Design Engineer. Answer every question. Attach to the Checklist an explanation of any negative responses.

Submit the Checklist according to 00540.41(a).

	YES	NO	N/A
<b>A. Contract Plans, Specifications, Permits, Etc.</b>			
1. Are the falsework plans prepared, stamped and signed by an engineer registered to practice in Oregon?	_____	_____	_____
2. Have three complete sets (five if railroad approval is required) of the design calculations been included with the falsework drawings submittal?	_____	_____	_____
3. Are falsework plans in compliance with the requirements of the construction plans general notes?	_____	_____	_____
4. Are falsework plans in compliance with contract plan structural details?	_____	_____	_____
5. Are falsework plans in compliance with the requirements of the Oregon Standard Specifications for Construction, subsection 00150.35?	_____	_____	_____
6. Are all existing, adjusted or new utilities in proximity with the proposed falsework shown on the falsework plans and is protection of these utilities addressed?	_____	_____	_____
7. Are clearance requirements satisfied and shown on the falsework plans?	_____	_____	_____
8. For construction in or over navigable waters have all requirements for construction of falsework that are called for in the Coast Guard Permit been incorporated in the falsework design?	_____	_____	_____
9. Has possible damage from traffic been considered in the falsework design?	_____	_____	_____



10. Has damage from stream drift been considered in the falsework design? \_\_\_\_\_

11. Is the concrete placing sequence shown and is it consistent with the contract plans? \_\_\_\_\_

**B. Foundation Requirements**

1. Are driven falsework piling provided as called for on the contract plans? \_\_\_\_\_

a. Is a minimum pile tip elevation or penetration indicated on the drawings? \_\_\_\_\_

b. If timber falsework piles are specified, are the recommended order lengths sufficient to virtually eliminate the possibility of pile splices? \_\_\_\_\_

c. Is a detailed static pile capacity analysis included in the calculations? \_\_\_\_\_

d. If lateral loads are applied to the piling by equipment, dead loads, flowing water, or drift, is a detailed lateral load analysis included in the calculations? \_\_\_\_\_

e. When piling are in an active waterway, have the potential effects of scour on axial and lateral pile support been addressed in the calculations? \_\_\_\_\_

f. Does the proposed falsework pile hammer meet the minimum field energy requirements as listed in 00520.20(d-2)? \_\_\_\_\_

g. Will a driving criteria graph [FHWA Gates Equation, in 00520.42(b)] plotting blow count versus stroke for an acceptable pile hammer be provided for the project inspector? \_\_\_\_\_

2. Is falsework supported on spread footings or mud sills? \_\_\_\_\_

a. Are the spread footing elevations shown on the drawings? \_\_\_\_\_

b. Has a rational method for determining the ultimate bearing capacity of the foundation materials been presented and described in the calculations? \_\_\_\_\_

- c. Have the soil parameters used in calculating the ultimate bearing capacity been listed and confirmed by the designer? \_\_\_\_\_
- d. Has an appropriate Factor of Safety been used for calculating the allowable bearing capacity of the foundation materials? \_\_\_\_\_
- e. Are spread footing settlement estimates included in the calculations? \_\_\_\_\_
- f. Have effective stresses been used in the calculations, when applicable? \_\_\_\_\_
- g. When spread footings are founded near the top of a slope or in a slope, have the ultimate bearing capacity calculations been modified accordingly? \_\_\_\_\_
- h. When spread footings may be subjected to flowing water, have the potential effects of scour on ultimate bearing capacity been addressed in the calculations? \_\_\_\_\_

**C. Loads**

- 1. Are the magnitude and location of all loads, equipment and personnel that will be supported by the falsework shown and noted on the falsework plans? \_\_\_\_\_
- 2. Has the mass of specific equipment units to be supported by the falsework been included in the calculations or on the falsework plans? \_\_\_\_\_
- 3. Is the deck finishing machine supported in a manner that will not impose load on concrete forms except deck overhang brackets? \_\_\_\_\_
- 4. Are design loads and material properties used to determine design stresses for each different falsework member shown on the falsework plans? \_\_\_\_\_
- 5. Is the worst loading and member property condition, rather than the average condition, used to obtain design loads? \_\_\_\_\_
- 6. Are deck forms for concrete box girders supported from the girder stem and not from the bottom slab? \_\_\_\_\_
- 7. Are diaphragm loads or other concentrated loads included in the analysis of supporting beams? \_\_\_\_\_
- 8. If sloping structural members exert horizontal forces on the falsework, is bracing or ties used to resist these loads? \_\_\_\_\_

**D. Allowable Stresses**

- 1. Has the method used for falsework design of all members except for manufactured assemblies been noted in the design calculations? \_\_\_\_\_
- 2. Are manufactured assemblies identified as to manufacturer, model, rated working capacity and ultimate capacity? \_\_\_\_\_
- 3. Is the allowable stress and the calculated stress listed in the summary for each different falsework member, except for manufactured assemblies? \_\_\_\_\_

**E. Timber Falsework Construction**

- 1. Are timber grades consistent with material to be delivered to the construction site, and noted on falsework drawings, and in accompanying calculations for all timber falsework material? \_\_\_\_\_
- 2. If "rough" lumber is specified for falsework by the falsework designer are the actual lumber dimensions used in calculations shown? \_\_\_\_\_
- 3. If plywood spans are governed by the strength of the plywood, are the allowable stress and the calculated stress shown on the submitted calculations? \_\_\_\_\_
- 4. If plywood spans are governed by the allowable spacing of supporting joists, are the allowable and the proposed spacing shown on the falsework plans? \_\_\_\_\_
- 5. Have timber stringers been checked for bending, shear, bearing stresses, and 1/240 of the span length deflection? \_\_\_\_\_
- 6. Are joists identified as being continuous over 3 or more spans when they are not analyzed as simple spans? \_\_\_\_\_
- 7. Have stringers and cap beams been checked for bearing stresses perpendicular to the grain as well as for bending and shear stresses? \_\_\_\_\_
- 8. Have posts been checked as columns as well as for compression parallel to the grain? \_\_\_\_\_

**F. Steel Falsework Construction**

- 1. Are steel structural shapes and plates identified by ASTM number on the falsework plans and in the calculations? \_\_\_\_\_
- 2. Have steel beams been checked for bending, shear, web crippling and buckling of the compression flange? \_\_\_\_\_
- 3. Has horizontal plane bracing been shown where required to limit compression flange buckling? \_\_\_\_\_

**G. Deflections and Settlement**

- 1. Is falsework deflection for concrete dead load shown on the plans for all falsework spans? \_\_\_\_\_
- 2. Is falsework deflection from concrete dead load limited to 1/240 of the span length for all falsework spans? \_\_\_\_\_
- 3. Do stringers supporting cast-in-place concrete compensate for estimated camber? \_\_\_\_\_
- 4. For beam spans with cantilevers, has the upward deflection of the cantilevers due to load placed on the main spans been investigated? \_\_\_\_\_
- 5. Are provisions shown for taking up falsework settlement? \_\_\_\_\_

**H. Compression Members, Connections and Bracing**

- 1. Has general buckling been evaluated for all compression members? \_\_\_\_\_
- 2. Has bracing been provided at all points of assumed support for compression members? \_\_\_\_\_
- 3. Was bracing in each direction considered in establishing the effective length used to check post capacity? \_\_\_\_\_
- 4. Is bracing strength and stiffness sufficient for the intended purpose? \_\_\_\_\_
- 5. If temporary bracing is required during intermediate stages of falsework erection, is it shown on the falsework plans? \_\_\_\_\_
- 6. Have all connections been designed and detailed? \_\_\_\_\_
- 7. Are web stiffeners required on steel cap beams to resist eccentric loads? \_\_\_\_\_

- 8. Are wedges required between longitudinal beams and cap beams to accommodate longitudinal slope or to reduce eccentric loading? \_\_\_\_\_
- 9. Has the width to height ratio of wedge packs been verified to fall within the limits given in the special provisions? \_\_\_\_\_
- 10. If overhang brackets are attached to unstiffened girder webs, has the need for temporary bracing to prevent longitudinal girder distortion been investigated? \_\_\_\_\_
- 11. Have beams and stringers with height/width ratios greater than 2.5:1 been checked for stability? \_\_\_\_\_
- 12. Have sloping falsework members that exert horizontal forces on the falsework been braced or tied to resist these loads? \_\_\_\_\_
- 13. If beams supporting cast-in-place concrete have cantilever spans, have the falsework plans been noted to require the main spans be loaded before loading the cantilever spans? \_\_\_\_\_
- 14. Have timber headers set on shoring towers been checked for eccentric loads, and for shear and bending stresses produced by the eccentricity? \_\_\_\_\_

**I. Highway and Railroad Traffic Openings (For falsework over or adjacent to highway or railroad traffic openings.)**

- 1. Do falsework plans satisfy construction clearances shown on the contract plans? \_\_\_\_\_
- 2. Are posts designed for 150% of the calculated vertical loading and increased or readjusted for loads caused by prestressing forces? \_\_\_\_\_
- 3. Are mechanical connections 2,000 pounds minimum capacity shown at the bottom of posts to footing connections? \_\_\_\_\_
- 4. Are mechanical connections 1,000 pounds minimum capacity shown at the top of the post to cap connections? \_\_\_\_\_
- 5. Are beam tie downs 500 pounds minimum capacity shown for all beams? \_\_\_\_\_
- 6. Are 5/8 inch or larger diameter bolts used at connections for timber bracing? \_\_\_\_\_
- 7. Are temporary erection and removal bracing shown? \_\_\_\_\_

**J. Additional Requirements for Railroad Traffic Openings**

- 1. Do falsework plans show collision posts as shown on the contract plans? \_\_\_\_\_
- 2. Do posts adjacent to the openings have a minimum section modulus of?
  - a. steel - 9.5 cubic inches \_\_\_\_\_
  - b. timber - 250 cubic inches \_\_\_\_\_
- 3. Are soffit and deck overhang forming details shown? \_\_\_\_\_
- 4. Are falsework bents within 20 feet of centerline of the track sheathed solid between 3 feet and 17 feet above top of rail with 5/8 inch thick minimum plywood and properly blocked at the edges? \_\_\_\_\_
- 5. Is bracing on the bents within 20 feet of the centerline of the track adequate to resist the required assumed horizontal load or minimum 5,000 pounds, whichever is greater? \_\_\_\_\_

\_\_\_\_\_  
Designer's Signature

\_\_\_\_\_  
Date

