New Hampshire DOT
Department of Transportation

Bridge Design Manual

Chapter 10

Non-Bridge Structures

January 2015 – v 2.0

(Revised August 2019)

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Chapter 10 Non-Bridge Structures

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Chapter 10 Non-Bridge Structures

10.1 General

The Bureau of Bridge Design provides design support for miscellaneous structures that are part of projects from other bureaus such as Highway Design, Traffic, Transportation Management Center (TMC) and Districts. These structures include overhead sign structures, bridge-mounted sign supports, non-standard traffic signal support structures, intelligent transportation systems (Closed Circuit Television, Road and Weather Information Station Systems and Non-Invasive Pavement Sensor Systems), support structures, and soundwalls. Design assistance should be requested through the Administrator of the Bureau of Bridge Design or through the Design Chiefs.

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10.2 Loads

A. General

Overhead signs, bridge-mounted signs, non-standard traffic signals, intelligent transportation systems (CCTV, Road and Weather Information Station Systems, and Non-Invasive Pavement Sensor Systems), luminaire support structures, and the foundations shall be designed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims, *NHDOT Standard Specifications for Road and Bridge Construction*, *NHDOT Bridge Design Manual*, and any special provisions.

B. Dead Loads

- Sign
  (Incl. weight of sign & attachments (3 psf [14.6 kg/m^2]) and weight of W6x9 sign support (typically avg. 2 psf [9.8 kg/m^2])) — 5.0 psf (24.4 kg/m^2)
- Dynamic Message Sign (DMS) — per manufacturer
- Variable Speed Limit Sign (VSLS) — per manufacturer
- Luminaire — per manufacturer
- Standard Signal Head — per manufacturer
- Bridge Mounted Sign Supports — calculate
- Structural Members — calculate
- Maintenance Walkway — per manufacturer
- Closed Circuit Television — per manufacturer

C. Wind Loads

- The 3-second wind gust map in the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* shows the basic wind speed to be used when computing design wind pressure.
- Basic wind speed of 100-mph **(**160-km/hr) shall be used for the entire state of NH *except* in the Special Wind Region (i.e. regions along the NH-VT border and Franconia Notch) as shown in *AASHTO Specifications*, Fig. 3.8.3-5. The maximum-recorded wind speed in this area shall be used as the basic wind speed if it is greater than the NH basic wind speed of 100-mph (160-km/hr). See the wind speed map located at http://www.windspeedbyzip.com/, Appendix 10.2-A1, and weather stations in the special wind region for recorded wind speeds.

D. Design Life and Recurrence Interval (*Table 3.8.3-1,2,3 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*)

- 50 years for all overhead sign structures (i.e. bridge or cantilevered), bridge-mounted sign supports, traffic signal mast arms with/without luminaires (all heights), ITS support poles, and lighting poles when the horizontal distance from roadway to pole ≤ height of pole.
- 25 years for ITS support poles, lighting poles when the horizontal distance from roadway to pole > height of pole, and soundwalls.

E. Ice Loads

- 3-psf (14.6-kg/m^2) applied around all the surfaces of the structure and attachments but applied to only one face of sign panels per *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.
- 3-psf (14.6-kg/m^2) applied to the top, ends, and one face of a DMS or VSLS.

F. Snow Loads

- 40-psf (195.3-kg/m^2) applied simultaneously with ice load to the top panel and any other nearly horizontal projection surfaces of a DMS or VSLS.

G. Fatigue Design:

Fatigue design shall conform to *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* and the following categories:

1) Cantilevered Fatigue Category I:
   - All overhead cantilever sign structures
     - ⇒ Galloping loads may be excluded for fatigue design of overhead cantilevered sign structures with four-chord horizontal trusses.
   - All bridge-mounted sign supports
   - High-mast lighting poles (horizontal distance from roadway to pole ≤ height of pole)
   - ITS support poles (horizontal distance from roadway to pole ≤ height of pole)
   - Typical lighting poles with mast arm (horizontal distance from roadway to pole ≤ height of pole)

2) Cantilevered Fatigue Category II:
   - All traffic signal supports (mast arms)
     - ⇒ Natural Wind Gust loading shall be <u>included</u>.
     - ⇒ Truck Induced Gust loading and Gallop loading may be <u>excluded</u>
   - ITS support poles (horizontal distance from roadway to pole > height of pole)
   - Typical lighting poles with mast arm (horizontal distance from roadway to pole > height of pole)
   - High-level (high-mast) lighting poles (horizontal distance from roadway to pole > height of pole)

3) Non-Cantilevered Fatigue Category I:
   - Overhead bridge sign structures located along the Turnpike, Interstate, and Interstate ramps

4) Non-Cantilevered Fatigue Category II:
   - Overhead bridge sign structures located on non-Turnpike, non-Interstate, NH, and US numbered routes

H. Live Load: A live load consisting of a single load of 500-lbs. (226.8-kg) distributed over 2.0-ft. (0.6-m) transversely to the member shall be used for designing members for walkways and platforms (See *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, Section 3.6*).

Support structures shall be designed using the maximum of the four load groups noted in *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, Section 3.4 and Table 3.4-1*.

10.3 Overhead Sign Structures

10.3.1 General

The design of overhead sign structures is a combined effort between the Bureau of Bridge Design and the supplier of the structure. Bridge Design is responsible for the preliminary and final design of the foundations for overhead sign structures for In-House projects. Consultants are responsible for the preliminary and final design of the foundations, with the guidance from Bridge Design, for Consultant projects. The supplier of overhead sign structures is responsible for the design of the structure and submits shop drawings to the Department for approval. The supplier's calculations and shop plans are reviewed for general conformity with Contract Plans and NHDOT's policies and specifications.

10.3.2 NHDOT Design Requirements

A. Structure

- Overhead sign structures shall be designed to accommodate sign surface areas 30 percent greater than those shown on the plans, unless otherwise noted.
- The structures shall be galvanized steel in accordance with NHDOT Specification 550.2.9.
- Provide a 3-foot (1-meter) walkway with OSHA approved railing for access to any electronic message signs on overhead structures. The walkway shall extend to the edge of pavement to provide access to the DMS without having to use a bucket truck over the travel lane, or having to shut down travel lanes.
- The structure shop plans and calculations shall be prepared and stamped by a professional engineer licensed in the state of New Hampshire.
- 25 percent of the base plate-to-post weld shall be inspected by magnetic particle testing per AASHTO Specifications. This requirement shall be noted on the shop plans.
- Sign support members (W6x9) shall not be greater in length than the sign height.
- The Fabricator shall furnish a complete set of shop drawings and design calculations, along with the design forces and offsets, as noted in Special Provision Amendment to Section 615, Traffic Signs.
- The connection of the structure to the foundation shall be a double-nut moment connection.
- Lock washers shall <u>not</u> be used with the installation of high strength bolts per FHWA Guidelines.
- Triangular truss and tubular arch type overhead sign structures, as shown below, are <u>not</u> permitted due to concerns with their susceptibility to fatigue cracking.

- NHDOT permitted sign structure types include the following (see Figure 10.3.2-1):
  1) truss upright, truss horizontal
  2) monotube upright, truss horizontal
  3) monotube upright, monotube horizontal

monotube upright, truss horizontal

truss upright, truss horizontal

monotube upright, monotube horizontal

truss upright, truss horizontal

NHDOT Sign Structure Types

Figure 10.3.2-1

B. Foundation

- Spread footing foundations shall be used for all sign structures, unless directed otherwise by the Geotechnical Engineer.
- NHDOT policy for maximum allowed area of footing with uplift shall be the following:
  ⇒ Sign bridge structure = 5 % of footing area.
  ⇒ Cantilevered sign structure = 1 % of footing area.
- Use the same reinforcing bar size for both directions in the footing.
- The vertical stem reinforcing bars shall be checked for development length, into both the stem and footing.
- The overlap length of the vertical reinforcing bar and anchor rod shall be checked that the length is equivalent to a class c splice of the reinforcing bar.
- The distance from the top of the concrete stem to the bottom of the sign structure base plate shall equal the nut height plus 1-inch (25-mm) (preferred) or nut height plus the anchor rod diameter (maximum). (Note the nut height equals the rod diameter.)
- Anchor rods shall conform to the requirements of ASTM F1554 Grade 55 (minimum). ASTM A615 reinforcing steel is not permitted. Galvanize the entire anchor rod per ASTM A153. Each anchor rod shall be supplied with a minimum of two hex nuts (ASTM A563 or ASTM A194) and a minimum of two flat hardened washers (ASTM F436).
- Anchor rods shall include hardened washers. Lock washers shall not be used as they do not prevent loss of the anchor bolt preload, and their variability of deformation under load does not provide for proper bolt tension during installation.
- Anchor rod size and layout shall be designed by the structure Fabricator and shall be identical for both left and right footings.
- For sign structures that are designed for Cantilevered Fatigue Category I, the anchor rods shall be designed for wind-induced cyclic loads per *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 5.17.3.4.*
- Each monotube upright post shall have a minimum of eight (8) foundation anchor rods. Each post of a multi post upright (truss) shall have a minimum of four (4) foundation anchor rods per post.
- The connection of the structure to the foundation shall be a double-nut moment connection.
- Grout shall <u>not</u> be used between the structure base plate and the top of the footing. The grout on existing footings has cracked, allowing water and chlorides to stay in the cracks and not dry out, which has led to corrosion of the anchor rods.
- A stainless steel standard grade wire cloth (1/4-in. (6.4 mm) maximum opening with minimum wire diameter of AWG No. 16) shall be installed around the structure base plate and top of footing with a 2-inch (51 mm) lap as shown and noted on the footing plans. The screen is to prevent debris from collecting beneath the base plate, keep animals out, and protect the electrical wires.
- Typical NHDOT sign footing plan is shown in Appendix 10.3-B1.
- Cofferdams, Item 503.20x may be required if there is insufficient room to excavate for the footing using 1.5:1 cut slopes. Cofferdams with Sheeting Left-in-Place, Item 503.30x, should be used when its removal would create a stability problem with adjacent

structures of any type, including roadways and drainage, the sign structure itself or as required by the geotechnical engineer.

Typical NHDOT Sign Structure Footing

Figure 10.3.2-2

C. Geometry

- The top of the concrete stem shall be placed 3-inches ± (76-mm) higher than the adjacent highest finished grade.
- The bottom of the foundation shall be placed a minimum of 5'-0" (1.5-m) below the lowest finished grade (normal to the ground surface) for frost cover.
- The upright face of the sign structure which is closest to traffic shall be located outside the clear zone. However, if the sign structure cannot located outside the clear zone, the upright face closest to traffic shall be located a minimum of 10-ft. (3-m) behind the guardrail for any Interstate or Turnpike location. Any exception to this shall be approved by the Bureau of Traffic.
- Overhead signs shall provide a vertical clearance of 17'-6" (5.3-m) [18'-0" (5.5-m) preferred by Bureau of Traffic] over the entire width of the travel way and shoulders.
- The maximum overhead cantilever sign structure span is 50-ft. (15-m). Any exception to this shall be approved by the Design Chief, Bureau of Bridge Design.
- The foundation and structure shall be located within the state owned right-of-way, and without interference with utilities, drainage pipes, or structures.

10.3.3 Installation

- The foundation shall be constructed and the sign structure installed according to NHDOT Standard Specifications for Road and Bridge Construction, Section 615 – Traffic Signs, and the Special Provision, Amendment to Section 615 – Traffic Signs.
- The Special Provision, Amendment to Section 615 – Traffic Signs, shall be included in all project proposals that have a sign structure. This special provision addresses the anchor rod installation and pretensioning procedures for the double-nut connection to the foundation.
- The structure shall not be placed onto the leveling nuts until the foundation concrete has cured for at least 7 days or attained at least 80 percent of its design compressive strength.
- Sign mounting brackets shall be attached to the structure utilizing only bolted connections, which allow complete lateral and vertical adjustment of the sign over the roadway, as noted in Section 615.
- Foundation must be backfilled to the elevation shown on the plans, prior to installation of the sign structure.
- When the sign panels are not installed immediately upon installation of the structure, an equivalent loading, such as dampers, shall be installed temporarily for mono-tube cantilever structures only.

10.3.4 Design Guidelines

A guideline for the review of the sign structure shop plans and design, and drawing of the foundation plan, can be found in Appendix 10.3-A1. A sample plan of a sign footing can be found in Appendix 10.3-B1.

If the site being considered for a sign structure has poor soil conditions, a decision must be made on whether to use a bridge sign structure with two foundations or a cantilevered sign structure

with one foundation on piles, a cost comparison will usually show that the cantilevered sign structure with one foundation on piles is approximately twice the cost of a bridge sign structure. The pile foundation cost is higher due to the cost of providing pile driving equipment.

10.3.5 Design Process and Coordination

1) Upon initiation of a design for a new sign structure, the lead Bureau shall request borings and shall provide the following to the Bureau of Materials and Research:
   - Roadway plan and cross-sections showing the proposed location of the structure(s) and boring location by station and offset.
   - One boring should be requested for each foundation. If poor soils are encountered, the designer shall be contacted to determine if a boring should be taken at another location (i.e., the location moved or a sign bridge structure could be used at the location instead of a cantilever structure).

2) The lead Bureau then requests a preliminary sign footing size and quantities from the Bureau of Bridge Design or the design Consultant. The request should include the following:
   - A "stick diagram" for each structure indicating the structure location, span, offset, signs, sign location on the structure, elevations, vertical clearance, dimensions, and any other attachments to the structure.
   - Roadway plan and cross-sections showing the proposed location of the structure(s).
   - Any other information that may affect the final location of the sign foundation.

3) In response to the Preliminary Sign Footing Request, the Bureau of Bridge Design or the design Consultant shall provide the following to the lead Bureau:
   - Approximate footing dimensions for each structure.
   - A cross-section of each structure with the preliminary footing drawn on the section, indicating the top and bottom footing elevations and showing cofferdams, if required.
   - Estimated quantities for construction of the footing:
     - ⇒ Item 206.1, Common Structure Excavation
     - ⇒ Item 503.20x, Cofferdams (if required)
     - ⇒ Item 503.30x, Cofferdams with Sheeting Left-in-Place (if required)
     - ⇒ Item 508, Structural Fill (if required)
     - ⇒ Item 520.2, Concrete Class B
     - ⇒ Item 544.1, Reinforcing Steel (Roadway)
   - Appendix 10.3-A2 provides tables of data for bridge and cantilever sign structures and their foundation that have been designed and constructed . This information is for reference only and can be used for preliminary estimates for footing dimensions and quantities.

4) Contract Plan Stage

The lead Bureau or design Consultant shall transfer the preliminary sign footing information onto the contract plans. The contract plans and/or proposal shall include the following:

- "Stick diagram" of each structure with the latest information showing the structure location, span, offset, signs, sign location on the structure, elevations, vertical clearance, dimensions, and any other attachments to the structure.
- Sign Text Layout Plan
- General Roadway Plan showing the structure and foundation locations
- Cross-sections showing the structures and foundations (transferred from the preliminary sign footing cross-section).
- Special Provision, Amendment to Section 615 – Traffic Signs
- The project estimate shall include funds for structural steel inspection during fabrication of the sign structure (approximately $2,000 for each structure).

5) Award of the Contract Stage

- The Contractor shall submit a complete set of sign structure shop drawings and design calculations, along with the design forces and offsets, as noted in Section 615.3.4.1.2, Structure Requirements, of the Special Provision Amendment to 615, Traffic Signs.
- The Bureau of Bridge Design, or the design Consultant, shall review the Fabricator's sign structure calculations and shop plans for conformity with the contract plans, proposal, specifications, and NHDOT policy. The shop plans shall be stamped "Approved", "Approved Except as Noted", or "Disapproved" and returned to the Bureau of Construction for distribution to the Contractor, Traffic Bureau, Steel Fabrication Inspector, and Fabricator.

  The review shall conform to the requirements of the following:

  - Contract plans
  - Addendums
  - Specifications
  - Special Provision, Amendment to Section 615
  - NHDOT Bridge Design Manual, Chapter 10 Non-Bridge Structures
  - Sign Structure and Footing Design Guidelines (Appendix 10.3-A1)

- The Bureau of Bridge Design or the design Consultant will design the sign structure footing(s) using the design loads provided by the Fabricator of the sign structure. A footing plan shall be prepared (See Appendix 10.3-B1 for a sample Sign Structure Footing Plan) and shall include the following:

  - ❑ Plan, elevation, and sectional view of footing
  - ❑ Reinforcing layout and schedule
  - ❑ Item numbers and quantities
  - ❑ Item number of structure
  - ❑ Notes
  - ❑ Detailed description of the footing location (obtain from the Bureau of Traffic; the description shall be more than the structure stationing)
  - ❑ Traffic Inventory Number (obtain from the Bureau of Traffic)

- ❑ Plan file number (Assign file number as instructed in the Sign Footing File Number document [S:\Bridge-Design\FORMS\PROJECT\Sign Footing Plan File Number.xls])
- ❑ Anchor Rod detail as shown on the sample footing plan
- ❑ Pay limits of Items 206.1 and 508 (if required)

6) Distribution of Plans

- Distribute the following to the Bureau of Construction:
  - ❑ Electronic copy of the sign structure footing plan(s).
  - ❑ Electronic copy of "Approved" stamped sign structure shop plans.
- Distribute the following to the Fabrication Engineer, Bureau of Bridge Design:
  - ❑ One (1) paper or electronic copy of the "Approved" stamped sign structure shop plans with a transmittal letter noting the project name, number, sign structure location, name of fabricator, and noting that the copy is to be distributed to the shop inspector.
- Email the Bureau of Traffic Engineering Section, noting that a copy of the "Approved" stamped sign structure shop plans and foundation drawings were scanned and placed as noted below in "Archiving the Plans".

7) Archiving the Plans

The sign structure shop plans and footing plans are stored in the Bureau of Bridge Design. The following shall be filed in Bridge Design for future reference:

- ❑ One (1) full size plan(s) of the sign structure footing, filed in the tub per the file number.
- ❑ A folder labeled with the sign structure project name and project number, and placed in the Sign Structure file cabinet. The folder shall contain the following:
  - ☐ Half-size paper copy of the "Approved" stamped sign structure shop plans
    - ⇒ Mark the **Traffic Inventory Number** for the structure on the corresponding shop plans for future reference
  - ☐ Design calculations of the sign structure and footing
  - ☐ Half-size paper copy of the sign structure footing plans
  - ☐ "Stick Diagrams" of each structure from the contract plans
  - ☐ Cross-section of each structure from the contract plans
    (Note: The final footing needs to be sketched on the cross-sections and noted since the cross-section shows the preliminary footing)
  - ☐ Copy of any addendums or special provisions
  - ☐ Half-size copy of the General Roadway Plans showing the structure locations
  - ☐ Geotechnical Report and Boring Logs
  - ☐ Half-size copy of the Sign Text Layout Plan from the contract plans
- ❑ Save an electronic copy of the "Approved" stamped sign structure shop plans and foundation drawings.
  - ☐ Save the scanned documents in the V:\ directory (V:\Bureaus\B54-Traffic\ENGINEERING&RESEARCH\OHSS\Plans (Structure & Footing).
  - ☐ Create a sub-folder with the structure inventory number.
  - ☐ Save the documents in the sub-folder. The scanned structure shop plans should be named with the year approved (i.e., structure 2012.pdf). The

scanned footing plans should also be named with the year designed (i.e., footing 2012.pdf). Include the word "original if a new structure and/or footing.

8) Recording Sign Structure and Footing Details

- The sign structure and footing details shall be entered into the Bureau of Bridge Design Database by the project engineer as described in the Sign Structure and Footing Design Guidelines (Appendix 10.3-A1).
- If Bridge Design was not the lead Bureau of the sign structure project, the lead Bureau or design Consultant shall forward the plans and information as noted above (Archiving the Plans) to the Bureau of Bridge Design for archiving and recording.

10.3.6 Adding New Signs to an Existing Overhead Sign Structure

Existing sign structures and foundations that were constructed since 1975 have been designed to accommodate a total sign surface area 30% greater than the proposed sign area. If a sign(s) needs to be replaced or added to an existing overhead sign structure, the Bureau of Traffic shall coordinate the following:

1) The Traffic Engineer shall determine, from the existing project folder calculations and shop plans, the total sign surface area for which the structure and foundation were designed. If the Bureau of Traffic does not have a copy of the calculations and shop plans, the Traffic Engineer shall contact the Bureau of Bridge Design for a copy. Since the existing signs on the structure may not be the actual signs for which the structure was designed, the actual designed sign surface area needs to be confirmed by the design calculations and shop plans. The Bureau of Traffic has created a sign structure database to inventory each structure and its signs. Information regarding the total designed sign surface area for the structure will be added to the database for future reference.

2) For overhead sign structures where the centroid of each sign remains coincident with the mid-height of the horizontal truss, does not lower the vertical clearance and does not move laterally:
   a) If the new total sign surface area is *less than* the total *designed* sign surface area (original sign surface area plus 30%), the Traffic Engineer can replace the existing sign with the new sign *without* any further analysis.
   b) If the new total sign surface area is *greater than* the total *designed* sign surface area (original sign surface area plus 30%), the Traffic Engineer shall contact the Bureau of Bridge Design for analysis of the existing structure and foundation with the new loading.

3) For overhead sign structures where the centroid of an existing or new sign moves vertically from the mid-height of the horizontal truss and/or moves laterally to a different location on the horizontal, the Traffic Engineer shall contact the Bureau of Bridge Design for analysis of the existing structure and foundation with the new loading, *regardless* of whether the total sign area increases *or* decreases.

4) Any change of the sign(s) on the structure or the structure itself shall be updated in the Bridge Design Database.

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10.4 Bridge-Mounted Sign Supports

10.4.1 General

Bridge-mounted sign supports shall be designed, fabricated, and constructed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,* including interims; *NHDOT Standard Specifications for Road and Bridge Construction, Section 615 – Traffic Signs*; the *Bridge Design Manual*, NHDOT Detail Plan and any special provisions.

A standard design for bridge mounted sign support is provided on the NHDOT Bridge Design Detail Sheets located at:
http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm .

- The standard design shown on the detail sheet has been designed in accordance with the criteria noted on the plan (See Appendix 10.4-B1).
- If the proposed sign support meets the standard design criteria, the detail sheet title box shall be filled out and the sheet can be included in the contract plans.
- If the proposed sign and/or support exceeds any of the standard design criteria (support dimensions, sign dimensions, sign weight, skew angle), the sign support members and anchors will need to be *redesigned*, the girder (to which it is attached) evaluated for the load, *and* a new plan prepared to include in the contract plans. This work shall be performed by Bridge Design if the project is an In-House project or by the Consultant if the project is a Consultant project.

If the bridge has an existing road identification sign attached to the deck coping, use Item 615.35801, Reset Bridge Mounted Traffic Sign Type BB to re-attached the sign to the bridge. See Figure 10.4.2-2 for a typical road identification sign attached to a bridge.

10.4.2 Coordination

1) Once the contract is awarded, the Contractor shall submit shop drawings indicating the member sizes, lengths, and materials, to the Bureau of Bridge Design for approval, in accordance with Section 105.02 of the NHDOT Standard Specifications.
    - The Bureau of Bridge Design or the design Consultant shall review the Fabricator's shop plans for conformity with the contract plans, proposal, specifications, and NHDOT policy. The shop plans shall be stamped "Approved", "Approved Except as Noted" or "Disapproved", and returned to the Bureau of Construction for distribution to the Contractor and Fabricator.

2) Distribution of Plans:
    - Distribute the following to the Bureau of Construction:
        - ❑ Four (4) copies of the stamped shop plans.
    - Distribute the following to the Fabrication Engineer, Bureau of Bridge Design:
        - ❑ One (1) copy of the "Approved" stamped shop plans with a transmittal letter noting the project name, number, sign support location and noting that the copy is to be distributed to the shop inspector.

- Email the Bureau of Traffic Engineering Section, noting that a copy of the "Approved" stamped shop plans were scanned and placed as noted below in "Archiving the Plans".

4) Archiving the Plans:
   - If the bridge-mounted sign support is part of a bridge project:
     - ❑ File one (1) half-size copy of the "Approved" stamped shop plans along with any correspondence, in the bridge project folder and in the Sign Structures file cabinet located in the Bureau of Bridge Design.
     - ❑ Scan a copy of the "Approved" stamped shop plans. Place the scanned documents in the V:\Towns directory under the town in which the bridge is located, the bridge inspection maintenance folder, the bridge number, and shop drawings sub-folder (i.e. V:\Towns\Bow\BridgeInspMaint\136_160\Shop Drawings). The scanned shop plans should be named with the year, description, and project number (i.e., 2012 bridge mounted sign supports_12567.pdf).

   - If the bridge-mounted sign is not part of a bridge project:
     - ❑ File one (1) half-size copy of the "Approved" stamped shop plans, along with any correspondence, in a folder with the town name and bridge number in the beginning of the Sign Structures files cabinet located in the Bureau of Bridge Design.
     - ❑ Scan a copy of the "Approved" stamped shop plans. Save the scanned documents in the V:\Towns directory under the town in which the bridge is located, the bridge inspection maintenance folder, the bridge number, and shop drawings sub-folder (i.e. V:\Towns\Bow\BridgeInspMaint\136_160\Shop Drawings). The scanned shop plans should be named with the year, description, and project number (i.e., 2012 bridge mounted sign supports_12567.pdf).

Typical NHDOT Bridge Mounted Sign Supports

Figure 10.4.2-1

Typical NHDOT Road Identification Sign

Figure 10.4.2-2

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10.5 Traffic Signal Supports (Mast Arms)

10.5.1 General

The traffic signal supports (mast arms) and foundations shall be designed, fabricated, and constructed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims; *NHDOT Standard Specifications for Road and Bridge Construction Section 616 – Traffic Signals*; and the *NHDOT Standard Plans for Road Construction* and any special provisions.

10.5.2 Design Process

1) The Bureau of Traffic will contact the Bureau of Materials and Research, Geotechnical Section as to whether the geotechnical capacity of the soils providing foundation support satisfies the design requirements of the standard foundation plans for the project site.
2) The contract plans will indicate mast arm dimensions and type required as directed by the Bureau of Traffic. The maximum mast arm length is 60-ft. (18.3-m).
3) The revised standard mast arm structure plan, TS-7, shows configurations of the traffic signal supports with combinations of signals, attachments, and luminaire. The corresponding revised foundation type that shall be used with each configuration is shown on the traffic standard plan TS-1, TS-2, TS-3, or TS-4. The plans are currently under review. Once approved, the Traffic Standard Plans will be included in the *NHDOT Standard Plans for Road Construction* and can be found at: http://www.nh.gov/dot/org/projectdevelopment/highwaydesign/standardplans/index.htm

Typical NHDOT Traffic Signal Support (Mast Arm)

Figure 10.5.2-1

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10.6 Intelligent Transportation Systems (ITS), Dynamic Message Sign (DMS), and Luminaire Support Structures

10.6.1 Intelligent Transportation Systems (ITS) Support Structures

Support structures and foundations for all intelligent transportation systems [Closed Circuit Television Cameras (CCTV), Road and Weather Information Station (RWIS) Systems, and Non-Invasive Pavement Sensor Systems] shall be designed, fabricated, and constructed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims; and the current NHDOT Special Provisions, Section 677.xx – Intelligent Transportation Systems (ITS) Equipment.

A. Closed Circuit Television Cameras (CCTV)

The design of CCTV systems is a combined effort between the Transportation Management Center, the Bureau of Bridge Design, Bureau of Materials and Research, and the supplier of the structure. Bridge Design and Materials and Research are responsible for the preliminary and final design of the CCTV pole foundation for In-House projects. For Consultant projects, Consultants are responsible for the preliminary and final design of the foundation, with the guidance from Materials and Research and Bridge Design. The supplier of the pole is responsible for the design of the pole and submits shop drawings (through the Contractor) to the Department or the Consultant for approval. The supplier's calculations and shop plans (stamped by a NH PE) are reviewed for general conformance with the Contract Plans and NHDOT policies and specifications. See Figure 10.6.1-3 for a typical CCTV.

B. Road and Weather Information Station (RWIS)

The design of Road and Weather Information Station Systems is a combined effort between the Transportation Management Center, the Bureau of Bridge Design, and the supplier of the structure and foundation. The supplier of the pole is responsible for the design of the pole and foundation and submits shop drawings and calculations to the Department for approval. Bridge Design is responsible for reviewing the pole and foundation shop plans and calculations (stamped by a NH PE) for general conformity, for In-House projects. For Consultant projects, the design Consultant is responsible for reviewing the pole and foundation shop plans and calculations (stamped by a NH PE) for general conformity. See Figure 10.6.1-1 for a typical RWIS.

C. Non-Invasive Pavement Sensor Systems

The design of Non-Invasive Pavement Sensor Systems is a combined effort between the Transportation Management Center, the Bureau of Bridge Design, and the supplier of the structure and foundation. The supplier of the pole is responsible for the design of the pole and foundation and submits shop drawings and calculations to the Department for approval. Bridge Design is responsible for reviewing the pole and foundation shop plans and calculations (stamped by a NH PE) for general conformity, for In-House projects. For Consultant projects, the design Consultant is responsible for reviewing the pole and foundation shop plans and calculations (stamped by a NH PE) for general conformity. See Figure 10.6.1-2 for a typical Non-Invasive Pavement Sensor.

D. Coordination of CCTV Support Pole and Foundation

1) Once the contract is awarded, the Contractor shall submit shop drawings of the CCTV support pole(s), design calculations, and top of foundation reactions for each pole location to the Bureau of Bridge Design for approval in accordance with Section 105.02 of the *NHDOT*

Standard Specifications and the special provision. The Contractor shall also indicate which foundation he will be installing: spread footing or drilled shaft foundation.

⇒ The Bureau of Bridge Design or the design Consultant will use the top of foundation reactions from the fabricator to verify or modify the preliminary foundation design that was included in the contract, for a final design.

⇒ The Bureau of Bridge Design or the design Consultant shall review the Fabricator's shop plans for conformity with the contract plans, proposal, specifications, and NHDOT policy. The shop plans shall be stamped "Approved", "Approved Except as Noted" or "Disapproved", and returned to the Bureau of Construction for distribution to the Contractor and Fabricator.

2) Distribution of Plans:

⇒ Distribute the following to the Bureau of Construction:
- ❑ Four (4) copies of "Approved" stamped structure shop plans
- ❑ Four (4) copies of the foundation plan stamped "Final Design".

⇒ Distribute the following to the Fabrication Engineer, Bureau of Bridge Design:
- ❑ One (1) copy of the "Approved" stamped structure shop plans with a transmittal noting the project name, number, fabricator, location, and noting that the copy is to be distributed to the shop inspector.

⇒ Distribute the following to the Transportation Management Center:
- ❑ One (1) copy of "Approved" stamped structure shop plans
- ❑ One (1) copy of "Approved" stamped foundation shop plans stamped "Final Design".

3) Archiving the Plans:

⇒ Archive the foundation support structure plans in the Bureau of Bridge Design:
- ❑ A folder labeled with the project name and number containing one (1) half-size copy of the "Approved" stamped shop plans, foundation plans, and any correspondence and shall be placed in the project folder (if applicable). A copy should also be filed in the ITS file cabinet located in the Bureau of Bridge Design.

Typical NHDOT RWIS

Figure 10.6.1-1

Typical NHDOT Non-Invasive Pavement Sensor System

Figure 10.6.1-2

Typical NHDOT CCTV

Figure 10.6.1-3

10.6.2 Dynamic Message Sign (DMS) Overhead Structures

All dynamic message sign (DMS) overhead structures and foundations shall be designed, fabricated, and constructed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims, *NHDOT Bridge Design Manual Chapter 10*, and the current NHDOT Special Provisions, Section 677.xx – Permanent Fixed Location Dynamic Message Sign System.

The design of DMS overhead structures is a combined effort between the Transportation Management Center, the Bureau of Bridge Design, and the Manufacturer of the structure. Bridge Design is responsible for the preliminary and final design of the foundations for In-House projects. Consultants are responsible for the preliminary and final design of the foundations, with the guidance of Bridge Design and Materials and Research, for Consultant projects. The Manufacturer of the structure is responsible for the design of the structure and shall submit shop drawings to the Department (through the Contractor) for approval. The Manufacturer's calculations and shop plans are reviewed for general conformity with Contract Plans and NHDOT policies and specifications.

The design process and coordination shall be as noted in Chapter 10, Section 10.3.5. The Department will furnish the foundation design plans for the DMS overhead structure to the Contractor after approval of the overhead structure shop drawings.

Typical NHDOT DMS Overhead Structure

Figure 10.6.2-1

10.6.3 Luminaire Support Structures

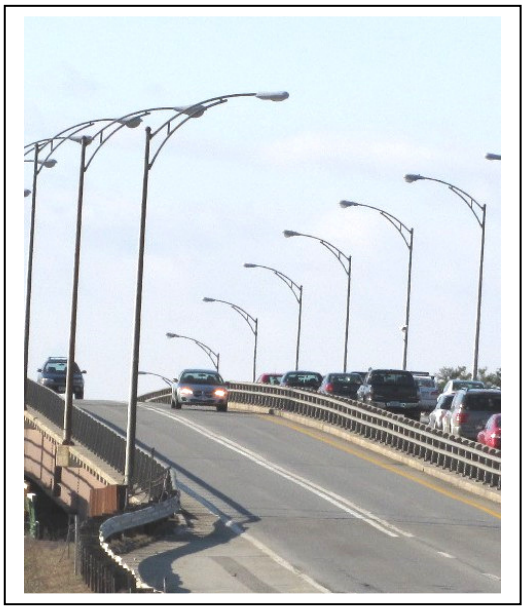
A. Light Poles with Mast Arm

The typical light poles with mast arm and foundation (light pole bases) shall be designed, fabricated, and constructed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims; the current *NHDOT Standard Specifications for Road and Bridge Construction, Section 625, Light Pole Bases;* and any special provision.

Standard foundation designs for typical light pole bases are provided in the *NHDOT Standard Plans for Road Construction*, SL-2, Concrete Foundations and Light Pole Base Type B located at: http://www.nh.gov/dot/org/projectdevelopment/highwaydesign/standardplans/index.htm.

B. High-mast Light Poles

High-mast light poles (towers) shall be designed, fabricated, and constructed in accordance with the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims; and the current *NHDOT Standard Specifications for Road and Bridge Construction* and any special provisions.



Typical NHDOT Light Pole with Mast Arm

Figure 10.6.3-1

Typical NHDOT High-mast Light Poles

Figure 10.6.3-2

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10.7 Soundwalls

10.7.1 General

Soundwalls shall be designed, fabricated, and constructed according to the current *AASHTO LRFD Bridge Design Specifications Section 15, Design of Sound Barriers; NHDOT Bridge Design Manual*, and *NHDOT Special Provision Section 594 – Sound Abatement Wall*. See Figures 10.7.2-1, 2 & 3 for NHDOT soundwalls.

10.7.2 Types

A. Wood Panel Soundwall Detail Sheets

A standard design for wood panel soundwalls is provided on the NHDOT Bridge Detail Sheets located at: http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm.

- The wood panel soundwall and foundation detail sheets provide a design for the soundwall system utilizing wood panels, precast concrete posts, and drilled shaft foundations for wall heights up to **25-ft**. (7.6 m) meeting the design criteria noted on the Bridge Detail Sheets (see Appendix 10.7-B1 for a sample plan of the Soundwall Detail Sheets).
- If any part of the proposed soundwall does not meet these design criteria, the soundwall will need to be designed by the Bureau of Bridge Design or the design Consultant.
- Borings shall be requested by the lead Bureau.
- The designer (Bureau of Highway Design or Consultant) shall develop an alignment and elevation plan for the soundwall.
- The designer shall provide the Bureau of Materials and Research Geotechnical Section with design loads at the top of each drilled shaft.
    - The soundwall foundation will be designed with the criteria specific to the project (i.e., exposure height, wind pressure), independent of the soundwall design. This allows more efficiency for the design of the drilled shaft.
    - The designer shall work with the geotechnical engineer in determining what design criteria shall be used for calculating design loads at the top of the foundation.
    - The Geotechnical Section will determine the drilled shaft lengths required and provide them to the designer to place on the plans.
    - The designer shall create a plan with a soundwall location chart that includes the following:
        - ❑ Post/shaft number
        - ❑ Coordinates of post foundation
        - ❑ Finished grade elevation
        - ❑ Minimum top of wall elevation
        - ❑ Wall height

B. Soundwall located on a MSE Wall

- If a soundwall is located over a MSE wall or some other obstruction where the drilled shaft foundation is not feasible, a concrete moment slab or spread footing shall be utilized.

- The concrete moment slab or spread footing and anchorage system, shall be designed by Bridge Design or the design Consultant with the criteria specific to the project (e.g., exposure height, wind pressure), independent of the soundwall design.
- The designer shall provide the Bureau of Materials and Research Geotechnical Section, with the proposed moment slab or spread footing design and associated bearing pressures.
  - The Geotechnical Section will check whether there is sufficient bearing resistance for the design.
  - If necessary, the designer shall work with the geotechnical engineer in redesigns until the bearing resistance is obtained.
- If the moment slab or spread footing is transferred to an underlying structure, the structural designer shall check the underlying structure's capacity to support any loading applied.
- If a vehicular collision (e.g., box truck tipping) to the soundwall would cause safety concerns regarding debris to the area below the MSE wall, the face of the soundwall wood panel shall be located greater than 4-ft. behind the face of the traffic barrier in accordance with *AASHTO LRFD 15.8.4*, unless the soundwall is designed for the vehicular collision load as noted in *AASHTO LRFD 15.8.4*. The barrier used in front of the soundwall shall meet a crash testing level of TL-4 in accordance with *AASHTO Section 13*.
- The designer shall create contract plans which include the following:
  - ❑ Design loads, materials and specification notes
  - ❑ Foundation design notes
  - ❑ Coordinates of post foundation
  - ❑ Plan and elevation sheets
  - ❑ Moment slab or spread footing masonry and reinforcing details
  - ❑ Anchorage system
  - ❑ Soundwall post and moment slab/spread footing locations and elevations
  - ❑ Summary of quantities
  - ❑ Wall heights

C. Soundwall on a Bridge

- The soundwall detail sheet shall <u>not</u> be used for soundwalls located on a bridge. <u>All</u> soundwall components, including the anchor assembly, shall be designed by the Bureau of Bridge Design or the design Consultant for the project specific criteria (i.e., exposure height, wind pressure).
- The designer shall create contract plans that include information as noted in Section B above.
- The concrete bridge deck overhang shall be designed for the soundwall loading in accordance with *AASHTO LRFD Bridge Design Specifications*.
- The face of the soundwall wood panel shall be located greater than 4-ft. behind the face of the bridge steel traffic barrier in accordance with *AASHTO 15.8.4*, for roadway crossings or if a vehicular collision (e.g., box truck tipping) to the soundwall would cause safety concerns regarding debris to the area below the bridge. The bridge barrier shall be T3 steel bridge railing to meet the height requirements for a crash testing level of TL-4. (*AASHTO Section 13*).

D. Soundwall Sample Plans

- For soundwall examples, see NHDOT Sample Plans located at: http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/sampleplans/index.htm.

NHDOT Soundwall on a Precast Leveling Panel

Figure 10.7.2-1

NHDOT Soundwall on a Moment Slab

Figure 10.7.2-2

NHDOT Soundwall on a Bridge

Figure 10.7.2-3

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10.8 Inspection and Maintenance

10.8.1 Inspection

The Bureau of Traffic will be implementing an inspection program that will include visual inspections of the structure, and UT testing of the anchor rods for all auxiliary structures such as the following:

- Overhead sign and DMS structures
- Traffic signal supports (mast arms)

10.8.2 Maintenance

A. Overhead Sign Structures

The Bureau of Traffic maintains and inspects overhead sign and DMS structures. The Bureau of Traffic maintains a database that inventories each sign structure and the signs located on the structure.

B. Bridge-mounted Sign Supports

The Bureau of Bridge Design Bridge Inspectors inspect the bridge-mounted sign supports at the time the bridge is inspected. The condition of the bridge-mounted sign supports is noted on the last page of the bridge inspection report. If there is concern with the supports or signs, a copy of the inspection report is sent to the Bureau of Traffic for their review. The Bureau of Traffic maintains a database that inventories the bridge-mounted sign supports and the signs located on the sign structure.

C. Typical Light Poles and High-mast Light Poles

The Bureau of Turnpikes and the Bureau of Highway Maintenance maintain light poles and high-mast light poles along the Turnpike, Interstate, Interstate ramps, and NH and US numbered routes, *within* the PSNH servicing area. Light poles and high-mast poles outside the PSNH servicing area are maintained by the servicing company that owns it. The Bureau of Highway Maintenance maintains an inventory of all light poles and high-mast light poles along the Turnpike, Interstate, Interstate ramps, and NH and US numbered routes.

D. ITS Camera Poles

The Bureau of Turnpikes and the Bureau of Highway Maintenance maintain ITS camera poles along the Turnpike, Interstate, Interstate ramps, and NH and US numbered routes. The Transportation Management Center (TMC) maintains the cameras and ITS equipment.

E. Traffic Signal Supports (Mast Arms)

The Bureau of Traffic maintains traffic signal mast arms along the Interstate ramps, and NH and US numbered routes.

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References

1. American Association of State Highway and Transportation Officials (AASHTO), *AASHTO LRFD Bridge Design Specifications, 7th Ed., 2014*, Washington, D.C.

2. American Association of State Highway and Transportation Officials (AASHTO), *Standard Specifications for Highway Bridges, 17th Ed., 2002*, Washington, D.C.

3. American Association of State Highway and Transportation Officials (AASHTO), *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Ed., 2013*, Washington, D.C.

4. Federal Highway Administration (FHWA), *FHWA Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaires, and Traffic Signals, Publication No. FHWA NHI05-036, March 2005*, Washington, D.C.
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5. Johannessen & Leone Associates, *WIND Speed by Zip*
   Retrieved from http://www.windspeedbyzip.com/

6. New Hampshire Department of Transportation Bureau of Bridge Design, *Bridge Design Manual, October1, 2000*, Concord, NH

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

9. Weather Underground, Inc., *Weather Underground Map*
   Retrieved from http://www.wunderground.com/wundermap/?lat=43.208099&lon=-71.537598&zoom=8&type=lightmap&rad=0&sat=0&stormreports=0&svr=0&pix=0&cams=0&tor=0&riv=0&wxsn=1&wxsn.mode=temp&wxsn.opa=50&wxsn.bcdgtemp=0&wxsn.rf=1&ski=0&tfk=0&mm=0&ndfd=0&fire=0&firewfas=0&extremes=0&hurrevac=0&sst=0&livesurge=0&femaflood=0&tsunami=0&seismicrisk=0&fault=0&fissures=0&fronts=0&dir=1&dir.mode=driving&hur=0

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New Hampshire DOT
Department of Transportation

Bridge Design Manual

Chapter 10 – Appendix A

January 2015 – v 2.0

(Revised Feb. 2016)

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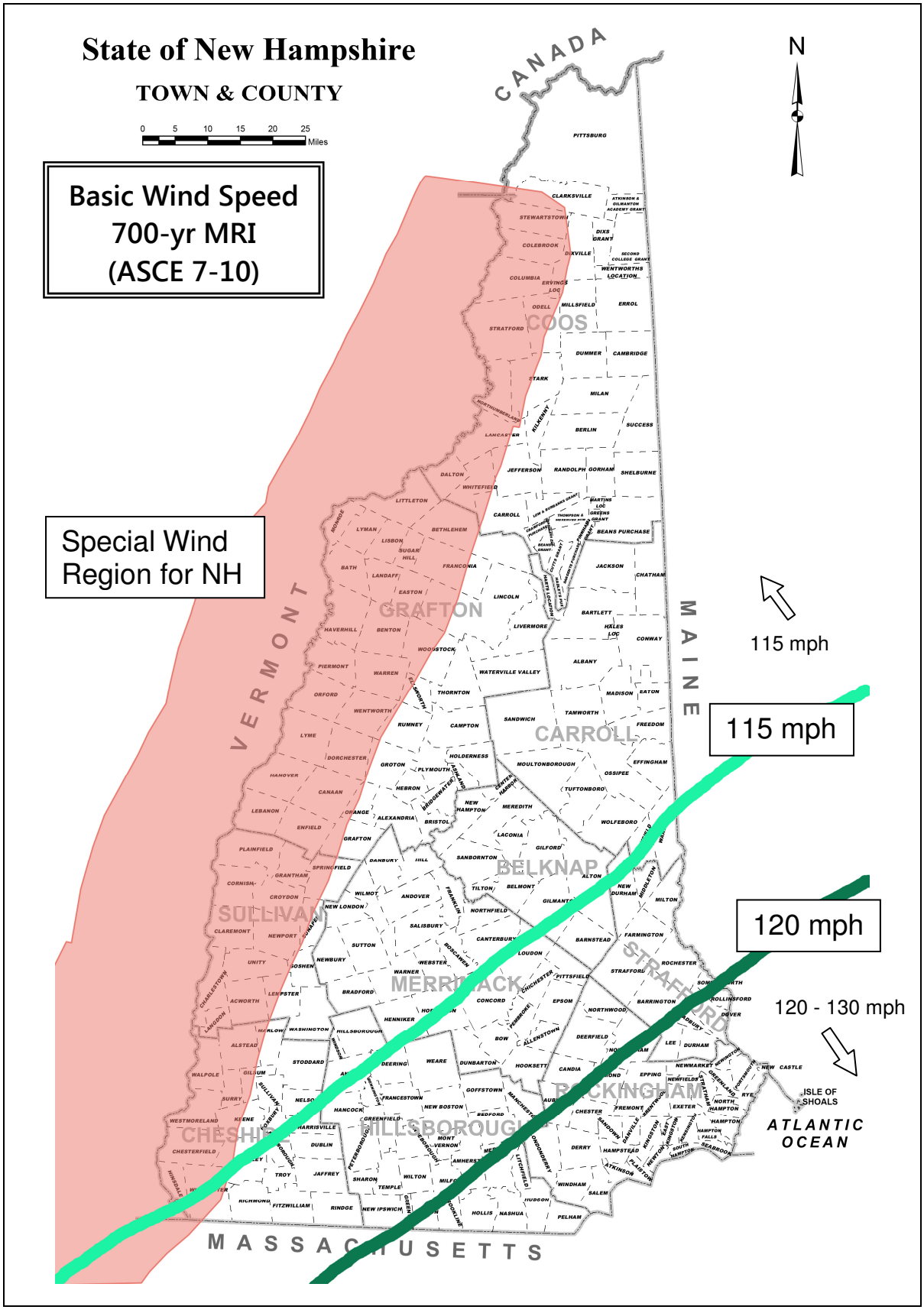
Basic Wind Speed Map for NH and Special Wind Region

- The map on the following page shows the 3-second gust basic wind speed and the Special Wind Region derived from AASHTO LRFD Figure 3.8.1.1.2-1 (ASCE 7-10, MRI 700-yrs.
- The MRI 700-yrs map shall be used for design of bridges, traffic signal mast arms, and soundwalls.
- The basic wind speed for the design of sign structures and CCTV pole supports shall be 100-mph (160-km.hr) as noted in Chapter 10, Section 10.2.
- For the Special Wind Region (i.e. regions along the NH-VT border and Franconia Notch) as shown in *AASHTO LRFD* Figure 3.8.1.1.2-1, the maximum-recorded wind speed in this area shall be used if it is greater than 115-mph (185-kph), else use 115-mph (185-kph). See Chapter 4, Section 4.3.11 Wind Loads, for additional information.
- For wind speeds in the *Special Wind Region*, weather station data can be accessed by clicking on the markers (weather stations) on the weather underground map located at: http://www.wunderground.com/wundermap/?lat=43.63526535&lon=-72.25418091&zoom=8&pin=Lebanon%2c%20NH


State of New Hampshire
TOWN & COUNTY
0 5 10 15 20 25
Miles
Basic Wind Speed
700-yr MRI
(ASCE 7-10)
Special Wind
Region for NH
N
CANADA
VERMONT
MAINE
MASSACHUSETTS
ATLANTIC OCEAN
ISLE OF SHOALS
COOS
GRAFTON
CARROLL
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
CHESHIRE
HILLSBOROUGH
115 mph
115 mph
120 mph
120 - 130 mph

SIGN STRUCTURE & FOOTING DESIGN GUIDELINES

The Sign Structure and Footing Design Guidelines is a working document for use as a guide for reviewing sign structure shop plans, designing the foundation, and drawing the sign structure foundation plan. This guideline is intended to promote consistency and continuity of sign structure and foundation designs, and project coordination.

Overhead sign structures and foundations shall be designed or analyzed in accordance with the following, as appropriate:

- Current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims
- *NHDOT Standard Specifications for Road and Bridge Construction*
- *NHDOT Bridge Design Manual*
- Special Provision, Amendment to Section 615 – Traffic Signs
- Special Provision Item 677.xx – Permanent Fixed Location Dynamic Message Sign

A. Sign Structure Shop Drawings Check List

- ❑ Overhead signs shall provide a vertical clearance of not less than 17’-6” [5.3 m] (18’-0” [6.3 m] preferred by Bureau of Traffic) over the entire width of the pavement and shoulders.
- ❑ Check for any changes made after proposal (i.e., addendums).
- ❑ Check that signs are correctly oriented with respect to stationing (i.e., back of sign).
- ❑ Compare dimensions for signs and structure (post and truss lengths, sign dimensions, and offsets) with stick drawings, cross-sections, Prosecution of Work, addendums, and special provisions.
- ❑ Anchor rod size and layout shall be identical for both left and right footings, otherwise disapprove.
- ❑ Check that the anchor rods are galvanized, include hardened washers, not lock washers, and two nuts (one above and one below base plate) per rod, are shown for the double-nut moment connection to the sign structure.
- ❑ Check for a licensed N.H. P.E. stamp.
- ❑ Check that the top of concrete stem elevation is 3-in. (75 mm) ± higher than adjacent highest finished grade.
- ❑ 25 percent of the base plate-to-post weld shall be inspected by magnetic particle testing per AASHTO specification. This requirement shall be noted on the shop plans.
- ❑ Triangular truss type overhead sign structures shall not be allowed due to concerns with their susceptibility to fatigue cracking.
- ❑ Tubular arch type structures are not allowed due to concerns with their susceptibility to fatigue cracking.
- ❑ Sign support members (W6x9’s) shall not be greater in length than the sign height.
- ❑ Check that the upright face closest to traffic of the sign structure support is a minimum of 10-ft. (3 m) behind the guardrail or is outside the clear zone, otherwise approval is required from Bureau of Traffic.

- ❑ The distance from the top of the concrete stem to the bottom of the sign structure base plate shall be the nut height plus 1-inch [25 mm] (preferred) or nut height plus the anchor rod diameter (maximum). If the shop plans are noted differently, cross-out the shop plan note and add in this note. See "Anchor Rod Detail" on Sign Footing Sample Plan.
- ❑ The connection of the structure to the foundation shall be a double-nut joint moment connection.
- ❑ The maximum overhead cantilever sign structure span is 50-ft. (15.2 m) Any exception to this shall be approved by the Design Chief of the Bureau of Bridge Design
- ❑ Anchor rods shall conform to the requirements of ASTM F1554 Grade 55 (minimum). ASTM A615 reinforcing steel is not permitted. Galvanize the entire rod per ASTM A153. Each anchor rod shall be supplied with a minimum of two hex nuts (ASTM A563 or ASTM A194) and a minimum of two flat hardened washers (ASTM F436).
- ❑ Each monotube upright post shall have a minimum of eight (8) foundation anchor rods. Each post of a multi post upright (truss) shall have a minimum of four (4) foundation anchor rods per post.

B. Check Input, Loads, and Reactions from Fabricator's Sign Structure Program

There have been many instances where computer programs have provided incorrect output and incorrect reactions (e.g: The values for the wind on the sign were 30% low, even though the input was correct.).

- ❑ Check for a licensed N.H. P.E. stamp.
- ❑ Check that the design was per the current edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, including interims
- ❑ Check that the Design Sign Area = 1.3 x Actual Sign Area
- ❑ Check input values and spot check output values. (See NHDOT Bridge Design Manual, Chapter 10, Section 10.2 Loads)
- ❑ Check that sign structures designed for Cantilevered Fatigue Category I, have the anchor rods designed for wind-induced cyclic loads per AASHTO Specifications Section 5.17.3.4.

C. Check Constructability of Footing.

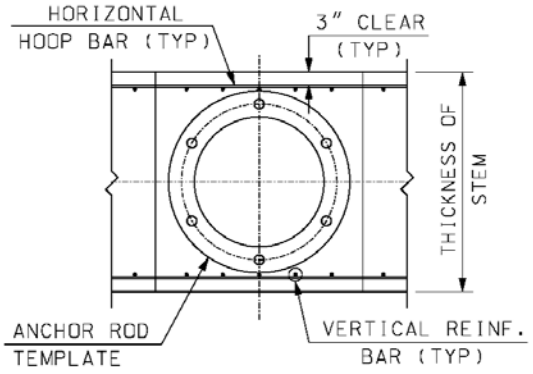
- ❑ Check if cofferdams are required. Include item number on sign footing plan, if the item is included in the contract items. Cofferdams, Item 503.20X may be required if there is not enough room to excavate for the footing using 1.5:1 slopes. Cofferdams with Sheeting Left-in-Place, Item 503.30x, should be used when its removal would create a stability problem with adjacent structures of any type, including roadways and drainage structures, the sign itself or required by the geotechnical engineer.
- ❑ Check that the sign structure and foundation are located to avoid any interference with utilities, drainage pipes, or structures.

D. Review Geotechnical Report.

- ❑ Check allowable bearing pressure
- ❑ Check frost depth:
  ⇒ The bottom of the foundation shall be placed a minimum of 5'-0" (1.5 m) below the lowest finished grade measured normal to the ground surface for frost cover.
- ❑ Check with the Design Chief to confirm the necessity of structural fill below the footing.
- ❑ Check to determine if rock anchors or any other foundation requirements are specified.

E. Footing Design Check List

- ❑ There are In-House Design programs for the foundation design located at: S:/Design/Programs/Sign
- ❑ Minimum thickness of stem = anchor rod template outside diameter + 2*(dia. vertical bar + dia. horizontal hoop bar + 3" [75 mm] clear)



- ❑ Length of stem base at top of footing = footing length – 1 ft. (300 mm)
- ❑ Length of stem at top of pedestal = post spacing + stem thickness
- ❑ If left and right footing are similar, use *identical* footings.
- ❑ Design method: ASD (Allowable Stress Design) per *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*
- ❑ Grout shall not be used between the bottom of the structure base plate and the top of the footing.
- ❑ Cantilever sign structure with more than one (1) sign:
  $L_{sign} = \sum(A_{sign} \times L_{sign}) \div \sum A_{sign}$
- ❑ Sign Bridge sign structure: If using Sign.Exe program, the input load $DL_{truss+signs}$ and $IL_{truss+signs}$ = reaction of one leg due to the DL or IL of total signs and truss. The designer needs to run two programs, one for each leg, if signs are not the same size and/or are not symmetrical.
- ❑ Check bearing pressure: $Q_{max} < Q_{allow}$

- If $Q_{min} < 0$ (negative soil pressure, footing uplift) use AASHTO Fig. 4.4.7.1.1.1C to calculate uplift.
- NHDOT policy for maximum allowed footing area with uplift is the following:
  - ⇒ Sign bridge structure = 5 % of footing area.
  - ⇒ Cantilevered sign structure = 1 % of footing area.
- If the area of footing having uplift is > 5% for sign bridge structure, or > 1% for cantilevered sign structure, *increase* footing size.
- Design the footing reinforcing for loading in both the transverse and longitudinal direction.
  - ⇒ Use the *same* size reinforcing bar for both directions, for ease of construction.
- Check the development length for stem reinforcement at the footing interface both into the stem and into the footing.
- Check that the overlap length of the vertical reinforcing bar and anchor rod is equivalent to a class c splice length of the reinforcing bar.
- If sign structure is a cantilever structure, the stem design should be checked for torsion.
- Check the area of reinforcing required for stem sections at the **bottom**, **top**, **middle**, and a **distance down from the top of the stem**, for both the transverse and longitudinal directions. (In some designs, the slope of the stem causes the bars to drop out of the section quickly, creating less area of steel at certain heights of the stem.) Make sure the stem design has adequate amount of reinf. required at all sections of the stem height.
- If the footing is founded on bedrock and if rock anchor rods are required:
  - ⇒ Check soils report for bearing capacity of bedrock
  - ⇒ Check the pullout capacity of the ledge. Per AASHTO Table 5.7.6.2B, granite = 50 k/ft.(74.4 Tn/m), FS = 3 for anchors in rock. (If anchor is drilled four feet into granite, then the granite can resist 4 ft. x 50 k/ft. /3 = 66.6 k force.)
  - ⇒ Check capacity of anchor = $0.55(F_y)(A_{bar})$.
  - ⇒ Rock anchors should be grade 60 ksi reinforcing steel.
  - ⇒ Anchor should be set in drilled holes = ½" (12 mm) + Dia. bar.
  - ⇒ Hole should be filled with an approved high-strength non-shrink grout, minimum 2 ft. (600 mm) deep.

F. Drafting Footing Plan Using CADD Macro: Sign Footing

- Enter MicroStation
- On the File Open splash screen, make sure the project is listed as "BRIDGE MISC ENGLISH" in the Workspace box.
  - ⇒ Open N:\CADD\Misc Accounts\BRD\Sign Footings
- Create a sub-folder with the project name and number
- Create a .dgn using the item number of the structure (e.g., 615_10001.dgn). If a sign bridge structure, add the designation of "LT" or "RT" to distinguish the file name (e.g., 615_10001_LT.dgn)
- Click on the "File" tab at the top of the File Open splash screen and click "New".
- Double click on the .dgn to open the drawing
- Open Level Manager, attach Library: BRC.csv, close out Level Manager
  - ⇒ This needs to be done every time a .dgn is created for the macro to run.
  - ⇒ N:\CADD\CADD\v8i_Workspace\Standards\dgnlib
- Click on NHDOT (top menus), Sign Footing
- Macro input menu opens. Input values as applicable on the "Footing", "Rods", "Reinforcing Bars" and "Pay Limit Details" tabs.
- Click on "Do It" once all input is complete.
- Click on full screen view when macro is done.

- Editing of the drawing may be required for job specific items.
  - File number for new sign footing plans: **122-x-x** (old files are 115-3 [2013 -11], 105-2 [2010 -2007], 77-5 [2006 -1999], 45-4 [1998 – prior]) Log file number in sign footing plan file document S:\Bridge-Design\FORMS\PROJECT\Sign Footing Plan File.xls
  - Give a detailed description of the footing location (e.g., 250-ft. north from Exit 12, I-93 SB), not just a construction station location. Obtain this description from the Bureau of Traffic.
  - Indicate on the plans near the title box, the **Traffic Inventory Number** for the structure. Call Bureau of Traffic to obtain the inventory number they have assigned to the structure.
  - Check Item numbers and descriptions and check that they match the contract plans.
  - Indicate the footing design bearing pressure in the Sign Footing Notes on the plan.
  - Indicate the design sign area for each footing (including 30% increase) in the Sign Footing Notes on the plan.
  - If bedrock exists, the macro does not draw the bedrock location. Its approximate location will need to be drawn manually and the rock excavation item number added to the quantity box and excavation quantities adjusted.
  - Other minor editing may be required.
  - The macro draws an anchor rod detail and a stainless steel wire cloth detail. A note is added stating, "For the installation and pretensioning of anchor rods, see Special Provision, Amendment to Section 615 – Traffic Signs.
  - Check that all items shown on the sign footing plan are included in the proposal contract estimate, otherwise the item number on the plan needs to change to match the contract estimate.

G. Pay Items and Limits

- ❑ Item 206.1, Common Structure Excavation
  - ⇒ Vertical pay limits shall extend from the bottom of footing (or structural fill) to the existing or proposed ground. If the existing ground is above the proposed ground line, excavation from existing ground to proposed ground is paid for under common excavation. Any additional excavation for the footing is paid for under common structure excavation (see Standard Specifications Section 203). No excavation payment shall be made if the sign footing is entirely above existing ground.
  - ⇒ Horizontal pay limits extend one foot (300 mm) beyond the footing limits on all sides unless founded on more than one foot (300 mm) of structural fill, or if cofferdams are used (see Appendix 10.3-B1).
- ❑ Item 206.1, Common Structure Excavation is measured to the nearest 1 CY
- ❑ Item 508, Structural Fill is measured to the nearest 1 CY
- ❑ Item 520.2, Concrete Class B is measured to the nearest 0.1 CY
- ❑ Item 544.1, Reinforcing Steel (Roadway) is measured to the nearest 1 LB
- ❑ No item is needed for fill since the same material excavated will usually be replaced. If ledge is excavated to construct the footing, check the contract estimate for a good draining replacement material such as Item 209.1, Granular Backfill. Quantify this item and include it in the quantity box on the footing plans.
- ❑ For DMS overhead sign structure and foundation, all items are subsidiary.

H. Inputting Sign Structure and Footing Data into the Database

- ➢ Go to "Add/Change Projects, Bridges or Signs" button.
- ➢ Enter the project number
- ➢ If the project is past the advertising date, click on the "Unlock Project" button to enter information in the window.
- ➢ Click on the "Sign Footing" tab and enter in the year built, town, and inventory number for each sign structure.
- ➢ Close out window
- ➢ Click on the "Misc Menu" tab on the main menu
- ➢ Click on the "Sign Footing" tab
- ➢ Click on the "Edit" tab and enter the sign footing information for each sign structure

I. Design Process and Coordination

See NHDOT Bridge Manual, Chapter 10, Section 10.3.5, Design Process and Coordination for the following:

- Design process and coordination of sign structures and foundations between bureaus and consultants
- Distribution of Plans
- Archiving Plans and Calculations

SIGN STRUCTURE & FOOTING REFERENCE TABLES

Appendix 10.3-A2 provides tables of data for bridge and cantilever sign structures and their foundation that have been designed and constructed. This information is for **reference only** and can be used for preliminary estimates for footing dimensions and quantities.

Sign Bridge Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft²)	Design Sign Area (ft²)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thick-ness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
NASHUA 10624P																							
615.10011 L	2000	68	STEEL	360		22	3.5' x 3.5' T	14" Ø x 0.312"	2	3	12	20				9.05	2		50.9		5334	4-1.75" Ø, 20" circle	
615.10011 R	2000	68	STEEL	360		23.75	3.5' x 3.5' T	14" Ø x 0.312"	2	3	12	20				9.05	2		50.9		5334	4-1.75" Ø, 20" circle	
615.10012 L	2000	64	STEEL	315		24	3.5' x 3.5' T	12.75" Ø x 0.25"	2	3	10	20				11	2		47.2		4911	4-1.75" Ø, 18" circle	
615.10012 R	2000	64	STEEL	315		28.25	3.5' x 3.5' T	12.75" Ø x 0.25"	2	3	10	20				11	2		47.2		4911	4-1.75" Ø, 18" circle	
615.10013 L	2000	88	STEEL	360		21.5	3.5' x 3.5' T	12.75" Ø x 0.25"	2	3	12	16				8	2		38.4		5194	4-1.5" Ø, 18" circle	
615.10013 R	2000	88	STEEL	360		24.6	3.5' x 3.5' T	12.75" Ø x 0.25"	2	3	12	16				8	2		38.4		5194	4-1.5" Ø, 18" circle	
615.10014 L	2000	82	STEEL	302		22.81	3.5' x 3.5' T	8.62" Ø x 0.322"	2	3	10	16				10	2		36.8		3320	4-1.25" Ø, 14" circle	
615.10014 R	2000	82	STEEL	302		24.9	3.5' x 3.5' T	8.63" Ø x 0.322"	2	3	10	16				10	2		36.8		3320	4-1.25" Ø, 14" circle	
615.10015 L	2000	79	STEEL	180		25	3.5' x 3.5' T	10.75" Ø x 0.25"	2	3	8	18				7	2		30.3		3413	4-1.25" Ø, 16" circle	
615.10015 R	2000	79	STEEL	180		25.5	3.5' x 3.5' T	10.75" Ø x 0.25"	2	3	8	18				7	2		30.3		3413	4-1.25" Ø, 16" circle	
STRATHAM-EXETER 10421D-2																							
615.10002 L	2000	150	STEEL	586		26.6	4' x 4' T	16" Ø x 0.375"	2	2	14	24				6	2		63.3		5223	8-1.25" Ø, 22" circle	
615.10002 R	2000	150	STEEL	586		23.1	4' x 4' T	16" Ø x 0.375"	2	2	14	24				6	2		63.3		5223	8-1.25" Ø, 22" circle	
615.10003 L	2000	173	STEEL	488.5		24.4	4' x 4' T	16" Ø x 0.375"	2	1.5	12	22				9	2		61.2		5865	8-1.25" Ø, 22" circle	
615.10003 R	2000	173	STEEL	488.5		25.4	4' x 4' T	16" Ø x 0.375"	2	2	12	22				9	2		61.2		5865	8-1.25" Ø, 22" circle	
CONCORD 13572																							
615.10001 L	2002	185	STEEL	979		10.75	5' x 5' T	12.75" Ø x 0.33"	2	1.5	18	22	0.66	3.27	0.14/2.64	10	2	550	87		18222	4-1.75" Ø, 24" circle	
615.10001 R	2002	185	STEEL	979		32.75	5' x 5' T	18" Ø x 0.375"	2	1.5	18	22	0.66	3.27	0.14/2.64	10	2	550	87		18222	4-1.75" Ø, 24" circle	
MANCHESTER 12110A																							
615.10001 L	2002	208	STEEL	947		28.5	6' x 5' T	18" Ø x 0.312"	2	2	15.5	24				8.5	2		79.7		11823	4-1.75" Ø, 24" circle	
615.10001 R	2002	208	STEEL	947		29	6' x 5' T	18" Ø x 0.375"	2	2	15.5	24				8.5	2		79.7		11823	4-1.75" Ø, 24" circle	
615.10002 L	2002	167	STEEL	826		29	5.5' x 4.5' T	16" Ø x 0.312"	2	1.5	17	20	0.7	3.43	-0.32/2.6	9	2		73.3		12227	4-1.5" Ø, 24" circle	
615.10002 R	2002	167	STEEL	826		29	5.5' x 4.5' T	18" Ø x 0.312"	2	1.5	17	20	0.7	3.43	-0.32/2.6	9	2		73.3		12227	4-1.5" Ø, 24" circle	
MANCHESTER 12110B																							
615.10001 L	2002	168.5	STEEL	846.5		25.36	5' x 5.5' T	16" Ø x 0.312"	2	1.5	12	24				9	2		65.8		6404	4-1.5" Ø, 22" circle	
615.10001 R	2002	168.5	STEEL	846.5		26.56	5' x 5.5' T	16" Ø x 0.312"	2	1.5	12	24				9	2		65.8		6404	4-1.5" Ø, 22" circle	
615.10002 L	2002	61.8	STEEL	385.8		24.01	4' x 5' T	8.622" Ø x 0.322"	2	1.5	10	18				8	2		39.5		3543	4-1.25" Ø, 16" circle	
615.10002 R	2002	61.8	STEEL	385.8		29.25	4' x 5' T	10.75" Ø x 0.366"	2	1.5	10	18				8	2		39.5		3543	4-1.25" Ø, 16" circle	
615.10003 L	2002	86.1	STEEL	676.2		24.31	4.5' x 5.5' T	10.75" Ø x 0.366"	2	3	12	22				9	2		58.9		5897	4-1.25" Ø, 20" circle	
615.10003 R	2002	86.1	STEEL	676.2		29.1	4.5' x 5.5' T	14" Ø x 0.375"	2	3	12	22				9	2		58.9		5897	4-1.25" Ø, 20" circle	
615.10004 L	2002	65.1	STEEL	362		21.03	4' x 4.5' T	8.622" Ø x 0.252"	2		8	16				9	2		30.74		2418	4-1.25" Ø, 14" circle	
615.10004 R	2002	65.1	STEEL	362		20.96	4' x 4.5' T	8.622" Ø x 0.322"	2		8	16				9	2		30.74		2418	4-1.25" Ø, 14" circle	
NASHUA - HUDSON 10624S																							
615.10001 L	2002	121	STEEL	656		26.5	5' x 4.5' T	14" Ø x 0.312"	2	3	14.5	22				8.5	2		65.6		6830	4-1.25" Ø, 20" circle	
615.10001 R	2002	121	STEEL	656		25.75	5' x 4.5' T	12.75" Ø x 0.33"	2	3	14.5	22				8.5	2		65.6		6830	4-1.25" Ø, 20" circle	
SEABROOK - HAMPTON FALLS - HAMPTON - NO. HAMPTON 13319																							
615.10001 L	2002	70	STEEL	336		24	3.5' x 3.5' T	8.625" Ø x 0.25"	2	1.5	10	16	0.42	2.08	-0.04/2.18	9	2	170	35.1		2631	4-1.25" Ø, 10.5" square	
615.10001 R	2002	70	STEEL	336		36.5	3.5' x 3.5' T	8.625" Ø x 0.25"	2	1.5	10	16	0.42	2.08	-0.04/2.18	9	2	170	35.1		2631	4-1.25" Ø, 10.5" square	
615.10002 L	2002	58	STEEL	264		26.25	3.5' x 3.5' T	8.625" Ø x 0.219"	2	1.5	10	16	0.36	1.86	0.1/1.77	8	2	240	33.5		2509	4-1.25" Ø, 10.5" square	
615.10002 R	2002	58	STEEL	264		24	3.5' x 3.5' T	8.625" Ø x 0.219"	2	1.5	10	16	0.36	1.86	0.1/1.77	8	2	240	33.5		2509	4-1.25" Ø, 10.5" square	
615.10003 L	2002	69	STEEL	359		24.75	3.5' x 3.5' T	8.625" Ø x 0.25"	2	1.5	10	16				8	2	190	33.5		2509	4-1.25" Ø, 10.5" square	
615.10003 R	2002	69	STEEL	359		23.75	3.5' x 3.5' T	8.625" Ø x 0.25"	2	1.5	10	16				8	2	190	33.5		2509	4-1.25" Ø, 10.5" square	
SEABROOK TO PORTSMOUTH 13584																							
615.10001 L	2002	108	STEEL	660		22.5	3.25' x 3.25' T	14" Ø x 0.25"	2	3	12	22				9	2		57.9		7075	4-1.75" Ø, 14" square	
615.10001 R	2002	108	STEEL	660		32.25	3.25' x 3.25' T	14" Ø x 0.281"	2	3	12	22				9	2		57.9		7075	4-1.75" Ø, 14" square	
BEDFORD - HOOKSETT 13703																							
615.10001 L	2003	182	STEEL		2064	25	4.75' x 4.75' T	18" Ø x 0.281"	2	2.5	12	26				10	2		72.1		8498	4-2" Ø, 18" square	ABH/AEW
615.10001 R	2003	182	STEEL		2064	25	4.75' x 4.75' T	18" Ø x 0.281"	2	2.5	12	26				10	2		72.1		8498	4-2" Ø, 18" square	ABH/AEW
615.10002 L	2003	204	STEEL		2640	25.5	5.25' x 5.5' T	18" Ø x 0.375"	2	2.5	14	24	0.84	4.19	-0.57/3.39	11	2	200	39		5534	4-2.25" Ø, 18" square	ABH/AEW
615.10002 R	2003	204	STEEL		2640	25	5.25' x 5.5' T	18" Ø x 0.375"	2	2.5	14	28	0.87	4.32	-0.42/3.21	11	2	205	44.8		6363	4-2.25" Ø, 18" square	ABH/AEW

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For Reference Only:

Sign Bridge Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft²)	Design Sign Area (ft²)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thickness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
MANCHESTER - AUBURN 12609																							
615.10001 L	2003	115	STEEL	494		26.6	5.5' x 5' T	12.76" Ø x 0.33"	2	4	13	21	0.62	3	-0.14/2.13	8	2		60.82		5907	4-1.25" Ø, 20" circle	
615.10001 R	2003	115	STEEL	494		28.9	5.5' x 5' T	14" Ø x 0.31"	2	4	13	21	0.62	3	-0.14/2.13	8	2		60.82		5907	4-1.25" Ø, 20" circle	
615.10002 L	2003	108.9	STEEL	436		24	5' x 5' T	10.75" Ø x 0.307"	2	5	12	18	0.62	3.02	-0.29/2.15	8	2		50.1		4850	4-1.25" Ø, 16" circle	
615.10002 R	2003	108.9	STEEL	436		24	5' x 5' T	10.75" Ø x 0.307"	2	5	12	18	0.62	3.02	-0.29/2.15	8	2		50.1		4850	4-1.25" Ø, 16" circle	
BEDFORD 13603																							
615.10001	2004	116.5	ALUM.	53	1472	30	4.5' x 4.5' T	18" Ø x 0.312"	2	1.5	18	24	0.43	2.09	0.51/2.54	10	2		92		25247	4-1.5" Ø, 24" circle	
615.10002 L	2004	119.6	STEEL		1520	27.75	4.5' x 4.5' T	18" Ø x 0.313"	2	4	18	24				6.5	2		80		16157	4-1.5" Ø, 24" circle	
615.10002 R	2004	119.6	STEEL		1520	28.25	4.5' x 4.5' T	18" Ø x 0.313"	2	4	18	24				6.5	2		80		16157	4-1.5" Ø, 24" circle	
615.10003 L	2004	140.58	STEEL		1856	33	6' x 5' T	20" Ø x 0.375"	2	3	16	30				8.5	2		101		15493	4-1.75" Ø, 26" circle	
615.10003 R	2004	140.58	STEEL		1856	27	6' x 5' T	18" Ø x 0.375"	2	3	16	30				8.5	2		101		15493	4-1.75" Ø, 26" circle	
615.10004 L	2004	223.5	STEEL		3152	30.75	6.25' x 5' T	24" Ø x 0.375"	2	4	22	30				15	2		74		25548	4-2.25" Ø, 30" circle	
615.10004 R	2004	223.5	STEEL		3152	30.25	6.25' x 5' T	24" Ø x 0.375"	2	3	22	30				10	2		142		38991	4-2.25" Ø, 30" circle	
615.10005 L	2004	164.67	STEEL		2240	29.75	6' x 5' T	20" Ø x 0.375"	2	1.5	24	30	0.51	2.51	0.43/1.87	10	2		144		33415	4-1.75" Ø, 26" circle	
615.10005 R	2004	164.67	STEEL		2240	28.75	6' x 5' T	20" Ø x 0.375"	2	1.5	24	30	0.51	2.51	0.43/1.87	10	2		144		33415	4-1.75" Ø, 26" circle	
615.10006 L	2004	164.67	STEEL		2240	28	6' x 5' T	20" Ø x 0.376"	2	2	22	28				8	2		118		28116	4-1.75" Ø, 26" circle	
615.10006 R	2004	164.67	STEEL		2240	28.5	6' x 5' T	20" Ø x 0.376"	2	2	22	28				8	2		118		28116	4-1.75" Ø, 26" circle	
MANCHESTER 12110C																							
615.10001 L	2004	66.58	STEEL		465	29.32	4.5' x 4' T	10.75" Ø x 0.307"	2	3	13	18				8.5	2		26.54		6377.97	4-1.56" Ø, 16" circle	
615.10001 R	2004	66.58	STEEL		465	28.34	4.5' x 4' T	10.75" Ø x 0.307"	2	3	13	18				8.5	2		26.54		6377.97	4-1.56" Ø, 16" circle	
615.10002 L	2004	90.55	STEEL		353.28	30.31	4.5' x 4' T	10.75" Ø x 0.307"	2	1.5	13	18				5	2		21.71		6104.6	4-1.56" Ø, 16" circle	
615.10002 R	2004	90.55	STEEL		353.28	30.31	4.5' x 4' T	10.75" Ø x 0.307"	2	1.5	13	18				8.5	2		21.71		6104.6	4-1.56" Ø, 16" circle	
MANCHESTER - HAMPTON 14163																							
615.10001 L	2004	133	STEEL	634	1360	31	4' x 4' T	20" Ø x 0.25"	3	3	14	26	0.74	3.59	-0.16/2.32	8.5	2	285	39.5		3998	4-2" Ø, 20" square	
615.10001 R	2004	133	STEEL	634	1360	29	4' x 4' T	18" Ø x 0.25"	3		14	24				6	2	130	32.2		3490	4-2" Ø, 20" square	
615.10002 L	2004	177	STEEL	739	1840	25.75	4' x 5' T	18" Ø x 0.291"	3	5	16	26	0.76	3.72	-0.14/2.1	7.5	2	170	41.7		4495	4-2" Ø, 18" square	
615.10002 R	2004	177	STEEL	739	1840	20	4' x 5' T	16" Ø x 0.25"	3	5	14	22	0.63	3.09	-0.14/2.6	9.5	2	205	36		3509	4-2" Ø, 18" square	
677.11 L	2004	133	STEEL	72	6800	25	4' x 4' T	16" Ø x 0.281"	3	3	14	26	0.72	3.53	-0.13/2.24	8	2	530	72.7		8276	4-2" Ø, 16" square	
677.11 R	2004	133	STEEL	72	6800	24	4' x 4' T	16" Ø x 0.25"	3	3	14	26	0.72	3.53	-0.13/2.24	8	2	530	72.7		8276	4-2" Ø, 16" square	
STATEWIDE 13122A																							
615.10001 L	2004	118.5	STEEL		1304.2	21.5	4.5' x 4.5' T	14" Ø x 0.375"	2	1.5	17	21	0.61	3	-0.07/1.88	7.5	2	315	73		13512	4-2" Ø, 22" circle	
615.10001 R	2004	118.5	STEEL		1304.2	27.5	4.5' x 4.5' T	16" Ø x 0.375"	2	1.5	17	21	0.61	3	-0.07/1.88	7.5	2	315	73		13512	4-2" Ø, 22" circle	
615.10002 L	2004	125.5	STEEL		1285.44	22.5	4.5' x 4.5' T	14" Ø x 0.375"	2	3	17	20	0.7	3.43	-0.24/2.02	8	2	320	71.6		12960	4-2" Ø, 20" circle	
615.10002 R	2004	125.5	STEEL		1285.44	20.5	4.5' x 4.5' T	14" Ø x 0.375"	2	3	17	20	0.7	3.43	-0.24/2.02	8	2	320	71.6		12960	4-2" Ø, 20" circle	
CONCORD P4809H																							
615.0005 L	2005	128	ALUM.	626	813.8	30.25	8' x 8' T	12" Ø x 0.5"														4-1.75" Ø, 17" circle	MJZ/TMH
615.0005 R	2005	128	ALUM.	626	813.8	30.25	8' x 8' T	12" Ø x 0.5"														4-1.75" Ø, 17" circle	MJZ/TMH
615.0007 L	2005	142	ALUM.	459	596.7	30.75		12" Ø x 0.5"														4-1.75" Ø, 17" circle	MJZ/TMH
615.0007 R	2005	142	ALUM.	459	596.7	30.75		12" Ø x 0.5"														4-1.75" Ø, 17" circle	MJZ/TMH
ENFIELD - LEBANON 14254																							
615.10001 L	2005	94.5	STEEL	306	397.8	27	3.5' x 3.5' T	10.75" Ø x 0.307"	2	3	12	18	0.47	2.22	0.02/1.91	8	2	0	22.95	15	1950	4-1.5" Ø, 1.3333" square	ABH/RLK
615.10001 R	2005	94.5	STEEL	306	397.8	32.75	3.5' x 3.5' T	10.75" Ø x 0.307"	2	3	12	18	0.47	2.22	0.02/1.91	8	2	0	22.95	15	1950	4-1.5" Ø, 1.3333" square	ABH/RLK
615.30001	2005																						
HAMPTON - NORTH HAMPTON 13760																							
615.10001 L	2005	135	STEEL	492	1680	26.75	4' x 4' T	18" Ø x 0.25"	2		14	22				8	2	122	62.3		7534	4-2" Ø, 18" square	
615.10001 R	2005	135	STEEL	492	1680	27.5	4' x 4' T	18" Ø x 0.25"	2		14	22				8	2	166	62.3		7534	4-2" Ø, 18" square	
615.10002 L	2005	143	STEEL	510	1760	28.5	4' x 4.5' T	20" Ø x 0.25"	2		14	24				8	2	118	35	20	4055	4-2" Ø, 20" square	
615.10002 R	2005	143	STEEL	510	1760	28.5	4' x 4.5' T	20" Ø x 0.25"	2	3	20	24	0.99	3.22	0/1.86	7.5	2	321	44.8	101	8833	4-2" Ø, 20" square	
HAMPTON - PORTSMOUTH - DOVER - ROCHESTER 14147																							
615.10001 L	2005	73.5	STEEL	435	800	26.25	4' x 4' T	12.75" Ø x 0.33"	2	1.11	12	24	0.59	2.87	-0.01/1.56	6.5	2	118.5	28	16.5	1867	4-1.75" Ø, 16" circle	ABH/RLK
615.10001 R	2005	73.5	STEEL	435	800	27.25	4' x 4' T	12.75" Ø x 0.33"	2	1.11	12	24	0.59	2.87	-0.01/1.56	6.5	2	118.5	28	16.5	1867	4-1.75" Ø, 16" circle	ABH/RLK
HOOKSETT TO CONCORD 14099																							
615.10001 L	2005	177.5	STEEL	689	895.7	28.75	5' x 5.5' T	14" Ø x 0.375"	2	4	14	26	0.6	2.91	0.06/1.73	7	2	130	35.25	0	3744	4-2" Ø, 20" circle	JAT/RLK
615.10001 R	2005	177.5	STEEL	689	895.7	25.5	5' x 5.5' T	14" Ø x 0.375"	2	4	14	26	0.6	2.91	0.06/1.73	7	2	130	35.25	0	3744	4-2" Ø, 20" circle	JAT/RLK

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Sign Bridge Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft^2)	Design Sign Area (ft^2)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thick-ness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
BEDFORD 10018D																							
615.10001 L	2006	148.3	STEEL	932	1211.6	32.5	5.5' x 5' T	16" Ø x 0.312"	2	1.5	12.5	23.5		3.69	0.068/2.29	10	2	117.5	33	25.5	8547	4-1.5" Ø, 24" circle	MAC/KGK
615.10001 R	2006	148.3	STEEL	932	1211.6	32.5	5.5' x 5' T	18" Ø x 0.312"	2	1.5	12.5	23.5		3.69	0.068/2.29	10	2	117.5	33	25.5	8547	4-1.5" Ø, 24" circle	MAC/KGK
MANCHESTER 10622C																							
615.10001 L	2006	75.69	STEEL	136	176.8	17.315	3.75' x 3.25' T	12.75" Ø x 0.219"	1	1	10.5	11.5		1.08	0.35/1.3	10	2	55.5	13	8	958	6-1.5" Ø, 18.75" circle	JH/JPB
615.10001 R	2006	75.69	STEEL	136	176.8	23.315	3.75' x 3.25' T	12.75" Ø x 0.25"	1	1	9.5	11.5		1.35	0.33/1.88	10	2	55.5	13	8	958	6-1.5" Ø, 18.75" circle	JH/JPB
615.10002 L	2006	87.25	STEEL	136	176.8	19.375	3.75' x 3.25' T	12.75" Ø x 0.219"	1	1	9.5	11.5		1.66	0.09/1.29	6	2	147.5	10.5	77	728	6-1.5" Ø, 18.75" circle	JH/JPB
615.10002 R	2006	87.25	STEEL	136	176.8	17.875	3.75' x 3.25' T	12.75" Ø x 0.219"	1		9.5	11.5				6	2	147.5	10.5	77	728	6-1.5" Ø, 18.75" circle	JH/JPB
615.10003 L	2006	72.88	STEEL	225	292.5	20.205	3.75' x 3.25' T	12.75" Ø x 0.281"	1	1	10.5	11.5		1.76	0.07/1.5	7	2	88	12.5	20.5	900.5	6-1.5" Ø, 18.75" circle	JH/JPB
615.10003 R	2006	72.88	STEEL	225	292.5	16.415	3.75' x 3.25' T	12.75" Ø x 0.219"	1	1	10.5	11.5		1.55	0.16/1.5	10	2	88	12.5	20.5	900.5	6-1.5" Ø, 18.75" circle	JH/JPB
615.10004 L	2006	159.5	STEEL	649	843.7	20.505	3.75' x 3.25' T	10.75" Ø x 0.25"	2	1	10.5	18.5		3.08	0.001/1.78	7	2	184	19	50.5	2264.5	4-1.5" Ø, 12" square	JH/JPB
615.10004 R	2006	159.5	STEEL	649	843.7	23.125	3.75' x 3.25' T	12.75" Ø x 0.219"	2	1	10.5	18.5		3.08	0.001/1.78	7	2	184	19	50.5	2264.5	4-1.5" Ø, 12" square	JH/JPB
PORTSMOUTH - MILTON 14232																							
615.10001 L	2006	244.25	STEEL	1081	1793	23.75	6' x 4.5' T	18" Ø x 0.25"	2	2	0.19	0.45	0.79	3.9	-0.35/2.55	9	2	153.5	35.5		4067	4-2" Ø, 18" square	RLK/WPS
615.10001 R	2006	244.25	STEEL	1081	1793	23.75	6' x 4.5' T	18" Ø x 0.25"	2	2	0.19	0.45	0.79	3.9	-0.35/2.55	9	2	153.5	35.5		4067	4-2" Ø, 18" square	RLK/WPS
615.10002 L	2006	324.25	STEEL	1477	2285.8	23.75	3.75' x 3.25' T	10.75" Ø x 0.188"	2	2	0.09	0.29	0.49	2.37	-0.1/1.67	7	2	72.5	18.8		1527	-" Ø, " square	RLK/WPS
615.10002 R	2006	324.25	STEEL	1477	2285.8	26	3.75' x 3.25' T	18" Ø x 0.312"	2	4	0.16	0.61	0.8	3.96	-0.28/2.46	8	2	168.5	41.6		7245	-" Ø, " square	RLK/WPS
STATEWIDE 14253																							
615.10001 L	2007	88.75	STEEL	474	616.2	27.5	3.75' x 3.25' T	10.75" Ø x 0.25"	2	2	10	19	0.51	2.53	-0.112/2.34	9	2	95.5	22.5	11	1843.5	8-1.5" Ø, 12" square	SDF/ACJ
615.10001 R	2007	88.75	STEEL	474	616.2	29	3.75' x 3.25' T	10.75" Ø x 0.25"	2	2	10	19	0.51	2.53	-0.112/2.34	9	2	95.5	22.5	11	1843.5	8-1.5" Ø, 12" square	SDF/ACJ
615.10002 L	2007	110	STEEL	420	546	26.25	3.75' x 3.25' T	10.75" Ø x 0.219"	2	2	10	18	0.52	2.57	-0.161/2.075	7.5	2	99	19.7	12.5	1608.5	8-1.25" Ø, 12" square	SDF/ACJ
615.10002 R	2007	110	STEEL	420	546	26.25	3.75' x 3.25' T	10.75" Ø x 0.219"	2	2	10	18	0.52	2.57	-0.161/2.075	7.5	2	99	19.7	12.5	1608.5	8-1.25" Ø, 12" square	SDF/ACJ
615.10003 L	2007	143.5	STEEL	426	553.8	23	3.75' x 3.75' T	10.75" Ø x 0.188"														8-1.25" Ø, "	
615.10003 R	2007	143.5	STEEL	426	553.8	7.5	3.75' x 3.75' T	10.75" Ø x 0.188"														8-1.25" Ø, "	
HOOKSETT 14885																							
615.10001	2008																						
SALEM TO MANCHESTER 13933C																							
615.10001 L	2008								2		12	24				11	3	175	41.35	17.5	2570	4-1.75" Ø, 13.5" square	GME/TSB
615.10001 R	2008								2		12	24				11	3	175	41.35	17.5	2570	4-1.75" Ø, 13.5" square	GME/TSB
STATEWIDE 14501																							
615.10001	2008																						
CONCORD 15389																							
615.10001 L	2009	115	STEEL		936	25.83	3.75' x 3.25' T	12.75" Ø x 0.219"	2	1.5	10.5	19.5	0.6	2.98	2.697/-0.31	9.75	2	116.5	24.5	11.5	2150	4-1.5" Ø, 13.5" square	SDF/WPS
615.10001 R	2009	115	STEEL		936	26	3.75' x 3.25' T	12.75" Ø x 0.219"	2	1.5	10.5	19.5	0.55	2.73	2.597/-0.188	9.75	2	116.5	24.5	11.5	2150	4-1.5" Ø, 13.5" square	SDF/WPS
615.10002 L	2009	145	STEEL		739.7	29.333	3.75' x 3.25' T	12.75" Ø x 0.219"	2	1.5	10.5	20.5	0.58	2.87	2.595/-0.201	9.75	2	123	25.65	13.5	2254	4-1.5" Ø, 13.5" square	SDF/WPS
615.10002 R	2009	145	STEEL		739.7	29.58	3.75' x 3.25' T	12.75" Ø x 0.219"	2	1.5	10.5	20.5	0.48	2.42	2.386/0.014	9.75	2	123	25.65	13.5	2254	4-1.5" Ø, 13.5" square	SDF/WPS
ROCHESTER 10620H																							
615.10001	2009																						
615.10002	2009																						
615.10003	2009																						
615.10004	2009																						
ROCHESTER 10620K																							
615.10001	2009																						
615.10002	2009																						
615.10003	2009																						
SALEM TO MANCHESTER 13933G																							
615.10001 L	2009	104	STEEL	299	388.7	28.1	3.75' x 3.25' T	10.75" Ø x 0.188"	2	1.5	8	18	0.77	2.49	-0.51/2.98	10	2	62	17.8	11.5	1647	4-1.25" Ø, 12" square	DDT/SDF
615.10001 R	2009	104	STEEL	299	388.7	30.31	3.75' x 3.25' T	10.75" Ø x 0.188"	2	1.5	8	18	0.43	1.64	0.17/2.37	10	2	95	17.8	11.5	1647	4-1.25" Ø, 12" square	DDT/SDF
615.10002 L	2009	112	STEEL	417	542.1	28.5	3.75' x 3.25' T	10.75" Ø x 0.25"	2	4	10	18	0.37	1.79	0.25/2.52	11	2	37	21.35	12.5	2009	4-1.5" Ø, 12" square	DDT/SDF
615.10002 R	2009	112	STEEL	417	542.1	30.71	3.75' x 3.25' T	10.75" Ø x 0.25"	2	4	10	18	0.5	2.44	-0.15/2.86	11	2	36	21.35	12.5	2009	4-1.5" Ø, 12" square	DDT/SDF
SALEM TO MANCHESTER 14633E																							
615.1001	2009																						

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Sign Bridge Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft²)	Design Sign Area (ft²)	Height (ft)	Arm	Leg	Type	Soil Pressure (ksf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thickness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
BEDFORD - MANCHESTER - LONDONDERRY - MERRIMACK 11512F																							
615.10001 L	2010	126.5	STEEL	452	588	20.54	4' x 4' T	10.75" Ø x 0.365"	2	1.5	12	17	0	1.11	0.54/1.83	10.42	2	143.5	25	13.5	2138	4-1.5" Ø, 16" circle	xxx/xxx
615.10001 R	2010	126.5	STEEL	452	588	26.79	4' x 4' T	10.75" Ø x 0.365"	2	1.5	12	17	0	1.11	0.54/1.83	10.4	2	143.5	25	13.5	2139	4-1.5" Ø, 16" circle	xxx/xxx
615.10002 L	2010	115.5	STEEL	358	465	22.53	4' x 4' T	8.625" Ø x 0.322"	2	1.1	13	16	0	0.62	0.83/1.47	9.77	2	148	24.5	14	2081	4-1.5" Ø, 14" circle	xxx/xxx
615.10002 R	2010	115.5	STEEL	358	465	22.53	4' x 4' T	8.625" Ø x 0.322"	2	1.5	13	16	0	0.62	0.83/1.47	9.77	2	148	24.5	14	2081	4-1.5" Ø, 14" circle	xxx/xxx
BEDFORD - MANCHESTER - LONDONDERRY - MERRIMACK 11512K																							
615.10001 L	2010	153	STEEL	591	768.3	32.9	3.75' x 4' T	12.75" Ø x 0.312"	2	1.1	C	0	0.49	2.45	1.806/0.183	8	2	147	34.55	21	3028	8-1.75" Ø, 13.5" square	SDF/ACJ
615.10001 R	2010	153	STEEL	591	768.3	24.54	3.75' x 4' T	12.75" Ø x 0.219"	2	1.1	C	0	0.3	1.47	0.503/1.472	8	2	0	34.55	0	3028	8-1.75" Ø, 13.5" square	SDF/ACJ
615.10002 L	2010	154	STEEL	399	518.7	28.46	3.75' x 4' T	12.75" Ø x 0.219"	2	1.1	C	0	1.20	0.24	1.662/0.671	9.75	2	0	32.25	0	2876.5	8-1.5" Ø, 13.5" square	SDF/ACJ
615.10002 R	2010	154	STEEL	399	518.7	33.23	3.75' x 4' T	12.75" Ø x 0.219"	2	1.1	C	0	0.48	2.40	2.157/0.169	9.75	2	0	32.25	0	2876.5	8-1.5" Ø, 13.5" square	SDF/ACJ
615.10003 L	2010	154	STEEL	590	767	29.56	3.75' x 4' T	12.75" Ø x 0.25"	2	1.1	C	0	0.46	2.29	2.129/0.247	9.75	2	0	33.5	0	2903.5	8-1.75" Ø, 13.5" square	SDF/ACJ
615.10003 R	2010	154	STEEL	590	767	27.67	3.75' x 4' T	12.75" Ø x 0.219"	2	1.1	C	0	1.61	0.32	1.84/0.526	9.75	2	0	33.5	0	2903.5	8-1.75" Ø, 13.5" square	SDF/ACJ
615.10004 L	2010	126	STEEL	570	741	31.4	3.75' x 4' T	12.75" Ø x 0.25"	2	1.1	C	0	0.46	2.27	2.144/0.223	9.75	2	0	32.25	0	2719	8-1.75" Ø, 13.5" square	SDF/ACJ
615.10004 R	2010	126	STEEL	570	741	30.29	3.75' x 4' T	12.75" Ø x 0.219"	2	1.1	C	0	0.34	1.72	1.962/0.456	9.75	2	0	32.25	0	2719	8-1.75" Ø, 13.5" square	SDF/ACJ
615.10005 L	2010	131	STEEL	398	517.4	29.83	3.75' x 4' T	10.75" Ø x 0.25"	2	1.5	0.5	0.36	0.61	3.05	2.044/-0.235	7	2	79	20.65	14.4	1935	8-1.5" Ø, 12" square	SDF/ACJ
615.10005 R	2010	131	STEEL	398	517.4	26.54	3.75' x 4' T	10.75" Ø x 0.219"	2	1.5	C	0	0.35	1.73	1.524/0.253	7	2	79	20.65	14.4	1935	8-1.5" Ø, 12" square	SDF/ACJ
BEDFORD - MANCHESTER - LONDONDERRY - MERRIMACK 11512H																							
615.10001 L	2011	126.58	STEEL	810	1053	29.58	3.75' x 3.25' T	12.75" Ø x 0.25"	2	1.5	14	20	0.92	3.01	-0.16/2.12	8.5	2	91.5	27.35	0	3225	4-1.75" Ø, 1.125" square	ACJ/KFD
615.10001 R	2011	126.58	STEEL	810	1053	27	3.75' x 3.25' T	12.75" Ø x 0.25"	2	1.5	14	20	0.92	3.01	-0.16/2.12	8.5	2	71.5	27.35	0	3225	4-1.75" Ø, 1.125" square	ACJ/KFD
615.10002 L	2011	97.67	STEEL	732	951.6	27.17	3.75' x 3.5' T	12.75" Ø x 0.219"	2	1.5	12	20	0.8	2.59	-0.05/2.23	8	2	114	23.95	0	2751.5	4-1.5" Ø, 1.125" square	ACJ/KFD
615.10002 R	2011	97.67	STEEL	732	951.6	25.17	3.75' x 3.5' T	12.75" Ø x 0.219"	2	1.5	12	20	0.8	2.59	-0.05/2.23	8	2	44	23.95	0	2751.5	4-1.5" Ø, 1.125" square	ACJ/KFD
615.10003 L	2011	106.5	STEEL	792	1029.6	25.83	3.75' x 3.25' T	12.75" Ø x 0.25"	2	1.5	14	20	0.81	2.64	-0.02/1.93	7.5	2	88	26.3	0	3134	4-1.75" Ø, 1.125" square	ACJ/KFD
615.10003 R	2011	106.5	STEEL	792	1029.6	30.17	3.75' x 3.25' T	12.75" Ø x 0.375"	2	1.5	12	20	0.91	2.97	-0.22/2.51	11	2	114	26.9	0	3117	4-1.75" Ø, 1.125" square	ACJ/KFD
615.10004 L	2011	127.83	STEEL	480	636.35	24.08	3.75' x 3.25' T	10.75" Ø x 0.188"	2	1.5	6	25	0.88	2.87	-0.26/2.03	6.5	2	49	16.3	0	1861	4-1.25" Ø, 1" square	ACJ/KFD
615.10004 R	2011	127.83	STEEL	480	636.35	22	3.75' x 3.25' T	10.75" Ø x 0.188"	2									54	16.3	0	1861	4-1.25" Ø, 1" square	ACJ/KFD
NEWINGTON - DOVER 11238L																							
615.10001 L	2011	178	STEEL	191.5	2177.8	32.61	5' x 6' T	18" Ø x 0.375"	2	2	16	22	1.46	3.21	0/3.81	12.5	2.5	190	51	165	5740	6-2" Ø, 24" circle	xxx/xxx
615.10001 R	2011	178	STEEL	191.5	2177.8	32.69	5' x 6' T	18" Ø x 0.375"	2	1.25	16	28	1.31	2.7	0/3.33	12.5	2.5	350	64	25	6880	6-2" Ø, 24" circle	xxx/xxx
PORTSMOUTH 15892																							
615.10001	2011																						
615.10002	2011																						
615.10003	2011																						
ROCHESTER 10620J																							
615.10001	2011																						
615.10002	2011																						
ROCHESTER 10620L																							
615.10001 L	2011	152	STEEL	616	800.8	25.25	4.5' x 4.5' T	10.75" Ø x 0.365"	2	3	9	18	0.69	2.55	0/2.25	8	2	52.2	18.7	11.9	1126	4-1.75" Ø, 18" circle	DDT/WPS
615.10001 R	2011	152	STEEL	616	800.8	28.25	4.5' x 4.5' T	12.75" Ø x 0.375"	2	3	10	20	0.96	2.7	0/3.11	10	2	89.9	24.5	13.9	2099	4-1.75" Ø, 18" circle	DDT/WPS
615.10002 L	2011	160	STEEL	727	945	30.75	4.5' x 4.5' T	14" Ø x 0.375"	2	1.5	12	24	1.12	2.64	0/2.84	10	2	42.3	33.4	18.25	3613	4-2" Ø, 20" circle	DDT/WPS
615.10002 R	2011	160	STEEL	727	945	33.75	4.5' x 4.5' T	14" Ø x 0.375"	2	1.5	12	24	1.18	2.88	0/2.96	10	2	42.3	33.4	18.25	3613	4-2" Ø, 20" circle	DDT/WPS
SALEM TO MANCHESTER 14633F																							
615.10001 L	2011	84.6	STEEL	179	232.7	21.95	4' x 4' T	8.625" Ø x 0.322"	2	3	8	15	0.6	1.85	-0.04/2.01	7.5	2	78	13.15	9	922	4-1.25" Ø, 14" circle	ACJ/KFD
615.10001 R	2011	84.6	STEEL	179	232.7	24.95	4' x 4' T	8.625" Ø x 0.322"	2	3	8	15	0.6	1.85	-0.04/2.01	7.5	2	33	13.15	9	922	4-1.25" Ø, 14" circle	ACJ/KFD
HOOKSETT 15803																							
615.10002	2012																						
615.10003	2012																						
NEWINGTON - DOVER 11238M																							
615.10001 L	2013	220.75	STEEL	625.3	812.8	18.56	5' x 4' T	10.75" Ø x 0.25"	2	3	15	17	6.18	7.05	0/2.04	7.75	2	81.9	25.5	12	3275	4-1.5" Ø, 13.5" square	VHB/VHB
615.10001 R	2013	220.75	STEEL	625.3	812.8	22.17	5' x 4' T	12.75" Ø x 0.219"	2	3	15	17	5.74	6.97	0/2.08	7.75	2	2.2	25.5	12	3275	4-1.5" Ø, 13.5" square	VHB/VHB
615.10002 L	2013	187	STEEL	838.46	1090	17.83	4' x 3.75' T	12.75" Ø x 0.219"	2	3	13.5	17	5.95	5.7	0/2.63	9.25	2.5	107.5	28.9	10.9	2512	4-1.5" Ø, 13.5" square	VHB/VHB
615.10002 R	2013	187	STEEL	838.46	1090	19.42	4' x 3.75' T	12.75" Ø x 0.219"	2	4	13.5	17	5.86	6.22	0/2.24	7.5	2.5	45	26.5	10.9	2361	4-1.5" Ø, 13.5" square	VHB/VHB
615.10003 L	2013	217	STEEL	896.23	1165.1	22.83	5' x 4' T	12.75" Ø x 0.312"	2		15	17	3.19	0.79		8.25	3	120.1	24.4	12	2795	4-1.75" Ø, 13.5" square	VHB/VHB
615.10003 R	2013	217	STEEL	896.23	1165.1	19.625	5' x 4' T	12.75" Ø x 0.312"	2		15	17	3.19	0.72		8.25	3	3	34.4	12	2795	4-1.75" Ø, 13.5" square	VHB/VHB

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For Reference Only:

Sign Bridge Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft²)	Design Sign Area (ft²)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thick-ness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
SALEM TO MANCHESTER 13933E																							
615.10001 L	2013	88	STEEL	361	469.3	23.39	3.5' x 3.25' T	8.625" Ø x 0.219"	2	1.5	12	13	0.57	1.67	-0.08/2.68	10	3	71.3	22.3	7.8	1030	4-1.25" Ø, 10.5" square	xxx/xxx
615.10001 R	2013	88	STEEL	361	469.3	19.39	3.5' x 3.25' T	8.625" Ø x 0.219"	2	1.5	12	13	0.57	1.67	-0.08/2.68	10	3	81.7	22.3	7.8	1030	4-1.25" Ø, 10.5" square	xxx/xxx
615.10002 L	2013	100	STEEL	399	518.7	22.625	3.5' x 3.25' T	10.75" Ø x 0.188"	2	3	12	16	0.53	2.19	-0.08/1.92	7	2	143.8	36.6	18.7	3042	4-1.25" Ø, 12" square	xxx/xxx
615.10002 R	2013	100	STEEL	399	518.7	27.18	3.5' x 3.25' T	10.75" Ø x 0.188"	2	3	12	16	0.53	2.19	-0.08/1.92	7	2	143.8	36.6	18.7	3042	4-1.25" Ø, 12" square	xxx/xxx
SALEM TO MANCHESTER 13933H																							
615.10001 L	2014	84	STEEL	300	390	25.02	3.75' x 3.25' T	8.625" Ø x 0.188"	2	3	8	15	0.43	1.9	-0.11/2.72	10	2	70	15	6.3	1008	4-1.25" Ø, 10.5" square	JER/ACJ
615.10001 R	2014	84	STEEL	300	390	24.44	3.75' x 3.25' T	8.625" Ø x 0.188"	2	5	8	18	0.57	2.23	-0.13/1.82	7	2	56.2	15.1	7.4	996	4-1.25" Ø, 10.5" square	JER/ACJ
615.10002 L	2014	144	STEEL	534	694.2	22.35	3.75' x 3.25' T	10.75" Ø x 0.219"	2	5	10	20	0.68	2.44	-0.13/2.09	7.5	2	77.6	21.6	9.8	1434	4-1.5" Ø, 12" square	JER/ACJ
615.10002 R	2014	144	STEEL	534	694.2	25.85	3.75' x 3.25' T	10.75" Ø x 0.219"	2	5	10	24	0.87	2.9	-0.16/1.71	7	2	87.2	24.8	11.6	2065	4-1.5" Ø, 12" square	JER/ACJ

Thursday, January 08, 2015 8:04:19 A

For Reference Only:

Sign Cantilever Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft²)	Design Sign Area (ft²)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmir/Qmax (ksf)	Footing Height (ft)	Footing Thickness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
KEENE 12876																							
615.20001	2000	45	STEEL	140		27	4' x 4' T	29" Ø x 0.375"	1	2	12	16	0.72	1.7	0.01/2.39	10	2	101	26		2276	10-1.75" Ø, 32" circle	
HILLSBOROUGH 10440E																							
615.20001	2001								1		15	15				9.5	3	142	28	15	3371	8-" Ø, 32" circle	TEK/SEB
LITTLETON 13407																							
615.20001	2001	40	STEEL	178		24.25	3.5' x ' T	26" Ø x 0.375"	1	5	8	9				6	2		8.9		1609	8-2" Ø, 32" circle	
SALEM C9338																							
615.20001	2001	55	STEEL	140		22.125	4' x ' T	24.125" Ø x 0.344"	1	1	12	23				5.5	2		28.2		2238	8-1.5" Ø, 36" circle	
615.20002	2001	34.5	STEEL	98		19.27	4' x ' T	21.27" Ø x 0.25"	1	1	10	18	0.63	1.26	0.14/1.21	5.5	2	57	18		1552	8-1.5" Ø, 26" circle	
SEAEROOK 10295																							
615.20001	2001	44.78	STEEL	21.8	28.34	20.67	2.5' x 2.5' T	18" Ø x 0.25"	1	1.5	10	12	0.74	0.97	0.06/1.49	6	2	47	12		891	8-1.5" Ø, 24" circle	ABH/JAT
CONCORD 13572																							
615.20001	2002	50	STEEL	347		28	4' x 4' T	34" Ø x 0.5"	1	1	16	22	1.1	2.48	-0.03/1.95	7.5	2	265	38.3		3548	8-2" Ø, 40" circle	
MANCHESTER 12110B																							
615.20001	2002	36.17	STEEL	196.8		26	3.5' x 3.5' T	28" Ø x 0.375"	1	1.5	12	18				9.5	2		28.77		2013	8-1.5" Ø, 34" circle	
PLYMOUTH - CAMPTON - THORNTON 13139A																							
615.20001	2002	48	STEEL	256		27.25	4' x 4' T	34" Ø x 0.375"	1	2.5	16	18	1.1	2.23	-0.16/2.2	8.5	2	94	32.2		2971	8-1.75" Ø, 40' circle	
MANCHESTER - AUBURN 12609																							
615.20001	2003	35.4	STEEL	120.15	156.2	22.64	3.5' x 3.5' T	24" Ø x 0.375"	1	4	10	17	0.65	1.68	0.02/2.03	8	2	107.3	19.75		1282.2	8-1.25" Ø, 30' circle	
NEW NGTON - DOVER 11238Z																							
677.12	2004	20.25	STEEL	56		21.5	3' x 3' T	23" Ø x 0.375"	1	2	8	13				7	2		11.6		889	8-1.25" Ø, 24' circle	
677.13	2004	29	STEEL	56		22.5	3' x 3.5' T	24" Ø x 0.375"	1	2	8	15				7	2		14.3		990	8-1.25" Ø, 30' circle	
677.15	2004	35.25	STEEL	56		23	3.5' x 3.5' T	24.5" Ø x 0.375"	1	2	8	17				7	2		16.6		1091	8-1.5" Ø, 32" circle	
STATEWIDE 13122A																							
615.20001	2004	57	STEEL	180	234	21.5	3.5' x 4' T	30" Ø x 0.375"	1	2	14	17	1.11	1.9	-0.13/1.91	8	2	116	26.5		2485	8-2" Ø, 36" circle	
615.200010	2004	48.5	STEEL	180	234	24	3.5' x 4' T	28" Ø x 0.375"	1	3	14	17	0.95	1.98	-0.09/1.76	7	2	110	25		2429	8-2" Ø, 34" circle	
615.200011	2004	48.5	STEEL	180	234	23	3.5' x 4' T	28" Ø x 0.375"	1	1.5	13	17	0.91	1.9	-0.09/1.96	8	2	113	25.3		1886	8-2" Ø, 34" circle	
615.200012	2004	48.5	STEEL	180	234	24.5	3.5' x 4' T	28" Ø x 0.375"	1	2	13	17	0.93	2	-0.13/2	8	2	112	25.3		1886	8-2" Ø, 34" circle	
615.20002	2004	57	STEEL	180	234	21.5	3.5' x 4' T	30" Ø x 0.375"	1	1.5	14	17	1.11	1.9	-0.13/1.91	8	2	115	26.5		2485	8-2" Ø, 36" circle	
615.20007	2004	48.5	STEEL	180	234	23	3.5' x 4' T	28" Ø x 0.375"	1		13	15				6	2	62	19.8		1589	8-2" Ø, 34" circle	
615.20008	2004	48.5	STEEL	180	234	23.5	3.5' x 4' T	28" Ø x 0.375"	1	2	14	17	0.98	2.02	-0.11/1.72	7	2	107	25		2429	8-2" Ø, 34" circle	
615.20009	2004	48.5	STEEL	180	234	23.5	3.5' x 4' T	28" Ø x 0.375"	1	3	14	17	0.98	2.02	-0.11/1.72	7	2	111	25		2429	8-2" Ø, 34" circle	
615.30001	2004																						
CONCORD P4809H																							
615.0001	2005	29	ALUM.	190	247	27	4' x 4' T	8" Ø x 0.188"														4-1.25" Ø, 12' circle	JHF/TMH
615.0002	2005	30	ALUM.	180	234	27.5	4' x 4' T	8" Ø x 0.188"														4-1.25" Ø, 12' circle	JHF/TMH
615.0003	2005	47	ALUM.	315	409.5	27.75	6' x 6' T	10" Ø x 0.188"														4-1.25" Ø, 14' circle	JHF/TMH
615.0004	2005	35	ALUM.	150	195	26.5	4' x 4' T	8" Ø x 0.188"														4-1.25" Ø, 12' circle	JHF/TMH
HAMPTON - PORTSMOUTH - DOVER - ROCHESTER 14147																							
615.20001	2005	48	STEEL	175	227.5	24.5	4' x 4' T	30" Ø x 0.375"	1		13	16				6	2	70	21		2150	8-2" Ø, 36" circle	ABH/RLK
615.20002	2005	52	STEEL	192	249.5	27.5	4' x 4' T	30" Ø x 0.5"	1		13	16				6.5	2	75	21		2185	8-2.25" Ø, 36' circle	ABH/RLK
HOOKSETT TO CONCCRD 14099																							
615.20001	2005																						
615.20002	2005	46	STEEL	110	143	25.5	3.5' x 4' T	24" Ø x 0.375"	1	3	12	18	0.83	1.76	0/1.59	6.5	2	61	21.7	0	2219	8-2" Ø, 30" circle	JAT/RLK
615.20003	2005																						
615.20004	2005	39.5	STEEL	333.5	433.55	28.25	4.5' x 4.5' T	36" Ø x 0.5"	2	1.5	16	20	0.86	2.29	-0.01/2.16	9	2	136	36.8	22	4994	12-2" Ø, 42" circle	JAT/RLK
615.20005	2005	47.5	STEEL	160	208	27	3.5' x 4' T	24" Ø x 0.5"	2	1.5	12	18	0.74	1.75	0.05/2.35	10	2	94	26	0	2434	12-1.75" Ø, 30" circle	JAT/RLK
615.20006	2005	41	STEEL	190	247	26.5	3.5' x 4' T	30" Ø x 0.375"	2		14	18				10	2	126	30.5	0	3394	12-1.75" Ø, 36" circle	JAT/RLK
615.20007	2005	46.5	STEEL	190	247	24.25	3.5' x 4' T	30" Ø x 0.375"	2	1.5	14	18	0.82	1.79	0.06/2.13	9	2	116	29	0	3288	12-1.75" Ø, 36" circle	JAT/RLK
BEDFORD 10018D																							
615.20001	2006	42	STEEL	401	521.3	29.75	5.5' x 4.5' T	34.125" Ø x 2"	1	1.5	16.5	19.5		2.37	0.068/2.29	9	2	0	37	29	5177	8-2" Ø, 40" circle	MAC/KGK
BEDFORD 10018E																							
615.20001	2006	45	STEEL	337	438.1	25.75	4' x 4.5' T	36.125" Ø x 2"	1							7.5	3	85	35		4163	8-2.09" Ø, 42' circle	TSB/JTK

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For Reference Only:

Sign Cantilever Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft²)	Design Sign Area (ft²)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thick-ness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
HOLDERNESS - PLYMOUTH 11849																							
615.20001	2006	32.5	STEEL	72	93.6	21.25	3' x 3' T	18" Ø x 0.375"	1	2	0	0	0.48	0.73	0.12/2.44	10	2	78.7	15.1	0	1241	8-1.75" Ø, 24" circle	RLK/WPS
615.20002	2006	21.5	STEEL	72	93.6	22.3	3' x 3' T	18" Ø x 0.25"	1	2	0.06	0.09	0.54	1.57	-0.06/1.65	6.5	2	47	12.3	0	1051	8-1.5" Ø, 24" circle	RLK/JWP
615.20003	2006	28	STEEL	64	83.2	22.75	3' x 3' T	18" Ø x 0.312"	1	4	0.1	0.1	0.55	1.38	0.09/1.39	6.5	2	58.7	15.7	0	1301	8-1.75" Ø, 24" circle	RLK/JWP
HOOKSETT 12537																							
615.20001	2006	36.4	STEEL	116.2	151.1	23	3' x 3' T	18" Ø x 0.5"	1	2.5	14.8	-1.5	0.69	1.62	-0.01/1.64	6.07	1.97	59.51	16.48		1263.9	8-1.75" Ø, 24" circle	JB/TAF
615.20002	2006	47.9	STEEL	184	239.2	25.4	3.5' x 4' T	30" Ø x 0.374"	1	3	14.8	-8.1	0.87	1.84	0.03/1.58	6.07	1.97	138.38	24.33	33.1	1861.8	8-2" Ø, 36" circle	JB/TAF
MANCHESTER 10622C																							
615.20001	2006	51.67	STEEL	225	292.5	21.75	4' x 3.5' T	30" Ø x 0.344"	1	1	12.5	-7.5	0.86	2.37	/1.887	7	2	49.5	11.5	6.5	1206.5	6-2.25" Ø, 36" circle	JH/JPB
MANCHESTER - CONCORD 14095B																							
615.20001	2006	52	STEEL	374.5	486.85	27.5	4' x 3.75' T	30" Ø x 0.5"	1	1	15	22	1.04	2.17	-0.01/1.98	8	2	163.3	36.7	36.3	3614	12-2" Ø, 36" circle	WPS/SDF
615.20002	2006	40	STEEL	136	176.8	23.75	4' x 3' T	20" Ø x 0.344"	1	1.5	10	14	0.76	1.49	-0.11/2.54	9	2	67.1	17.2		1138	8-2" Ø, 24" circle	WPS/SDF
615.20003	2006	45.25	STEEL	405.5	527.15	27.25	4' x 3.75' T	30" Ø x 0.5"	4	1.25	10	15	1.19	2.9		10.5	2					16-1.25" Ø, 10" square	WPS/SDF
CONWAY 1832H																							
616.1	2007	60	STEEL		26.25	21	14" x 0.25" P	17" Ø x 0.25"	2														.DDT
KEENE - SWANZEY 10309H																							
615.20001	2007	50	STEEL	327		24.41	4' x 3.75' T	30" Ø x 0.344"														6-2.25" Ø, 36" circle	
615.20002	2007	55	STEEL	337		24.9	4' x 3.75' T	30" Ø x 0.375"														8-2.25" Ø, 36" circle	
615.20003	2007	50	STEEL	336		24.4	4' x 3.75' T	30" Ø x 0.344"														6-2.25" Ø, 36" circle	
615.20004	2007	50	STEEL	305		27.15	4' x 3.75' T	30" Ø x 0.375"														8-2.25" Ø, 36" circle	
Misc Eng District 3 1832H																							
616.1	2007	60	STEEL		26.25	21	14" x 0.25" P	17" Ø x 0.25"	2														.DDT
STATEWIDE 14253																							
615.20001	2007	46.5	STEEL	244	317.2	24.75	4' x 4' T	30" Ø x 0.344"	1	3	13	19	1.04	1.94	-0.083/1.878	7	2	119	27.7	16	2027	6-2.25" Ø, 36" circle	SDF/ACJ
615.20002	2007	50	STEEL	244	317.2	28.25	4' x 4' T	30" Ø x 0.375"	1	4	14	18	1.08	2	-0.124/2.039	7	2	96	37		2249	8-2.25" Ø, 36" square	SDF/ACJ
HOOKSETT 14885																							
615.20001	2008	50	STEEL	210	273	26.5	4' x 3.5' T	30" Ø x 0.375"	1	4	14	22	1.07	1.8	0.03/1.19	5.5	2	90	29.3	0	3202	6-2.25" Ø, 36" circle	JAS/DDT
SALEM TO MANCHESTER 13933C																							
615.20001 L	2008								1		16	22				11	2	220	42.7	20	5050	8-2.25" Ø, 36" circle	GME/TSB
615.20001 R	2008								1		16	22				11	2	220	42.7	20	5050	8-2.25" Ø, 36" circle	GME/TSB
BEDFORD - MANCHESTER - LONDONDERRY - MERRIMACK 11512I																							
615.20001	2009	37	STEEL	196	254.8	29.72	4.5' x 4.5' T	30" Ø x 0.375"	1	3	12	20	0	2.71	0.136/1.242	8.5	2	136	27	15	2296	12-1.75" Ø, 36" circle	
615.20002	2009	40	STEEL	186	241.8	28.54	4.5' x 4.5' T	30" Ø x 0.375"	1	3	12	20	0	2.52	0.176/1.203	8.5	2	72	27	15	2296	12-1.75" Ø, 36" circle	
615.20003	2009	53.5	STEEL	338	439.4	29.74	5' x 5' T	36" Ø x 0.5"	1	1.5	17	22	0	2.87	0.157/1.225	7.5	2	193	38	21	3570	16-2" Ø, 42" circle	
CONCORD 15389																							
615.20001	2009	40	STEEL		270.4	27.25	3.75' x 3.25' T	26" Ø x 0.32"	2	3	11.5	-8.5	0.92	2.15	-0.165/2.079	7.75	2	105	25.1	12	2001	6-2.25" Ø, 32" circle	SDF/WPS
CONCORD 15645																							
615.20001	2009	39	STEEL	254	330.2	32	4.5' x 4.5' T	36" Ø x 0.375"	1	3.62	15	18	0.93	2.09	-0.069/2.157	8.5	2	127	31.7	17	3031	16-2" Ø, 42" circle	SDF/JWP
ROCHESTER 10620K																							
615.20001	2009																						
SALEM TO MANCHESTER 13933G																							
615.20001	2009	46	STEEL	160	208	24.9	4' x 3' T	24" Ø x 0.353"	1	5	12	16	0.81	1.55	0.01/2.01	8	2	98	28.5	0	1354	6-2.25" Ø, 30" circle	DDT/SDF
615.20002	2009	50	STEEL	160	208	29.1	4' x 3' T	24" Ø x 0.353"	1	1.5	14	16	1.31	1.33	-0.08/2.67	11	2	55	27.4	15	2578	6-2.25" Ø, 30" circle	DDT/SDF
615.20003	2009	45	STEEL	272	353.6	29.6	4' x 3.5' T	30" Ø x 0.375"	1	1.5	14	18	1.41	1.83	-0.28/2.87	11	2	157	42	0	3040	8-2.25" Ø, 36" circle	DDT/SDF
615.20004	2009	47.42	STEEL	202.664	263.6	27.31	4' x 4' T	30" Ø x 0.386"	1	1.596	14	24	1.44	1.46	0.02/2.56	11	2	0	42.9	20	4070	8-2.25" Ø, 36" circle	DDT/SDF
BEDFORD - MANCHESTER - LONDONDERRY - MERRIMACK 11512F																							
615.20001	2010	47.5	STEEL	264	343	24.1	4.5' x 4.5' T	36" Ø x 0.375"	1	1.5	15	21	0	0.97	0.71/1.598	9	2	88	42	19	3426	12-2" Ø, 42" circle	xxx/xxx
PLYMOUTH - LINCOLN 16079																							
615.20001	2011	26	STEEL	166	216	27.75	3.5' x 2.75' T	20" Ø x 0.312"	1	1.5	10	16	0.54	1.84	0/2.22	9	2	100	19.2	11	1238	8-2" Ø, 26" circle	DDT/WPS
PORTSMOUTH 15892																							
615.20001	2011	50	STEEL	235	305.5	23.5			1	4	15	18	1.43	1.72	-0.15/2.18	8.5	2	119	34.9	15	2958	12-2" Ø, 47" circle	KFD/ACJ

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For Reference Only:

Sign Cantilever Footing Data

Description	YR. BUILT	Span (ft)	MAT'L	Actual Sign Area (ft^2)	Design Sign Area (ft^2)	Height (ft)	Arm	Leg	Type	Soil Pressure (tsf)	X (ft)	Y (ft)	eX (ft)	eY (ft)	Qmin/Qmax (ksf)	Footing Height (ft)	Footing Thick-ness (ft)	Excavation Quantity (CY)	Concrete Quantity (CY)	Structural Fill Quantity (CY)	Rebar Quantity (lbs)	Anchor Bolts per post	Designer/ Checker
SALEM TO MANCHESTER 13933D																							
615.20001	2011	50	STEEL	240	312	22.83	4' x 3.5' T	30" Ø x 0.386"	1	3	14	18	0.87	1.45	0.26/2.19	10	2	152	31.1	14	2429	6-2.25" Ø, 36" circle	ACJ/KFD
615.20002	2011	50	STEEL	256	332.8	23	4' x 3.5' T	30" Ø x 0.386"	1	1.5	14	18	1	1.69	0.09/2.13	10	2	0	31.1	16	2426	8-2.25" Ø, 36" circle	ACJ/KFD
615.20003	2011	50	STEEL	172	223.6	22.23	4' x 3.5' T	26" Ø x 0.32"	1	3	12	16	0.8	1.31	0.24/2.5	12	2	80	26.9	13	2025	6-2.25" Ø, 32" circle	ACJ/KFD
615.20004	2011	50	STEEL	256	332.8	25.46	4' x 3.5' T	30" Ø x 0.386"	1	4	12	18	0.96	1.67	0.07/2.87	12	2	104	31.6	14	2412	8-2.25" Ø, 36" circle	ACJ/KFD
SALEM TO MANCHESTER 14633F																							
615.20001	2011	35	STEEL	168	218.4	25.75	4' x 4' T	30" Ø x 0.375"	1	6	9	18	0.89	1.76	-0.07/2.28	9	2	4	22.4	12	1700	8-2" Ø, 36" circle	ACJ/KFD
615.20002	2011	35	STEEL	168	218.4	25.57	4' x 4' T	30" Ø x 0.375"	1	1.5	8	20	0.91	1.79	-0.09/2.32	9.5	2	74	24	12	2090	8-2" Ø, 36" circle	ACJ/KFD
615.20003	2011	50	STEEL	176	228.8	23.53	4.5' x 4.5' T	36" Ø x 0.375"	1	3	12	18	1.22	1.53	-0.04/2.09	9	2	106	28	14	2063	12-1.75" Ø, 42" circle	ACJ/KFD
SALEM TO MANCHESTER TO CONCORD 10418Z																							
DMS-1	2011	46	STEEL	202.92	263.6	23.333	3.75' x 3.75' T	30" Ø x 0.386"		1.2	13	27			0.17/1.68	8	2.5					8-2.25" Ø, 36" circle	Walpar
DMS-2	2011	46	STEEL	202.92	263.6	23.292	3.75' x 3.75' T	30" Ø x 0.386"		1.2	13	27			0.15/1.64	7.5	2.5					8-2.25" Ø, 36" circle	Walpar
DMS-4	2011	48	STEEL	238.7	310.4	24.25	3.75' x 3.75' T	30" Ø x 0.386"		1.2	14	24			0.08/1.87	9	1.5					8-2.25" Ø, 36" circle	Walpar
DMS-5	2011	48	STEEL	202.92	263.6	23.313	3.75' x 3.75' T	30" Ø x 0.386"		1.2	14	25			0.07/1.59	7	1.5					8-2.25" Ø, 36" circle	Walpar
DMS-6	2011	48	STEEL	202.7	263.6	23.063	3.75' x 3.75' T	30" Ø x 0.386"		1.2	14	25			0.07/1.58	7	1.5					8-2.25" Ø, 36" circle	Walpar
DMS-7	2011	48	STEEL	238.7	310.4	24.542	3.75' x 3.75' T	30" Ø x 0.386"		1.2	14	24			0.13/1.94	9.5	1.5					8-2.25" Ø, 36" circle	Walpar
DMS-8	2011	48	STEEL	202.8	263.6	26.42	3.75' x 3.75' T	30" Ø x 0.386"			23	13			0.1/2.39	11.5	1.5					8-2.25" Ø, 36" circle	Walpar
LINCOLN - FRANCONIA 15603																							
677.11-1	2012	46.75	STEEL	244.9	244.9	24.42	3.75' x 3.75' T	30" Ø x 0.5"	1	1.5	14	27			0/1.64	7.5	2		33.09		2611	12-2.25" Ø, 36" circle	Walpar
677.11-2	2012	46.75	STEEL	244.9	244.9	24.13	3.75' x 3.75' T	30" Ø x 0.5"	1	1	14	26				8.5	3		45.54		2479	12-2.25" Ø, 36" circle	Walpar
NEWINGTON - DOVER 11238M																							
615.20001	2013	50	STEEL	133.77	173.9	23.33	3.5' x 3' T	20" Ø x 0.375"	1		12	12	1.22	1.59		9.5	3	88.4	22.1	7.3	2329	8-2" Ø, 24" circle	VHB/VHB
615.20002	2013	50	STEEL	220	286	22.17	3.5' x 3' T	12.75" Ø x 0.219"	1	1.5	15	17	7.08	5.69	0/2.69	10.75	2	0	31.9	28.3	4467	8-2" Ø, 27.75" circle	VHB/VHB
SALEM TO MANCHESTER 13933E																							
615.20001	2013	50	STEEL	166	215.8	26.75	3.5' x 3.25' T	26" Ø x 0.32"	1	5	15	17	1.05	1.14	0.18/1.88	8.33	2	62.4	28.3	12	2631	6-2" Ø, 32" circle	xxx/xxx
615.20002	2013	50	STEEL	166	215.8	29.12	3.5' x 3.25' T	26" Ø x 0.32"	1	3	16	19	1.2	1.2	0.15/1.56	6.92	2	78.6	30.6	14	2803	6-2.25" Ø, 32" circle	xxx/xxx
615.20003	2013	50	STEEL	234	304.2	26.85	3.75' x 3.5' T	30" Ø x 0.386"	1	3	14	17	1.06	1.41	0.06/2.38	9.75	2	93.3	29.1	11.3	2953	6-2.25" Ø, 36" circle	xxx/xxx
615.20004	2013	50	STEEL	240	312	26.33	3.75' x 3.5' T	26" Ø x 0.32"	1	4	14	16	0.78	1.33	0.21/2.35	9.75	3	102.5	34.4	10.7	2335	6-2.25" Ø, 32" circle	xxx/xxx
SALEM TO MANCHESTER 13933I																							
615.20001	2013	34	STEEL	160	208	26.28	3.75' x 3.25' T	20" Ø x 0.375"	1	3	10.5	15.5	0.62	1.45	0.1/2.31	10	2	82.7	21.4	8.1	1787	8-1.75" Ø, 26" circle	JAS/ACJ
615.20002	2013	34	STEEL	144	187.2	25.46	3.75' x 3.25' T	20" Ø x 0.375"	1	3	10.5	15.5	0.57	1.29	0.22/26	10	2	82.7	21.4	8.1	1787	8-1.75" Ø, 2.1667" circle	JAS/ACJ
615.20003	2013	54.75	STEEL	185.75	241.5	23.6	4' x 3.5' T	26" Ø x 0.32"	1	3	11.5	17.5	0.89	1.36	0.08/2.33	10	2	100	27.1	10	2565	8-2" Ø, 32" circle	JAS/ACJ
MANCHESTER 14966																							
615.20001	2014	49.75	STEEL	355.5	462.2	28.667	4' x 3.5' T	30" Ø x 0.375"	1	7	16.5	19.5	0.53	1.97	2.1/	8.75	2.75	146	43	18	3572	8-2.25" Ø, 36" circle	CLD/CLD
615.20002	2014	34.667	STEEL	221.75	288.275	27.75	4' x 3.5' T	24" Ø x 0.312"	1	1.5	16.5	22.5	0.24	1.17	/1.7	12.75	2.75	20	59	21	4491	8-1.75" Ø, 36" circle	CLD/CLD
SALEM TO MANCHESTER 13933H																							
615.20001	2014	40	STEEL	120	156	27.06	4' x 3' T	24" Ø x 0.312"	1	3	10.5	13.5	0.9	1.38	-0.19/3.24	12	2	81.9	22.7	7.2	1456	8-1.75" Ø, 30" circle	JER/ACJ

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New Hampshire DOT
Department of Transportation

Bridge Design Manual

Chapter 10 – Appendix B

January 2015 – v 2.0

(Revised August 2019)

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SIGN FOOTING SAMPLE PLAN

The sign footing sample plan can be found at NHDOT Bridge Design Sample Plans web page:
https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/sampleplans/index.htm

Scroll down to: Sign Structure

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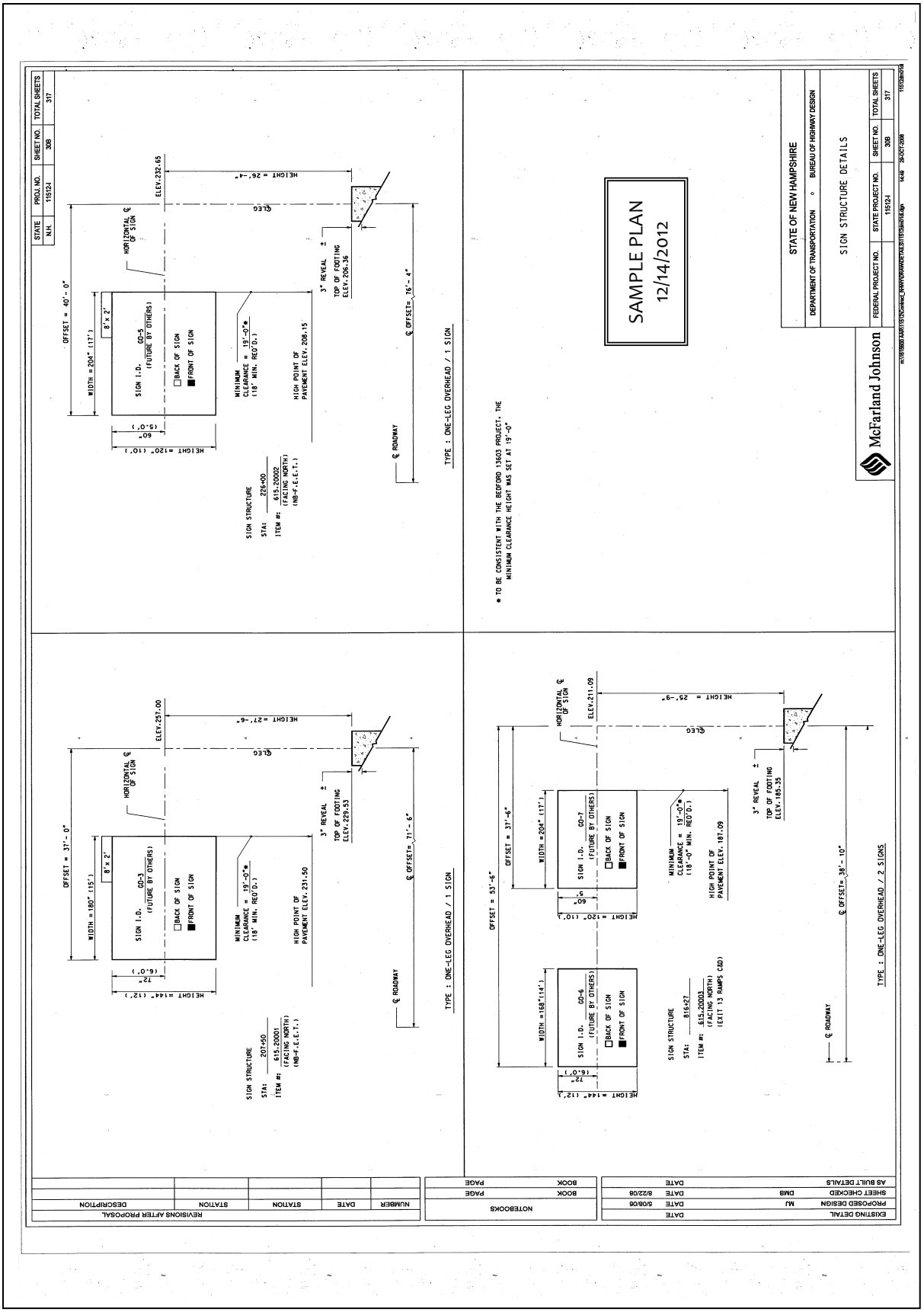
SAMPLE PLAN
12/14/2012
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION ○ BUREAU OF HIGHWAY DESIGN
SIGN STRUCTURE DETAILS
McFarland Johnson
* TO BE CONSISTENT WITH THE BEDFORD 13603 PROJECT, THE MINIMUM CLEARANCE HEIGHT WAS SET AT 19'-0"
TYPE 1 ONE-LEG OVERHEAD / 1 SIGN
TYPE 1 ONE-LEG OVERHEAD / 2 SIGNS
SIGN I.D. GD-5 (FUTURE BY OTHERS)
SIGN I.D. GD-7 (FUTURE BY OTHERS)
SIGN I.D. GD-6 (FUTURE BY OTHERS)
BACK OF SIGN
FRONT OF SIGN
SIGN STRUCTURE STA: 226+00 ITEM #: 615.20002 (FACING NORTH) (NB-F.E.E.T.)
SIGN STRUCTURE STA: 207+50 ITEM #: 615.20001 (FACING NORTH) (NB-F.E.E.T.)
SIGN STRUCTURE STA: 816+27 ITEM #: 615.20003 (FACING NORTH) (EXIT 13 RAMPS CBD)
HORIZONTAL ℄ OF SIGN
3" REVEAL ± TOP OF FOOTING
MINIMUM CLEARANCE = 19'-0"* (18' MIN. REQ'D.)
HIGH POINT OF PAVEMENT
℄ ROADWAY
℄ LEG
EXISTING DETAIL
PROPOSED DESIGN
SHEET CHECKED
AS BUILT DETAILS
NOTEBOOKS
REVISIONS AFTER PROPOSAL

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BRIDGE MOUNTED SIGN SUPPORT DETAIL SHEET

The bridge mounted sign support detail can be found at NHDOT Bridge Design Detail Sheets web page: http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm

Scroll down to: Bridge Mounted Sign Supports

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SOUNDWALL DETAIL SHEETS

The soundwall detail sheets can be found at NHDOT Bridge Design Detail Sheets web page:
http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm

Scroll down to: Soundwalls

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