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 Materials - In the list of materials, add the following line:

Concrete Surface Retarder 02055

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

00540.45 Construction of Forms - In the paragraph that begins "Construct forms that:", add the following bullet to the bullet list:

- Conform to ACI 347 and ACI SP-4.

Replace the paragraph that begins "On structures 25 aerial miles…" with the following two paragraphs:

On structures located within 25 aerial miles of the Pacific Ocean, remove metal ties and anchorages to a depth of 2 inches from accessible surfaces. Remove fiberglass form ties and anchorages to a depth of 1 inch from accessible surfaces.

On structures located more than 25 aerial miles from the Pacific Ocean, construct ties or anchorages within the forms so they can be removed to a depth of at least 1 inch from accessible surfaces.

(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
A. Contract Plans, Specifications, Permits, Etc.			
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