

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE**

<p>701 CONTRACT PLAN PRESENTATION <i>June 30, 2010</i></p>
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This Design Directive will generally describe the make-up and presentation of a complete set of contract plans, in order to standardize the production of such plans throughout the Division of Highways. All directions contained herein will apply to contract plans developed by all Central Office Divisions, to include plans developed by consultants, and all Districts. It should be noted that other Design Directives, the Drainage Manual, the Bridge Design Manual, and Traffic Engineering Directives are referenced in this document that pertain to similar subject matter and are more precise than these guidelines. They are intended for clearer understanding of what should be included in each set of contract plans.

Also, this Design Directive will describe the order that the different types of sheets required within the contract plans are to be placed, and generally describe the content of each type of sheet.

It is to be noted that not all types of sheets described herein will be required for all projects. This determination will be made by the Division's Designer or Project Manager, and is dependent on the type, size, and complexity of the project.

All of the referenced publications are available on the Division's web site, under the following link: www.transportation.wv.gov/highways/engineering/Pages/publications.aspx. Other links are given for CADD Standards and plan presentation information hereinafter described in this document.

I. GENERAL

Contract plans are sheets or drawings which show the locations, character, and dimensions of the prescribed work, including layouts, profiles, cross sections, and other details.

Contract plan sheet originals shall be 22" x 34" including borders of 1" on the left and ½" for the other three. Preliminary submissions of Design Reports shall be assembled and bound into sets not to exceed 36" x 48". Roll plans or profiles will not be accepted.

When only a few sheets for a special purpose are submitted, they shall be folded to 8½" x 11" or 8½" x 14".

All plans including review plans shall be prepared in such a manner that they can be reduced to quarter size (¼ area and ½ scale – commonly referred to as “half-sizes”) by the Division. Quarter size prints may be submitted for review and their use is encouraged. When quarter size prints are submitted, they are to be accompanied by at least one full size set, unless waived by the Division of Highways.

The use of contract plan sheets with existing contours and topography 60% screened is required unless waived by the Division of Highways. This shall also apply to Right of Way Plans.

CADD standards developed by the Engineering Division shall be used in the development of all contract plans. These standards are available on the Division’s website at: www.transportation.wv.gov/highways/engineering/cadd/Pages/default.aspx. Also available on the Division’s website are sample plans for small and large bridge and roadway projects at: www.transportation.wv.gov/highways/engineering/Pages/planpresentationindex.aspx.

II. ORDER OF SHEETS WITHIN THE CONTRACT PLANS

The order of the sheets within the contract plans will be as follows. A general description of information that is required on each type of sheet follows in Section IV of this Design Directive. Note that not all types of sheets shown and described below are required in each set of contract plans, dependent on the type, size, and complexity of each project. Also, some of the different types of sheets may be combined; for instance the Survey Reference Points sheet may be combined with the Geometric Layout sheet on smaller projects.

1. Title Sheet
2. Typical Sections and Details
3. Summary of Estimated Quantities
4. Quantity Tables
5. General Notes
6. Special Details
7. Mass Haul Diagram
8. Survey Reference Points

9. Geometric Layout
10. Superelevation Tables and Diagrams
11. Interchange Grading Plans
12. Intersection Details
13. Temporary Traffic Control Plans
14. Plan and Profile Sheets
15. Drainage Detail Sheets
16. Utility Relocation Plans
17. Erosion And Sediment Control Plans
18. Environmental Mitigation Plans
19. Traffic Sketch Maps
20. Pavement Marking Plans
21. Signing Plans
22. Lighting Plans
23. Traffic Signal Plans
24. Ownership Index
25. Property Maps
26. Soil and Geologic Information Plans
27. Structure Plans per Order Of Station
28. Cross Sections

III. DEFINITIONS

- A. **Contract Plans.** Defined in Section IV. below.
- B. **Standard Details.** Drawings approved for repetitive use showing details to be used where appropriate. Included are Revised Standard Details that are to be referenced by revision date as appropriate.
- C. **Special Details.** Modifications to a Standard Detail drawing, or any detail drawing required to describe an item of work not covered by a Standard Detail drawing.
- D. **Standard Specifications.** A book of Specifications approved for general application and repetitive use.
- E. **Supplemental Specifications.** Approved additions and revisions to the Standard Specifications.
- F. **Special Provisions.** Specifications for specific items or details applicable to the individual project and which are not covered in the Standard or Supplemental Specifications.
- G. **Temporary Traffic Control Plan.** A plan for handling traffic through a specific highway or street work zone or project.

IV. CONTRACT PLANS

- A. General.** Contract plans (hereinafter referred to as “plans” or “contract plans”) are instructions using drawings containing engineering data and details pertaining to geometrics, drainage, structures, soils and pavements, and other appurtenances.
1. Plans should not encompass material that is properly a part of the Standard or Supplemental Specifications, Special Provisions, or Standard Details.
 2. The original drawings should be on standard sheets conforming to modern, accepted drafting practices or aerial photograph base maps. See the description under the “GENERAL” heading above for more information.
 3. Straight-line plans may be used provided they give sufficient information to properly complete the project.
 - a. Straight-line plans are particularly adaptable to special types of projects such as those for minor emergency relief, safety improvements, resurfacing, restoration, and rehabilitation and pavement marking.
 - b. A typical set of straight-line plans consists of only that information necessary to describe the type of work and its limits, such as:
 - 1) General plan, sketch, or line drawing;
 - 2) Cross section, if appropriate;
 - 3) Estimate of quantities;
 - 4) Tabulation of construction items, providing station and offset, and elevation (if needed);
 - 5) General notes; and/or
 - 6) Special details.
- B. Standard Details.** Standard details are used to reduce the number of drawings required to be supplied for each project and provide uniformity of design and construction where the details are the same from project to project. When modifications to standard details are made and intended for use on most projects, Revised Standard Details will be issued by Technical Section. When modifications to standard details are necessary for a specific project, special details should be prepared, properly describing the work, and included in the project plans.

C. Contract Plans. Contract plans show the details, dimensions, and other information that are necessary to construct a specific project and should be tailored to provide all information necessary to accomplish the work in an orderly manner.

1. Title Sheet. The Title Sheet should show in a convenient arrangement:
 - a. Project Name and Construction Project Number(s);
 - b. A location sketch with sufficient identifying information so that the project may be easily located on a county or state map;
 - c. Project Length, split into roadway and bridge(s) lengths, and then totaled. Note that projects which do not contain any paving, such as Grading and Drainage projects, will have a zero Project Length, however mainline Begin and End Work stationing shall be tabulated;
 - d. A project layout, showing the proposed centerlines, Begin and End Project and Work stationing, all Station Equations, and numerical designations of all roadways to be constructed in the project. The Project Length will be that of the mainline only, sideroads and ramps are not to be included in the Project Length;
 - e. A detail or group index of the sheets in the set of plans;
 - f. The conventional symbols employed;
 - g. Design designation (average daily traffic for the year that the project is to be constructed and the design year (usually 20 years after the construction year); design hour volume, directional distribution, and percent trucks in the design year; and design speed);
 - h. Federal-aid project designation, if applicable;
 - i. A provision for the dates and signatures of the appropriate approving officials (See DD-702 for examples);
 - j. All approved design exceptions shall be noted on the title sheet.
2. Typical Sections and Details. Typical Sections are to be placed on the sheet(s) immediately following the Title Sheet, except that on combined roadway and bridge projects the cross section for the bridges may be shown with other bridge plan information.

- a. Typical Sections should be included in plans for all projects. Typical Sections shall be provided for all roadways to be constructed in the project, including the mainline roadway, all sideroads, ramps, and driveways.
- b. All functional elements should be shown to a convenient scale including:
 - 1) All different slopes of cut and fill with references to the cross sections for slopes not shown;
 - 2) The width of the roadway traveled way, shoulders, and median;
 - 3) The shape of the finished surface and shoulders (cross slopes including breakovers, and ditch foreslopes and backslopes, according to DD-601);
 - 4) Curb and gutter, if part of the design;
 - 5) All integral parts of the surfacing and shoulders including, as appropriate, subbase, base course, and surface course.;
 - 6) Limiting locations where each Typical Section is to be used;
 - 7) Ultimate Typical Section for stage construction project;
 - 8) Thickness of each lift for each element of the surfacing system;
 - a) Where variations in surfacing or base thickness are proposed because of differing soil conditions or other reasons, such variations should be in tabular form, including station limits for each thickness,
 - b) In instances in Subparagraph a) above, the typical section need show only that varying thicknesses are to be employed,
 - i) See DD-644 for appropriate layer thicknesses for HMA layers.
 - 9) Relation between either proposed or ultimate status and a control survey line and profile grade line;

- 10) Lateral location of profile grade line (grade point);
 - 11) Typical Details required to properly describe any work that cannot be clearly depicted on the Typical Sections, such as HMA edge stepping details, median barrier details, shoulder breakover and pavement layer thinning details, etc.
3. Summary of Estimated Quantities
- a. The Summary of Estimated Quantities for the entire project is to appear on separate sheets following the Typical Sections.
 - b. If more than one category of funds is required for a project, the quantity of each item required for each category should be identified separately and then combined for bidding purposes.
 - 1) See DD-805 for guidance on quantities for projects which cross boundaries between Municipal and Non-Municipal areas.
 - 2) A state-by-state breakdown is to be provided where a project crosses state lines.
 - 3) Non-Federal-aid work included as part of a Federal-aid contract should be identified separately.
4. Quantity Tables
- a. These sheets will tabulate all construction items such as drainage, signing, guardrail, earthwork, pavement, underdrain, and all other items in a table format showing station and offset for the location of the item. This is desirable on projects to assist in identifying locations where the specific item is to be installed. The Municipal/Non-Municipal, county-by-county, and state-by-state station locations are to be indicated in these Tabulation of Quantities tables, and quantities computed using these station as breakpoints. See DD-805. Earthwork will be computed by the cross sectioning method.
5. General Notes
- a. A table referencing Revised Standard Details will be included when necessary.

See DD-704 for information concerning General Notes to be included in the contract plans.6. Special Details

- a. Details not incorporated into the current approved Standard Details or Revised Standard Details are to be added to the contract plan assembly as Special Details.
 - b. Special Details should be prepared and included, as necessary, to properly describe any items of the work not covered by an applicable Standard Detail or Revised Standard Detail.
7. Mass Haul Diagram
- See DD-705 for more information concerning the preparation of the Mass Haul Diagram.
8. Survey Reference Points
- a. Aerial Photography Control: This sheet will show all Survey Reference Points which were set and utilized by the Designer to survey and set up the aerial photography control for the project. See DD-810 and the description in 8.b. below for more information concerning Survey Reference Points for aerial photography control.
 - b. Conventional Surveys: This sheet will show all Survey Reference Points utilized for conventional surveys and aerial photography surveys. These Reference Points shall be shown individually, with a description of the point shown (hub and tack, $\frac{3}{4}$ " rebar with cap, etc.). Each Survey Reference Point is to be referenced from at least three other points for future recovery or resetting of the point. Distances to the references are to be obtained and shown, and the references described (RR spike in power pole, "X" cut on sidewalk, etc.). Also, coordinates in the North (N), East (E), and Elevation (Z) format are to be indicated for each Survey Reference Point. The West Virginia State Plane Coordinates System is to be utilized, when this information is available.
9. Geometric Layout
- a. A separate Geometric Layout sheet(s) shall be provided depicting the following:
 - 1) Construction centerline of the mainline roadway, intersecting roads, side roads, and interchanges.
 - 2) Description blocks coinciding with the project description.

- 3) Equalities with symbols similar to plan sheet symbols.
 - 4) Horizontal curve data for all curves, to include PI station, delta angle, radius (note that degree of curvature is not necessary), length of curve, length of tangent, and superelevation on circular curves; and on spiraled curves, spiral angle and spiral length, tangent offset and tangent distance, spiral offset from tangent and spiral distance on tangent, long spiral tangent and short spiral tangent, and spiral length of chord.
 - 5) Stationing and bearings. Typically, centerlines and bearings are to be shown running south to north and west to east. However there are some existing roads in the State that run opposite from that convention as shown on the Straight Line Diagrams. In this case, the direction of the centerline stationing and bearings shall match that shown on these Diagrams.
 - 6) Coordinates for all horizontal control points, such as Begin and End Project/Work stations; horizontal curve TS, SC, CS, ST, PC, PT, etc. points; intersecting centerlines and/or baselines points; or other pertinent points required to properly lay out the project by survey, shall be given, with North (N), East (E), and Elevation (Z) format. The West Virginia State Plane Coordinates System is to be utilized, when this information is available. This information can be shown in table format, if necessary.
10. Superelevation Tables and Diagrams
- See DD-603 for more information concerning superelevation tables and diagrams.
11. Interchange Grading Plans
- See DD-623 for more information concerning interchange grading plans.
12. Intersection Details
- See DD-622 for more information concerning the requirements for intersection details.

13. Temporary Traffic Control Plans

See DD-681 for guidance concerning the preparation of Temporary Traffic Control Plans.

14. Plan and Profile Sheets

a. General. Plan and profile sheets should be prepared at a scale adequate to show the necessary details as governed by the topography and the complexity of the work.

- 1) Plans should be drawn to one of the following horizontal scales: small - 1"=100', medium - 1"=50', large - 1"=20' or 1"=10', depending on the density of information to be shown on the plan sheets. The small scale of 1"=100' is only to be used for design studies, and not for contract plans.
- 2) Profiles should be drawn to the same horizontal scale as the plan, but the vertical scale may be 10% to 20% of the horizontal scale.

b. Plans

- 1) The general highway plan should include:
 - a) The base line of the survey which, if practicable, should also be the centerline of the proposed roadway;
 - i) When the centerline and the base line are not coincident, their relationship should be indicated,
 - ii) Divided highways, where independent base lines are used, may be treated as separate roadways indicating only the general relationship between the two,
 - iii) Special areas such as interchanges and safety rest areas should be shown with separate survey control lines, as necessary. Control lines on ramps are to run in the same direction as the centerline of the proposed roadway regardless of the direction of traffic flow,

- iiii) Bearings on all tangents based on the West Virginia Coordinates System, when this information is available.
- b) Stationing reading from left to right including equations of stationing;
- c) Design data of curves, to include PI station, delta angle, radius (note that degree of curvature is not necessary), length of curve, length of tangent, and superelevation on circular curves; and on spiraled curves, spiral angle and spiral length, tangent offset and tangent distance, spiral offset from tangent and spiral distance on tangent, long spiral tangent and short spiral tangent, and spiral length of chord;
- d) Proposed and existing rights of way and access control lines, easements, and special-use areas;
- e) North arrow and bar scale;
- f) Proposed and existing edges of pavement and shoulders;
- g) Proposed and existing drainage features such as pipes, culverts, headwalls, manholes, inlets, etc., with the elevations of the top and all inverts shown;
- h) Topography, existing streams with direction of flow indicated, railroads with the valuation baseline and stations shown, and other features such as existing roads, streets, and airports on or near the right of way when these items influence the proposed construction. Adjacent roadway shall be shown for 1000' - 1500' on major projects and for 500' - 1000' on minor projects at both the beginning and end of the project. Existing roadways and streets shall have a centerline with stationing established and shown on the plans, and the relationship of this centerline to any proposed centerlines is to be shown;
- i) Incidental construction items such as erosion control provisions, guardrail, and retaining walls;

- j) Amount and volume of materials available at known sources;
- k) Existence of and disposition of all public utilities, buildings and appurtenant items, and any other obstruction or encroachment within the right of way or adjacent thereto if affecting the proposed construction. See DD-709 for information concerning buildings and appurtenant items disposition, DD-303 and DD-310 for information concerning railroad involvement and utility relocations, and DD-305 concerning water and sanitary sewer relocations;
 - i) If not part of the project, their disposition should be included in the project records,
 - ii) If part of the project, the plan should show the present and, if applicable, the proposed location including both horizontal and vertical positions and such additional details as may be needed to indicate the scope of work to be performed.
- l) It is to be noted that on complex projects, a reference sheet showing the layout of the plan sheets and/or cross section sheets is desirable to facilitate the use of the plans.

c. Profiles

- 1) Profile grade represents the trace of the vertical plane intersecting the top surface of the wearing course, base course, or other surface along the designated profile grade line.
- 2) The existing ground line should represent the trace of a vertical plane intersecting the present traveled way or ground line along the designated centerline.
- 3) Profiles should show:
 - a) Proposed grade and existing ground lines;

- i) When standard plan and profile sheets are used, surface elevations may be omitted and grade elevations shown at changes or gradient only,
- ii) When plan sheets are used, grade and existing ground elevations should be shown,
- b) Datum line;
- c) Station ordinate lines;
- d) Percentage of gradient;
- e) Vertical and horizontal clearances and the cross section of the roadbed for railroads, highways, and stream beds under proposed and existing structures;
- f) Identification of type and clearance under and over utility lines within the right of way;
- g) Culverts, storm sewers, and underdrains.
- h) Vertical curve data, to include the vertical PI station and elevation, vertical curve length, k value, and stopping sight distance available on crest vertical curves.
- i) Cut/fill grading transition details. See DD-405, "Grading Transition Detail".

15. Drainage Detail Sheets

- a. Minor Drainage Facilities - Minor drainage facilities shall be defined as straight culverts less than 36" in diameter, erosion control structures, headwalls, inlets, and manholes. Detail plans for minor drainage facilities shall include the following (refer to the most current edition of the WVDOH Drainage Manual for more guidance concerning information to be shown on the contract plans):
 - 1) Sufficient stationing and offsets to show the location and orientation to centerline.
 - 2) All necessary elevations.

- 3) The intersection of straight culverts less than 36" in diameter with the centerline and each station shall be shown on the profile sheets and each affected roadway cross section.
 - 4) Separate cross sections for structures such as sediment dams or sediment ponds.
- b. Major Drainage Facilities - Major drainage facilities shall be defined as any culvert which has bends, culverts 36" in diameter or greater, and channel changes. Detail plans for major drainage facilities shall include the following (refer to the most current approved edition of the WVDOH Drainage Manual for more guidance concerning information to be shown on the contract plans):
- 1) Sufficient stationing and offsets to show the location and orientation to centerline.
 - 2) All necessary elevations.
 - 3) A profile along the centerline of the culvert or drainage structure showing the relationship between the existing ground line, proposed template, and the culvert or drainage structure, total length of the culvert or drainage structure, all necessary elevations, and utility locations.
 - 4) The intersection of culverts or drainage structures with the centerline and each station shall be shown on the profile sheets and each affected roadway cross section.
 - 5) Separate cross sections for culverts or drainage structures when the cost of excavation is not included in the cost of the culvert or drainage structure.

If all of the information listed above is shown elsewhere in the plans (plan sheets, profile sheets, standard details, etc.), separate detail plan sheets will not be required.

- c. Storm Sewers – storm sewers are defined as a composite system of one or more sections of pipe or box culvert, or a combination thereof, generally connecting a series of inlets or manholes. Storm sewers are different from culverts in that they are usually longer and pick up additional water from inlets and intersecting storm sewers along its length. Refer to the most current edition of the WVDOH Drainage Manual for more information.

- 1) A profile of each storm sewer is required to be shown. This profile can be shown on its own profile sheet, or can be combined with the roadway profile sheets when the sewer runs along the centerline of the roadway (usually multilane divided roadways).
 - 2) The hydraulic grade line developed in the drainage calculations should be shown on each storm sewer's profile.
16. Utility Relocation Plans
- See DD-303, DD-305, and DD-310 for more information concerning Utility Relocation Plans.
17. Erosion And Sediment Control Plans
- See the latest approved edition of the Erosion And Sediment Control Manual for more information concerning information that is to be shown in the contract plans. Also see DD-250, "Dust Palliative" and DD-251, "Temporary Erosion Control".
18. Environmental Mitigation Plans
- Commitments for environmental mitigation features which are contained in the environmental documentation should be detailed as necessary and included in the project plans as special details and/or shown at the appropriate location in the plans. These plans will also include any necessary stream relocation plans, special planting plans, and any other plans deemed necessary to adhere to the environmental commitments made for the project. Also see DD-252, "Environmental Mitigation Items".
19. Traffic Sketch Maps
- See DD-802, "Traffic Sketch Maps" for more information.
20. Pavement Marking Plans
- See the 300 series Traffic Engineering Directives for guidance concerning the preparation of Pavement Marking Plans.
21. Signing Plans
- See Traffic Engineering Directive 103-3, "Preparation of Contract Sign Plans".

22. Lighting Plans

See Traffic Engineering Directives 101, "Guidelines for Highway Lighting" and 102-3, "Roadway Lighting Design".

23. Traffic Signal Plans.

See the 400 series Traffic Engineering Directives for guidance concerning the preparation of Traffic Signal Plans.

24. Ownership Index

See DD-301 for more information concerning the preparation of the Ownership Index.

25. Property Maps

See DD-301 for more information concerning the preparation of Property Maps.

26. Soil And Geologic Information Plans

- a. Location of borings, test pits, or other sites where subsurface investigations have been made are to be shown on the Soil and Geologic Information Plans; and
- b. Location and depth of subsurface borings or test pits shall be shown (actual log or test results need not be shown, but a reference should be included indicating where this material may be viewed).

Also see DD-402 for more information concerning the preparation of Soil and Geologic Plans, and their inclusion into the contract plans.

27. Structure Plans per Order Of Station

Reference is made to Section 4, General Plan Presentation, of the latest approved edition of the West Virginia Division of Highways Bridge Design Manual and all addendums thereto, for guidance concerning information required on each sheet of each set of structure plans.

The structure detail plans are to be placed in the contract plans in the order of stationing, with the structure at the lowest station first, and so on. Structure plans shall be placed in the following order: bridge(s) first, followed by retaining wall(s), with box culvert(s) last.

28. Cross Sections

- a. Cross sections shall be at a natural scale, i.e. the vertical scale will equal the horizontal scale.
- b. Cross sections should be taken every 50' for rural projects, every 20' for urban projects, and at major changes in the existing ground line to determine accurately the character and extent of the proposed work.
- c. Intersecting road cross sections, side road cross sections, and ramp cross sections shall be shown on mainline cross section sheets where possible. Where cross sections are provided on separate sheets, designers must check with mainline cross sections for accuracy. A quantity match line is to be placed on such cross sections to ensure quantity estimates are not duplicated or omitted.
- d. Cross sections shall be placed in the following order: mainline cross sections first, followed by ramp cross sections (if applicable), with side road cross sections last.
- e. See DD-705 for general information to be shown on the cross sections. Earthwork shall be computed by the average end area method. Additional information to be shown on the cross sections is as follows, but is not an all-inclusive listing: top and bottom of proposed surface (paved or otherwise) to include shoulders, free-draining base layer (if applicable), aggregate base layer (if applicable), bottom of subgrade layer (if applicable), drainage items such as culverts, wingwalls, ditches/linings, free-draining base trench if applicable, utility crossings and clearances, existing and proposed right-of-way limits, water bodies with edges of water shown, existing roadways with edges of pavement shown, existing structures within the proposed right-of-way, etc.

D. Contiguous Projects

A general plan or layout of contiguous construction projects that are to be constructed with either a different class of funds or by another agency should be included to show the location and effect of the work. (Such details and information necessary to establish their relationship to the project should be shown.) Also, smaller projects “broken out” of a larger design project should show enough information from the adjoining projects or any future project which will incorporate the work of the smaller project to establish their relationship with the work of the smaller project.