

DESIGN AND CONSTRUCT BRIDGE

****From Hartford (Wilder) STP 1444(35)**

- xx. DESCRIPTION. This work shall consist of designing and constructing a bridge superstructure and substructure in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown in the Plans.
- xx. MATERIALS. The Contractor may use any material or combination of materials that will conform to the requirements of this Section. The Engineer reserves the right to reject any material not meeting these requirements.
- (a) Pavement. Pavement shall meet the requirements of Section 490.
 - (b) Cast-in-Place Concrete. Cast-in-place concrete shall meet the requirements of Section 501.
 - (c) Structural Steel. Structural steel shall meet the requirements of Section 506.
 - (d) Reinforcing Steel. Reinforcing steel shall be epoxy coated reinforcing steel meeting the requirements of Section 507.
 - (e) Prestressed Concrete. Prestressed concrete shall meet the requirements of Section 510.
 - (f) Water Repellent. Water repellent shall meet the requirements of Section 514.
 - (g) Expansion Joints. Expansion joints shall meet the requirements of Section 516.
 - (h) Membrane. Membrane shall meet the requirements of Section 519.
 - (i) Joint Sealer. Saw cut joints and joint sealer shall meet the requirements of Section 524.
 - (j) Bridge Railing. Bridge railing shall meet the requirements of Section 525.
 - (k) Bearing Devices. Bearing devices shall meet the requirements of Section 531.
 - (l) Precast Concrete. Precast concrete shall meet the requirements of Section 540.
 - (m) Testing Equipment. Testing equipment shall meet the requirements of Section 631.
 - (n) Backfill. Backfill shall meet the requirements of Subsection 704.08.
 - (o) Longitudinal Grooving. Longitudinal grooving, if required, shall meet the requirements of LONGITUDINAL DECK GROOVING of Section 900.

9/13/2010

- xx. DESIGN. The bridge shall be designed in accordance with the 2007 *AASHTO LRFD Bridge Design Specifications* and its latest interim revisions and the 2010 VTRANS Structures Design Manual and its latest revisions. The Structures Design Manual is available on the Agency's website at the following address:

http://www.aot.state.vt.us/progdev/Documents/Structures/Structures_Design_Manual.pdf.

Where there is a discrepancy between the 2007 *AASHTO LRFD Bridge Design Specifications* and the VTRANS Structures Design Manual, the VTRANS Structures Design Manual shall control.

Deflections shall be checked in accordance with AASHTO 2.5.2.6.2, and unless specified otherwise shall meet the requirements for pedestrians.

The following data are provided on the Contract Plans:

- (a) Design life;
- (b) Maximum allowable headwater elevation;
- (c) Maximum allowable velocity through the structure;
- (d) Tailwater depth used for design;
- (e) Minimum required open-end area;
- (f) Bearing capacity to be used for the design of the foundation, at the required location;
- (g) Design year ADT;
- (h) Design year percent trucks;
- (i) Typical roadway section;
- (j) Roadway profile and elevation; and
- (k) Required clearance envelope, bearing capacity, and roadway profile for tunnels or underpass structures.

If parapets are used on any headwalls or wingwalls, the connections and walls shall be designed to resist traffic loads in accordance with the AASHTO LRFD Bridge Design Specifications to meet the test level 3 criteria, unless otherwise specified in the Contract.

The length and height of the wingwalls and headwalls must be designed to accommodate the specified fill slope without fill encroaching on the underlying streambed, waterway, or edge of roadway template.

Acceptable wall systems for wingwalls and headwalls are those included in the "VAOT Earth Retaining System Selection Chart", available on the Agency's website at the following address:

http://www.aot.state.vt.us/matres/Documents/ACROBAT.pdf/VAOT%20APPROVED%20Retaining%20Walls%202-2010_Final.pdf.

Alternative systems shall be submitted to the Agency's Office of Contract Administration a minimum of 10 days in advance of the bid opening date. Alternatives requested after award shall be submitted to the Agency's Project Manager.

Multiple piece arch structures shall be designed and detailed such that the completed structure is structurally continuous.

xx. SUBMITTALS.

- (a) Design Documentation. Three (3) copies of the design of the bridge, including all design calculations and structural details, shall be submitted to the Agency's Structures Engineer a minimum of 28 calendar days in advance of the proposed work. The design calculations shall substantiate that the proposed bridge components satisfy the design parameters of the Contract, and shall include a load rating for the superstructure for the seven standard axle configurations shown in the load rating block in the Contract Plans and any general or construction notes required for the fabrication and construction of the components.

The submittal shall be made as Construction Drawings for documentation purposes only in accordance with Subsection 105.03. The submitted documents shall be signed, stamped, and dated by a Professional Engineer (Structural or Civil). The Professional Engineer is responsible for ensuring that the design and details of the proposed bridge conforms to all Contract requirements.

- (b) Working Drawings. Working Drawings shall be submitted in accordance with Section 105 for any item of work requiring Fabrication or Construction Drawings. Drawings shall meet the requirements of the specifications for that item of work.

Working Drawings shall include all details, dimensions, quantities, and cross sections necessary to construct the bridge, including but not limited to the following:

- (1) Size and spacing of all members or components with complete identification of all proposed materials;
- (2) A plan view;
- (3) An elevation view showing the span and rise of the structure;
- (4) A typical section;
- (5) Hydraulic calculations to determine the headwater elevation and velocity of flow for the proposed bridge;
- (6) Section details showing all concrete dimensions and reinforcing steel requirements;
- (7) Where required, design computations and details for pedestals;

- (8) Footing details showing all concrete dimensions, elevations, and reinforcing steel with bar size, length, and spacing indicated. Footing plan and section views shall be provided. The soil bearing pressure used in the design shall be noted on the footing detail sheets.
- (9) Wingwall design computations and details showing all concrete dimensions, reinforcing steel, and anchorage details. Wingwall plan, elevation, and section views shall be provided.
- (10) Headwall details, showing all concrete dimensions, reinforcing steel, and anchorage details. Headwall elevation and section views shall be provided.
- (11) Structure backfill type and limits for substructure and wingwalls; and
- (12) Lifting handling points.

The time required for preparation and review of these submittals shall be charged to the allowable Contract time. Delays caused by untimely submittals or insufficient data will not be considered justification for time extensions. No additional compensation will be made for any additional material, equipment, or other items found necessary to comply with the project specifications as a result of the Engineer's review.

The proposed bridge design shall be compatible with the Contractor's proposed method of construction, and shall be compatible with any method of construction shown in the Plans. The Agency does not assume nor warrant any bridge system's compatibility with any particular construction methods.

xx. CONSTRUCTION REQUIREMENTS.

- (a) Turf Drag. If the finished structure will include a Portland Cement concrete riding surface, that surface shall receive a turf drag finish as follows:

The top (finished grade) surface shall be given a suitable texture with an artificial turf drag made of molded polyethylene with approximately 64,000 synthetic turf blades per square meter (6000 blades per square foot), each approximately 13 mm (1/2 in) long.

The Contractor shall apply texture in a transverse direction by hand methods. Other directions may be allowed with the approval of the Engineer.

One pass of the turf drag over the finished area is desired. The drag shall leave a seamless strip between passes.

The drag shall produce a transverse, skid resistant micro-texture acceptable to the Engineer, but should not tear the surface. If the drag is not producing an acceptable micro-texture, the

Contractor shall adjust means and methods until an acceptable micro-texture is achieved.

The Contractor shall clean or replace the drag as often as necessary to maintain a well defined micro-texture.

The turf drag shall not be applied when the surfaces is so wet or plastic that the ridges formed flow back valleys when the drag has passed, nor shall dragging be delayed until the concrete is so hard that sharp ridges cannot be formed by the drag. Surface conditions may not be uniform, however, and dragging shall be timed to maximize skid resistance.

- (b) Excavation. Excavation shall be performed in accordance with Section 204.
- (c) Concrete and Backfill. Concrete and backfill shall be placed under dry conditions. If the design necessitates undercutting the foundation and backfilling to the footing elevation with select rock fill, the select rock fill shall be separated from the underlying soils with geotextile meeting the requirements of Section 649 for Geotextile for Roadbed Separator.
- xx. INSPECTION AND TESTING. Reinforcing steel shall be tested in accordance with the Materials Sampling Manual on file with the Agency's Materials and Research Section and available on the Agency's website at the following address:

<http://www.aot.state.vt.us/MatRes/Documents/ACROBAT.pdf/2010MSMFinal030110.pdf>.
- xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Design and Construct Bridge) to be measured for payment will be on a lump sum basis in the complete and accepted work.
- xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Design and Construct Bridge) will be paid at the Contract lump sum price. Payment will be full compensation for designing, detailing, and constructing all substructure and superstructure bridge components; furnishing all required submittals; furnishing and placing membrane, pavement, joints, and water repellent as required; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

When all Working Drawings have been submitted and approved in accordance with Section 105, a payment of 15 percent of the Contract lump sum price will be allowed. Further payments totaling 70 percent of the Contract lump sum price will be paid on a pro-rated basis for the duration of the work. The remaining 15 percent of the Contract lump sum price will be paid when the bridge has been fully constructed and accepted by the Engineer.

Excavation required for constructing the bridge, including any undercut to establish an adequate foundation, and furnishing and placing geotextile and backfill required for constructing the bridge, regardless of the type of backfill placed, will not be paid separately

9/13/2010

but will be considered incidental to Special Provision (Design and Construct Bridge).

Methods employed to place concrete and backfill in the dry, including but not limited to cofferdams and pumping, will not be paid separately but will be considered incidental to Special Provision (Design and Construct Bridge).

Additional work arising from changed conditions during construction will be paid in accordance with Subsection 104.02.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.645 Special Provision (Design and Construct Bridge)	Lump Sum