

SECTION 00540 - STRUCTURAL CONCRETE

(Follow all instructions and make all edits with “Track Changes” turned on. If there are no instructions [purple text] above a subsection, paragraph, sentence, or bullet, then include it in the project. Delete all purple text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

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

Add the following subsection:

00540.10(a) Pigmented Sealer - Furnish a semi-opaque, or opaque, 100% acrylic or acrylic co-polymer resin concrete sealer meeting the following requirements:

Property	Test Method	Requirement
UV Resistance	ASTM D5894	5000 hour exposure
Wind Driven Rain Resistance	ASTM D6904 reference FED TT-P-555B	No visible leaks
Permeance	ASTM E96/E96M or ASTM D1653	Minimum 10 perms
Fungal Growth	FED STD 141	No fungal growth after 21 Days

Provide colors and color samples as shown or directed. Furnish a sealer designated for vertical application when applied to walls. When applied to structures with soffits or overhangs, furnish a sealer that is designated for vertical and overhead application.

Furnish pigmented sealer color that conforms to the following colors:

(In the following list, replace the color and color number if necessary. Delete all purple parentheses.)

Light Gray, conforming to SAE AMS-STD-595C color #(36375).

Dark Gray, conforming to SAE AMS-STD-595C color #(36176).

00540.17(c) Hardened Concrete – Replace the paragraph that begins “Cast and cure...” with the following paragraph:

Cast and cure test specimens according to AASHTO R 100 in 6 inch x 12 inch or 4 inch x 8 inch, single-use plastic molds and test at 28 Days according to AASHTO T 22.

(Use the following subsection .41(f) if bolt holes are allowed in the exterior girder web to support form brackets.)

00540.41(f) Concrete Forms on Steel Structures – Add the following to the end of the subsection:

Shop drill bolt holes in the exterior girder web to support form brackets. Fill the holes with fully torqued ASTM F3125 Grade A325 or button-head twist-off bolts ASTM F1852 or F2280 bolts according to Section 02560. Place each bolt head on the exterior side of the web. No holes are to be made in the flanges.

00540.50(d) Deck Sidewalk and Curb Ramp Finish - Replace this subsection, except for the subsection number and title, with the following:

Finish concrete surfaces on pedestrian facilities including but not limited to sidewalks, curb ramps and pedestrian structures that contain a Pedestrian Accessible Route according to 00759.50.

00540.51(b) Curing Concrete Bridge Decks – Replace the bullet that begins “Maintain a continuous water...” with the following bullet:

- Except for HPC(IC), maintain a continuous water cure of the concrete surface for 14 Days. For HPC(IC), maintain a continuous water cure of the concrete surface for 7 Days.

00540.52 Removal of Forms and Falsework, and Subsequent Loading – Replace the paragraph that begins “In determining when to remove ...” with the following paragraph:

In determining when to remove Forms and Falsework, and when to place subsequent loads, the Engineer will consider the Contractor's proposed schedule, the location and character of the Structure, the weather, and other conditions influencing the setting of the concrete. If appropriate, these operations will be controlled by compressive strength tests of cylinders cast by the Contractor and witnessed by the Engineer. Test the cylinders at a recognized testing laboratory at no additional cost to the Agency. Cast and cure cylinders according to AASHTO R 100 (field cured) which is equivalent to the most unfavorable field conditions for the portions of the concrete which the cylinders represent.

00540.53(d) Concrete Coating – Replace the paragraph that begins “Apply either a concrete paint...” with the following paragraph:

Apply either a concrete paint or a pigmented sealer as shown or specified. Where a Class 1 or Class 2 surface finish is shown, apply a concrete paint unless specified or shown otherwise.

00540.53(d)(2) Penetrating Concrete Stain or Sealer - Replace this subsection with the following subsection:

00540.53(d)(2) Pigmented Sealer - Prepare concrete surfaces and apply 2 coats of the pigmented sealer according to the manufacturer's recommendations. Follow all recommended curing schedules for newly placed concrete prior to application and for recoat

or repair. Monitor and follow all environmental limitations as published by the manufacturer during application, and curing.

(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 _____	_____

(Use the following subsection .80(b) if surface texturing is required.)

00540.80(b) Sawcut Texturing - Replace this subsection with the following subsection:

00540.80(b) Surface Texturing - The quantities of surface texturing will be measured on the area basis and will be the area of each bridge deck or approach slab as shown, less 16 inches along each curb and 6 inches from joint blockouts and bridge ends. Field measurement of surface texturing will not be made.

(Use the following subsection .90 if surface texturing is required.)

00540.90 Payment – Replace the Pay Item Sawcut Texturing with the following Pay Item:

Pay Item	Unit of Measurement
(d) Surface Texturing.....	Square Yard

(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).

A. Contract Plans, Specifications, Permits, Etc.	YES	NO	N/A
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	YES	NO	N/A
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	YES	NO	N/A
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	YES	NO	N/A

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	YES	NO	N/A
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	YES	NO	N/A
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	YES	NO	N/A
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	YES	NO	N/A
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 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.)	YES	NO	N/A
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	YES	NO	N/A
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

