OHIO DEPARTMENT OF TRANSPORTATION

CENTRAL OFFICE, 1980 W. BROAD ST., COLUMBUS, OHIO 43216-0899

July 19, 2013

To: Users of the Bridge Design Manual

From: Tim Keller, Administrator, Office of Structural Engineering

By: Sean Meddles, Assistant Administrator, Office of Structural Engineering

Re: 2013 Third Quarter Revisions

Revisions have been made to the ODOT Bridge Design Manual, January 2004. These revisions shall be implemented on all Department projects begin Stage 2 plan development date after July 19, 2013. Implementation of some or all of these revisions for projects further along the development process should be considered on a project-by-project basis.

This package contains the revised pages. The revised pages have been designed to replace the corresponding pages in the book and are numbered accordingly. Revisions, additions, and deletions are marked in the revised pages by the use of one vertical line in the right margin. The header of the revised pages is dated accordingly.

To keep your Manual correct and up-to-date, please replace the appropriate pages in the book with the pages in this package.

To ensure proper printing, make sure your printer is set to print in the 2-sided mode.

The January 2004 edition of the Bridge Design Manual may be downloaded at no cost using the following link:

http://www.dot.state.oh.us/Divisions/HighwayOps/Structures/standard/Pages/default.aspx

Attached is a brief description of each revision.

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Summary of Revisions to the July 2004 ODOT BDM

BDM Section	Affected Pages	Revision Description
303.4.2.5	3-73	This change reflects the Department's consolidation of geotechnical expertise into the Office of Geotechnical Engineering.
304.2	3-84 through 3-85	These changes reflect the Department's release of updated and new Standard Bridge Drawings for concrete barriers.
306.2.3	3-93	This change resulted from the Department's release of a new supplemental specification for Polymer Modified Asphalt Expansion Joints which replaced the Office of Structural Engineering Plan Insert Sheet for the same product.
606.2	6-19	This change to note [30c] reflects the Department's consolidation of geotechnical expertise into the Office of Geotechnical Engineering.
606.6	6-20	This change to note [34] permits the note to be used with either the 2010 or 2013 C&MS.
606.7.1	6-21	This change to note [34A] reflects the Department's consolidation of geotechnical expertise into the Office of Geotechnical Engineering.
610.3	6-25 through 6-26	Note [44] has been revised to eliminate double P.E. stamps on level UF field fabrication shop drawings.
611.5	6-32	Note [54] has been retired with the release of updated and new Standard Bridge Drawings for concrete barriers.

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The results of both the static and dynamic testing shall be forwarded to the Office of Geotechnical Engineering to the attention of the Foundations Engineer. Refer to Section 600 for a General Note to include in the plans.

303.4.2.6 PILES, DYNAMIC LOAD TEST

The Department now requires dynamic load testing to establish the driving criteria (i.e. blow count) for all piling not driven to refusal on bedrock. The dynamic testing and resulting wave analysis has replaced the Engineering News Record Formula, used in previous issues of the CMS.

For an individual structure, the Designer shall specify one dynamic load testing item for each pile size. If multiple pile capacities are required for a given pile size, the Designer shall specify one testing item for each Ultimate Bearing Value. When static load tests are required, provide two dynamic load testing items and two restrike items for each static load test item.

The driving criteria for battered piles will be determined in the field as a function of a dynamically tested vertical pile of the same Ultimate Bearing Value. When battered piles are specified, refer to Section 600 for a General Note to include in the plans.

One dynamic load testing item consists of testing a minimum of 2 piles and performing a CAPWAP analysis on one of the two piles. One restrike item consists of performing dynamic testing on two piles and performing a CAPWAP analysis on one of the two piles.

303.4.2.7 PILE FOUNDATION – DESIGN EXAMPLE

The following example for a 6-span bridge shall be used as a guide for specifying pile testing and estimated quantities for pile foundations.

Rear Abutment ~
30 - 12" C.I.P. Reinforced Concrete Piles
20 piles installed vertical & 10 piles battered
Ultimate Bearing Value = 76 ton
Estimated Length = 65 ft
Order Length = 70 ft (Total Length = 2100 ft)

Requires 1 dynamic load-testing item.

Piers 1, 2, 3, & 4 ~
80 - 14" C.I.P. Reinforced Concrete Piles at each pier
56 piles installed vertical & 24 piles battered
Ultimate Bearing Value = 125 ton

Estimated Length = 70 ft
Order Length = 75 ft (Total Length = 24,000 ft)

The total length (24,000 ft) requires 1 static load test item and 1 subsequent static load test. Each static load test requires 2 dynamic load testing items and 2 restrike items.

Pier 5 ~
52 - 14" C.I.P. Reinforced Concrete Piles
36 piles installed vertical & 16 piles battered
Ultimate Bearing Value = 135 ton
Estimated Length = 85 ft
Order Length = 90 ft (Total Length = 4680 ft)

The difference in Ultimate Bearing Value between piers 1, 2, 3 & 4 and pier 5 requires 1 dynamic testing item.

Forward Abutment ~
30 - 12" C.I.P. Reinforced Concrete Piles
20 piles installed vertical & 10 piles battered
Ultimate Bearing Value = 76 ton
Estimated Length = 75 ft
Order Length = 80 ft (Total Length = 2400 ft)

No additional dynamic load testing items are required.

For this example, the Designer should include notes **[30]**, **[30c]** and **[30d]** from Section 606.2 in the General Notes. Note **[30]** should be modified as follows:

PILE DESIGN LOADS (ULTIMATE BEARING VALUE): The Ultimate Bearing Value is 76 ton per pile for the rear and forward abutment piles. The Ultimate Bearing Value is 125 ton per pile for Pier 1, 2, 3, and 4 piles and 135 ton per pile for Pier 5 piles.

Abutment Piles:
30 piles 70 ft long, order length (Rear)
30 piles 80 ft long, order length (Forward)
1 dynamic load testing item

Pier 1, 2, 3, and 4 Piles:
320 piles 75 ft long, order length
1 static load test item
1 subsequent static load test item
4 dynamic load-testing items
4 restrike items

Modifications to the ODOT standard railing types or other NCHRP 350 or MASH approved railing system should be avoided. Additional structural steel tubing added to satisfy pedestrian concerns does not require additional crash testing provided these elements do not protrude nearer to the roadway than the rail elements on the tested design and they do not present any type of snagging potential to an impacting vehicle. If an accepted crash tested railing system is modified, the face geometry (i.e. offset, rail height, spacing, etc.) shall match the tested design and the static strength and deflections shall remain at least equal to the tested design. Include with the preliminary design submission to the Office of Structural Engineering, strength and deflection calculations to support these modifications. The calculations shall follow the procedure defined in the AASHTO LRFD Bridge Design Specifications, 2nd Edition, Sections A13.1-3. The intent of any modification shall be to maintain the original NCHRP 350 or MASH acceptability level.

All railing elements fabricated with ASTM A500 steel tubing shall specify a drop-weight tear test per CMS 707.10. Provisions shall be made at tube splices for expansion and contraction. Steel railing systems shall also allow for structural movement at expansion joints without adversely affecting the system's level of acceptability.

Aesthetically pleasing railing systems have been successfully crash tested but are for use only where TL-2 acceptability requirements are allowed. These systems include the Texas Classic Traffic Railing, Type T411 with open windows, a smooth stone masonry barrier with reinforced concrete core wall and an artificial stone precast concrete barrier. Detailed information regarding the latter two systems may be found in FHWA Report No. FHWA-RD-90-087 "Guardrail Testing Program: Final Report", June 1990 and FHWA Report No. FHWA-SA-91-051 "Summary Report on Selected Aesthetic Bridge Rails and Guardrails", June 1992.

The recommended railing design for bridges with combination vehicular and pedestrian traffic is detailed in Standard Bridge Drawing BR-2-98. Other designs are allowed as previously mentioned above, provided the following requirements are met:

A. The curb height shall be 8".
B. The sidewalk width shall be 5'-0" or greater.

A pedestrian railing may be used in lieu of a crash tested barrier at the deck edge provided a crash tested barrier system meeting the minimum requirements for the specific location is used to separate the vehicular and pedestrian traffic. Pedestrian railing shall be designed in accordance with AASHTO.

304.2 STANDARD RAILING TYPES

Drawing No.	Description	NCHRP Level
BR-1-13	36" New Jersey Shape Concrete Bridge Railing	TL-4
	42" New Jersey Shape Concrete Bridge Railing	TL-5
BR-2-98	Bridge Sidewalk Railing with Concrete Parapet	TL-4
DBR-2-73	Deep Beam Bridge Guardrail	TL-2
DBR-3-11	Deep Beam Bridge Retrofit Railing	TL-3
PCB-91	Portable Concrete Barrier (Fully Anchored)	TL-4
	Portable Concrete Barrier (Unanchored)	TL-3
SBR-1-13	42" Single Slope Concrete Bridge Railing	TL-5
SBR-2-13	57” Single Slope Concrete Median (Unreinforced)	TL-3
	57” Single Slope Concrete Median (Fully Reinforced)	TL-5
TBR-91	Thrie Beam Bridge Railing (Retrofit)	TL-4
TST-1-99	Twin Steel Tube Bridge Railing	TL-4

304.3 WHEN TO USE

304.3.1 PARAPET TYPE (BR-1-13, SBR-1-13 & SBR-2-13)

The department currently has three (3) standard concrete parapet type bridge railing systems for use at deck edges: a 36" New Jersey shape, a 42" New Jersey shape and a 42" single slope shape. These systems are for use on roadway and railroad overpass structures with no sidewalks and structures where the finished deck surface is 25-ft or more above the ground line or water surface. Details for these parapet types, including end transitions to terminal assemblies, are provided in the Standard Bridge Drawings. The transition section may be placed on a structure’s turned back wingwalls, widened approach slab or directly on the actual structure.

The 36" barrier section is for use on structures located on two (2) lane routes with an ADTT in one direction less than 2500.

The 42" barrier sections are for use on structures located on interstates, divided highways of four

(4) lanes or more, and two (2) lane routes with an ADTT in one direction of 2500 or more. Final decision of which section to use rests with the districts and should be finalized during the preliminary structural design review. The single slope barrier section is unaffected by the placement of future overlays, but weighs 23% more than the 42" New Jersey type parapet.

A Standard Bridge Drawing detailing a 57" single slope median barrier is available for use on structures where protection against oncoming headlight glare is required.

For each of the above listed barrier types, designers are required to confirm the structural adequacy of the concrete deck slab as described in the "Concrete Deck Design" Section 302.2 of this manual.

For all concrete parapet type barriers including the 14'-0" transition, the project plans shall include the following information: plan views, elevation views, cross-sections, deflection joint spacing, deflection joint details, reinforcing marks, reinforcing bending diagrams and reinforcing weights. Reference in the plans to the Standard Bridge Drawings shall be made for historical purposes only.

304.3.2 DEEP BEAM BRIDGE GUARDRAIL (DBR-2-73)

This railing configuration does not meet the Department's minimum NCHRP 350 or MASH acceptance criteria (i.e. TL-3) for use on any project described in Section 304.1 of this manual. In no case, shall this railing system be used on an overpass structure or a project where the finished deck surface is greater than 25 feet above the normal water surface elevation or final ground line.

When a structure is included in a project, as defined in Section 304.1 of this manual, existing Deep Beam Bridge railing shall be upgraded in accordance with Standard Bridge Drawing, DBR-3-11.

The standard configuration for this rail type does not meet the minimum requirements specified by AASHTO for pedestrian and bicycle railings and shall not be used where pedestrian or bicycle traffic is expected. A modified railing design meeting these requirements and using the Type 1 post design may be justified.

Use of Type A anchors, as detailed on the Standard Bridge Drawing, is not recommended. The Type B alternative is recommended because they are easier to install in a deck or box beam and easier to replace if damaged in a collision.

Designers should recognize that variable post lengths may be required along the length of a

structure due to beam camber. A design data sheet is available from the Office of Structural Engineering to address these concerns.

304.3.3 TWIN STEL TUBE BRIDGE RAILING (TST-1-99)

This railing configuration was developed as a replacement to the Deep Beam Bridge Guardrail system on projects requiring a higher NCHRP acceptance level. The Twin Steel Tube Bridge Railing is for use over rural stream crossings on two (2) lane routes with an ADTT in one direction less than 2500 where the finished deck surface is less than 25 feet above the normal water surface elevation or final ground line. This system shall not be used on an overpass structure.

The standard configuration for this rail type does not meet the minimum requirements specified by AASHTO for pedestrian and bicycle railings and shall not be used where pedestrian or bicycle traffic is expected. A modified railing design meeting these requirements may be justified.

The required bridge terminal assembly section used to transition from Type 5 or 5A approach roadway guardrail to the bridge railing is detailed on Standard Construction Drawing GR-3.6.

The typical post spacing is 6'-3". The standard drawing enables the designer to reduce the first, last and one additional post spacing per span on each side of the bridge to account for construction clearances. The designer should carefully review the position of the posts that are near the corner of a structure for possible interference with wingwalls, tie rods, etc. For box beam bridge types, post spacing dimensions shall be referenced to each box beam end.

The site plan shall show the station of the center of the first inlet-mounted post on each corner of the bridge.

304.3.4 BRIDGE RETRO-FIT RAILING, THRIE BEAM BRIDGE RAILING FOR BRIDGES WITH SAFETY CURBS (TBR-1-11)

Thrie beam railing, as described on Standard Bridge Drawing TBR-1-11, is for use as a provisional upgrade on structures with safety curb and parapets where a safety upgrade is required under Section 304.1, and the structure will be rehabilitated or replaced in the near future.

The Office of Structural Engineering does not generally recommend this alternative because of the potential for high maintenance costs. A more suitable alternative is concrete refacing of existing safety curb and parapets to either a New Jersey or Single Slope shape. See Section 400 of this Manual for additional information on refacing of safety curb and parapets.

304.3.5 PORTABLE CONCRETE BARRIER (PCB-91)

This system is for use on construction projects to protect project personnel and to provide a

Sidewalk details for standard expansion devices (strip seals) are shown on the standards. For non-standard devices, a curb plate and sidewalk cover plate will be required. The Curb and sidewalk plates should be separated at the interface of the sidewalk and curb. See details on Standard Bride Drawings: EXJ-2-81, EXJ-3-82, EXJ-4-87, EXJ-5-93 and EXJ-6-95 for sidewalk plates.

306.1.3 EXPANSION DEVICES WITH STAGE CONSTRUCTION

On projects involving stage construction, joints in the seal armor must be located and shown in the plans. At the stage construction lines, expansion devices should require complete penetration welded butt joints. If butt welds will be in contact with a sealing gland the butt-welded joint shall be ground flush at the contact area.

306.2 EXPANSION DEVICE TYPES

306.2.1 ABUTMENT JOINTS IN BITUMINOUS CONCRETE, BOX BEAM BRIDGES

This poured joint seal system is capable of small expansion movements, up to 3/16" [5 mm]. A plan insert sheet, Abutment Joints in Bituminous Concrete Box Beam Bridges, is available through the Office of Structural Engineering's web page. This device requires three bid items: Item Special - Sawing and Sealing Bituminous Concrete Joints; Item 516 - Joint Sealer, As Per Plan; and Item 516 - 1" Preformed Expansion Joint Filler.

306.2.2 ABUTMENT JOINTS AS PER AS-1-81

A group of no or small movement joints used for sealing and rotational purposes are detailed on Standard Bridge Drawing, AS-1-81.

306.2.3 EXPANSION JOINTS USING POLYMER MODIFIED ASPHALT BINDER

This device is for use on structures with concrete or asphalt overlays and where total expected movement is 0 to 1½". The Department has a Supplemental Specification for the Polymer Modified Asphalt Expansion Joint System.

Thickness of the polymer-modified joint shall be between 2" and 5". The design plans shall show a plan view and cross-section of each polymer modified asphalt expansion joint location on the bridge. The plan view shall provide the station of the joint centerline at the centerline of construction, skew angle and dimension its length as measured along the centerline of the joint. The cross-section shall dimension the width and thickness of the joint, width of the expansion gap and other significant joint details.

306.2.4 STRIP SEAL EXPANSION DEVICES

The seal size is limited to a 5" [125 mm] maximum. Unpainted A588[M] weathering steel should not be used in the manufacture of this type expansion device as A588[M] does not perform well in the atmospheric conditions an expansion device is subjected to. Standard Bridge Drawings, EXJ-4-87, EXJ-5-93 and EXJ-6-95, are available. The designer must ensure that all details are covered in the plans because the standard drawing is not inclusive for all structure types.

The strip seal shall be of one piece across the total width of the structure. No splices will be acceptable.

306.2.5 COMPRESSION SEAL EXPANSION DEVICES

Maximum allowable seal size is 4" [100 mm]. A 5" [125 mm] wide seal shall not be used since installation problems have been encountered. Compression seal expansion devices are limited to structures with a maximum skew of 15 degrees. Movement should be limited so that the seal is not compressed greater than 60 percent or less than 20 percent.

The compression seal shall be of one piece across the total width of the structure. No splices will be acceptable. Standard Bridge Drawings EXJ-2-81 & EXJ-3-82 give generally used details.

306.2.6 STEEL SLIDING PLATE ENDDAMS, RETIRED STANDARD DRAWING SD-1-69

In general steel sliding plate enddams are not recommended for new structures. This expansion device is limited to total movement of 4" [100 mm], including movement in both directions.

Sliding plates should be configured to prevent binding and bearing when the superstructure is supported on elastomeric bearings.

Unpainted A588[M]/A709[M] Grade 50W materials are not recommended for construction of this type of joint.

306.2.7 MODULAR EXPANSION DEVICES

Modular expansion devices may be required for structures when total required movements exceed movement capacity of a strip or compression seal. Consult the Office of Structural Engineering for recommendations prior to completion of the project plans.

Modular devices main load bearing beams, support beams and welds shall be designed for fatigue.

for the remaining piling represented by the testing. Submit all test results to the Office of Geotechnical Engineering.

For subsequent static load tests, upon completion of a 10,000 ft [3000 m] increment of driven length, repeat the above procedure for the initial static load test. If necessary, the Engineer will revise the driving criteria for the remaining piling accordingly.

When performing the restrike, if the pile has not reached the blow count determined for the plan specified Ultimate Bearing Value, continue driving the pile until this capacity is achieved.

Provide the following note when battered piles are specified.

[30d] Note retired – see appendix

606.3 STEEL PILE POINTS

[31] Note retired - see appendix

606.4 PILE SPLICES

Provide the following note when H-piles are specified.

[100] PILE SPLICES: In lieu of using the full penetration butt welds specified in CMS 507.09 to splice steel H-piles, the Contractor may use a manufactured H-pile splicer. Furnish splicers from the following manufacturer:

Associated Pile and Fitting Corporation

8 Wood Hollow Rd. Plaza 1

Parsippany, New Jersey 07054

Install and weld the splicer to the pile sections in accordance with the manufacturer's written assembly procedure supplied to the Engineer before the welding is performed.

606.5 MINIMUM HAMMER SIZE

[33] Note retired - see appendix

606.6 PILE ENCASEMENT

The following note shall be used where capped pile piers and steel "H" piles are being used for a bridge structure crossing a waterway. The exposed steel piling corrodes at the waterline, or near there. The note should not be used if the capped pile pier standard drawing is being used as standard drawing already specifies pile encasement methods.

[34] ITEM SPECIAL - PILE ENCASEMENT

Encase all steel H-piles for the capped pile piers in concrete conforming to C&MS 511 (F′c = 4.0 ksi). Provide a concrete slump between 6 to 8 inches with the use of a superplasticizer. Place the concrete within a form that consists of polyethylene pipe (707.33), or PVC pipe (707.42). The encasement shall extend from 3 feet [1 meter] below the finished ground surface up to the concrete pier cap. Position pipe so that at least 3 inches [75 mm] of concrete cover is provided around the exterior of the pile.

In lieu of encasing the pile in concrete, galvanize the piles according to 711.02. The galvanizing shall be continuous from a minimum of 3 feet below the finish ground surface up to the concrete pier cap. The galvanized coating thickness shall be a minimum of 4 mils [100 μm]. Repair all gouges, scrapes, scratches or other surface imperfections caused by the handling or the driving of the pile to the satisfaction of the Engineer.

The Department will measure pile encasement by the number of feet. The Department will determine the sum as the length measured along the axis of each pile from the

bottom of the encasement to the bottom of the pier cap. The Department will not pay for galvanizing provided beyond the project requirements. The Department will pay for accepted quantities at the contract price for Item – Special, Pile Encasement.

606.7 FOUNDATION BEARING PRESSURE

Provide the following note, with the blanks filled in as appropriate for each individual project, if there are abutments or piers which are supported by spread footings. Show the actual calculated maximum bearing pressure under the footing.

[35] FOUNDATION BEARING PRESSURE: _____ footings, as designed, produce a maximum bearing pressure of _____ tons per square foot [Mpa]. The allowable bearing

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pressure is _____ tons per square foot [MPa].

606.7.1 SPREAD FOOTINGS NOT ON BEDROCK

When abutments or piers are supported by spread footings, include the following note to require that reference monuments be constructed in each footing. The purpose of the reference monuments is to document the performance of the spread footings, both short and long term.

[35A] ITEM 511, CLASS __*__ CONCRETE, __*__ , AS PER PLAN : * In addition to the requirements of Item 511*, install a reference monument at each end of each spread footing. The reference monument shall consist of a #8, or larger, epoxy coated rebar embedded at least 6" [150 mm] into the footing and extended vertically 4 to 6 inches [100 to 150 mm] above the top of the footing. Install a six inch [150 mm] diameter, schedule 40, plastic pipe around the reference monument. Center the pipe on the reference monument and place the pipe vertical with its top at the finished grade. The pipe shall have a removable, schedule 40, plastic cap. Permanently attach the bottom of the pipe to the top of the footing.

Establish a benchmark to determine the elevations of the reference monuments at various monitoring periods throughout the length of the construction project. The benchmark shall be the same throughout the project and shall be independent of all structures.

Record the elevation of each reference monument at each monitoring period shown in the table below.

The original completed tables will become part of the District's project plan records.

Project Number:	Maximum Bearing Pressure: *	
Bridge Number: *	Structure File Number: *	
Benchmark Location:		
Footing Location: *		
Monitoring Period	Left monument	Right monument
After footing concrete is placed		
Before placement of superstructure members		
Before deck placement		
After deck placement		
Project completion		

* The Designer shall modify items marked with an asterisk to describe the class of concrete, pier and/or abutment location, bridge number, SFN, maximum bearing

pressure and to correctly describe the "As Per Plan" bid item.

606.8 FOOTINGS

Provide the following note if the footing excavation is mainly bedrock and the footings are to be at an elevation no higher than plan elevation:

[36] FOOTINGS: Place footings in bedrock at the elevation shown.

Provide the following note where footings are to be founded in bedrock at an elevation no higher than plan elevation.

[37] FOOTINGS shall extend a minimum of 3 inches [75 mm]* into bedrock or to the elevation shown, whichever is lower.

Provide the following note where footings are to be founded in bedrock, and where the encountering of bedrock at an elevation considerably above plan elevation may make it desirable to raise the footing to an elevation not above the specified maximum in order to effect an appreciable saving:

[38] FOOTINGS shall extend a minimum of 3 inches [75 mm]* into bedrock. If necessary due to poor bedrock material, the footings should be lowered. If the low point of the bedrock surface occurs 2 feet [0.6 meters] or more above plan elevation, the final footing elevations may be raised, upon approval by the Director, but to an elevation not higher than __**__ feet [meters]. Stepping of individual footings will not be permitted unless shown on the plans.

* Shall be greater than 3 inches [75 mm] if required by design considerations.

** The maximum elevation allowed should assure that minimum soil cover over the footing is obtained; clearance from the superstructure to the finished ground elevation meets standards; quality of bedrock material at that elevation is adequate; and minimum embedment into the bedrock material will not be adversely affected.

606.9 DRILLED SHAFTS

Use the following drilled shaft notes when applicable for the specific project. Revise the note for the project conditions and the different drilled shaft designs, if any, on the project.

[38a] DRILLED SHAFTS
The design load to be supported by each drilled shaft is ___*___ tons [kN] at the abutments and ___*___ tons [kN] at the piers. This load is resisted by shaft adhesion within a portion of the bedrock socket and also by shaft end bearing. The allowable

* Delete the reference to 513.04 if structural steel is not involved.

610.2 REINFORCING STEEL REPLACEMENT

Place the following note in the plans where the preserved existing reinforcing steel which projects from the existing structure after partial removal is to be lapped with new reinforcing steel.

[43] ITEM 509 REINFORCING STEEL, REPLACEMENT OF EXISTING REINFORCING STEEL, AS PER PLAN: Replace all existing reinforcing bars deemed by the Engineer to be unusable because of corrosion. The Department will measure the replacement reinforcing steel by the number of pounds accepted in place.

Replace all existing reinforcing steel bars which are to be incorporated into the new work and are deemed by the Engineer to be made unusable by concrete removal operations with new epoxy coated reinforcing steel of the same size at no cost to the Department.

NOTE TO DESIGNER: Include a bid item as defined above with a specific weight of reinforcing steel.

On rehabilitation plans where new reinforcing steel may require field bending and cutting, use the following note. Clearly designate in the plans the bar marks to which this note applies.

[43a] ITEM 509 - EPOXY COATED REINFORCING STEEL, AS PER PLAN: In addition to the provisions of item 509, field bend and/or field cut the reinforcing steel designated in the plans, as necessary, in order to maintain the required clearances and bar spacings. Repair all damage to the epoxy coating, as a result of this work, according to 709.00.

610.3 REHABILITATION – STRUCTURAL STEEL

Use the following note on bridge rehabilitation projects where repair or replacement of members not designed to carry tension live loads (i.e. cross frames, bearing plates, etc.) consist of materials readily available from a structural warehouse (i.e. angles, channels, bars, etc.) and must be field fabricated to dimensions obtained in the field after contract letting. The recommended bid item quantity for rehabilitation work is in pounds [kilograms] rather than Lump Sum. The Designer should adequately define all steel members to be included in this pay item.

[44] ITEM 513 - STRUCTURAL STEEL MEMBERS, LEVEL UF, AS PER PLAN: All requirements of 513 apply to shop fabricated members. Perform work for field-fabricated members according to Item 513, except as modified herein. The Department will not require the contractor performing field fabrication to be pre-qualified as specified in Supplement 1078. Submit a written letter of material acceptance in accordance with

501.06, to the Engineer. Provide the Engineer "as-built" drawings according to 513.06, except 501.04 does not apply. Upon receipt of the Engineer's acceptance, supply a copy of the drawings, according to Supplement 1002, to the Office of Material Management for record purposes.

The following members are included in this item: _____ , _____ and _____ .

[44a] Note retired - see appendix

610.4 REFURBISHED BEARINGS

When the following note is used, a separate plan note and pay quantity for jacking or temporary support of the superstructure is required. Revise this note, as appropriate, to describe the work for the type of bearing being refurbished.

[45] ITEM 516 - REFURBISHING BEARING DEVICES, AS PER PLAN: This item shall include all work necessary to properly align bridge bearings as well as their cleaning and painting. Included shall be the disassembly of the bearings, hand tool cleaning (grinding if necessary), painting according to Item 514, replacement of any damaged sheet lead with preformed bearing pads (711.21), installation of any necessary steel shims of the same size as the bearings to provide a snug fit, realignment of the upper bearing plate by removing existing welds and rewelding so that the bearings are vertically aligned at 60º F [15º C], lubricating sliding surfaces, and reassembly of the bearings. Assure all bearings are shimmed adequately and that no beams and/or bearing devices are "floating". At no additional cost to the State, the Contractor may install new bearings of the same type as the existing in place of refurbishing the bearings. All work shall be to the satisfaction of the Engineer. Payment for all of the above described labor and materials will be made at the contract price bid for Item 516 - Refurbish Bearing Devices, As Per Plan.

610.5 JACKING BRIDGE SUPERSTRUCTURES

Use the following note, modified as necessary, where jacking and/or temporary support of the existing superstructure is required. Modifications to this note are often not being performed by the designers. Use of this not without a review of the project may add un-necessary requirements to the jacking process or, in reverse, not be restrictive enough. Designers are again cautioned to appropriately review this note before incorporation into a set of plans.

[46] ITEM 516, JACKING AND TEMPORARY SUPPORT OF SUPERSTRUCTURE, AS PER PLAN:

This work consists of raising or re-positioning existing structures to the

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611.3 INTEGRAL AND SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEALS

[51] Note Retired - See Appendix

611.4 BACKWALL DRAINAGE

[52] Note Retired - See Appendix

[53] Note Retired - See Appendix

611.5 CONCRETE PARAPET SAWCUT JOINTS

[54] Note Retired - See Appendix

611.6 BEARING PAD SHIMS, PRESTRESSED

Add the following note to ensure proper seating of prestressed concrete box beams for skewed bridges.

[55] BEARING PAD SHIMS: Place 1/8" [3 mm] thick preformed bearing pad shims, plan area ___ inches by ___ inches, under the elastomeric bearing pads where required for