

201.1.2.1 PROFILE FOR BRIDGE ALTERNATIVE

G Minimum and required vertical and lateral clearances.

H. Vertical clearance of wildlife path(s), if applicable.

~~H.~~ I. Spans dimensioned as follows:

1. Spans on straight (tangent) alignments: measure from center to center of bearings along the centerline of construction.

2. Spans on curved alignments: measure along the Reference Line.

3. Spans for standard concrete slab bridges: measure from a line 1-ft behind the face of abutment substructure or breastwall.

I. J. Existing and proposed (if known) utility lines running perpendicular to the structure.

201.2.1.1.a PLAN VIEW

F. Treatment of slopes around the ends and under the bridge (location and length of rock channel protection). Location and width of wildlife path(s), if applicable.

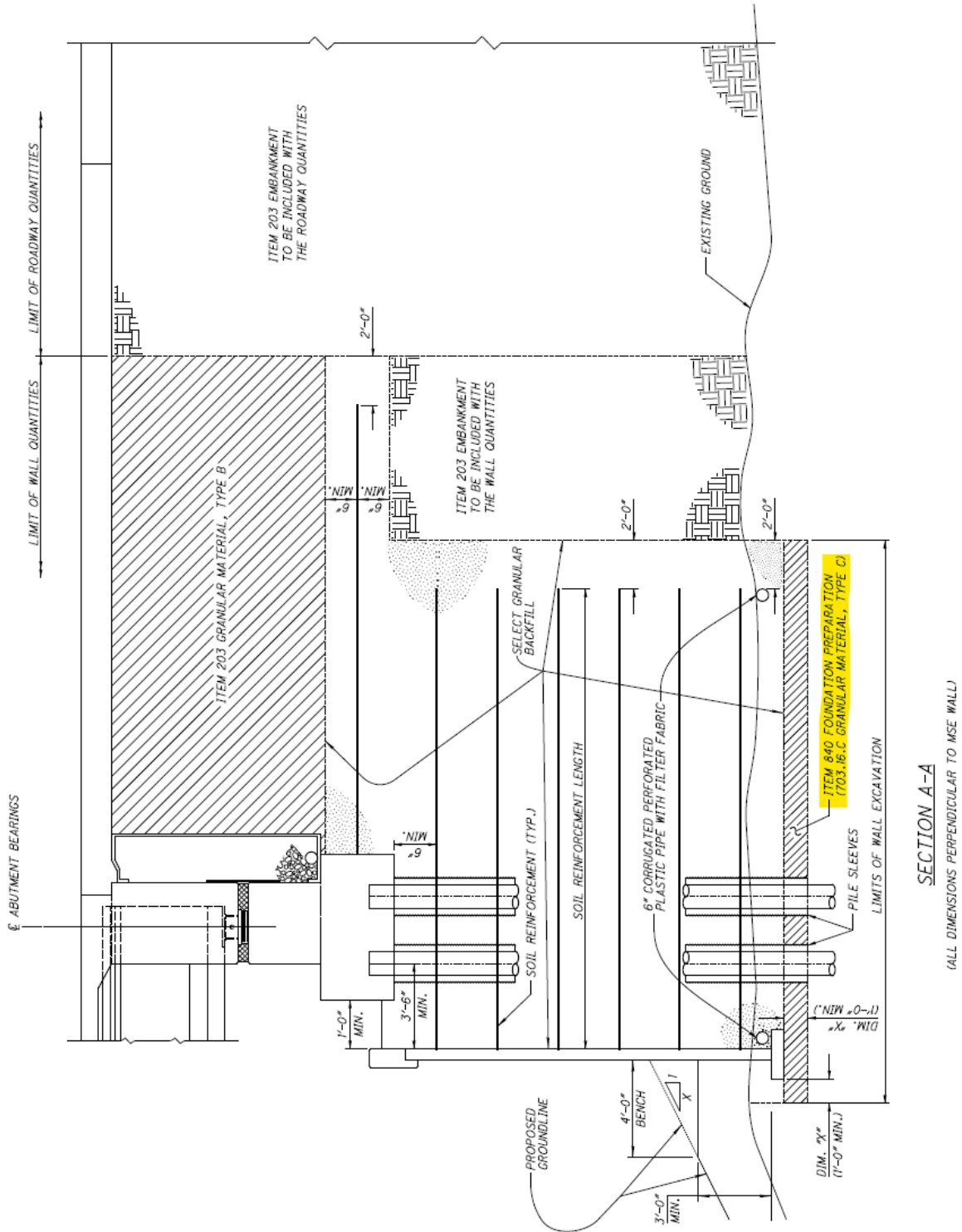


Figure 201-3

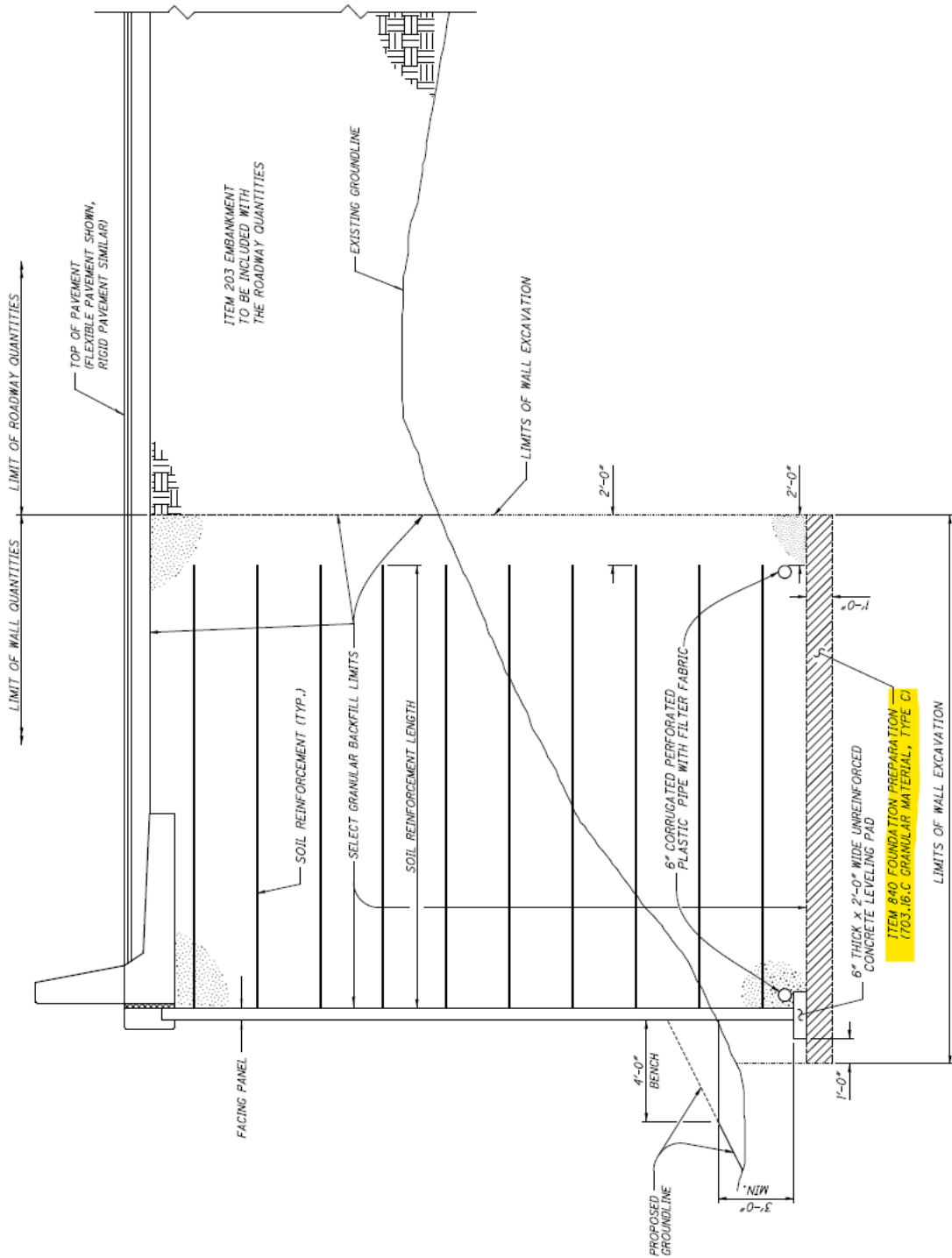
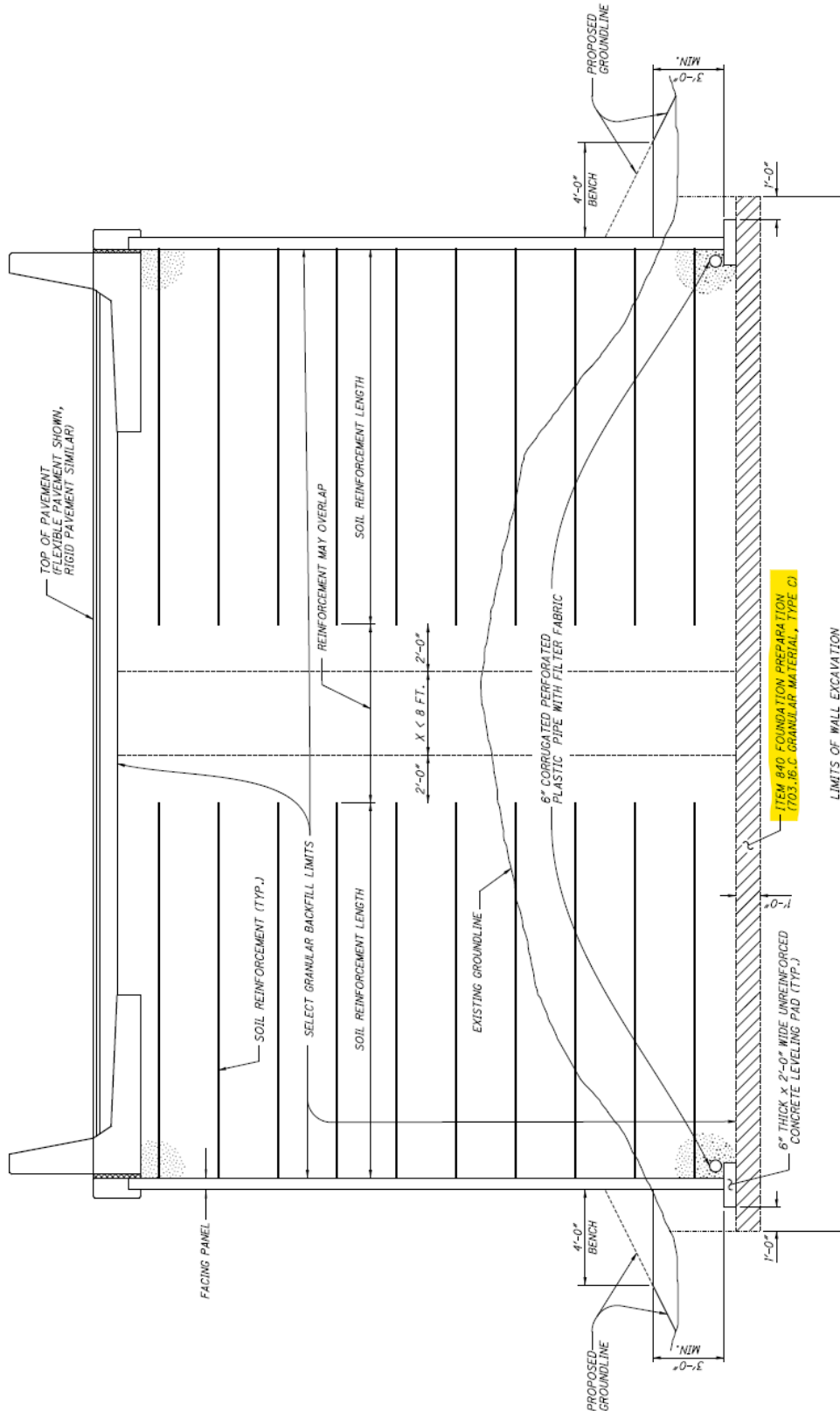
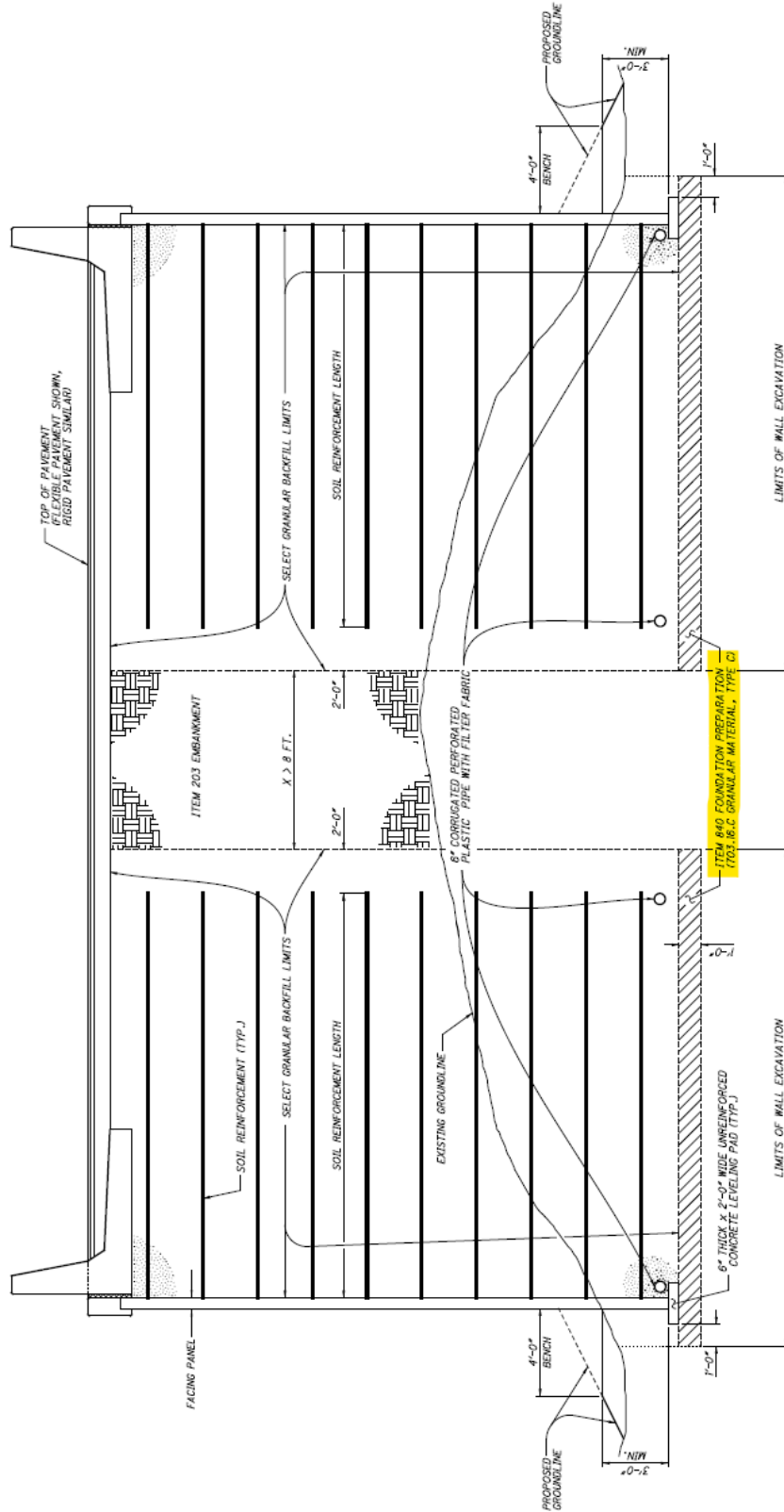


Figure 201-5



IF X IS LESS THAN 8 FT., USE SELECT GRANULAR
BACKFILL MATERIAL BETWEEN SOIL REINFORCEMENT.
SEE ROADWAY PLANS FOR PAVEMENT BUILD UP

Figure 201-6



IF X IS MORE THAN 8 FT., USE ITEM 203 EMBANKMENT
BETWEEN SOIL REINFORCEMENT.
SEE ROADWAY PLANS FOR PAVEMENT BUILD UP

Figure 201-7

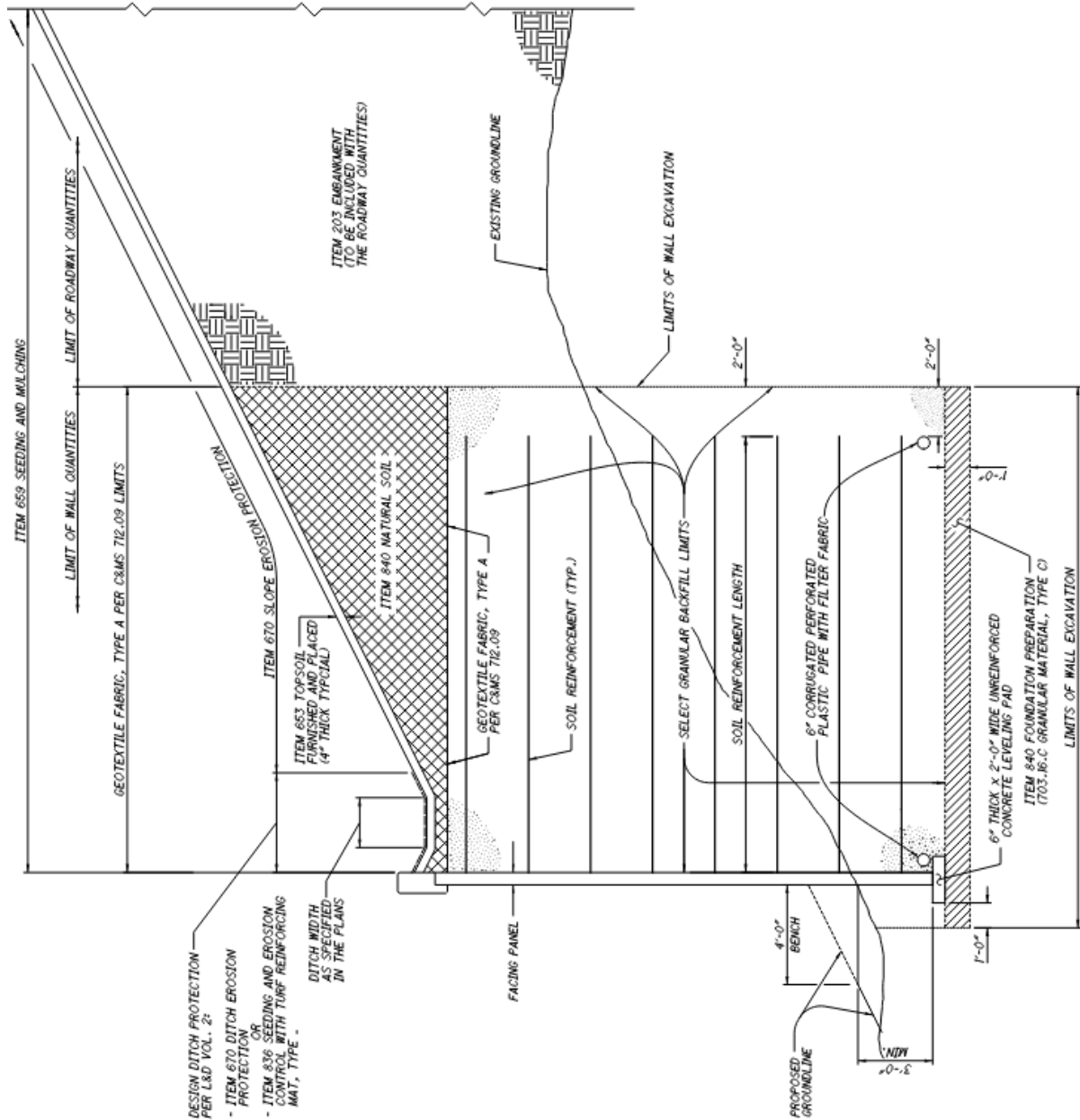


Figure 201-8

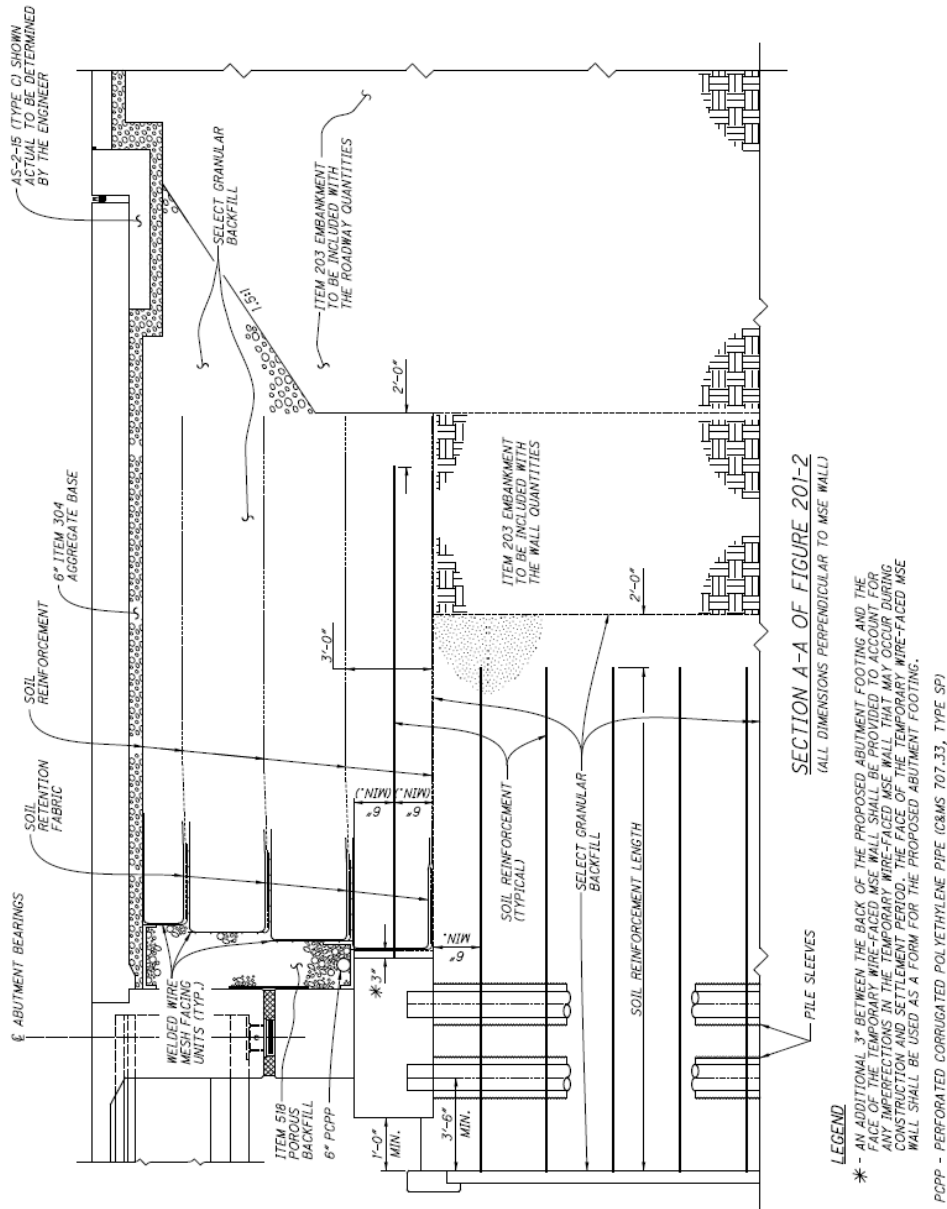


Figure 201-9

305.4.4.1 DRILLED SHAFT SPACING, CLEARANCE, AND EMBEDMENT INTO CAP

Maximize the drilled shaft spacing based on the factored resistance in axial compression, considering redundancy and group effects.

The drilled shaft cap shall be adequately reinforced based on the proposed center-to-center spacing of the drilled shafts. Perform a punching shear analysis of the drilled shaft cap to determine the necessary cap thickness.

The distance from the edge of a drilled shaft cap to the side of a drilled shaft shall be not less than 6-in. Shafts shall be embedded sufficiently into the cap to develop the required structural resistance.

306.2.1.4 EARTH BENCHES & SLOPES

Do not provide a rectangular or trapezoidal shaped bench in the soil as seen in the Plan View in front of the abutment face.

Spill thru slopes shall be 2:1, except where soil analysis or existing slopes dictates flatter slopes. Measure the slope normal to the face of the abutment.

For bridges over waterways where wildlife paths are included in the scope of services, benches & slopes shall be provided as shown in the Standard Bridge Drawing, WU-1-26.

For superelevated bridges over waterways, the intersection of the top of slope with the face of abutment shall be on a level line.

306.2.2.5 INTEGRAL ABUTMENTS

For phased construction projects, do not design an abutment phase to be supported on less than three (3) piles.

~~Detail a closure section in the integral diaphragm between sections of staged construction to allow for dead load rotation of the main beams or girders.~~

For phased construction, see BDM Section 702.4.2 for concrete end diaphragm placement requirements.

C305.4.4.1

For guidance on center-to-center spacing of drilled shafts, refer to LRFD 10.8.1.2.

C306.2.1.4

This makes the structure unnecessarily long. The Department will permit a triangular shaped bench formed where a level top of slope intersects at the nearest face of the abutment

During scoping of the project consider right-of-way limits, wingwall lengths, future maintenance issues, and overall bridge aesthetics and if altering the slope from 2:1 may be beneficial.

Wildlife paths/wildlife underpasses are a low-cost modification that effectively reduces the number of deer-vehicle collisions. Benching for wildlife paths can be installed under new and existing bridges without increasing the length of the bridge. For more information refer to the [ODOT User Guide: A Simple Solution to Reduce Deer-Vehicle Collisions: Wildlife Underpass](#) located on the OES website.

For other superelevated structures the top of slope should generally be made approximately parallel to the bridge seat.

306.2.2.6 SEMI-INTEGRAL ABUTMENTS

For phased construction projects, do not design an abutment phase to be supported on less than three (3) piles or two (2) drilled shafts

~~For phase constructed semi integral designs, detail a closure section in the diaphragm between stages of construction to allow for dead load rotation of the main beams or girders.~~

For phased construction, see BDM Section 702.4.2 for concrete end diaphragm placement requirements.

308.2.2.1.b STEEL FABRICATION QUALIFICATION

Specify the required steel fabricator classification in the pay item for the structural steel.

C308.2.2.1.b

The Department's requirements for steel fabricators are defined in C&MS 513 and S1078. Steel fabricators are classified according to their capabilities into eight levels (1 thru 6, SF & UF). Levels 1 thru 6 require certification according to the American Institute of Steel Construction (AISC). No AISC certification is required for Levels SF and UF.

The AISC categories of certification are listed here for information:

~~A. AISC Category Sbr – Fabricators qualified for single span rolled beam bridges~~ Simple (SBR) – Qualified for unspliced rolled sections.

~~B. AISC Category Mbr – Fabricators qualified for all other bridge structures~~ Intermediate (IBR) – Qualified for typical bridges that do not require extraordinary measures

AISC Category Advanced (ABR) – Qualified for bridges requiring an additional standard of care in fabrication or erection.

~~C. AISC has also established a P and F endorsement for fabricators:~~

~~1. P – Painting of steel structures endorsement~~

~~2. F – Fracture Critical endorsement~~

AISC has also established three optional endorsement categories for Complex Coatings (CCE), as well as an optional Fracture Control Endorsement (FCE).

**308.2.2.3.b FRACTURE CRITICAL
NONREDUNDANT STEEL TENSION
MEMBERS**

C308.2.2.1.b

This section is not intended to recommend ~~fracture critical~~ **NSTM** designs. The designer should make all efforts to not develop a structure design that requires fracture critical members.

Structures with fracture critical details require a concurrent detail design review to be performed by the Office of Structural Engineering.

If a bridge design includes members or their components that are **nonredundant or** fracture critical, clearly identify those members and components as ~~FRACTURE CRITICAL MEMBERS (FCM)~~ **NONREDUNDANT STEEL TENSION MEMBERS (NSTM)** in the plans. Designate fracture critical welds as ~~FCM~~ **NSTM** in the plans. Include the detail note provided in BDM Section 702.16 that references the appropriate sections of the AASHTO/AWS Bridge Welding Code.

~~Fracture critical~~ **nonredundant steel tension** members are defined in Section 2, Definitions, of the AASHTO/AWS D1.5, Chapter 12 Fracture Control Plan.

If a girder is non-redundant, include the entire girder in the pay quantity for ITEM 513 - STRUCTURAL STEEL MEMBERS, LEVEL 6. Designate the tension and compression zones in the ~~fracture critical~~ **nonredundant steel tension** members.

308.2.3.3 BOX BEAMS

C308.2.3.3

Do not use 36-in wide box beams for full bridge replacements.

36-in wide box beams may be used for replacing in-kind beams on existing bridges. **Due to current fabrication practice, 36-in wide box beams are typically less economical to use than 48-in wide box beams.**

Beam section details, section properties, and reinforcing for 36" wide box beams are provided in the PSBDD-3 design data sheet. Mixing 48" wide box beams with 36" wide box beams in the same span is not permitted unless replacing in-kind.

309.1 WEARING SURFACE TYPES

2. Apply two applications of ITEM 407 – TACK COAT - one prior to placement of the first lift of surface course and one prior to placement of the second lift of surface course. Refer to the ~~ODOT Pavement Design Manual, Section 400~~ **C&MS Table 407.06-1** for application rates.

309.3.1 DECK THICKNESS

For reinforced concrete decks on steel or concrete longitudinal members, compute the deck thickness with the following formula:

$$T_{\min} (\text{inches}) = (S + 17)(12) \div 36 \geq 8.5\text{-in}$$

Where S is the effective span length in feet determined according to **LRFD 9.7.2.3**.

Round up T_{\min} to the nearest 1/4-in.

The 1-in monolithic wearing surface, BDM Section 309.1A, is included in the minimum concrete deck thickness but excluded in the calculations for structural design of the deck slab.

310.2 APPROACH SLABS

Provide approach slabs for all ODOT bridges.

The approach slab width shall extend to the back side of the concrete sidewalk, barrier, and curb.

310.4 UTILITIES

C310.4

~~For approval procedures for installation of utilities on bridges, please refer to ODOT's Utilities Manual.~~

Reference the Real Estate Manual for the permitting process for accommodating utilities within the right-of-way. See section 8108 for additional information for utility installations on highway bridges.

310.5.2 LETTERING AND LOGO POLICY ON ODOT FACILITIES

The criteria for permitting lettering and logos on Bridges and Noise Walls are as follows:

A. City, village, township, or county names and ~~City~~ logos are acceptable provided the bridge or noise wall is within the territorial jurisdiction of that ~~City~~ administrative division.

B. ~~County~~ Names and ~~County~~ logos that promote tourism are acceptable provided the bridge or noise wall is within a 5 mile radius of the destination or area being promoted. ~~territorial jurisdiction of that County.~~

C. Street names and Path names are acceptable provided the bridge carries that public street or public path. Private street names or private path names are not permissible.

D. Obtain FHWA acceptance, if necessary.

E. Lettering or logos shall not extend above the top of bridge railing or fence. Lettering or logos shall not extend below the normal lines of the bridge superstructure.

F. Lettering or logos on bridge substructure units shall be within the normal limits of those units. Do not add extraneous elements for the sole purpose of displaying lettering or logos.

G. Lettering or logos shall follow all applicable design and placement guidelines listed in the [L&D, Vol. 1 Section 904.2.1.](#)

G.H. Provide 5 copies of rendering(s) of the proposal with the request.

The local agency requesting the lettering or logo may be required to fund the additional cost over what ODOT would normally install on the bridge or noise wall.

A. ODOT traditionally uses standard concrete form liners on bridges and noise walls. If the lettering or logo will require additional or custom concrete form liners, the cost over a standard concrete form liner may be required to be secured/funded by the local agency.

B. ODOT traditionally places vandal protection fencing on bridges. If the lettering or logo will require non-standard fence or supports, the cost over the standard fence may be required to be secured/funded by the local agency.

310.9 MAINTENANCE AND INSPECTION ACCESS

C310.9

Maintenance and inspection access requirements should be included in the Structure Type Study, Narrative of Bridge Alternatives. For multiple span bridges with 8-ft or deeper girders, an inspection handrail located on the girders should be provided. Catwalks should also be considered. Safety cables and other fall arrest systems should be considered in addition to handrails and catwalks. Provisions for maintenance and inspection access should be provided for ~~fracture-critical~~ ~~NSTM~~ girders, cross girders and bents that cannot be inspected from a snooper. The use of ~~fracture critical~~ nonredundant steel tension members is strongly

discouraged. For these types of structures, consult the Office of Structural Engineering for details and recommendations. ~~Additional information is provided in “FHWA Guidelines for Providing Access to Bridges for Inspections”, dated November 1985.~~

312.3.1.1 LOADS & LOAD COMBINATIONS

If bridge members were fabricated using the AASHTO/AWS D1.5 FCP use the load factors presented in BDM Table 312-1.

Table 312-1: Bridge Members Fabricated using AASHTO/AWS D1.5 FCP

Load Combination	γ_{DC}	γ_{DW}	γ_{LL}	DA_R	IM
Redundancy I	1.05	1.05	0.85	0.40	0.00
Redundancy II	1.05	1.05	1.30	0.00	0.15

If bridge members were not fabricated using the AASHTO/AWS D1.5 FCP use the load factors presented in BDM Table 312-2.

Table 312-2: Bridge Members Not Fabricated using AASHTO/AWS D1.5 FCP

Load Combination	γ_{DC}	γ_{DW}	γ_{LL}	DA_R	IM
Redundancy I	1.15	1.25	1.00	0.40	0.00
Redundancy II	1.15	1.25	1.50	0.00	0.15

403.5.3 CLOSURE POUR

Do not provide a closure pour between adjacent phases of deck placement on an existing superstructure where cross-frames or diaphragms remain fully connected between all phases.

For phased deck replacements that include integral and or semi-integral diaphragms, ~~see east against the diaphragms from the in preceding phases, the concrete in the diaphragm shall remain plastic during placement of the deck concrete in the adjacent span. Use either plan note [702.4.27 3 2] or [702.4.2 4] in BDM Section 702.4.2 for concrete end diaphragm placement requirements.~~

404.1.2 FATIGUE

404.1.2.1 GENERAL

C404.1.2.1

Repair or retrofit the detail if cracks are detected.

Retrofit all E or and E' details on ~~fracture critical~~ **nonredundant steel tension** members.

404.1.8 HEAT STRAIGHTENING

C404.1.8

Do not heat straighten ~~fracture critical~~ **nonredundant steel tension** members.

Provide details showing the location of all repairs and include Item 513 pay items for repair of damaged members

404.6 SEMI-INTEGRAL ABUTMENT CONVERSIONS

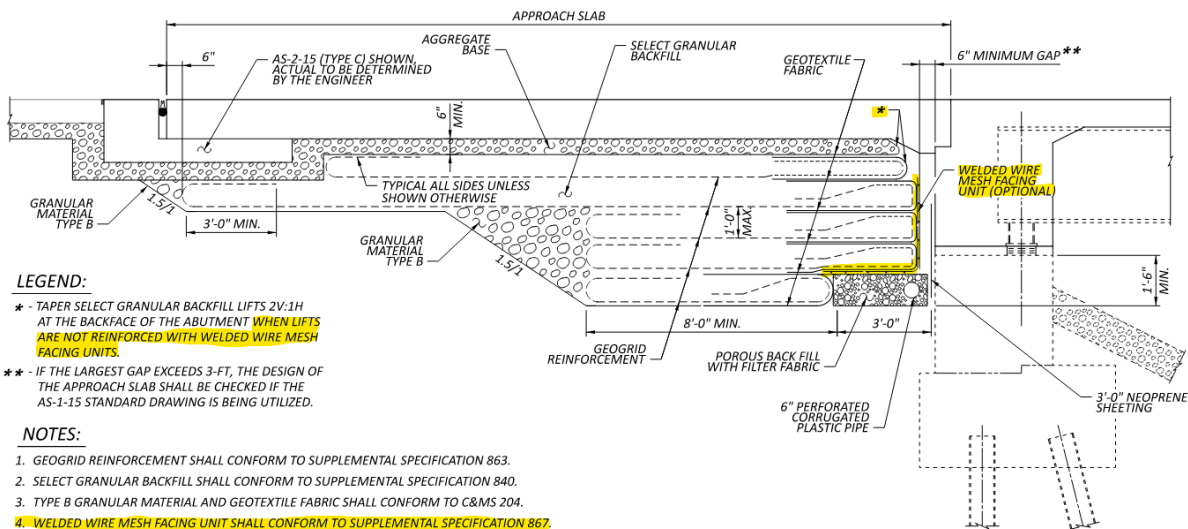


Figure 404-6

405.15 BRIDGE SCOUR

For all bridges over waterways ~~to be rehabilitated,~~ perform a Scour Appraisal in accordance with the ODOT Manual of Bridge Inspection, Section 3.4.3.7 Assessment.

~~The Owner may want to perform a Scour Assessment for projects not meeting BDM Section 405.15.3.B prior to finalizing the Scope of Services. If this work is included in the Scope of Services for the Design Agency to perform, there is the potential for scope creep to occur.~~

For bridges carrying ODOT's Priority System (SNBI Item B.H.01.01 – Code P) and located within a Federal Aid project limits, include all work necessary to eliminate scour criticality as part of the project.

~~An assessment checklist is available in Appendix I of the ODOT Manual of Bridge Inspection.~~

405.15.1 SCOUR DEFINITIONS

Scour Analysis – The process required to determine an estimated depth of scour for the design and check flood events. This process includes geotechnical exploration, topographic and hydrographic survey, hydraulic modelling, and scour computations.

Scour Appraisal – The risk-based and data-driven determination of a bridge's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated through a Scour Evaluation or a Scour Assessment.

Scour Assessment – An activity performed by competent individuals to identify, locate, measure and document Observed Scour by inspecting existing conditions and comparing to past conditions. AssetWise form entitled "SNBI Scour Appraisal" represents an acceptable Scour Assessment. ~~An assessment checklist is available in Appendix I of the ODOT Manual of Bridge Inspection.~~

Scour Countermeasures – Material, devices, or structures designed to prevent, slow, or stop the occurrence of scour.

Scour Critical – A bridge condition that indicates structural instability is possible due to any future scouring action of a waterway. This condition can be illustrated by analysis when: (1) The calculated scour depth is lower than the foundation elevation; (2) Observed Scour produces a foundation capacity-to-demand ratio less than 1.0. (3) ~~This condition also exists~~ When the foundation for a bridge over or adjacent to a waterway is unknown.

Scour Evaluation – An interdisciplinary team approach involving hydraulic, structural, and geotechnical expertise to determine the scour vulnerability of an existing or proposed structure over a waterway. A Scour Evaluation includes a Scour Assessment, Scour Analysis and resulting structural evaluation.

Scour Plan of Action – Documented monitoring plan for known and potential Scour Critical deficiencies. A Scour POA template can be found in the ODOT Manual of Bridge Inspection, Appendix H. ~~Refer to Appendix H of the ODOT Manual of Bridge Inspection for a template.~~

405.15.3 SCOUR EVALUATION

C405.15.3

Perform a Scour Evaluation for the following:

A₁. Structures with Observed Scour as noted in BDM Section 405.15.2.A

~~B₁. All rehabilitated bridges over waterways that require a hydraulic analysis in accordance with L&D Volume 2, Section 1005.1.~~

~~Refer to L&D Volume 2, Section 1005.1.3 for project types that do not require hydraulic analysis.~~

~~C₁. B₁. All bridges carrying ODOT's Priority System (SNBI Item B.H.01.01 - Code P) and located within a Federal Aid project limits, with a SNBI Item B.AP.03 - Code C, D, E or U, with unknown foundations that have not previously received a Scour Evaluation.~~

~~D₁. Other bridges and structures as noted in the Scope~~

The Scour Evaluation process is defined as follows:

M₂. Develop plans for Scour Countermeasures. Include the Design Flood and Check Flood scour elevations in the General Notes.

This part of the process shall involve expertise from hydraulic, structural and geotechnical engineering for final consideration of Scour Countermeasures.

For bridges with unknown foundations, the Design and Check Flood scour elevations shall both be equal to the bottom of footing elevation. Skip to Step P. Otherwise, the Observed Scour elevation shall be provided as the Design Flood elevation in the Plans. Skip to Step ~~Q~~R.

~~P₂. Prepare a Scour Plan of Action~~

~~Continue to Step Q.~~

~~Q₂ P₂. Implement Scour Countermeasures and structural upgrades as necessary.~~

Continue to Step R.

702.16 FRACTURE CRITICAL NSTM FABRICATION NOTE

For structures that contain fracture critical components and members, place the following note in the design plans.

[702.16-1]

FCM NSTM: All items designated **FCM NSTM** (, including____)* are **Fracture Critical Nonredundant Steel Tension** Members and Components and shall be furnished and fabricated according to the requirements of Section 12 of the AASHTO/AWS Bridge Welding Code D1.5.

* - Include this additional wording if there exists **nonredundant or** fracture critical components such as welds, attachments, etc. that are not easily or clearly identified in the plan details. Write descriptions of such components as specific as necessary to prevent any possible confusion during fabrication.

801 INTRODUCTION

When noise barriers are necessary, the Office of Environmental Services will furnish the required noise barrier height, length and location(s).

Include the detail design for noise barriers in the Stage 2 Detailed Design Review Submission.

C801

Design specifications for ground mounted precast concrete noise barrier walls are provided in Standard Bridge Drawing NBS-1-09. Associated designer notes are provided in Design Data Sheet NBSDD-1-09. The Department ~~occasionally~~ permits the use of noise barrier walls consisting of material types other than precast concrete. These wall types are pre-approved according to the requirements of the Department's Standard Procedure 27-005(SP) for new products and this Manual. Alternate noise barrier material types currently approved include: metal; fiberglass; brick or masonry; acrylic; and PVC. A complete listing of approved noise barrier suppliers for material types other than precast concrete are provided in the ~~BDM Table 801-1 and BDM Table 801-2~~ **ODOT Noise Analysis Manual**.

Delete tables 801-1 & 801-2