Chapter 25

CONSTRUCTION SUPPORT

NDOT STRUCTURES MANUAL

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Chapter 25
CONSTRUCTION SUPPORT

The Structures Division is involved in many activities related to the construction of structural elements. These are all accomplished in coordination with NDOT's Resident Engineer responsible for the construction project. The majority of this Chapter addresses construction support activities related to the bridge designer. Chapter 26 addresses construction-related activities associated with the NDT Squad.

The bridge designer must be responsive to the field crew and give priority to contract-related questions, requests for information and submittal reviews. Delays caused by an untimely review can result in contractor claims for time and/or compensation.

The Resident Engineer has the responsibility and authority for construction contract administration. To maintain contract efficiency, the bridge designer will have direct communication with suppliers and fabricators to discuss technical issues. However, the bridge designer should not provide direct opinions or interpretation of contract documents. Supplier and fabricator questions on the direction needed on contract documents should be submitted as a Request for Information through the prime contractor to the Resident Engineer. This process is necessary to keep both the Resident Engineer and prime contractor informed of contract document issues and to allow these parties to negotiate a solution.

25.1 REVIEW OF SHOP DRAWINGS

25.1.1 General

Shop drawings (or working drawings) are intended to transform the general structural design, as presented in the contract documents, into detailed working drawings from which each individual structural member or component can be fabricated and/or constructed. If modifications to the structural design are necessary for fabrication and/or construction of structural components, NDOT must approve any changes before fabrication.

25.1.2 Responsibility

In general, it is the responsibility of NDOT to verify that the fabricator and constructor of structural elements is supplying the items as specified by the contract; it is the contractor's responsibility to ensure that all structural items are fabricated or constructed to the correct dimensions, to use the correct materials, and to conform to the contract documents.

25.1.3 Procedures

The following procedures apply to NDOT's review and approval of shop drawings.

25.1.3.1 Contractor Submittals

Section 105.02 "Plans and Working Drawings" of the *NDOT Standard Specifications for Road and Bridge Construction* documents the general requirements with respect to shop drawing

submittals. Additional items of work requiring shop drawing submittal and review may be included in the Special Provisions.

The *Standard Specifications* specifies the number of submittal copies, but this may not be adequate for some projects. Copies of the approved shop drawings are needed for the Resident Engineer, prime contractor and bridge designer. Additional copies are needed for the NDT Squad, supplier/fabricator, design consultant and other involved entities. The number of required submittal copies should be reflected in the Special Provisions if different from the *Standard Specifications*.

25.1.3.2 Division Review

In its review of shop drawings, the Structures Division will take one of the following actions on NDOT-designed projects:

1. No Corrections. If everything is correct on the shop drawing, the checker will stamp "APPROVED" on the drawings.

2. Minor Corrections. If the basic concept of the shop drawing is acceptable with only the need for minor corrections, the checker will stamp "APPROVED EXCEPT AS NOTED" on the drawings. The contractor will not be required to resubmit the plans for NDOT review and approval.

3. Major Corrections. If the shop drawings contain major discrepancies and errors, the checker will stamp "RETURNED FOR CORRECTION" on the drawings. The contractor must revise the shop drawings and resubmit the drawings to NDOT with the corrections clearly noted.

On consultant-designed projects, the consultant is responsible for reviewing the shop drawings, determining their acceptability and placing the applicable stamp on the drawings as indicated above. The Structures Division will independently review the shop drawings and convey any suggestions to the consultant for inclusion. The Structures Division will stamp "REVIEWED" on the drawings. The Division's review is usually conducted concurrently with the consultant's review.

The Traffic Division and Structures Division are both responsible for sign, signal and high-mast lighting shop drawings. The Traffic Division will review these submittals for conformance with layout and electrical requirements; the Structures Division will review the structural details.

Discussion of shop drawings issues between the reviewer and supplier/producer is typically conducted through the Resident Engineer and prime contractor. To expedite a resolution of issues and shop drawing approval, the Structures Division will at times correspond directly with the supplier/producer. The Resident Engineer and prime contractor must first approve direct communication with the fabricator. The reviewer must provide copies of all correspondence to the Resident Engineer.

25.1.3.3 Review Periods

The *Standard Specifications* provides 30 calendar days for review and approval of shop drawings. If Railroad approval is also required, the time is increased to 90 days. The Railroad will only review shop drawings that have first been reviewed and approved by the Structures Division. The bridge designer should increase the review time for complex structures or on

projects with multiple submittals that require more review time than the standard 30 days. The Special Provisions should explicitly define the increased number of days needed for review and approval and any requirements for scheduling multiple submittals for large projects with several structures.

25.1.3.4 Distribution

After the Structures Division or consultant has approved the shop drawings, distribute copies as outlined below. Copies for the contractor, subcontractors, vendors and suppliers are generally routed through the Resident Engineer. For some submittals (e.g., structural steel, precast girders), copies of approved drawings may be returned directly to the supplier to expedite fabrication. Such direct delivery must first be approved by the Resident Engineer and prime contractor.

The typical distribution for copies of approved shop drawings is as follows:

- one copy for Structures Division files;
- two copies for the NDT Squad, as applicable;
- one copy for the design consultant, as applicable;
- one copy for the Resident Engineer;
- one copy for the prime contractor;
- two copies for the structural steel fabricator or precast concrete producer;
- one copy for other subcontractors, vendors or suppliers; and
- additional prints distributed as needed (e.g., railroad, utility, local agency).

25.1.4 Checklists

Appendix 25A presents the standardized shop drawing checklists used by NDOT. The bridge designer (and others as appropriate) will complete those checklists applicable to a project. It may be determined, on a project-by-project basis, that other shop drawings are required if so noted in the contract documents.

25.2 CONSTRUCTION FIELD AND SHOP INSPECTIONS

25.2.1 General

The Structures Division has an active and significant role in conducting field and shop inspections for the construction of structural items. The bridge designer has a unique perspective and knowledge of the structure design, and this knowledge can help ensure that construction problems are avoided. Therefore, the Division must make a conscientious effort to participate in the construction of structural elements through attendance at project meetings and periodic site visits.

The NDT Squad performs actual construction quality assurance inspection and approval of fabricated structural steel and precast, prestressed concrete members. Chapter 26 presents a more detailed description of the NDT functions.

25.2.2 Responsibilities

The following briefly describes the responsibilities of the various NDOT units in construction inspections of structural items.

25.2.2.1 Resident Engineer (RE)

The RE is NDOT's field representative on construction projects and is responsible for:

- assessing the compatibility of the design with site conditions;
- administering the construction project in accordance with established policies and procedures;
- monitoring projects to ensure compliance with the plans;
- conducting preconstruction conferences and pre-pour conferences;
- enforcing specifications, controlling inspection and testing and ensuring proper documentation;
- resolving issues and disputes with the contractor; and
- preparing contract change orders.

The RE will notify the Structures Division of any issues related to structural items and will coordinate submittal reviews.

25.2.2.2 Assistant District Engineer – Construction

The Assistant District Engineer – Construction is responsible for:

- managing the overall administration of construction projects in the District;
- evaluating, processing and approving change orders;
- resolving disputes and potential claims;

- coordinating construction activities with other District operations; and
- providing day-to-day supervision of the Resident Engineer.

25.2.2.3 Construction Division

The Construction Division within the Headquarters Office is responsible for:

- assigning, as practical, its available staff to conduct field inspections on major areas of structural construction;
- ensuring that the Assistant District Engineers – Construction conduct periodic field inspections on all major structures;
- processing construction progress payments;
- administering contract compliance;
- providing constructibility reviews;
- coordinating change orders initiated by the various NDOT Divisions; and
- processing and responding to contractor claims.

25.2.2.4 Structures Division

25.2.2.4.1 *Bridge Design Squads*

The Bridge Design Squads are responsible for:

- providing technical assistance to the Resident Engineer on construction issues;
- participating in project meetings as necessary;
- participating in construction field and shop inspections; and
- reviewing and approving shop drawings.

25.2.2.4.2 *NDT Squad*

The NDT Squad provides quality assurance in structural steel and precast, prestressed concrete fabrication shops, and observes field welding, erection, post-tensioning and grouting operations in the field. See Chapter 26 for more information.

25.2.3 Field Coordination

The bridge designer can make an initial field visit prior to the start of construction concurrent with the preconstruction conference. This is an opportunity to meet with the RE and the RE's crew to review the contract documents. In addition and as applicable, the bridge designer typically participates in the following field activities to assist and support the RE during construction:

- attend pre- and post-construction meetings;

- attend pre-pour conferences ahead of planned major concrete pours;
- observe concrete placement on major pours;
- accompany the Materials Division to observe foundation subgrade preparation and foundation construction activities;
- on major structural projects, conduct routine field visits approximately once a month (these may be performed in conjunction with regularly scheduled project meetings);
- for cast-in-place structures supported by falsework, observe the construction operation at some point during falsework placement or before the concrete pour is scheduled; and
- provide support for processing change orders and resolving claims and disputes.

Notify the Resident Engineer of planned visits or any issues or problems observed and follow the appropriate safety procedures.

The NDT Squad, as applicable, typically participates in the following field activities to support the Resident Engineer during construction:

- inspect the placement of precast concrete and structural steel girders (Note: The bridge designer may also be on-site during girder placement);
- inspect stressing and grouting operations (Note: The bridge designer may also assist); and
- inspect the steel and precast concrete fabrication sites to provide a full-time quality assurance presence and continuous audit of the fabricator's procedures. (Note: The bridge designer may visit the fabrication sites to observe plant operations).

See Chapter 26 for more discussion on the NDT Squad participation in construction operations.

25.3 MISCELLANEOUS ISSUES

25.3.1 Construction Change Orders

25.3.1.1 Objectives

During construction operations, construction change orders will occasionally be necessary. At times, the Structures Division is responsible for initiating change orders, and reviewing and approving all change orders related to structural items. The objectives of the Division in its review are to:

- determine its agreement with and acceptance of the change order, and
- calculate and verify the quantities and costs.

25.3.1.2 Procedures

Construction change orders will normally be processed with the following basic procedure:

1. Resident Engineer. The RE will notify the Structures Division of the need to process a change order on a structural item.

2. Structures Division. If in agreement, the Chief Structures Engineer will verbally inform the RE of tentative approval. The Principal Structures Engineer – Design will prepare a memorandum for signature by the Chief Structures Engineer to the Chief Construction Engineer, Construction Division, Headquarters. The memorandum will fully address the justification for the change order and will include plans, details and quantities, as applicable.

3. Construction Division. The Construction Division obtains approval to initiate the change order from the Assistant Director – Operations and then authorizes the RE to prepare the change order.

4. Resident Engineer. The RE prepares the change order. The RE then obtains the signatures of the contractor and the District Engineer. The RE submits both copies of the change order to the Construction Division in Headquarters.

5. Chief Structures Engineer. The Construction Division will submit the change order to the Structures Division. If in agreement with the change order, the Chief Structures Engineer, or the Assistant Structures Engineer – Design, will sign the change order. The change order is then sent to the Construction Division. If the Structures Division does not agree with the change order, the Chief Structures Engineer or the Assistant Chief Structures Engineer – Design will sign the change order as “reviewed” but not “reviewed and approved.” In addition, a memorandum is prepared outlining the reasons for not agreeing with the change order.

6. FHWA. If applicable, the Construction Division provides the FHWA with a copy of the change order for review and concurrence.

7. Construction Division. The Construction Division signs and submits the change order to NDOT’s upper management for signature. After signature, the Construction Division circulates all needed copies, including one to the Structures Division.

25.3.2 Bridge Deck Contour Sheets

Bridge deck contour plan sheets are not provided in the contract documents. However, the contour plots may provide a benefit to the field construction personnel. Therefore, bridge deck contour plots may be provided upon the request of the Resident Engineer.

25.3.3 Value Engineering Proposals

Section 105.18 of the *Standard Specifications* allows contractors to submit Value Engineering (VE) Proposals to NDOT "for modifying the plans, specifications or other requirements of the contract for the purpose of reducing the total cost of construction without reducing design capacity or quality of the finished product." The *Standard Specifications* presents the procedures that a contractor must follow for a VE Proposal, which is processed as a Change Order.

The Construction Division will seek input from the Structures Division for any VE Proposals related to structural items. In general, the bridge designer that reviews the Proposal must recognize that the contract documents represent one solution to accomplishing the project objectives. For a variety of reasons (e.g., equipment, specialized contractor expertise, field conditions), this solution may not be the most economical. In the review of the Proposal, the bridge designer must ensure that the proposed design is at least equal to the functionality, durability and longevity of the design presented in the contract documents.

25.3.4 Plan Revisions

25.3.4.1 Requests for Information

During the advertisement period, prospective bidders may submit Requests for Information (RFIs) to NDOT's Project Manager or Project Coordinator. If related to structural items, these RFIs will be forwarded to the Structures Division for a response. If changes to the contract documents are necessary, the bridge designer must coordinate with the Project Manager or Project Coordinator to initiate a Supplemental Notice. At this stage, post all responses to RFIs on the NDOT website.

During construction, the Resident Engineer and/or Contractor may submit RFIs to the Structures Division seeking clarification on provisions, design details, etc., in the contract documents. The bridge designer will respond to these as needed.

For consultant-designed projects, the Structures Division will coordinate with the consultant to respond to RFIs.

25.3.4.2 Revisions During Construction

NDOT construction personnel must ensure that all design changes, whether related to formal change orders or the practical realities of construction, are documented. The Resident Engineer will produce a set of as-built plans that are transmitted to Central Records for storage. These as-built plans are essential for any future bridge rehabilitation projects and for use in future bridge inspections conducted by the Bridge Inspection Squad.

Appendix 25A

SHOP DRAWING CHECKLISTS

Appendix 25A presents the following checklists for each of the following shop drawings:

- cast-in-place, post-tensioned concrete structures (503);
- structural steel (506);
- precast, prestressed concrete I-girders (503);
- falsework (502);
- stay-in-place forms (502);
- overhang forms (502);
- girder erection (503, 506);
- bearings (high-load, multi-rotational) (502);
- expansion joints (502);
- temporary shoring (206);
- MSE walls (640);
- sign/signal/lighting structures (623); and
- precast, concrete box culverts (502).

The applicable Section of the NDOT *Standard Specifications* is noted in parentheses next to the checklist title. The bridge designer must verify compliance with the shop drawing requirements noted in the *Standard Specifications* and contract Special Provisions.

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

CAST-IN-PLACE, POST-TENSIONED CONCRETE STRUCTURES (503)

Are the following items properly included on the shop drawings for cast-in-place, post-tensioned concrete structures?	**Yes**	**No**	**N/A**
Prestressing Submittal			
1. Drawings.			
a. Prestressing system details.	☐	☐	☐
b. Anchor head.			
i. Anchorage blockout and pour back details.	☐	☐	☐
ii. Necessary local zone reinforcement.	☐	☐	☐
iii. Anchorage set.	☐	☐	☐
c. Standard plan reinforcing and any supplemental reinforcing.	☐	☐	☐
d. Prestressing steel, ducts, tendons and anchorage layout and geometry.	☐	☐	☐
e. Grout vent types and locations.	☐	☐	☐
f. Grout cap details.	☐	☐	☐
g. Stressing location(s) and sequence.	☐	☐	☐
h. Jacking forces.	☐	☐	☐
2. Calculations.			
a. Anchor set losses.	☐	☐	☐

Are the following items properly included on the shop drawings for cast-in-place, post-tensioned concrete structures?	**Yes**	**No**	**N/A**
b. Friction calculations.	☐	☐	☐
c. Bearing stresses at anchorage (if applicable).	☐	☐	☐
d. Elongation.	☐	☐	☐
3. Procedures.			
a. Stressing equipment and procedures.	☐	☐	☐
b. Detensioning procedures.	☐	☐	☐
c. Grouting operations.	☐	☐	☐
4. Certifications.			
a. Anchorage tests and acceptances.	☐	☐	☐
b. Certified grouting technician(s).	☐	☐	☐
Grouting Operations Plan			
1. Equipment information and procedures.	☐	☐	☐
2. Type, quality and brand of materials used.	☐	☐	☐
3. Theoretical grout volumes for each typical duct.	☐	☐	☐
4. Group cap and vent information.			
a. Vent types and locations.	☐	☐	☐
b. Direction of grouting.	☐	☐	☐

Are the following items properly included on the shop drawings for cast-in-place, post-tensioned concrete structures?	**Yes**	**No**	**N/A**
c. Proposed blockouts for vents.	☐	☐	☐
5. Grouting procedures.			
a. Sequence of use of inlets and outlets.	☐	☐	☐
b. Handling blockages.	☐	☐	☐
6. Procedure compliance with specifications.	☐	☐	☐
7. Vertical rise calculations.	☐	☐	☐
8. Cleaning and proofing equipment.	☐	☐	☐
9. Certifications for materials and equipment.	☐	☐	☐

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STRUCTURAL STEEL (506)

Are the following items properly included on the shop drawings for structural steel?	**Yes**	**No**	**N/A**
1. Principal controlling dimensions and materials.			
a. Length of span adjusted to accommodate roadway profile grade.	☐	☐	☐
b. Length, thickness and width of plates in primary members and splices.	☐	☐	☐
c. Primary dimensions and/or weight per length of rolled shapes.	☐	☐	☐
d. Diameter, specification and grade of mechanical fasteners and coating on faying surfaces (if any), if required.	☐	☐	☐
e. Specification, grade and toughness testing requirements for steel components.	☐	☐	☐
f. Size of fillet welds and partial joint penetration welds; appropriate partial and complete joint penetration weld configurations.	☐	☐	☐
2. Web and flange plates of welded members and rolled girder stringers.			
a. Weld designations.	☐	☐	☐
b. Shop butt weld splice locations.	☐	☐	☐
c. Flange and web tapers and haunches (controlling dimensions only).	☐	☐	☐
d. Cover plate dimensions and termination details.	☐	☐	☐
e. Location of tension and compression zones in welded members.	☐	☐	☐
3. Stiffener and connection plates.			

Are the following items properly included on the shop drawings for structural steel?	**Yes**	**No**	**N/A**
a. Width, thickness, material grade, and if toughness testing required.	☐	☐	☐
b. Weld size and termination details and bolting to web and flange details.	☐	☐	☐
c. Appropriate spacing of intermediate stiffeners.	☐	☐	☐
d. Avoiding interference with shop web and flange splice locations.	☐	☐	☐
e. Fit and location of stiffeners.	☐	☐	☐
f. Bolt hole edge distances and compatibility with diaphragm/ cross-frame connections.	☐	☐	☐
4. Bolted splices.			
a. Flange and web splice plate thickness and dimensions.	☐	☐	☐
b. Number, size and spacing of bolts and holes in splice material.	☐	☐	☐
c. Fill plates if necessary.	☐	☐	☐
d. Proper bolt hole edge distances.	☐	☐	☐
5. Cross-frames and diaphragms.			
a. Member dimensions and orientation.	☐	☐	☐
b. Number and spacing of connection plate bolts and types of holes, especially for slip-critical connections or details required for differential deflections.	☐	☐	☐
c. Size, designation and length of welded connections. Proper weld termination details.	☐	☐	☐
6. Camber and/or mid-ordinate for cambered rolled girders or girder sections.	☐	☐	☐
7. Procedures and sequence for shop assembly including handling methods.	☐	☐	☐

Are the following items properly included on the shop drawings for structural steel?	**Yes**	**No**	**N/A**
8. Elevation at center of span or segment, field splice, abutment and pier ordinates on shop assembly diagrams.	☐	☐	☐
9. Number and spacing of bolts in floor girder and cross girder connections and special attachments (brackets, pot bearings, etc.).	☐	☐	☐
10. Necessary provisions for overhang jack assemblies and fall protection systems are depicted.	☐	☐	☐
11. Bearings and Expansion Joints — typically provided as separate submittals (see applicable checklist).	☐	☐	☐
12. Erection plan, showing general layout of structural steel framing and erection equipment. (Note: This is typically a separate submittal; see Girder Erection checklist).	☐	☐	☐
13. General Notes and Detail Sheets relative to cleaning and painting.			
a. Corner preparation (if required for cut edges).	☐	☐	☐
b. Cleaning, required surface preparation and profile depth (if specified).	☐	☐	☐
c. Shop primer: type; manufacturer; wet or dry film thickness; verification of cure before shop application of subsequent coatings; applicable restrictions on field contact (faying) surfaces; any requirements for pre-priming shop contact surfaces before assembly; and designation of any field weld areas to be left unprimed.	☐	☐	☐
d. Field and top coat(s); shop or field; type; manufacturer; wet or dry film thickness; intermediate coat cure times and/or recoating "window" (time) specified by the contract documents or paint manufacturer's data sheet; any blockout areas where shop top coats are not permitted (e.g., field splices, diaphragm/cross-frame connections, bearings, etc.).	☐	☐	☐
14. Designation of material, tension zones, and welds for fracture-critical members (FCMs), including applicable nondestructive testing.	☐	☐	☐
15. Material and material testing.			
a. Material specified in accordance with the contract documents.	☐	☐	☐
b. Proposed material substitutions.	☐	☐	☐
16. Incorporation of all necessary revisions into the Shop Drawings.			

Are the following items properly included on the shop drawings for structural steel?	**Yes**	**No**	**N/A**
a. Errors or discrepancies in the contract plans discovered during Shop Drawing preparation or review.	☐	☐	☐
b. All construction changes that affect the Shop Drawings.	☐	☐	☐
c. Fabricator-proposed modifications approved by NDOT and Contractor.	☐	☐	☐
17. Framing plan details.			
a. Basic span lengths and, where appropriate, transverse girder spacing.	☐	☐	☐
b. Pier and abutment identifications.	☐	☐	☐
c. Orientation of structure (north arrow), skew(s), spot checks of curve or flare geometry, if applicable.	☐	☐	☐
d. Piecemarks indicated for every element, and their relative location is shown to clarify member orientation.	☐	☐	☐
18. Answer or acknowledge all appropriate questions noted on Shop Drawings as “Engineer verify” (does not include “Contractor verify” or “Field verify” queries that must be resolved by others before final Shop Drawing approval).	☐	☐	☐
19. Verification of fabricator certification.	☐	☐	☐
20. Compliance with project-specific requirements that may supersede the requirement of this checklist (such as utility attachments, special connections or connection materials (pins, links, cables), and stage removal and construction).	☐	☐	☐

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PRECAST, PRESTRESSED CONCRETE I-GIRDERS (503)

Are the following items properly included on the shop drawings for precast, prestressed concrete I-girders?	**Yes**	**No**	**N/A**
1. All dimensions including total length of girder adjusted to accommodate roadway profile grade and including 0.0075 in per ft of girder length for elastic shortening.	☐	☐	☐
2. Erection plan, showing general layout of the concrete elements including diaphragm locations (Note: This may be a separate submittal; see Girder Erection checklist).	☐	☐	☐
3. The number and size of all members (completed girders shall be marked with an assigned production number).	☐	☐	☐
4. The number, size and type of prestressing strands, their locations and the forces in these prestressing elements.	☐	☐	☐
5. Girder end details, including size of blockouts at abutments, location and diameter of holes or inserts and embedded bearing plates.	☐	☐	☐
6. Bearing details showing mark number, number required, size, type, materials, including anchor bolts and sole plates (Note: This may be a separate submittal).	☐	☐	☐
7. The location and details of lifting devices and support points if the girder will not rest on its bearings while being stored or transported.	☐	☐	☐
8. The location and type of any inserts required for attachments.	☐	☐	☐
9. The layout of the casting bed to be used for casting the prestressed girders showing the location of hold-down devices for any harped strands.	☐	☐	☐
10. Methods for providing and controlling required girder camber during casting, transport and erection.	☐	☐	☐
11. The location and length of any de-bonded prestressing strands.	☐	☐	☐
12. Jacking forces, number of strands and sequence of harping and detensioning.	☐	☐	☐
13. Tendon path showing straight and harped strands, including deflecting saddles (provide details and required number).	☐	☐	☐
14. The details and type of reinforcing steel, rebar mark number, rebar size, number per girder, total number, length each, total length, total weight, bent rebar, minimum lap for size of bar used and grade of rebar used.	☐	☐	☐

Are the following items properly included on the shop drawings for precast, prestressed concrete I-girders?	**Yes**	**No**	**N/A**
15. All general notes and construction notes presented in the contract plans properly reflected in the shop drawings.	☐	☐	☐
16. Verification of fabricator certification.	☐	☐	☐
17. Girder design and stress calculations (stamped by a Nevada registered civil or structural professional engineer) for proposed modifications to girders to accommodate fabricator's operations.	☐	☐	☐
18. Girder curing methods.	☐	☐	☐
19. Concrete mix design submitted and approved by Materials Division.	☐	☐	☐

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FALSEWORK (502)

Are the following items properly included on the shop drawings for falsework?	**Yes**	**No**	**N/A**
1. General layout including plan and elevation views plus adequate typical sections and special details.	☐	☐	☐
2. Horizontal and vertical clearances; adequate openings for pedestrian and vehicular traffic.	☐	☐	☐
3. Provisions for overheight vehicle protection.	☐	☐	☐
4. Material designation; member sizes and spacing.	☐	☐	☐
5. Concrete placement sequence and construction joint locations.	☐	☐	☐
6. Provisions for grade adjustments and superstructure camber.	☐	☐	☐
7. Determination of nominal soil bearing resistance for wet and dry conditions.	☐	☐	☐
8. Data for proprietary systems or manufactured assemblies (e.g., overhang jacks, metal scaffolding); verify acceptable working loads and deflections.	☐	☐	☐
9. Design calculations (stamped by a Nevada registered civil or structural professional engineer) conforming to contract documents.			
a. Design loads and member stresses.	☐	☐	☐
b. Lost deck formwork.	☐	☐	☐
c. Connections and bracing.	☐	☐	☐
d. Settlements and deflections.	☐	☐	☐
e. Local bending and buckling effects.	☐	☐	☐
f. Mud sills/footings meet soil bearing requirements.	☐	☐	☐

Are the following items properly included on the shop drawings for falsework?	**Yes**	**No**	**N/A**
10. Provision for accessing low-point drains in prestressing ducts.	☐	☐	☐
11. Provisions for metal stay-in-place forms (Note: This may be a separate submittal).	☐	☐	☐
12. Provisions for deck overhang supports/jacks (Note: This may be a separate submittal).	☐	☐	☐
13. Sequence and method for falsework removal.	☐	☐	☐

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STAY-IN-PLACE FORMS (502)

Are the following items properly included on the shop drawings for stay-in-place forms?	**Yes**	**No**	**N/A**
1. General plan layout including structure support locations, girder lines and location of SIP forms; if applicable, clearly designate use of varying SIP form sections throughout the structure (irregular girder spacing).	☐	☐	☐
2. Typical section(s) and dimensions.	☐	☐	☐
3. Deck thickness and minimum concrete cover.	☐	☐	☐
4. Material designations and galvanized coating.	☐	☐	☐
5. Maximum allowable form weight including corrugation fill.	☐	☐	☐
6. Design loading and SIP form capacity data and/or calculations.	☐	☐	☐
7. Design calculations (stamped by a Nevada registered civil or structural professional engineer) conforming to contract documents.	☐	☐	☐
8. Maximum allowable deflection not exceeded.	☐	☐	☐
9. Girder connection details; no welding to structural steel girders.	☐	☐	☐

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

OVERHANG FORMS (502)

Are the following items properly included on the shop drawings for overhang forms?	**Yes**	**No**	**N/A**
1. General plan layout, typical section(s) and dimensions.	☐	☐	☐
2. Material designations; member sizes and spacing.	☐	☐	☐
3. Finishing machine rail support located beyond the perimeter of the bridge deck.	☐	☐	☐
4. Data for proprietary systems or manufactured assemblies; verify acceptable working loads and deflections.	☐	☐	☐
5. Design calculations (stamped by a Nevada registered civil or structural professional engineer) conforming to contract documents.			
a. Design loads, member stresses and allowable deflections.	☐	☐	☐
b. Local girder bending and buckling effects; girder bracing.	☐	☐	☐

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GIRDER ERECTION (503, 506)

Are the following items properly included on the shop drawings for erection?	**Yes**	**No**	**N/A**
1. Span lengths along base line; splice locations; degree/direction of curve and skew.	☐	☐	☐
2. Spacings (beams, diaphragms, cross bracings, anchor bolts).	☐	☐	☐
3. Match marking diagram and weight of each piece identified.	☐	☐	☐
4. General logistics and sequence of girder erection.	☐	☐	☐
5. Erection towers identified and details provided.	☐	☐	☐
6. Girder pick-points identified consistent with girder fabrication drawings; description of pick-up devices (cables, clamps, etc.) and method of protecting girders.	☐	☐	☐
7. Crane location(s); location(s) relative to existing facilities (rail lines, utilities, etc.).	☐	☐	☐
8. Verify crane capacity based on swing and reach requirements.	☐	☐	☐
9. Girder bracing/blocking.	☐	☐	☐
10. Evaluation of existing bridge to support loaded delivery vehicle and/or crane; special structure protection details.	☐	☐	☐
11. Calculations to verify that girders are not overstressed due to erection procedures (pick-up points not consistent with girder fabrication drawings).	☐	☐	☐
12. Verification of erector certification, if required.	☐	☐	☐

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BEARINGS (502)

Are the following items properly included on the shop drawings for bearings?	**Yes**	**No**	**N/A**
1. Location diagram showing the general layout of the structure with the locations and orientation of the bearings.	☐	☐	☐
2. The number, size and types of all bearings.	☐	☐	☐
3. Plan and elevation of bearings showing dimensions, tolerances and fabrication details; details of all components.	☐	☐	☐
4. Bearing fabrication and assembly details; welding details.	☐	☐	☐
5. Material designations and testing requirements are noted.	☐	☐	☐
6. Steel surface preparation and shop coating details.	☐	☐	☐
7. Design calculations conforming to contract documents, if necessary.	☐	☐	☐

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

EXPANSION JOINTS (502)

Are the following items properly included on the shop drawings for expansion joints?	**Yes**	**No**	**N/A**
1. Product is on the Qualified Products List.	☐	☐	☐
2. General layout and dimensions (overall length, skew angle). Orientation of expansion joint components within the joint blockout.	☐	☐	☐
3. The number, size (movement rating) and types of all expansion joints.	☐	☐	☐
4. Plan and elevation views and sections for all components.	☐	☐	☐
5. Material designations for all components; coatings.	☐	☐	☐
6. Installation widths (minimum and maximum) noted including provisions for temperature variations.	☐	☐	☐
7. Manufacturer recommendations for installation methods and procedures. Required attendance of manufacturer's technical representative noted, if applicable.	☐	☐	☐
8. Where applicable, strip seal glands or joint fillers are provided as one continuous piece. Details for method of splicing glands or joint fillers for non-continuous installations.	☐	☐	☐
9. Details for shop and field welding of steel joint components.	☐	☐	☐
10. Supplementary items for modular expansion joints.			
a. AISC certified fabricator.	☐	☐	☐
b. Installation Manual: Installation sequence and procedures, lifting locations and mechanisms, leveling assemblies details, adjustments for temperature changes, temporary and permanent anchorage to bridges, and shipping and storage requirements.	☐	☐	☐
c. Maintenance Manual: Maintenance plan, parts list, parts replacement schedule and inspection instructions.	☐	☐	☐
d. Design calculations and fatigue testing conforming to contract documents.	☐	☐	☐

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

TEMPORARY SHORING (206)

Are the following items properly included on the shop drawings for temporary shoring?	**Yes**	**No**	**N/A**
1. Elevation view showing existing and proposed ground elevations.	☐	☐	☐
2. Plan view showing the beginning and ending stations and alignment.	☐	☐	☐
3. Typical section view showing composition and configuration of the shoring system with dimensions, member sizes, embedment length and height of retained fill.	☐	☐	☐
4. Material designations for all shoring system components.	☐	☐	☐
5. Connection details for various system components including weld details and specifications.	☐	☐	☐
6. Design soil properties including unit weight, coefficients of active and passive pressure, live load surcharge, railroad surcharge (as applicable) and location of groundwater table.	☐	☐	☐
7. Design calculations (stamped by a Nevada registered civil or structural professional engineer) conforming to contract documents.	☐	☐	☐
8. Calculations and details demonstrate conformance to OSHA regulations.	☐	☐	☐
9. Shoring construction sequence.	☐	☐	☐
10. Geotechnical Section review and recommendation for approval.	☐	☐	☐

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

MSE WALLS (640)

Are the following items properly included on the shop drawings for MSE walls?	**Yes**	**No**	**N/A**
1. Product is on the Qualified Products List, QPL remarks are addressed.	☐	☐	☐
2. Plan view indicating beginning and ending stations, offset to front face of wall and stationing for any change in wall alignment.	☐	☐	☐
3. Elevation view indicating beginning and ending stations, elevations at top of leveling pad for each step, panel layout and designation.	☐	☐	☐
4. Typical wall section(s) showing overall height and length of reinforcement.	☐	☐	☐
5. Soil reinforcing layout and limits of MSE backfill.	☐	☐	☐
6. Soil reinforcing corrosion protection.	☐	☐	☐
7. Typical section of wall coping, anchor slab and barrier rail.	☐	☐	☐
8. Typical details.			
a. Wall panel details with sections at top, bottom, left and right sides; details of the vertical and horizontal joints; maximum panel size.	☐	☐	☐
b. Leveling pad including steps.	☐	☐	☐
c. Panel to soil reinforcement connections.	☐	☐	☐
d. Aesthetic treatments.	☐	☐	☐
e. Filter cloth.	☐	☐	☐
9. Material designations for soil reinforcing, concrete embedments and connection hardware.	☐	☐	☐

Are the following items properly included on the shop drawings for MSE walls?	**Yes**	**No**	**N/A**
10. Design calculations (stamped by a Nevada civil or structural professional engineer) conforming to contract documents.			
a External and internal stability design verified (reviewed by geotechnical engineer).	☐	☐	☐
b. Wall panels.	☐	☐	☐
c. Reinforcement bridging frames; reinforcing layout and capacity adjustments to accommodate obstructions.	☐	☐	☐
11. Notes indicating special construction procedures recommended or required by the wall manufacturer.	☐	☐	☐

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

SIGN/SIGNAL/LIGHTING STRUCTURES (623)

Are the following items properly included on the shop drawings for sign/signal/lighting structures?	**Yes**	**No**	**N/A**
1. Plan and elevation views showing structure configuration and orientation to roadway.	☐	☐	☐
2. Minimum vertical clearance.	☐	☐	☐
3. Material designations.	☐	☐	☐
4. Member sizes, dimensions and coatings.	☐	☐	☐
5. Complete fabrication details, connections details, provisions for accommodating structure deflection or providing structure camber.	☐	☐	☐
6. Anchor bolts/assemblies.	☐	☐	☐
7. For deviations from Standard Plans or contract document details or for designated contractor designed installations — Design calculations (stamped by a Nevada registered civil or structural professional engineer) conforming to contract documents.	☐	☐	☐
8. Special installation requirements.	☐	☐	☐

Contract No. _____ Date: _____

Structure No. _____ Reviewer(s): _____

PRECAST, CONCRETE BOX CULVERTS (502)

Are the following items properly included on the shop drawings for precast, concrete box culverts?	**Yes**	**No**	**N/A**
1. Design calculations conforming to *NDOT Standard Specifications*.	☐	☐	☐
2. Concrete box dimensions and height of earth fill.	☐	☐	☐
3. Reinforcing materials, sizes, dimensions, orientation and minimum concrete cover.	☐	☐	☐
4. Concrete 28-day compressive strength and mix design. Identify casting process and sources and mass proportions of all materials.	☐	☐	☐
5. Joint details and materials.	☐	☐	☐
6. Laying schedule with section piece-marks, section lengths, total length, horizontal and vertical alignment, stationing and invert elevations.	☐	☐	☐
7. All general notes and construction notes presented in the contract plans properly reflected in the shop drawings.	☐	☐	☐