ATTACHMENT 61 – ANSWERS TO STANDARD SET OF QUESTIONS BY THE VIRGINIA DOT

(65 pages)

Virginia DOT

June 24, 2008

Italics represent the responses by the Virginia DOT.

1. What was your procedure in reviewing consultant engineering bridge plans in the early 1960's? What is your procedure in reviewing consultant engineering bridge plans today?

In the early 1960's, most of the bridge projects that were outsourced to consultants were the very large, complex or specialty type projects. They were awarded to consultants because the VDOT did not have the staff or the expertise to complete them in-house. For the most part, the projects were contracted exclusively as bridge only projects and they did not include any other technical services such as roadway design. Typically, all of the projects outsourced were Lump Sum contracts. Consultants were selected based on a workload matrix database that was maintained in the Division. The database included a listing of qualified structural engineering consultant firms. The Bridge Division consisted of several Sections, one of which was devoted to consultant plan review and contract administration. The engineers in the consultant section managed the contract and reviewed the milestone plan submissions. The plans were submitted at the Preliminary Plan stage, as well as at the 60%, 90% and 100% stages of final development. The review plans were marked up with review comments and returned to the consultant so that the drawings could be modified if warranted.

Today, there are a wide range of typical bridge projects, as well as routine rehabilitation designs and safety inspection contracts that are being outsourced to consultant forces. In most cases, the projects are being advertised for multi-disciplinary services (roadway design, bridge design, geotechnical exploration, hydraulic and hydrologic analyses, survey, materials testing, etc.) In addition to project specific contracts, limited services term contracts are also being awarded to consultants. These limited services term contracts include traditional VDOT staff work such as development of maintenance and repair plans, typical new bridge design and safety inspections. In addition, it also includes specialty design services that may be required for tunnels, movable bridges and underwater inspections. As additional ancillary structures such as luminaries, overhead signs and traffic signals were added to the structural inventory; more structural inspections were outsourced to consultants to supplement VDOT's forces. The project specific awards are mainly cost-plus-fixed fee contracts, while the limited services term contracts normally employ fixed billable rates for payment. Beginning in the early 1980's, VDOT began to advertise for consultant services and made awards based on Qualifications Based Selection criteria in accordance with the Federal Brooks Act. The plan review process is similar to the policy that was followed in the 1960's. The engineers in the District Structure and Bridge Sections normally provide the initial reviews for the rehabilitation projects, as well as for deck slab or superstructure replacement projects. In addition to the District reviews performed on those projects, the final plan submittals for these projects are also reviewed by one of the Assistant State

Structure and Bridge Engineers before the plans are released to the Construction Division for advertisement. New bridges or bridge replacements that are designed by consultants are normally reviewed by the Structure and Bridge Staff in the VDOT Central Office. Similar to the plans in the 1960's, they are reviewed at various milestone stages; normally at the Preliminary Bridge Plan Stage, and the 60%, 90% and 100% stages of the final plan development. The consultants either submit the plan sheets or submit the electronic files to the Department. The plans are reviewed at each stage for general concept, structural integrity and plan clarity. Comments are developed by S & B staff and those remarks are submitted to the consultant for corrections. The 100% plans undergo an additional review by one of the Assistant State Structure and Bridge Engineers before the plans are approved for construction. In addition, constructability reviews are conducted at each of the Current Engineering Milestones.

2. How do you ensure the QA/QC process of a consultant engineering firm is adequate? In the early 1960's and today? What procedures are in-place to ensure that the consultant does not submit an inadequate design?

During the 1960's, the plans were reviewed by senior level engineers. The engineers performing the reviews had a great deal of practical bridge design experience based on the volume of road and bridge projects that they developed in the 1950's and 1960's. The basis for most of the design and plan review was from the bridge engineer's past experience.

Today, the Consultant Coordinators assigned to outsourced projects are also made up of Senior Engineers or Supervisors. Each of these Coordinators have years of design experience before they are assigned to a consultant contract. To aid the reviewers, the Structure and Bridge Division has developed a comprehensive checklist that relates to each type of plan sheet that may be included in a normal set of drawings. The checklist, which is also provided to the consultant, serves as an aid that helps ensure that key elements of design and plans are not omitted. The Division also maintains a Structure and Bridge Design Manual that consists of typical details and standard drawings that are used by both in-house and consultant designers. During the plan reviews, the VDOT engineers who review the plans make sure that the consultant's drawings make maximum use of the standard details. The actual structural shapes and sizes shown on the design plans are reviewed using a "magnitude of scale" approach. If there are questions raised concerning the structural design, the reviewer requires that the consultant confirm the calculations.

3. What does the Virginia DOT consider a red-flag item when reviewing consultant engineering bridge plans? What follow-up action is taken to address the red-flag item? Describe the level of detail the Virginia DOT uses in reviewing consultant engineering bridge plans?

The VDOT Consultant Coordinators review the plans and concentrate on two major areas: design deficiencies that could create safety issues and plan errors or ambiguities that could result in construction delays or claims. Any questions that VDOT has with consultant plans in either of those areas are marked on the review plans. Depending on the seriousness and the magnitude of the comments, the consultant is either sent the marked up review plans or a separate transmittal letter is developed that describes the items noted. If warranted, a face-to-face meeting is arranged with the consultant. In addition to the plan submittal reviews, a constructability review, a biddibility review and a pre-advertisement conference is conducted before the project is advertised. After the construction contract is awarded, a Pre-Construction Meeting is held. This allows the Department the opportunity to respond to any questions that the contractor may have concerning the contract drawings before the construction begins.

4. Does the Virginia DOT review consultant engineering bridge plans concurrently with the FHWA Division Office? Does the Virginia DOT review the consultant plans with the expectation that FHWA will be performing a similar type of review?

The Department coordinates and manages Federal Aid projects in accordance with the terms in the annual VDOT-FHWA Virginia Division 2005 SAFETEA-LU Program Efficiency Agreement dated May 2007.

In May 1995, FHWA approved VDOT's "Guidelines for the Procurement & Management of Professional Services" whereby VDOT no longer had to secure FHWA approval for individual consultant agreements on non-exempt projects. The FHWA office approves any changes to the Procurement & Management of Professional Services and projects are handled in accordance with the procurement procedures.

For most typical bridge projects, the VDOT Structure and Bridge Division reviews the structural drawings independently of the FHWA review. On complex projects or projects that are on an accelerated schedule, VDOT sometimes arranges for concurrent review meetings with the FHWA Bridge Engineer. In all cases, VDOT reviews the plans in a thorough manner assuming that no other agencies will provide a review.

5. What are the qualifications of the Virginia DOT personnel who conduct the review of consultant engineering bridge plans?

The Structure and Bridge Division assigns senior level Professional Engineers to coordinate and review consultant plans. Most of the engineers assigned to perform the QA reviews began their careers as design engineers and possess a great deal of experience in performing structural design. A few of the engineers providing this service worked for consultants before coming to VDOT. We also try to provide the QA engineers opportunities to attend technical conferences and workshops to ensure that they remain familiar with the latest technical advances and also with projects being developed for other Dots'.

6. What is the percentage of bridge design work that is done in-house versus the percentage that is done by consultant engineering firms?

In the 1960's and 1970's, the majority of the bridge designs being performed in Virginia, were provided by the VDOT Bridge staff, both in the Central Office and in the Districts. The projects that were outsourced to consultants were mainly the large projects that would provide a hardship to VDOT's manpower resources if designed in-house, or were complex or specialty projects in which VDOT staff did not have the expertise required. Today, VDOT outsources not only the complex projects, but also typical stream crossings and routine grade separation structures. As the staff of the VDOT organization becomes smaller, more work is being advertised for consultant design. The volume of work that the Department outsources fluctuates depending on the bridge program. It can range from about 30% of the workload to about 70% of the workload. The VDOT staff can accommodate the design and plan development of a modest workload. As the bridge program increases to a higher level, the additional work is outsourced to the private sector.

7. Describe the structure of the Virginia DOT? Is the bridge office centrally organized? How many district bridge offices are located in the state? Are consultant engineering bridge plans reviewed at the central office or district bridge office?

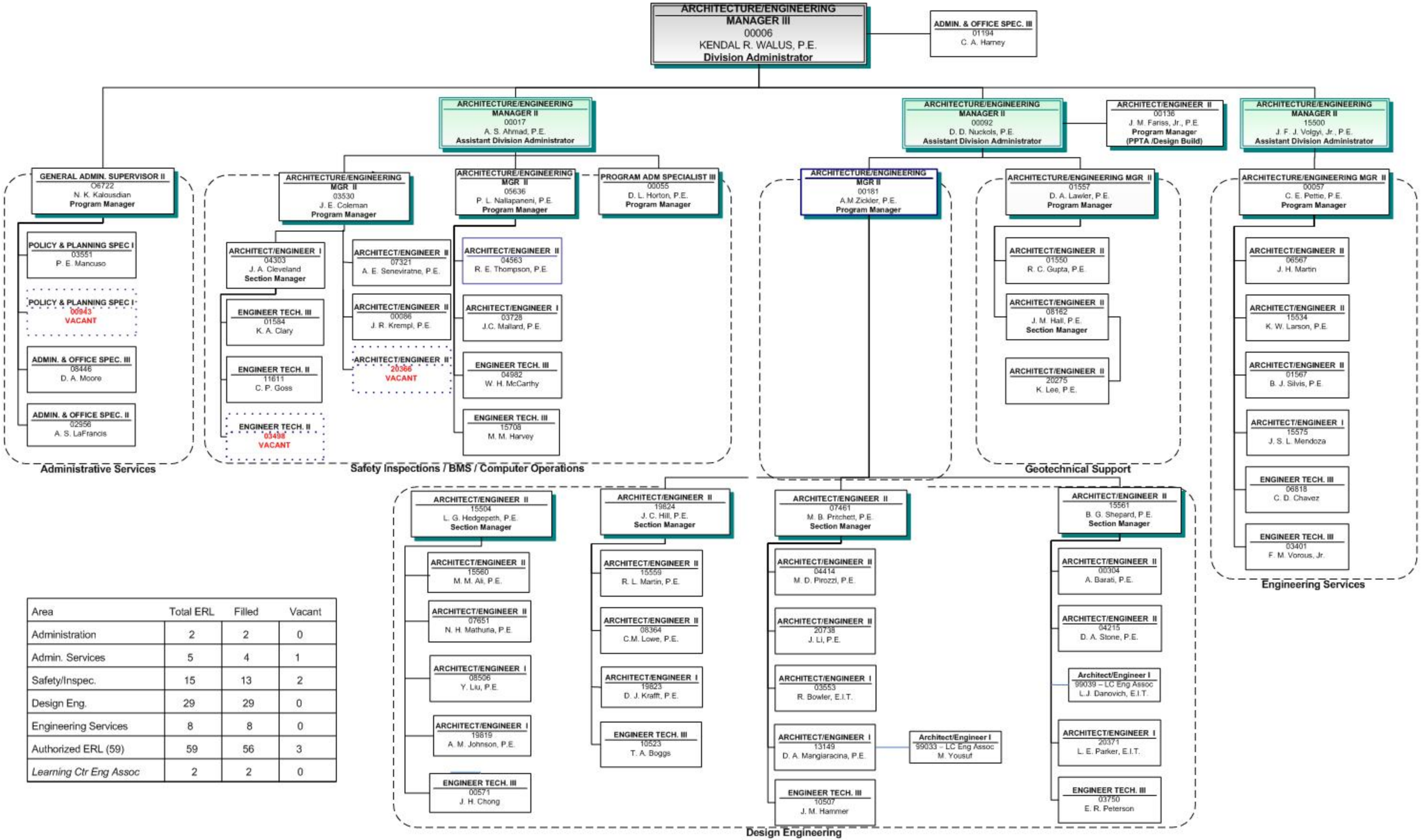
An organization chart for VDOT and the Structure and Bridge Division is shown in Attachment A.

The Structure and Bridge design functional area is organized as a Division in the VDOT Central Office, and as a Section in each of the nine (9) District Offices. The Central Office is responsible for providing direction, developing policies, performing design and providing Quality Control. The Central Office staff provides design services for bridges on the Interstate system and the Primary system the Central Office staff also provides assistance to the District Sections for the bridges on the Secondary system where the Districts cannot handle them. The Chief Engineer has mandated that all consultant contracts be procured and managed out of the Central Office.

The Structure and Bridge Sections in each of the Districts are responsible for providing NBIS safety inspections for the structures in the Districts, providing rehabilitation design for bridges in the Districts, and performing new and replacement designs for structures on the Secondary system. The Districts coordinate and direct the work of consultants on projects related to the maintenance, repair and widening of existing structures.

VDOT STRUCTURE AND BRIDGE DIVISION

June 10, 2008



Area	Total ERL	Filled	Vacant
Administration	2	2	0
Admin. Services	5	4	1
Safety/Inspec.	15	13	2
Design Eng.	29	29	0
Engineering Services	8	8	0
Authorized ERL (59)	59	56	3
Learning Ctr Eng Assoc	2	2	0

STAGE I – SHEET REQUIREMENT CHECKLIST

Front Sheet Requirements:

- Ensure current front Sheet cell is being used

- Title (Volume V, Part 2, File No. 07.01)
  - General heading
  - Description (including name of road if applicable)
  - County
  - Location (description should be similar to L&D plans if applicable.)
  - Project (Do not show "PE" number)

- Project Block (Volume V, Part 2 File No. 07.05)
  - State route
  - State project (Do not show "PE" number)
  - PPMS number
  - FHWA construction and scour code
  - Right-of-way note (if applicable)

- General Note
  - Width information
  - Span layout information (round to nearest foot increment)
  - Live load capacity
  - Drainage area (if applicable)
  - Specifications (Construction, Design & Standards (if applicable))
  - Structural steel information
  - Concrete information
  - Preliminary soil or rock bearing capacities and/or pile/drilled shaft capacity

- Section Along Centerline/Baseline View *(Elevation view drawn as a section along centerline/baseline. Therefore, skewed substructure units, wingwalls or parapets should not be shown.)*
  - Title and scale
  - Label
    - Beginning/End of bridge
    - Back of backwall/End of slab Station
  - Dimension Beginning to End of Bridge
  - Label abutments and piers (print with all capitals and use "subtitle" lettering)
  - Label existing ground
  - Dimension minimum vertical clearance (if applicable) (When there is a divided highway under the bridge the vertical clearance shall be given for each traffic direction.)
  - Label finished grade
  - Label riprap/slope protection (if applicable)
  - Label slope of riprap/slope protection (state directions: "normal to abutment", etc.) (if applicable)
  - Label "Fill" (if applicable)
  - Label Sheeting or bulkhead for protection of track (if applicable, Volume V, Part 2, File Nos. 02.01-20 & 21)

STAGE I - SHEET REQUIREMENT CHECKLIST

Front Sheet Requirements (Continued):

- Label elevation ordinary high water (if applicable)
- Label elevation and date high water (if applicable)
- Label elevation mean low tide and mean high tide (if applicable) (Where there are discrepancies between the survey and hydraulic report elevations, the report elevations (obtained from tide tables) should be used. If differences are large enough to suggest an error, the Hydraulics Section should be requested to resolve the difference.)
- Label and show vertical curve data at the approximate location.

❖ Plan View
- Title and scale
- Label
  - Face of backwall/End of slab
  - Abutment and its station
  - Centerline pier and its station
  - Dimension span lengths
  - Label centerline/baseline
- Dimension centerline/baseline to face of curb
- Label the face of curb (if there is a median label it as “Face of median”, sidewalk curb as “Face of sidewalk” anything else as “Face of curb”)
- Dimension face-to-face of curb
- Label skew angles (if applicable) (if 90 degrees, then show as such, do not show as normal to centerline/baseline)
- Label elevations at beginning and end of bridge
- Provide North Arrow in its appropriate orientation.
- Dimension horizontal clearance (if applicable)
- Label toe of fill (if applicable)
- Label approach slab (if applicable)
- Label stream flow arrow (if applicable)
- Label stream ebb and flood arrow (if applicable)
- Label edge of stream (if applicable)
- Label construction joints (if applicable)
- Label slope protection/riprap (if applicable) (Volume V, Part 2, File No. 07.18)
- Label point of minimum vertical clearance
- Label tie stations (if applicable)
- Label centerline/baseline and edge of pavement (include future/ultimate) & label roadway below the bridge (if applicable)
- Provide direction of roadway
- Label centerline of track (incl. future tracks) and label railroad below the bridge (if applicable)
- Label distance and direction to nearest railroad milepost (if applicable)
- Label right-of-way limits (if no road plans/if applicable)
- Label existing underground utilities

STAGE I - SHEET REQUIREMENT CHECKLIST

Transverse Section Sheet Requirements:

- Label centerline/baseline
- Provide type of beam/girder proposed
- Provide beam/girder spacing
- Dimension beam/girder spacing from construction centerline/baseline.
- Provide proposed depth of beam/girder (for preliminary plans only)
- Dimension width(s) as shown in General Note
- Dimension face of curb to edge of slab
- Designate crown or super-elevation and label the proposed grade line (PGL).
- Title and scale
- Show pedestrian fence (if applicable)
- Half section of haunch ((for concrete slab spans)
- Show proposed utilities and locations (if applicable)
- Show conduits in parapets (if applicable)

STAGE I - SHEET REQUIREMENT CHECKLIST

Abutment Sheet Requirements:

❖ Elevation View

- Dimension face-to-face of curbs along face of backwall
- Dimension out-to-out along face of backwall.
- Dimension from face of curb to construction centerline/baseline along face of backwall.
- Provide elevations along top of backwall and at top of footing. *(If the elevations at the face of backwall and back of backwall vary by more than ¼"(5mm) the elevation should be given on both faces. Elevations are required at face of curbs, at center/base line and any location the slope of backwall changes.)*
- Dimension proposed steps in abutment seat.
- Make sure the seats are a minimum of 1" (25 mm) in height.
- Show location of proposed utilities in backwall.
- Provide pile/drilled shaft information (if applicable)
- Show weep holes (if applicable)

❖ Plan View

- Label Centerline (provide radius if applicable)
- Label Face of backwall/Back of backwall/End of slab
- Provide skew angle
- Provide North Arrow
- Dimension bearing pad width
- Dimension the distance from face of backwall to line through centers of bearings.
- Dimension footing, seat, backwall and approach ledge widths. (Make sure the approach slab ledge is low enough to accommodate an approach slab with the 2" (50mm) overlay, if applicable).
- Show backwall requirements to accommodate proposed joints
- Dimension out-to-out normal to the construction centerline/baseline

❖ Abutment Section

- Provide a typical section of abutment (between bearing pads).
- Dimension footing, seat, backwall and approach ledge widths.
- Label line through centers of bearings.
- Dimension distance from line through centers of bearings to face of backwall.
- Provide pile/drilled shaft information (if applicable)
- Show porous backfill (if applicable)
- Show weep holes (if applicable)

STAGE I - SHEET REQUIREMENT CHECKLIST

Pier Sheet Requirements:

- Elevation View
  - Dimension out-to-out along centerline of pier
  - Dimension girder/beam spacing from construction centerline/baseline along centerline of pier
  - Provide pad elevations
  - Provide top of footing elevations
  - Dimension proposed column
  - Provide pile/drilled shaft information (if applicable)
  - Provide preliminary footing size

- Plan View
  - Label construction centerline/baseline (provide radius if applicable)
  - Label centerline of pier
  - Label line through centers of bearings
  - Provide skew angle
  - Provide North Arrow
  - Dimension bearing pad width
  - Dimension pier cap width
  - Dimension between centerline of pier and line through centers of bearings
  - Dimension length of cap out-to-out
  - Dimension out-to-out normal to the construction centerline/baseline

STAGE I - PLAN REVIEW CHECK LIST

- Preliminary Plan Geometric
  - Does the bridge plan geometry match the road plan geometry?
    - Number/width of lanes, shoulder widths, tie stations, etc.
  - Does the proposed bridge geometry match the VDOT S&B guidelines (Volume V, Part 2, File Nos. 02.01-1 through 02.01-21)?
  - Is future roadway widening considerations incorporated in the proposed layout? If not, are geometric exceptions required?
  - If geometric exemptions are required have they been requested and authorized? (Obtain copy of letter authorizing exception for records.) (LD-440 and approval letter.)
  - Is a design exception needed? Has it been authorized by the State Structure and Bridge Engineer? (Obtain copy of letter authorizing exception for records.) (LD-440 and approval letter.)

- Vertical clearance check (if applicable)

- Horizontal clearance check (if applicable)

- Transverse Section
  - Does the type of beam/girder proposed match the site conditions? (i.e. prestressed beams in corrosive coastal environments, etc.)
  - Does beam/girder spacing seem appropriate? Could a line of beams/girders be eliminated and still be economical?
  - Does the depth of beam/girder provide the required vertical clearance requirements?
  - Does the proposed transverse section width match Roadway geometric and VDOT S&B guidelines (Volume V, Part 2, File Nos. 02.01-1 through 02.01-21)?
  - Is a median required? Does the proposed median curb height match the roadway plans?
  - Is a sidewalk required? Does the proposed sidewalk curb height match the roadway plans?
  - Are VDOT overhang requirements met (Limited to 0.30 x interior beam/girder spacing)?
  - Is the proposed parapet/rail type been crash tested?
  - Was open railing considered? (for stream crossing)
  - Have future redecking capabilities been investigated? (if future redecking is likely under traffic)
  - Is a pedestrian fence required?
  - Are proposed utilities on the bridge shown?
  - Does the width of the proposed shoulders meet sight distance requirements?

- Pedestrian Walkway/Bike Trail Requirements
  - Does the proposed geometry meet VDOT guidelines?
  - Does the proposed railing height meet AASHTO guidelines?
  - Does the bike trail require a separate lane?
  - Is traffic separator required?
  - Are the guardrails and the traffic separating barriers terminated correctly?

- Stage Construction Requirements

  - Does the proposed bridge MOT plan match roadway MOT plans?
  - Are temporary lane width requirements met?
  - Are proposed clearances between stages adequate for construction?
  - Check equipment accessibility outside barrier to ensure constructibility.

STAGE I - PLAN REVIEW CHECK LIST (Continued)

- Abutment Types
  - Has the type of abutment been indicated?
  - Integral – Does it match the integral or semi-integral abutment requirements provided in Volume V, Part 2, File Nos. 11.02-1 through 11.02-9?
  - Stub/shelf

- Pier Types
  - Has the type of pier been indicated?
  - Does the proposed geometry meet VDOT guidelines? (Volume V, Part 2, File Nos. 07.17-1 through 07.17-3)

- MSE Wall (alternate) vs. Cantilever Walls
  - Are the subsurface conditions anticipated to be suited for MSE (alternate) walls, or are conventional walls with deep foundations anticipated? (Please refer to Volume V, Part 3, MSE-1 and MSE-2 notes to designer File Nos. 3 and 4 for the preparation requirements of alternate retaining wall plans.)
  - If MSE (alternate) walls are to be used in conjunction with a stub/shelf abutment on a single row of piles (not integral), have the strips in the backwall been provided? What is the proposed capacity of the wall strips?
  - What is the proposed height of the wall?
  - Are the walls called out separately on the plans?
  - If MSE (alternate) walls are part of the bridge contract does the engineers cost estimate include the MSE (alternate) walls?

- Foundation Supports
  - Pile Type
    - Is a preliminary pile type shown on the plans?
    - Are the preliminary piles uniform in size for the entire project?
    - Is a preliminary capacity shown in the general note?
    - Are overhead obstructions present that might interfere with pile installation?
    - Are dynamic pile tests anticipated to be utilized for this project? If so, at what substructure location? Has this cost been incorporated in the cost estimate?
  - Pile Bents
    - Is a preliminary pile type shown on the plans?
    - Are the preliminary piles uniform in size for the entire project?
    - Is a preliminary capacity shown in the general note?
    - Are dynamic pile tests anticipated to be utilized for this project? If so, at what substructure location? Has this cost been incorporated in the cost estimate?
  - Drilled Shafts
    - Is a preliminary drilled shaft size shown?
    - Are the preliminary drilled shaft sizes uniform for the entire project?
    - How many cross-hole sonic logging tests will be utilized? At what locations? Has this cost been incorporated in the cost estimate?
    - Is a technique shaft (demo shaft) required? If so, has this cost been incorporated in the cost estimate?
    - Is a load test required? If so, has this cost been incorporated in the cost estimate?
  - Spread Footing
    - Is a preliminary bearing pressure shown in the general note?

STAGE I - PLAN REVIEW CHECK LIST (Continued)

- Preliminary Geology Report
  - Is there any existing substructure information at the site or in close proximity to the site?
  - What is the existing soil information (existing bridge plans, roadway borings, etc.)? Has it been provided to the designer?

- Hydrologic and Hydraulic Analysis (if applicable)
  - Has a preliminary H&H analysis been performed?
  - Did the analysis indicate the span layout to be satisfactory?
  - What is the minimum bridge length required?
  - Do the proposed footing/piles or drilled shafts meet scour requirements?

- Utilities (if applicable)
  - Are there utilities on the existing structure?
  - Are there underground utilities along the alignment and transverse to the project site?
  - If the bridge is on a curved alignment and utilities are planned to be on the bridge, has the Right-of-Way and Utilities Division been provided with the appropriate standards and notified that the respective utility company will have to provide the S&B Division with the utility layout and the associated loads generated based on the curvature? (Exception-conduit in parapets)
  - Have overhead power lines been located on the plans?
  - Are there underground utilities that cannot be relocated and will need to be designed for? (Box culverts, large diameter forced main sewer lines.)
  - Can beam/girder depth accommodate utility without the utility protruding into the vertical clearance envelope?

- Signs/Signals (if applicable)
  - Is there an overhead lighting requirement?
  - Is there a lighting requirement for underneath the bridge?
  - Will traffic loop detectors need to be located in the bridge slab?

- Coast Guard Requirements (if applicable)
  - Does the bridge cross a navigable waterway?
  - Have horizontal and vertical clearance requirements been established?
  - Have proposed lighting requirements been shown?
  - Have line of sight issues been addressed for the bridge tender of the new movable bridge?
  - Have line of sight issues been addressed for the bridge tender of an adjacent movable bridge? (if applicable)

- Railroad Requirements (if applicable)
  - Are crash walls required?
  - Bridge piers straddling over the railway (i.e. steel box straddle bent) shall have a crash wall even if the pier falls outside the 25-foot horizontal clearance zone.
  - Are shoring requirements shown?
  - Have vertical and horizontal clearances been indicated?

- Environmental Considerations
  - Will Section 106 coordination be required?
  - Are designated wetlands, flood plains or floodways involved?
  - Are cofferdams required?

STAGE I - PLAN REVIEW CHECK LIST (Continued)

- Are there hazardous material concerns? (i.e. asbestos conduit or pipe, lead paint, petroleum projects, etc.)
- Are there 4F property concerns?
- (Parks, historic structures, agricultural areas)
  - Are there nesting birds and fish migration concerns?
- Are there siltation transportation concerns?
- Will a temporary causeway/accessway or work bridge be needed for construction?
- Are structure mounted sound walls anticipated for the bridge?

❖ Aesthetic Considerations
- Are there aesthetic considerations for this bridge?
- Have locality preferences/considerations been taken into account?

❖ Constructibility Review
- Can the proposed bridge be constructed using normal construction techniques?
- Will a temporary causeway or work bridge be needed for construction?
- Have crane placement locations been considered?
- Can piles be driven if overhead power lines exist at the project site?
- Can the beams/girders be transported to the site?

❖ Cost Estimate
- Have alternative layouts and foundation systems been considered?
- Do the quantities shown in the Stage I report incorporate all design features for this project?

❖ Funding
- How does the preliminary construction cost estimate compare with the budgeted construction cost estimate?
- If the preliminary estimate is not in line with the budgeted estimate have the bridge scope requirements been investigated to determine where reductions in costs can be achieved?
- If reductions in construction costs cannot be achieved through a change in scope requirements has the project manager been made aware of the change in the cost estimate?

STAGE II – PLAN REVIEW CHECKLIST

February 1, 2004

PREFACE

The purpose of this document is to provide the designers and checkers of Virginia Department of Transportation (VDOT) Structure and Bridge (S&B) Division Stage II Bridge plans with the basic list of items required on each plan sheet. This document has been created to ensure a consistent plan sheet format is provided on all bridge plans prepared for the VDOT Structure and Bridge Division.

It is the intent of this document to eliminate the wide diversity of submittals being provided to the S&B Division and to eliminate the uncertainty of what items are expected to be present on S&B bridge plan drawings.

We hope this document is a positive source of information for the development of future Stage II bridge plans. This document is considered to be a living document and will be adjusted over time. The next step in the process of the development of this document is to provide graphical illustrations for each narrative provided in this guideline. Your comments on the content of this document are very much appreciated. Please forward your comments to the attention of Kendal R. Walus at kendal.walus@virginiadot.org.

STAGE II – PLAN REVIEW CHECKLIST

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STAGE II – PLAN REVIEW CHECKLIST

Front Sheet (General Plan and Elevation):

- Sheet size
  - Ensure the correct sheet size was used (Volume V-Part 2, File No. 01.02-1 thru –5 dated November 7, 2003).

- Project box (Volume V-Part 2, File No. 07.05-1 thru -3)
  - FHWA 534 Data (for bridge only projects)
  - Federal Aid
    - Place the Route and Project numbers in spaces provided. If there is no Federal Aid on the project place a dash in these spaces.
  - State Block
    - Place the route number the bridge is located on. This is the route number within the project number but without any of the leading zeros.
    - Place the project number with "B" number, less the PE number, in the project block.
    - In the sheet number block, place the sheet number of the associated road plan package where the bridge plans will be located. Followed by, in parenthesis, the sheet number in the bridge plan set. For example, roadway plan sheet number is 34 and bridge sheet is the front sheet (sheet number 1). Therefore the corresponding entry is 34(1).
  - Place the FHWA Scour Code
    - Placed beneath State Block on title sheet only (Volume V-Part 2, File No. 07.05-2 & -3)
  - PPMS Number.
    - Placed beneath construction and scour code on title sheet only
  - Provide Special Provision numbers (if applicable)

- Title block (Volume V-Part 2, File No. 07.01)
  - Place the title of the sheet in the lower right hand corner as shown in Volume V – Part 2 and do not include the PE number.
  - Place the plan number in the lower right corner of the sheet.
  - Place the bridge plan sheet number in the lower right corner of the sheet. The format for this entry is sheet "x of y" with "x" being the sheet number and "y" the total number of sheets in the bridge plan set.
  - The date shown is the date the plans were completed and shall be prior to the first submission date and approved by coordinator. The date shall be shown as month, day and year (e.g. September 21, 1995).
  - Initials must be given for "Coordinated", "Supervised", "Designed", "Drawn" and "Checked" prior to first submission.
  - The copyright date shall be the year in which the plans were submitted for first submission.

Front Sheet (General Plan and Elevation) (Continued):

- CAD file number (New Volume V-Part 2, File No. 01.01-7)
  - This number is located outside the sheet border at the lower left corner of the sheet. It shall consist of the plan number preceded by a lower case "b" and followed by the sheet number. The sheet number contains leading zeros to make three digits, for example "b11122001".
- General Note
  - Provide general notes required for the bridge (Volume V-Part 2, V-2-09.01).
- Section Along Centerline/Baseline View
  - Elevation view drawn as a section along centerline/baseline. Therefore, skewed substructure units, wingwalls and parapets should not be shown.
- Elevation View
  - Title and scale
  - Label (non-integral abutments)
    - Beginning/End of bridge
    - Back of backwall
    - Beginning/End of bridge station
  - Label (integral abutments)
    - Beginning/End of bridge
    - Beginning/End of slab
    - Beginning/End of bridge station
  - Dimension beginning to end of bridge
  - Provide elevations at beginning and end of bridge
  - For multiple continuous units, dimension beginning to end of unit
  - Label abutments and piers (print with all capitals and use "subtitle" lettering). Abutments will be designated by capital letters. Piers will be designated by using numbers when more than one (1) pier exists.
  - Label spans using lower case span designators: Example Span a, Span b
  - Label bearing types (Fix., Exp.)
  - Label existing ground profile on centerline/baseline
  - Label existing and proposed underground/overhead utilities
  - Dimension minimum vertical clearance (if applicable). The label should be shown at edge of pavement. When there is a divided highway under the bridge the vertical clearance shall be given for each traffic direction. (Round down to nearest 1" (25mm) increment)
  - Label finished grade
  - Label riprap/slope protection (if applicable)
  - Label slope of riprap/slope protection (state directions: "normal to abutment", etc.) (if applicable)
  - Label "Fill" or "Cut" (if applicable)
  - Label edge of berm
  - Label longitudinal stiffeners (if applicable)

Front Sheet (General Plan and Elevation) (Continued):

- Label sheeting or bulkhead for protection of track or protection from roadways, groundwater, etc. (if applicable, Volume V, Part 2, File Nos. 02.01-19 & 20)
- Label elevation of ordinary high water (if applicable)
- Label elevation and date of high water (if applicable)
- Label elevation of mean low tide and mean high tide (if applicable). Where there are discrepancies between the survey and hydraulic report elevations, the report elevations (obtained from tide tables) should be used. If differences are large enough to suggest an error, the Hydraulics and Hydrologic Section should be requested to resolve the difference.
- Substructure elements drawn below ground line shall be drawn using a solid object line.
- Show approach slab (if applicable).
- Show vertical curve data, including grade in and grade out, at the approximate PVI location using the following format: (Imperial C.G. Sta. XX+XX.XX; C.G. Elev. XX.XX' & V.C. = XXX.XX' & Metric C.G. Sta. XX+XX.XXX; C.G. Elev. XX.XXX (meter) & V.C. = XX,XXXmm)

❖ Plan View

- Title and scale
- Label (non-integral abutments)
  - Face of backwall
  - Abutment and face of backwall station
  - Elevation at face of backwall
- Label (integral abutments)
  - Beginning/End of slab
  - Abutment and Beginning/End of station
  - Elevation at Beginning/End of slab
- Label
  - Centerline pier(s) and its station(s)
  - Dimension span lengths and label spans.
  - Label centerline/baseline. Do not show station tics or callouts along centerline/baseline.
  - Label retaining walls (if applicable)
- Dimension centerline/baseline to face of curb
- Dimension centerline/baseline radius (if applicable)
- Label the face of curb (if there is a median label it as "Face of median curb", sidewalk curb as "Face of sidewalk curb" anything else as "Face of curb")
- Dimension face-to-face of curb
- Dimension parapet/barrier widths
- Label skew angles (if applicable) (if 90 degrees, then show as such, do not show as normal to centerline/baseline)
- Provide elevations at centerline of piers
- Provide North Arrow in its appropriate orientation
- Dimension horizontal clearance (if applicable)
- Label toe of fill (if applicable)
- Label Edge of berm
- Label approach slab (if applicable)
- Dimension length of approach slab (if applicable)
- Label stream flow arrow and stream name (if applicable)

STAGE II – PLAN REVIEW CHECKLIST

Front Sheet (General Plan and Elevation) (Continued):

- Label stream ebb and flood arrow (tidal) (if applicable)
- Label edge of stream (if applicable)
- Label construction joints (if applicable)
- Label slope protection/riprap (if applicable) (Volume V, Part 2, File No. 07.18)
- Provide 15'-0" (4500mm) dimension for riprap extension behind face of abutment (Volume V, Part 2, File No. 07.18)
- Label point of minimum vertical clearance (each lane if applicable)
- Label tie stations (if applicable)
- Label approach slab (if applicable)
- Label centerline/baseline and edge of pavement (include future/ultimate) & label roadway below the bridge (if applicable)
- Provide traffic direction of all roadways to a town or intersection of prominent roadways (e.g., To Route 150, To Town of Farmville, etc.)
- Label centerline of track (incl. future tracks) and label railroad below the bridge (if applicable)
- Label distance and direction to nearest railroad milepost (if applicable)
- Label right-of-way limits on bridge projects with no road plans (if applicable)
- Label existing and proposed underground/overhead utilities
- Label deck drains and light posts (if applicable)
- Plans need to be sealed and signed by PE from consultant firm and also from subconsultant (if applicable)

STAGE II – PLAN REVIEW CHECKLIST

Interior Sheet Generic Requirements:

- Sheet size
  - Ensure the correct sheet size was used (Volume V-Part 2, File No. 01.02-1 thru –5 dated November 7, 2003).
- Project box (Volume V-Part 2, File No. 07.05-1 thru -3)
  - Federal Aid
    - Place a dash in the Route and Project spaces on all sheets following the sheet containing the Table of Revisions.
  - State Block
    - Place the route number the bridge is located on. This is the route number within the project number but without any of the leading zeros.
    - Place the project number with "B" number, less the PE number, in the project block.
    - In the sheet number block, place the sheet number of the associated road plan package where the bridge plans will be located followed by, in parenthesis, the sheet number in the bridge plan set. For example, roadway plan sheet number is 34 and bridge sheet is the front sheet (sheet number 1). Therefore the corresponding entry is 34(1).
- Title block (Volume V-Part 2, File No. 07.04)
  - Place the title of the sheet in the title block. If multiple sheets are used, place "Sheet X of Y" as a separate line of text in the title.
  - Place the plan number in the plan number block.
  - Place the bridge plan sheet number in the sheet number block. The format for this entry is sheet "x of y" with "x" being the sheet number and "y" the total number of sheets in the bridge plan set.
  - The date shown is the date the plans were completed and shall be prior to the first submission date. The date shall be shown as month and year (e.g. Sept. 2003).
  - Initials must be given for "Designed", "Drawn" and "Checked" prior to first submission.
  - The copyright date shall be the year in which the plans were submitted for first submission.
- CAD file number (New Volume V-Part 2, File No. 01.01-7)
  - This number is located outside the sheet border at the lower left corner. It shall consist of the plan number preceded by a lower case "b" and followed by the sheet number. The sheet number contains leading zeros to make three digits, for example "b11122001" or "b11122013" etc.
- First Interior Sheet
  - Provide Table of Revisions
  - Provide the name of the consulting firm providing the professional design services

STAGE II – PLAN REVIEW CHECKLIST

Estimated Quantity and Index Sheet:

❖ Index of sheets

- The index of sheets should contain the sheet number and the sheet title as it appears on the individual sheets.
- The Estimated Quantities table, table of revisions and the index of sheets shall be placed on the second sheet unless the complexity of the project requires it be placed on another sheet. If there is insufficient room on the quantity sheet for the index of sheets, place it on the sheet immediately following. (New Volume V-Part 2 File No. 01.02-5).

❖ Estimated quantities table

- The format used shall be similar to that shown in Volume V-Part 2 File No. 10.03-1.
- Show the entire table of quantities on one sheet unless the complexity of the project requires it be continued to another sheet.
- When there are multiple structures with different "B" numbers detailed in one set of plans, a table of quantities shall be shown for each "B" number.
- The quantities for abutments and piers shall be broken down into neat and footing. Bents only require one line to be used with the pile, concrete and reinforcing steel quantities shown on this single line.
- All quantities in the table shall be rounded off to the units shown in Volume V-Part 2 File No. 10.01-1 through –17.
- All bid items in table shall be worded as they appear in the trnsport item codes.
- All quantities shall be left justified in the table to allow room for possible future revisions or posting of final quantities.
- Lump Sum bid items such as mobilization, construction surveying, removal of existing structure, utilities and etc. shall be shown below the quantity table.
- When there are multiple bridges included in the contract and items such as Telephone System, 12" (300mm) water line, etc. are shown, the "B" number should be included in the item description. For example: Deck Drainage System – B601 Lump Sum.
- All plan quantity items shall be designated by placing a plan quantity symbol (⊗) in the item title adjacent to the units. For superstructure epoxy coated reinforcing steel, the plan quantity symbol shall be shown adjacent to the quantity.
- When high strength main members have attachments (secondary members, etc.) of carbon steel, add a note under the table of quantities indicating the weight of Grade A36/A250 steel included. For example: * Lump Sum – weight shown includes XXXX lbs. (XXXX kgs.) of ASTM A709 Grade A36 / ASTM A709M Grade 250.
- When prestressed beams are used the following note shall be placed under the quantity table: * Bid price for prestressed concrete beams shall include XXXX lbs. (XXXX kgs.) of galvanized ASTM A709 Grade 36/ ASTM A709M Grade 250 steel in the intermediate diaphragms.
- When low permeability concrete is to be used the following note shall be added below the quantity table: * Low permeability concrete shall be used for this structure. Each concrete item such as Class A3 (25) & A4 (30), parapets, median barriers, prestressed beams & piles, etc. shall be referenced to this note.
- A dash shall be placed in all spaces were there are no quantities.
- When galvanized reinforcing steel is used, a note shall be placed with reference to the epoxy coated steel: "* Weight shown includes XXXX lbs (kgs) of galvanized reinforcing steel"
- Add note (if applicable) "Porous backfill shall be included in price bid for excavation."

Substructure Layout Sheet:

❖ Substructure Layout

- The substructure layout should preferably be drawn to a scale. The drawing may be drawn "not to scale" as long as the span lengths and footings are shown proportionately.
- Indicate the drawing scale or label as "Not to scale".
- Provide the span lengths from face of backwall (end of slab for integral abutments) to centerline of pier/bent, from centerline of pier/bent to centerline of pier/bent and from centerline of pier/bent to the face of backwall (end of slab for integral abutments).
- Label the spans if a Curved Bridge Layout sheet is not included.
- Provide the radius of curvature of the centerline/baseline (if applicable).
- Provide Point of Curvature and Point of Tangent with stations.
- Show and label short or long chords (if applicable).
- Show and label the centerline/baseline as shown on the front sheet.
- For the situation when a point of tangency or point of curvature exists between two-substructure units, provide a "line" drawn between the substructure unit stations. This is not a chord and should be labeled as a "line".
- Show a north arrow.
- Show and label the face of backwall/end of slab and the centerline of pier(s)/bent(s).
- Provide the substructure unit station at the intersection of the centerline/baseline and the face of backwall/end of slab/centerline of pier(s)/bent(s).
- Provide the skew angle between the face of backwall/end of slab/centerline of pier/bent and the centerline/baseline/chord/line at each substructure unit (if applicable). When all abutments and pier(s)/bent(s) have the same skew angle provide the angle once and label as typical.
- Indicate whether or not the face of backwall/end of slab and centerline of pier(s)/bent(s) are radial (if applicable).
- Provide the outline of each abutment/wingwall and pier footing.
- Provide the dimensions of the abutment footing from the face of backwall/end of slab to the front and back face of footing.
- Provide the abutment footing dimensions from the intersection of the centerline/baseline and face of backwall/end of slab to each corner of the footing.
- Dimension the inside and outside faces of the wingwall footing (if applicable).
- Provide a dimension from the intersection of the centerline/baseline and the face of backwall/end of slab to the intersection of the face of backwall/end of slab to the exterior face of wingwall (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the face of wingwall (if applicable).
- Provide dimensions from the face of wingwall to the outside corners of the wingwall footing.
- Provide dimensions from the intersection of centerline/baseline and the centerline of pier to the centerline of each column footing located on either side of centerline/baseline. Additional pier column footings (if applicable) are located from the initially located column footing centerline.
- Provide dimensions from the centerline of the column footing to each face of the footing.
- Provide dimensions from the centerline of pier to each face of the pier footing.
- Provide an overall dimension for each pier footing face. When the column footings for an individual pier are the same size, dimension one column footing and label as typical.

Substructure Layout Sheet (Continued):

- Label and station any existing centerlines that intersect new bridge

❖ Pile Bents

- Draw the outline of each pile in the pile bent(s)
- Label the type and size of piles
- Graphically designate the direction of battered piles but do not provide the batter numerically
- Provide dimensions from intersection of centerline/baseline and the centerline of bent to the centerline of the pile located on either side of centerline/baseline. Other piles are then located from the initially located pile centerline.

❖ Retaining Walls

- Draw the outline of each retaining wall footing included as part of the bridge plans.
- Provide the wall length along face of retaining wall.
- Label each wall as it is shown on the retaining wall detail sheets.
- Provide the station and the distance from the centerline/baseline to the face of retaining wall at the beginning and the end of the retaining wall.
- If the wall is extremely long, it may be graphically shortened by the use of cut lines.
- If wrap around retaining walls are used at abutment locations, locate the retaining wall corners from the intersection of the centerline/baseline and face of backwall/end of slab to the face of the retaining wall at the break point.
- Provide dimensions from the face of retaining wall to the face of footing.
- Provide overall dimensions for the footing.

❖ Locate the edge of berm

- Locate the edge of berm a minimum of 2’-0” (600mm) away from the face of abutment seat.
- Show and label the edge of berm and provide the station and elevation where it intersects the centerline/baseline.
- Provide the station and elevation of the edge of berm when the elevation is different at the intersection of the face of superstructure and edge of berm with that of the intersection of edge of berm and centerline/baseline. Dimension to these locations along the edge of berm from the intersection of the edge of berm and the centerline/baseline.
- Edge of berm elevations provided require a minimum of 2’-0” (600mm) clearance between the bottom of beam(s)/girder(s) and the top of berm at the face of abutment seat.

❖ Geotechnical Borings

- Show the location of geotechnical borings using the boring symbol.
- Label the borings as they are designated on the geology sheets.
- Provide a table for the geotechnical borings. This table shall provide the name of the boring, its station and offset.

Substructure Layout Sheet (Continued):

- Temporary shoring/sheet piling
  - Show required temporary sheet piling/shoring.
  - Provide station of start and end of temporary shoring/sheet piling.
  - Provide dimensions for the required length of shoring and the depth of shoring, if depth varies, state that it varies. A detail may be required to show this information clearly.

- Notes
  - Add sheet references to sheets on which details of the abutments, pier(s)/bent(s), walls and temporary sheeting/shoring are shown.
  - Locate all notes at one location on sheet and number each one for easy reference in the drawing details (See new 01.02-1 for location.)
  - Add note: "This layout is to be used only for the purpose of locating fill slopes and footings of abutments and piers. For details of Neatwork, see Abutment and Pier details."

STAGE II – PLAN REVIEW CHECKLIST

Concrete Slab Slope Protection, Concrete Slab Riprap and Riprap Sheet:

❖ Concrete slab slope protection (Volume V-Part 2 File No. 07.19-1 and -2)

- Locate the edge of berm so the distance between the bottom front corner of the abutment footing and the surface of slope protection is not less than the following:
  - Spread footing: (1½:1 slope) 8'-0" (2450mm) minimum
    (2:1 slope) 10'-0" (3000mm) minimum
  - Pile footing: (1½:1 slope) 6'-0" (1800mm) minimum
    (2:1 slope) 8'-0" (2450mm) minimum
- Part Plan
  - Provide a part plan view in order to show the slope protection details not easily shown on the front sheet.
  - Show and label the toe of fill (if applicable).
  - The outside edge of the slope protection shall be 3'-0" (900mm) from the outside face of the superstructure.
- When there are parallel structures, 50'-0" (15,240mm) or less between adjacent edges of pavement, the extension of the concrete slab slope protection between the structures shall be considered.
- Specification Section 415 allows the use of an optional concrete slab and stone slope protection. At railroad crossings and other locations where this is not an option, a note shall be placed with the slope protection details stating that the optional concrete slab and stone slope protection will not be permitted.
- Section Normal to Abutment (along centerline/baseline)
  - Locate the edge of berm a distance of 2'-0" (600mm) minimum from the face of abutment seat.
  - The berm shall slope away from the abutment at a rate of 1:12.
  - The standard slope protection will have a minimum thickness of 4" (100mm).
  - The slope protection shall not terminate at the face of the footing but shall rest on a 4" (100mm) earthen bed located on top of the footing and extended to the face of seat.
  - Label the edge of berm.
  - Show and label the limits of slope protection for payment.
  - If a paved ditch is provided, the portion of the ditch at the base of slope protection will become part of and detailed with the slope protection. If no paved ditch is provided, the slope protection will be terminated by an 8" (200mm) wide block set 12" (300mm) into the ground.
  - Provide elevations and stations of the centerline of ditch at the intersection of the face of structure and the centerline of ditch.
  - Ensure that a minimum of 2'-0" (600mm) clearance exists between the bottom of beam(s)/girder(s) and the top of the berm at the face of the abutment seat.

❖ Concrete Slab Riprap (Volume V-Part 2 File No. 07.19-3 and -4)

- Locate the edge of berm so the distance between the bottom front corner of the abutment footing and the surface of riprap is not less than the following:
  - Spread footing: (1½:1 slope) 8'-0" (2450mm) minimum
    (2:1 slope) 10'-0" (3000mm) minimum
  - Pile footing: (1½:1 slope) 6'-0" (1800mm) minimum
    (2:1 slope) 8'-0" (2450mm) minimum
- Show and label the toe of fill. (if applicable)

Concrete Slab Slope Protection, Concrete Slab Riprap and Riprap Sheet (Continued):

- The concrete slab riprap shall be shown in the plan view on the front sheet. No additional plan view is required.
- The concrete slab riprap shall be shown and dimensioned as extending 15'-0" (4500mm) beyond the face of backwall/end of slab. This dimension shall be shown as parallel to the edge of pavement and can be shown once and labeled as typical.
- Show the elevation of the top of concrete slab riprap for the 15'-0" (4500mm) extension (if applicable). This elevation shall be set 2'-0" (600mm) above the design high water elevation.
- When there are parallel structures, 50'-0" (15,240mm) or less between adjacent edges of pavement, the extension of concrete slab riprap between the structures shall be considered.
- Section Normal to Abutment
  - Locate the edge of berm 2'-0" (600mm) minimum from the face of seat.
  - The berm shall slope away from the abutment at a rate of 1:12.
  - The standard concrete slab riprap will have a thickness of 6" (150mm).
  - Concrete slab riprap shall not terminate at the face of footing but shall rest on a 4" (100mm) earthen bed located on top of footing and extended to the face of seat.
  - Ensure that a minimum of 2'-0" (600mm) clearance exists between the bottom of beam(s)/girder(s) and the top of berm at the face of the abutment seat
  - Show and label the limits of the concrete slab riprap for payment.
  - The concrete slab riprap shall terminate with a concrete block increasing from a 6" (150mm) thickness to a 12" (300mm) thickness and imbedded 3'-0" (900mm) vertically into the ground.

❖ Riprap (Volume V Part 2 file 07.19-1 thru 4)

- Locate the edge of berm so the distance between the bottom front corner of the abutment footing and the surface of riprap is not less than the following:
  - Spread footing: (1½:1 slope) 8'-0" (2450mm) minimum
    (2:1 slope) 10'-0" (3000mm) minimum
  - Pile footing: (1½:1 slope) 6'-0" (1800mm) minimum
    (2:1 slope) 8'-0" (2450mm) minimum
- Show and label the toe of fill (if applicable).
- The riprap shall be shown in the plan view of the front sheet. No additional plan view is required.
- The riprap shall be shown and dimensioned as extending 15'-0" (4500mm) beyond the face of backwall/end of slab. This dimension shall be shown as parallel to the edge of pavement and can be shown once and labeled as typical.
- Show the elevation at the top of the riprap for the 15'-0" (4500mm) extension (if applicable). This elevation shall be set 2'-0" (600mm) above the design high water elevation.
- When there are parallel structures, 50'-0" (15,240mm) or less between adjacent edges of pavement, the extension of riprap between the structures shall be considered.
- The preferred unit for payment of riprap is ton (metric ton).

STAGE II – PLAN REVIEW CHECKLIST

Concrete Slab Slope Protection, Concrete Slab Riprap and Riprap Sheet (Continued):

- Section normal to the abutment
  - The depth of riprap shall be dimensioned perpendicular to the surface of riprap. This dimension shall be labeled as "Dry riprap class __" followed by the thickness. The depth of riprap provided shall be based on scour protection requirements and shall match the standard thickness bid item designation shown in the estimating system. (Volume V-Part 2, File No. 10.01-1 thru -17)
  - The depth and aggregate size of stone bedding shall be provided (if applicable).
  - A layer of "geotextile bedding" shall be shown and labeled under the riprap and bedding stone (if applicable). The geotextile bedding material shall be placed in accordance with Section 414 of the Specifications with the 9" (225mm) anchorage called for shown and dimensioned.
  - The riprap shall be keyed into and parallel to the existing ground a distance equal to the depth of riprap.
  - Locate the edge of berm 2'-0" (600mm) minimum from the face of abutment seat.
  - The berm shall slope away from the abutment at a rate of 1:12.

❖ Notes

- Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1 for location)

STAGE II – PLAN REVIEW CHECKLIST

Curved Bridge Layout Sheet (Volume V-Part 2, File No. 02.02):

❖ Curved Bridge Layout (layout on short chords end-to-end of spans)

The short chord layout is to be used when the middle ordinate of the centerline/baseline is greater than one-fourth the width of the superstructure.

- The layout shall preferably be drawn to a scale. The drawing may be drawn "not to scale" as long as the span lengths are shown proportionately.
- Indicate scale or label as "not to scale"
- Show and label the centerline/baseline as shown on the front sheet.
- Show and label the chords.
- Label spans
- For the situation when a point of tangency or point of curvature exists between two-substructure units, provide a "line" drawn between the substructure unit stations. This is not a chord and should be labeled as a "line".
- Provide the radius of curvature of the centerline/baseline.
- Show a north arrow.
- Show and label the face of backwall/end of slab and centerline of pier(s)/bent(s). If the centerline of pier(s)/bent(s) is radial, the centerline should be so labeled.
- Provide the station at the intersection of the centerline/baseline and face of backwall/end of slab and at the intersection with the centerline of pier(s)/bent(s).
- Provide the span lengths, along the centerline/baseline, from the face of backwall/end of slab to centerline of pier/bent, from centerline of pier/bent to centerline of pier/bent and from the centerline of pier/bent to the face of backwall/end of slab.
- Provide the chord lengths from the face of backwall/end of slab to centerline of pier/bent, from centerline of pier/bent to centerline of pier/bent and from the centerline of pier/bent to the face of backwall/end of slab.
- Provide the skew angles, on the inside of curve, from the chord to face of backwall/end of slab and from each adjacent span short chord to the centerline of pier/bent.

❖ Curved Bridge Layout (layout on common chord)

The common chord layout is to be used when the middle ordinate of centerline/baseline is equal to or less than one-fourth the width of the superstructure. The common chord can be used if the centerline is not one continuous radius.

- The curved bridge layout shall preferably be drawn to a scale. The drawing may be drawn "not to scale" as long as the span lengths are shown proportionately.
- Show and label the centerline/baseline as shown on the front sheet.
- Label spans
- Show the chord and label it as long chord to centerline/baseline.
- Provide the radius of curvature of the centerline/baseline.
- Show a north arrow.
- Show and label the face of backwall/end of slab and centerline of pier(s)/bent(s). If the centerline of pier(s)/bents is radial, the centerline should be so labeled.
- Provide the station at the intersection of the centerline/baseline and face of backwall/end of slab and at the intersection with the centerline of pier(s)/bent(s).
- Provide the span lengths, along the centerline/baseline, from face of backwall/end of slab to centerline of pier/bent, from centerline of pier/bent to centerline of pier/bent and from the centerline of pier/bent to the face of backwall/end of slab.

Curved Bridge Layout Sheet (Continued):

- Provide the span lengths, along the common chord, from the face of backwall/end of slab to the centerline of pier/bent, from the centerline of pier/bent to the centerline of pier/bent and from the centerline of pier/bent to the face of backwall/end of slab.
- Provide the skew angle, on the inside of curve, between the face of backwall/end of slab and the chord and between the centerline of pier/bent and the chord.
- Show a dimension along the centerline of pier from the intersection of the centerline of pier/bent and centerline/baseline to the intersection of centerline of pier/bent and the common chord. This dimension needs to be shown at each pier.

❖ Notes

- Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1 for location)

Transverse Section Sheet:

❖ Transverse Section

- Show the entire transverse section. Do not show interior or end diaphragms or cross frames.
- The drawing shall preferably be drawn at ¼" or ⅜" = 12" (1:20 or 1:30) scale.
- Show and label the centerline/baseline of bridge and transitional centerline (as applicable).
- Label each beam/girder as Beam 1, Beam 2, Girder 3, etc. or B1, B2, G3 etc. The labeling of the beams/girders shall be from left to right looking stations ahead.
- Label parapet conduit (if applicable)
- Label face of curbs.
  - When there is a sidewalk, label the sidewalk curb as "Face of sidewalk curb".
  - When there is a median, label the median curb as "Face of median curb".
  - When there are parapets on each side of the transverse section label as "Face of curb".
- Provide dimension from centerline/baseline to the face of curb on both sides of bridge. Label as "varies" from XXX min. to XXX max. (if applicable).
- Provide dimension from face-to-face of curbs.
- Provide the out-to-out width of deck.
- Provide the parapet/railing width.
- Provide the raised median width (if applicable).
- Provide the median barrier width (if applicable).
- Provide the sidewalk width (if applicable).
- Dimension height of parapet at face of curb
- Indicate the slab thickness
- Indicate the overhang thickness and label as typical.
- Indicate the point of finished grade (PGL).
- Indicate the deck cross slope on each side of the centerline/baseline if there is a crown, if the deck is super-elevated, give the slope only once. If the cross slope varies then it shall be indicated as "varies" from XXX min. to XXX max. (if applicable).
- Indicate the cross slope as inch per foot (¼"/foot) for imperial projects and percent slope (2%) for metric projects.
- Show pedestrian fence (if applicable).
- Do not show reinforcing steel contained in the median barrier or parapets. The standard insertable parapet sheets will provide the necessary reinforcing steel details. Add the note: "Parapet (and median) reinforcing steel not shown."
- Reinforcing modifications needed to anchor the median barrier to the deck shall be detailed on the standard insertable barrier sheet.
- Show beams/girders and provide spacing.
  - Provide dimension from centerline/baseline to the first beam/girder on each side of centerline/baseline.
  - Provide beam/girder spacing for the remaining beams/girders from the beam/girder located each side of centerline/baseline.
  - Provide a dimension from centerline of outside beam/girder to outside edge of superstructure. This dimension shall not exceed 30% of the beam/girder spacing without prior approval of the State Structure & Bridge Engineer and not to be less than 2'-7" (785mm) for skewed bridges over 20 degrees.
- Show and label all utilities supported between the beams/girders.
  - Locate utilities from the centerline of the adjacent beams/girders.
  - Label the type and size of utility.

Transverse Section Sheet (Continued):

- Show the correct number of conduits supported between beams/girders.
- Do not show any rebar within Typical Section. Rebar is to be shown and detailed within part transverse section(s) detail described below

❖ Typical outside bay and exterior overhang transverse section detail

- Provide a detail of the exterior overhang and the outside bay, the location of which is to be shown on the transverse section by circling it and referring to it as Detail (X).
- In cases where there is an interior median overhang provide a transverse section of a typical bay with the detail of the interior median overhang (this is a part section).
- The preferred scale for the transverse section bay and overhang detail is ¾" = 12" (1:20).
- Show and label the top and bottom longitudinal reinforcing steel between the centerlines of the beams/girders.
- Show and label the top and bottom longitudinal reinforcing steel between the centerline of the exterior beam/girder and the outside face of deck.
- Show the laps and the minimum lap lengths for the transverse bars. Laps can be shown by "tick" marks or actual lapped reinforcing steel.
- Indicate the spacing of the longitudinal reinforcing steel. The spacing shall be labeled typical where applicable.
- Provide a dimension from outside face of deck to the first longitudinal reinforcing bar in the overhang (top and bottom).
- Provide a dimension from the centerline of beam/girder to the first bottom longitudinal reinforcing bar in the interior and exterior bay.
- Show and label the transverse reinforcing steel.
  - The spacing of the transverse reinforcing steel shall be shown on the slab plan.
  - Dimension distance to transverse steel from top & bottom of slab
  - Placement of transverse bars within slab and location of transverse bar bends shall conform to Volume V-Part 5, File No. 05.02-2
- Provide a separate detail of the chamfer and drip bead at the exterior edge of slab. The location of which is to be shown on the transverse section by circling it and referring to it as Detail (X).
  - This detail may also be required when a longitudinal joint is located in the deck.
- Show all applicable items such as parapet, sidewalk, pedestrian fence and utilities in this view.
- Do not show parapet-reinforcing steel in this section.
- Show, label and provide spacing for transverse and longitudinal reinforcing steel in sidewalks or raised medians.
- Indicate the sidewalk cross slope as inch per foot (1/8"/foot) for imperial projects and percent slope (1%) for metric projects.
- Provide a separate detail at the face of sidewalk curb and at the face of median curb (if applicable). These dimensions should match the roadway curb details.
- Provide a section showing any required median. (Volume V-Part 2, File No. 07.47)
  - Where space is limited this can be incorporated in the detail of a required interior overhang. Where a wide median is required the use of cut lines, is permitted in order to save space.
- On continuous units it is necessary to have an additional transverse section bay detail to show the additional longitudinal reinforcement required over the pier(s).

Transverse Section Sheet (Continued):

- Identify this detail as being applicable over the pier(s).
- Show and label all the reinforcing steel shown.
- Provide the spacing of the additional reinforcing steel needed over the pier.
- Spacing shall be measured from the face of structure for the overhang steel and from the centerline of beam/girder for the interior bay.

❖ Notes

- Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1)

STAGE II – PLAN REVIEW CHECKLIST

Slab Plan Sheet:

❖ Slab Plan

- Draw the slab plan to scale. The preferred scale is 1”=10’-0” or 1/8”=1’-0” (1:100).
  - For long continuous spans the use of match lines are encouraged. Indicate the station along the centerline/baseline of the match line.
  - Show the entire continuous unit on the same sheet (if possible).
- Label each span as shown on the front sheet (e.g. Span a, Span b, etc.).
- Show the north arrow.
- Show and label the centerline/baseline as shown on front sheet.
- Provide the radius of curvature of the centerline/baseline (if applicable).
- Show parapet(s), sidewalk(s) (if applicable), raised median(s) (if applicable) and median barrier (if applicable) and provide the width of each.
- Label face of curbs.
- Label the sidewalk curb as “Face of sidewalk curb” (if applicable).
- Label the median curb as “Face of median curb” (if applicable).
- Label the parapet curb as “Face of curb”.
- Label End of deck slab
- Dimension joint width from centerline of pier or face of backwall to end of slab @ 60°F (e.g. 1 ½” @ 60°F).
- Provide a dimension from the centerline/baseline to the face of curb on both sides of the bridge and at both ends of the bridge if not typical.
- Provide a dimension from face to face of curbs.
- Provide a dimension for the out-to-out width of the bridge.
- Show and label the face of backwall/end of slab and the centerline of pier(s)/bent(s).
- Provide the skew angle between the face of backwall/end of slab/centerline of pier/bent and the centerline/baseline/chord/line at each substructure unit (if applicable). When all abutments and pier(s)/bent(s) have the same the skew angle provide the angle once and label as typical.
- Indicate whether or not the face of backwall/end of slab and centerline of pier(s)/bent(s) are radial (if applicable).
- Provide the span length(s) for each span. Span lengths shall be dimensioned as follows: from the face of backwall/end of slab to centerline of pier/bent, from centerline of pier/bent to centerline of pier/bent and from centerline of pier/bent to the face of backwall/end of slab.
- Do not show the beam(s)/girder(s) outlines or centerlines.
- Indicate the location of construction joints with stations along the centerline/baseline or dimension the location of the construction joint from the centerline of pier/bent.
- Show and locate deck drainage structures by station.
- Show and locate lighting structures by station.
- Indicate traffic loop detectors to be placed during slab placement (if applicable).

❖ Reinforcing steel

- Show and label the transverse reinforcing steel.
- Identify all reinforcing steel in accordance with Volume V-Part 2, File number 05.12-1 & 2.
- Provide the spacing of the transverse reinforcing steel.

Slab Plan Sheet (Continued):

- Spacing of the transverse reinforcing steel shall always be dimensioned from a work point (e.g. intersection of the face of backwall/end of slab and the centerline/baseline or the intersection of the centerline of pier/bent and the centerline/baseline).
  - Reinforcing steel will not be dimensioned from the end of slab when there is an expansion joint.
  - Transverse reinforcing steel immediately adjacent to the expansion joint shall be straight top and bottom bars.
- The spacing of the reinforcing steel may be shown "not to scale" in order to be legible.
- Show and label the longitudinal reinforcing steel.
  - Do not show all longitudinal bars in the plan view.
  - Provide only the outside longitudinal bars.
  - For continuous span layouts, show and label the additional negative moment longitudinal reinforcement.
  - Locate the end of the additional negative moment reinforcing steel from the intersection of the centerline/baseline and the centerline of pier/bent.
  - Provide a transverse callout between each set of longitudinal reinforcing steel bars indicating the quantity, bar designation, location and the following note "*For spacing see transverse section*".
  - The spacing will be shown on the transverse section.
  - Utilize a common bar designation utilizing 40'-0" (12,190mm) bar lengths or 60'-0" (18,290mm) bar lengths when the majority of the reinforcing steel is greater than 40'-0" (12,190mm). Provide an additional bar designation for the bar required to complete the longitudinal reinforcing steel in the slab. This practice may need to be modified to adjust the location of the splice locations to avoid the maximum positive and negative moments regions in the span layout or use Class "C" splices.
- Avoid locating reinforcing steel splice locations at the maximum positive or negative moment regions in the span layout.
- Indicate the minimum lap length required for each spliced bar size. It is important to include the modifier for epoxy coated reinforcing steel (if applicable) (AASHTO 8.25.2.3).
- Show and label all reinforcing steel in sidewalk(s) or raised median (if applicable).
- Alternate locations of splices in adjacent transverse bars when possible.

❖ End haunch detail

- Provide a detail showing the additional reinforcing steel in the haunch located at the end of spans between the beam(s)/girder(s).
- Circle the area between the beam(s)/girder(s) at the end of slab to be detailed.
- Refer to this as "Detail X".
- Indicate the location of the adjacent beam/girder centerlines.
- Provide a dimension from the beam/girder centerline to the "ES" bar closest to the centerline of beam/girder.
- Provide the spacing of the "ES" bars between the beams/girders.
- Locate the "EH" bars located in the bottom of the haunch.

Slab Plan Sheet (Continued):

- Provide a section through this end haunch detail to show the “ES” and “EH” bars. A section similar to this one, less reinforcement, can be found on standard sheet BEJ-1 and MBEJ-1 located in Volume V-Part 3 Current Details (Standards) & (Metric Standards).
- If this detail is typical between all beams/girders note it as such.

❖ Deck slab pouring sequence diagram

- Provide a plan view of the deck slab concrete placement diagram (Volume V-Part 2, file Number 07.33).
- This diagram can be incorporated into the deck slab, if done so legibly, with all appropriate notes.
- Provide dimensions for each construction joint measured along the centerline/baseline.
- Indicate the pouring sequence with a numerical indicator.
- Locate the face of backwall/end of slab and centerline of pier(s)/bent(s).

❖ Notes

- Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1)

STAGE II – PLAN REVIEW CHECKLIST

Framing Plan Sheet:

❖ Framing Plan (general)

- Do not show a beam/girder elevation on this sheet. A separate insertable sheet shall be provided for the beam/girder elevation.
- Draw the plan view to a scale that clearly shows all required details. A preferable scale is 1”=10’-0” (1:100).
- Use single lines to depict the centerline of beams/girders and the cross frames.
- Label each span as indicated on the front sheet (e.g. Span a, Span b, etc.)
- Label each beam/girder as Beam 1, Beam 2, Girder 3, etc. or B1, B2, G3 etc. The labeling of the beams/girders shall be from left to right looking stations ahead.
- Provide the radius of curvature for each beam/girder (if applicable).
- Show a north arrow.
- Show and label the bridge centerline/baseline as shown on the front sheet.
- Show and label the face of backwall/end of span and the centerline of pier(s)/bent(s).
- Provide the skew angle between the face of backwall/end of slab/centerline of pier(s)/bent(s) and the centerline/baseline/chords.
- Indicate whether the face of backwall/end of slab and the centerline of pier(s)/bent(s) are radial (if applicable).
- Show and label the “Line through centers of bearing”. When providing the label indicate the type of bearings being used (e.g. fixed bearings, expansion bearings).
- Provide the span lengths along the centerline/baseline. This is the distance between the face of backwall/end of slab and the centerline of pier/bent, centerline to centerline of pier/bent and from the centerline of pier/bent to the face of backwall/end of slab.
- Provide the perpendicular dimension between the face of backwall/end of slab and the line through centers of bearing.
- Provide the perpendicular dimension between the centerline of pier/bent to the line through centers of bearing.

❖ Framing Plan - Rolled Beams

- Provide the spacing of the beams as shown on the transverse section.
- Provide dimensions along the line through centers of bearing.
- Provide the dimensions between the intersection of the face of backwall/end of slab and centerline/baseline to the intersection of the line through centers of bearing and the centerline of beam for each abutment.
- Provide the dimensions between the intersection of the centerline of pier/bent and the centerline/baseline to the intersection of the line through centers of bearing and the centerline of beam for each pier/bent. The dimensions shall be provided for each span at the pier/bent.
- Provide the dimensions for the remaining beams along the line through centers of bearing.
- Show and label the connector plates and bearing stiffeners (if applicable).
- Show and label the end diaphragms along the line through centers of bearing. (Volume V-Part 2, File No. 07.21-1 and -2).
- The connector plates shall be parallel to the line through centers of bearing up to and including a 20º skew. Over a 20º skew they shall be perpendicular to the centerline of beam. Provide a detail showing the bent plate for the connection between the connector plate and the diaphragms.
- Show, label and provide spacing of intermediate diaphragms and connector plates.

Framing Plan Sheet (Continued):

- The intermediate diaphragms shall be parallel to the line through centers of bearing up to and including a 20º skew. Over a 20º skew the diaphragms shall be perpendicular to the centerline of beam.
- Provide a dimension to the centerline of splice along the centerline/baseline from the intersection of the centerline of pier/bent and the centerline/baseline (if applicable).
- Label each line of splices (if applicable).
- Diaphragm connection plates shall be located to clear the edge of the splice plate by 1'-0" (300mm).
- Provide a dimension from the centerline of splice to the nearest connection plate.
- Ensure the bearing stiffener plate does not interfere with the bearing anchor bolts.

❖ Framing Plan - Plate Girders

- Provide the spacing of the girders as shown on the transverse section.
- On a non-skewed bridge this spacing will be perpendicular to the centerline/baseline.
- Provide girder spacing dimensions along the line through centers of bearing.
- Provide the dimensions between the intersection of the face of backwall/end of slab and centerline/baseline to the intersection of the line through centers of bearing and the centerline of girder for each abutment.
- Provide the dimensions between the intersection of the centerline of pier/bent and the centerline/baseline to the intersection of the line through centers of bearing and the centerline of girder for each pier/bent. The dimensions shall be provided for each span at the pier/bent unless typical; then they can be shown once.
- Provide the dimensions to the remaining girders along the line through centers of bearing.
- Show and label the cross frame connection plates, transverse intermediate stiffeners and bearing stiffeners.
- Indicate the size of the cross frame connection plates, transverse intermediate stiffeners and bearing stiffeners
- Provide the spacing of the transverse intermediate stiffeners.
- Transverse intermediate stiffeners shall be perpendicular to the centerline of girder.
- Provide the spacing of the cross frames.
- End cross frames shall be oriented along the line through centers of bearings.
- The intermediate cross frames shall be parallel to the line through centers of bearing up to and including a 20º skew. Over a 20º skew the cross frames shall be perpendicular to the centerline of girder.
- Label the cross frames in accordance with the naming nomenclature used on the cross frame standard sheets (Volume V-Part 3) BCF-1, BCF-2 & BCF-3 or MBCF-1, MBCF-2 & MBCF-3.
- Provide a dimension to the centerline of splice along the centerline/baseline from the intersection of the centerline of pier/bent and the centerline/baseline (if applicable).
- Label each line of splices (if applicable).
- Cross frame connection plates shall be located to clear the end of the splice plate by 1'-0" (300mm).
- Provide a dimension from the centerline of splice to the nearest connection plate.

❖ Framing Plan – Prestressed Beams

- Provide the spacing of the beams as shown on the transverse section.
- Provide dimensions along the line through centers of bearing.

Framing Plan Sheet (Continued):

- Provide the dimensions between the intersection of the face of backwall/end of slab and centerline/baseline to the intersection of the line through centers of bearing and the centerline of beam for each abutment.
- Provide the dimensions between the intersection of the centerline of pier/bent and the centerline/baseline to the intersection of the line through centers of bearing and the centerline of beam for each pier/bent. The dimensions shall be provided for each span at the pier/bent.
- Provide the dimensions for the remaining beams along the line through centers of bearing.
- Show and label the end, intermediate and closure diaphragms (if applicable).
- Provide the spacing of the intermediate diaphragms.
- End diaphragms shall be cast-in-place concrete in accordance with the details shown in Volume V-Part 2, File No. 07.39-2.
- Provide details of the cast-in-place end diaphragms.
- Intermediate cross frames shall be steel. Details of the steel cross frames can be found on standard sheets (Volume V-Part 4) PCB-D3, PCB-D4, PCBT-D1 & PCBT-D2 along with their related notes to designer.
  - When utilities located on the bridge cannot be accommodated by the steel cross frames intermediate cast-in-place concrete diaphragms shall be utilized.
- Provide details of cast-in-place intermediate diaphragms (if applicable).
- Provide closure pour details for prestressed beams made continuous for live load.
- End and closure diaphragms (if applicable) will have to be modified to allow the utility to pass through.

❖ Utilities supported by stringers

- Show, label and locate the centerline of all utilities supported by the bridge.
- Provide the pipe diameter along with the type of utility (e.g. water, sewer, gas, etc.).
- Provide number of conduits.
- Label conduits to the type of utility (e.g. telephone, cable TV, electric power line, etc.).
- Utilities shall preferably be located in the outside bay unless otherwise directed by the utility company involved.
- Show and provide the spacing of the utility supports.
- Ensure the utilities can pass through the type of cross frame/diaphragms proposed for the bridge.

❖ Notes

- Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1)

STAGE II – PLAN REVIEW CHECKLIST

Standard Sheets:

❖ General comments for all standard sheets

- Standards provided by the VDOT Structure and Bridge Division shall be used whenever possible. Standards are located in the Manual of the Structure and Bridge Division in the following volumes.
  - Volume V - Part 3 Current Details
  - Volume V – Part 3 Current Details (Metric)
  - Volume V - Part 4 Prestressed Concrete Beam Standards
  - Volume V - Part 5 Prestressed Concrete Slab Standards
  - Volume V - Part 7 Steel Plate Girder Standards
  - Volume V – Part 7M Steel Plate Girder Standards (Metric)
- Standard sheets shall be used as provided by the Department.
- Copyright dates are not to be changed. The copyright date is not to be changed even when the sheet is modified.
- Changes to Standard Sheets (other than filling in tables)
  - Provide the terminology "(Modified or MOD.)" to the outside left border of sheet immediately adjacent to the standard name.
  - The current standard name and date shall remain on the sheet's left border.
  - Change the initials for "Designed", "Drawn" and "Checked" from S&B Div. to the individual's initials responsible for the modifications.
  - Edit the standard designation that may be located in the "Plan No." space, to reflect the current plan number.
- Any views shown on the standard sheet shall remain on the sheet even if it does not apply to the design.
- Do not line through views that do not apply. A note may be appropriate on some occasions.
- The designer is to assure all details, specification references, spelling, etc. are correct prior to finalizing the set of plans. Discrepancies shall be brought to the attention of the Structure and Bridge project manager.
- Verify that the correct standards, such as approach slabs and bridge conduit/future lighting, are being used in the set of plans.

❖ Approach Slabs BAS-11 thru BAS-20 series and BAS-11A thru BAS-20A series

- Ensure the appropriate standard is being used based on the skew and the type of roadway surface on the approach roadway.
- Sheets must be modified when used in conjunction with integral backwalls and abutments. (Volume V-Part 2 File Number 11.02-8)
- Verify the design of the approach slab when using a sleeper pad for support.
- The sleeper pad detail must be incorporated into Section B-B.
- Sleeper pad reinforcing steel shall be shown, labeled and the spacing provided in section B-B.
- Provide a detail of the sleeper pad in the Plan View.
- Reinforcing steel in the sleeper pad shall be shown, labeled and spacing provided in the Plan View.
- A section through the sleeper pad showing the preformed elastomeric joint sealer dimensions shall be provided.
- A detail of the retainer block located on each side of the sleeper pad shall be added.

Standard Sheets (Continued):

- Additional notes relating to the elastomeric joint sealer shall be added.
- Add the sleeper pad reinforcing steel to the reinforcing steel schedule.
- Add the sleeper pad reinforcing steel bending diagrams to bending diagram.
- Modify the estimated quantity table. Show the Class A4 (Class 30) concrete and reinforcing steel quantities in the approach slab and the sleeper pad on separate lines. Add a quantity column for the preformed elastomeric joint sealer. Be sure to include the sealer size. Show sealer as a plan quantity.
- Indicate the number of approach slabs include in the quantities provided.

❖ Cross Frame Details BCF-1 thru BCF-3

- Verify the numbers of bolts provided in the connections are sufficient for each bridge design.
- All curved girder structures require the cross frames to have an independent design.
- Curved girder cross frames shall be designed as main members. If required, specify that cross frames must comply with Charpy V-Notch test requirements.
- Provide connection bolt spacing.
- Locate bolt group work point.
- Check chord and diagonal member sizes for non-curved bridges with girder spacing greater than 10-0” (3050mm).

❖ Telephone Conduit System BTC-4 thru BTC-8

- Circle the conduit configuration to be provided in the Under Conduit Formations table.
- Verify the type of conduit, PVC or FRE, required by the utility involved.

❖ Water Line System BWL-1 and BWL-2

- The standard drawings are detailed using ductile iron pipe, verify that this meets the requirements of the utility involved.

❖ Steel Plate Girder Standards

- When using one of the plate girder standards the original standard name and date is to remain as shown.
- When using the girder detail sheets such as SGDET1A do not delete dimension designations in the girder elevation. Place a dash on the table for the designated dimensions that are not used.
- Ensure the total of the dimensions shown in table for the top and bottom flanges equals the dimension shown for “L”.
- For skewed bridges, ensure that girder flanges clear face of backwall. Provide a detail showing the plan view of the flange with the required flange clip dimensions (if applicable).
- Provide a detail showing the typical shear stud connectors.

Standard Sheets (Continued):

- In the elevation view, provide the shear stud connector spacing for the entire girder. The spacing should be detailed to take into account splice lengths (if applicable).

- For intermediate transverse stiffener and connector plate details, refer to 07.21-3
  - Provide an intermediate transverse stiffener detail.
- Provide a bearing stiffener detail.
  - Ensure the bearing stiffener plate does not interfere with the bearing anchor bolts.
- Show drip plate detail and location (if applicable).
- Provide a connector plate detail.
- Provide a bearing stiffener detail.
- For rolled beam superstructures provide an end diaphragm detail.
- For rolled beam superstructures provide an intermediate diaphragm detail.

❖ Splice Detail Standard

- Provide splice details in accordance with Volume V Part 2 file number 07.26.
- Use VDOT economical splice location guidelines when determining change in plate thickness and/or width (Volume V-Part 2 File Number 07.27-1 and 2).
- When plate changes are to occur the thickness of the plate should be the governing dimension to be changed prior to the width of the plate changing

STAGE II – PLAN REVIEW CHECKLIST

Pier Sheet:

Plan view, elevation, and end view should all be on same sheet if possible. All other views and sections can be on this sheet or following sheets as necessary.

❖ Plan View (Volume V-Part 2, File No. 07.17-1 thru -8)

- Follow the criteria for establishing the pier/bent cap length using Volume V-Part 2, file 07.17-5.
- The plan shall preferably be drawn at a 3/8" = 1'-0" (1:30 scale).
- Indicate the drawing scale.
- Locate the plan view at the top of the sheet.
- Show and label the centerline/baseline as shown on front sheet.
- Show and label "Line through centers of bearing".
- Provide the radius of curvature of the centerline/baseline (if applicable) and centerline of beams/girders.
- Provide the centerline/baseline station at the intersection with the centerline of pier.
- Show and label short or long chords (if applicable). In the case of long chords, provide the dimension between the chord and the centerline/baseline.
- Provide the skew angle between the centerline of pier/bent and the centerline/baseline/chord/line (if applicable).
- Show a north arrow.
- Dimension the pier cap length between the end cap radius points (if applicable).
- Indicate the end of cap radius (if applicable).
- Provide the pier cap out-to-out dimension.
- Provide a dimension from the end cap radius point (if applicable) or the end of cap (if square) to the intersection of the centerline pier/bent and the centerline/baseline.
- Dimension the centerline of beam(s)/girder(s) spacing along the line through centers of bearing. These dimensions should agree with the framing plan.
  - Provide a dimension from the intersection of the centerline of pier/bent and centerline/baseline to the intersection of the centerline beam/girder and the line through centers of bearing for the adjacent beam/girder on each side of the centerline/baseline.
  - Provide the spacing of the remaining beam(s)/girder(s) along the line through centers of bearing.
- Provide the skew angle between the line through centers of bearing and the centerline of beam(s)/girder(s) (to be used when the beam/girder skew angle is not typical).
- Dimension the length and width of the bearing pads. These dimensions can be shown once and labeled as typical (if applicable).
- Dimension the overall width of the cap.
- Dimension from the centerline pier/bent to each face of cap.
- Dimension from centerline pier/bent to line through centers of bearing.
- Show the anchor bolts. Can be shown on a separate detail and at a larger scale for clarity.
- Call-out anchor bolt diameter (e.g. 1" (25mm) diameter H.S. swedged anchor bolt).
- Provide a typical anchor bolt layout indicating the location of the anchor bolts from and along the centerline of pier/bent.
- Make sure that anchor bolts do not interfere with pier cap reinforcing steel. When necessary, provide a note instructing the contractor to adjust reinforcing steel to clear anchor bolts.
- Show the hidden outline of pier columns (if applicable).

Pier Sheet (Continued):

- Show, label and indicate spacing of end cap reinforcing steel.
- For bents show the hidden outline of the piles. Graphically indicate battered piles but do not provide the numerical pile batter.

❖ Elevation View (on piles)

- For general information, refer to (Volume V-Part 2, File No. 07.17-1 thru -8).
- Provide the elevation view directly underneath the plan view.
- The elevation view shall preferably be drawn at a 3/8" = 1'-0" (1:30) scale. In all cases the view shall be to the same scale as the plan view.
- Show the location of the cap section. Do not locate the section through a bearing pad.
- Provide elevations for each bearing pad.
- Provide elevations for each end of cap unless cap is level.
- Provide elevations at the bottom of footing.
- Show bearing pads with a minimum of 1" (25mm) above the top of cap.
- Extend the bottom of cap a minimum of 3" (75mm) beyond the outside face of column prior to starting the cantilever sloped portion.
- Provide the pier column size dimension. When the column sizes are identical, label once and call out as typical.
- Provide the dimension from the centerline of the pier column, located on each side of the centerline/baseline, to the centerline/baseline.
- Provide dimension(s) to the remaining pier column(s) from previously located columns.
- Show and label the centerline of each column.
- Dimension the footing thickness.
- Provide a bearing pad detail. The detail shall show, label and provide the spacing for the pad reinforcement. Show a section with re-bar through pad.
- Show and label the main reinforcing steel in the pier/bent cap. Hook bars if necessary.
- Show and label the temperature reinforcing steel in the face of the pier/bent cap.
- Show, label and provide spacing of end cap reinforcing steel.
- Show, label and provide spacing for cap stirrup reinforcing steel.
- Indicate the minimum lap length required for each spliced bar size. It is important to include the modifier for epoxy coated reinforcing steel (if applicable) (AASHTO 8.25.2.3). Alternate laps so that adjoining bars are not lapped in the same area.
- Avoid locating reinforcing steel splice locations at the maximum positive or negative moment regions.
- Show and label the main reinforcing steel in the pier column. This can be shown in one column if similar.
- Show and label the spiral/tie reinforcing steel in the pier column.
- Provide a dimension showing the minimum required embedment of the column vertical reinforcing steel into the pier/bent cap.
- Provide a dimension showing the minimum required embedment of the column vertical reinforcing steel into the pier/bent footing (if applicable). Hook bars if necessary.
- Show and label the reinforcing steel in the footing. The main footing reinforcement shall be hooked.
- Show and label the size and type of pile. This label can be referred as typical.
- Show the reinforcing steel projecting from the end of prestressed pile into footing. Label at one location and refer to as typical (if applicable).

Pier Sheet (Continued):

- Dimension the embedment of the pile into pier footing.
- Show the battered piles and provide the numerical batter designation.
- Main reinforcing steel is to be located over the top of the piles. Provide a dimension from the centerline of the main reinforcing steel to the top of piles.
- Show, label and provide spacing for longitudinal, transverse and temperature footing reinforcing steel.

❖ Elevation View (spread footing)

- Provide the elevation view directly underneath the plan view.
- The elevation view shall preferably be drawn at a 3/8" = 1'-0" (1:30) scale. In all cases the view shall be to the same scale as the plan view.
- Show the location of the cap section. Do not locate the section through a bearing pad.
- Provide elevations for each bearing pad.
- Provide elevations for each end of cap.
- Provide elevations at the top of each column, on high side, unless cap is level.
- Show bearing pads with a minimum of 1" (25mm) above the top of cap.
- Extend the bottom of cap a minimum of 3" (75mm) beyond the outside face of column prior to starting the cantilever sloped portion.
- Provide the pier column dimension size. When the column sizes are identical then label once and call out as typical.
- Provide the dimension from the centerline of the pier column, located on each side of the centerline/baseline, to the centerline/baseline.
- Provide dimension(s) to the remaining pier column (s) from previously located columns.
- Provide a dimension for the length along the high side of each column from bottom of cap to top of footing.
- Show a dimension from the top of cap, at each end of pier, to the top of footing of the outside columns.
- Show and label the centerline of each column.
- Dimension the footing thickness.
- Provide a bearing pad detail. The detail shall show, label and provide the spacing for the pad reinforcement. Show a section with re-bar thru pad.
- Show and label the main reinforcing steel in the pier/bent cap. Hook bars if necessary.
- Show and label the temperature reinforcing steel in the face of the pier/bent cap.
- Show, label and provide spacing of end cap reinforcing steel.
- Indicate the minimum lap length required for each spliced bar size. It is important to include the modifier for epoxy coated reinforcing steel (if applicable) (AASHTO 8.25.2.3). Alternate laps so that adjoining bars are not lapped in the same area.
- Avoid locating reinforcing steel splice locations at the maximum positive or negative moment regions.
- Show and label the main reinforcing steel in the pier column.
- Show and label the spiral/tie reinforcing steel in the pier column. This can be shown in one column if similar.
- Provide a dimension showing the minimum required embedment of the column vertical reinforcing steel into the pier/bent cap.
- Provide a dimension showing the minimum required embedment of the column vertical reinforcing steel into the pier/bent footing (if applicable). Hook bars if necessary.

Pier Sheet (Continued):

- Show and label the reinforcing steel in the footing. The main footing reinforcement shall be hooked and located at bottom of footing.
- Show, label and providing spacing for longitudinal, transverse and temperature footing reinforcing steel.
- Footing reinforcement shall be located dimensionally from the top and bottom face of footing respectively.
- Detail vertical column reinforcing steel for an additional 2'-0" in length. The specifications allow the contractor to adjust the bottom of footing elevation by 2'-0" (600mm). Ensure the reinforcing steel is detailed in such a way as not to cause construction problems.

❖ Elevation View (pile bent)

- Provide the elevation view directly underneath the plan view.
- The elevation view shall preferably be drawn at a 3/8" = 1'-0" (1:30) scale. In all cases the view shall be to the same scale as the plan view.
- Show the location of the cap section. Do not locate the section through a bearing pad.
- Provide elevations for each bearing pad.
- Provide elevations for each end of cap.
- Show bearing pads with a minimum of 1" (25mm) above the top of cap.
- Extend the bottom of cap a minimum of 3" (75mm) beyond the outside face of exterior pile prior to starting the cantilever sloped portion.
- Provide the dimension from the centerline of the pile to the centerline/baseline for the piles adjacent to the centerline/baseline.
- Provide dimension(s) for the remaining pile spacing.
- Show and label the centerline of piles (e.g. "Centerline of 24" (600mm) prestressed concrete pile").
- Provide a bearing pad detail. The detail shall show, label and provide the spacing for the pad reinforcement.
- Show and label the main reinforcing steel in the pier/bent cap.
- Show and label the temperature reinforcing steel in the face of the pier/bent cap.
- Show, label and provide spacing of end cap reinforcing steel.
- Indicate the minimum lap length required for each spliced bar size. It is important to include the modifier for epoxy coated reinforcing steel (if applicable) (AASHTO 8.25.2.3).
- Avoid locating reinforcing steel splice locations at the maximum positive or negative moment regions.
- Show and label the size and type of pile. This label can be referred as typical.
- Show the reinforcing steel projecting from the end of prestressed pile into footing. Label at one location and refer to as typical (if applicable).
- Dimension the embedment of the pile into bent cap.
- Show the battered piles and provide the numerical batter designation.

❖ Elevation View (bridge over railroad -Volume V-Part 2 file 02.01-19 & 20 and 07.17-7)

In addition to items shown for pier on piles and/or on spread footings the following items need to be addressed for railroad crossings.

- Provide a crash wall when there is less than 25'-0" (7620mm) horizontal clearance between the main or passing track centerline and the face of pier column.

Pier Sheet (Continued):

- Crash walls shall be detailed on the pier elevation view.
- Crash walls shall match the appropriate railroad crash wall criteria.
- The minimum crash wall thickness shall be indicated.
- Provide the dimension from the face of exterior column to the face of crash wall.
- Show, label and provide spacing of crash wall reinforcing steel.
- Do not show all reinforcing steel. Provide only the outside bars in the bar series or show separate detail.
- Provide a section through the crash wall.
- Pier footings that require shoring for excavation adjacent to the railroad shall show the shoring in the elevation view. Separate details may be required to provide the level of detail necessary for the shoring design.
- Shoring details shall be provided (if applicable)
  - Provide a dimension from the centerline of track to face of shoring excavation.
  - Provide the plan and elevation view of the proposed shoring.
  - Show location of proposed footing on the plan view.
  - Show and label all structural components.
  - Provide the size of all structural components.
  - Provide safety railing around excavation.
  - Provide all connection details (if applicable).
  - Locate waler locations (if applicable).
  - Locate ground water elevation.
  - Provide pay limits.

❖ Typical Footing Plan (Does not apply to pile bents)

- Footings on piles
  - The plan shall preferably be drawn at a 3/8” = 1’-0” (1:30) scale.
  - Indicate the drawing scale.
  - When multiple identical footings exist for a pier the designer needs only to detail one (1) footing. A note shall be provided indicating the detailed footing is typical.
  - Show and label the centerline/baseline as shown on front sheet.
  - Provide the radius of curvature of the centerline/baseline (if applicable).
  - Show and label short or long chords (if applicable).
  - Show a dimension along the centerline of pier from the intersection of the centerline of pier and centerline/baseline to the intersection of centerline of pier and the common chord (if applicable).
  - Provide the skew angle between the centerline of pier and the centerline/baseline/chord/line (if applicable).
  - Show a north arrow.
  - Label the centerline of pier and centerline of column.
  - Provide dimensions for the overall length and width of footing.
  - Provide dimensions from the centerline of pier/footing to the face of footing.
  - Provide dimensions from centerline of column to each face of footing.
  - Label the type and size of piles.
  - Dimension the location of the rows of piles. This dimension shall be from the intersection of the centerline of pier and the centerline/baseline to the adjacent pile row.
  - Provide the pile spacing in both the transverse and longitudinal directions.

Pier Sheet (Continued):

- Provide the distance from centerline pile to outside face of footing. If distance is the same on all faces show at one location and label as typical.
- Designate which piles are battered and provide the direction of batter.
- Show, label and provide the spacing of the reinforcing bars in the footing.
- Provide the distance from centerline of outside most reinforcing bars to faces of footing.
- Designate test pile (if applicable).

▪ Spread footings
- The plan shall preferably be drawn at a 3/8” = 1’-0” (1:30) scale.
- Indicate the drawing scale.
- When multiple identical footings exist for a pier the designer needs only to detail one (1) footing. A note shall be provided indicating the detailed footing is typical.
- Show and label the centerline/baseline as shown on front sheet.
- Provide the radius of curvature of the centerline/baseline (if applicable).
- Show and label short or long chords (if applicable).
- Show a dimension along the centerline of pier from the intersection of the centerline of pier and centerline/baseline to the intersection of centerline of pier and the common chord (if applicable).
- Provide the skew angle between the centerline of pier and the centerline/baseline/chord/line (if applicable).
- Show a north arrow.
- Label the centerline of pier and centerline of column.
- Provide dimensions for the overall length and width of footing.
- Provide dimensions from the centerline of pier/footing to the face of footing.
- Show, label and provide the spacing of the reinforcing bars in the footing.
- Provide the distance from centerline of outside most reinforcing bars to faces of footing.

❖ End View

- The end view shall preferably be drawn at a 3/8” = 1’-0” (1:30) scale.
- Should be located directly adjacent to the Plan and Elevation View.
- Indicate the drawing scale.
- Indicate the centerline of pier.
- Dimension width of cap.
- Provide cap dimensions from the centerline of pier to each face of cap.
- Show only the outside most bearing pad.
- Provide the dimension from face of column to face of cap (1” (25mm) minimum).
- Show piles, including battered piles (if applicable).
- Provide the numerical batter designation (if applicable).

❖ Typical Section of Column (Volume V-Part 2, File No. 07.17-1)

- Does not apply to bents.
- The section shall preferably be drawn at a 3/4” = 1’-0” (1:20) scale.
- Provide the size of the column. The minimum column width is 3’-0” (900mm).
- Show and label vertical and spiral/tie bars in the column section.

Pier Sheet (Continued):

- Provide dimension from centerline of vertical reinforcing bars to outside face of column.
- Show concrete sectioning.

❖ Section through pier/bent cap (Volume V-Part 2, File No. 07.17-1)

- The section shall preferably be drawn at a 3/4" = 1'-0" (1:20) scale.
- Indicate the centerline of pier.
- Locate the main reinforcing steel so a minimum 1" (25mm) clearance is maintained between edge of anchor bolts and the edge of the main reinforcing steel.
- Provide the dimension from centerline of outside main reinforcing bars to outside faces of cap.
- Show splices in stirrup bars at the center of section using 90˚ bends rather than 135˚ hooks.
- Show, label and provide reinforcing steel spacing.
- Dimension the cap width and height.
- Provide dimensions from centerline pier/bent to both faces of cap.
- Show concrete sectioning.

❖ Typical Anchor Bolt Layout

- The layout shall preferably be drawn at a 3/4" = 1'-0" (1:20) scale.
- Show the complete bearing pad.
- Show and label the centerline of pier, line through centers of bearing and centerline of beam/girder.
- Provide perpendicular dimensions between centerline of pier and line through centers of bearing.
- Provide the overall pad width.
- Provide dimensions to each anchor bolt (both parallel and perpendicular to line through centers of bearing) from the intersection of the line through centers of bearing and the centerline of beam/girder.

❖ Notes

- Add the note "*When finishing concrete between and beyond the pads, float surface to drain from centerline pier/bent to edges of cap*" to all pier/bent plan & elevation sheets.
- Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1)
- When required, add the note "The pier seat elevations were determined based on the bearing heights shown on the Bearing Sheets. If different bearing heights are used, the Contactor shall adjust the seat elevations."

STAGE II – PLAN REVIEW CHECKLIST

Abutment Sheet:

The typical abutment detail sheets should contain the Plan and Elevation views and if possible the section through the abutment on one sheet. Additional sheets should be added as required for the Footing Plan, Wingwalls and miscellaneous sections and details.

❖ Plan View

- The plan view shall preferably be drawn at a 3/8" = 1'-0" (1:30) scale.
- Indicate the drawing scale.
- Locate the plan view at the top of the sheet.
- Show and label the centerline/baseline as shown on front sheet.
- Provide the radius of curvature of the centerline/baseline (if applicable) and centerline of beams/girders.
- Show and label short or long chords (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the centerline/baseline/chord/line (if applicable).
- Provide a dimension from the intersection of the centerline/baseline and the face of backwall/end of slab to the intersection of the face of backwall/end of slab to the exterior face of wingwall (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the face of wingwall (if applicable).
- Provide section marks for wingwall views (if applicable).
- Show a north arrow.
- Show and label the face of backwall/end of slab.
- Show and label the line through centers of bearing.
- Provide the station at the intersection of face of backwall/end of slab and the centerline/baseline.
- Show and label the centerline of beam(s)/girder(s).
- Provide a dimension from the intersection of the face of backwall/end of slab and centerline/baseline to the intersection of the centerline beam/girder and the line through centers of bearing for each beam/girder on each side of the centerline/baseline.
- Provide the spacing of the remaining beam(s)/girder(s) along the line through centers of bearing. These dimensions should agree with the framing plans.
- Provide the skew angle between the line through centers of bearing and the centerline of beam(s)/girder(s) (to be used when the beam/girder skew angle is not typical).
- Dimension the length and width of the bearing pads. These dimensions can be shown once and labeled as typical (if applicable).
- Provide a typical anchor bolt layout indicating the location of the anchor bolts from and along the line through centers of bearings. Can be shown on a separate detail and at a larger scale for clarity.
- Make sure that anchor bolts do not interfere with pier cap reinforcing steel. When necessary, provide a note allowing the contractor to adjust reinforcing steel to clear anchor bolts.
- Provide a dimension from the line through centers of bearing to the face of backwall/end of slab.
- Provide dimensions perpendicular to the face of backwall/end of slab for the footing, approach slab seat, backwall and seat widths.
- Provide overall perpendicular dimension of the footing.

Abutment Sheet (Continued):

- Provide dimensions along the face of backwall/end of slab from the intersection of the centerline/baseline and face of backwall/end of slab to the face of curbs. When the abutment is skewed, provide dimensions to the joint break points.
- Provide dimensions for stepped seats and/or footings (if applicable).
- Provide a concrete block (chamfer), at a 45˚ angle, between the back face of backwall and the back face of the wingwall. The minimum dimensions for the concrete block are 12" (300mm) along the back face of the wingwall and backwall. The concrete block shall extend from the top of approach slab seat down to the top of footing. The concrete block shall be reinforced using #4(imperial)/#13(metric) (min.) for the vertical reinforcing steel and #5(imperial)/#16(metric) (min.) for the horizontal reinforcement steel. The vertical and horizontal reinforcing steel shall be shown and labeled in the plan view. The horizontal bars can be hooked or bent to provide development into the wingwall and backwall.
- Provide the elevations along the face of backwall/end of slab where the cross slope changes. As a minimum, elevations shall be provided at the face of curbs, the centerline/baseline and joint break points (if applicable). When the elevation varies between the back face of the backwall and the face of backwall by ¼" (6mm) provide elevations along both faces of the backwall.
- Show and label the pipe underdrain as a hidden line (if applicable). The pipe underdrain shall extend to the surface of the fill.
- Show direction of water flow in pipe underdrain (if applicable).
- Show the hidden outline of weep holes through the abutment backwall (if applicable).
- Provide dimensions to locate the centerline of weep holes from the intersection of the centerline/baseline and the face of backwall/end of slab (if applicable).
- Show wingwalls along with pertinent dimensions. If the skew angle of the wingwalls is different than that shown for the centerline/baseline these skew angles should be shown.
- Show and label utilities that pass through the backwall. Dimension the utility location from the intersection of the centerline/baseline and the face of backwall/end of slab to the centerline of utility.

❖ Elevation View

- The Elevation View shall be drawn, where room permits, directly below the Plan View.
- Show and label the centerline/baseline.
- Provide dimensions along the face of backwall/end of slab from the intersection of the centerline/baseline and the face of backwall/end of slab to the face of curbs.
- Provide the overall out to out dimension.
- Provide the elevations along the face of backwall/end of slab where the cross slope changes. As a minimum, elevations shall be provided at the face of curbs, the centerline/baseline, joint break points (if applicable) and outside face of abutment.
- Provide elevations for each bearing pad.
- Provide elevations for top of seat.
- Provide bottom of footing elevation.
- Bearing pads shall be a minimum of 1" (25mm) in height.
- Show a ½" (12mm) wash between bearing pads.
- Show the location of the opening for utilities that pass through the backwall.
- Provide the elevation at bottom of the utility at the centerline of the opening.
- Show the weep holes (if applicable).

Abutment Sheet (Continued):

- Show the hidden outline of the pipe underdrain behind the abutment backwall (if applicable).
- Provide the direction of water flow in the pipe underdrain (if applicable).
- Show, label and provide the spacing for the horizontal reinforcing steel in the neatwork. Utilize cut lines were possible to avoid clutter.
- Locate horizontal reinforcing steel from the top of footing, top of backwall and top of seat.
- Indicate the minimum lap length required for each spliced bar size. It is important to include the modifier for epoxy coated reinforcing steel (if applicable) (AASHTO 8.25.2.3).
- Show and label all vertical reinforcing steel in footing, backwall and seat.
- Dimension the vertical bars in backwall from the intersection of centerline/baseline and the face of backwall/end of slab. In the event there is a construction joint in the backwall provide spacing to and from the centerline of the construction joint in addition to the intersection of centerline/baseline and the face of backwall/end of slab.
- Locate vertical reinforcement in the face of seat in the same manner as that used in the backwall.
- Show piles (if applicable). For clarity provide only one pile on either end of the elevation view rather than showing all the piles.
- The footing reinforcement shall be omitted for clarity, a note shall be added indicating the reinforcing steel has been omitted for clarity.

❖ Pile Footing Plan

- The plan view shall preferably be drawn at a 3/8” = 1’-0” (1:30) scale.
- Show face of backwall with a phantom line. Label face of backwall.
- Indicate the drawing scale.
- Show and label the centerline/baseline as shown on front sheet.
- Provide the station at the intersection of centerline/baseline and face of backwall/end of slab.
- Provide the radius of curvature of the centerline/baseline (if applicable) and centerline of beams/girders.
- Show and label short or long chords (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the centerline/baseline/chord/line (if applicable).
- Provide a dimension from the intersection of the centerline/baseline and the face of backwall/end of slab to the intersection of the face of backwall/end of slab to the exterior face of wingwall (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the face of wingwall (if applicable).
- Show a north arrow.
- Provide dimensions from the face of backwall/end of slab and the face of footing.
- Provide overall dimension of the footing.
- Provide dimensions for the length of footing from the intersection of the face of backwall/end of slab and the centerline/baseline to each face of footing.
- Show piles and label as to size and type.
- Designate which piles are battered and provide the direction of batter.

Abutment Sheet (Continued):

- Provide dimensions from the centerline of each pile row to the face of backwall/end of slab and a dimension from intersection of centerline/baseline and face of backwall/end of slab to the first piles on each side of the centerline/baseline. Provide the number of piles and spaces in order to locate the remaining piles.
- Show, label and provide the spacing of the reinforcing bars in the footing.
- Provide a #8(imperial)/#25(metric) reinforcing bar longitudinally in the top and bottom corners of the footing.
- Show and label the longitudinal and transverse reinforcing steel in the bottom of footing between the piles.
- Designate test pile (if applicable).
- Locate the bottom longitudinal and transverse reinforcing steel from the centerline of pile.
- Provide the spacing of the bottom transverse reinforcing steel between the piles rows. If the spacing of the piles is the same the entire length of footing the spacing can be shown once and labeled as typical.
- Provide the spacing of the bottom longitudinal reinforcing steel.
- Show and label the longitudinal and transverse reinforcing steel in the top of footing.
- Locate the top longitudinal and transverse reinforcing steel from the face of footing.
- Provide the top longitudinal and transverse reinforcing steel spacing.
- Indicate the minimum lap length required for each spliced bar size.
- Provide two (2) transverse and two (2) longitudinal #6(imperial)/#19(metric) reinforcing steel bars over the top of the piles.
- Provide a “U” shaped #6(imperial)/#19(metric) reinforcing bar around each pile and extend toward center of footing. When multiple rows of piles are used the front row bars should lap with the back row bars and a minimum lap length provided. When the rows of piles do not align these bars should be detailed as extending a distance equal to the required development length past the centerline of pile.

❖ Spread Footing Plan

- The plan view shall preferably be drawn at a 3/8” = 1’-0” (1:30) scale.
- Show face of backwall with a phantom line. Label face of backwall.
- Indicate the drawing scale.
- Show and label the centerline/baseline as shown on front sheet.
- Provide the station at the intersection of centerline/baseline and face of backwall/end of slab.
- Provide the radius of curvature of the centerline/baseline (if applicable).
- Show and label short or long chords (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the centerline/baseline/chord/line (if applicable).
- Provide a dimension from the intersection of the centerline/baseline and the face of backwall/end of slab to the intersection of the face of backwall/end of slab to the exterior face of wingwall (if applicable).
- Provide the skew angle between the face of backwall/end of slab and the face of wingwall (if applicable).
- Show a north arrow.
- Provide dimensions from the face of backwall/end of slab and the face of footing.
- Provide overall dimension of the footing.
- Provide dimensions for the length of footing from the intersection of the face of backwall/end of slab and the centerline/baseline to each face of footing.

Abutment Sheet (Continued):

- Show and label the face of backwall/end of slab and provide a dimension from it to the front and back of the footing.
- Provide a #8(imperial)/#25(metric) reinforcing bar longitudinally in the top and bottom corners of the footing.
- Locate the top and bottom longitudinal and transverse reinforcing steel from each face of footing.
- Indicate the minimum lap length required for each spliced bar size.

❖ Typical Anchor Bolt Layout

- Use if details are not included on plan view.
- Show a section thru pad.
- The layout shall preferably be drawn at a 3/4" = 1'-0" (1:20) scale.
- Show the complete bearing pad.
- Show and label the face of backwall/end of slab, line through centers of bearing and centerline of beam/girder.
- Provide dimension between face of backwall/end of slab and line through centers of bearing.
- Provide the overall pad width.
- Provide dimensions to each anchor bolt (both parallel and perpendicular to line through centers of bearing) from the intersection of the line through centers of bearing and the centerline of beam/girder.

❖ Section through abutment

The section is not to be taken through a bearing pad location.

- Neatwork
  - The section view shall preferably be drawn at a 3/8"=1'-0" (1:30) scale.
  - Locate section between bearing pad locations.
  - Show adjacent bearing pad.
  - Show and label "Line through centers of bearing".
  - Show and label Face of backwall/End of slab.
  - Provide dimensions for the footing, approach slab seat, backwall and seat widths.
  - Provide dimensions from face of backwall/end of slab to outside faces of footing plus the overall width of footing.
  - Show and dimension the ½" (15mm) wash. This may have to be exaggerated in order to see it clearly.
  - Provide a dimension from face of backwall/end of slab to line through centers of bearing.
  - Dimension the height of approach slab seat. When giving this dimension make sure the approach slab does or does not have an asphalt concrete overlay.
  - Show, label and dimension width and height of porous backfill (if applicable).
  - Show and label pipe underdrain (if applicable).
  - Show and label weep hole and invert elevation at face of seat (if applicable).
  - Indicate location and elevation of backwall permissible construction joint (if applicable).
  - Show and label shear key requirements at construction joints.

Abutment Sheet (Continued):

- Show and label expansion joint forming requirements at the top of backwall (if applicable).
- Show, label and provide spacing of reinforcing steel.
- Locate reinforcing steel from the top of backwall, top of seat and top of footing.
- Indicate the minimum lap length required for each spliced bar size (if applicable).

▪ Pile Footing
- Show piles and label the centerline as to type and size of pile.
- Provide the distance between the rows of piles and the distance from centerline of pile to edge of footing.
- Show the reinforcing steel projecting from the end of prestressed pile into footing. Label at one location and refer to as typical (if applicable).
- Dimension the embedment of the pile into footing.
- Show the battered pile(s) and provide the numerical batter designation.
- Dimension the minimum embedment length of the neatwork vertical reinforcing steel into the footing.
- Show, label and provide spacing of reinforcing steel.
- Provide the dimension between centerline of reinforcing bars and the outside face of footing.
- Dimension footing thickness.

▪ Spread Footing
- Dimension the minimum embedment length of the neatwork vertical reinforcing steel into the footing.
- Show, label and provide spacing of reinforcing steel.
- Provide the dimension between centerline of reinforcing bars and the outside face of footing.
- Dimension footing thickness.

❖ Notes

▪ Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1)
▪ When required, add the note “The abutment seat elevations were determined based on the bearing heights shown on the Bearing Sheets. If different bearing heights are used, the Contactor shall adjust the seat elevations.”

Drilled Shaft Sheet:

❖ Elevation View of Drilled Shaft

- Provide the minimum required bearing capacity of the drilled shaft. This shall match the value provided in the general notes on the front sheet.
- Show the elevation at top of drilled shaft and the estimated elevation at the bottom of the drilled shaft.
- Show minimum diameter of the drilled shaft.
- Show the estimated elevation at the top and bottom of the permanent steel casing (if applicable).
- Show the rock socket at the bottom of the drilled shaft (if applicable).
- Show the estimated elevation at the bottom of rock socket (if applicable).
- Show the minimum length of the rock socket (if applicable).
- Show the diameter of the rock socket (if applicable).
- Use cut lines to break the elevation height (if necessary).
- Show and label the centerline of drilled shaft/centerline pier column.
- Show the pier column/footing using phantom line attributes.
- In cases where the steel casing is to be permanent it shall be shown on the plan details and noted that it is to be permanent. The method of payment for any required permanent casing shall be made clear on the plans.
- Provide information in tabular format when there are multiple drilled shafts on the project.
- Locate and label a permissible construction joint at the top of shaft.
- In the event of a stream crossing, where the casing is permanent, locate the permissible construction joint a minimum of 1'-6" (460mm) below top of casing.
- Provide distance above top of drilled shaft to the permissible splice location in the spiral-reinforcing bar. Add note stating any special requirements for this permissible splice.
- Show and dimension any required splices in the vertical reinforcement.
- Show a lap between the vertical reinforcement in the drilled shaft and the pier column. Show this minimum lap length in a table located on this detail sheet.
- Ensure the plans and special provisions are clear as to what items are included in the bid item for the drilled shaft(s).
- The class of concrete should be noted on the sheet. If tremie concrete is used, the limits should be shown in the elevation.
- Provide sections through the drilled shaft, including the steel casing if applicable, provide a section through shaft below the steel casing (if steel casing is used) and provide a section through the rock socket, if applicable.
- Show steel and concrete sectioning.
- Show and label all vertical reinforcing steel.
- Show and label the spiral reinforcing steel.
- Provide the minimum distance from the centerline of vertical reinforcement to the outer face of the concrete shaft.
- Show and locate required cross-hole sonic logging (CSL) tubes.
- Show and locate required temporary reinforcing cage stiffeners.
- When structure is built in coastal areas and pier column is spliced directly to drilled shaft, consider applicability of VDOT spec. 404.03(i) when setting location of construction joint.

Drilled Shaft Sheet (Continued):

- Pay Item Designation

  - Designate the limits of payment for the drilled shaft. (Depending on how the limits of payment are described in the Special Provisions, the drilled shaft(s) may be considered either “Classified” or “Unclassified”. When “Classified” designations are used, an attempt is made to distinguish between the types of material through which the shafts are placed (soil, weathered rock, bedrock, etc.). When “Unclassified” is used, no distinction is made between the various subsurface strata as far as the payment limits are concerned.)
  - When the pay item for the drilled shaft is per linear foot/meter and is all-inclusive, a reinforcing steel schedule and a bending diagram shall be provided on this sheet.
  - All items that are not included in the price bid for drilled shaft (e.g. Cross hole Sonic Logging tests) shall be included in the quantity table.

- Notes

  - Locate all notes at one location on sheet and number each one for easy reference in the drawing details. (See new 01.02-1)

STAGE II – PLAN REVIEW CHECKLIST

Reinforcing Steel Schedule Sheet:

- Department reinforcing steel program

  - The reinforcing steel program contained in our English (ereb) and Metric (mreb) MicroStation tool palettes shall be used to produce the reinforcing steel sheets.
  - Instructions on how to use these programs are contained in the Structure & Bridge Division Manual Volume VI-Part 4 Consultant Information File Number 45.02-1 through -12. These instructions are provided for the metric version of the program but can be utilized as a guide for the imperial version.

- Reinforcing Steel Schedule/Dimension Table

  - When placing the reinforcing steel bars for each structural unit in the schedule list all epoxy coated bars together with the heading "Epoxy Coated", list all galvanized bars with the heading "Galvanized" and the uncoated bars together with the heading "Uncoated". The quantity, in pounds (kilograms), for each type of bar of each unit shall be provided.
  - Galvanized reinforcing steel, that is to be listed in the reinforcing steel schedule, shall be shown separately as done with epoxy-coated reinforcement and a total quantity provided in the table. On the quantity sheet an "*", or other designation, shall be placed by the epoxy coated reinforcing steel callout shown for the structural unit containing the galvanized reinforcement. A note shall be added under the quantity table stating the quantity shown for epoxy coated reinforcing steel includes XXXX lbs. (kgs.) of galvanized reinforcing steel.
  - No other designation for epoxy coated or galvanized reinforcement shall be made other than that noted above.
  - The weight of reinforcement shown on this sheet shall be the actual weight of the reinforcement in each unit shown to the nearest pound/kilogram.
  - The weight of the reinforcing steel shown in the quantity summary table shall be rounded to the nearest 10 pounds (5 kilograms).
  - When using a variable bar dimension place the terminology "varies" in the column for the dimension that is to vary.
  - When using a variable bar, limit the number of varying dimensions to no more then two. If more are required, investigate using multiple lapped bars utilizing a fixed minimum lap length.
  - Verify the total number of a variable bars shown in this table with that of the number of bars of each length shown in variation table.
  - Deck transverse slab reinforcing bars shall be dimensioned as extending the full width of the deck (See Notes below).

- Dimension Variation Table

  - Verify all required information is shown in the table.
  - Verify the total number of reinforcing bars shown in the reinforcing steel schedule is divisible by the number of bars shown for each length.
  - Limit the number of variable dimensions to no more than two.

- Bending Diagram

  - Only the reinforcing bars referred to on each sheet shall be shown in this diagram.

Reinforcing Steel Schedule Sheet (Continued):

❖ Notes

- The following note shall be placed on all reinforcing steel schedule sheets:
  - *Dimensions in bending diagram are out-to-out of bars.*
- The following notes shall be placed on all reinforcing steel schedule sheets containing deck reinforcement:

  If fabrication of deck slab bars is not possible for the length detailed and multiple bars are required, bars shall have the least number of Class B splices possible. Splices shall be located approximately at points of contraflexure and splices in alternate bars shall be located in different bays.

  Straight bars (top and bottom) may be substituted for truss bars (SB Series) in the deck superstructure at no extra cost to the State.

- When the reinforcing steel program “ereb” or “mreb” is used all the above notes are placed on all sheets automatically and do not have to be modified.

STAGE II – PLAN REVIEW CHECKLIST

Geology Sheet:

- gINT format
  - The Materials Division and the Structure and Bridge Division agree to have all geology logs presented in gINT format. This format is the geotechnical database the Department has developed. Any other program used must be compatible with this system.
- Plan view requirement
  - Do not provide a plan view for locating the boring locations on geology sheets. The boring locations are to be shown on the substructure layout sheet.
- BC number
  - All geology sheets require a BC number to be shown on the sheet. The District geologist assigns the BC number. The BC number is located immediately above the title block on the sheet.
- Subsurface Information
  - The boring logs disclaimer shall be shown on each engineering geology sheet.
- Footing symbol
  - Show bottom of footing symbol adjacent to applicable boring logs.
- Electronic submittal
  - An electronic copy of the completed geology sheet shall be provided the geotechnical section of the Central Office Structure and Bridge Division.
- Plan sheet initials
  - Provide the following initials:
    - Designer – Individual who provided the geotechnical boring information.
    - Drawn – Individual who created the sheet
    - Checked – Individual who check the sheet for accuracy

Alternate Retaining Wall Sheet:

❖ Preparation of Alternate Retaining Wall Plans

- Review road plans and cross-sections to estimate approximate wall location, height and length of reinforced soil mass.

  - Check that the entire wall (including the reinforced mass) is located within the Department's right-of-way (R/W). If the wall is outside the R/W limits, determine if it is feasible to acquire additional R/W or underground easement.
  - Check if any utilities or obstructions located within the reinforced soil mass can be adequately accommodated within the requirements and limitations of the proposed systems allowed for construction.

- Review the geotechnical information [geotechnical reports, boring logs (geology sheets), laboratory test data. etc.] and estimate the location of the proposed bearing stratum.
- Perform bearing capacity calculations to determine the maximum allowable soil bearing capacity at the estimated bearing stratum.
- Determine the anticipated loading condition (level backfill, level backfill with traffic surcharge, sloping backfill or sloping backfill with traffic surcharge, etc.).
- Calculate the maximum bearing pressure that the wall will impose on the soil. If the maximum bearing pressure imposed by the wall is less than the maximum allowable soil bearing capacity calculated previously, the bearing pressure requirements are satisfied. (The maximum allowable soil bearing pressure must be stated on the plans.) (Maximum soil capacity is based on wall height so values will be in tabular form if there are multiple walls or if a single wall has a significant range of heights)
- Perform settlement calculations to determine total and differential settlements. In addition to the magnitude of settlement, an estimate of the time-rate of settlement shall be performed. Wick drains, surcharge loading or some other method of ground improvement may be required to limit post wall construction settlements to an acceptable amount. Check the angular distortions to determine if they appear to be within allowable limits according to AASHTO. Depending on the amount of anticipated settlement, the designer shall implement one of the following actions:

Settlement ≤ 3 inches (75mm)	No action required
Settlement between 3 inches (75mm) and 6 inches (150mm)	Provide vertical slip joints at intervals not exceeding 50 feet (15,240mm)
Settlement ≥ 6 inches (150mm)	Requires approval from State Structure and Bridge Engineer

- Evaluate whether a waiting period for installing coping, parapet, barrier, moment slab, piles, paving, etc. is required after wall completion.
- Calculate factors of safety with respect to overturning, sliding and global stability for the applicable loading conditions. If the factors of safety are greater than required, the overall stability requirements are satisfied.
- Evaluate the site for potentially deleterious environmental factors such as corrosive groundwater, seepage forces, stray currents, etc. which may adversely affect the wall.

STAGE II – PLAN REVIEW CHECKLIST

Alternate Retaining Wall Sheet (Continued):

- If all of the external stability issues described above (bearing pressure, settlement, overturning, sliding and global stability requirements) are satisfied, alternate walls may be used at this location. If any of the above is not satisfied, ground modification or a different type of retaining wall may be required.
- If an alternate wall is feasible, determine the wall geometry (stationing and offsets).
- Determine the top of wall elevations at intervals (stations) not exceeding 50 feet (15,240mm). This can be accomplished using roadway information such as road plans, profiles, cross-sections and the like. The top of wall shall be either the top of coping or the top of the moment slab (whichever is applicable).
- Determine the bottom of wall elevations at the same locations (stations) that the top-of-wall elevations were found in the previous step. Check that there is adequate embedment at the toe of the wall in accordance with AASHTO and that the embedment satisfies global stability requirements. The bottom of wall shall be taken to be the top of the leveling pad.
- Check that the top and bottom elevations of the wall determined in the two previous steps are within the limits assumed during the initial evaluation. If not, recalculate the bearing capacity, settlement and the factors of safety with respect to overturning, sliding and global stability to be sure that the external stability of the wall is adequate.
- Draw the Elevation View (or “Three-Line Drawing”) showing the top of wall, bottom of wall and the approximate finished grade adjoining the front face of the wall. Show the locations of all pipes and utilities that will be penetrating the wall or the panels so the selected alternate wall company can design for those conditions. The Department prefers the straight-line approach that illustrates the minimum wall embedment requirements. The selected wall company will step the wall as necessary so that the wall is below the minimum embedment line at all locations.
- Draw the Plan View. Show stationing, offsets, boring locations and all pipes and utilities in the vicinity of the wall.
- If required, rustication treatment and details shall be included on the drawings.
- Draw Typical Sections for all significantly different wall sections. For each section show the limits of payment, the required slope in front of the wall, the required slope of the backfill and all special loading conditions. The limits of payment shall be shown to extend from the top of the wall (top of coping or moment slab) to the bottom of the wall (top of the leveling pad).
- Calculate the surface area of the wall based on top and bottom wall elevations and show this quantity on the plans in “Square Feet” and as a plan quantity item. When required, the traffic barrier/parapet shall be listed as a separate payment item in Linear Feet (linear meter) and as a plan quantity item.
- The plans shall clearly indicate whether some method of ground improvement is required and the manner in which the Contractor will be paid for this work. If over-excavation and replacement is required, these items shall be listed as separate payment items [Undercut excavation, Cubic Yards (Cubic Meters)] and [Select Material Type I, minimum CBR of 30 tons (metric tons). The estimated limits of undercut and backfilling shall be indicated on the Elevation View and the Typical Sections.
- List the approved wall companies with their addresses and telephone numbers on the plans so the Contractor can contact them to request bids. Some projects have geometric constraints (e.g. walls that wrap around bridge abutments) that preclude the use of some wall systems. Wall systems that cannot conform to the geometrics of the project shall not be included on the plans as an allowable wall system.
- Place appropriate General Notes on the plans.

STAGE II – PLAN REVIEW CHECKLIST

Alternate Retaining Wall Sheet (Continued):

- When alternate retaining walls are utilized as wrap around abutments the moment slab design shall take into consideration the full width approach slab extending from the back of the abutment backwall and provide details for its incorporation.
- When alternate retaining walls are utilized as wrap around abutments the SF (SM) quantity for the wall should be listed in the bridge quantity table along with any undercut excavation and select backfill. Any parapet located on the moment slab shall be listed under Abutment Neat.