111 Final Engineering Design Process

111.1 General

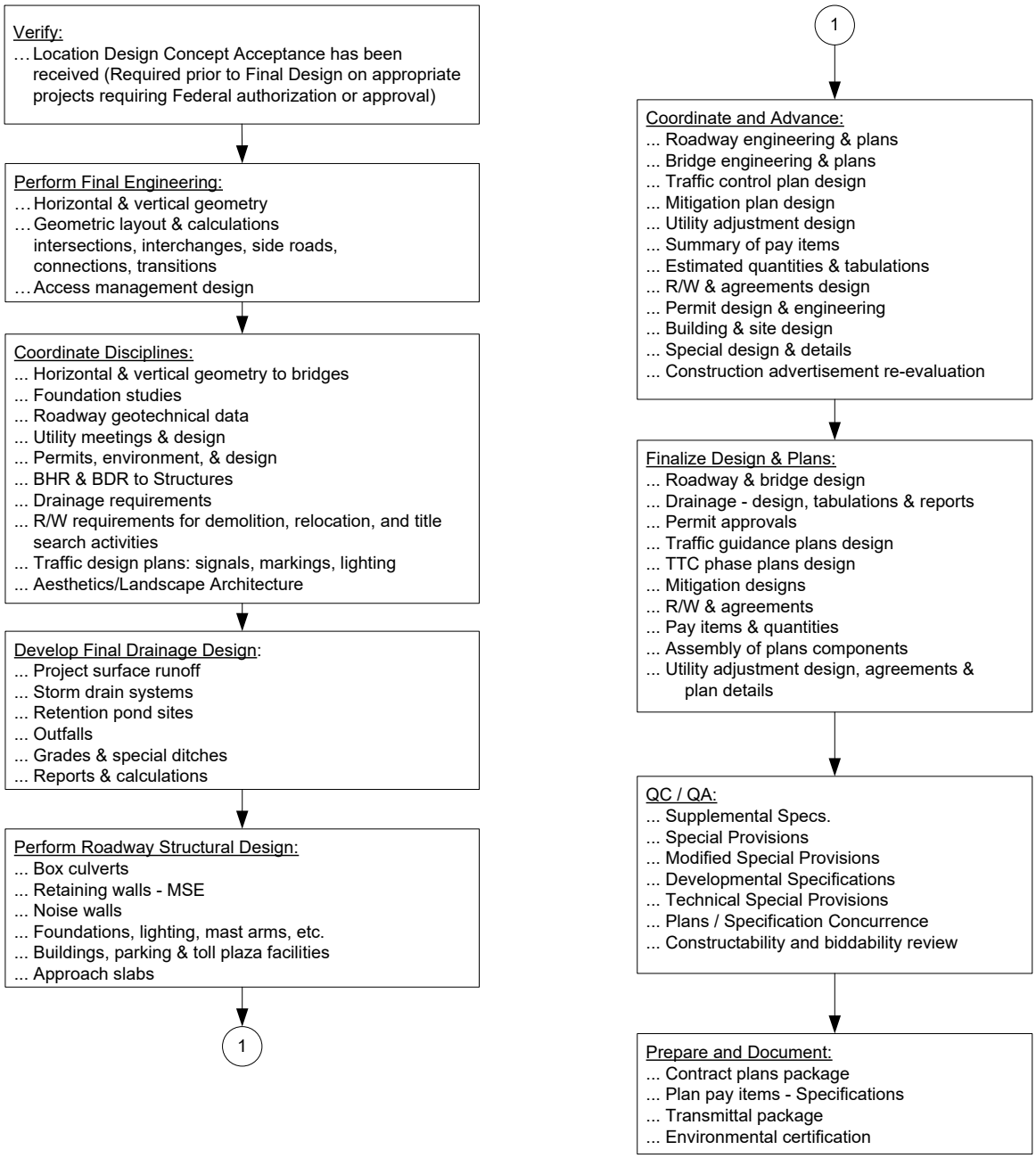
The final engineering design process follows the initial engineering design process and review. The primary objective of the final engineering design phase is to prepare contract plans and specifications that can be used to bid and construct the project with a minimum number of field changes, delays, and cost overruns.

Modification for Non-Conventional Projects:
Delete the above paragraph and replace with the following: The primary objective of the final engineering design phase is to prepare contract plans and specifications sufficient to construct the project.

On projects requiring Federal authorization where the Design Phase and the PD&E Phase overlap, the Department must receive Location Design Concept Acceptance (LDCA), prior to acceptance of the Phase II submittal (prior to advancing into Final Design). To advance past Phase II coordinate with the Environmental Management Office who will work with FHWA (see ***Part 1, Chapter 4*** of the ***PD&E Manual***). The Design Project Manager must coordinate with the PD&E Project Manager, and the District Environmental Management Office to ensure that that the Department has received LDCA for the project. The Design Project Manager will need to convey this information to the district federal aid staff in the District Work Program Office. (See the ***Project Management Handbook, Part 2, Chapter 3***). ***Figure 111.1.1*** shows the major activities included in the final engineering design process.

Modification for Non-Conventional Projects:
Delete the first two sentences of the above paragraph and replace with the following: On projects requiring Federal authorization where the Design Phase and the PD&E Phase overlap, the Department must receive Location Design Concept Acceptance (LDCA), prior to finalizing the RFP.

Figure 111.1.1 Major Activities – Final Engineering Design Process



111.2 Final Engineering Design

The Engineer of Record (EOR) and Design Project Manager must coordinate activities to ensure that the quality, accuracy, and appropriate decisions go into the performance of each step. The project quality control should include a plan-do-check routine for each set of activities or operations.

The major design activities include, but are not limited to, the following:

(1) Pavement design

(2) Drainage design

(3) Structural (bridge) design

(4) Structural (roadway) design

(5) Roadway design including access management, earthwork, selective clearing and grubbing, geometrics, ADA

(6) Traffic plans design including signing, marking, signals, lighting

(7) Utility adjustment design

(8) Permit preparation design including ponds, mitigation

(9) Traffic control plans (work zone) design

(10) R/W requirements design

(11) Building and site design including landscaping, ADA, transit

(12) Estimates and Quantities preparation

(13) Specifications and special provisions

(14) Landscape design including accommodating existing and proposed vegetation.

(15) Noise barrier design

Modification for Non-Conventional Projects:
Delete item 12 above.

111.2.1 Work Program Administration (WPA) System

Project stationing information is to be checked and entered into the Work Program Administration (WPA) system during final engineering design. This information is

important for tying construction records, such as material coring, sampling and testing to other databases. The information is entered by stations, which are related to roadway mile post for later information retrieval.

The EOR is responsible for finalizing the project stationing. The District Design Engineer should designate an individual to be responsible for coordinating the input of stationing information into the WPA system.

The begin and end stations, and station equations are entered into the WP50 computer screen under FM on the FDOT CL/SUPERSESSION Main Menu for each WPA location. After logging onto SUPERSESS, the WP50 designees enter on FM (Financial Management System). On the FM Main Menu, press ENTER: 3 for WPA (Work Program Administration). On WPA Main Menu, press ENTER: 25 for WP50 (Station Definition).

Update access to WP50 screen is granted through the Work Program Development Office in Tallahassee. Listed below are the important edit and browse features:

(1) Only enter FM Item Segment number on the top line.

(2) The RDWYLOC sequence number displays on the top line of the screen and on the first line of the header information. It's entered on the top line to retrieve a particular location.

(3) The transaction type "00" is entered on the top line to browse station equation information for that RDWYLOC. The transaction type "02" is entered on the top line to update station equation information for that RDWYLOC. The transaction type "99" is entered on the top line to erase station equation information for that RDWYLOC.

(4) Press the F8 key will forward from one RDWYLOC to the next RDWYLOC on the same Item Segment number. Press ENTER key to update or delete data on the screen depending on the transaction type but will not page forward.

(5) Press F3 key will take the user to the FM main menu while press F15 key will take the user back to the SUPERSESS main menu.

After entering the station information, it is important to verify the milepost limits in WPA are still accurate. This can be accomplished by reviewing the WP50 computer screen.

If the project length has changed, the District Work Program Office should be advised to correct the mileposts.

111.3 Contract Plans Preparation

The products of the engineering design activities are component sets of contract plans. The major component sets may include:

(1) Roadway

(2) Signing and Pavement Marking

(3) Signalization

(4) Intelligent Transportation Systems (ITS)

(5) Lighting

(6) Landscape

(7) Architectural Plans

(8) Structures Plans

Each Utility Work by Highway Contractor Agreement may have a separate phase for each Financial Project Identification Number (FPID). The plan set for each agreement is placed in the back of the contract plans set under the associated FPID.

Modification for Non-Conventional Projects:
Delete the two sentences above and see the RFP.

These component sets, the specifications package, and the pay items list with calculated quantities are assembled and packaged as the construction contract letting documents.

Modification for Non-Conventional Projects:
Delete the sentence above and replace with the following: These component sets, the specifications package, and the pay item list are assembled and packaged as the construction contract documents.

111.3.1 Three-Dimensional Models

If horizontally and vertically controlled cross sections are required for plans production to communicate design intent and construct the project, then that section of the project should be three-dimensionally (3D) modeled.

Modification for Non-Conventional Projects:
Delete ***FDM 111.3.1*** and see RFP for requirements.

111.4 Standard Specifications and Special Provisions

The EOR must develop engineering designs that can be constructed, controlled, measured and paid for under the current ***Standard Specifications***. In the event the work required is not covered by the Standard Specifications or the supplements and special provisions thereto, the EOR must develop Modified Special Provisions or Technical Special Provisions to be made part of the contract for the project. The EOR can obtain Department procedural guidance to assist with the preparation of the specifications package. Additional guidance on the preparation of Specification packages can be found in the ***Specifications Handbook***.

111.5 Pay Items and Summaries of Quantities

As the engineering plans are prepared, the quantities are calculated, tabulated, and summarized by Pay Item (of work) as stipulated by the Standard Specifications and the ***Basis of Estimates Manual***. The summary of pay items is updated as quantities are determined and summarized.

Modification for Non-Conventional Projects:
Delete ***FDM 111.5***.

111.6 PS&E Package Submittal

A submittal consisting of the final Plans, Specifications, and Estimate (PS&E), along with any other contract and transmittal documents, is known as a PS&E package. PS&E submittals are numbered consecutively, and re-submittals are required until the project is accepted by the District Program Management Office. The PS&E package is transmitted to the Central Office for letting or is assembled and held in the district for district advertisement and letting. ***FDM 131*** provides further guidance on the contents of the transmittal.

Modification for Non-Conventional Projects:
Delete ***FDM 111.6***.

111.7 Project Documentation

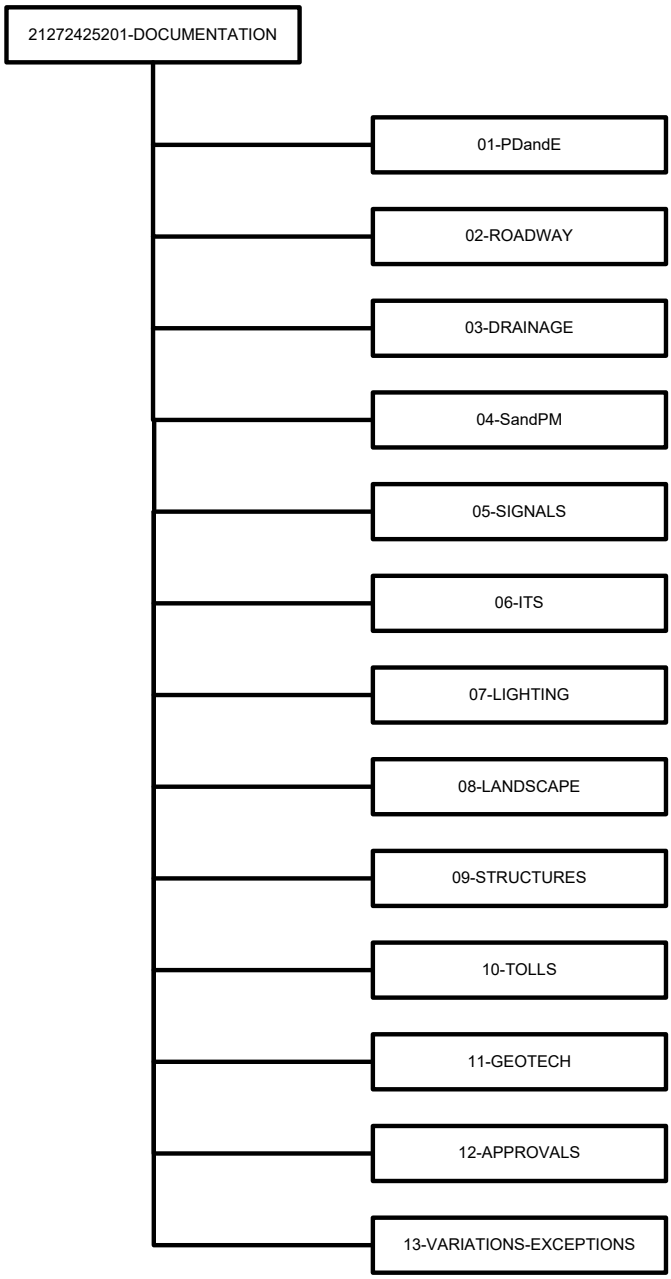
The submittal of project documentation is required for all projects. This section describes the required process for delivery of project documentation, and a list of documents that are to be provided.

Create a project documentation folder structure as shown in ***Figure 111.7.1***. Title the primary folder with the FPID number followed by "-DOCUMENTATION." Second level folders must be named as shown in the figure. Include the second level folder even when empty. Do not create third level folders.

Place only final documents in this folder structure; do not submit working files or draft documents. Standard file format is PDF; however, an Excel spread sheet may be placed in the folder structure if protected to prohibit changes.

When the folder structure is fully populated, zip the folder and submit to the Department Project Manager (PM). Deliver the zipped folder with the second PS&E submittal (see ***FDM 301.2.5***). The PM will place the zipped folder in the Final Plans Processing Module of ProjectSuite.

Figure 111.7.1 Folder Structure



111.7.1 File Naming Convention

Although the filename is limited to 240 characters, the number of characters used should not exceed 48. Filename is not to contain spaces or special characters (!@#$%^&*+).

Filenames are not case sensitive; however, the use of uppercase letters to begin each word in the filename is encouraged.

The filename should be easily searchable within the folder

111.7.2 Documents

Include the following list of documents only when the Scope of Services indicates that the document must be produced. Other final documents, reports, or calculations not listed in this chapter may be included if they support the development of the contract plans.

Recommended filename for the submitted document is provided in square brackets; e.g., [TypicalSectionPackage]. Additional document description may be provided using a hyphen before the identifying information; for example:

- MiscStructureDesignCalcs-TempRetWall2
- LoadRatingReport-Bridge1
- DesignVariation-Sidewalk
- GeotechReport-MSERetWall
- GeotechReport-PondSoilSurvey

111.7.2.1 PD&E

Place the following documents in the folder “01-PDandE”:

(1) Noise Study Report Addendum [NoiseSudyReportAddendum]

(2) Contamination Screening Evaluation Report [ContaminationScreeningReport]

(3) Contamination Level II Report [ContaminationLevel2Report]

Place the following additional documents in the in the 01-PDandE folder, for projects with concurrent or overlapping PD&E and Design Phases:

(4) Project Commitments [ProjectCommitments]

(5) Existing Conditions Report [ExistingConditionsReport]

(6) Project Traffic Analysis Report [TrafficAnalysisReport]

(7) Project Traffic Forecasting Memorandum [TrafficForcastingMemo]

(8) Alternatives Analysis Report [AlternativesAnalysisReport]

(9) Preliminary Engineering Report [PreliminaryEngineeringReport]

(10) Noise Study Report [NoiseStudyReport]

(11) Interchange Justification Report or System Interchange Justification Report [InterchangeJustificationReport] or [SystemInterchangeJustificationReport]

(12) Interchange Modification Report or System Interchange Modification Report [InterchangeModReport] or [SystemInterchangeModReport]

(13) Interchange Operational Analysis Report or System Interchange Operational Analysis Report [InterchangeOperationalAnlyReport] or [SystemInterchangeOperationalAnlyReport]

(14) Comments and Coordination Report [CommentsCoordinationReport]

(15) Public Involvement Plan [PublicInvolvementPlan]

(16) Value Engineering Report [ValueEngineering]

(17) ICE Report [ICEReport]

(18) Public Meeting / Hearing Summary [PublicMeetingSummary]

111.7.2.2 Roadway

Place the following documents in the folder “02-ROADWAY”:

(1) Typical Section Package [TypicalSectionPackage]

(2) Pavement Design Report [PavementDesignReport]

(3) AutoTurn Analysis [AutoTurnAnalysis]

(4) Superelevation Analysis [SuperelevationAnalysis]

(5) Cross Slope Evaluation [CrossSlopeEvaluation]

(6) Barrier Length of Need Analysis [LengthofNeedAnalysis]

(7) Sight Distance Analysis [SightDistanceAnalysis]

(8) Lane Closure Analysis; include documentation for using lane closure period less than eight hours [LaneClosureAnalysis]

(9) Work Zone Speed less than Existing Posted Speed Documentation [WorkZoneSpeedDoc]

(10) Community Awareness Plan [CommunityAwarenessPlan]

111.7.2.3 Drainage / Permits

Place the following documents in the folder “03-DRAINAGE”:

(1) Bridge Hydraulics Report [BridgeHydraulicsReport]

(2) Location Hydraulics Report [LocationHydraulicsReport]

(3) Pond Siting Report [PondSitingReport]

(4) Drainage Report (e.g., Storm Drain Tabulation Form, Spread Calculations) [DrainageReport]

(5) Drainage Map, when not included in plans or drainage report [DrainageMap]

(6) Base Clearance Water Evaluation Report [BaseClearanceWaterEvaluation]

(7) Pipe Inspection Report [PipeInspectionReport]

111.7.2.4 Signing and Pavement Marking

Place the following documents in the folder “04-SandPM”:

(1) Multi-Post Sign Report (Miscellaneous Structural Calculations) [MultiPostSignReport]

(2) Attachment to Barrier Calculations [AttachmentToBarrierCalcs]

111.7.2.5 Signalization

Place the following documents in the folder “05-SIGNALS”:

(1) Signal Warrant Report [SignalWarrantReport]

(2) Signal Analysis (e.g., Turn Lane Length, Queuing, HCM) [SignalAnalysis]

(3) Sub-Surface Utility Location Form (mast arm location) [SubSurfaceUtilityLocationForm]

111.7.2.6 Intelligent Transportation Systems (ITS)

Place the following documents in the folder “06-ITS”:

(1) ITS Power Design Analysis Report [ITSPowerDesignAnalysis]

(2) ITS Concept of Operations [ITSConceptOfOperations]

111.7.2.7 Lighting

Place the following documents in the folder “07-LIGHTING”:

(1) Lighting Justification Report [LightingJustificationReport]

(2) Lighting Design Analysis Report [LightingDesignAnalysis]

(3) Voltage Drop Calculations [VoltageDropCalcs]

(4) Intersection Lighting Retrofit Report [IntersectionLightingRetrofitRep]

111.7.2.8 Landscaping

Place the following documents in the folder “08-LANDSCAPE”:

(1) Irrigation Feasibility Report [IrrigationFeasibilityReport]

(2) Landscape Opportunity Plan [LandscapeOpportunityPlan]

(3) Landscape Maintenance Plan [LandscapeMaintenancePlan]

(4) Landscape Maintenance Cost Estimate [LandscapeMaintenanceCost]

111.7.2.9 Structures

Place the following documents in the folder “09-STRUCTURES”:

(1) Bridge Development Report [BridgeDevelopmentReport]

(2) Structural Design Calculations (Bridge) [StructuralDesignCalcs]

(3) Misc. Structure Design Calculations (e.g., Temp Retaining Wall, Temporary Shoring, Sheet Pile Wall, Overhead Sign, Noise Wall, CCTV Poles, Mast Arms, Box Culverts, High Mast Lighting) [MiscStructureDesignCalcs]

(4) Bridge Load Rating Report [BridgeLoadRatingReport]

111.7.2.10 Toll and Express Lane Facilities

Place the following documents in the folder “10-TOLLS”:

(1) Toll Siting Technical Memorandum [TollSitingTechMemo]

(2) Tolls Design Analysis Report – Equipment Building – Mechanical [TollMechanicalDAR]

(3) Tolls Design Analysis Report – Equipment Building – Structural [TollStructuralDAR]

(4) Tolls Design Analysis Report – Gantry [TollGantryDAR]

(5) Tolls Power Design Analysis Report [TollPowerDAR]

(6) Tolls Concept of Operations [TollConceptOfOperations]

(7) Express Lanes Diagrams and Concept Plans [ELDiagramsAndConceptPlans]

(8) Express Lanes Separation Treatment Selection Memorandum [ELSeparationTreatmentSelectionMemo]

(9) Express Lanes Systems Engineering Management Plan [ELSystemEngineeringManagementPlan]

(10) Express Lanes Concept of Operations [ELConceptOfOperations]

(11) Tolls Building Foundation Calculations [TollsBldgFdnCalcs]

(12) Tolls Building Screen Wall Calculations [TollBldgScreenWallCalcs]

111.7.2.11 Geotechnical

Place the following documents in the folder “11-GEOTECH”:

(1) Roadway Geotechnical Reports (e.g., Soil Survey, Pavement Cores) [RoadwayGeotechReport]

(2) Sign Structures Geotechnical Report [SignStructuresGeotechReport]

(3) Signals Geotechnical Report [SignalsGeotechReport]

(4) ITS Geotechnical Report [ITSGeotechReport]

(5) Lighting Geotechnical Report (High-mast) [LightingGeotechReport]

(6) Structures Geotechnical Reports (e.g., Bridge, Noise Wall, MSE Retaining Wall, Pond Soil Survey) [StruturesGeotechReport]

111.7.2.12 Approvals

Place the following documents in the folder “12-APPROVALS”:

(1) Lane Elimination Approval [LaneEliminationApproval]

(2) Central Office Roundabout Design Approval Memorandum [RoundaboutDesignApprovalMemo]

(3) Federal Aviation Administration (FAA) Approval Form [FederalAviationAdminAprovalForm]

(4) Proprietary Product Approval Forms [ProprietaryProductApprovalForms]

(5) Modified Special Provision (signed and sealed stand-alone document) [ModifiedSpecialProvision]

(6) Intersection Number Request Form [IntersectionNumberRequestForm]

(7) Contract Time Memo [ContractTimeMemo]

(8) Permit Exemption Letter [PermitExemptionLetter]

(9) Interchange Operational Analysis Report [InterchangeOperationalAnalRep]

(10) Structure Number Request Form [StructureNumberRequestForm]

(11) Summary of Pay Items Report generated in AASHTOWare Project™ Webgate Reporting during final stage of PS&E Phase [SummaryPayItems]

111.7.2.13 Design Variations and Design Exceptions

Place the following documents in the folder “13-VARIATIONS-EXCEPTIONS”:

(1) Design Variation Package [DesignVariation]

(2) Design Exception Package [DesignException]

(3) Design Memorandum [DesignMemo]