

CHAPTER 3: DESIGN TOPICS AND REFERENCE MATERIAL

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3.1 GENERAL

This chapter briefly describes design topics and reference material relative to plan preparation and design. The designer needs to become familiar with these design practices prior to project development. Some of the topics and material have references or hyperlinks for further instruction and/or discussion regarding the topic.

3.2 CADD MANUAL

The [VDOT CADD Manual](#) provides standards and procedures for automated electronic development of Right of Way and Construction Plans as well as [VDOT Location & Design Division, Reference Guides](#).

3.3 INSTRUCTIONAL & INFORMATIONAL (I & I) MEMORANDA

I & I memoranda are published by several Divisions within VDOT. These memoranda provide official instruction and information on design related issues. The designer can find these memoranda from the Traffic Engineering, Location and Design, Structure and Bridge, and Construction and Maintenance Divisions as follows:

Traffic Engineering - I&I Memoranda must be obtained by contacting VDOT Traffic Engineering Division.

[L&D - I&I Memoranda](#) are available online.

Structure and Bridge - I&I Memoranda are available on VDOT INTRA network.

Scheduling and Contract Development Division, and Asset Management Division – I&I Memoranda are available online at:

<http://www.vdot.virginia.gov/business/const/>

3.4 TITLE SHEET DEVELOPMENT

TCD plans for stand-alone projects must include a Title Sheet with the plan set. A stand-alone project is defined as a project whereby the TCD design is not being constructed in conjunction with a roadway project. A Title sheet is to be created in accordance with the [VDOT CADD Manual, Chapter 3 - Section 2](#).

3.5 PLAN SHEET FORMAT AND NUMBERING CRITERIA

All design disciplines, including TCD construction plans, must meet plan sheet format and numbering criteria established in the index of sheet, refer to [VDOT Road Design Manual, Chapter 2E–54 Field Inspection](#).

3.6 GUIDANCE IN THE USE OF PLAN AND CONTRACT GENERAL NOTES

A memorandum discussing VDOT's contract language used in the General Notes sheet and Plan sheet(s) of a plan set. A copy of this is provided in [Appendix IA-5](#).

3.7 STANDARD AND NON-STANDARD PAY ITEMS

The design of TCD plan sets will consist of pay items that are to be included in the Summary of Quantities sheet. Summary of Quantities sheets will be required for each construction plan set that is being prepared, (e.g. Signing plan set, Pavement Marking plan set, Traffic Signal plan set, etc.). When a plan set is prepared primarily for one TCD such as a traffic signal(s) and there are other incidental TCDs which supplement the plan set, then only one Summary of Quantities sheet is required. An example of this situation is where a traffic signal plan set is being prepared and signs and lighting are included within the intersection and are incidental to the traffic signal design.

Pay items will be shown in tabular form and must be identified on the Summary of Quantities sheet exactly as noted in the Standard and Non-Standard pay item listings. These pay item listing are available online as noted below.

Standard pay items are pay items that are identified in the VDOT Road and Bridge Specifications. Standard pay items are supported in TRNS-PORT, whereby the unit cost estimate for the pay item is provided within TRNS-PORT. Standard pay items are available online at:

<http://www.vdot.virginia.gov/business/default.asp>

Non-Standard pay items are pay items that are not identified in the VDOT Road and Bridge Specifications. A Non-Standard pay item may require support by a Special Provision or Special Provision Copied Note. Non-Standard pay items require unit cost estimates to be provided within TRNS-PORT. Non-Standard pay items are available online at:

<http://www.vdot.virginia.gov/business/default.asp>

3.8 SPECIAL PROVISIONS, SPECIAL PROVISION COPIED NOTES AND OTHER CONTRACT ELEMENTS

A VDOT contract is the governing document for project construction. A contract package consists of several elements, which have order and hierarchy of which are identified in [VDOT Road and Bridge Specifications Section 105.05](#) and briefly described below:

3.8.1 Special Provision Copied Note (SPCN)

A document that sets forth specifications or requirements usually limited in scope, for a particular project item or issue and as a modification to a Special Provision or Specification.

- A strict adherence to the preparation of a Special Provision Copied Note is required.
- A discussion on the preparation of a Special Provision Copied Note is provided in [Appendix IA-6](#).
- If there is a need for a SPCN, the designer should check with Traffic Engineering Division as well as Scheduling and Contract Development Division to determine if a previously developed SPCN exists.

3.8.2 Special Provision

A document that sets forth specifications or requirements for a particular pay item that is not addressed in the VDOT Road & Bridge Supplemental Specifications or the VDOT Road & Bridge Specifications. The Special Provision must address the pay item in same manner as specifications published in the VDOT Road & Bridge Specifications. A pay item may include, but is not limited to information regarding description, materials, procedures, and measurement and payment.

- A strict adherence to the preparation of a Special Provision is required.
- A discussion on the preparation of a Special Provision is provided in [Appendix IA-6](#).
- If there is a need for a Special Provision, the designer should check with Traffic Engineering Division as well as Scheduling and Contract Development Division to determine if a previously developed Special Provision exists.

3.8.3 Plans

Approved plans show the location, character, dimension and details of the work specified in the contract.

3.8.4 Road and Bridge Supplemental Specifications

A publication that contains additions and revisions to the VDOT Road & Bridge Specifications that was adopted after the issuance of the latest published book.

3.8.5 Road and Bridge Specifications

A publication that contains standard specifications, which provide procedures, provisions, and requirements that, are necessary for the proper fulfillment of the contract.

3.8.6 Road and Bridge Standards

A publication that contain standard drawings, which graphically provide directions, provisions, and requirements that, are necessary for the proper fulfillment of the contract.

3.8.7 Insertable Sheets

A plan sheet detail that contains standard drawings, which graphically provide directions, provisions, and requirements that are necessary for the proper fulfillment of the contract. Insertable sheets cannot be modified and are inserted into the detail section of the plan set. An Insertable Sheet is a standard drawing that has been adopted by VDOT and is either not included in the VDOT Road and Bridge Standards or modifies a standard within the VDOT Road and Bridge Standards.

3.8.8 Virginia Work Area Protection Manual

A document that contains standards and guidelines to promote uniform traffic control during construction, special events and incident management. The Virginia Work Area Protection Manual is available online at:

<http://www.vdot.virginia.gov/business/>

3.9 PROJECT ESTIMATES AND TRNS-PORT

Throughout the design process, from the Scoping phase to Project Advertisement, project estimates are to be developed and continually updated to reflect estimated costs for construction. When substantial increases or decreases in construction cost estimates occur, documentation identifying the basis for the change in costs will need to be provided to the project manager at the CEP milestone meeting.

Detailed information is not available to perform accurate construction estimates, during the Scoping phase. Use of the cost estimating system (CES) may be employed to address traffic engineering related costs for traffic signals. Other traffic related costs for lighting, signing, and pavement marking or markers will have to be estimated based on the scope and limits of construction.

Construction cost estimates developed after the Scoping phase will be based on a level of design commensurate with the maturity of the overall design. The development of the TCDs at conceptual design, preliminary design, final design and for the construction plan set must be developed to a level that will permit reasonable estimation of construction costs for the TCDs.

TRNS-PORT is an AASHTO's integrated software system that is being used by VDOT and other State Highway Agencies to support highway construction management activities.

TRNS-PORT modules can be used for managing bid letting, bid analysis, and award determination. Also, after the award of the contract, TRNS-PORT can manage each of the activities in a permanent database. This database can be used for bid evaluation and review, collusion detection, project cost estimation, and general management studies. The TRNS-PORT system supports the project during design, (when an estimate needs to be produced), through project completion.

3.10 ESTIMATED QUANTITIES FOR POLE / STRUCTURE FOUNDATIONS

In accordance with VDOT Specifications Section 700.04, traffic signal pole foundations, high mast lighting pole foundations and overhead sign structure foundations are to be paid for in cubic yards (cubic meters) of concrete. The cubic yards (cubic meters) of concrete in the contract is an approximation and payment will be made for the actual cubic yards (cubic meters) of concrete needed based upon the supplied foundation designs. The following quantities should be utilized FOR EACH FOUNDATION when determining the total number of cubic yards (cubic meters) of concrete with the quantities being rounded to the nearest whole number when placed on the Summary Sheet.

Traffic Signal Pole – 3.5 Cubic yards (2.7 Cubic meters)

High Mast Lighting Pole – 4 Cubic yards (3 Cubic meters)

Overhead Sign Structure (Span & Butterfly) – 9 Cubic yards (7 Cubic meters)

Overhead Sign Structure (Cantilever) – 11 Cubic yards (8.4 Cubic meters)

3.11 QUALITY CONTROL REVIEW

A Quality Control (QC) review involves detailed checking of the plan set, verifying the plans for correctness, completeness, and technical accuracy by a senior engineer / designer who is independent from the project engineer / designer of the plans.

Prior to submission of the plan set, all work shall undergo an independent QC review to verify the quality and integrity of the work products and to verify compliance with the standard of professional practice.

To assist in the QC review process, a Designer / Reviewer Checklist is provided in Appendix B for each of the TCD design disciplines. The designer will provide their name, title and phone number in the spaces provided at the bottom of the checklist. The checklist is to be submitted with the plan set for review.