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11.1 General

The efforts of the Department are judged to a great extent by the clarity, neatness, and accuracy of its Contract Plans. It is the intent of the Department to require that all drawings meet the NHDOT standards which will produce clear, consistent, and effective plan sheets that have uniform appearance and information.

Designers and drafters are responsible for ensuring that these standards are implemented. The designer and the drafter together coordinate the scope of the detailing work involved in each project. Time needs to be allotted for checking plans for accuracy and consistency with the Bureau’s practice. Any deviation from these standards must be approved by the Bridge Design Administrator.

Similar bridge plans and details should be reviewed and kept as examples for maintaining consistent detailing practices for future projects. These examples should not be older than three years.

11.2 Graphic Guidelines

11.2.1 Line Styles

- All line styles shall follow the *NHDOT CAD/D Procedures and Requirements*.
- Dimension lines and grade elevations shall be placed to avoid the lines of the drawings/details as practicable.
- Intersecting dimension lines, extension lines, and leaders shall be broken.
- Callout arrows are placed under the first line or at the beginning or the end of the sentence and come off left or right.
- Place leader lines from notes between line one and two or at the beginning or end of the note blocks.
- Line styles shall be chosen so that the primary subject of the drawing is in a bold line style. [Example: Reinforcing Detail; the reinforcing bar shall be shown in a bold line style (MicroStation line weight of 3) and the masonry shall be shown in a lighter line style (MicroStation line weight of 1). See *NHDOT CAD/D Procedures and Requirements*].

```
\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{line_precedence_diagram.png}
\caption{Line Precedence Diagram}
\end{figure}
```

11.2.2 Character Styles

- All character styles (note and detail text, title text, sub-title text) shall be in accordance with the *NHDOT CAD/D Procedures and Requirements*.
- Lettering shall be in upper case.
- Text shall be oriented so as to be read from the bottom or right edge of the sheet.
11.2.3 Dimensioning

- All dimensioning shall be in accordance with the NHDOT CAD/D Procedures and Requirements.
- A dimension shall be shown once on a drawing. Duplication and unnecessary dimensions shall be avoided.
- All dimension figures shall be placed above the dimension line, such that they may be read from the bottom or the right edge of the sheet.
- Reinforcing bar clear cover need not be specified on the plans unless different from the “General Notes”.
- When details or structural elements are complex, utilize two details or drawings: one for dimensioning the structure and the other for reinforcing bar details.
- Dimensions that are 12 inches or more shall be displayed in feet and inches unless the item dimensioned is conventionally designated in inches (e.g., 18” pipe).
- Dimensions larger than 10 meters shall be shown in meters, otherwise use millimeters.
- Dimensions that are less than one inch over an even foot, the fraction shall be preceded by a zero (e.g., 3’-0 ¾”).
- Place dimensions outside the view. Examples of dimensioning placement are shown in Appendix 11.2-A1.

11.2.4 Graphic Symbols

- Graphic symbols shall be in accordance with the following:
  - The NHDOT CAD/D Procedures and Requirements Standard Cell Library
  - Structural steel shapes: See AISC Manual of Steel Construction.
  - Welding Symbols: See American Welding Society (AWS)
  - Hatching: See Appendix 11.2-A2 for examples.

11.2.5 Abbreviations

- Abbreviations shall only be used if the use aids the flow of the sheet.
- Abbreviations shall *not* be used in the text of notes unless they are conventional abbreviations, such as mm (millimeters) or HS bolt (high strength bolt).
- Because different words sometimes have identical abbreviations, words shall be spelled out where the meaning may be in doubt.
- A period shall be placed after abbreviations, except as listed in Appendix 11.2-A3.
- Apostrophes are usually not used. Exceptions: pav’t and req’d
- Abbreviations for plurals are usually the same as the singular.
- Abbreviations in titles shall be avoided.
- See Appendix 11.2-A3 for a list of abbreviations commonly used on bridge plan sheets.
11.2.6 Sheet Layout

- The standard bridge sheet format is 34 inches (864-mm) x 22 inches (559-mm) with the NHDOT Bridge Design border.
- Do not repeat typical features. Use “TYP” designations as much as practicable.
- Details, enlargements, and blowups shall be oriented the same as the original.
- North arrow shall be placed on all plan views.
- Related details shall be grouped together in an orderly arrangement (i.e., align details horizontally and vertically and draw to the same scale, if possible. An exception is an enlarged detail).
- Do not crowd the plan sheet with details.
- Layout the plan and profiles with stations increasing from left to right.
- The layout of the abutment and pier/bent bearings shall begin with Abutment A and increase as the stationing increases from left to right.
- The layout of the working points for the abutments and pier(s)/bent(s) shall be oriented so that they increase from left to right as the structure is being faced. See Appendix 11.2–B1 for a survey layout sample. Working points for pier(s)/bent(s) shall be numbered consecutively beginning from the highest numbered working point at Abutment A.
- The layout of superstructure beams/girders shall begin with G #1 and increase from left to right on the Typical Deck Section, looking upstation.

11.2.7 Scale

- When selecting a scale, whether SI units or Metric, keep in mind that the drawing will be reduced to a half scale. The full size scale must be compatible with a usable scale on a half-size drawing (See Appendix 11.2-A4 for drawing scales).
- Generally, the minimum scale for a section detail with reinforcement is 1/4” = 1'-0”.
- The minimum metric scale shall be at least 1:50.
- Care shall be taken that all structural elements are accurately drawn to scale.
- The contract plan sheets are not to be used for measurements in the field. They shall be drawn using scales that can be found on a standard architectural or engineering scale.
- Sections and views may be enlarged to show more detail, but the number of different scales used shall be kept to a minimum.
- Verify legibility when the drawings are reproduced to an 11x17-in. (279x432-mm) print.

11.2.8 Title Block

- The Bridge Design title block is part of the Bridge Design Border for the plan sheet and is a graphic cell file as shown in the NHDOT CAD/D Procedures and Requirements.
- The title block consists of town name(s), bridge number(s), state project number, location(s), plan sheet title, bridge sheet number, total bridge sheet number, plan sheet
number, total plan sheet number, file number, federal project number, and initials of
designer, checker, and drafter.

- The title text style used shall follow the guidelines in the *NH DOT CAD/D Procedures
  and Requirements*.

- The project information in the title block shall be written the same as that listed in the
  project database through the Bureau of Planning and Community Assistance.

### 11.2.9 Revisions

- Revisions made to the contract plans (electronic and paper) shall be made as noted in
  Chapter 1, Section 1.3.5, Contract Plan Changes (Revisions After Proposal & As-Builts).

### 11.2.10 Miscellaneous

- Do not detail a bridge element in more than one location. If the element is changed
  there is a danger that only one of the details is updated.

- Centerline callouts shall be normal to the line itself.

- Show dead load camber, and dead load and live load deflections to the nearest 1/16-in.
  (2-mm).

- Do not provide a plan showing the location of construction signs (permanent or temporary).
  Only provide a table stating the description and quantity. If the project has a detour, then a plan
  showing the location of the signs is required, along with a table indicating the description and
  quantity.

- The skew angle is angle measured from the CL of bearing to a line perpendicular to the
  CL of construction. See Figure 11.2.10-1.

- The angle of crossing is the angle measured from the CL of construction to the CL of
  bearing or from the CL of construction to the CL of the road below.

![Skew Angle](Figure 11.2.10-1)
11.3 Plans for Public Meetings

11.3.1 General

- Plans for Public Informational/Officials Meetings and Public Hearings shall be developed and drafted in accordance with NHDOT standards, and the Project Manager and/or Senior Project Engineer’s guidance.

- The public meeting base plan typically includes the existing survey detail, existing and proposed right-of-way information, proposed alignment and work, and shall be colored according to the NHDOT Legend as shown in the Highway Design Manual, Chapter 2, Appendix 2-10 (See Appendix 11.3-A1 for the color legend).

- The scale for a public meeting base plan can vary depending on the length of the project. A bridge-only project base plan typically uses a 1” = 20’ (1:250 metric) scale. A base plan that includes highway work typically uses a 1” = 50’ (1:500 metric) scale.

- As an alternative to the base plan or as an additional plan, the public meeting base plan can use aerial photography with the proposed work shown on it.

- The profile is typically drawn with a 1v:1h ratio for bridge projects with a small amount of approach work.

- The profile is typically drawn with an exaggerated scale for a project with a large amount of roadway work. The horizontal scale matches the base plan scale and the vertical scale shall be 1:5 (e.g., 1”= 20’ H, 1”= 4’V or 1:50 H, 1:10 V).

- If a bridge deck cross section or elevation view has been drafted, it can be brought to the public meeting for informational purposes, if approved by the Project Manager or Senior Engineer.

- All plans used for public meetings shall be filed in either the Bureaus of Highway Design or Bridge Design, and kept as an official public record.

- See Chapter 1, Section 1.2.4 for information regarding public meeting procedures and Appendix 1.2-A2 (S:\Bridge-Design\FORMS\PROJECT\Project___Presentation Outline.doc) for a sample outline of items to be addressed at presentations.
11.4 Sequence of Drawings

11.4.1 General

Plan sheets shall be assembled in the order of construction and include the items listed below. Phasing or large-scale projects may require more than one sheet to properly detail plan items.

Sample bridge plans are located at:

The sequence of drawings in a project shall be as follows:

1. General Plan & Elevation (Summary of Quantities)
2. Note Sheet (alternately Summary of Quantities can be placed here)
3. Site Plan & Profile (Survey Layout)
4. Channel Sections (Survey Layout can also be placed here)
5. Construction Access and Grading Plan
6. Boring Layout and Boring Logs
7. Footing A Masonry (Plan & Sections)
8. Footing A Reinforcement
9. Abutment A Masonry (Plan, Elevation, Section & Excavation Limits)
10. Abutment A Reinforcement
11. Wingwall Masonry (Plan, Elevation, Section & Excavation Limits)
12. Wingwall Reinforcement
13. (Repeat sequence of sheets 7-12 for Abutment B sheets)
14. Pier Masonry (Footing Plan, Pier Elevation, Sections, etc.)
15. Pier Reinforcement
16. Bridge Bearings
17. Superstructure Framing Plan, Details
18. Typical Deck Section, Details
19. Deck Reinforcement
20. Deck Panels
21. Approach Slabs
22. Expansion Joint Details
23. Rail & Curb Layout
24. Bridge Rail
25. Bridge Approach Rail
26. Lighting
27. Concrete Barrier
28. Reinforcing Schedules
11.5 Quantities

11.5.1 General

The quantities of the various materials and work items involved in the construction of a project that includes bridges and structures are needed for establishing the estimated cost of the project throughout the design process, and for establishing a basis for comparison of the Contractor’s bids.

- A summary of Bridge Quantities shall be placed on the General Plan and Elevation Sheet or on the Notes Sheet.
- Intermediate summaries shall not be included in the contract plans (e.g., abutment quantities, superstructure quantities, etc.). However, quantity calculation sheets shall include intermediate quantity summaries.
- Roadway quantities will need to be included if the project is initiated by the Bureau of Bridge Design and approach work is part of the project. The roadway quantities shall be placed on Highway Design Quantity Plan Sheets.
- References for the computation of quantities include Highway Design Manual, Chapter 8 and NHDOT Standard Specifications for Road & Bridge Construction. Also, the Special Attention, Special Provisions, Special Details, and Supplemental Specifications shall be reviewed for various application rates, constants, appropriate item numbers, and the intent of the work to be performed.

11.5.2 Procedure for Computation

Quantities are to be computed and checked independently. Both individuals (designer and checker) are responsible for the accuracy of the quantities. The designer and checker shall use identical breakdown of quantities for different components in the item. For example, the designer’s quantities for excavation for each of Piers 1, 2, and 3 should be compared separately against the corresponding quantities made by the checker. The designer and checker shall compare the total quantity of each item within the percent accuracy listed in the table in Appendix 11.5-A2. If the final quantity between the checker and the designer is within the percent accuracy, the calculations of the higher value shall be included in the quantity calculations for all the items. If the designer and checker are not within the percent accuracy shown on the table in Appendix 11.5-A2, they shall discuss and recalculate until an agreed quantity is reached.

Keep the quantity calculations as simple, organized, clear, and neat as possible. It is helpful to write down formulas, define variables, and always include the units. This will avoid confusion, minimize errors in calculation, and make it easier for construction personnel to follow the calculations.

- All quantity calculation sheets and Quantity Summary Table(s) shall match the quantities for the contract estimate. All calculations sheets and the Quantity Summary Table(s) are to be filed in the project file.
- Calculations for Final Pay items shall be posted electronically on the website so that Contractors can review them prior to bidding. The final value shown on the calculations for the Final Pay items needs to match the Quantity Summary Table. A .pdf file of all the Final Pay item calculations shall be sent to the Specifications Office for placement on the
website, and also stored in the electronic project file, S:\Projects\Active\(Town)\(Project No.)\Final Pay Quantities.

- Two copies of the quantity calculations shall be given to the Construction Bureau upon award of the project.
- Any subsequent revisions shall be handled in the same manner as the original quantities. On the “Bridge Calculation Sheet,” any revision to the original figure shall not be erased but crossed out and replaced by the new figure using a different colored pencil. If there are too many revisions, the old summary sheet shall be marked superseded and left in the file and a new sheet prepared, marked “Revised,” dated, and placed in the project file. Any quantity revision after the project has been advertised shall be revised on the plans in accordance with Chapter 1, Section 1.3.5 Contract Plan Changes (Revisions After Proposal & As-Builts).
- A NHDOT Bridge Design quantity calculation sheet can be found at: S:\FORMS\PROJECT\Quantity Calc Sheet.xls. (See Appendix 11.5-A1 for a Sample Quantity Calculation Sheet)
- Examples of bridge excavation limits are shown on Appendix 11.5-A3.

### 11.5.3 Accuracy

Both individuals (designer and checker) are responsible for the accuracy of the quantity. Mistakes in quantities can be very costly to the Department. The designer and checker must account for all items of work and must also be careful to enter an item of work only once.

Final pay items are designated with an “(F)” at the end of the item description. These quantities are paid during construction with no field measuring or checking of the calculations for these quantities (i.e., no adjustment is made in the field). Therefore, it is important that the quantity shown in the estimate be as accurate as possible. See Appendix 11.5-A2 for a list of bridge items and the percent accuracy of the final quantity required between the designer and checker.

In calculating the total amount of structural steel, Item 550.1, the splice plates, cross-frames, diaphragms and gusset plates shall be quantified. A percentage can be included for nuts, washers, and bolts, typically 0.5% (15,000 square foot bridge).

Generally, the quantity shall be calculated to one more significant digit than is stated in the Method of Measurement for that item in the NHDOT Standard Specifications for Road & Bridge Construction.
11.5.4 Cost Estimating Quantities

Quantities for establishing cost estimates are often necessary during various stages of project development and are required at the completion of the Final Contract Plans. These quantities shall be calculated from the best information available at the time. The policy regarding the preparation of quantity calculations is as follows:

A. Conceptual Stage

During the conceptual stage of a project, estimated quantities are required to arrive at an estimated cost. Conceptual cost estimates are prepared when little information about the project is available (See Chapter 2, Section 2.9 TS&L Estimate, for guidelines on slope-intercept cost estimates). Assume a “worst case” condition, unless actual conditions are known. In remote areas, or for small projects, use the high end of the cost range. Use mid-range costs for usual conditions. To cover unforeseen project modifications, add a 10 percent or higher contingency to the project estimate. These contingencies can be adjusted depending on the preliminary information available.

B. Preliminary Plan Stage

Upon completion of the preliminary plans, estimated quantities may be required to arrive at an estimated cost. Preliminary design estimates are prepared during the preliminary design stage when the type and size of the bridge is known. Limited foundation information is sometimes available at this stage. If the foundation conditions are unknown, assume the “worst case conditions.” The construction costs from previous projects, located in the estimate database G:\DATABASE\BUR34\Estwork32.mdb, shall be used with an appropriate inflation factor along with a minimum of 10 percent contingency to cover scope creep and unforeseen site conditions or constraints. See Chapter 1, Section 1.4.4, Preliminary Plans (40% -50%) for guidelines on developing the preliminary estimate.

C. Design Stage

Quantity calculations shall be made, reviewed, and submitted for the PPS&E (80%) and PS&E (90%) stages. As refinements in the design are made, quantities that have increased, may require an increase in STIP. During the design period, the designer shall keep the Senior Project Engineer informed of significant changes to the design that might affect the cost. Examples of significant changes are: deeper than expected footings and seals, use of deep foundations (shafts or piles) when none were previously expected, change of substructure types, and changes to superstructure. This is a critical element in the project estimate process. See Chapter 1, Section 1.4.4, Preliminary Plans, Specification & Estimate (PPS&E) (80%) and PS&E (90%) for guidelines on developing the estimate.

D. Final Contract Quantities

Upon completion of the structural design and plans, the final quantities of materials and work items involved in the construction of the project shall be computed. The contract estimate is prepared using the final quantities shown on the final contract plans, unit bid prices from the estimate database located at G:\DATABASE\BUR34\Estwork32.mdb, other historical data, and the judgment of the engineer preparing the estimate. Unique projects require special consideration and shall include an appropriate construction cost contingency. The quantity summary box on the plan and the contract estimate needs to
be checked to confirm that both have the same item numbers, description, unit, and quantity. If any errors are found, the change needs to be made on either the plan sheet or estimate. See Chapter 1, Section 1.4.4, PS&E (90%) for guidelines on developing the estimate.
11.6 Concrete Drawings (Masonry & Reinforcement)

11.6.1 General

- Reinforcement layout: Avoid using "±" spacings. Layout reinforcing steel to even spaces, preferably standard spacings [e.g., 6 in. (150 mm), 1 ft.-0 in. (300 mm), etc.]. Label dimensions at the joints or ends of the wall, footing, etc.

- List reinforcement bars separately for different portions of the structure (e.g., abutments, piers, decks, etc.) on the reinforcing schedule sheets of the contract plans.

- Use reinforcing bar letter prefixes which will locate the bar in the structure (e.g., Abut. A Footing, AF; Abutment B, B; Northwest Wing, NW; Deck, D; Approach Slab, AS; Frame, F; Pier, P; Retaining Wall, RW; etc.).

- Reinforcing steel shall be designated by a bar number (e.g., NW1, NW2, NW3, etc.) and proceeded by bar size (e.g., #4NW1, #5NW2). Indicate reinforcing bars with heavy solid lines (MicroStation line weight of 3). Show masonry lines on the reinforcing sheets with a lighter linestyle (MicroStation line weight of 1). See NHDOT CAD/D Procedures and Requirements for additional information.

- Epoxy coated reinforcement shall be noted by an “E” after the bar mark on all reinforcing details. If all the reinforcing in the deck is epoxy, a note on the Reinforced Deck Plan can be put on the plan in place of noting all the bar marks.

- Stainless steel reinforcement shall be noted by an “SS” after the after the bar mark on all reinforcing details. If all the reinforcing in the deck is stainless steel, a note on the Reinforced Deck Plan can be put on the plan in place of noting all the bar marks.

- Reinforcement geometry shall be clear in plan details. Congested areas, bent bars, etc. can be clarified with additional views/details/sections or bending diagrams. In bending diagrams, reinforcement dimensions are given out-to-out.

- Call out each rebar only twice; the spacing for the bar is shown in one view and the bar is indicated in a view/section taken from a different angle. It may also be indicated in other views if necessary for clarity. The spacing for a bar must go on a dimension line with extension lines. Do not point to a single bar and call out the spacing.

- When calling out rebar spacing, always give a distance. If the distance needed is not equally divisible by the number of spaces, then give a maximum spacing in the callout. Do not use “equal spaces” as in “23 equal spaces = 18'-9”. The construction workers should not have to calculate the spacing. Also, do not use the word “about”, as in 23 spaces @ about 10” = 18'-9” - this is open to too much interpretation. Instead, this shall read “23 spaces @ 10” max. = 18'-9”.

- Show all exposed corners and edges of concrete chamfered 3/4 in. (20 mm). The description shall be noted under the standard bridge notes.

- Show and label the required lap length of reinforcing bars for each portion of the bridge (e.g. footing, abutment, deck, etc.) on the view where the bar is shown.

- Concrete dimensions are given to the nearest 1/8 in. (1 mm) [Including bottom of deck slab elevations.]

- Concrete elevations are rounded to the nearest hundredth of a foot (metric; rounded to the nearest thousandth of a meter).
• See NHDOT Bridge Design Manual Chapters 6 and 8 for sample details of concrete elements.

• Rebar Schedule: Dimension partial lengths of reinforcing steel to the nearest ¼-in. (5-mm); dimension overall lengths to the nearest 1-in. (25-mm).

• In order to achieve standard stock lengths, reinforcing steel mechanical connectors should be dimensioned on the reinforcing schedule with the following splice lengths (where practical):

Item 544.11, Reinforcing Steel, Mechanical Connector
Item 544.21, Reinforcing Steel, Epoxy Coated, Mechanical Connector

<table>
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<th>Reinforcing Steel Mechanical Connector Standard Splice Lengths</th>
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<tr>
<td>Bar Size</td>
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<tr>
<td>#5 (16)</td>
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<td>#6 (19)</td>
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</tbody>
</table>

Criteria:
- 3,000 or 4,000-psi (20.7 or 27.6 MPa) concrete
- Black or epoxy coated bars
- Horizontal temperature reinforcing steel (abutment, backwall, wingwall, & approach slab)
- Primary reinforcing steel (bridge deck)
- 1.25-in, 2.5-in, or 3-in. (32, 64, or 76-mm) minimum cover

Reinforcing Steel Mechanical Connectors (Male and Female)

Figure 11.6.1-1
11.7 Structural Steel Drawings

11.7.1 General

- On structural steel drawings, avoid duplication in the designation of components. Give the complete designation for each component only once, usually in a major view, then use an abbreviated designation to locate the component in all other sections, details, etc.
- Use current AISC symbols for plates, shapes, bars, etc.
- Use current AWS symbols for welds.
- Steel dimensions are given to the nearest 1/16 in. (1 mm).
- See Chapter 7 for sample details of steel elements.
- All fracture critical members (FCM) shall be noted on all drawings with a diamond label at each member in accordance with AASHTO LRFD Section 6.6.2.1. See Figure 11.7.1-1.

![Diagonal and Vertical Layout](image)

Example of Labeling Fracture Critical Members

*Figure 11.7.1-1*
Page intentionally left blank.
11.8 Bridge Rehabilitation Drawings

11.8.1 General

- If the bridge deck is constructed using phases, the deck section showing the barrier membrane joint location(s) for the phasing shall be dimensioned so the membrane is placed like shingles (overlapped so the splice opening is on the downward slope) between the phases.

- The phasing layout shall be as follows, unless otherwise approved by the Design Chief:
  A. Three-phase construction:
   - If the bridge deck has a crown and the rehabilitation work needs to be completed with 3 phases, phase 1 and 2 shall be placed on the deck ends and phase 3 placed at the center, to create the shingle effect with the bridge barrier membrane in both directions.
   - If the bridge deck is superelevated and the rehabilitation work needs to be completed with 3 phases, phase 1 shall be placed at the low end of the deck, phase 2 at the center, and phase 3 on the high end of the deck, to create the shingle effect with the bridge barrier membrane.

  B. Two-phase construction:
   - If the bridge deck has a crown and the rehabilitation work needs to be completed with 2 phases, phase 1 shall be placed at the low end to a point near the crown point. Phase 2 will pass over the crown and cover the low side membrane of phase 1 to create a shingle effect.
   - If the bridge deck is super elevated and the rehabilitation work needs to be completed with 2 phases, the layout is similar to a deck with a crown.

- For all phases, the portable concrete barrier for traffic control shall be shown placed on the bridge base pavement, not on the final wearing course.

- For bridge decks constructed in phases, mechanical connector reinforcing bars shall be used if there is not enough space for the bar splice length to extend beyond the construction joint.

- For the use of temporary barrier, see Chapter 7, Section 7.

- For phase construction, the following shall be considered in the location of the deck joint:
  - Minimum temporary lane widths may be required by the Traffic Control Committee and NETC (New England Transportation Consortium) Multistate Permit Routes (see the NETC map located at: http://www.nh.gov/dot/org/operations/highwaymaintenance/overhaul/documents/netcmultistatepermitroutes.pdf)
  - If the deck joint is located over a girder, this will allow the girder to deflect due to half the dead load, and no temporary deck support would be required.
  - If the deck joint is over a girder, the designer shall consider how the bridge will deflect between the phases.
  - A closure pour may be required for some situations such as large deflections, wide decks, or long flexible girders that can twist.
If an analysis shows that a construction joint is required at a certain location, it shall be noted on the plans that the location cannot be changed by the Contractor.

Consider the bridge loading and constructability for all phases of construction.

Locating the deck joint between the girders may provide better balance during construction. Placing the deck joint over a girder is not always the best location.

Cross-frames under a deck joint shall never be bolted on both sides until the deck placement is complete because the bolt holes will not match up during phased construction. One side of the cross-frame shall be bolted and the holes on the other side field drilled once the bridge deck has been poured.

If the difference in elevation between phasing joints is ≥ 1” (25-mm), a closure pour will be required.

- No shear key is required between phasing. Forming the key around the extended reinforcing and shear connectors is difficult.

- Existing curtain walls shall be removed to below bottom of deck or lower. See Figure 11.8.1-1.

**Figure 11.8.1-1**

- Item 520.0201, Concrete Class AA, Above Footings shall be used for the backwall, concrete curbs and full-depth deck repairs for a bridge rehabilitation project. This item is being used for the following reasons:
  - Item 520.0201 was created as a non-final pay item after Item 520.02, Concrete Class AA, Above Footings was made into a final pay item.
  - The quantity of full-depth repairs is an estimate and a non-final pay item is required. Also, the concrete for the deck and backwall are from the same mix.
  - The new concrete for patched areas does not need to meet the QC/QA requirements since the existing deck concrete does not meet the requirements.
  - The "Above Footings" concrete items are items that require forming such as full-depth repairs, curbs, and backwall work. The Concrete Class AA items that don't
have "Above Footings" in the description do not require forming of the concrete, such as partial-depth deck repair, and will therefore utilize Item 520.01, Concrete Class AA.

- For deck patching, curb, and expansion joint rehabilitation projects, all new reinforcing shall be epoxy coated bars unless directed otherwise by the Design Chief.

- Sample bridge rehabilitation plans are located at:
11.9 Bridge Detail Sheets, Bridge Details, and Sample Plans & Notes

11.9.1 Bridge Detail Sheets

Bridge Detail Sheets are plan sheets prepared by the Department for use on NHDOT projects. Others who use the Bridge Detail Sheets do so at their own risk. Bridge Detail Sheets are backed by engineering analysis, calculations, crash testing, and are approved by NHDOT Administrators and the Federal Highway Administration (FHWA). Only certain details can be modified by designers. As noted on each bridge sheet, if any modifications are made to details other than those noted, the engineer responsible for the modification becomes the Engineer of Record (EOR) for those details and for all effects the modifications may have on other components within the sheet. The sheets are located at:
See Appendix 11.9-A1 for a list of the Bridge Detail Sheets.

11.9.2 Bridge Details

The Department makes these documents available on an "as-is" basis. Bridge Details are considered nothing more than examples of items that are often used with very similar application from job to job. The details are intended to be copied to a project and modified to fit the particular aspects of the project. They are not intended to be included in a contract plan set without close scrutiny for application to the job. The bridge details are located at
See Appendix 11.9-A1 for a list of the Bridge Details.

11.9.3 Sample Plans and Notes

A. Sample Plans

The Bureau of Bridge Design has assembled sample plans and bridge plan checklists that can be used as an aide in the preparation of detailed construction plans for bridges. The sample plans and checklists are intended to be used only as a general guide, or reminder, to the designer, checker, and reviewer, and are not intended to be a replacement for the user’s own professional judgment based on sound engineering principles. It is the responsibility of the designer to provide the details that will allow the Contractor to construct the project as intended.

The Bureau of Bridge Design makes these documents available on an "as is" basis. Details and items of the sample plans may have changed. It is the responsibility of the designer to provide the most current details and items on the contract plans.

The sample plans are located at:

The bridge plan checklists are located at:
http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/sampleplans/index.htm and
• Chapter 2 for TS&L Plan Checklist
Chapter 11  Preparation of Plans

- Chapter 3 for Preliminary Plan Checklist
- Chapter 11, Appendix 11.9-A2 for Final Plan Checklist
- Chapter 11, Appendix 11.9-A3 for Constructability Checklist

B. Sample Notes

The Bureau of Bridge Design has assembled sample notes that can be used as an aide in the preparation of contract bridge plans. The sample notes are intended to be used only as a general guide to the designer, checker, and reviewer. The sample notes may be copied to a project and modified to fit the particular aspects of the project. They are not intended to be included in a contract plan set without close scrutiny for application to the project.

Project notes shall be placed on the Project Note Sheet except for notes that apply to elements that are manufactured specifically from the elements’ sheets (e.g., expansion joints, bearings, railings), in which case, the notes shall be placed on their respective element sheet. The sample notes are located at http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/sampleplans/index.htm.
Chapter 11  Preparation of Plans

References


5. New Hampshire Department of Transportation, *NHDOT Standard Specifications for Road and Bridge Construction*, 2010, Concord, NH


DIMENSIONING EXAMPLES

ONLY WHEN SPACE IS TOO SMALL

3/8" TO 3/4" SPACING FOR STACKED DIMENSIONS

1" Ø DRILLED HOLE (TYP)

R = 10'

OR R = 10'

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HATCHING EXAMPLES

Note:
• Do not put concrete reconstruction hatching on top of removal hatching. Show separate details or one type of hatching.
• The type of hatching used shall not obstruct the detail, especially on the printed plan.
HATCHING EXAMPLES

(Refer to NHDOT CAD/D Procedures and Requirements Manual)
# ABBREVIATIONS

List of abbreviations commonly used on bridge plan sheets:

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<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<td>American Iron and Steel Institute</td>
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### Abbreviations

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<td>thick(ness)</td>
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<tr>
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<td>M</td>
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<tr>
<td>thousand (feet) board measure</td>
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<td>Full Form</td>
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<td>transportation</td>
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<td>transverse</td>
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<td>T.W.</td>
<td>travel way</td>
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<td>ultimate</td>
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<td>undercrossing</td>
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<td>USCG</td>
<td>United States Coast Guard</td>
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<td>VAR.</td>
<td>variable, varies</td>
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<td>vertical</td>
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<td>V.C.</td>
<td>vertical curve</td>
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<td>vitrified clay pipe</td>
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<td>VOL. or V</td>
<td>volume</td>
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<td>W.S.</td>
<td>water surface</td>
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<td>weight(s)</td>
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<td>WSP</td>
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<td>W.W.F.</td>
<td>welded wire fabric</td>
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<td>W.</td>
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<td>wingwall</td>
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<td>with</td>
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<td>W/o</td>
<td>without</td>
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<td>working stress design</td>
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<td>YD., YDS.</td>
<td>yard, yards</td>
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<tr>
<td>YR.</td>
<td>year(s)</td>
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</table>
DRAWING SCALES

In MicroStation, the details (Bridge Design only) are drawn at 1:1, and then scaled down to fit the sheet border. A self-reference is created for each detail, and then scaled accordingly into the border. The reference files usually have a logical name such as “Detail A”, “Section B-B”. Note, do not use 1” = 40’ scale [English] (there is no physical 80 scale) or use 1:75 or 1:150 [metric] (there is no physical 150 or 300 scale).

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<tr>
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<th>Absolute Scale</th>
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<td>( \frac{3}{32} )&quot; = 1'-0&quot;</td>
<td>1:128</td>
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<td>( \frac{1}{8} )&quot; = 1'-0&quot;</td>
<td>1:96</td>
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<td>( \frac{3}{16} )&quot; = 1'-0&quot;</td>
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<td>( \frac{1}{4} )&quot; = 1'-0&quot;</td>
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<td>( \frac{3}{8} )&quot; = 1'-0&quot;</td>
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<td>( \frac{1}{2} )&quot; = 1'-0&quot;</td>
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<td>( \frac{3}{4} )&quot; = 1'-0&quot;</td>
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<tr>
<td>1&quot; = 1'-0&quot;</td>
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<tr>
<td>1 ( \frac{1}{2} )&quot; = 1'-0&quot;</td>
<td>1:8</td>
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<tr>
<td>2&quot; = 1'-0&quot;</td>
<td>1:6</td>
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<tr>
<td>3&quot; = 1'-0&quot;</td>
<td>1:4</td>
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<td>6&quot; = 1'-0&quot;</td>
<td>1:2</td>
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<td>*1&quot; = 50’</td>
<td>1:600</td>
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<tr>
<td>1&quot; = 30’</td>
<td>1:360</td>
</tr>
<tr>
<td>*1&quot; = 20’</td>
<td>1:240</td>
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<td>1:120</td>
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<td>1&quot; = 1’</td>
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<td>*1:250</td>
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<td>1:100</td>
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<td>1:2</td>
</tr>
<tr>
<td>1:1</td>
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</table>

* These scales are preferred for use on the Gen Plan and Site Plan, depending on the size of the bridge and how it fits on the page.
COLOR LEGEND

(For MicroStation CAD/D drawings, see the cell “Legend” for pen numbers)
Page intentionally left blank.
Sheet Description: This sheet estimates the volume of concrete in the bridge deck. Beam haunches and cantilevered deck overhangs are included.

**Volume of Concrete in Deck where Deck Panels are Located**

<table>
<thead>
<tr>
<th>Area of hatching of deck</th>
<th>$A_{\text{area}}$</th>
<th>17.99 ft$^2$</th>
<th>measured in CAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Deck with Panels</td>
<td>$l_{\text{pane}}$</td>
<td>304.00'</td>
<td>measured in CAD</td>
</tr>
<tr>
<td>Volume of C.I.P. Deck</td>
<td>$V_{\text{deck}}$</td>
<td>202.55 yd$^3$</td>
<td>$A_{\text{area}} \cdot l_{\text{pane}} + 2\pi h^2/\text{yd}^2$</td>
</tr>
</tbody>
</table>

**Volume of Concrete in Deck where Deck Panels are not Located**

<table>
<thead>
<tr>
<th>Area of hatching of deck</th>
<th>$A_{\text{area}}$</th>
<th>8.48 ft$^2$</th>
<th>measured in CAD, incl. 2 end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out to Out Bridge width</td>
<td>$b_{\text{bridge}}$</td>
<td>33.00'</td>
<td>measured in CAD</td>
</tr>
<tr>
<td>Volume of Deck</td>
<td>$V_{\text{deck}}$</td>
<td>10.36 yd$^3$</td>
<td>$(A_{\text{area}} \cdot b_{\text{bridge}}) = 276\text{ft}^3/\text{yd}^2$</td>
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</tbody>
</table>

Total volume of Item 520.7002 = 250 yd$^3$
**Sheet Description:** This sheet estimates the volume of concrete in the bridge deck. Beam branches and confined deck overhangs are included.

**Volume of Concrete in the Brush Curb**

\[
A_{\text{con}} = \frac{3.33 \text{ ft}^2}{\text{measured in CAD}}
\]

\[
L_{\text{deck}} = 311.27''
\]

\[
V_{\text{con}} = 37.19 \text{ yd}^3 = A_{\text{con}} \times L_{\text{deck}} = 276 \text{ yd}^3
\]

\[
V_{\text{con}} = 250 \text{ yd}^3
\]

**Say:** 250 yd$^3$
## ACCURACY OF BRIDGE QUANTITIES

<table>
<thead>
<tr>
<th>Item No./ Section No.</th>
<th>Description</th>
<th>Quantity Box Significant Digit</th>
<th>Calculation Significant Digit</th>
<th>% Accuracy (Between Designer &amp; Checker)</th>
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<tbody>
<tr>
<td>Section 207</td>
<td>Channel Excavation</td>
<td>1 CY</td>
<td>0.1 CY</td>
<td>90 %</td>
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<tr>
<td>Section 209</td>
<td>Granular Backfill</td>
<td>1 CY</td>
<td>0.1 CY</td>
<td>95 %</td>
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<tr>
<td>Section 403</td>
<td>Hot Bituminous Pavement</td>
<td>0.1 TON</td>
<td>0.1 TON</td>
<td>99 %</td>
</tr>
<tr>
<td>Section 504</td>
<td>Bridge Excavation</td>
<td>1 CY</td>
<td>0.1 CY</td>
<td>90 %</td>
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<tr>
<td>Section 508</td>
<td>Structural Fill</td>
<td>1 CY</td>
<td>0.1 CY</td>
<td>95 %</td>
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<tr>
<td>Section 511</td>
<td>Preparation for Concrete Bridge Repairs</td>
<td>0.1 SY</td>
<td>0.1 SY</td>
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<tr>
<td>Section 512</td>
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<td>0.1 SY</td>
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<td>Concrete Class AA, Approach Slab (QC/QA) (F)</td>
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<td>0.1 CY</td>
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<td>Concrete Class A, Above Footings, (F)</td>
<td>1 CY</td>
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<td>Concrete Bridge Deck (QC/QA) (F)</td>
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<td>Prestressed Concrete Girders, NEBT XXX (F)</td>
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<td>Prestressed Concrete Bridge Deck, Spread Box Beams (F)</td>
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<td>Waterstops</td>
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<td>Section 544</td>
<td>Reinforcing Steel</td>
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<td>1 LB</td>
<td>100 %</td>
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<td>Item 547</td>
<td>Shear Connectors (F)</td>
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<td>1 EA</td>
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<td>Section 548</td>
<td>Elastomeric Bearings</td>
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<td>1 EA</td>
<td>100 %</td>
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# Accuracy of Bridge Quantities

| Item No./Section No. | Description                                      | Quantity | Calculation | % Accuracy
|----------------------|--------------------------------------------------|----------|-------------|----------------
| Item 550.1X          | Structural Steel (F)                             | 1 LB     | 0.1 LB      | 99 %           |
| Item 550.2X          | Bridge Shoes (F)                                 | 1 EA     | 1 EA        | 100 %          |
| Item 559.4           | Asphaltic Plug Expansion Joint (F)               | 1 LF     | 0.1 LF      | 100 %          |
| Section 560          | Prefab. Compression Seal Exp. Joint (F)          | 1 LF     | 0.1 LF      | 100 %          |
| Section 561          | Prefab. Expansion Joint (F)                      | 1 LF     | 0.1 LF      | 100 %          |
| Item 562.1           | Silicone Joint Sealant (F)                       | 1 LF     | 0.1 LF      | 90 %           |
| Section 563          | Bridge Rail                                      | 1 LF     | 0.1 LF      | 100 %          |
| Section 570          | Stone Masonry                                    | 1 CY     | 0.1 CY      | 90 %           |
| Section 582          | Slope Paving                                     | 1 SY     | 0.1 SY      | 95 %           |
| Section 583          | Riprap                                           | 1 CY     | 0.1 CY      | 90 %           |
| Section 585          | Stone Fill                                       | 1 CY     | 0.1 CY      | 90 %           |
| Item 587.1           | Keyed Stone Fill                                 | 1 CY     | 0.1 CY      | 90 %           |
| Section 591          | Structural Plate Pipes, Pipe-Arches and Arches    | 1 LB     | 1 LB        | 100 %          |
| Section 593          | Geotextile                                       | 1 SY     | 0.1 SY      | 90 %           |
BRIDGE EXCAVATION LIMITS

EXISTING BRIDGE REMOVAL NOTES (located on the Note Sheet)

(1) The Contractor’s method for removal of the existing bridge shall be submitted for documentation in accordance to 105.02, prior to the commencement of any removal operations.

(2) Item 502.10X, Removal of Existing Bridge Structure, shall include the removal of the entire superstructure.

(3) Item 502.10X, Removal of Existing Bridge Structure, shall include the removal of the piers (including footings) and any portions of existing substructure which fall outside the limits of all other excavation items.

NOTE: Removal of substructure within pay limits of other excavation items may be paid under Item 502.10X, if approved by District Construction Engineer (DCE).
EXCAVATION LIMITS CON'T

EXCAVATION LIMITS EXAMPLE

EXISTING MIRE
(REMOVING UNDER ITEM 602, 70X)
(SEE NOTE ON PREVIOUS PAGE)

PAY LIMITS ITEM 207.1
(TYP)

APPOROXIMATE EXISTING STREAM BED

SUITABLE FILL (TYP)

VENT EL. 563.00
EL. 559.13

EL. 562.00
EL. 567.00

ITEM 503, 201
(TYP)

EL. 549.75
END OF SEAL

© BEARING

EXISTING WINDWALL

PAY LIMITS ITEM 203.1

PROPOSED WINDWALL

PROPOSED FINISHED GRADE

© CONSTRUCTION & ROADWAY
CHANGES IN ITEM NUMBER, DESCRIPTION OR METHOD OF MEASUREMENT

The following bridge items have changed or been added since the current edition of the NHDOT Standard Specifications for Road & Bridge Construction:

- **Item 403.61, Pavement Joint Adhesive (Bridge Base) – new.** The item is to be applied to curbs, concrete armory, and pavement joints (including phase construction joints and joints assuming a 12-ft. wide paver), for the bridge base course. A sub-Contractor is mobilized to the site to apply the adhesive for the bridge base. This becomes a costly item due to the small quantity on the bridge. If the project is a Bridge Design driven project, the adhesive for the approach base pavement shall also be included in Item 403.61 if the sub-Contractor will have a separate mobilization than the top coat placement. The adhesive for the top course is paid for under the highway item 403.6, Pavement Joint Adhesive. The new item shall be quantified and placed with the bridge quantities.

- **Item 502.1012, Removal of Existing Bridge Structure (Asbestos) - new.** Use this item if asbestos containing materials have been identified in the bridge asphalt pavement, membrane or other areas.

- **Item 511.0X, Preparation for Concrete Bridge Deck Repairs – new.** The existing reinforcing is no longer coated with anticorrosion coating. It was difficult to apply therefore, not all the existing bar areas received the coating which was needed to stop the corrosion circuit. The Department is looking into the use of disc anodes for cathodic reduction. This work now includes the application of an anti-corrosion coating to uncoated reinforcing steel that is within areas of the concrete patch. The uncoated reinforcing steel is blast cleaned and 2 coats of anti-corrosion coating are applied. This work and material is subsidiary to Item 511.0X. No quantity is required. A supplemental specification will be placed in each project that has Item 511.0X.

- **Item 534.1, Water Repellent (Linseed Oil) - removed.** Use Item 534.3, Water Repellent (Silane-Siloxane). The use of linseed oil is discontinued since it is no longer acceptable due to VOCS. Linseed oil which is currently produced meeting current regulations, does not meet NHDOT specifications.

- **Item 534.3, Water Repellent (Silane-Siloxane) – Application rate is now 150 sf/gal.** If the project has existing concrete, the following note shall be placed on the plans:

  “Existing bridge copings, abutments, wings, backwalls, piers, and bridge seats shall be power washed (subsidiary to Item 534.3) in such a manner that overspray into surface waters is kept to a minimum. If the water beads, no coating needs to be applied. If the water does not bead, coat the surface with Item 534.3, Water Repellent (Silane-Siloxane), application rate of 150 sf/gal.”

- **Item 536.11, Epoxy Coating for Concrete – Do not use on abutment seats.** It was found that the coating did not provide any benefit and traps water underneath it when it gets cracked. This item shall only be used on pier caps that have an expansion joint above. Any water that falls on a pier cap is able to run off the cap and not be trapped in the epoxy coating.
• Item 537, Concrete Sealer - removed. Concrete sealer will no longer be used on bridge abutments to prevent staining from weathering steel since testing from Materials and Research has shown that the sealer does not help in cleaning the staining off the abutments.

• Item 538.1, Barrier Membrane, Peel and Stick (F) - formerly Barrier Membrane.

• Item 538.2, Barrier Membrane, Peel and Stick – Vertical Surfaces (F) - formerly Barrier Membrane, Vertical Surfaces.

• Item 538.5, Barrier Membrane, Heat Welded (F) - formerly Barrier Membrane Welded by Torch. Use for deck lengths < 100 ft. (this is the hand method). If the hand method item is used on the plans, the Contractor always has the option to use machine method if preferred but gets paid for the item noted on the plans.

• Item 538.6, Barrier Membrane, Heat Welded – Machine Method (F) - formerly Barrier Membrane Welded by Torch, Machine Method. Use for deck lengths ≥ 100 ft.

• Item 559.4, Asphaltic Plug Expansion Joint (F) - formerly Elastomeric Plug Type Expansion Joint (F).

• Item 559.41, Asphaltic Plug for Crack Control (F) - formerly Modified Elastomeric Plug Type Flexible Joint (6” wide) (F).

• Item 559.412, Repair Asphaltic Plug Expansion Joint (F) - formerly Modified Elastomeric Plug Type Expansion Joint (20” wide) (F).

• Item 560.1, Elastomeric Sealant - removed. Use item 562.1, Silicone Joint Sealant (F) instead.

• Item 560.10xx, Prefabricated Compression Seal Expansion Joint (F) - formerly Item 560.1x, Prefabricated Compression Seal Expansion Joint (F).

• Item 560.12xx, Prefabricated Compression Seal Expansion Joint w/ Plow Plates (F) - new.

• Item 560.13xx, Prefabricated Compression Seal Expansion Joint - Rehabilitation (F) - formerly Item 560.20x, Prefabricated Compression Seal Expansion Joint – Rehabilitation (F).

• Item 561.10xx, Prefabricated Strip Seal Expansion Joint (F) - formerly Item 561.110, Prefabricated Expansion Joint Type A (F).

• Item 561.12xx, Prefabricated Strip Seal Expansion Joint w/ Plow Plates (F) – new.

• Item 561.13xx, Prefabricated Strip Seal Expansion Joint – Rehabilitation (F) - formerly Item 561.112x, Prefabricated Expansion Joint Type A - Rehabilitation (F).

• Item 561.20xx, Prefabricated Modular Bridge Joint System (F) - formerly Item 561.111, Prefabricated Expansion Joint, Modular Type A (F).

• Item 561.211, Prefabricated Expansion Joint, Modular Type B (F) – removed.

• Item 561.23xx, Prefabricated Modular Bridge Joint System – Rehabilitation (F) – new.
• Item 561.30xx, Prefabricated Finger Expansion Joint (F) - formerly Item 561.30x, Prefabricated Expansion Joint, Finger Joint (F).

• Item 561.33xx, Prefabricated Finger Expansion Joint – Rehabilitation (F) – new.

• Item 562.1, Silicone Joint Sealant (F) - formerly Item 559.5

• Items 563.xx, Bridge Rail xx – These items are no longer a final pay item. They are now measured by the linear foot.

• Item 583.x, Riprap, Class x – Revised specification. Riprap is required for erosion protection of bridge structures in waterways, for active waterway channel slopes and bottoms, and for intermittent waterway channels where the Engineer determines riprap protection is required to resist expected high water flow velocities or volumes. The designer shall specify a median stone diameter for the rock to correspond with the standard classes noted in the specification. (This is the only item that will be used for bridge channel protection.)

• Item 585.x, Stone Fill, Class x – This item will be used for highway work such as roadway slope protection and at drainage outlets.

• Item 587, Keyed Stone Fill – removed. (Parts of this specification were combined with Item 583.x to create one new channel protection specification.)

• Item 609.01, Straight Granite Curb – This item is used for the bridge approach curb as shown on the bridge approach rail sheets. The item needs to be listed on the Summary of Bridge Quantities table with an asterisk (*) by the item noting that it is “not an item total”, if the item is also used as a highway item.
LIST OF BRIDGE DETAIL SHEETS

Bridge Detail Sheets are backed by engineering analysis, calculations, crash testing and are approved by NHDOT Administrators and the Federal Highway Administration (FHWA). Only certain details can be modified by designers. As noted on each bridge sheet, if any modifications are made to details other than those noted, the engineer responsible for the modifications becomes the Engineer of Record (EOR) for those details and all effects the modifications have on other components within the sheet.

The Bridge Detail Sheets are located at:

- Steel Bridge Rail
- T101 Bridge Rail
- Bridge Mounted Sign Supports
- Deck Panels
- Soundwalls
- Lane Closure
- Vehicular Collision Pier Protection
LIST OF BRIDGE DETAILS

The New Hampshire Department of Transportation (NHDOT) makes these documents available on an "as is" basis. These documents are prepared by the NHDOT for use on NHDOT projects. Others who use the NHDOT documents do so at their own risk.

Bridge Details are considered nothing more than examples of items that are often used with very similar application from job to job. The details are intended to be copied to a project and modified to fit the particular aspects of the project. They are not intended to be included in a contract plan set without close scrutiny and modifications for application to the job.

The details are located at http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/bridgedetails/index.htm

- Expansion Joints
- Substructure
LIST OF SAMPLE PLANS

The Bureau of Bridge Design has assembled Sample Plans that can be used as an aide in the preparation of detail construction plans for bridges. The sample plans are intended to be used only as a general guide, or reminder, to the designer, checker, and reviewer, and are not intended to be a replacement for the user’s own professional judgment based on sound engineering principles. It is the responsibility of the designer to provide the details that will allow the Contractor to construct the project as intended.

The sample plans are located at:

- Plan Check Lists
- Sample Project Notes
- Expansion Joints
- Sign Structure
- Steel Girder Bridge Plans
- Steel Bridge Rehabilitation Plans
- Sample Soundwall Plans
BRIDGE DESIGN FINAL PLAN CHECKLIST

**PROJECT INFORMATION**

- **Project Name:**
- **Project No.:**
- **Bridge No.:**
- **Location:**
- **Designer:**
- **Checker:**
- **Drafter:**
- **Reviewer:**

**NOTE:** Each Task, when applicable & completed, is Checked (Y, N, N/A), Dated and Initialed by the Designer, Checker, and Reviewer.

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Checklist is to be used as a general guide. The list is not all inclusive. Additional information may be required on plans.
## Final Plan Tasks Cont.

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### Bridge Elevation

| Proposed Bridge Projected from Plan |   |   |     |         |         |          |      |
| Proposed Channel Protection       |   |   |     |         |         |          |      |
| OHW and 100 yr Flood Call-out w/ Elev |   |   |     |         |         |          |      |
| Proposed Bridge and Approach Rail |   |   |     |         |         |          |      |

### Project Notes

| Project Note Sheet |   |   |     |         |         |          |      |

### Site Plan and Profile

| Profiles of upper and lower roadways or railroad |   |   |     |         |         |          |      |

### Bridge Site Plan

| Oriented with over road upstation to the right and centerline at horizontal, if possible |   |   |     |         |         |          |      |
| Deck not shown. Show channel or roadway below deck       |   |   |     |         |         |          |      |
| Outline of Proposed Substructures, Footings, Approach Slab, Wingwalls |   |   |     |         |         |          |      |
| Outline of Existing Bridge |   |   |     |         |         |          |      |
| Proposed Alignment and Stations |   |   |     |         |         |          |      |
| Alignment Data |   |   |     |         |         |          |      |
| Intersection Stations and & Angles |   |   |     |         |         |          |      |
| Begin and End Bridge Stations & FG Elev |   |   |     |         |         |          |      |
| Expansion and Fixed Joints |   |   |     |         |         |          |      |
| Traffic Arrows |   |   |     |         |         |          |      |
| Angles between Bents and Centerline |   |   |     |         |         |          |      |
| Proposed Utilities |   |   |     |         |         |          |      |
| Right-of-way Lines/ Easements |   |   |     |         |         |          |      |
| North Arrow |   |   |     |         |         |          |      |
| Proposed Slopes |   |   |     |         |         |          |      |
| Proposed Channel Protection |   |   |     |         |         |          |      |
| Stream Name and Flow Arrow |   |   |     |         |         |          |      |
## Final Plan Tasks Cont.

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- **Architectural Treatment Details**

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- Working Line and CL Construction Line
- Working Points Labeled
- Section Location Labels
- Layout of Reinforcement Steel
- Label and Dimension Reinforcing Steel
- Footing Steps
- Phase Construction Locations Labeled
- Identify Mechanical Connections
- Label Lap Splices
- Sections of Wingwalls
- Dimension J-bar Height from Top of Footing

## Pier Masonry

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  - North Arrow
  - Outline Pier
  - Working Line and CL Construction Line
  - Working Points Labeled
  - Angle of Crossing
  - All dimensions and angles required to construct the pier tied to the centerline of bearings and working line
  - Outline of Beam Seats
  - Label Beam Numbers
  - Location of Construction Joints
  - Phase Construction Location

- **Elevation**
  - Proposed Ground
  - Existing Ground
  - Outline of New and Existing Pier
  - Elevations
  - Structural Fill
  - Phase Construction Location
  - Piles/ Drilled Shafts
  - Existing and Proposed Utilities
  - Architectural Treatment
  - Location of Construction Joints
  - Location of Exp. And Contraction Joints
  - Section Location Labels
  - Footing Steps
  - Cofferdams
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Comments:

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<td>The accuracy and completeness of the contract plans so the design can be built as shown on the final plans.</td>
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<tr>
<td>A. Site Investigation</td>
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<td>Sufficient field investigation done to ascertain that contract work can be performed as shown on plans?</td>
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<td>Subsurface exploration?</td>
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<td>Utility investigation?</td>
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<td>Current Traffic counts?</td>
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<td>Structural inspection?</td>
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<td>Emergency/interim structural repairs been considered?</td>
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Checklist is to be used as a general guide. The list is not all inclusive.
### Bridge Design Constructability Checklist

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>More Info Needed</th>
<th>Designer Checker</th>
<th>Reviewer</th>
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<tbody>
<tr>
<td><strong>B. Right of Way</strong></td>
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<tr>
<td>Equipment, material, and hazardous waste storage?</td>
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<td>Staging?</td>
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<td>Access to work areas?</td>
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<td>Adequate ROW to erect beams?</td>
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<td><strong>C. Construction Phasing</strong></td>
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<tr>
<td>Phased to provide minimum number of stages and reasonable work areas and access?</td>
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<td>Are there areas with restricted access?</td>
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<td>Does phasing cause special conditions (i.e. structural adequacy/ stability)?</td>
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<td>Proposed adjacent contracts, restrictions, constraints identified and accounted for?</td>
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<tr>
<td>Can the details as shown on the plans be constructed using standard industry practices, operations, and equipment?</td>
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<td><strong>D. Traffic Control</strong></td>
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<td>Requirements realistic for site conditions</td>
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<td>Are lane closures reasonable for traffic volumes?</td>
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<tr>
<td>Can construction operations be carried out safely under plan traffic control and phasing?</td>
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<td>Design adequate for averting delays/ congestion?</td>
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<td>Is a detour necessary for averting delays/ congestion?</td>
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<td><strong>E. Schedule</strong></td>
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<td>Is sequence of construction reasonable?</td>
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<td>Seasonal limits on construction operations?</td>
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<td>Utility relocation schedule reasonable?</td>
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<td>Regulatory permit restrictions?</td>
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<td>Materials ordering, fabrication, and delivery requirements</td>
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<td>All necessary construction operations identified?</td>
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<td>Impact of additional work?</td>
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<td>Time related specs - completion/ milestone realistic?</td>
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</table>
### F. Special Materials / Conditions

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<tr>
<th>Description</th>
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<th>No</th>
<th>N/A</th>
<th>More Info Needed</th>
<th>Designer Checker</th>
<th>Reviewer</th>
<th>DATE</th>
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<tbody>
<tr>
<td>Pertinent provisions and restrictions clearly indicated?</td>
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<td>Any special (unique/proprietary) materials, methods of technologies required for contract?</td>
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<td>Special coordination required, RR, Permits, Regulatory?</td>
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<td>Presence of asbestos, hazardous waste or toxic materials?</td>
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<tr>
<td>Safety requirements, fall protection, electric lines, and other utilities, RR requirements?</td>
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<td>Winter concreting and the schedule for delivery of concrete?</td>
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Bridge Design Manual

Chapter 11 – Appendix B

January 2015 – v 2.0
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Edmund Gunter

Edmund Gunter was born in Hertfordshire, England in 1581. He was a mathematician who invented many useful measuring devices, including a forerunner of the slide rule.

He was educated on the royal foundation of Westminster school, and in 1599 was elected a student of Christ Church, Oxford. After graduating bachelor and master of arts, he became a preacher in 1614, and in November, 1615, proceeded to the degree of bachelor in divinity. Mathematics, however, which had been his favorite study in youth, continued to engross his attention, and on March 6, 1619, he was appointed to the professorship of astronomy in Gresham College, London, a post he held until his death.

Gunter published seven figure tables of logarithms of sines and tangents in 1620 in Canon Triangulorum, or Table of Artificial Sines and Tangents. The words cosine and cotangent are due to him. He made a mechanical device, Gunter's scale, to multiply numbers based on the logs using a single scale and a pair of dividers.

He also invented Gunter's chain which was 22 yards long with 100 links. 66 feet or 22 yards is the length of a cricket pitch. The acre, defined as ten square chains, was approximately the amount of land tillable by one man behind an ox in one day. This explains its definition of in terms of the non-square one-Chain by one-furlong (660 feet or 10 chains) parcel of land; a long narrow strip of land is more efficient to plough than a square plot, since the plough does not have to be turned so often.

Gunter also did important work on navigation, publishing New Projection of the Sphere in 1623. He died December 10, 1626.

Reference:
http://www.todayinsci.com/12/12_10.htm#death
http://www.britannica.com/EBchecked/topic/249527/Edmund-Gunter