

Road Design Reference Material for Consultant Prepared Plans for Carolina Crossroads Phase 3C

January 2023

SCDOT
Road Design Reference Material for Consultant Prepared Plans for Carolina Crossroads Phase 3C

TABLE OF CONTENTS

1. SURVEY…… 3
1.1 AERIAL PHOTOGRAPHY, CONTROL SURVEYS, AND MAPPING.. 3
1.2 ENGINEERING SURVEYS…… 3

2. DESIGN FIELD REVIEW (DFR)…… 4

3. PRELIMINARY RIGHT OF WAY PLANS FIELD REVIEW…… 7

4. RIGHT OF WAY PLANS……. 8

5. CONSTRUCTION PLANS..... 10

6. DELIVERABLES……...…… 12
6.1 DESIGN FIELD REVIEW (DFR) AND PRELIMINARY RIGHT OF WAY..12
6.2 RIGHT OF WAY……. 12
6.3 CONSTRUCTION……... 15

7. VERIFICATION OF DELIVERABLES……. 18

8. SPECIFICATIONS AND BID PROPOSAL…… 18

9. REVISIONS……. 19
9.1 RIGHT OF WAY……19
9.2 CONSTRUCTION……..... 19

ATTACHMENT A - ROAD DESIGN DELIVERABLES CHECKLIST
ATTACHMENT B - ELECTRONIC FILES INDEX
ATTACHMENT C - CADD FILE LAYOUT
ATTACHMENT D - PLANS COVER DETAILS

1. SURVEY

1.1 AERIAL PHOTOGRAPHY, CONTROL SURVEYS, AND MAPPING

Control surveys to allow the production of 1" = 50' mapping at one-foot contour interval will be performed. Necessary surveys will be conducted to identify control points and GPS points to provide sufficient coverage of the final alignment. Coordinates and elevations will be established for these critical control points. Composition and placement of legal advertisement for notice to affected landowners prior to field surveys will be provided by the Department, as required by law.

Areas to be photographed shall be outlined on maps, aerial photos, or described by the appropriate Department personnel. Base mapping, at a scale of 1" = 50' and one-foot contour interval, will be digitized in three dimensions (3D). The width of the topography and planimetrics will cover the width of the proposed right of way and any additional areas specified by the Department. All electronic files must be developed in Microstation and Geopak or OpenRoads designer design software. Translation from any other platform including any exchange files will not be acceptable.

1.2 ENGINEERING SURVEYS

A. All survey work will be accomplished under the direct supervision of a professional land surveyor licensed in the state of South Carolina and in conformance with the Department's Pre-Construction Survey Manual.

B. Engineering surveys will be performed on the final alignments to determine accurate elevations and locations of existing facilities such as roadways, bridges, culverts, utilities, railroads, and drainage facilities as needed for design.

C. All points taken on the survey will be shown in the original topography.

D. The Consultant shall provide all signing necessary for traffic control during survey work in accordance with the requirements of the Manual on Uniform Traffic Control Devices.

2. DESIGN FIELD REVIEW (DFR)

The purpose of this task is to perform roadway design to the point necessary to determine if the horizontal and vertical alignments indicated on the plans meet the scope of the project in order to develop right of way plans. The preliminary design relating to the following activities will be developed:

A. Plan and profile sheets for roadways, interchanges, and intersections showing information necessary to permit construction stakeout and to indicate and delineate details necessary for construction. Profile shall be shown in the plans at a scale of 1" = 10' vertically and 1" = 50' or 20' horizontally to match scale of plans.

B. Design and drafting shall be accomplished on a CADD system using the latest version of MicroStation V8i or MicroStation CONNECT Edition currently being utilized at SCDOT. GEOPAK or OpenRoads Designer shall be the roadway design software. GEOPAK Drainage or OpenFlows StormCAD or CivilStorm shall be the storm sewer system design software. IPLOT is the preferred plotting software and is the only plotting software that SCDOT can support.

C. Provide detailed plan sheets with adequate information to evaluate Design Criteria, including but not limited to the items below:

1. Controlling Design Criteria
   - (a) design speed
   - (b) horizontal alignment
     - minimum radii
   - (c) vertical alignment
     - K values based on level stopping sight distance
     - maximum grade
   - (d) vertical clearance
   - (e) travel lane width
   - (f) shoulder width
   - (g) cross slope
     - travel lane
     - shoulder
   - (h) superelevation
   - (i) stopping sight distance
   - (j) horizontal clearance to obstruction
   - (k) bridge width
   - (l) structural capacity

2. Roadside Safety / Clear Zone

3. Roadway Geometry
   - (a) Lane Configurations
   - (b) Intersections

(c) Interchanges

4. Construction limits

5. Right of way (present and proposed)

6. Property lines

7. Others as per Departmental Standards

D. Design standards will be in compliance with the Departmental approved version in effect as of the Final RFP release date. List includes but is not limited to the Standards listed in TP Attachment 100-1:

E. Designs should limit the use of minimum criteria.

F. Cross-sections of roadways, interchanges, and intersections showing the existing and proposed typical sections, at intervals of 100 feet on tangents and 50 feet on horizontal curves, measured along the centerline or baseline of construction. In areas of ramps and interchanges, cross-sections are to be perpendicular to the referenced centerline.

Templates are to be placed on original cross-sections utilizing Geopak or OpenRoads Designer. The cross-section scale shall be 1" = 5' both vertical and horizontal, unless another scale is authorized by the Department.

G. Additional cross-sections, as necessary, to complete construction of the project.

3. PRELIMINARY RIGHT OF WAY PLANS FIELD REVIEW

The Design Field Review (DFR) plans with recommended field changes will be used to continue development of the right of way plans. The following information will be added to the DFR plans in order to obtain the Preliminary Right of Way Plans. A field review will be made with these plans in order to finalize the Right of Way Plans.

The purpose of this review is to examine the Preliminary Right of Way Plans with emphasis on the roadway drainage and the impact of the project to the adjacent properties. Also, this review will identify how new and existing rights of way and roadway designs will impact construction. Attendees should review plans for consistency, completeness, and uniformity.

A. Additional information to be added to plan sheets or provide additional detailed plan sheets for all design items including, but not limited to the items below:

1. Drainage facilities
2. Geotechnical subsurface investigations
3. Property ownership
4. Property parcel number
5. Control of access
6. Bridge Construction Access (determined on DFR)
7. Other sheets as per Departmental Standards

B. Additional cross-sections, as necessary, to complete construction of the project.

4. RIGHT OF WAY PLANS

A. Final right of way plans will be developed to depict the following:

1. All property lines within and immediately adjacent to the proposed improvement. Property shall be closed on all Federal aid projects. Property shall be closed on other projects as designated in the Consultant's agreement.

2. Property ownership

3. Property improvements

4. Control of Access

5. Existing and proposed right of way

6. Existing known utilities

7. Construction limits

8. Show all easements, or right of way, needed for road construction and bridge construction access and for implementation of the Sedimentation and Erosion Control Plan.

9. Design speed on the Typical Section Sheets.

10. Maximum superelevation, superelevation rate, design speed, control points, state plane coordinates and bench marks located on Reference Data Sheets.

11. Location of all topographic features including utilities by stations and offsets.

12. Include stations and offsets for right of way changes (i.e. step out/in and beginning and end of tapers).

13. Appropriate labeling of triangular right of way areas to be obtained as well as present triangular right of way areas.

14. Verification of present right of way (File and date obtained or Plat Book and Page showing dedicated R/W).

15. Identify any pipe, drainage structures, etc., outside R/W with "Obtain Permission".

16. Label all ditches with "Obtain permission" for cleaning, constructing and include estimated length and excavation.

17. Include Right of Way Data Sheet with all information provided.

18. Designate obtains as marshlands/highlands if pertinent to job.

19. Dimension lines for critical R/W areas such as nonparallel survey/construction centerlines and complicated intersections, etc. where more clarification would be necessary.

20. Adequate horizontal and vertical control data to facilitate ease of construction for Department personnel - Reference points for all PC's, PI's, PT's, and POT's.

21. Include PCN (Project Control Number) on cover and title sheet.

22. Detailed description of moving items if included in notes. Also include Moving Item Sheet and show on plans.

23. Completion of hydraulic design with alternate pipe unless otherwise directed by the Department. Run routine to plot pipe locations on cross-sections.

24. Plan sheets shall include Tract Numbers. Also, drainage and relocated driveway permissions must be shown.

25. Property layouts need only Tract Numbers.

26. Right of Way obtains and remainders shall be shown in acres and/or square feet as specified on the Right of Way Data Sheet.

27. Show all centerlines (survey, original, relocated, etc.) from which present or new R/W is referenced and label all main and side roads.

B. All parcels of property to be acquired as right of way will be assigned a parcel number, identification of property owner, areas of property obtained and remaining, and acreage of permanent easements indicated. The entire parcel of property from which right of way is to be acquired will be shown (even if illustrated as an insert at a reduced scale).

C. All field inspection and public hearing recommendations accepted for inclusion in the plans are to be verified and made part of the right of way plans.

5. CONSTRUCTION PLANS

A. Construction plans will be a continuation of right of way plans and a separate set is not acceptable. Original right of way plans will be retained by the Consultant after appropriate Departmental reviews and signatures and then developed into construction plans.

B. Plan and profile sheets will be included for roadways, interchanges, and intersections showing information necessary to permit construction stakeout and to indicate and delineate details necessary for construction.

C. A new title sheet for construction plans will be included, with the title sheet for right of way to follow as sheet 1A and labeled as "For Information Only".

D. Detailed plan sheets will be included for all design features requiring additional detail design information, including but not limited to:

- The geometry of intersections
- Local street treatment
- Drainage facilities
- Appurtenances
- Details covering special problems
- Moving Items
- Roadside Safety / Clear Zone
- Geometric control (vertical and horizontal)
- Construction limits (lines) including bridge construction access
- Right of way (existing and proposed)
- Ties and equalities
- Other as per Departmental standards
- Utilities
- Sedimentation and Erosion Control Plan
- Traffic Control Plan
- Pavement Marking Plan

- Signal plans

- Signing plans

E. Drainage designs in accordance with the approved hydrological/hydraulic criteria. A complete tabulation of the drainage analysis along with the calculations used to determine the size of drainage structures will be submitted. Run routine to plot pipe locations on cross-sections. Include alternate pipe information unless directed otherwise by the Department.

F. Additional cross-sections as necessary to complete construction of the project.

G. At locations where existing traffic is to be maintained, a detailed construction staging plan, showing details of all detour routings, temporary pavements, and special traffic control devices will be provided. Required restrictions to construction sequence will also be included.

H. Construction Plans will be provided to the Department on bond (22" x 36" 'D'-size or 22" x 34" for OpenRoads Designer) prints. No reverse-side prints are acceptable.

I. Construction plans shall also include the following:

1. Verified pay item numbers and units. All bid items shall have an item number on the Department's Trns·port Proposal and Estimates System (PES).

2. The Consultant shall verify constructability of project to meet present Departmental policies, standards, and specifications.

3. Include those items listed under the "Right of Way Plans" as required for construction.

4. Special drawings for items not covered by standard drawings.

5. The Consultant shall ensure that permitted plans are in agreement with final construction plans.

6. DELIVERABLES

6.1 DESIGN FIELD REVIEW (DFR) AND PRELIMINARY RIGHT OF WAY

A. A completed copy of the Road Design Deliverables Checklist (See Attachment A).

B. One set of bond half-size (12" x 18") prints. No reverse-side plan prints are acceptable.

C. An Adobe PDF file containing the entire plan set with sheet size shall be 22”x36” or 22” x 34” for OpenRoads designer in landscape format. Large projects may be broken into several PDF files.

6.2 RIGHT OF WAY

A. A completed copy of the Road Design Deliverables Checklist (See Attachment A).

B. One set of bond (22" x 36" 'D'-size or 22” x 34” for OpenRoads designer) prints of the final right of way plans. No reverse-side plan prints are acceptable.

C. The plan sheets shall be placed in a cover constructed with 150 lb. tag manila paper. The cover should be made by placing two 24” x 36” sheets of the heavy duty manila sheets together and adding a binding edge or cap of 6” x 24” tag manila 150 lb. paper between the two larger sheets. Overlap of the larger sheets onto the cap is approximately one inch. All cover seams shall be stapled and taped longitudinally with brown reinforced paper packing tape. On the front of the cover, project information should be placed as shown on Attachment D. The information should be the PCN, County, file number, project number, Road/Route, local name, termini, and the company name of the Consultant.

D. Deliverables for right of way plans will be provided electronically by method designated by Program Manager (example: Projectwise, Sharepoint, etc.). The electronic submittal will include the following items:

1. An Adobe PDF file containing the entire plan set with sheet size shall be 22”x36” or 22” x 34” for OpenRoads Designer in landscape format. Large projects may be broken into several PDF files.

2. CADD electronic files index (See Attachment B) with the detailed descriptions of the contents of each file must be provided in a “readme” file. The index should also include detailed descriptions and names of horizontal and vertical alignments and profiles utilized by the GEOPAK or OpenRoads Designer software on the project. A copy of the recommended file folder structure is shown on Attachment C.

3. All surveyed mapping, control points, benchmarks, GPS setup, 2D or 3D contours, spot points, survey notes, DTM, breaklines, TIN files, aerial photos and all other CADD files and data used in developing

surveys for the project. Also, the survey points should be provided in ASCII file format (Point number, N, E, Z, and Descriptions). Contact information for the survey company should be provided. All electronic survey files are to be placed in a separate folder.

4. All MicroStation files that pertain to existing property lines, owners, layouts their improvements and labeling.

5. All MicroStation files that pertain to existing and proposed Right of Way lines, obtains and remains and it's labeling as well as Right of Way Data sheets.

6. All MicroStation files that pertain to existing and proposed pipes, drainage structures, bridges and other hydraulic features as well as the labeling of these items.

7. All MicroStation files that pertain to utilities or railroads.

8. All MicroStation files that contain Typical Sections for project.

9. All MicroStation and Raster files that pertain to project Title Sheets.

10. All MicroStation files that show construction limits of project.

11. All MicroStation files that pertain to Moving Items.

12. All Microstation resource files used by the project's workspace. Especially any MicroStation files that would supplement the ability to view and print files correctly such as reference files, plot configuration files, pen tables, font libraries, custom linestyle libraries, and cell libraries.

13. All .gpk or 3D .dgn files and any other Geopak files or OpenRoads Designer models, such as input and criteria files that are needed to facilitate the review of plans should be submitted.

14. Copies of any hand written or electronic calculations or notes (non-CADD) that will facilitate verification and review of the plans.

15. On each printed sheet in the plans, the electronic folder name, file name, and date must be shown.

16. Provide plot setting to include levels used, symbology, line weights and pen tables in order to reproduce all plans sheets.

17. Pavement Design will be provided in a separate folder with soil support data, traffic volumes, and ESAL's.

E. Approved Design Exceptions to AASHTO and/or SCDOT design standards.
F. Upon receipt of the right of way documents by the Department; one copy of the completed, checked, and signed bond (22" x 36" 'D'-size or 22” x 34” for OpenRoads Designer) prints of the final right of way plans and the electronic files will be provided to the SCDOT Program Manager along with one copy of all design calculations, and CADD and computer files. Upon completion of the necessary Departmental reviews, the electronically signed PDF of the final approved right of way plans and the corresponding electronic media will be provided to the Letting Preparation Office. The plans will be delivered in a cover as shown in Attachment D. All other project related information is to be retained by the SCDOT Program Manager.

6.3 CONSTRUCTION

A. A completed copy of the Road Design Deliverables Checklist (See Attachment A).

B. One set of the specifications, special provisions, and one set of bond (22" x 36" 'D'-size or 22” x 34” for OpenRoads Designer) prints of the final construction plans. No reverse-side plan prints are acceptable. The plans will be delivered in a cover that is described in detail under the “Right of Way Phase Deliverables” (See Attachment D).

C. CADD electronic files index (See Attachment B) with the detailed descriptions of the contents of each file must be provided in a “readme” file. The index should also include a detailed descriptions and names of horizontal and vertical alignments and profiles utilized by the GEOPAK software or OpenRoads Designer on the project. A copy of the recommended file folder structure is shown on Attachment C.

D. Deliverables for construction plans will be provided on electronically to the SCDOT Program Manager. The submittal will include the following items:

1. An Adobe PDF file containing the entire plan set with sheet size shall be 22”x36” or 22” x 34” for OpenRoads Designer in landscape format. Large projects may be broken into several PDF files.

2. All files that were previously submitted for Right of Way phase with corrections and changes per SCDOT review and in their final form including an updated file index (Attachment C).

3. All updated and additional surveyed mapping, control points, benchmarks, GPS setup, 2D or 3D contours, spot points, survey notes, DTM, breaklines, TIN files, aerial photos and all other CADD files and data used in developing surveys for the project. Also, the survey points in ASCII file format (Point number, N, E, Z, and Descriptions). Contact information for survey company. All electronic survey files are to be placed in a separate folder.

4. All MicroStation files that pertain to the project plan and profiles sheets which contain all horizontal and vertical alignments.

5. All MicroStation files that contain any special drawings for the project.

6. All MicroStation files that pertain to Sedimentation and Erosion Control plans.

7. All MicroStation files that pertain to traffic control, pavement markings, detours and special traffic control devices.
8. All MicroStation files that pertain to cross-sections for all project alignment.

9. All MicroStation files that pertain to hydrological/hydraulic data and summary of drainage.

10. All Microstation resource files used by the project's workspace. Especially any MicroStation files that would supplement the ability to view and print files correctly such as reference files, plot configuration files, pen tables, font libraries, custom linestyle libraries, and cell libraries.

11. All gpk, ddb, inputs, and criteria files utilized by GEOPAK or OpenRoads Designer for the project will be submitted and placed in a separate folder.

12. If other Civil Engineering software packages were utilized for project development then all binary or ASCII files that are software dependant for that package should be submitted.

13. All electronic files that pertain to the construction stake out. Files will be in Landxml, ascii, or csv formats and will include all horizontal controls, vertical controls and templates. Control files data will be provided in a separate folder.

14. On each printed sheet in the plans, the electronic folder name, file name, and date must be shown.

15. All quantity calculations will be provided in a separate folder.

16. All roadway structures' design criteria with calculations will be provided in a separate folder.

17. Pavement Design will be provided in a separate folder with soil support data, traffic volumes, ESAL's, and final calculations for temporary, staging and final construction.

18. All plans and project data will be delivered to the Department using the "Design Deliverable" form. This form and a description of this procedure are shown in Attachment B.

19. Electronic files for specifications and special provisions in Adobe PDF and Microsoft Word format.

E. Approved Design Exceptions to AASHTO and/or SCDOT design standards.

F. Upon receipt of the construction documents by the Department; one copy of the completed, checked, signed, and sealed bond (22" x 36" 'D'-size or 22" x 34" for OpenRoads Designer)

prints of the final construction plans and the electronic files will be provided to the SCDOT Program Manager along with one copy of all quantity and design calculations. Upon completion of the necessary Departmental reviews, the hardcopy of the final approved construction plans and the corresponding electronic media will be provided to the Letting Preparation Office. The plans will be delivered in a cover that is described in detail under "Right of Way Phase Deliverables" (See Attachment D). All other project related information is to be retained by the SCDOT Program Manager.

After a review of the plans for letting and the appropriate signatures obtained, the plans will be taken to Engineering Reproduction Services for printing and distribution to prospective bidders.

7. VERIFICATION OF DELIVERABLES

When Consultants are submitting their contract deliverables to the Department for roadway projects, the Road Design Deliverables Checklist (See Attachment A) shall be completed by the Consultant, and verified by the Consultant's staff responsible for Quality Control (QC) prior to delivery to the Department. A copy of the completed checklist is to be provided to the SCDOT Program Manager along with the deliverables.

Verification of the deliverables will ensure that all design data originally used by the Consultant can be fully utilized in the event that it is needed by the Department for revisions, further development, or to assist District personnel with automated construction techniques.

Upon receipt of the checklist with the completed and signed deliverables, the SCDOT Program Manager will verify the deliverables and forward the link to the storage location to the Letting Preparation Office in Engineering Support and cc the Design Automation Office. The electronic files shall contain all items as described in this document.

All hardcopy and electronic deliverables will be included for the various stages of development such as Design Field Review, Right of Way, and Construction.

8. SPECIFICATIONS AND BID PROPOSAL

Consultant shall prepare detailed specifications and special provisions covering items of construction not covered by the State's standard specifications or standard bridge special provisions. All bid items shall have an item number on the Department's Trns·port Proposal and Estimates System (PES).

9. REVISIONS

9.1 RIGHT OF WAY

During the course of completing the final plans for construction, should changes be necessary which will affect the right of way acquisition process; these revisions will be promptly made, documented as revisions on plans, and provided to those implementing right of way appraisal and acquisition. All Right of Way revisions and the date of revisions shall be noted in the revision block or in the upper right hand corner of the sheet if no revision block is available. Right of way plan revisions along with all revised electronic files will be submitted to the Department's Regional Production Engineer or designated Program Manager who will deliver a hard copy of the revised information to the Letting Preparation Office. The Letting Preparation Office will provide the desired number of hard copies to the Right of Way Section for handling. The Consultant shall retain the original right of way plans during this phase so the construction plans may be developed using the most up to date version of the right of way plans. If the Consultant's scope of services does not include development of construction plans, the original right of way plans shall be delivered to the Department so that construction plans can be completed.

9.2 CONSTRUCTION

Revisions Prior to Letting

Changes to plan sheets that are made available to the bidders after the advertisement and prior to the letting will be submitted to the Department's Regional Production Engineer or designated Program Manager who will deliver the revised information to the Letting Preparation Office. The revisions are to include all revised electronic files. The Letting Preparation Office will incorporate the revised sheets into the letting plans by addendum.

Revisions After Letting

Revisions to plan sheets after the letting will be added to the Working Plans. These revised sheets will include the note "Construction change. Sheet provided after letting". Changes to plan sheets after the letting will be submitted to the Department's Regional Production Engineer or designated Program Manager who will deliver the revised information to the Letting Preparation Office. The revisions are to include all revised electronic files. The Letting Preparation Office will provide the desired number of hard copies to the Construction Division for handling. The Plans Storage Office will incorporate the revised sheets into the Working Plans.