Chapter 26

Bridge Project Development

Exhibits

THIS PAGE LEFT BLANK INTENTIONALLY

Chapter 26

Bridge Project Development

26.1 General

All structural designs for new construction for the Florida Department of Transportation (FDOT) are developed under the direction of the Structures Design Office (SDO) and/or the District Structures Design Offices (DSDO).

Modification for Non-Conventional Projects:
Delete the above paragraph.

All designs are to be developed in accordance with the ***Structures Manual (Topic No. 625-020-018)*** (which includes the ***Structures Design Guidelines***, the ***Structures Detailing Manual***), this Manual, the ***Design Standards (Topic No. 625-010-003)***, and the ***AASHTO Standard Specifications for Highway Bridges*** or the ***AASHTO-LRFD Bridge Design Specifications*** as referenced in the Structures Manual, applicable FHWA Directives, and other criteria as specified by the Department.

Designs for repair or rehabilitation of bridges are generally developed under the direction of the District Structures Maintenance Engineer (DSME) and may not include all the submittal types discussed in this chapter.

Modification for Non-Conventional Projects:
Delete the above paragraph.

Structures for other agencies or authorities such as the Jacksonville Transportation Authority, various Expressway Authorities, etc. may be designed to meet the Department's criteria or additional criteria as specified by the authority.

For projects involving bridges over navigable water, notify the District Structures Maintenance Engineer (DSME) a minimum of 90 days prior to engaging in any action in, on, or around the bridge. Refer to ***Section 13.5.3*** of this volume for further information.

26.2 Organization

The Structures Design Office (SDO) is a subdivision of the Office of Design under the direction of the Chief Engineer and the Assistant Secretary for Engineering and Operations. The SDO is under the direction of the State Structures Design Engineer (SSDE). Each District, including the Turnpike, has a staff of structural design engineers that comprise the District Structures Design Office (DSDO), and which is under the direction of the District Structures Design Engineer (DSDE).

26.3 Definitions

All structures have been grouped into the following two categories based upon design difficulty and complexity:

26.3.1 Category 1 Structures

Category 1 Structures consist of box or three-sided culverts, short span bridges (continuous reinforced slabs and prestressed slabs), simple span non-posted tensioned concrete girder bridges, continuous straight steel plate girder bridges with spans less than 170 feet, bridge widenings for these structure types, retaining walls, roadway signing, signalization and lighting supports, noise barriers, and overhead sign structures.

Pedestrian bridges consisting of steel bridge truss spans utilizing proprietary designs shall be classified as Category 1 Structures.

26.3.2 Category 2 Structures

A structure will be classified as a Category 2 Structure when any of the following are present: steel box girders, curved steel plate girders, continuous straight steel plate girder bridges with spans greater than or equal to 170 feet, cast-in-place concrete box girder bridges, concrete segmental bridges, continuous and simple span post-tensioned concrete bridges with or without pretensioning, steel truss highway bridges, cable stayed bridges, movable bridges, depressed roadways, tunnels, non-redundant foundations, substructures containing post-tensioned components, straddle piers, integral caps, bridges designed for vessel collision, or any design concepts, components, details or construction techniques with a history of less than five (5) years of use in Florida.

Pedestrian bridges consisting of steel bridge truss spans requiring custom non-proprietary designs shall be classified as Category 2 Structures. Cable stayed pedestrian bridge shall be classified as Category 2 Structures.

26.4 Abbreviations Used in Structures Design

Terminology used in the area of Structures Design for the Florida Department of Transportation often is written or spoken in the form of abbreviations and/or acronyms. Following is a list of those terms frequently encountered in this manual and in other references used in structures design and include those commonly used for offices, organizations, materials, systems, features, equipment, conditions, and expertise:

AASHTO	***American Association of State Highway and Transportation Officials***
ACI	***American Concrete Institute***
ACIA	***Assigned Commercial Inspection Agency***
ADA	***Americans with Disabilities Act***
AISC	***American Institute of Steel Construction***
ANSI	***American National Standards Institute***
AREMA	***American Railway Engineering and Maintenance Association***
ASTM	***American Society for Testing and Materials***
AWS	***American Welding Society***
BBS	***Bulletin Board System***
BDR	***Bridge Development Report***
BHR	***Bridge Hydraulics Report***
BHRS	***Bridge Hydraulics Recommendation Sheet***
CADD	***Computer Aided Design and Drafting***
CEI	***Construction Engineering and Inspection***
C.I.P. (C-I-P)	***Cast-in-Place (Concrete)***
CSIP	***Cost Savings Initiative Proposal***
CPAM	***Construction Project Administration Manual***
CVN	***Charpy V-Notch (Impact Testing)***
DSDE	***District Structures Design Engineer***
DSDO	***District Structures Design Office***
DSME	***District Structures Maintenance Engineer***
EMO	***Environmental Management Office***
EOR	***Engineer of Record***
FDOT	***Florida Department of Transportation***
FHWA	***Federal Highway Administration***
LRS	***Low-relaxation Strands***
LRFD	***Load and Resistance Factor Design***
MHW	***Mean High Water***
MSE	***Mechanically Stabilized Earth (Walls)***
MUTCD	***Manual on Uniform Traffic Control Devices***
NBR	***Nominal Bearing Resistance***
NHS	***National Highway System***
NHW	***Normal High Water***

NOAA	***National Oceanic and Atmospheric Administration***
OIS	***Office of Information Systems***
OSHA	***Occupational Safety and Health Administration***
PDA	***Pile Driving Analyzer***
PD&E	***Project Development and Environment***
PPD	***Plans Production Date***
PPM	***Plans Preparation Manual***
QPL	***Qualified Products List***
RDR	***Required Driving Resistance***
SDO	***Structures Design Office***
SIP (S-I-P)	***Stay-in-Place (Forms)***
SRS	***Stress-relieved Strands***
SSDE	***State Structures Design Engineer***
TAG	***Technical Advisory Group (SDO and DSDEs)***
TFE (PTFE)	***Polytetrafluorethylene (Teflon)***
TRB	***Transportation Research Board***
TTCP	***Temporary Traffic Control Plans***
UBC	***Ultimate Bearing Capacity***
UV	***Ultraviolet***

Modification for Non-Conventional Projects:

Expand ***PPM*** 26.4 with the following abbreviation.

RFP	***Request For Proposal***

26.5 Responsibility

The District Structures Design Office has total project development and review responsibility for projects involving Category 1 Structures. The Structures Design Office has total project development and review responsibility for projects involving Category 2 Structures. This responsibility for Category 2 Structures extends to widening and rehabilitation projects and repairs of bridge components that qualify the structure as a Category 2 Structure. For large projects with multiple bridges, review responsibilities will be coordinated between the District Structures Design Office and the Structures Design Office based on the category of the individual bridge, work load demands and project make-up. In general, where the majority of the structures on a large multi-bridge project are Category 2, the Structures Design Office will have total project development and review responsibility for the entire project; where the majority of the structures are Category 1, the Structures Design Office will have project development and review responsibility for the Category 2 bridges only, and the District Structures Design Office will have project development and review responsibility for the Category 1 bridges.

The District Project Manager shall coordinate with the District Structures Design Engineer who shall review and concur with the bridge aspect of all projects during the PD&E process in accordance with ***Chapter 4*** of the ***PD&E Manual***.

The District Structures Design Engineer or the State Structures Design Engineer, as appropriate, shall concur/approve all bridge related work after location design approval is granted.

To assure a uniform approach to a project, the engineer shall coordinate with the appropriate Structures Design Office to discuss structures related phase review comments and get concurrence on how to proceed.

Modification for Non-Conventional Projects:

Delete ***PPM*** 26.5 and replace with the following:

26.5 Responsibility

RFP's on those projects where it is anticipated that Category 2 bridges will be designed and constructed shall be submitted to the State Structures Design Engineer for review and approval. RFP's on those projects where it is anticipated that Category 1 bridges will be designed and constructed shall be submitted to the District Structures Design Engineer for review and approval.

The District Structures Design Office has total component structure plan review responsibility for projects involving Category 1 Structures. The Structures Design Office has total component structure plan review responsibility for projects involving Category 2 Structures. This responsibility for Category 2 Structures extends to widening and rehabilitation projects and repairs of bridge components that qualify the structure as a Category 2 Structure. The District Structures Design Engineer or the State Structures Design Engineer, as appropriate, shall determine when structure component plans should be "Released for Construction."

The District Project Manager shall coordinate with the District Structures Design Engineer who shall review and concur with the bridge aspect of all projects during the PD&E process in accordance with Chapter 4 of the ***PD&E Manual***.

26.6 FHWA Oversight

See ***Chapter 24*** of this volume for FHWA requirements.

26.7 Bridge Project Development

The following sections will define, clarify and list the information necessary to produce an acceptable and reproducible set of contract documents (special provisions, bridge contract drawings, etc.) ready for advertisement and construction.

Bridge project development normally includes five phases of development. The first phase of development, bridge analysis, occurs during the Project Development and Environment (PD&E) process. After location design approval is granted, the second phase, Bridge Development Report/30%Structures Plans, is initiated. After approval of the BDR, the final phases of work will begin. The third phase is the 60% Structures Plans that consists of the substructure foundation submittal for all projects and 60% Structures Plans for most Category 2 Structures. The fourth phase includes the 90% Structures Plans and specifications. The fifth phase includes the 100% Structures Plans and specifications. For efficiency, one engineering firm (one design team) should be responsible for the BDR and the final plans and specifications.

For Category 2 bridges and some Category 1 bridges, step negotiations are suggested. Step negotiations are desirable because the final bridge type cannot be determined until the BDR is complete. Utilizing this scenario, the first step of the negotiations would include the BDR/30% Structures Plans. After submittal of the BDR/30% Structures Plans, negotiations for final three phases of work (60% Structures Plans, 90% Structures Plans and 100% Structures Plans) would begin. Negotiations should not be finalized until the BDR/30% Structures Plans are approved by the DSDO or the SDO as appropriate.

Modification for Non-Conventional Projects:

Delete ***PPM*** 26.7 and replace with the following:

26.7 Bridge Project Development

Bridge project development normally includes four phases of development. The first phase of development, bridge analysis, occurs during the Project Development and Environment (PD&E) process**.** The second phase includes the development of the bridge related project constraints based on project specific requirements and development of the bridge concept plans for inclusion into the RFP. A series of pre-scoping questions has been compiled and are available on the Office of Construction website to aid in the development of project specific constraints. Depending on the complexity of the project and at the discretion of the Department,

this second phase may include a Bridge Feasibility Assessment for the purpose of developing the structures concept plans. The third phase involves the project procurement process. See ***Procurement and Administration Procedure (Topic No. 625-020-010k)*** for specific requirements. The fourth phase includes component structure plan reviews in accordance with the requirements of the RFP.

26.8 Bridge Analysis

26.8.1 General

The Bridge Analysis is performed during the PD&E phase by qualified bridge engineers. The District Structures Design Engineer must concur with the findings of the bridge analysis, which is part of the preliminary engineering report. The function of the bridge analysis is to determine the general attributes for the recommended bridge. The specific attributes of the bridge will be defined in the BDR.

For bridges over water, a location Hydraulics Report will be prepared in conjunction with the bridge analysis. General site geotechnical knowledge is also required (usually from existing bridge plans) or, in some cases, it may be desirable to obtain borings.

26.8.2 Contents

The bridge analysis shall provide conceptual guidance for the bridge design consultant. Conceptual guidance on how the bridge should fit into the uniqueness of the site should be provided. Bridge design and structure type should be left to the design team in the later phases of work. Bridge analysis shall include the following:

1. Environmental and site considerations.
2. Vertical and horizontal clearances (existing and proposed).
3. Disposition of existing structure. (Final disposition of demolished bridge debris will depend on whether or not a local, State or Federal agency has agreed to receive the debris. See ***Section 13.5.2.3***).
4. Vertical and horizontal geometry.
5. Typical section.
6. Conceptual ship/barge impact data (sample of recreational and commercial traffic).
7. Identification of historical significance of bridge and surrounding structures.
8. Aesthetic level for bridge and bridge approaches.
9. Location Hydraulics Report.
10. Bridge deck drainage considerations.
11. Stream bottom profile.
12. Conceptual geotechnical data.
13. For sites with movable bridge options, a life cycle cost comparison will be prepared and compared to a fixed bridge.
14. Phase Construction Impacts.
15. Construction time.

26.9 Bridge Development Report (BDR)/30% Structures Plans

26.9.1 General

The BDR is intended to establish all the basic parameters that will affect the work done in the Design and Plans Preparation phase. Initiation of the BDR shall occur after location design approval (For some sites only a programmatic categorical exclusion will be required before initiation of the BDR). Once approved, the BDR will define the continuing work by the Engineer of Record (EOR). It is mandatory that the EOR obtain and coordinate the information and requirements of the offices and engineering disciplines whose input is essential to the preparation of an effective BDR. Changes to the parameters after the BDR is approved could result in schedule delays and supplemental agreements; therefore, it is critical that District Offices, FHWA (if involved), the Structures Design Office and other involved agencies recognize the purpose and importance of the BDR. The BDR phase of work will contain sufficient detail for the justification of the proposed bridge type. For most projects, the 30% Structures Plans will be included as an appendix to the BDR. The BDR is developed from information outlined on the Bridge Development Report Submittal Checklist shown in ***Exhibit 26-A***, located at the end of this chapter. This information is often provided by others; however, the EOR is responsible for ensuring that all of the information is adequate and appropriate. If the data is not sufficient, the EOR must obtain the required information before the BDR can be completed and submitted.

When alternate designs are considered, consistency between the alternates is essential in ensuring equitable competition and optimum cost-effectiveness. This consistency includes uniformity of design criteria, material requirements and development of unit costs.

The BDR should contain only supportable and defendable statements. Subjective opinions or unsubstantiated statements are not acceptable. All arguments must be clearly and logically defensible with calculations, sketches or other technical data.

The quantity of work necessary to prepare the BDR depends upon the project's complexity; however, the usual work effort for bridge types normally encountered is:

1. Minor Bridge Widenings: The BDR will be a minor work effort; however, viable structural possibilities and economical options should be thoroughly investigated to determine if replacement of the bridge would be more appropriate than its widening. This is particularly true at sites where the existing bridge condition is marginal, where there has been a record of serious flooding or scouring, when

the widening is part of a route improvement with a high potential for attracting traffic, if the existing bridge has a history of structural problems (including vessel collision), or if the inventory rating is less than required by AASHTO and cannot be improved. Load rating considerations that shall be included in the BDR recommendations are provided in ***Section 7.1.1 of the Structures Design Guidelines***.

2. Minor Grade Separations or Small Water Crossings: The BDR shall be a thorough document that adequately addresses all viable structure types; however, the BDR will not usually be an extensive document since the viable types of superstructure and substructure are generally limited. Scour and vessel collision shall be considered.

3. Major Bridges (including Movable) and Major Interchanges: The BDR shall be an extensive and comprehensive document that thoroughly considers all viable structure types and considers all design parameters (such as vessel collision and scour).

26.9.2 Contents

The major items to be considered in the BDR are:

1. General: The bridge length, height and pier locations are subject to vertical and horizontal design clearance requirements such as those for clear zone, navigation and hydrology. After these considerations are met, span lengths are governed by economics and aesthetic considerations. Superstructure depths (grade separation structures in particular) shall be kept to the minimum that is consistent with good engineering practice. Recommended span/depth ratios for steel superstructures are shown in AASHTO.

   The length of the bridge will be affected by:

   a. Opening required by the Bridge Hydraulic Report.

   b. Environmental Considerations.

   c. Railroad clearances and cross sections.

   d. Width of waterway and/or width of cross section of roadway being spanned including the use of retaining walls, or fender systems.

2. Statical System: The economic and engineering advantages of both simple span and continuous spans shall be addressed.

3. Superstructure: Some superstructure types that could be considered are prestressed concrete girders, inverted-tee sections, reinforced or prestressed concrete slabs, steel rolled sections or plate girders, steel or concrete box girders, and post tensioned slabs, bulb-tees or boxes.

4. Substructures: Some substructure types that could be considered are pile bents and multi-column or hammerhead piers. Variations of column shapes may be appropriate for aesthetic or economical requirements.

5. Foundations: Some foundation types that could be considered are steel and concrete piles, drilled shafts and spread footings.

6. Vessel Collision: Vessel collision forces will often have a major effect on the structural configuration and overall economics. See vessel collision requirements in the ***Structures Design Guidelines***.

7. Scour: The 100 year and 500 year predicted scour elevations will often have a major effect on the foundation design. See the foundations and geotechnical requirements in the ***Structures Design Guidelines***.

8. Temporary Traffic Control: Show how traffic will be maintained during construction for each of the bridge alternates considered. Assess the impacts of the traffic carried on the structures as well as under the structures being constructed. Consider all major overhead work items such as bridge demolition and girder placement. Show stability towers locations, phased construction sequences, girder splice locations, etc., for each alternate being considered. Compare traffic user impacts for each of the alternates.

   (See ***PPM Volume 1, Section 10.4*** for additional requirements)

9. Precast Bridge Options: Investigate the use of either partial or full precast bridge alternate(s) with the specific purpose of accelerating bridge construction and reducing user impacts. As part of this investigation:

   A. Conduct a feasibility assessment responding to questions similar to those listed in ***Exhibit 26-F***.

   B. Based on responses to the feasibility questions, explain whether a precast alternate should be considered an advantage on the project or what site constraints, economic impacts, or other factors (e.g., haul distance from precast yard, project variability, etc.) precluded or limited its application. If precasting is determined not to be applicable for the project, provide a statement in the BDR indicating so and the reasons why. This statement fulfills the requirements of this section.

   C. Only if precasting is found to be viable, evaluate preliminary precast alternates and associated MOT schemes against conventional methods using the assessment matrix and referenced links given in ***Exhibit 26-F***. Provide enough detail in the preliminary evaluation in order to estimate total direct and indirect costs. Indirect costs, typically referred to as road user costs, include fuel use and man-hour losses resulting from detours, anticipated traffic flow reduction, and reduced speed limits. Determine indirect costs using the Department's software at the following link:
   http://infonet.dot.state.fl.us/tlconstruction/SchedulingEng/AddSoftwareScheduling.htm

At this stage, a meeting with the District Structures Design Engineer is recommended to discuss the preliminary evaluation and cost estimates before finalizing the alternates for inclusion in the BDR.

D. Report the estimated total direct costs and estimated total indirect costs, as well as the sum of both, for *each* alternate as three separate dollar amounts in a summary table in the same section as the completed assessment matrix (see "Alternate Cost Summary" table in ***Exhibit 26-F***).

The Structures Design office has developed several training videos for the purpose of educating designers on factors for consideration related to use of Prefabricated Bridge Elements and Systems (PBES) for Accelerated Bridge Construction (ABC). The main emphasis of the training videos is to demonstrate the sort of factors and project constraints that influence whether bridge components should be used. Also discussed are overall prefabricated ABC strategies and implications, including examples showing how labor, material, and equipment costs are considered.

These training videos have been posted on a website along with notification of upcoming developments and helpful links to related external websites. The Department's Structures Design Office website for Every Day Counts can be viewed at:
http://www.dot.state.fl.us/structures/edc

Commentary: Providing both the direct and indirect costs of the project in the BDR enables Department management to make informed decisions to maximize construction dollars while at the same time minimizing construction time and economic impacts to Florida's traveling public.

Also, demonstrate in the BDR text that consideration was given to identify and employ other innovative techniques aimed at reducing costs, shortening project delivery time, enhancing safety during construction, and protecting the environment.

10. Quantity estimates: For minor bridges rough quantities (such as reinforcing steel based on weight per volume of concrete) may be sufficient. For major and complex bridges the degree of accuracy may require more exact calculations keeping in mind that the intent is to establish relative and equitable costs between alternates and not necessarily to require the accuracy of the Final Estimate. For major and complex structures it may be necessary to develop unit costs from an analysis of fabrication, storage, delivery and erection costs of the different components. For projects involving the demolition of bridges, debris volume quantities must be calculated.

11. Unit costs: Data available from the FDOT or contractors and suppliers should be used to arrive at unit costs. The sources of all price data shall be recorded for later reference. Base cost should be obtained from the ***BDR Estimating Section*** of the ***Structures Manual***.

12. Develop cost curves: For each alternative establish the most economical span arrangement, i.e., minimum combined superstructure and substructure cost.
13. Retaining Wall Study: If retaining walls are present, a retaining wall study shall be included in the BDR. This study will conform with the work as specified in ***Chapter 30*** of this volume and the ***Structures Manual***.
14. Movable Bridges: For movable bridges the BDR shall include information on the type of equipment for the machinery and electrical drive systems, together with a general description of the control system to be utilized. A written description and preliminary layouts of system components shall be included.
15. Bicycle and Pedestrian Facilities: The report shall describe the facilities to be provided and the means to be used to comply with ADA requirements and ***Chapter 8*** of this Volume.

For rehabilitation project plans, the BDR stage shall include plans and written descriptions of those system components to be modified from the existing configuration, along with plans of the existing configuration. Submittal of information described in the previous paragraph is not required unless the electrical and mechanical configuration is modified from the existing configuration.

26.9.3 Format

The report shall use standard, letter-size pages with any larger sheets or drawings folded to fit the report size. The report shall be neatly written and the contents presented in a logical sequence with narrative, as required, to explain the section contents. An Executive Summary shall compare the relative features and costs of the alternates considered and recommend alternate(s) to be carried forward into the Final Structures Plans Preparation phase.

The BDR shall be as self-contained as possible by including all arguments that establish, justify, support, or prove the conclusions. It is acceptable to make reference to other documents that will be included in the final submittal package; however, any documentation that will help emphasize a point, support a statement, or clarify a conclusion shall be included. Such documentation may include drawings, clear and concise views, or other such illustrated information.

The BDR shall address construction time requirements and the effect that components, systems, site constraints and conditions, or other site characteristics or criteria have upon the construction time, whether additive or deductive.

For most projects, the 30% Plans shall be an appendix to the BDR.

26.9.4 Aesthetics

1. General: Any bridge design must integrate three basic elements: efficiency, economy and elegance. Regardless of size and location, the quality of the structure, its aesthetic attributes and the resulting impact on its surroundings must be carefully considered. Achieving the desired results involves:

   a. Full integration of the three basic elements listed previously.

   b. The EOR's willingness to accept the challenge and opportunity presented. A successful bridge design will then be elegant or aesthetically pleasing in and of itself and will be compatible with the site by proper attention to form, shapes and proportions. Attention to details is of primary importance in achieving a continuity of line and form. In general, the rule of "form following function" shall be used.

   The designer must consider the totality of the structure as well as its individual components and the environment of its surroundings. A disregard for continuity or lack of attention to detail can negate the best intent. Formulas cannot be established; however, the ACI's ***Aesthetic Considerations for Concrete Bridges*** and the TRB's ***Bridge Aesthetics Around the World*** as well as authors such as David P. Billington can guide the designer. A book developed by the Maryland Department of Transportation entitled ***Aesthetic Bridges*** provides excellent guidance. In bridge aesthetics the designer is dealing with the basic structure itself; not with enhancement, additions or other superficial touches. The EOR is expected to be well read on the subject of bridge aesthetics and committed to fulfilling both the structural and aesthetic needs of the site.

   The challenge differs for major and minor structures. Indeed, the challenge may be greater the smaller the project. Major structures, because of their longer spans, taller piers, or curving geometry often offer inherent opportunities not available for minor bridges.

   Some basic guidelines where aesthetics may play a more important role are:

   a. Bridges highly visible to large numbers of users (maritime and/or motorists).

   b. Bridges located in or adjacent to parks, recreational areas, or other major public gathering points.

   c. Pedestrian bridges.

   d. Bridges in urban areas in or adjacent to commercial and/or residential areas.

   e. Multi-bridge projects, such as interchanges, or corridors should attain conformity of theme and unifying appearance. Avoid abrupt changes in structural features.

Considering these guidelines, the District will determine the level of aesthetic effort warranted on a project early in its development. When significant aesthetic expense is proposed, such as is the case with Level Three (Level of Aesthetics), Federally funded projects require legitimate written justification.

2. Levels of Aesthetics:

Normally the District will establish one of the following three general levels of aesthetic consideration and effort at each structure's site:

a. **Level One:** Consists of cosmetic improvements to conventional Department bridge types, such as the use of color pigments in the concrete, texturing the surfaces, modifications to fascia walls, beams, and surfaces, or more pleasing shapes for columns and/or caps.

b. **Level Two:** The emphasis is on full integration of efficiency, economy and elegance in all bridge components and the structure as a whole. Consideration should be given to structural systems that are inherently more pleasing, such as hammerhead or "T" shaped piers, oval or polygonal shaped columns, integral caps, piers in lieu of bents, smooth transitions at superstructure depth change locations, box-type superstructures, concealed drain pipes, conduits and utilities, etc.

c. **Level Three:** The emphasis in this level applies more to the overall aesthetics when passing through or under an interchange or at other sites such as historic or highly urbanized areas where landscaping or unique neighborhood features must be considered. The bridge itself shall comply with Level Two requirements. This level of work may require, at the District's option, a subconsultant (architect to consider adjacent building styles, and landscape themes) with the necessary expertise and credentials to perform the desired work.

These aesthetic levels are not exclusive. For example, where the EOR believes a specific landscape feature might significantly enhance bridge site elegance, even on a Level 1 design, the recommendation should be offered for the Department's consideration. For aesthetic Levels 2 and 3, public input into this issue may be appropriate. The EOR may recommend particular public involvement to the Department for consideration or the district might specify such efforts at specific times during the BDR and/or final plan development phase of the project.

The BDR shall include a summary of aesthetic considerations for the structure and the site. The summary shall consist of sketches, drawings, etc. of recommended treatment as well as the options considered in the aesthetic study but not recommended as appropriate. It shall also include an estimate of cost to implement the recommended aesthetic treatment.

The default condition for new steel bridges is uncoated weathering steel where site conditions permit (See ***SDG 1.3.2***). An Inorganic Zinc Coating System shall be used where site conditions preclude uncoated weathering steel and may be used elsewhere with approval of the Chief Engineer. Use of a High Performance Coating System to any extent for Steel bridges requires written approval from the Chief Engineer.

26.9.5 Construction and Maintenance Considerations

All viable structure concepts shall be evaluated for constructability. Items such as member sizes, handling, fabricating, and transporting members as well as maintenance of traffic, construction staging, equipment access, equipment requirements, etc. must be considered. Special evaluation shall be made to insure against potential problems that may occur in obtaining permits and equipment to transport long and/or heavy members from point of manufacture to the project site. The Department's Road Use Permits Office shall be contacted for questions concerning the feasibility of transporting long and/or heavy structural components. Also, considerations for future maintenance inspection shall be taken into account in the structure's design. Such considerations shall include those described in ***Section 26.15*** of this Chapter and the requirements of the ***Structures Manual***. All special construction and maintenance requirements should be identified and appropriately considered in any concepts recommended for design. A design is properly inspectable when it permits safe inspector access to all portions of the structure using equipment available to District Structures Maintenance personnel.

26.9.6 Historical Significance Considerations

When an older bridge is considered for rehabilitation or replacement, the Environmental Management Office will evaluate the historical significance of the structure. A structure may be historically significant due to some of the following characteristics:

1. The structure may be an historic example in the development of engineering.
2. The crossing may be historically significant.
3. The bridge may be associated with an historical property or area.
4. The bridge might be associated with significant events or circumstances.
5. National Register of Historic Places or on a state or local historical register. If it is determined that the structure is historically significant, then the project should be developed to preserve the historic character of the structure.

26.9.7 Bridge Security

Perform a refined evaluation of all new Category 2 bridges identified in a PD&E study as critical, landmark or signature bridges to determine if anti-terrorist countermeasures must be included as part of the design. Contact the State Structures Design Office and the State Maintenance Office for guidance and assistance. Alternative designs developed in the BDR shall minimize the bridge vulnerability. Countermeasures shall be designed to minimize the effectiveness of explosives. Vulnerability to shape charges and vehicle bombs shall be minimized. The use of structural redundancy and continuity shall be maximized to limit structural damage.

Countermeasures designed into the bridge alternatives shall meet one or more of the following objectives:

1. Protect structure from blast effects;
2. Maximizing explosive standoff distance;
3. Denial of access;
4. Minimizing time-on-target;
5. Selective protection of the structural integrity of key members;
6. Structural redundancy.

Use one or more of the following countermeasure strategies in the design:

1. Deter attacks by the possibility of exposure, capture or failure of the attacker due to visible countermeasures;
2. Detect potential attacks before they occur and provide the appropriate response force;
3. Defend the bridge by delaying and distancing the attacker from the bridge and protecting the bridge from the effects of weapons, fire and vehicle and vessel impacts;
4. Design the bridge to minimize the potential effects of Weapons of Mass Destruction (WMDs) and conventional explosives, fire and vehicle and vessel impacts.

Structural members that are fracture critical and/or are cable stays, cable stay pylons, hollow boxes, single columns, twin wall columns and thin wall columns require design modification to reduce the potential impact of explosions. Access into cable stay pylons, box superstructures and movable bridge machinery require heavy doors with secure lock systems. Bridges with essential communication utilities and or gas lines require the design to minimize risk to the utility.

26.9.8 Alternative Designs

The use of alternative designs for some larger or complex projects may result in more competitive bids and lower costs. Accordingly, the EOR shall evaluate benefits from alternatives for the particular structure being developed and provide a recommendation for or against preparing alternative designs. The alternative designs recommended shall be supported by the evaluations included in the BDR. As a guide, consider the following in evaluating justification for alternative designs:

1. Alternative designs shall be considered for all structures that cost more than $25 Million and a difference in alternate material (steel versus concrete) construction costs that are within twice the cost of producing the alternate plans. For example, alternative designs would be warranted if the additional preliminary engineering cost for final plans preparation is $1.5 million per alternate and the difference between the construction cost estimates utilizing FDOT estimating practices in the BDR was less than $3 million.
2. For bridges that cost less than $25 million consider alternative designs when project issues reflect possible advantages (i.e., TTCP, A+B) from competitive bids.
3. For bridges estimated to cost more than $10 million consider evaluation of alternative designs whenever a unique design concept is proposed until such time that a bid history is established for the unique design.
4. Projects containing multiple bridges with a reasonable mixture of concrete and steel designs do not require alternate designs.

Steel box structures and steel plate girders should be evaluated including the differences in corrosion potential. Box Girders are preferred over plate girders when located in extremely aggressive environments.

26.9.9 Conclusions and Recommendations

With due consideration for all applicable data, the engineer shall recommend the final bridge design system for the site. Thorough justification for the selection will be presented which examines each element of data, and the total estimated construction cost of the recommended design shall be indicated in the BDR. For most projects, the recommended design shall be supported by thirty percent plans (preliminary) as an appendix to the BDR.

The following sections will define, clarify and list the information necessary to produce an acceptable and reproducible set of contract documents (special provisions, bridge contract drawings, etc.) ready for advertisement and construction. The production of a

bridge project commences with the Bridge Development Report (BDR) and ends with complete Contract Documents.

26.9.10 30% Structures Plans

The 30% Structures Plans should be submitted with the Bridge Development Report for most structures. The consultant's scope of services should clearly state at what point are the 30% plans to be submitted. If the 30% Structures Plans are submitted separately, the BDR shall contain enough information and drawings to depict the information needed to properly determine the type, size and location of the bridge. The Phase 1 Geotechnical Report and the Hydraulic Report shall be included with the submittal containing the BDR.

The 30% Structures Plans should show, as a minimum, the following information:

1. General Notes Sheet: As many general notes as possible should be included on this sheet at this stage. Subsequent additions shall be made, when necessary, as the design progresses (for example of General Notes, see ***Chapter 5*** of the ***Structures Detailing Manual***).
2. Plan and Elevation Sheet: provide contents as required by the ***Structures Detailing Manual***.
3. Substructures: For end bents, piers or intermediate bents, show substructure elements and sizes including all deviations from the typical dimensions, foundation type including element spacing and the arrangement of piles or drilled shafts.
4. Superstructure: Include cross section showing lanes, shoulders, railings, slab thickness, beam type and spacing and web depth for steel girders. If applicable, show geometric changes in shapes of various components. Also show construction phases and maintenance of traffic data, outline of the existing structure and portions to be removed, and utilities (existing and proposed as available).
5. Retaining Walls: Preliminary control drawings shall be submitted when proprietary or standard cast-in-place walls are proposed. Include control drawings for all critical temporary walls.
6. Bridge Hydraulics Recommendation Sheet.
7. Report of core borings.
8. Proposed construction sequence and methods, indicate construction easements and methods of construction access.
9. Preliminary aesthetic details.
10. Preliminary post-tensioning layouts.

11. Preliminary foundation layouts and installation table.
12. Sidewalks: If provided, show preliminary accessible elements.
13. Any other special details required by the Engineer or details which are not normally used on Department projects.

In addition to these requirements, the following items will be included for moveable bridges: preliminary electrical and mechanical equipment layouts in plan and elevation, submarine cable routing, and single line electrical diagrams including service voltage. All equipment shall be rough sized and supporting calculations shall be submitted.

Requests for Design Exceptions and/or Design Variations for structural design criteria, shall be included in the 30% Structures Plans Submittal. Design Exceptions and Design Variations shall be approved in accordance with ***Chapter 23*** of the PPM, Volume 1 with concurrence of the DSDO or SDO as appropriate.

Modification for Non-Conventional Projects:

Delete ***PPM*** 26.9 and replace with the following.

26.9 Bridge Feasibility Assessment/Structures Concept Plans

At the discretion of the Department, a Bridge Feasibility Assessment may be necessary during the RFP development phase for the purpose of developing the structures concept plans. When required, the assessment shall target specific critical bridge components to ensure that the preliminary information presented in the concept plans can meet all of the project constraints depicted in the RFP.

For aesthetic requirements, see RFP.

26.10 Bridge Development Report (BDR) Submittal Checklist

The Bridge Development Report (BDR) Submittal Checklist (***Exhibit 26-A***) contains a list of the key supporting elements that are required for the preparation, submittal and review of a BDR. This Checklist must be included with the BDR when submitted for review and consists of the following items:

1. Typical Sections for Roadway and Bridge

   The approved typical sections for both the bridge and roadway are required.

2. Roadway Plans:

   Preliminary roadway plans covering the bridge vicinity are required.

3. Maintenance of Traffic Requirements:

   The Maintenance of Traffic Plan must show the number of required lanes as well as lane widths of all affected roadways.

4. Bridge Hydraulics Report and Bridge Hydraulics Recommendation Sheet:

   The Bridge Hydraulics Report (BHR) shall be prepared in accordance with the FDOT Drainage Manual. It shall include the Bridge Hydraulic Recommendations Sheet (BHRS) and address the required hydraulic opening, clearances, scour and deck drainage requirements. In addition to design water elevations normally shown, the BHRS shall include the Mean High Water (MHW) elevation for tidal crossings and Normal High Water (NHW) for non-tidal crossings. Concurrence of the BHR by the District Drainage Engineer with the District Structures Design Engineer for Category 1 Structures and State Structures Design Engineer for Category 2 Structures is required.

5. Geotechnical Report:

   The Bridge Geotechnical Report (Phase I) shall be prepared in accordance with ***Chapter 3*** of the ***Structures Design Guidelines*** and the Department's ***Soils and Foundation Handbook***. The report shall document a thorough investigation of all viable foundation types for the bridge and retaining walls. Concurrence of the District Geotechnical Engineer is required for Category 1 Structures and of both the State and District Geotechnical Engineers for Category 2 Structures.

6. Bridge Corrosion Environment Report:

   A Bridge Corrosion Report shall be prepared to determine the environmental classifications for the structure in accordance with the ***Structures Design Guidelines*** and must be approved by the District Materials Office.

7. Existing Bridge Plans:

   A set of prints of the existing (preferably as-built) bridge plans should be included for replacement structures and widenings. This is of particular importance for widenings and phase construction. These plans are not usually necessary for completely separate alignments or new interchanges unless the existing structures either will be used for new construction activities or will infringe upon the Contractor's allowed work zone.

8. Existing Bridge Inspection Report:

   A copy of the latest existing Bridge Inspection Report and Structures Inventory and Appraisal Form is required for all widenings and rehabilitations and may be required for new structures. The existing paint system(s) on all significant metal elements of existing structures shall be identified. The presence of lead-based paint and/or asbestos shall be clearly delineated.

9. Utility Requirements:

   All proposed utility attachments to the structure as well as all existing and proposed utilities in the vicinity of the structure shall be identified. The requirements of the Department's ***Utility Accommodation Manual (Topic No. 710-020-001)*** shall be followed regarding attachments to the structure.

10. Railroad Requirements:

    Existing as well as future railroad requirements must be identified. This will include all clearances as well as crash wall or other construction parameters. Copies of correspondence with the Railroad Agency shall be included.

11. Retaining Wall and Bulkhead Requirement:

    All permanent and temporary retaining wall requirements shall be identified and the proposed type of wall shall be shown. The type, location and extent of temporary walls to accommodate phased construction and/or maintenance of traffic must be identified.

    For water crossings where erosion and/or wave action is anticipated, the type, location and extent of bulkhead production shall be identified. The tie-back and anchor system proposed for use shall be included in the submittal.

12. Lighting Requirements:

    All proposed lighting on or under the structure shall be identified.

13. ADA Access Requirements:

    Any ADA access requirements that affect the structure shall be identified.

Modification for Non-Conventional Projects:
Delete ***PPM*** 26.10.

26.11 Final Plans and Specifications Preparation

26.11.1 General

Within this phase of work, for both Category 1 and 2 Structures, there are three phases of work; viz., 60% Substructure submittal or 60% Structure Plans, 90% Structure Plans and 100% Structures Plans and Specifications. For projects where preapproved proprietary wall systems cannot be used and fully designed proprietary wall plans are required, approved control drawings shall be submitted to the appropriate proprietary wall companies as soon as possible and no later than the 60% substructure submittal. A copy of this submission shall be sent to the DSDO or SDO as appropriate. At any time during the project development, the reviewer may require submittal of design calculations.

After each of the phases, except the 100% Structures Plans Phase, review comments from the FDOT are sent to the EOR by letter and/or a marked-up set of prints. The EOR must address each of the comments in writing and resolve each comment prior to the next submittal. The FDOT 100% Structures Plans review comments are to be handled in the same manner; except that unresolved comments may be handled by telephone, in some instances, if confirmed in writing. Also, for any phase, items and drawings from a preceding phase must be included. These drawings shall reflect the comments resolved from the previous phase as well as the accumulated design and drafting effort required of the current phase.

26.11.2 60% Substructure Submittal / 60% Structures Plans

This submittal phase is divided into two distinct parts; viz., the 60% Substructure Submittal (required for all projects) and the 60% Structures Plans for Category 2 Structures and some Category 1 Structures.

1. 60% Substructure Submittal:

   This submittal is required for every project and should be made a part of the 60% Structures Plans phase when that phase is part of the project. The submission is only a partial plans set. The purpose of this submittal is to communicate essential project information to the Geotechnical and Hydraulic Engineers so that all remaining calculations can be performed using actual structural shapes, loads, and dimensions. Plan sheets required for this submittal include: Plan & Elevation, Bridge Hydraulics Recommendation Sheet, Boring Logs, Foundation layout, Substructure Plans, and draft technical specifications.

60% Substructure Submittal Contents:

a. Foundation Layouts

b. Foundation Installation Notes

c. Pile/Drilled Shaft Installation Table

d. Footing Concrete Outlines (All Variations)

e. Pier Concrete Outline (All Variations)

f. Wall Plans - Control Drawings

g. Pile Details

h. Lateral Stability Analysis Completed

i. Phase II Geotechnical Report

j. Draft Technical Specifications

k. Reinforcement of Footing and Column

l. Post-Tensioning Details

m. Plan and Elevation Sheet

n. Bridge Hydraulics Recommendation Sheet

o. Boring Logs

2. 60% Structures Plans:

When a 60% Structures Plans submittal is required, all comments from earlier reviews shall have been resolved. At this phase, the design should be 90% complete and the plans, 60% complete. In addition to the documents required for the 60% Substructure Submittal, the 60% Structures Plans shall include the following details as applicable: final concrete outlines of all individual components, major reinforcing steel, final post-tensioning layouts, steel box/I-girder details, segmental concrete box details, bearing details, seismic details, details of congested areas, details of unique features, accessible pedestrian facilities details, and other details as required. For moveable bridges the following additional information is required: electrical calculations (for generator size, service voltage drop, short circuit, service size, automatic transfer switch, etc.), single line diagram showing equipment sizes and utilities, conduit and wire sizes, panelboard schedules, and light fixture schedules.

26.11.3 90% Structures Plans

Upon approval of the BDR/30% Structures Plans or 60% Structures Plans, as applicable, 90% Structures Plans shall begin. At this stage of plans development, the EOR shall have resolved the 30% and/or 60% Structures Plans review comments and developed the plans for completion. The design and plan production shall be 100% complete. This submittal shall include prints of the completed plans, Summary of Pay Items (complete with quantities), design calculations, Final Phase II Geotechnical Report, Addendums to Hydraulic Report and, if appropriate, Technical Special Provisions. No sheet or detail should be missing at this stage.

26.11.4 100% Structures Plans and Specifications

After resolution of the 90% Structures Plan comments, the EOR shall make all authorized changes necessary to complete the plans and Technical Special Provisions. The EOR shall provide a list of all changes made to the Plans or Specifications that were not directly related to the 90% Structures Plans review comments. The intent is to help minimize the Department's review time and to help the Department's review office to focus on only those new items or details proposed by the EOR. This will, in turn, help to expedite the project's authorization.

The 100% Structures Plans submittal is divided into two distinct phases. First, prints of the original drawings and technical special provisions are submitted 30 days prior to the District's Plans Production Date (PPD). Secondly, once notified by the FDOT, the original drawings and all other documents are submitted to the District.

Within the 30-day period allotted, the EOR will receive notification either of additional changes/corrections to be made or to submit the Final Plans as they are. If at any time during the 30-day period the EOR finds additional changes/corrections that should be made, the Structures Design Office responsible for plans approval (either the District Structures Design Engineer (DSDE) or the Structures Design Office (SDO) as appropriate) must be notified for discussion and resolution.

Once all changes/corrections are made, or if no changes/corrections are necessary, the EOR shall submit all his work to the District prior to or on the PPD. Submittal of this stage of the work shall include the original drawings, one record set of prints with each sheet sealed in accordance with ***Chapter 19*** of this volume, quantities book assembled as specified in the Department's ***Basis of Estimates Manual***, sealed Technical Special Provisions (if required), and sealed Summary of Pay Items with estimated bridge quantities. If included in the Scope of Services, original documents in electronic format may also be required to be delivered as part of the Electronic Project Submittal.

Modification for Non-Conventional Projects:
Delete ***PPM*** 26.11. See the RFP for plans submittal requirements.

26.12 Independent Peer Review of Category 2 Bridges

For all Cost Savings Initiative Proposals involving a Category 2 bridge, an independent peer review is required. The Peer Review shall be performed by a single independent engineering firm other than the engineer responsible for the initial work that is designated by the contractor to conduct the review. The designated independent peer review firm shall have no involvement with the project other than conducting the peer review and shall be pre-qualified in accordance with ***Rule 14-75 of the Florida Administrative Code***. For bridges consisting of both Category 1 and Category 2 bridge spans only the Category 2 spans and corresponding substructure components require a peer review. Where the superstructure is Category1, but the substructure component is Category 2, only the substructure component has to be peer reviewed. For water crossings with vessel impact, the spans or superstructure units with spans over water require a peer review.

Modification for Non-Conventional Projects:
Delete the above paragraph and replace with the following: For all Category 2 bridges, an independent peer review is required. The Peer Review shall be performed by a single independent engineering firm other than the engineer responsible for the initial work and will be designated by the Contractor or Concessionaire (P3 projects) to conduct the review. The designated independent peer review firm shall have no other involvement with the project other than conducting the peer review and shall be pre-qualified in accordance with ***Rule 14-75 of the Florida Administrative Code***. For bridges consisting of both Category 1 and Category 2 bridge spans only the Category 2 spans and corresponding substructure components require a peer review. Where the superstructure is Category1, but the substructure component is Category 2, only the substructure component has to be peer reviewed. For water crossings with vessel impact, the spans or superstructure units with spans over water require a peer review.

The peer review is intended to be a comprehensive, thorough independent verification of the original work. An independent peer review is not simply a check of the EOR's plans and calculations; it is an independent verification of the design using different programs and independent processes than what was used by the EOR. All independent peer reviews shall include but not be limited to the independent confirmation of the following when applicable:

1. Compatibility of bridge geometry with roadway geometrics including typical sections, horizontal alignment, and vertical alignment. Minimum horizontal and vertical clearance requirements.

2. Compatibility of construction phasing with Traffic Control Plans.
3. Conflicts with underground and overhead utilities.
4. Compliance with AASHTO, Department and FHWA design requirements.
5. Conformity to Department Design Standards.
6. Structural Analysis Methodology, design assumptions, and independent confirmation of design results.
7. Design results/recommendations (independent verification of the design).
8. Completeness and accuracy of bridge plans.
9. Technical Special Provisions, and Modified Special Provisions where necessary.
10. Constructability assessment limited to looking at fatal flaws in design approach.

* When Category 2 superstructure elements are designed with software using refined analyses (e.g. Grid, Finite Element Method, etc.), the peer review consultant shall verify the design results by a different program/method.

In addition to the requirements of ***PPM Sections 26.11.3 and 26.11.4***, the following documents shall be included with plan submittals for Category 2 bridges requiring an independent peer review:

1. 90% Plan Submittals
    a. A tabulated list of all review comments from the independent review engineer and responses from the originator of the design.
    b. A standard peer review certification letter following the format presented in ***Exhibit 26-B*** signed by the independent review engineer. All outstanding/unresolved comments and issues presented in this letter shall be resolved and implemented prior to the 100% plan submittal.
2. 100% Plan Submittals
    a. A certification letter following the format presented in ***Exhibit 26-C*** signed and sealed by the independent review engineer stating that all review comments have been adequately addressed and that the design is in compliance with all Department and FHWA requirements.

26.13 Plans Assembly

Consult the ***Structures Detailing Manual*** for plans assembly, materials, content of plans, and other drafting information.

26.14 Plans Submittal

26.14.1 Schedule

The District Project Manager is responsible for establishing the schedule of submittals with input from the EOR and either the District Structures Design Engineer for Category 1 or Structures Design Office for Category 2 projects.

26.14.2 Submittal Schedule

1. BDR/30% Structures Plans
2. 60% Substructure Submittal/60% Structures Plans
3. 90% Structures Plans
4. 100% Structures Plans

Modification for Non-Conventional Projects:
Delete ***PPM*** 26.14.1 and 26.14.2. See the RFP for requirements.

26.14.3 Summary of Phase Submittals

Submittals made at various stages of project development must conform to a uniform standard of completeness for each phase. Use ***Exhibit 26-D*** to prepare deliverables for each stage of project development for fixed bridges. Use ***Exhibits 26-D*** and ***26-E*** to prepare deliverables for each stage of project development for moveable bridges.

Exhibits 26-D and ***26-E*** categorizes sheets based on four levels of completeness. Each level is defined as follows:

1. **Preliminary (P):** Basic shapes, geometry and layout of specified members are shown. Rebar, elevations, quantities, etc. are not required for Preliminary submittals. For example, the outline drawing of an end bent with complete dimensions including stationing, beam and pedestal layout but without pile layout dimensions or rebar.
2. **Substantially Complete (S):** Shapes, geometry and layout have been finalized. Design is 90% complete with most rebar, plate sizes, bolt patterns, concrete strengths finalized and incorporated into the plans. For example, an end bent drawing with rebar, complete dimensions, pile and beam layout but without elevations or quantities.
3. **Complete but Subject to Change (C):** The design, drawings and details are complete for the specified component. Only reviewer-initiated changes should be expected at this level. For example, an end bent drawing would be complete, including all rebar callouts, elevations, dimensions and quantities.
4. **Final (F):** All drawings and designs are complete. No changes are expected at this level. Plans are ready to be signed and sealed by the EOR.

Modification for Non-Conventional Projects:

Delete **PPM** 26.14.3 and replace with the following.

26.14.3 Design-Build Technical Proposal and Component Plan Submittals

Component Plan Submittals must conform to a uniform standard of completeness for each submittal. Use ***Exhibit 26-DD*** to prepare deliverables for each component submittals for fixed bridges. Use ***Exhibits 26-DD*** and ***26-EE*** to prepare deliverables for component submittals for moveable bridges. Unless otherwise shown in the RFP, Technical Proposals shall include the requirements of ***Exhibits 26-DD*** and ***26-EE.***

Design/Build projects utilize a unique submittal process due to the coincident nature of design and construction. The RFP will typically detail submittals required throughout the project schedule. Component submittals are generally allowed (e.g., substructure, superstructure, walls, etc.). However, specific member submittals (e.g., End Bent 1, Pier 3, I-girder details, etc.) are not allowed unless agreed to with the DSDE or SDO.

Exhibits 26-DD and ***26-EE*** categorizes sheets based on four levels of completeness. Each level is defined as follows:

1. **Preliminary (P):** Basic shapes, geometry and layout of specified members are shown. Rebar, elevations, etc. are not required for Preliminary submittals. For example, the outline drawing of an end bent with complete dimensions including stationing, beam and pedestal layout but without pile layout dimensions or rebar.
2. **Substantially Complete (S):** Shapes, geometry and layout have been finalized. Design is 90% complete with most rebar, plate sizes, bolt patterns, concrete strengths finalized and incorporated into the plans. For example, an end bent drawing with rebar, complete dimensions, pile and beam layout but without elevations.
3. **Complete but Subject to Change (C):** The design, drawings and details are complete for the specified component. Only reviewer-initiated changes should be expected at this level. For example, an end bent drawing would be complete, including all rebar callouts, elevations, and dimensions.
4. **Final (F):** All drawings and designs are complete. No changes are expected at this level. Plans are ready to be signed and sealed by the EOR.

26.15 Review for Constructability and Maintainability

26.15.1 Purpose

The purpose of this review is to provide reasonable and practical use of fabrication and construction techniques and equipment without overloading and/or overstressing components, provide for proper material handling and transportation, provide safe maintenance of traffic and provide an appropriate construction sequence. Additionally, provide features which will retard bridge deterioration, permit reasonable access to all parts of the bridge for inspection and performance evaluation and provide features to facilitate replacement of damaged and/or deteriorated bridge components.

26.15.2 Responsibility

For Category 1 and 2 Structures, it will be the responsibility of the project manager or his designee to coordinate a review of both the 30% and 90% Structures Plans submittals by the appropriate District Construction and Maintenance personnel for constructability and maintainability. For Category 1 Structures, technical issues shall be resolved to the satisfaction of the appropriate DSDE. For Category 2 Structures, technical issues shall be resolved to the satisfaction of the SDO.

The Construction and Maintenance Offices should be given adequate time to perform these reviews. All comments from these reviews shall be addressed prior to the next submittal and its subsequent review.

Modification for Non-Conventional Projects:
Delete ***PPM*** 26.15 and see the RFP for requirements.

26.16 Review for Biddability

26.16.1 Purpose

To prevent construction problems, the District Construction Office will review the plans to make certain the plans are clearly understandable, contain all pertinent notes and have sufficient and correct pay items. During the biddability review, the Construction Office will check for the interface with the roadway segment of the project, utility agreements and environmental permits.

26.16.2 Responsibility

For Category 1 and 2 Structures, it will be the responsibility of the project manager to coordinate a review of the 90% Structures Plan submittal. This review should occur at the same time as the Phase III Plans submittal for the roadway segments of the project.

Additionally, for Category 2 Structures, it will be the responsibility of the Structures Design Office to coordinate a review of the 90% Structures Plans submittal.

The Construction Offices should be given adequate time to perform these reviews. All comments from these reviews shall be addressed prior to the 100% Structures Plans Stage submittal.

Modification for Non-Conventional Projects:
Delete ***PPM*** 26.16.

26.17 Bridge Load Rating

Load rating analysis of new or existing bridges shall be performed in accordance with the ***AASHTO "Manual for Bridge Evaluation"*** as amended by the ***FDOT "Structures Manual", Volume 1 and the FDOT "Bridge Load Rating Manual (Topic 850-010-035)***.

For new bridges the Engineer of Record shall load rate the bridge(s) and submit the calculations with the 90% plan submittal.

Prior to developing the scope-of-work for bridge widening and/or rehabilitation projects, the FDOT or their consultant will determine the suitability of the bridge project using the load rating. If the existing load rating is inaccurate or was performed using older methods (e.g. load Factor), perform a new load rating using the procedures outlined in the ***"FDOT Structures Manual", Volume 1 - Structures Design Guidelines, Chapter 7***. Load rating calculations for the entire structure (existing and new) shall be submitted with the 90% plan submittal for the project.

Modification for Non-Conventional Projects:
Delete ***PPM*** 26.17 and see the RFP for requirements.

26.18 Review of Non-FDOT Funded Projects (New Construction)

FDOT review will be required whenever a privately funded structure crosses over Department owned right of way or when such work otherwise affects such a route; i.e., lane closures, access, R/W changes, etc. FHWA review will be required whenever a privately funded structure crosses over an interstate route, or when such work otherwise affects such a route; i.e., lane closures, access, R/W changes, etc. The extent of FDOT and FHWA review is that:

1. Plans must meet all current clearance requirements (vertical and horizontal).
2. Maintenance of traffic scheme for construction must be reviewed and approved.
3. All attachments to the structure over the highway must be securely fastened.
4. Design must be sealed by a licensed professional engineer.
5. Design must be in accordance with a nationally recognized code such as AASHTO, ACI, AISC, etc.

6. Plans must meet all District permit requirements and procedures.
7. Only projects over or affecting a NHS facility shall be submitted to FHWA for approval.
8. FDOT review for these structures shall be performed by the District Structures Design Office for Category 1 and State Structures Design Office for Category 2 Structures.

Exhibit 26-A Bridge Development Report (BDR) Submittal Checklist

Project Name _____

Financial Project ID_____

FA No. _____ FHWA Oversight (yes no) NHS (yes no)

Date _____ FDOT Project Manager _____

	ITEMS	STATUS[b]		
1.	Typical Sections for Roadway and Bridge [a]	P	NA	C
2.	Roadway Plans in Vicinity of Bridge [a]	P	NA	C
3.	Maintenance of Traffic Requirements [a]	P	NA	C
4.	Bridge Hydraulics Report [c]	P	NA	C
5.	Geotechnical Report [c]	P	NA	C
6.	Bridge Corrosion Environmental Report [c]	P	NA	C
7.	Existing Bridge Plans	P	NA	C
8.	Existing Bridge Inspection Report	P	NA	C
9.	Utility Requirements	P	NA	C
10.	Railroad Requirements	P	NA	C
11.	Retaining Wall and Bulkhead Requirements	P	NA	C
12.	Lighting Requirements	P	NA	C
13.	ADA Access Requirements	P	NA	C
14.	Other	P	NA	C

(a) Must be approved by District before BDR submittal.
(b) Circle appropriate status:
P - Provided NA - Not Applicable C - Comments attached
(c) See approval requirements for these documents elsewhere in this chapter.

Exhibit 26-B Independent Peer Review Certification Letter (90% Submittal)

Insert Date

Florida Department of Transportation
District ___
[Insert Street Address]

Attn: *[Insert Project Manager/Construction Project Engineer]*

Reference: Independent Peer Review Category 2 Structures
Financial Project ID: *[Insert FPID]*
Federal Aid Number: *[Insert Federal Aid Number]*
Contract Number: *[Insert CN]*

Submittal: 90% Bridge *[Insert Component/CSIP]* Plans
Submittal *[Insert Submittal No.]*
Bridge Number(s): *[Insert Bridge No.(s)]*

Dear *[Insert Project Manager/Construction Project Engineer]*,

Pursuant to the requirements of the Contract Documents, *[Insert the name of the Independent Peer Review Firm]* hereby certifies that an independent peer review of the above-referenced submittal has been conducted in accordance with Chapter 26 of the Plans Preparation Manual and all other governing regulations. Component plans that were included in the peer review are as follows:
[Insert a list of all component plans that underwent an Independent Peer Review]

Outstanding / Unresolved Comments and Issues:
[Provide a statement of outstanding/unresolved comments for the above-referenced review, and actions being taken to resolve issues.]

Certification Statement:
I certify that the component plans listed in this letter have been verified by independent review and are in compliance with all requirements presented in the Contract Documents. Independent Peer Review comments and comment resolutions have been included in this submittal under separate cover.

Please do not hesitate to contact me if you have any questions.

Name of Independent Peer Review Firm	*[Insert Firm Name]*
Name of Independent Peer Reviewer	*[Insert Reviewer Name]*
Title	*[Insert Reviewer Title]*
Signature	_____
Florida Professional Engineer Lic. No.	*[Insert License Number]*

Exhibit 26-C Independent Peer Review Certification Letter (100% Submittal)

Insert Date

Florida Department of Transportation
District ___
[Insert Street Address]

Attn: *[Insert Project Manager/Construction Project Engineer]*

Reference: Independent Peer Review Category 2 Structures
Financial Project ID: *[Insert FPID]*
Federal Aid Number: *[Insert Federal Aid Number]*
Contract Number: *[Insert CN]*

Submittal: 100% Bridge *[Insert Component/CSIP]* Plans
Submittal *[Insert Submittal No.]*
Bridge Number(s): *[Insert Bridge No.(s)]*

Dear *[Insert Project Manager/Construction Project Engineer]*,

Pursuant to the requirements of the Contract Documents, *[Insert the name of the Independent Peer Review Firm]* hereby certifies that an independent peer review of the above-referenced submittal has been conducted in accordance with Chapter 26 of the Plans Preparation Manual and all other governing regulations. Component plans that were included in the peer review are as follows:
[Insert a list of all component plans that underwent an Independent Peer Review]

Certification Statement:

I certify that the component plans listed in this letter have been verified by independent review, that all review comments have been adequately resolved, and that the plans are in compliance with all Department and FHWA requirements presented in the Contract Documents.

Please do not hesitate to contact me if you have any questions.

Name of Independent Peer Review Firm	*[Insert Firm Name]*
Name of Independent Peer Reviewer	*[Insert Reviewer Name]*
Title	*[Insert Reviewer Title]*
Florida Professional Engineer Lic. No.	*[Insert License Number]*

[Insert Signature, Date and Seal here.]

Exhibit 26-D Summary of Phase Submittals

Provide the sheets listed as applicable based on structure type.

ITEM	BDR	30%	60% Substr. Submittal	60% Structures Plans*	90%	100%
Cover Sheet		P	S	S	C	F
Key Sheet		P	S	S	C	F
Sheet Index		P	S	S	C	F
General Notes		P	S	S	C	F
Summary of Pay Items					C	F
Surface Finish Details			S	S	C	F
Riprap Details			S	S	C	F
Slope Protection Details			S	S	C	F
Plan and Elevation	S	S	C	C	C	F
Bridge Typical Section	S	S	C	C	C	F
Hydraulics Recommendation	P	P	S	S	C	F
Construction Sequence	S	S		C	C	F
Borings		C	C	C	C	F
Foundation Layout		S	S	S	C	F
Pile/Shaft Data Table			S	S	C	F
End Bent		P	S	S	C	F
End Bent Details			S	S	C	F
Wing Wall Details			S	S	C	F
Pier	P	P	S	S	C	F
Pier Details		P	S	S	C	F
Footing Details		P	S	S	C	F
Intermediate Bent	P	P	S	S	C	F
Intermediate Bent Details			S	S	C	F
Drilled Shaft Details		P	S	S	C	F
Finish Grade Elevations				C	C	F
Camber//Build-up/Deflection Diagrams				C	C	F
Framing Plan		P		S	C	F
Superstructure Plan				S	C	F
Superstructure Details				S	C	F
Erection Sequence	P	P	S	S	C	F
P/S Beam Data Tables				S	C	F
Cross Frames/Diaphragm Details				S	C	F
Steel Girder Details		P		S	C	F
P/T Systems		P		S	C	F
Bearing Details				S	C	F
Expansion Joint Details				S	C	F
Approach Slab Details				S	C	F
Reinforcing Bar List					C	F
Conduit and Inspection Lighting Details				P	C	F
Vermin Guard				S	C	F
Wall Control Drawings		S	S	S	C	F
Wall Details		P	S	S	C	F
Temporary Critical Wall Drawings	P	P	S	S	C	F
Wall Data Tables			S	S	C	F
Temp. Bridge Plan and Elevation			P	P	C	F
Temp. Bridge Foundation Layout			P	P	C	F

Exhibit 26-D Summary of Phase Submittals (continued)

Provide the sheets listed as applicable based on structure type.

ITEM	BDR	30%	60% Substr. Submittal	60% Structures Plans*	90%	100%
Segment Joint Coordinates/Deck Elev.				S	C	F
Segment Layout		P		S	C	F
Typical Segment Dimensions	P	P		C	C	F
Typical Segment Reinforcing				S	C	F
Pier Segment Dimensions	P	P		C	C	F
Pier Segment Reinforcing **				S	C	F
Abutment Segment Dimensions	P	P		C	C	F
Abutment Segment Reinforcing **				S	C	F
Expansion Joint Segment Dimensions		P		S	C	F
Expansion Joint Segment Reinforcing **				S	C	F
Deviation Segment Dimensions		P		C	C	F
Deviation Segment Reinforcing **				S	C	F
Post Tensioning Layout		P		C	C	F
P/T Details	P	P		S	C	F
Transverse P/T Details		P		C	C	F
Bulkhead Details		P		S	C	F
Drainage Layout		P		S	C	F
Drainage Details		P		S	C	F
Load Rating Summary Sheet					C	F
Developmental Design Standards		C	C	C	F	F
Existing Bridge Plans		F ‡‡	F ‡‡	F ‡‡	F	F

Status Key:

P – Preliminary

S – Substantially Complete

C – Complete but subject to change

F – Final

***** – 60% Structures Plan submittals are required for all Category 2 and some Category 1 bridges. See ***Section 26.11.2*** for additional information

** – May require integrated drawings

‡ – Where required for project

‡‡ – Widenings and projects with phased construction

Exhibit 26-E Summary of Phase Submittals - Movable Bridges

For approach span requirements, see ***Exhibit 26-D***.

Provide the sheets listed as applicable based on machinery and electrical components utilized.

ITEM	BDR	30%	60% Structures Plans*	90%	100%
Bascule Pier Notes		P	S	C	F
Bascule Pier Quantities			S	C	F
Bascule Span Elevation	P	S	S	C	F
Leaf Clearance Diagrams		P	S	C	F
Bridge Railing Clearance Diagrams		P	S	C	F
Bascule Pier North Elevation View	P	S	S	C	F
Bascule Pier South Elevation View	P	S	S	C	F
Bascule Pier East Elevation View	P	S	S	C	F
Bascule Pier West Elevation View	P	S	S	C	F
Bascule Pier Deck Plan	P	S	S	C	F
Bascule Pier Deck Elevations	P	S	S	C	F
Bascule Pier Trunnion Level Plan	P	S	S	C	F
Bascule Pier Machinery Level Plan	P	S	S	C	F
Bascule Pier Pit Plan	P	S	S	C	F
Bascule Pier Footing Plan	P	S	S	C	F
Bascule Pier Longitudinal Sections	P	S	S	C	F
Bascule Pier Transverse Sections	P	S	S	C	F
Bascule Pier Railing Details			P	C	F
Bascule Pier Stair Details			P	C	F
Bascule Pier Trunnion Access Platform Details	‡	‡	S	C	F
Bascule Pier Finger Joints			P	C	F
Bascule Pier Deck Level Reinforcing			P	C	F
Bascule Pier Trunnion Level Reinforcing			P	C	F
Bascule Pier Machinery Level Reinforcing			P	C	F
Bascule Pier Pit Reinforcing			P	C	F
Bascule Pier Footing Reinforcing			P	C	F
Bascule Pier North Elevation Reinforcing			P	C	F
Bascule Pier South Elevation Reinforcing			P	C	F
Bascule Pier East Elevation Reinforcing			P	C	F
Bascule Pier West Elevation Reinforcing			P	C	F

Exhibit 26-E Summary of Phase Submittals - Movable Bridges (Continued)

For approach span requirements, see ***Exhibit 26-D***.

Provide the sheets listed as applicable based on machinery and electrical components utilized.

ITEM	BDR	30%	60% Structures Plans*	90%	100%
Bascule Pier Longitudinal Section Reinforcing			P	C	F
Bascule Pier Transverse Section Reinforcing			P	C	F
Bascule Pier Reinforcing Bar List			P	C	F
Control House General Notes			P	C	F
Control house Reflected Ceiling Plan			P	C	F
Control House Access Bridge Dimensions	‡	‡	S	C	F
Control House Access Bridge Reinforcing	‡	‡	S	C	F
Control House Access Bridge Bar List	‡	‡	S	C	F
Control Tower Floor Plans	P	S	S	C	F
Control Tower Sections	P	S	S	C	F
Control Tower Reinforcing Plans			P	C	F
Control Tower Reinforcing Elevations			P	C	F
Control Tower Section Reinforcing			P	C	F
Control Tower Bar List			P	C	F
Control Tower Schedules			P	C	F
Control Tower Elevations	P	S	S	C	F
Control Tower Building Sections			P	C	F
Control Tower Details			P	C	F
Control Tower Stair Plans			P	C	F
Control Tower Stair Sections			P	C	F
Control Tower Roof			P	C	F
Control Tower Door and Window Types and Details			P	C	F
Control Tower Architectural Details			P	C	F
Control Tower HVAC Notes			P	C	F
Control Tower HVAC and Plumbing Floor Plans			P	C	F
Control Tower HVAC and Plumbing Elevations			P	C	F
Bascule Leaf Notes			S	C	F
Bascule Leaf Framing Plan and Longitudinal Section	P	S	S	C	F
Bascule Leaf Transverse Sections at Floorbeams	P	S	S	C	F
Bascule Leaf Transverse Sections at Trunnion	P	S	S	C	F

Exhibit 26-E Summary of Phase Submittals - Movable Bridges (Continued)

For approach span requirements, see ***Exhibit 26-D***.

Provide the sheets listed as applicable based on machinery and electrical components utilized.

ITEM	BDR	30%	60% Structures Plans*	90%	100%
Bascule Leaf Transverse Sections at Counterweight Girders	P	S	S	C	F
Main Girder Elevation	P	S	S	C	F
Main Girder Details			P	C	F
Main Girder Web Geometry and Camber Details			P	C	F
Main Girder Force Diagrams			P	C	F
Main Girder Reaction Influence Lines			P	C	F
Main Girder Moment Influence Lines			P	C	F
Floorbeam Details			P	C	F
Counterweight Girder Details			P	C	F
Stringer Details			P	C	F
Lateral Bracing Details			P	C	F
Counterweight Bracing Plan and Details			P	C	F
Counterweight Bracing Sections and Details			P	C	F
Counterweight Plan			P	C	F
Counterweight Longitudinal Sections			P	C	F
Counterweight Transverse Sections			P	C	F
Counterweight Details and Reinforcing Bar List			P	C	F
Bridge Deck Panel Layout			P	C	F
Bridge Deck Panel Sections			P	C	F
Bridge Deck Panel Details			P	C	F
Armored Joint Details			P	C	F
Span Lock Housing Details			P	C	F
Bascule Leaf Jacking Details and Notes			P	C	F
Mechanical General Notes		P	S	C	F
Mechanical Equipment Schedules		P	S	C	F
Drive Machinery Layout		P	S	C	F
Machinery Support Details			S	C	F
Trunnion Assembly Details		P	S	C	F
Open Gearing Details		P	S	C	F

Exhibit 26-E Summary of Phase Submittals - Movable Bridges (Continued)

For approach span requirements, see ***Exhibit 26-D***.

Provide the sheets listed as applicable based on machinery and electrical components utilized**.**

ITEM	BDR	30%	60% Structures Plans*	90%	100%
Rack/Rack Frames and Rack Pinion Details		P	S	C	F
Mechanical Bearing Details		P	S	C	F
Drive Hydraulic Cylinders Details		P	S	C	F
Hydraulic System Layout/Piping Details		P	S	C	F
Hydraulic Cylinder Support Assemblies		P	S	C	F
Hydraulic System Details		P	S	C	F
Live Load Shoe Details		P	S	C	F
Centering Device Details			S	C	F
Span Lock Assembly Details		P	S	C	F
Control Tower – Control Console and Operator's Visualization Geometry Analysis Including CCTV Locations		P	S	C	F
Electrical General Notes		P	S	C	F
Electrical Site Plan		P	S	C	F
Conduit Riser Diagram		P	S	C	F
Single Line Diagram		P	S	C	F
Electrical Symbol Legend		P	S	C	F
Lighting and Equipment Plan (Including Control Tower Lighting, Fire Detection and Lighting Panel Schedules)		P	S	C	F
Lightning Protection, Bonding, and Grounding Plan		P	S	C	F
Navigation Lighting Plan		P	S	C	F
Communication Equipment Plan		P	S	C	F
Control Panel Details		P	S	C	F
Control Console Details		P	S	C	F
Block Diagram of Operating Sequence		P	S	C	F
Control System Architecture Diagram		P	S	C	F
Schematic Diagrams of all Control Systems and Interlocks		P	S	C	F
Control System I/O Points		P	S	C	F
Ladder Logic for PLC			P	C	F
Submarine Cable/Submarine Cable Termination Cabinet Details		P	S	C	F

Exhibit 26-E Summary of Phase Submittals - Movable Bridges (Continued)

For approach span requirements, see ***Exhibit 26-D***.

Provide the sheets listed as applicable based on machinery and electrical components utilized.

ITEM	BDR	30%	60% Structures Plans*	90%	100%
Fire and Security Panel Schematic Diagram		**P**	**C**	**C**	**F**
CCTV Plan and Elevation		**P**	**C**	**C**	**F**
Limit Switch Development		**P**	**C**	**C**	**F**
Conduit and Cable Schedule		**P**	**C**	**C**	**F**
Electrical Equipment Layout - Including but not limited to Generators, Motors, Control Console, Control Panels, and Motor Control Center.		**P**	**C**	**C**	**F**
CCTV Layout			**P**	**S**	**F**

Status Key:

P – Preliminary

S – Substantially Complete

C – Complete but subject to change

F – Final

***** – 60% Structures Plan submittals are required for all movable bridges. See ***Section 26.11.2*** for additional information

‡ – Where required for project

Exhibit 26-DD Summary of Design/Build Technical Proposal and Component Plan Submittals

Provide the sheets listed as applicable based structure type.

Foundation Submittal

ITEM	Technical Proposal	90%	Final
Cover Sheet		C	F
Key Sheet		C	F
Sheet Index		C	F
General Notes	S	C	F
Surface Finish Details		C	F
Riprap Details		C	F
Slope Protection Details		C	F
Plan and Elevation	P	C	F
Bridge Typical Section	P	C	F
Hydraulics Recommendation	P	C	F
Construction Sequence	P	C	F
Borings		C	F
Foundation Layout	P	C	F
Pile/Shaft Data Table		C	F
Drilled Shaft Details		C	F
Temp. Bridge Foundation Layout	P	C	F
Existing Bridge Plans		F	F

All submittals shall include additional details and backup information necessary to substantiate the loading on the foundations. All submittals shall also include a copy of the Geotechnical Report.

‡‡ – Widenings and projects with phased construction

90% and Final submittals for category 2 bridges require an Independent Peer Review.

Substructure Submittal

ITEM	Technical Proposal	90%	Final
End Bent	P	C	F
End Bent Details		C	F
Wing Wall Details		C	F
Pier	P	C	F
Pier Details		C	F
Footing Details	P	C	F
Intermediate Bent	P	C	F
Intermediate Bent Details		C	F
Reinforcing Bar List		C	F

90% and Final submittals for category 2 bridges require an Independent Peer Review.

Exhibit 26-DD Summary of Design/Build Technical Proposal and Component Plan Submittals (cont.)

Provide the sheets listed as applicable based on structure type.

Superstructure Submittal

ITEM	Technical Proposal	90%	Final
Finish Grade Elevations		C	F
Camber/Build-up/Deflection Diagrams		C	F
Framing Plan		C	F
Superstructure Plan		C	F
Superstructure Details		C	F
Erection Sequence	P‡	C	F
P/S Beam Data Tables		C	F
Cross Frames/Diaphragm Details		C	F
Steel Girder Details	P	C	F
P/T Systems	P	C	F
Bearing Details		C	F
Expansion Joint Details		C	F
Approach Slab Details		C	F
Reinforcing Bar List		C	F
Conduit and Inspection Lighting Details		C	F
Vermin Guard		C	F
Wall Control Drawings	P	C	F
Wall Details		C	F
Temporary Critical Wall Drawings	P	C	F
Wall Data Tables		C	F
Temp. Bridge Plan and Elevation	P	C	F
Segment Joint Coordinates/Deck Elev.		C	F
Segment Layout	P	C	F
Typical Segment Dimensions	P	C	F
Typical Segment Reinforcing		C	F
Pier Segment Dimensions	P	C	F
Pier Segment Reinforcing **		C	F
Abutment Segment Dimensions	P	C	F
Abutment Segment Reinforcing **		C	F
Expansion Joint Segment Dimensions	P	C	F
Expansion Joint Segment Reinforcing **		C	F
Deviation Segment Dimensions	P	C	F
Deviation Segment Reinforcing **		C	F
Post Tensioning Layout	P	C	F

Superstructure Submittal (cont.)

ITEM	Technical Proposal	90%	Final
P/T Details	P	C	F
Transverse P/T Details		C	F
Bulkhead Details		C	F
Drainage Layout		C	F
Drainage Details		C	F
Load Rating Summary Sheet		C	F
Developmental Design Standards		F	F
Existing Bridge Plans		F	F
90% and Final submittals for category 2 bridges require an Independent Peer Review.			

Status Key:

P – Preliminary

S – Substantially Complete

C – Complete but subject to change

F – Final

****** – May require integrated drawings

‡ – For geometrically constrained sites, show temporary stability towers in the vicinity of the underlying roadways consistent with the Traffic Control Plans. Also show temporary stability towers within navigable waterways.

‡‡ – Widenings and projects with phased construction

Exhibit 26-EE Summary of Design/Build Technical Proposal and Component Plan Submittals – Movable Bridges

For approach span and foundation submittal requirements see ***Exhibit 26-DD***.
Provide the sheets listed as applicable based on machinery and electrical components utilized.

Substructure Submittal

ITEM	Technical Proposal	90%	Final
Bascule Pier Notes		C	F
Bascule Span Elevation	P	C	F
Leaf Clearance Diagrams		C	F
Bridge Railing Clearance Diagrams		C	F
Bascule Pier North Elevation View	P	C	F
Bascule Pier South Elevation View	P	C	F
Bascule Pier East Elevation View	P	C	F
Bascule Pier West Elevation View	P	C	F
Bascule Pier Deck Plan	P	C	F
Bascule Pier Deck Elevations	P	C	F
Bascule Pier Trunnion Level Plan	P	C	F
Bascule Pier Machinery Level Plan	P	C	F
Bascule Pier Pit Plan	P	C	F
Bascule Pier Footing Plan	P	C	F
Bascule Pier Longitudinal Sections	P	C	F
Bascule Pier Transverse Sections	P	C	F
Bascule Pier Railing Details		C	F
Bascule Pier Stair Details		C	F
Bascule Pier Trunnion Access Platform Details	‡	C	F
Bascule Pier Finger Joints		C	F
Bascule Pier Deck Level Reinforcing		C	F
Bascule Pier Trunnion Level Reinforcing		C	F
Bascule Pier Machinery Level Reinforcing		C	F
Bascule Pier Pit Reinforcing		C	F
Bascule Pier Footing Reinforcing		C	F
Bascule Pier North Elevation Reinforcing		C	F
Bascule Pier South Elevation Reinforcing		C	F

Exhibit 26-EE Summary of Design/Build Technical Proposal and Component Plan Submittals – Movable Bridges (cont.)

For approach span and foundation submittal requirements see ***Exhibit 26-DD***.
Provide the sheets listed as applicable based on machinery and electrical components utilized.

Substructure Submittal (cont.)

ITEM	Technical Proposal	90%	Final
Bascule Pier East Elevation Reinforcing		C	F
Bascule Pier West Elevation Reinforcing		C	F
Bascule Pier Longitudinal Section Reinforcing		C	F
Bascule Pier Transverse Section Reinforcing		C	F
Bascule Pier Reinforcing Bar List		C	F
90% and Final submittals for category 2 bridges require an Independent Peer Review.			

Exhibit 26-EE Summary of Design/Build Technical Proposal and Component Plan Submittals – Movable Bridges (cont.)

For approach span and foundation submittal requirements see ***Exhibit 26-DD***.
Provide the sheets listed as applicable based on machinery and electrical components utilized.

Superstructure Submittal

ITEM	Technical Proposal	90%	Final
Control House General Notes		C	F
Control house Reflected Ceiling Plan		C	F
Control House Access Bridge Dimensions	‡	C	F
Control House Access Bridge Reinforcing		C	F
Control House Access Bridge Bar List		C	F
Control Tower Floor Plans	P	C	F
Control Tower Sections	P	C	F
Control Tower Reinforcing Plans		C	F
Control Tower Reinforcing Elevations		C	F
Control Tower Section Reinforcing		C	F
Control Tower Bar List		C	F
Control Tower Schedules		C	F
Control Tower Elevations	P	C	F
Control Tower Building Sections		C	F
Control Tower Details		C	F
Control Tower Stair Plans		C	F
Control Tower Stair Sections		C	F
Control Tower Roof		C	F
Control Tower Door and Window Types and Details		C	F
Control Tower Architectural Details		C	F
Control Tower HVAC Notes		C	F
Control Tower HVAC and Plumbing Floor Plans		C	F
Control Tower HVAC and Plumbing Elevations		C	F
Bascule Leaf Notes		C	F
Bascule Leaf Framing Plan and Longitudinal Section	P	C	F

Exhibit 26-EE Summary of Design/Build Technical Proposal and Component Plan Submittals – Movable Bridges (cont.)

For approach span and foundation submittal requirements see ***Exhibit 26-DD***.
Provide the sheets listed as applicable based on machinery and electrical components utilized.

Superstructure Submittal (cont.)

ITEM	Technical Proposal	90%	Final
Bascule Leaf Transverse Sections at Floorbeams	P	C	F
Bascule Leaf Transverse Sections at Trunnion	P	C	F
Bascule Leaf Transverse Sections at Counterweight Girders	P	C	F
Main Girder Elevation	P	C	F
Main Girder Details		C	F
Main Girder Web Geometry and Camber Details		C	F
Main Girder Force Diagrams		C	F
Main Girder Reaction Influence Lines		C	F
Main Girder Moment Influence Lines		C	F
Floorbeam Details		C	F
Counterweight Girder Details		C	F
Stringer Details		C	F
Lateral Bracing Details		C	F
Counterweight Bracing Plan and Details		C	F
Counterweight Bracing Sections and Details		C	F
Counterweight Plan		C	F
Counterweight Longitudinal Sections		C	F
Counterweight Transverse Sections		C	F
Counterweight Details and Reinforcing Bar List		C	F
Bridge Deck Panel Layout		C	F
Bridge Deck Panel Sections		C	F
Bridge Deck Panel Details		C	F
Armored Joint Details		C	F
Span Lock Housing Details		C	F
Bascule Leaf Jacking Details and Notes		C	F
Mechanical General Notes	P	C	F
Mechanical Equipment Schedules	P	C	F
Drive Machinery Layout	P	C	F
Machinery Support Details		C	F

Exhibit 26-EE Summary of Design/Build Technical Proposal and Component Plan Submittals – Movable Bridges (cont.)

For approach span and foundation submittal requirements see ***Exhibit 26-DD***.
Provide the sheets listed as applicable based on machinery and electrical components utilized.

Superstructure Submittal (cont.)

ITEM	Technical Proposal	90%	Final
Trunnion Assembly Details	P	C	F
Open Gearing Details	P	C	F
Rack/Rack Frames and Rack Pinion Details	P	C	F
Mechanical Bearing Details	P	C	F
Drive Hydraulic Cylinders Details	P	C	F
Hydraulic System Layout/Piping Details	P	C	F
Hydraulic Cylinder Support Assemblies	P	C	F
Hydraulic System Details	P	C	F
Live Load Shoe Details	P	C	F
Centering Device Details		C	F
Span Lock Assembly Details	P	C	F
Control Tower – Control Console and Operator's Visualization Geometry Analysis Including CCTV Locations	P	C	F
Electrical General Notes	P	C	F
Electrical Site Plan	P	C	F
Conduit Riser Diagram	P	C	F
Single Line Diagram	P	C	F
Electrical Symbol Legend	P	C	F
Lighting and Equipment Plan (Including Control Tower Lighting, Fire Detection and Lighting Panel Schedules)	P	C	F
Lightning Protection, Bonding, and Grounding Plan	P	C	F
Navigation Lighting Plan	P	C	F
Communication Equipment Plan	P	C	F
Control Panel Details	P	C	F
Control Console Details	P	C	F
Block Diagram of Operating Sequence	P	C	F
Control System Architecture Diagram	P	C	F
Schematic Diagrams of all Control Systems and Interlocks	P	C	F

Exhibit 26-EE Summary of Design/Build Technical Proposal and Component Plan Submittals – Movable Bridges (cont.)

For approach span and foundation submittal requirements see ***Exhibit 26-DD***.
Provide the sheets listed as applicable based on machinery and electrical components utilized.

Superstructure Submittal (cont.)

ITEM	Technical Proposal	90%	Final
Control System I/O Points	P	C	F
Ladder Logic for PLC		C	F
Submarine Cable/Submarine Cable Termination Cabinet Details	P	C	F
Fire and Security Panel Schematic Diagram	P	C	F
CCTV Plan and Elevation	P	C	F
Limit Switch Development	P	C	F
Conduit and Cable Schedule	P	C	F
Electrical Equipment Layout - Including but not limited to Generators, Motors, Control Console, Control Panels, and Motor Control Center.	P	C	F
CCTV Layout		S	F

Status Key:

P – Preliminary

S – Substantially Complete

C – Complete but subject to change

F – Final

‡ – Where required for project.

Exhibit 26-F Precast Alternate Development

Precast Feasibility Assessment Questions:

Several negative responses to the following questions more than likely indicate precasting is not feasible for the project. In this case, provide a statement in the BDR stating that precasting is not feasible and indicate the reasons why in order to satisfy the requirements of ***PPM Volume 1, Section 26.9.2 #9.***

- Will precasting reduce traffic impacts? Factors may include: average traffic volumes being affected, detour lengths and durations, lane reductions and duration.
- Is this structure likely to be on the critical path for construction of the project or is this structure on a hurricane evacuation route which requires accelerated delivery?
- Is the size of the project large enough to benefit from economy of scale, assembly line construction processes, and is it large enough to capitalize on a construction learning curve?
- Is precasting practical given the project aesthetics when component lifting weights are considered?
- Is precasting practical given project variability? Factors may include: formwork reuse, multiple construction methods and steps, and variable equipment requirements.
- Does the project site have space within FDOT R/W to use as a near-site casting yard and can precast elements be hauled from likely near-site casting yard locations to the site?
- Can precast elements be hauled from likely off-site prestressed yard locations to the site?
- Are the lifting weights practical given the assumed equipment, construction access, and construction methods?
- Can connection details be developed with the following characteristics –
    - durable?
    - easily inspected during construction?
    - accommodates shaft/pile placement tolerances?
    - accommodates fit up?
    - accommodates differential camber (full-depth deck panels)?

Exhibit 26-F Precast Alternate Development (Continued)

Assessment Matrix:

The following is a tool useful in documenting the decision making process for evaluation of precast construction versus conventional cast-in-place construction for a particular project. Also shown is a sample Alternate Cost Summary Table indicating how to summarize the component cost estimates and their sum.

SAMPLE ASSESSMENT MATRIX
- example values in italics -

		PRECAST		CONVENTIONAL	
Selection Factor	**Factor Weight (%)**	**Score *(0 to 5)***	**Weighted Score***	**Score *(0 to 5)***	**Weighted Score***
Total Direct Costs	*40*	*4*	*160*	*5*	*200*
Total Indirect Costs	*10*	*5*	*50*	*4*	*40*
Factor 3 - *Constructability*	*25*	*3*	*75*	*4*	*100*
Factor 4 – *Traffic Impacts*	*0*				
Factor 5 - *Construction Duration*	*0*				
Factor 6 - *Durability*	*0*				
Factor 7 – *Environmental Impacts*	*10*	*5*	*50*	*2*	*20*
Factor 8– *Aesthetics*	*15*	*5*	*75*	*3*	*45*
Factor 9 – *Other*	*0*				
Factor 10 – *Other*	*0*				
TOTAL (∑ Factor Weights = 100%)	***100***		***410***		***405***
TOTAL (Excluding Indirect Cost Factor)**	*90*		*360*		*365*

*Weighted Score = Factor Weight x Score **See following explanation, Instructions "6."

Assessment Matrix Instructions:

1. **List Selection Factors** to be used to evaluate the applicability of alternates to meet the goals of the project. Factors are project specific and always include Total Direct Costs and Total Indirect Costs (road user costs) and may include some of the following: Constructability, Traffic Impacts (e.g., Maintenance of Traffic, Detours, Traffic Delays, etc.), Construction Duration, Durability, Environmental Impacts, and Aesthetics. Include other Factors as required to capture any unique project characteristics that are not otherwise addressed. Note that as many or as few criteria may be used in the assessment matrix as deemed appropriate by the designer; though, a sufficient number of Selection Factors (i.e., criteria) are required to provide a thorough evaluation of the alternates being considered to meet the objectives of the project. When choosing selection factors and applying factor weights avoid double counting benefits. For instance, indirect costs and traffic impacts may be related selection factors.

Exhibit 26-F Precast Alternate Development (Continued)

Costs of precast versus conventional may be affected by:

- Savings associated with labor rates and insurance costs for reduced time working from a barge on a large water project.
- Savings associated with structural efficiencies resulting from precasting (e.g., composite dead loads in the case of shored deck casting).
- Savings associated with simultaneous substructure and superstructure component construction.
- Savings associated with increased productivity rates of precasting.

2. **Construct** a two-dimensional table allowing one row for each Selection Factor and two columns for each alternate, one for Score and one for Weighted Score.

3. **Factor Weights** to distinguish the level of importance of each criterion relative to the other criteria in achieving the project objectives. Weighting the various factors will usually require Department/District input. Distribute the Factor Weights such that their sum is equal to 100%.

4. **Score** the relative difference between alternates. Range of scores can vary for a given project (e.g., 0 to 5 or 0 to 10). Scoring may be accomplished by a committee and then the average score for each Selection Factor entered into the matrix.

5. **Calculate** the Weighted Score by multiplying the Factor Weight by Score for each alternate.

6. **Total** the Weighted Score columns: (1) Provide the absolute total of each column, which includes the Indirect Costs Score and, (2) Provide the column total *excluding* the contribution from the "Total Indirect Costs." It is useful for management to compare the impacts, both relative and in hard dollar amounts, of indirect costs on bridge construction projects when making their decisions. *The column with the largest total weighted score theoretically indicates the alternate which most closely meets the project objectives as implicated by the matrix construct.*

Exhibit 26-F Precast Alternate Development (Continued)

SAMPLE ALTERNATE COST SUMMARY

Alternate	Direct Costs* ($)	Indirect Costs**							Sum: Direct + ∑Indirect ($)
		Lane Closures		Detour Time		Facility Closure		∑Indirect ($)	
		Days (#)	$$/Day	Days (#)	$$/Day	Days (#)	$$/Day		
Precast 1									
Precast 2									
Conventional 1									
Conventional 2									

***** In calculation of Direct Costs, give specific consideration to factors that will:

- increase the cost of the bridge, as necessary to accommodate:
  - self-propelled modular transporters (SPMTs)
  - large capacity cranes
  - special erection equipment
  - casting yard setup
- decrease the cost of the bridge, as necessary to accommodate:
  - reduced labor rates (e.g., work from barges)
  - reduced maintenance of traffic (MOT) work restrictions
  - reduced worker compensation insurance rates (e.g., work from barges)
  - increased production rates due to assembly line processes.
  - increased production rates due to multiple crews working simultaneously

****** Use engineering judgment and knowledge of construction processes to estimate the number of days required for each lane closure, detour, or facility closure for each alternate. Coordinate this estimate with the preliminary construction schedule and MOT scheme.

Exhibit 26-F Precast Alternate Development (Continued)

Referenced Links:

- Connection Details for Prefabricated Bridge Elements and Systems
  http://www.fhwa.dot.gov/bridge/prefab/if09010/

- Manual on Use of Self-Propelled Modular Transporters to Remove and Replace Bridges
  http://www.fhwa.dot.gov/bridge/pubs/07022/

- Framework for Decision-Making
  http://www.fhwa.dot.gov/bridge/prefab/framework.cfm

- Prefabricated Bridge Elements and Systems Cost Study: Accelerated Bridge Construction Success Stories
  http://www.fhwa.dot.gov/bridge/prefab/successstories/091104/index.cfm

- FDOT RUC (Road User Cost) software *(only available through infonet)*
  http://infonet.dot.state.fl.us/tlconstruction/SchedulingEng/AddSoftwareScheduling.htm