

**STRUCTURES**  
**PERFORMANCE SPECIFICATION**

**1.0 INTRODUCTION**

The Design-Builder shall design and construct permanent structures necessary for the widened Interstate 12 facility, such as, widened and/or replacement bridges, retaining walls, box culvert drainage structures, and any major overhead sign structures in accordance with the criteria established in this Structures Performance Specification.

The completed structures shall provide functionality, durability, ease of inspection and maintenance, safety, and pleasant aesthetics.

**1.1 WIDENING OR REPLACEMENT BRIDGE ALTERNATES**

The Design-Builder will have the option to widen the existing bridges or to replace the existing bridges as per the Contract documents.

**1.2 SCOPE**

The design and construction of this project will be a six lane divided interstate with inside and outside shoulders in accordance with the performance specifications. The new structures shall be built completely within the existing state owned right-of-way. The Design-Builder shall design and construct all structures to account for and include, but not be limited to, all applicable loads, bridge geometry, bridge decks, bridge joints, bridge bearings, bridge traffic barriers, bridge drainage, approach slabs, substructure and superstructure, retaining walls, temporary retaining walls and all other required bridge components and features.

The structure related objective of this Project is to provide constructed facilities within the specified criteria while allowing the Design-Builder the flexibility to develop innovative solutions that benefit the LA DOTD and the Design-Builder while providing the essential functions and characteristics of the project, including safety, traffic operations, desired appearance and maintainability. The project includes the following four (4) bridge structures.

- I-12 Bridges over Grey's Creek, Structure Nos. 4540203301 and 4540203302
- I-12 Westbound Overpass over 4H club Road (LA 1032), Structure No. 4540201082
- I-12 Westbound Overpass over Range Avenue (LA 3002), Structure No. 4540201902

**2.0 PERFORMANCE GOALS**

- A) Provide a safe structure for the traveling public.
- B) New structures shall provide a 75 year design life.
- C) Smooth ride for the traveling public transitioning from the roadway surface and bridge structure.
- D) Structures designed for all applicable loads and predicted scour.
- E) Ease of access for long term inspection of superstructure, joints, bearings, etc.
- F) Structures preserve and enhance the environment.

### **3.0 STANDARDS AND REFERENCES**

The design and construction of structures shall be in accordance with this Structures Performance Specification and the relevant requirements of the following standards, unless otherwise stipulated in this performance specification. Standards and references specifically cited in the body of the Structures Performance Specification establish requirements that shall have precedence over all others. Should the requirements in any standard conflict with those in another, the standard highest on the list shall govern. Listed under references are guidelines that the Design-Builder may use in addressing the requirements as the Design-Builder sees fit. It is the Design-Builder's responsibility to obtain clarification of any unresolved ambiguity prior to proceeding with design or construction. Items listed as standards or references in this Structures Performance Specification shall be the most recent version available at the time of issuance of the Scope of Services Package.

#### **3.1 STANDARDS**

- LA DOTD Design Standards for Freeways (F3 Roadway Classification), ;
- AASHTO LRFD Bridge Design Specifications, Fourth Edition, 2007, 2008 and 2009 Interims;
- LA DOTD LRFD Bridge Design Manual, First edition, including revisions and memorandums;
- LA DOTD Bridge Design Manual, Fourth English editions and revisions;
- LA DOTD Standard Plans and Standard Bridge Details; La DOTD Permanent Sign Standard Details;
- AASHTO LRFD Bridge Construction Specifications, 2nd Edition with 2006, 2007, 2008, and 2009 Interims;
- AASHTO A Policy on Geometric Design of Highways and Streets, Fifth Edition, 2004;
- AASHTO/AWS D1.5M/D1.5:2008 Bridge Welding Code, with 2009 AASHTO Interim;
- AASHTO Manual for Bridge Evaluation, 1st Edition, 2008;
- LA DOTD, The policy and guidelines for Bridge Rating and Evaluation, March 3, 2009;
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, 5th Edition, 2009;
- LA DOTD Standard Specifications for Roads and Bridges, 2006 Edition;
- LA DOTD Specifications for High Performance Concrete bridge members;
- FHWA Hydraulic Engineering Circular No. 21 "Design of Bridge Deck Drainage";
- LADOTD Software and Deliverable Standards for Electronic Plans.  
([http://altivasoft.com/ladotd/PDFs/DOTD\\_Software\\_Standards\\_for\\_Electronic\\_Plans.pdf](http://altivasoft.com/ladotd/PDFs/DOTD_Software_Standards_for_Electronic_Plans.pdf))  
; and
- LA DOTD Standard plans and Standard Details for Bridge, Guardrail and bridge barrier brush curb retrofit.

### 3.2 REFERENCES

- LA DOTD as-built bridge plans for I-12 Bridges over Grey’s Creek, Westbound I-12 Overpass over 4H Club Road and Westbound I-12 Overpass over Range Avenue;
- AASHTO Guide Design Specifications for Bridge Temporary Works, latest edition with interims;
- NCHRP Report 314, Guidelines for the Use of Weathering Steel in Bridges, 1989;
- NCHRP 445, Forces on Highway Bridges;
- ACI 305 R-99, Hot Weather Concreting;
- ACI 207.1 R-99, Mass Concrete;
- FHWA NHI-001, Hydraulic Engineering Circular Manual 18;
- NCHRP Report 489, Design of Highway Bridges for Extreme Events, 2003;
- LA DOTD Bridge Inspection report for I-12 Bridges over Grey’s Creek, Westbound I-12 Overpass over 4H Club Road and Westbound I-12 Overpass over Range Avenue;
- The Environmental Documents and permits for the project; and
- AASHTO Construction Handbook for Bridge Temporary Works, latest edition with interims.

### 4.0 REQUIREMENTS

#### 4.1 MATERIALS

As a minimum, all materials shall satisfy the requirements listed in the LA DOTD Standard Specifications for Roads and Bridge, 2006 Edition. All materials not meeting Contract requirements will be addressed through the Non-Conformance Report procedures as outlined in the Contract Documents.

#### 4.2 DESIGN PARAMETERS

##### 4.2.1 GENERAL

The structures shall be designed and detailed using the customary English units. Structural design shall be in accordance with the AASHTO LRFD Bridge Design Specifications 4th edition 2007 with 2008 and 2009 interims and the LA DOTD LRFD Bridge Design Manual first edition. The LA DOTD Bridge Design English Manual fourth edition and any revisions and technical memoranda issued by the State Bridge Design Engineer prior to the issue date of the Scope of Services Package shall also be used. Plans shall be prepared in accordance with the LA DOTD Bridge Design English Manual, Chapter 1. All submittals and submittal requirements shall be as per the performance specifications. The LA DOTD Bridge Design Manuals and Technical Memorandums can be downloaded from the LA DOTD Bridge Section Website at: ([http://www.dotd.la.gov/highways/project\\_devel/design/home.asp?ID=BRIDGE](http://www.dotd.la.gov/highways/project_devel/design/home.asp?ID=BRIDGE))

##### 4.2.2 Loads And Forces

The following load factors shall be used for ductility and importance.

$$\eta_D, \text{ ductility} = 1.00$$

$$\eta_I, \text{ importance} = 1.05$$

For redundancy load factor,  $\eta_R$ , follow the LA DOTD LRFD Bridge Design manual to select the required load factor.

#### **4.2.2.1 Dead Loads**

Add 12 psf unit dead load for a future wearing surface to all bridge structures except slab span structures. Add 19 psf for unit dead load for a future wearing surface for slab span bridges. Metal stay in place forms may be used on this project. If these forms are used, the additional dead load due to the stay in place forms shall be included in the design of the structure. The top 1/2" of the roadway concrete slab shall be considered non-structural and shall be accounted for as dead load.

#### **4.2.2.2 Live Loads**

Bridges shall be designed for HL-93 vehicular live load. For fatigue use ADT and traffic data provided by LADOTD. The Louisiana Special Design Vehicles specified in Figure 3.1 of LADOTD LRFD Bridge Design Manual shall be included in the design for Strength II Limit State.

#### **4.2.2.3 Earthquake**

The seismic performance category for all structures shall be Zone 1. The importance classification for all bridges shall be Critical.

#### **4.2.2.4 Stream Pressure**

The forces shall include the effects of debris in accordance with NCHRP 445.

#### **4.2.2.5 Bridge Load Rating**

Load rate all new and existing bridges based on existing as-built conditions in accordance with the AASHTO Manual for Bridge Evaluation and the LA DOTD Policies and Guidelines for Bridge Rating and Evaluation. The Design-Builder shall submit the load rating prior to the final acceptance of the bridges.

### **4.3 CORROSION PROTECTION**

The Design-Builder shall provide for review and approval by LA DOTD a Corrosion Control Plan including material selection modeling process and estimates of life-cycle costs, to assure the stated service lives for the structural elements of the bridges. Cathodic protection is not required.

For post-tensioned bridges, the Corrosion Protection Plan shall include specific detailed provisions for post-tensioning tendons corrosion protection. The plan shall specify corrosion allowances and outline detailed provisions with regards to reinforcing steel and structural steel protection. In regards to concrete performance, the plan shall assess the effects on concrete permeability, corrosion thresholds, corrosion rate, impacts on cracked concrete, time-to-repair and provide recommendations on the use of calcium nitrate, silica fume, sealers, membranes, reinforcing coatings, increased cover, corrosion inhibitors, etc.

### **4.4 AESTHETICS**

At a minimum, bridge aesthetics shall meet the requirements of the LA DOTD Bridge Design Manual Chapter 3, Bridge Aesthetics. If weathering steel is used, the requirements listed in NCHRP, Report 314 should be followed.

### **4.5 GEOMETRY**

The minimum typical section for the bridge structures shall consist of 3 travel lanes, inside and outside shoulders and a bridge barrier on each side.

New bridge construction shall meet the LA DOTD design standards and the required vertical and horizontal clearances shall be as per the LA DOTD Bridge Design English Manual, Chapter 3 Normal Highway Clearances and Chapter 3, Bridge Finish Grade Elevation for debris prone areas.

#### **4.6 BRIDGE TYPE**

Bridge type will not be restricted to those traditionally used by the LA DOTD. Other types and components may be used, but will be allowed only if they have been accepted for general use by other United States transportation authorities and the Design-Builder can demonstrate that its design of the bridge type and components will perform according to these specifications.

Experimental bridge types, pre-cast concrete flat slab bridges, timber bridges, masonry bridges, and structural plate arches are not permitted.

The Design-Builder shall minimize the number of expansion joints through the use of continuous superstructure units.

#### **4.7 INSPECTION ACCESS**

All bridge superstructures, joints, and bearings shall be designed so as to provide easy access for long term inspection.

#### **4.8 UTILITY COORDINATION**

See Utilities Performance Specification.

#### **4.9 HOT WEATHER CONCRETE**

Hot weather concrete shall be in accordance with ACI 305 R-99 Hot Weather Concreting.

#### **4.10 HURRICANE PREPAREDNESS**

The Design-Builder shall have a plan to address securing and protection of the project site during a hurricane event. The Design-Builder shall provide a copy of the plan within 90 days of NTP to LA DOTD for review and comment.

#### **4.11 COMPONENTS**

##### **4.11.1 Traffic Railing Barrier**

New outside and median side bridge traffic railing barriers shall be a cast-in-place concrete F-shape. Bridge traffic railing barriers on the outside shall be a minimum total height of 32 inches high and meet a minimum TL-4 test level. Bridge traffic railing barriers on the median side shall be a minimum total height of 54 inches high and meet a minimum TL-4 test level. Glare screens may be used.

##### **4.11.2 Approach Slabs**

The Design-Builder shall replace all approach slabs on each bridge. The Design-Builder shall provide a minimum 40'-0" long approach slab at the end of each bridge in accordance with the LA DOTD Bridge Design Manual. Any settlement of the approach slab shall be taken into consideration when designing the approach slab.

##### **4.11.3 Decks**

Decks shall be of concrete with a designed deck thickness of 7.5 inches including 0.5 inch wearing surface, not to be included in the structure design. The LRFD empirical deck design method is not allowed. Pre-tensioned, pre-cast concrete deck forms may be used provided that a minimum of four

inches of cast in place deck thickness is provided over the pre-cast deck forms. Open or filled grating decks and orthotropic decks are not permitted.

For new bridge decks, the IRI must be 95 in/mile IRI or less using the testing procedure described in LA DOTD's DOTD-TR 644-06.

In order to maintain adequate coverage of the top reinforcing steel in the bridge deck, the Design-Builder shall submit a remediation plan, if surface correction is required, to the Department's Project Manager for approval.

#### **4.11.4 Deck Joints**

Avoid or minimize joints wherever possible. Use only strip seal, finger joints or standard slab span joints as per the current LA DOTD slab span standard plans. Strip seals can only be used for total movement not exceeding 3.5 inches. Movement greater than 3.5 inches shall use finger joints. Aluminum finger joints are permitted if fatigue requirements are met. Steel plate finger joints shall be hot dipped galvanized.

Design-Builder shall repair or replace existing joints as necessary to result in deck joints that are structural sound, provide adequate structural movement and/or continuous across existing and new portions of the structure.

#### **4.11.5 Post-Tensioning**

All post-tensioning details and grouting operations shall be in accordance with current industry standards for detailing and grouting post-tensioning tendons, which meet or exceed the American Segmental Bridge Institute's recommended practices.

#### **4.11.6 Structural Steel**

Structural steel members shall be weathering steel. The design and details for preventing staining of concrete by weathering steel shall be in accordance with the LA DOTD Bridge Design manual, Chapter 5, Subsection for guidelines for Weathering Steel Design. All bolted steel connections shall use Direct Tension Indicators.

#### **4.11.7 Bearings**

Design and location of bearings shall provide for maintenance accessibility and future replacement. Elastomeric bearings are preferred.

#### **4.11.8 Pier Caps**

The type of pier cap shall be consistent with the bridge system and shall meet the aesthetic requirements of the LA DOTD Bridge Design manual Chapter 3, Bridge Aesthetics.

#### **4.11.9 Embankment Slope Protection**

Embankment slope protection shall be in accordance with the details contained in the LA DOTD's Bridge Design English Manual, Chapter 6, Embankment protection and shall be consistent with the bridge hydraulic analysis and permits.

#### **4.11.10 Foundations**

Maximum pile load demands shall be determined using the AASHTO LRFD Bridge Design Specifications. The structural capacity of the foundation elements shall be designed per LRFD Specifications for all required LRFD load combinations.

The effects of scour shall be considered with all load combinations except for extreme event provisions allowed by NCHRP 489. Scour determination shall be done for each pier exposed to stream flow using FHWA NHI 01-001, HEC-18 Manual as a guideline; likewise other related manuals shall apply. The forces due to stream pressure shall include the effects of debris.

Foundations shall be designed in accordance with AASHTO LRFD Bridge Design Specifications, LA DOTD Bridge Design English Manual, LADOTD LRFD Bridge Design Manual and Geotechnical Performance Specification in this Scope of Services Package. Spread footings and timber piles are not permitted. No exposed steel piles will be allowed above ground elevation.

#### **4.11.11 Deck Drainage**

The deck drainage shall be based on hydrologic analysis and satisfy all permit requirements. Deck drains shall extend a minimum of 12 inches below the bottom of steel girders. This requirement is not applicable to concrete girders. Avoid drainage over existing and proposed roadways and railroad right-of-ways.

The deck drainage shall be in accordance with FHWA Hydraulic Engineering Circular no. 21 “Design of Bridge Deck Drainage”.

#### **4.11.12 Retaining Walls**

Retaining walls shall be designed in accordance with Geotechnical Performance Specifications.

### **4.12 MAJOR DRAINAGE STRUCTURES**

Major drainage structures shall be designed in accordance with AASHTO LRFD Bridge Design Specification.

### **4.13 PERMANENT SIGN STRUCTURES**

Sign structures and supports shall be designed in accordance with the LA DOTD’s Bridge Design English Manual, Chapter 10, Permanent Signing and the latest edition of the AASHTO Standard specifications of Structural Supports of Highway Signs, Luminaries and Traffic Signals. It is preferred that the LA DOTD standard sign details be used for the project. The LA DOTD preferred overhead standard sign detail is based on a 4 chorded pipe box truss. Completed designs for the LA DOTD sign structures are available upon request based on the contractor supplying the span lengths and sign panel areas.

### **4.14 GUARDRAIL**

All approach guard rail on I-12 for the bridges shall be replaced. The guard rail shall be designed and replaced in accordance with the LA DOTD guard rail Standard plans.

### **4.15 EXISTING LEAD PAINT**

Not Applicable.

## **5.0 FINAL SUBMITTALS**

### **5.1 PLANS**

Final plans shall be signed and sealed by a Licensed Professional Engineer registered in the State of Louisiana. The Design-Builder shall produce electronic final plan deliverables in conformance with “DOTD Software and Deliverable Standards for Electronic Plans”.

### **5.2 CALCULATIONS FOR FINAL DESIGN AND BRIDGE RATING**

The Design-Builder shall submit all design calculations in an electronic .pdf file. The design calculations shall include a table of contents, design criteria and design assumptions. Reference computer programs

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input and output files and the appropriate code sections in the calculations. All computer program input and output files shall be submitted with the calculations. All calculations shall be signed by the designer and the reviewer. The bridge rating shall use the Virtis Software and the rating calculations shall be submitted in accordance with LADOTD The Policy and Guidelines for Bridge Rating and Evaluation. Final design calculations and rating calculations shall be signed and sealed by a Licensed Professional Engineer registered in the State of Louisiana.