



## FDM 15-1-1 General

February 15, 2023

### 1.1 Originator

The Director, Bureau of Project Development is the Originator of this chapter. All questions and comments concerning this chapter should be directed to the following individuals:

- Section 1 (Standards) and 10 (Review) - Proposal Management Section, 608-266-3721.
- Section 5 (Methods) - Methods Development Unit, [support.cae@dot.wi.gov](mailto:support.cae@dot.wi.gov).

### 1.2 Objective

Preparation of contract plans involves preparing a set of detailed drawings showing location and geometric configuration, quantities, and details of work to be performed on a project. The objective of this chapter is to present plan content that will meet the requirements of the Wisconsin Department of Transportation, the Federal Highway Administration, and the contractor.

### 1.3 Composition

The number and type of sheets is dependent on the type and scope of work. All plans shall be E Submitted as E Plans and shall be 11" x 17". All plans shall be black, white, and gray shade (no color). As a minimum, the following shall be included:

- Title Sheet
- General Notes
- Typical Sections or Detail Sheet
- Miscellaneous Quantities Sheet
- Plan Sheet

Other sheets included as needed:

- Project Overview
- Construction Details
- Plan Details
- Right-of-Way Plat
- Plan and Profile Sheet
- Standard Detail Drawings
- Sign Plates
- Structure Plans
- Computer Earthwork Data (Required When You Have Cross Sections)
- Cross Sections

Sheets may be combined when space permits (e.g. Typical Section and Details).

### 1.4 Multiple Projects in One Contract

When multiple project I.D.s are included under one contract, the plans may be prepared in separate plan sets for each project, multiple plan sets for multiple projects, or all the projects included in one plan set (max.9 projects per plan set.)

### 1.5 Numbering of Plans

The numbering system for plans begins with page 1 for the title sheet and increases sequentially through the last page of the plan. Final numbering shall only be completed by the Central Office Plan Examiner when the contract is ready for LET. The title sheet is not numbered.

A system of sections is used to subdivide the contract plan into various subject areas. The sections are identified by numbered tabs in the left and right margins of the plan sheet as shown in [FDM 15-5-5](#). All plan sheets included (except the Title Sheet) shall have these section tabs and be arranged within the plan according to section number. A complete listing of potential contract plan subject areas and associated sections are listed below.

Subject Area	Section
Title Sheet	1
Typical Sections	2
Estimate of Quantities	3
Miscellaneous Quantities	3
Right-of-Way Plat	4
Plan and Profile	5
Standard Detail Drawings	6
Sign Plates	7
Structure Plans	8
Computer Earthwork Data	9
Cross Sections	9

### 1.6 Typical Section and Detail Sheets

When there are 15 or more typical section and detail sheets (Section 2 sheets) a note showing the order of the sheets should be included in the plan. The note should appear on the first sheet of section 2. This is the preferred order of Section 2 sheets when incorporated into the plan:

- General Notes
- Project Overview
- Typical Sections
- Construction Details
- Intersections
- Interchanges
- Contour Maps
- Earthwork Matchlines
- Erosion Control and Drainage
- Storm Sewer and Utilities
- Planting
- Signing
- Lighting
- Traffic Signals
- Pavement Marking
- Traffic Control and Construction Staging
- Fencing
- Alignment

Some of the above sheets may be combined on one sheet as presented in [FDM 15-1-20](#). If combined, the detail highest on the preferred order list shall govern its placement.

## FDM 15-1-4 Preliminary Plan

November 15, 2019

### 4.1 General

A preliminary plan is a graphical representation of the Design Study Report (DSR). It differs from the final plan in purpose since it is intended for designers and reviewers to reach agreement on project concepts whereas the final plan will provide detail for bidding and construction of the project by contractors. Preliminary plans are working documents; hence, they are less formal and are prepared with less detail than are final plans. Because of the varied nature of highway improvement projects, no single set of requirements can apply to all preliminary

plans, therefore, its content should be thoroughly discussed and agreed upon at the project scoping meeting(s).

## 4.2 Design Process

A preliminary plan should be prepared for every project. Preliminary plans should contain enough detail to prepare a R/W plat, if needed, and to prepare an updated cost estimate and construction schedule. The completed preliminary plan is provided to appropriate staff by region design or consultants for review. It is circulated for review, to gain acceptance of, or receive comments on project concepts prior to submitting the DSR for approval/concurrence. The reviewers are then responsible for returning the comments on preliminary plan(s) to region design, or the consultant, within a specified time. Complete this process prior to approval of the DSR. The preliminary plan is not an approval document for the Bureau of Project Development.

The preliminary plan process typically follows these steps.

1. Prepare the plan in accordance with final scoping document/decision.
2. Circulate the completed preliminary plan and DSR to appropriate staff to review for acceptance or comments. Include local units of government if applicable. Indicate response date so all relevant comments can be addressed during this period.
3. Resolve issues and make necessary changes to the preliminary plan and DSR. Preliminary plan changes may be hand written notes and comments since the preliminary plan is intended to be a working document.
4. Submit the DSR for approval/ concurrence. Preliminary plan sheets may be attached to the DSR as exhibits to clarify details difficult to describe when needed.

## 4.3 Content

[Attachment 4.1](#) is a list that identifies items that could potentially be included in a preliminary plan. All items unique to a specific project should be added to the list. This list can be used during project scoping to determine the content of the preliminary plan to be submitted.

## LIST OF ATTACHMENTS

[Attachment 4.1](#) Preliminary Plan Checklist

## FDM 15-1-5 Sample Plan: Improvement Projects

February 15, 2023

This procedure contains examples of plan sheet types. They are illustrated in the linked documents at the end of this section.

The attachments in this procedure have been included as typical examples only and are not intended to cover all situations. They should not be used as standard detail drawings or for establishing project design criteria. See [FDM Chapter 11](#) for detailed design criteria information.

Each subject area is further described by a separate procedure, such as [FDM 15-1-15](#), "Typical Section Sheet." An example Right-of-Way Plat is not included here but is illustrated and described in [FDM 12-15-1](#).

Standard Detail Drawings are illustrated in [FDM Chapter 16](#). Sign plates are shown in the Department's standard sign plate manual:

<https://wisconsin.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/signplate/signplate.aspx>

A listing of codes with sizes are shown in the Department's sign code manual:

<https://wisconsin.gov/dtsdManuals/traffic-ops/manuals-and-standards/signcode/signcode.pdf>

Structure Plan Sheets are described in the Bridge Manual.

## LIST OF DOCUMENTS

[Sample Title Sheet](#)

[Sample General Notes Sheet](#)

[Sample Project Overview Sheet](#)

[Sample Typical Section Sheet](#)

[Sample Detail Sheet \(Construction Details\)](#)

[Sample Detail Sheet \(Intersection Details\)](#)  
[Sample Detail Sheet \(Plan Details\)](#)  
[Sample Detail Sheet \(Curb Ramp Details\)](#)  
[Sample Detail Sheet \(Pavement Grades\)](#)  
[Sample Detail Sheet \(Contour Map\)](#)  
[Sample Detail Sheet \(Earthwork Matchlines\)](#)  
[Sample Detail Sheet \(Erosion Control\)](#)  
[Sample Detail Sheet \(Storm Sewer Plan/Profile\)](#)  
[Sample Detail Sheet \(Planting\)](#)  
[Sample Detail Sheet \(Permanent Signing\)](#)  
[Sample Detail Sheet \(Lighting\)](#)  
[Sample Detail Sheet \(Traffic Signal Plan\)](#)  
[Sample Detail Sheet \(Traffic Signal Phasing\)](#)  
[Sample Detail Sheet \(Pavement Marking\)](#)  
[Sample Detail Sheet \(Traffic Control/Construction Staging\)](#)  
[Sample Detail Sheet \(Detour\)](#)  
[Sample Detail Sheet \(Alignment\)](#)  
[Sample Miscellaneous Quantities Sheets](#)  
[Sample Plan and Profile Sheet](#)  
[Sample Earthwork Quantities Sheet](#)  
[Sample Cross Sections Sheet](#)

#### **FDM 15-1-6 Sample Plan Abbreviated Project**

*November 15, 2021*

Plans for Perpetuation and Rehabilitation with S-1 application Projects and Traffic Maintenance Projects shall be prepared in accordance with [FDM 15-1-5](#). Plans for these improvement strategy type projects having limited scope/complexity may be prepared as abbreviated plans.

The plans should generally only include those plan sheet types necessary to successfully bid and construct the project. The typical types of sheets to include in an abbreviated plan are a title sheet, typical section sheet(s), as needed detail sheet(s), estimate of quantities sheet(s), miscellaneous quantities sheet(s), as needed plan sheets (usually Plan Views), standard detail drawings and structure plans when applicable. Refer to [FDM 15-1-10](#), [FDM 15-1-12](#), [FDM 15-1-15](#) and [FDM 15-1-25](#).

This procedure contains typical examples of the most common plan sheets for these abbreviated plans and are shown in [Attachment 6.1](#), [6.2](#), [6.3](#) and [6.4](#).

Depending on the type of work being completed on any specific project, various Plan Detail Sheets, as shown in the sample sheet documents, may need to be provided to convey specialized information in detail.

#### **LIST OF ATTACHMENTS**

<a href="#">Attachment 6.1</a>	Sample Title Sheet-Abbreviated Plan
<a href="#">Attachment 6.2</a>	Sample Typical Section Sheet - Abbreviated Plan
<a href="#">Attachment 6.3</a>	Estimate of Quantities Sheet – Abbreviated Plan
<a href="#">Attachment 6.4</a>	Miscellaneous Quantities Sheet - Abbreviated Plan
<a href="#">Attachment 6.5</a>	Sample Plan Sheet - Abbreviated Plan

#### **FDM 15-1-10 Title Sheets**

*February 15, 2023*

A [Title Sheet](#) is required on all contract plans. An abbreviated example is also illustrated in [Attachment 6.1](#).

Title sheets for Maintenance Projects shall contain the designation Federal Preventative Maintenance Project in the project description area. The designation of Federal Preventative Maintenance Project shall be deleted from title sheets used for Highway Maintenance Projects and Traffic Maintenance Projects.

### 10.1 Project Title

The project title and subtitle on the title sheet must be consistent with that shown on the DSR, and the Project Summary Screen in FIIPS. Follow the title/subtitle guidelines as set in the Program Management Manual (PMM). Once the DSR is signed the title /subtitle should not be changed.

### 10.2 Project Numbers

The state project number must appear on the title sheet in the box in the top right corner. This number is assigned by the region planning personnel.

If federal funds are involved, a federal project number is required and will be added by central office in the top right corner with the corresponding state project number(s). Each federally funded project will have its own federal ID.

### 10.3 Margin Information

Add the following information in the left margin of the title sheet. Data fields have been established in the plan sheet cell files for this information.

Project ID: enter the state project ID number(s) of all projects in the plan set.

County: enter the county(ies) where the work will be done.

With: enter the project ID's of all additional plan sets that will be let with the subject plan set. Enter "N/A" if the contract consists of only one plan set.

### 10.4 Order of Sheets

This information is for section reference. The plan examiner will line through any sections not used within a plan.

### 10.5 Location Sketch

A base map of appropriate scale, size, and detail to show nearby cities, villages or other landmarks should be used to identify where the project is located without requiring reference to other maps.

These maps should use one of the scales shown below with the project location accented.

**Table 10.1 Project Scales**

Rural:	1 inch = 1 mile
	1 inch = 2 miles
	1 inch = 4 miles
Urban:	1 inch = 500 ft
	1 inch = ½ mile

The following items should also be indicated:

Begin Project and End Project: Describe by station or log distance where applicable, and reference line label. The state project number is not required unless there are two or more projects listed on the title sheet.

Coordinates shall be calculated from a survey and shall be shown on all projects at the "Begin Project" location. They shall be referenced to the Wisconsin Coordinate Reference System (WISCRS) or an alternate approved coordinate system (see [FDM 9-5-10](#)). All coordinates shall be grid coordinates and indicated by "Y" and "X".

Equations: Show all station equations greater than 100 feet.

Place Names: Label counties, municipalities, and towns and ranges, as appropriate.

Road Identifications: On small-scale sketches all county, state, and federal highways should be labeled. On larger scale sketches street names within the immediate area of the project should also be shown. The names of all roads and streets that are referred to in the Special Provisions should be shown.

North Arrow: A north arrow is required. It is also required on every plan sheet depicting horizontal or plan layout

where cardinal direction is important.

Scale of Sketch: A graphic scale shall be placed directly beneath the sketch.

Structure Numbers: Structures on which work is to be done shall be described by their structure number and reference line label showing location.

### 10.6 State Map

Indicate the county or counties in which the project is located by crosshatching the appropriate county areas.

### 10.7 Design Designation

The Design Designation is required to be shown on all projects except those for which the type of work is unrelated to capacity or traffic volume of the highway (e.g., landscaping, erosion control, signing, lighting, maintenance projects, etc.).

For projects requiring a traffic forecast, complete all entries within the design designation block. Only the current year annual average daily traffic (AADT) is required on projects for which no traffic forecast is required. See [FDM 11-5-2](#) for more information on traffic forecasting.

AADT: Annual Average Daily Traffic (indicate the construction year).

AADT: Annual Average Daily Traffic (indicate the design year, see paragraph above).

DHV: Design Hour Volume (indicate the design year).

D: Directional distribution of traffic (design year).

T: Percent of trucks (indicated as percent of AADT).

(Values for DHV, D and T can be found on the [Traffic Forecast](#) webpage on the [WisDOT](#) homepage)

Design speed: Miles per hour (mph)

ESALS: The number of Equivalent Single Axle Loads (ESALS) the design lane is expected to accommodate during the design life of the project. This value is calculated as follows:

$$ESALS = 365 \times A \times L \quad \text{where}$$

"A" is the Traffic Analysis Period in years and

"L" is the Design Lane Total ESALS per day.

Both "A" and "L" can be obtained from the WisPave pavement design software. See [FDM 14-15-10](#).

Note: An ESALS value is required on only those improvement projects that include Asphaltic or Concrete pavements. For all other projects just note "N/A."

### 10.8 Net Length of Center Line

The total net length of center line shall be listed for every contract plan to the nearest thousandth of a mile. To determine Net Centerline, see PMM 05-10-10 Appendix A.

Log distance measured to the nearest one hundredth of a mile may be used as the basis for measuring net centerline length.

List the net centerline length for each project if there are two or more projects.

List 0.000 for the following situations:

- The improvement crosses the project route.
- The improvements are intermittent along the route or routes (spot locations only).
- The improvements involve park roads, institution roads, waysides, or rest areas.
- The improvement involves miscellaneous construction (e.g. highway lighting, pavement marking).
- When dual roadways are built at separate times, the roadway built along the auxiliary reference line will have zero length.
- Maintenance Perpetuation and Rehabilitation with S-1 application Resurfacing projects will have a net centerline length while Perpetuation Bridge and Traffic Maintenance Roadway projects will have 0.000.

### 10.9 Conventional Symbols

Commonly used symbols are preprinted on the title sheet. Additional symbols may be found in [FDM 15-5-30](#) and should be added below the preprinted symbols on the title sheet when appropriate.

## 10.10 Signatures

The Department establishes the following meanings for the signatures that appear on the title sheet.

**Table 10.2 Title Sheet Signatures**

<b>1. Consultant Prepared Plans</b>		
Who	Action	Meaning
a) Consultant	Prepared By	By signing and sealing, the Consulting Engineer is attesting to the engineering integrity and accuracy of the plan, including proper concern for public health, safety and welfare. This action constitutes the practice of engineering and the responsibilities attendant thereto, per Chapter 443 Wisconsin Statutes.
b) Municipality	Accepted	Municipality is accepting the plan as to concept, general intent, general design criteria, line, grade and related details.
c) Region	Approved By	In approving a consultant plan the region is generally approving the concept, general project intent, etc, as well as approving the project for submittal and letting.
<b>2. Department Prepared Plans</b>		
The Department practices engineering and accepts the responsibilities attendant to Chapter 443, Wisconsin Statutes.		
Who	Action	Meaning
a) Region	Prepared By or Checked By	Names (not initials) of persons closest to the work should appear in these blocks. Need not be a Professional Engineer.
	Approved By	Endorses or accepts concept design criteria, and general project intent as being appropriate. region person "in responsible charge of project" should sign. Must be a Professional Engineer. Discretionary – Region Director designates level.
<b>3. Municipality Prepared Plans</b>		
Who	Action	Meaning
a) Municipality	Prepared By	Same as Consultant.
	Accepted	Municipality is accepting the plan as to concept, general intent, general design criteria, line, grade and related details.
b) Region	Approved By	In approving a municipality plan the region is generally approving the concept, general design criteria, general project intent, etc., as well as approving the project for submittal and letting.

## 10.11 Signature Blocks

All STH and connecting highway P.S.& E.s submitted to central office shall use the signature block shown in [Figure 10.1](#). This includes all construction, traffic and maintenance projects. [Figure 10.1](#) is reserved for WisDOT staff only.

STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
PREPARED BY	
Surveyor	_____
Designer	_____
Project Manager	_____
Regional Examiner	_____
Regional Supervisor	_____
APPROVED FOR THE DEPARTMENT	
DATE: _____	_____ (Signature)

**Figure 10.1 Signature Block for STH & Connecting Highway Projects**

The signature block in [Attachment 10.1](#), Detail B is to be used for projects on local roads:

- Approved by the person in responsible charge in the region as designated by the Region Director.

See [FDM 15-5-5](#) for title sheet cells containing these signature blocks. Other combinations of signature blocks may be required depending upon the circumstances.

The signature block also provides for the names of region personnel directly involved in the preparation and processing of the plans. These must be filled in.

Two other types of signature blocks may also be required, as shown in [Attachment 10.2](#), Details A and B. These blocks should be placed above the standard signature block. Note: When the plans have been prepared by a consultant, the "Original Plans Prepared By" portion of Detail A would be replaced by Detail B.

- Plans Prepared and/or to be Signed by Cities, Villages, Counties or Towns (See [Attachment 10.2](#), Detail A): If the plans were prepared by the city, village, county or town, the signature and professional seal of the professional engineer in responsible charge must be included. The plans shall also be signed by the city, village, county or town official.
- Plans Prepared by Consultants (See [Attachment 10.2](#), Detail B): If the plans were prepared by a consultant, the consultant's name, professional seal, and signature must be included. The consultant's logo may also be shown in this signature block if it does not interfere with the information that is required to be shown on a title sheet.

## 10.12 Coordinates

Place the following notes on the title sheet based on the coordinate system used in the plan.

- *Horizontal positions shown on this plan are Wisconsin Coordinate Reference System (WISCRS), (County name) County, NAD83 (year), in U.S. Survey Feet. Positions shown are grid coordinates, grid bearings, and grid distances. Grid distances are the same as ground distances.*
- *Elevations are referenced to NAVD 88 (year). GPS derived elevations are based on GEOID (xx)*

The Region Survey Coordinator shall be consulted for proper verbiage when any other coordinate systems are used.

## LIST OF ATTACHMENTS

- [Attachment 10.1](#)      Signature Blocks for WisDOT Projects
- [Attachment 10.2](#)      Signature Blocks for Local Road Projects

## FDM 15-1-12 General Notes, Railroad, and Contacts Sheet

July 13, 2018

Sheet 2 of the plan should always have the Utility Contacts listed. General Notes, abbreviations, and typical sections may be included as space permits or on following sheets.

## 12.1 General Notes

Information contained in the General Notes is intended to supplement, but should not duplicate, the Special Provisions or Standard Specifications. General notes should not contain material that is properly a part of the Standard Specifications, the Special Provisions, a typical section, a detail, the miscellaneous quantity sheets or



the plan sheets. They should be kept to an absolute minimum. The following is a sample list of general notes that are commonly used:

- No trees or shrubs are to be removed without approval of the engineer.
- Disturbed areas within the right-of-way, except the areas within the finished shoulder points, shall be fertilized, seeded and mulched.
- X-inch HMA pavement shall be constructed with an x-inch upper layer and x-inch lower layer.
- The (paving, grading) contract shall include the backfill for the area behind the curb and gutter (specify appropriate contract when curb and gutter and grading are in separate contracts).
- The locations of existing and proposed utility installations as shown on the plans are approximate. There may be other utility installations within the project area that are not shown.

## 12.2 Abbreviations

The use of abbreviations in the plan should be kept to a minimum.

Abbreviations found within the plan that would not be readily recognized by the ordinary user of a highway plan shall be shown in an abbreviation listing on the first Typical Section Sheet. Other abbreviations used in the plan shall not be shown on the list. Right-of-way plat abbreviations shall not be included in this listing. [FDM 15-5-25](#) contains a list of standard abbreviations.

## 12.3 Utilities / Railroads Listing

A list of all utility companies, cooperatives, municipal utilities, and railroad companies whose facilities are located within the right-of-way shall be included on the first general note/utility contact sheet. The following shall be included:

1. Utility name
2. Address
3. Telephone number, including area code
4. Contact person or department
5. E-Mail address for the contact.

For railroad companies, the contact person is their local road master. The above information for road masters is available from either the region rail coordinator or the region project development section.

## 12.4 DNR Liaison

All projects require a WDNR area liaison, address, E Mail address, and phone number. A link to the WDNR liaison contacts is in [FDM 5-10-1](#).

See [Sample General Notes Sheet](#).

## FDM 15-1-14 Project Overview

November 15, 2021

Projects of a complex nature with interchanges, frontage roads and numerous streets and/or side roads should have an overall view of the entire project on one sheet. It should show and label all the highways, streets, ramps, frontage roads, city or village limits, rivers, landmarks and other pertinent information relating to project orientation.

See [Sample Project Overview Sheet](#).

## FDM 15-1-15 Typical Section Sheet

November 15, 2021

A [Typical Section Sheet](#) is required on all contract plans other than specialty type projects such as planting, pavement marking and signing, etc. The typical sections for structures are located with the structure plans.

A pavement boring log shall be provided on the typical section sheet for projects containing item(s) such as; Removing Asphaltic Pavement Milling, Pulverize and Relay, or Rubbelizing.

An abbreviated example is also illustrated in [Attachment 6.2](#).

Each typical section sheet shall have a title block along the bottom edge of the sheet. The title block shall include the State Project Number(s), space for a sheet number and title.

An existing typical section shall be shown when work is being done on the pavement or shoulder, the pavement

is being removed or the pavement or shoulder is being used to carry traffic.

A main line finished section shall be shown for all applicable projects. Additional typical sections shall be shown for side roads, frontage roads, ramps, driveways and temporary roads where applicable.

Each typical section shall utilize the following:

- Scale: The width of section shall be selected to provide clarity of detail. A horizontal scale of one-inch equals five feet is often used on plan sheets. The vertical scale is normally exaggerated such as one-inch equals two feet.
- Slopes: This is expressed as a ratio of horizontal distance to vertical distance. All slopes between edges of shoulder and original ground, and those between edge of shoulders in the median should be labeled. Where slopes are variable, maximum and minimum should be labeled also. A typical section should illustrate both cut and fill sections.
- Cross Slope: This is the amount of rise or fall indicated in percent. The gradient of the finished surface, shoulders and subgrade should be indicated.
- Width: The width of lanes, shoulders, roadbed, ditches, clear zone and median should be shown to the nearest tenth of a foot.
- Material Identification and Thickness: The thickness and type of materials constituting the pavement structure such as X" HMA Pavement XXX or X" Base Aggregate Dense 1 1/4-Inch shall be shown. For urban sections, other elements such as sidewalk and curb and gutter shall also be shown. Material thicknesses shall be shown to the nearest one-quarter inch (not decimals).
- The limits of topsoil, salvaged topsoil, fertilizer, seed or sod shall be shown.
- Where variations in material thickness are proposed, these may be shown in tabular form indicating thickness and station limits.
- Pavement ties, tie bars, underdrains, geotextile fabrics, islands, concrete barriers, removals, etc. shall be shown when they are required in the construction.
- Location Limits: Typical sections shall be titled, and stationing limits indicated. Minor equations may be omitted. Station limits need not be shown where there is only one typical section per roadway.
- Vertical and Horizontal Reference: All typical sections in plans containing Plan and Profile information shall show the relationship between the typical section and the grade line profile shown on the Plan and Profile Sheet(s) with a point referred to on profile note. The vertical relationship between the typical section(s) and the cross sections when included in the plan shall also be shown by a point referred to on cross section note unless indicated on the Cross-Section Sheets. Typical sections should also show their relationship to the horizontal alignment reference line.
- Doweled Concrete Pavements: All doweled concrete pavements shall have a notation indicating that dowels are required. An example of such a notation is: Concrete Pavement 10-inch (Doweled).
- Tined Concrete Pavements: All concrete pavements to be tined shall include a notation indicating that tining is required. An example of such a notation is: Concrete Pavement 10-inch (Doweled and Tined).

## **FDM 15-1-20 Detail Sheets**

*February 15, 2023*

Detail sheets, when needed, immediately follow or are combined with typical section sheets in a contract plan. Information placed on these sheets supplement or complement the plan and profile sheets or other elements of the plan. Details will be referred to as construction details or layout details.

Construction details, when needed, focus on a particular item or associated items in a specialized area. Typical examples of construction details would be concrete steps, riprap, sod, flumes, pipe underdrain and stone walls.

Layout details, when needed, show the detail and layout for a sizeable area of construction. Typical examples of layout details would be intersections, interchanges, contour maps, earthwork matchlines, erosion control and drainage, storm sewer and utilities, planting, signing, lighting, traffic signals, pavement marking, traffic control and construction staging, fencing and alignment.

Each detail sheet shall have a title block along the bottom edge of the sheet. The title block shall include the State Project Number, space for a sheet number, and the title of the major item or items shown on that sheet.

Examples of Detail Sheets are illustrated in [FDM 15-1-5](#).

Abbreviated plan special details are not typically required when intersections, guardrail, etc., are not to be upgraded or modified. If any such work is incorporated in the contract, the details should be included.

## 20.1 Construction Details

Construction details are required for bid items that require detailing not covered in the standard detail drawings or other plan elements.

There is no standard format for construction details. They should be kept simple and should avoid duplication with standard detail drawings or plan and profile sheets. Choose a scale that will sufficiently display the detail. A title is required for each detail. If more than one detail is shown on a sheet the details should be separated by lines.

If control points and associated tie points are not shown on alignment sheets or plan and profile sheets, a construction details showing these shall be added. The control points should be shown graphically with Wisconsin State Plane Coordinate System ground coordinates (N, E) or Wisconsin County Coordinate system coordinates (X, Y) shown on the appropriate sheets.

Certain specialized construction details for projects such as planting, traffic signals, signing, pavement marking, electrical work, rest areas and waysides are available through the Bureau of Traffic Operations and can be obtained upon request.

When a beveled structural plate culvert (circular or arch shape) is used in a plan, a detail should be included which indicates the total structure lengths (top and bottom) given to the nearest foot. Also, to be indicated are span and rise (or diameter), radii of curvatures, skew angle (if not 90° to reference line), plate thickness and corrugation (2-inch x 6-inch etc.), and end treatment (angles of bevel and/or skew). Include details of end protection (sod, riprap, or concrete). Beveled ends should be reinforced with masonry or concrete collars when the bevel is flatter than 2:1 and the skew angle exceeds 20°.

See [Sample Detail Sheet \(Construction Details\)](#).

## 20.2 Intersection and Interchange

Intersections, other than the standard types shown on the standard detail drawings, shall be shown on detail sheets separate from the plan and profile sheets.

Interchange details shall also be shown on detail sheets separate from the plan and profile sheets.

The intersection and interchange details shall show the pavement and shoulder widths, curb and gutter, curve radii, pavement grades, manholes and inlets, culvert pipe, islands, medians, tapers and other pertinent information. The scale should be 1"=50' or larger.

All interchange details or other layout details not showing the full interchange or layout details on that sheet shall have a small line diagram of the full interchange or layout detail with the detailed portion shown by a darker line or other distinguishing designation on each layout detail sheet.

See [Sample Detail Sheet \(Intersection Details\)](#), [Sample Detail Sheet \(Plan Details\)](#) and [Sample Detail Sheet \(Pavement Grades\)](#).

## 20.3 Curb Ramps

See [FDM 11-46-10](#) for design requirements of curb ramps including a discussion of incorporating the Standard Detail Drawings (SDD 8D5) and curb ramp detail sheets that contain site specific dimensions, elevations, and grades into the plan. Per [FDM 11-46-10.2.1](#), curb ramp detail sheets are required for work on curb ramps. Curb ramp detail sheets shall show location information, elevations, slopes, an elevation table, general notes, and other pertinent information that the designer deems important to curb ramp construction.

See [Sample Detail Sheet \(Curb Ramp Details\)](#).

## 20.4 Contour Maps

Contours may best exhibit the finished grade elevations of intricate work such as intersection areas, rest areas, waysides, interchanges, special landscape grading, and special drainage grading.

Special contour maps, when provided, should include the existing features and the finished contours of the proposed improvement. Contour lines should not obscure pertinent topographic or design features. The contour lines should be labeled at the appropriate intervals.

See [Sample Detail Sheet \(Contour Map\)](#).

## 20.5 Earthwork Matchlines

Interchanges and complex intersections should have an earthwork matchline detail for use in computing cut and fill yardage. The details may be shown separately on a detail sheet or combined with another detail. It should show the stationing and distances to the matchline and other pertinent information necessary to compute the cut

and fill yardage. This detail is not necessary if the matchlines can be properly shown on the cross sections.

See [Sample Detail Sheet \(Earthwork Matchlines\)](#).

## **20.6 Erosion Control and Drainage**

Erosion control and drainage shall be shown on separate detail sheets or on the plan sheets. Projects with complex erosion control and drainage patterns, such as interchanges, should be shown on a separate detail sheet. The detail should show the drainage pattern with direction of flow, drainage structures and erosion control features. Erosion control features consist of silt fence, erosion mat, erosion bales, sod, reinforced sod, riprap, intercepting embankments, ditch dikes, paved flumes and other necessary erosion control items. The slope intercepts should also be shown. See [FDM 10-5 Attachment 60.1](#) for a checklist of items required in an erosion control plan.

See [Sample Detail Sheet \(Erosion Control\)](#).

## **20.7 Storm Sewer and Utilities**

The plan and profile of storm sewers and utilities shall be shown on detail sheets separate from the plan and profile sheets.

The plan view shall show the location of manholes and inlets, existing underground utilities, storm sewers and other information pertinent to the storm sewer system. The scale should normally be 1"=50' or larger.

The profile shall show the existing ground, existing utilities if available, flow line grades, the profile of the storm sewer, manholes and inlets, the size, type and grade of the storm sewer, and the manhole and inlet grades. The scales should normally be 1"=50' horizontally and 1"=5' vertically or larger.

See [Sample Detail Sheet \(Storm Sewer Plan/Profile\)](#).

## **20.8 Planting**

Planting is the furnishing and planting of trees, shrubs, vines, perennial plants and special seed mixtures.

When planting is included under a contract with other construction operations such as grading, base, paving, etc., the planting shall be shown on detail sheets separate from the plan and profile sheet. The planting may be combined with other details such as intersection and interchange details, when appropriate.

If the planting is let as a separate contract, the planting layout detail sheets will become the plan sheets.

Planting layout details shall show the location of plants and plant beds, species and size of plants, the quantity of each planting, root condition and other pertinent planting information. The common name for trees, shrubs and vines shall be used on the planting layout details and shall be referenced to the plant data chart.

See [Sample Detail Sheet \(Planting\)](#).

## **20.9 Permanent Signing**

When signing is included under a contract with other construction operations such as grading, base, paving, etc., the signing shall be shown on detail sheets separate from the plan view or plan and profile sheets. The signing may be combined with other details such as intersection and / or interchange details, when appropriate.

If signing is let as a separate contract, the signing layout detail sheets will become the plan.

A pictorial drawing of the signs shall appear on the sign layout sheets. A legend with pictorial drawings on each sign layout sheet is also acceptable. Each sign pictorial drawing shall be designated by standard sign code as shown on the department's Sign Plate book. Number each sign location on the sign layout sheet to refer to the signing miscellaneous quantities. Show the sign size and/or sign size code below the sign code. Specialized or additional information about a sign can be shown on either the miscellaneous quantity sheet or the sign layout sheet. Notes showing existing signs, moving signs and removing signs should appear on the signing plan sheet only.

Permanent signing miscellaneous quantities shall show a location referencing the sign to the sign layout sheet; a sign offset distance for Type 1 signs only (if applicable), sign code, sign size, sign message, and all applicable signing and post quantities. Any remarks/comments concerning permanent signing can be noted in the miscellaneous quantities or on the signing plan sheet. Contact the region signing/marketing Engineer for miscellaneous quantity preferences.

See [Sample Detail Sheet \(Permanent Signing\)](#) and [Sample Miscellaneous Quantities Sheets](#).

## **20.10 Lighting**

When lighting is included under a contract with other construction operations such as grading, base, paving,

etc., the lighting shall be shown on detail sheets separate from the plan view or plan and profile sheets. The lighting may be combined with other details such as the intersection and/or interchange details, when appropriate.

If the lighting is let as a separate contract, the lighting layout detail sheets will become the plan sheets.

Lighting lay-out details shall show the location of conduits, cables, wires, concrete bases, poles, mast arms, luminaires, transformers, pull boxes, circuits, pole identification numbers, lighting unit codes, control cabinets, existing electrical facilities and other pertinent lighting information.

See [Sample Detail Sheet \(Lighting\)](#).

### **20.11 Traffic Signals**

Traffic signal layout details shall be shown on detail sheets separate from the plan view or plan and profile sheets.

The traffic signal detail shall show the location of pull boxes, controllers, concrete bases, conduit, standards, poles, mast arms and loop detectors; the location, arrangement and direction of signal heads; the size of such items as conduit, loop detector, etc; and other pertinent traffic signal information.

State owned traffic signals shall be signed (initialed) and dated by both the Region Signals Engineer and the State Traffic Signals Systems Engineer.

Sequence of operation, controller logic, detector logic and cable layout shall be shown in tabular form.

See [Sample Detail Sheet \(Traffic Signal Plan\)](#) and [Sample Detail Sheet \(Traffic Signal Phasing\)](#).

### **20.12 Pavement Marking**

When pavement marking is included under a contract with other construction operations such as grading, base, paving, etc., the pavement marking shall be shown on detail sheets separate from the plan view or plan and profile sheets. The pavement marking may be combined with other details such as the intersection and/or interchange details, when appropriate.

If the pavement marking is let as a separate contract, the pavement marking layout detail sheets will become the plan sheets.

Intersections, gore areas, parking lots, paved medians and lanes with words and arrows are typical areas where pavement marking layout details are required.

On resurfacing contracts where there is no change in either the horizontal or vertical alignments or the gravel or paved shoulder are not changed the Locating No Passing Zone bid item typically can be omitted. Before omitting the No Passing Zone bid item contact the region marking engineer to confirm no safety issues exist that may warrant including the Locating No Passing Zone bid item.

On contracts that contain changes in horizontal or vertical alignment or changing the width of shoulder include the Locating No Passing Zone and Moving Signs Type II bid items to the contract. On contracts that contain the Locating No Passing Zone bid item and have a 55 mph posted speed, the designer **shall** contact the Region Signing/Marking Engineer to determine the correct No Passing Zone Sight Distance to be used. STSP 648-005 **shall** be inserted into the Special Provisions with the correct No Passing Zone Sight Distance for 55 mph posted speed roadways.

See [Sample Detail Sheet \(Pavement Marking\)](#).

### **20.13 Traffic Control/Stage Construction**

Traffic control/stage construction details shall be included in all plans except where the necessary information is provided by the standard detail drawings. These details shall be shown on detail sheets separate from the plan view or plan and profile sheets. These details shall include the location of traffic control signing, pavement markings, drums, barricades, safety barriers, arrow boards, temporary pavement marking, construction areas, direction of traffic and other pertinent traffic control information. Traffic control devices that are in place and the party responsible for their maintenance should be noted on the details.

The location of established detours shall be shown on the traffic control/stage construction layout details. Work being performed on the detour by parties other than the contractor should be noted on the details.

The sign layouts and sign code numbers used in the traffic control layout details shall be in accordance with the Federal Highway Administration Manual of Standard Highway Signs. If a desired sign is not contained in the Manual, then a department sign plate shall be specified.

Usually all warning signs in construction zones have an orange background. The Federal Highway Administration Manual of Standard Highway Signs lists most of the orange background signs commonly used in construction zones with a beginning sign code of "W". However, there are signs with other background colors listed in the Manual with a beginning sign code of "W" that may be used in construction zones. These signs shall be labeled with a beginning code of "WO".

The traffic control/stage construction layout details shall include the following notes when appropriate.

1. All signs are 48-inch x 48-inch unless otherwise noted. (This note may be used in place of labeling the size of each sign. Any other size of sign must be individually labeled.)
2. "WO" signs are the same as "W" signs except the background is orange.

See [Sample Detail Sheet \(Traffic Control/Construction Staging\)](#) and [Sample Detail Sheet \(Detour\)](#).

#### 20.14 Fencing

Fencing layout details shall be included on projects where the right of way is required to be fenced. The details may be shown on separate detail sheets, combined with other details or shown on the plan sheets. The location of the fence shall be referenced with dimensions to the reference line or right of way line.

#### 20.15 Alignment

For projects with complex alignment, such as interchanges, a separate alignment detail shall be included. The detail should show reference lines, survey lines, stationing (and equations), points of intersection, points of curvature, points of tangent, bearings, curves, etc. Curve data, offset data, coordinates referenced to the Wisconsin Grid Coordinate System, ties, and other pertinent data should also be included.

The control points shall be shown graphically with Wisconsin State Plane Coordinate System ground coordinates (N, E) or Wisconsin County Coordinate System coordinates (X, Y) so the initial layout construction staking can be performed.

See [Sample Detail Sheet \(Alignment\)](#).

#### 20.16 Other Details

Layout details may also be required showing environmentally sensitive areas, soil boring or sounding locations, pipe underdrain and other pertinent information necessary for the bidding of the contract and construction of the highway. These details may be combined with other details, when appropriate.

### FDM 15-1-25 Estimate of Quantities Sheet

November 15, 2021

An Estimate of Quantities Sheet is required for all bid contract plans. It is prepared by the Central Office Plan Examiner and inserted into the final plan. The Estimate of Quantities is a listing of all the bid items in the project(s) and their respective quantities. A sample is shown in [Attachment 6.3](#).

For Local Force Account and state forces contracts, the Estimate of Quantity list shall be manually prepared as shown in Figure 25.1. It shall be a one lump sum item for the type of work that is being performed. The list should be placed in a convenient place on the title sheet or second sheet of the plan.

Item Title		TRAFFIC SIGNALS
	Item No.	SPV.0105.01
	Unit	LUMP SUM
PROJECT 2290-01-02		1
Total		1

**Figure 25.1 Estimate of Quantities**



**FDM 15-1-30 Miscellaneous Quantities Sheet**

November 15, 2021

Miscellaneous quantities sheets are required on all projects that have bid items needing a detailed breakdown. See [Sample Miscellaneous Quantities Sheets](#) for an example of miscellaneous quantities sheets.

Each miscellaneous quantities sheet shall have a title block along the bottom edge of the sheet. The title block shall include the State Project Number(s) and space for a sheet number. If the title Miscellaneous Quantities is not preprinted on the sheet, it should be included in the title block.

A detailed breakdown of bid items is required to readily show the location, size, quantity and other pertinent information. It is needed to supply information to those who review the plans, bid the contract, supply materials, construct the project, etc. Examples of work requiring detailed breakdown of bid items on the miscellaneous quantities sheet are removals, earthwork, bases, pavements, drainage structures and incidental construction items. These listings shall be placed on the miscellaneous quantities sheet in numerical order of their bid item numbers beginning at the top left of the first sheet.

A detailed breakdown of structure items should be shown on the structure plans and not repeated on the miscellaneous quantity sheets.

Bid items such as Finishing Roadway, Maintenance and Repair of Haul Roads, Mobilization and some other lump sum items are not required to be shown on the Miscellaneous Quantities Sheet. "Lump Sum" or "Each" items such as Grading and Shaping Intersections or Grading Shaping and Finishing for Barrier Terminals shall be shown with the estimated quantities of materials incorporated into the item.

If a bid item is included in more than one category in the estimate, the distribution of the item by categories shall be shown on the miscellaneous quantities sheet. A subtotal for each category shall also be shown as well as an overall total for the bid item. See [Figure 30.1](#).

The bid items shall also be separated by construction stages and projects. Bid item subtotals shall be shown for each project.

The typical format for a given item should include the bid item number, description, unit of measure, quantity, category, project number (if more than one project), construction stages, remarks, and any other information that may clarify the quantities. When showing categories, show the complete four-digit category number (e.g., 0010, 0020, etc.).

A detailed earthwork summary table shall be shown in the miscellaneous quantities section of the plan for all projects involving grading. The earthwork summary table is a summary of the data from all of the earthwork data tables and identifies the contract quantities of all earthwork bid items. Each earthwork data table should be represented by one line in the earthwork summary table. The earthwork summary should identify for each segment: earthwork division, station to station location, applicable volumes of common excavation (cut and EBS excavation), salvaged/unusable pavement, available material, marsh excavation, rock excavation, reduced marsh in fill, reduced EBS in fill, expanded marsh backfill, expanded EBS backfill, expanded rock, unexpanded fill, expanded fill, mass ordinate, waste, borrow, and any comments needed to clarify the information in the table. If a project includes more than one division of earthwork, each division will be identified and treated as a separate entity in the earthwork summary table.

The following is further clarification on each of these columns in the earthwork summary table:

1. **Division** - Typically a project will only have one earthwork division. Staging needs or physical barriers may require a project to be separated into more than one division.
2. **Station to Station and Location** – Identifies the segment of the earthwork being analyzed in the line of the summary table. Each line in the summary table will correspond to the totals for each earthwork data sheet.
3. **Common Excavation (Cut and EBS)** – Cut includes the sum of all items, except EBS, that are paid for as common excavation (also includes all salvaged/unusable pavements). EBS includes the volume of any identified or estimated excavation below subgrade (EBS). Both "cut" and "EBS" are paid for as common excavation.
4. **Salvaged / Unusable Pavement material** – Include this column only if there is salvaged / unusable concrete or asphalt pavement that is included in the common excavation. This column identifies the quantities of any salvaged or other concrete or asphalt pavement that will not be used in the fill.
5. **Available Material** – Include this column only if there is salvaged/unusable pavement that will not be used in the embankment. This includes only the portion of the cut that is available to be used in the embankment. (Salvaged/unusable pavements that will not be used in the embankment are subtracted from the "cut").

6. **Marsh Excavation** – Include this column only if there is marsh excavation specified in the contract.
7. **Rock Excavation** – Include this column only if there is rock excavation specified in the contract.
8. **Reduced Marsh or EBS in Fill** – Include these columns only if marsh or EBS excavation will be used in the fill outside of the 1:1 slope. These columns identify the volume that the marsh or EBS will occupy in the fill.
9. **Expanded Marsh Backfill** – Include this column only if there is marsh excavation identified in the contract. This column identifies the volume of material required to backfill the marsh. This accounts for the shrinkage of the backfill material, the displacement of the marsh during the excavation and backfilling process, and the placement of one foot of select borrow or granular backfill placed above the marsh if the contract specifies granular backfill or select borrow for the marsh. The expanded marsh backfill is computed by multiplying the volume of marsh excavation times the marsh backfill expansion factor. If granular backfill or select borrow is specified for backfilling the marsh, this represents the quantity of the granular backfill or select borrow to backfill the marsh and is not included in the mass ordinate. If common or borrow is designated to be used as backfill, this quantity is used in the mass ordinate.
10. **Expanded EBS Backfill** – Include this column only if there is EBS specified in the contract. This column identifies the volume of material required to backfill the EBS. This volume is computed by multiplying the volume of EBS times the EBS expansion factor. If the contract specifies granular backfill or select borrow for backfill of EBS, this represents the required quantities of the granular backfill or select borrow required to backfill the EBS and is not included in the mass ordinate. If common excavation or borrow is specified to be used to backfill the EBS, this quantity is used in the mass ordinate.
11. **Expanded Rock** – Include this column only if there is rock specified in the contract. The expanded rock is the volume that the rock excavation will occupy in the fill. This volume is computed by multiplying the volume of rock excavation times the rock expansion factor.
12. **Unexpanded Fill** – This is the volume of fill identified in the earthwork data sheets for the segment being analyzed.
13. **Expanded Fill** – This is a visualization of the fill expanding to account for the percent increase in the volume of cut and / or borrow excavation, as measured in its original location that is needed in the fill. This is computed by multiplying the unexpanded fill (minus all rock, EBS, and/or marsh designated as fill) times the fill expansion factor.
14. **Mass Ordinate** – Indicates the volume of excess or deficient excavation required for the segment being analyzed. The mass ordinate is computed by deducting the expanded file from the "Available Material" or "Cut" if the "Available Material" column is not used. A plus value indicates the volume of waste, a minus value indicates the volume of borrow that is needed to complete the line segment being analyzed.
15. **Comments** – This column is used for any comments that are needed to clarify the information on the data sheet.

It is recommended that the earthwork be designed and computed using the Civil 3D "Earthwork Process" and that the earthwork summary table, in the miscellaneous quantities section of the plan, be created using the excel spreadsheet in [FDM 11-5-10](#). If this process is not used, the computations and the earthwork summary table must be similar and identify the same information.

The quantities on the earthwork summary table, in the miscellaneous quantities section of the plan, should be compared to the quantities on the earthwork data sheets. The earthwork summary table shall also include any comments or notations needed to supplement or clarify the information contained in the table. All discrepancies between the earthwork summary table and the earthwork data sheets should be explained in these notes.

An example of the earthwork summary table is illustrated in the [Sample Earthwork Quantities Sheet](#).

Miscellaneous areas of asphaltic pavement such as driveway aprons, side roads, etc. should be included on the miscellaneous quantities sheet under the appropriate bid item. Example: 10 P.E.'s at 5 ton = 50 tons. Whenever a plan includes the installation of culvert pipe, it shall be listed on the Miscellaneous Quantities Sheet. The pipes shall be listed under separate headings entitled Cross Drains and Minor Side Road, Private Entrance, and Slope Drains. The pipe culvert list should include, as a minimum, the pipe location, quantity and materials information necessary for ordering the drainage items. The required thicknesses of metal culvert pipe and the class of concrete culvert pipe should be clearly shown. If corrugated metal pipe with 3-inch x 1-inch corrugations is required, or if there are culvert pipes requiring Class B bedding, this should also be indicated. When Structural



Plate Pipes or Structural Plate Pipe Arches are used, the end treatment information on the culvert list should be supplemented with a drawing on the detail sheet as per [FDM 15-1-20](#).

BASE AGGREGATE DENSE 1 ¼ - INCH		
Item 305.0120		
CATEGORY	LOCATION	TON
0010	200+25 – 230+31	10 398
0010	30+90'G' – 39+40'G'	3294
<u>Sub-total (0010)</u>		13 692
0020	15+18'Y' – 16+05'Y'	543
0020	14+12'H' – 16+10'H'	2003
<u>Sub-total (0020)</u>		2546
Project total		16 238

**Figure 30.1 Sample Miscellaneous Quantities by Category**

## **FDM 15-1-35 Plan View or Plan and Profile Sheet**

November 15, 2021

A plan and profile sheet is required on most Rehabilitation and Modernization Improvement Strategy contract plans. A plan view sheet is typically all that is needed on Perpetuation and Rehabilitation with S-1 application contract plans. An example is illustrated in the [Sample Plan and Profile Sheet](#) and in [Attachment 6.3](#). The CADDs and Civil 3D programs produce sheets with different borders and title blocks than are shown in the above examples but they are acceptable.

Each Plan View or Plan and Profile Sheet shall have a title block that shall include the State Project Number(s) and space for a sheet number. This title block is along the bottom edge of the sheet.

When abbreviated plan sheets are necessary, they may be prepared as conventional plan sheets or as line diagrams. The plan sheets should include the centerline stationing, structure notations, stationing of exceptions and equations and side road locations. Log distance may be used in lieu of centerline stationing on highways where centerline stationing cannot be established from existing plans or surveys.

Superelevations are typically not revised with a maintenance overlay so curve and superelevation data is not required unless changes to the superelevation rate are proposed.

### **35.1 Scales**

The scale to be used for plan and profile sheets should be adequate to show the necessary details. This is governed by the topography to be shown and the complexity of the work. Plans should be drawn to a horizontal scale of one-inch equals 100 feet, 50 feet or 20 feet. A scale of one-inch equals 20 feet is normally used for an urban project.

Profiles shall be drawn to the same horizontal scale as the plan, but the vertical scale is usually ten times that of the horizontal scale.

### **35.2 Plan Requirements**

The plan shall show the centerline or other reference line of the proposed roadways, side roads, interchange ramps, frontage roads, rest areas, etc. When the centerline of the proposed roadway is not coincident with the survey base line, their relationship should be indicated unless the relationship is indicated elsewhere. Where independent centerlines or reference lines are used, only the general relationship between the two should be indicated.

**Stationing** - Stationing of all roadways shall increase from south to north or west to east based on the cardinal direction of the highway route.

When multiple alignments are required (ramps, alternate alignments, etc.) an identifier is often used to label each alignment. These alignment identifiers shall consist of 1 or 2 upper case alpha characters – no numeric characters. The format shall show the alignment identifier following the numeric stationing, e.g. 123+45 XX where XX is the alignment identifier.

**Bearings** - The bearing of all centerlines or reference lines shall be shown.

**Station Equations** - Station Equations shall be shown.

**Begin Project and End Project Locations** - Begin Project and End Project Locations should be noted and described by stationing or log distance where appropriate. The State Project Number should also be given if two or more projects are in a contract plan.

**Begin Construction and End Construction Limits** - Begin Construction and End Construction Limits should be indicated if different than Begin and/or End Project Locations. The construction limits for side roads should also be shown.

**Coordinates** - Coordinates referenced to the Wisconsin Coordinate Reference System (WISCRS) or approved coordinate system shall be shown for the beginning of all projects. If the centerline was tied to the Wisconsin Coordinate Reference System by a field survey traverse, the coordinates for points of intersection (PI's) and the end of the project shall also be shown.

**Curve Design Data** - Curve Design Data are required unless indicated elsewhere. Curve data should include the following:

- PI station
- < (Deflection Angle)
- Delta
- T (Tangent)
- L (Length)
- R (Radius)
- SE (Superelevation)
- RO (Runoff)
- SE Transition

PI grid coordinates (Y, X,) in the Wisconsin County Reference Coordinate System or an approved alternate coordinate system (see [FDM 9-5-10](#)) should be included except on resurfacing projects.

**Right-of-Way** - Right-of-Way shall be shown when the project contains construction impacts outside or very close to the existing road right-of-way. Dimensioning is required only if a right-of-way plat has not been included as part of the plan. The boundaries and dimensions of all construction permits shall be shown. Also show property lines and the names of property owners.

If the plan sheet is also being used as a right of way plat, see [FDM 12-15-5](#) for additional plan sheet requirements.

**Slope Intercepts** - shall be shown when applicable.

**Topography** - Topography and other features influencing the proposed construction shall be illustrated. Included are such items as streams, marshes, woods, fences, railroads, utilities (see [FDM 18-10-25](#)), drainage facilities, driveways, roads, streets, airports, buildings on or near the right-of-way and other pertinent features.

Show the names of streets, highways, railroads, airports, cities, villages, etc. Some plans show multiple utility lines of the same type (telephone, gas, electricity, etc.) but owned by different entities. In this case show the name of the owning entity near their line.

**North Arrow** - shall be shown.

**Bench Marks** - Bench Marks should be indicated when appropriate. Specialty projects such as planting and signing generally do not require benchmarks. Benchmarks should be described by location, station-offset, description, and elevation.

**Special Areas** - Special Areas such as interchanges, rest areas, and wide medians should be shown, including separate survey control lines as necessary. Details for these areas shall be shown on separate layout detail sheets.

**Combustible Fluids** - In order to more readily identify pipelines carrying combustible fluids, the use of the "CAUTION" symbol shown in [FDM 15-5 Attachment 30.2](#), is required on all contract plans. Within the highway right-of-way all pipelines carrying natural, manufactured, or liquefied petroleum gases, or any other combustible or explosive fluids shall be so identified. This includes identifying the location of all flush or below ground appurtenances such as valve and regulator pits. Additional notes may be added such as depth, pressure, location, pipe size, pipe type, etc.

**Removing Culvert Notations** - notations are required and shall include the station, size, type and disposition of the culvert. An example is given below.

Station 132 + 11 Remove 1-24" CMCP
---------------------------------------

**Public Survey Landmark locations** - locations within the right of way shall be shown.

**Environmentally Sensitive Areas** - and areas that are not to be disturbed shall be shown.

**Intersections and Curb Ramps** - The type of intersections and curb ramps as shown in the standard detail drawings shall be shown unless covered by a general note.

### 35.3 Profile Requirements

Profiles of both the proposed grade line and existing surface grade shall be shown when applicable. These may be supplemented with profiles of existing rock, marsh, existing roadway surfaces, special ditches, side roads, etc., as appropriate. On complex projects, some profiles may be shown on separate sheets. The proposed grade line shall be drafted as the dominant line, with the percentage of gradient and vertical curve information shown. Stationing and elevations should be indicated on the profile grid. All profile stationing shall be shown increasing from left to right on the sheet.

**Original Surface Elevations** are optional.

**Proposed Grade Elevations** shall be shown at all 100-foot stations when applicable.

**Profile Notation** should indicate if the proposed grade line represents the surface or subgrade unless it is indicated on the typical section.

**Structures** - The clearance and cross section of the intersecting roadway, railroad, or streambed at each existing and proposed structure should be illustrated.

A structure notation including the location, structure number, structure type, span lengths, clear roadway width and skew angle shall be shown on the profile. An example is given below.

Structure notations shall also be included for sign bridges, retaining walls and high mast lighting foundations.

Station 109 + 50 Structure B-60-47 Required 2 Span 48" Continuous Welded Plate Girder 40' Clear Roadway Skew 3° RHF
--

A notation is also required for old structures that are being removed. This notation should include the location, structure number, span length, width and type of structure. It may be shown on either the profile or plan portion of the sheet. An example is given below.

Station 10 + 00 Remove Structure P-12-79 Single Span Steel Pony Truss 40' Overall Length 14' Overall Width
--

**Culverts** - A culvert notation for cross drains including the location, number, size and skew angle shall be shown on the profile. An example is given below.

Station 240 + 50 1-36" CPRC Required Skew 20° RHF
---

The graphic location of the culvert shall be drawn on both the plan and profile portions of the sheet.

**Balance Points** show the location of all earthwork balance points, together with associated earthwork volumes, shrinkage and swell<sup>1</sup>. If earthwork is to be performed by stages, the balances for each stage shall be shown. The earthwork volumes shall be absolute volumes before the shrinkage or swell has been applied.

**Separating Plans and Profiles** - In some cases it may be desirable to place plan data and profile data on separate sheets. Examples are interchanges and complex urban projects. On Perpetuation and Rehabilitation with S-1 Application projects and Traffic Maintenance Type project profiles are not required. Examples are

<sup>1</sup> Unless a computer earthwork data sheet is provided, or sufficient data is given in the earthwork summary in the miscellaneous quantities to cover balance points.

resurfacing, signing, and planting projects.

### **FDM 15-1-36 Standard Detail Drawings**

*November 15, 2019*

The standard detail drawings to be inserted into the plan shall be selected in the Standard Detail Drawing Spreadsheet, see [FDM 15-5-15](#). Central Office Plan Examiners, will insert the details into the final plan. See [FDM 19-40-1, Exhibit 1.2](#) for Standard Detail Drawing usage guidance.

### **FDM 15-1-37 Sign Plates and/or Sign Details**

*November 15, 2019*

The Plan Letter (see [FDM 19-10-15](#)) shall include a notice that central office will insert sign plates if required. No listing of sign plates is provided in the plan. Bureau of Traffic Operations will review the project and provide the Central Office Plan Examiner the department permanent sign plates, along with traffic control signs plates, to be insert into the final plan. Special Sign Plates are to be requested from Bureau of Traffic Operations using the Sign Request Form and emailing [DOTBTOSigndetails@dot.wi.gov](mailto:DOTBTOSigndetails@dot.wi.gov) a minimum of three weeks prior to PS&E Submittal.

### **FDM 15-1-40 Earthwork Data Sheet**

*November 15, 2021*

The earthwork data sheets, immediately preceding the cross sections in the plan, should be used to identify the following applicable information for each station or incremental station identified in the cross sections:

1. Incremental end areas, incremental volumes, cumulative volumes, expanded volumes and expansion factors for; cut, fill, marsh excavation, rock excavation, and EBS. If marsh and/or EBS are designated to be used in the fill outside of the 1:1 slope, the fill reduction factors and the resulting marsh and/or EBS fill should be identified.
2. Cumulative mass ordinate.

Materials or conditions that may affect the end areas include salvaged pavement, pavement removal, select materials in the upper portions of the subgrade, marsh or EBS placed in the embankment, staged construction, suitability of some common excavation in early or late season construction, suitability of rock excavation or pavement removal items in shallow fills, as well as storm sewer excavation and miscellaneous structure excavation that will be incorporated into the fill. If these materials or conditions are not accounted for in the cross sections, volume corrections must be made in the earthwork summary sheet. The suitability of the material used should be discussed with the regional soils engineer.

If the project involves staged construction or multiple earthwork divisions, the earthwork for each stage or earthwork division should be analyzed separately. Each stage or earthwork division should have a separate earthwork data table.

It is recommended that the earthwork be designed and computed using the Civil 3D “Earthwork Process” and that the earthwork data tables be created using the excel spreadsheet in [FDM 11-5-10.4](#). If this process is not used, the computations and the earthwork data tables must be similar and identify the same information. Note, if subgrade improvement is being used the designer should calculate earthwork quantities using the bottom of the subgrade improvement as the top of the earth subgrade. Excavation for subgrade improvement is included as part of the common excavation.

An example of earthwork data table is illustrated in [Sample Earthwork Quantities Sheet](#). The following is further clarification of each of the columns in the earthwork data table:

1. Station – Include all stations and incremental stations that are included in the cross sections.
2. Area (SF) – Include the end areas for all cut, fill, marsh, rock and EBS that is included in the cross sections. Include in the table, only the columns that apply to the project being considered. If the end areas for the “salvaged pavement/unusable material” are shown on the cross sections, these end areas should also be shown. An optional method of computing the “salvaged pavement/unusable material” is to do a length multiplied by width multiplied by depth volume calculation for the “incremental volume” column.
3. Incremental Volume – This is a computation of the volume for each end area column included in item 2 above. These are unadjusted values and do not include any expansion or shrinkage factors.
4. Cumulative Volumes – These are the cumulative volumes, with all volume correction factors applied for all of the columns identified in the “incremental volume”. In addition, any marsh or EBS that is designated to be used in the fill outside of the 1:1 slope will be identified with the shrinkage factor

applied. Marsh and EBS backfill will also be identified with the expansion factor applied.

5. Mass Ordinate – The mass ordinate indicates the cumulative volume of excess material (+ value indicates waste) or deficient material (- values indicate borrow) required to complete the fill.

#### FDM 15-1-45 Cross Section Sheets

November 15, 2022

Cross section sheets are required in contract plans that have the following bid items:

- Common Excavation
- Marsh Excavation
- Borrow Excavation
- Rock Excavation
- Fill being measured in place

The normal cross section interval shall be 100 feet. For urban projects, a 50-foot interval should be used. Additional cross sections shall be provided at the following locations:

- Begin and end transitions to horizontal and vertical geometry changes to proposed work. Examples of this include:
  - o Begin and end of lanes and shoulders and their slope transitions
  - o Begin and end of subgrade, side slope, and pavement transitions
  - o The beginning of the 15:1 taper, and posts 1, 5, and 9 of [Midwest Guardrail System \(MGS\) Energy Absorbing Terminal](#)
- Spot location features that impact roadway geometry. Examples of this include:
  - o Entrances (driveway may be half-section)
  - o Culverts crossing the cross-sectioned roadway
- Significant changes in the existing terrain between regular cross section intervals

Each sheet shall provide a direct reading grid pattern background, either by the use of a weighted dot pattern or a weighted/screened line pattern.

Each cross-section sheet shall have a title block along the bottom edge of the sheet. The title block shall include the state project number and space for a sheet number.

See [Sample Cross Sections Sheet](#).

#### 45.1 Scale

Horizontal and vertical graphic scales shall be shown on each cross-section sheet in the lower right corner. The scales most commonly used are shown below. These scales are for 22" x 34" sheets, double the scale for 11" x 17" sheets. Example: 1"=10' Horz and 5' Vert on 22" x 34" sheets is 1"=20' Horz and 10' Vert on 11" x 17" sheets.

**Table 45.1 Cross Section Sheet Scale Combinations**

Scales	1"=10' Horz	1"=10' Horz	1"=5' Horz	1"=5' Horz
Project Type ↓	1"-10' Vert	1"=5' Vert	1"=5' Vert	1"=2' Vert
Rural	X	X	X	X
Urban	X	X	X	X
Roadside Development	NOT ACCEPTABLE	X	X	X

For consultant designed projects the choice of a scale should be determined during project scoping.

#### 45.2 Earthwork Block

The earthwork block shall contain stationing, absolute volumes for excavation by type, absolute fill volumes and sheet totals or other appropriate totals and subtotals. The excavation shall be tabulated by the bid items used in the contract. If an Earthwork Summary Sheet(s) is shown in the contract plan, the earthwork block may be omitted.

The earthwork volumes shall be absolute volumes before the shrinkage or swell has been applied.

### **45.3 Cross Section**

Each cross section shall show the original ground line with a lightweight dashed line and the proposed cross section with a heavy weight solid line. The cross sections shall be drawn to show the finished slopes, including any topsoil or salvaged topsoil that will be placed on them. Do not show topsoil or salvaged topsoil as separate items in the cross sections and do not adjust cross sections to remove topsoil or salvaged topsoil from the final slopes or earthwork quantities. The location of marsh, rock, or special drainage sections should be indicated when relevant. The Civil 3D surface models, referred to as the refinement surfaces in WisDOT Civil 3D workflow, shall be used to produce proposed work graphics in the section views used for plan cross section sheets.

Each cross section shall show station location, grade line elevation, proposed centerline, the right of way limits on both sides, and datum elevation. Additional grades, cross slopes, or transition diagrams may be shown for superelevated sections.

The cross sections can begin at the bottom of the sheet and progress to the top in ascending order of stationing. It is preferred that cross sections begin at the top of the sheet and progress to the bottom in ascending order of stationing. This allows cross sections to be viewed in ascending order across sheets in electronic format. There shall be a minimum of 1-inch clearance between cross sections.

Cross sections for divided highways shall be shown on one sheet. If the sheet lacks sufficient width to show the entire cross section at an acceptable scale, the cross section shall be split and offset.

All lines and data shall be drawn on the front of the sheet and shall be inside the printing borders as defined in [FDM 15-5-5](#).

### **45.4 Begin and End Notations**

A notation indicating the beginning and ending of common, marsh and rock excavation, as well as the beginning and end of construction, shall be included, when appropriate.

### **45.5 Culvert Pipe and Cattle Pass Notation**

Pipe culverts and cattle passes may be illustrated on the cross sections. If notations are included, they should be minimal. They should show the number, size, location and skew angle if applicable.