

**Chapter Seventeen**  
**PLAN PREPARATION**  
**(Signing/Pavement Markings)**

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## Chapter Seventeen

### PLAN PREPARATION (Signing/Pavement Markings)

[Chapter Three](#) in Part I provides the general plan preparation criteria for the MDT Traffic Engineering Section including criteria for the Signing Unit. [Chapter Three](#) contains information on sheet sizes, sheet numbering, drafting guidelines, computerized design, etc. Chapter Seventeen presents information that is specifically used on the plan sheets developed by the Signing Unit when preparing signing and pavement marking plans.

#### 17.1 GENERAL INFORMATION

##### 17.1.1 Plan Sequence

Signing and pavement marking plans can be prepared for a stand-alone project or as a subsection of another project (e.g., Road Design project). Where Signing is the lead unit, the plan sequence will be as follows:

1. Title Sheet
2. Table of Contents
3. Control Diagram
4. Summary Signing and Delineation Quantities Sheet
5. Sign Location and Specifications Sheet
6. Signing Detail Sheet
7. Plan Sheets

The project type will determine which sheets will be included. For example, where signing is included as part of a Road Design project, the Signing Unit will not prepare separate Title and Table of Content Sheets. [Section 3.1.2.1](#) provides a list of the required plan sheets and their sequence where the signing and pavement marking plans are part of another project. It should be noted that all signing sheets should be numbered separately and include the prefix "S" in front of the sheet number, whether they are a stand-alone project or part of another project.

### **17.1.2 Preparation Guidelines**

In general, signing plans should be prepared as simply as practical. The use of duplicated data and unnecessary cross references should be avoided. Volume VII “Miscellaneous” provides samples of the Signing and Pavement Marking Sheets discussed in this Chapter. The following Sections provide additional information on what should be included within each sheet. [Chapter Three](#) provides information on text sizes, font types, symbols, cell libraries and drafting levels that should be used for each plan sheet. The designer should contact the Traffic Engineering Section — Signing Unit to obtain a copy of the applicable CADD files for these sheets.

### **17.1.3 Project Blocks**

All sheets, except the Title Sheet, should include a standard block indicating the State, project number and sheet number. For metric projects, it will be in the upper right-hand corner. For US Customary projects, the project block will be in the lower right-hand corner.

## 17.2 TITLE AND TABLE OF CONTENTS SHEETS

### 17.2.1 Title Sheet

The Title Sheet is the front cover for a set of plans. It identifies the project type, project location and other pertinent project information. Pre-drafted title sheets are available as reference files. These pre-drafted sheets provide the State map and blocks for design data, project approvals, related projects and associated project agreement numbers. Also shown is the Department name and standard data for scales and project length.

The Title Sheet should contain the following information:

1. State Map. A State map in the upper left-hand corner of the sheet should show the general location of the project relative to other roads within the State. An arrow labeled "THIS PROJECT" will indicate the project location.
2. Title Information. Provide the project title information in the top center of the sheet in the following order:
  - a. Montana Department of Transportation.
  - b. Project construction number as provided by the Fiscal Programming Section. [Figure 17.2A](#) defines the project number codes.
  - c. Project name, description, work type with code and work description as provided in the Engineering Management System Report.
  - d. Access control note, if applicable.
  - e. County name(s).
3. Project Length. Show the project length to the nearest tenth of a mile (kilometer) (i.e., 0.1 mi (0.1 km)) immediately below the title information.
4. Scales. Indicate the scales used in the plan sheets immediately below the project length.
5. Surfacing Source. If Geometric or Safety sheets are included with the signing plans and include surfacing quantities, indicate whether or not the surfacing source is contractor furnished for the project just to the right of the scales.
6. Design Data. The need for completing the project design data block in the upper right-hand corner of the sheet will be determined on a project-by-project basis.

## Project NH1-9(23)565

NH-Funding Designation (see table below)

1 - Route Number

9 - County Designation along the route (west to east, south to north)

23 - Agreement Number

565 - Milepost on the Route

Federal-Aid Program	Project Prefix
Interstate Program: Interstate – Maintenance	IM
National Highway System: National Highway	NH
Surface Transportation Program: Secondary Urban Primary (Minor Arterial) State Flexible (State Highway) Rail/HWY Crossing – Hazard Elimination Rail/HWY Crossing – Protective Devices Hazard Elimination Transportation Enhancements	STPS M, STPU STPP STPX STPRR STPRP STPHS STPE
Bridge Program: Bridge Replacement & Rehabilitation – 20% (Optional) Bridge Replacement & Rehabilitation – 15% (Off-System) Bridge Replacement & Rehabilitation – 65% (On-System)	BR & BH BR & BH BR & BH
Congestion Mitigation & Air Quality Improvement Program: Congestion Mitigation & Air Quality	CM
SPR/PL Program: HWY Planning & Research Research, Development & Technology Transfer Metropolitan Planning	SPR SPR PL
Innovation Projects: DPI Projects (Shiloh & Missoula Interchange)	DPI
Demonstration Projects	HDP
Discretionary Funds: Public Lands	PLH
Forest Highway	FH
<b>State-Aid Program</b>	<b>Project Prefix</b>
National Highway System: National Highway (Less Interstate) National Highway (Interstate)	SFCN SFCI
State Primary	SFCP
State Secondary	SFCS
State Urban	SFCU
State Highway (State-Maintained)	SFCX

**PROJECT CODE DEFINITIONS****Figure 17.2A**

7. Letting Date. The letting date recorded in the upper right-hand corner will represent the actual letting date, not the proposed letting date. Generally, the designer does not enter this information.
8. Layout Map. The layout map is located at the bottom center of the Title Sheet. Reference the layout map from the county maps directory – \\ASTROMAPS\. The designer should only show the area necessary for the project. The standard scale for rural layout maps is 1:5000 (1:60 000) and should be used wherever practical. Layout maps for urban-area work should show enlarged views of the urban areas affected.

The layout map should clearly show the following:

- a. the location of the project roadway relative to true north, county lines, townships, ranges, sections, existing roads, towns, railroads and buildings;
- b. the beginning and ending stations of the project and project number;
- c. signed route numbers for US, State and local highways; and
- d. enlarged maps of cities and towns where construction is scheduled through those areas.

For typical CADD symbols that should be used on the Title Sheet, see the MDT CADD Standards Manual.

9. Related Projects. A block for related projects should be provided in the lower left-hand corner of the sheet. Data for "Related Projects" include contract units not covered by the contract plans and project numbers financially related to the main project (e.g., projects constructed in stages or units, projects tied for letting).
10. Associated Project Agreement Numbers. Associated project agreement numbers for right-of-way, incidental construction (utilities) and preliminary engineering should be shown under the related project box.
11. Project Approval Block. A project approval block will be shown in the lower right-hand corner of the sheet. The approval box should include:
  - a. the contract plan approval date;
  - b. the Director's name;
  - c. the Traffic and Safety Engineer's signature;

- d. the Traffic and Safety Engineer's professional registration symbol; and
- e. where appropriate, the FHWA Division Administrator's approval.

### **17.2.2 Table of Contents Sheet**

Where other Unit's plans are included with the signing plans, a table of contents should be included. For these situations, a separate sheet is generally used solely for the table of contents. Where the table of contents is combined with other notes and data, clearly label each group of information (e.g., TABLE OF CONTENTS, NOTES) and place them in order from left to right, respectively.

The table of contents will indicate the major groups of sheets and those subgroups necessary to facilitate locating each item in the plans. [Section 3.1.2](#) provides the proper order for listing, numbering and prefixing the plan sheets.



## 17.3 SUMMARY AND SPECIFICATION SHEETS

### 17.3.1 Summary Signing and Delineation Quantities Sheet

A Summary Signing and Delineation Quantities Sheet should be included with each set of signing plans. This sheet shows all signing quantities of work and materials required for the project. [Figure 17.3A](#) provides a sample of a typical signing summary frame. No other plan data should be shown on this sheet. The majority of the quantities presented on this sheet can be determined from the sign location and specification sheets. The Summary Sheets should be prepared according to the following guidelines:

1. CADD Cells. The designer should use the Signing Summary Sheet provided in the Signing Unit's CADD reference file ETRAFPL.DGN for US Customary plans and MTRAFPL.DGN for metric plans. To get the appropriate drawing, turn all levels off except Levels 1, 2, 3, 4 and 6 for a single summary frame. For multiple summary frames, turn off all Levels except Levels 1, 2, 3, 5 and 6.
2. Frame Adjustments. The summary frame may need to be adjusted for the project. The frame should include three blank lines between the last quantity and the total. Additional lines may be required for projects with additional items. The MDT CADD Standards Manual provides the CADD drafting information that should be used to add lines to existing frames or to develop an additional frame.
3. Rounding. [Chapter Four](#) presents the rounding procedures that should be used to round signing quantities.
4. Lump-Sum Items. Desirably, lump-sum items should not be used on a project. However, this is not always practical. Where necessary, only use lump-sum bid items where the scope of work for the item is clearly defined and the amount of work has a minimal chance of changing during construction. The MDT Standard Specifications for Road and Bridge Construction defines which signing and pavement marking items may be considered as lump-sum bid items.
5. Placement. Quantities should be centered within the "Total" cell of the Summary Table. A period (.) will be used to signify the decimal point (e.g., 3.5).

Material	Total	Unit
Signs-Sheet Aluminum-Reflective Sheeting (I)	1,415.5	sq foot
Signs-Sheet Aluminum-Reflective Sheeting (III)	424.1	sq foot
Signs-Aluminum Sheet Increment Sheeting (I)	94.7	sq foot
Signs-Aluminum Sheet Increment Sheeting (III)	57.1	sq foot
Overlay-Sheet Aluminum		sq foot
Posts-Steel "U"		pounds
Poles-Treated Timber-Barn-4 in TOP DIA.		linear foot
Poles-Treated Timber-Barn-5 in TOP DIA.		linear foot
Poles-Treated Timber-Class 4		linear foot
Poles-Treated Timber-Class 3		linear foot
Posts-Tubular Steel (Round)		pounds
Posts-Tubular Steel (Square Perforated)	299.4	pounds
Posts-Structural Steel		pounds
Overhead Structure-Metal-Cantilever		each
Overhead Structure-Metal-Bridge		each
Highway Traffic Striping-White (Material Type)		gallons
Highway Traffic Striping-Yellow (Material Type)		gallons
Words & Symbols (Material Type)		gallons
Delineator-Design A		each
Delineator-Design B		each
Delineator-Design C		each
Delineator-Design D		each
Delineator-Design E		each
Delineator-Design F		each
Delineator-Design G		each
Delineator-Design H		each
Remove Signs	22	each
Remove Signs-Guide	5	each
Reset Signs	11	each
Reset Signs-Guide		each
Frangible Sign Post Breakaway Device-S3 x 5.7	8	each
Frangible Sign Post Breakaway Device-		each
Square Tubular Slipbase Breakaway Device-3 in	2	each

**SAMPLE SIGNING SUMMARY  
(US Customary)**

**Figure 17.3A**

Material	Total	Unit
Signs-Sheet Aluminum-Reflective Sheeting (I)	131.50	sq meter
Signs-Sheet Aluminum-Reflective Sheeting (III)	39.40	sq meter
Signs-Aluminum Sheet Increment Sheeting (I)	8.80	sq meter
Signs-Aluminum Sheet Increment Sheeting (III)	5.30	sq meter
Overlay-Sheet Aluminum		sq meter
Posts-Steel "U"		kilogram
Poles-Treated Timber-Barn-100 mm TOP DIA.		meter
Poles-Treated Timber-Barn-130 mm TOP DIA.		meter
Poles-Treated Timber-Class 4		meter
Poles-Treated Timber-Class 3		meter
Posts-Tubular Steel (Round)		kilogram
Posts-Tubular Steel (Square Perforated)	135.8	kilogram
Posts-Structural Steel		kilogram
Overhead Structure-Metal-Cantilever		each
Overhead Structure-Metal-Bridge		each
Highway Traffic Striping-White (Material Type)		liter
Highway Traffic Striping-Yellow (Material Type)		liter
Words & Symbols (Material Type)		liter
Delineator-Design A		each
Delineator-Design B		each
Delineator-Design C		each
Delineator-Design D		each
Delineator-Design E		each
Delineator-Design F		each
Delineator-Design G		each
Delineator-Design H		each
Remove Signs	22	each
Remove Signs-Guide	5	each
Reset Signs	11	each
Reset Signs-Guide		each
Frangible Sign Post Breakaway Device-S75X8	8	each
Frangible Sign Post Breakaway Device-		each
Square Tubular Slipbase Breakaway Device-75 mm	2	each

**SAMPLE SIGNING SUMMARY  
(Metric)**

**Figure 17.3A**

## 17.3.2 Sign Location and Specifications Sheets

### 17.3.2.1 General

This sheet is used to define the sign type, location, materials and other pertinent information required by the contractor to bid and install the sign. When completing this sheet, the designer should consider the following:

1. CADD Files. The designer should use the sign location and specification sheet provided in the Signing Unit's CADD reference file ETRAFPL.DGN for US Customary plans and MTRAFPL.DGN for metric plans. This CADD file contains three specification sheets. These sheets can be accessed by turning on and off various CADD levels. Each level provides additional lines on the various sheets.
2. Sheet Layout. List the signs in the table as they appear along the centerline. For clarity, the designer should consider the following:
  - a. Breaks in the mainline stationing for side street signing should be clearly noted.
  - b. If various funding sources are used, they should be clearly noted on the sheet.
  - c. For better readability, the designer should consider skipping every other row.
  - d. At a maximum, only two signs per row should be listed. Where additional signs are located at the same station, they should be inserted in the row directly below. Note the second row does not repeat the stationing.
3. Overhead Signs. Where a sign is located on an overhead structure (e.g., signal mast arm, cantilever structure, bridge), only the following columns need to be completed:
  - a. station;
  - b. ramp number, if applicable;
  - c. sign number;
  - d. panel size;
  - e. reflective sheeting type; and
  - f. remarks, if appropriate.

In the remarks column, note the type of structure and where the sign is located (e.g., mounting location on the signal mast arm).

4. Sign Removals. Where a sign is removed and not replaced, only the following columns need to be completed:
  - a. stationing;
  - b. ramp number, if applicable;
  - c. sign number;
  - d. panel size (indicate “REMOVE” in the column);
  - e. sign — removal (indicate the number of signs removed at the location); and
  - f. remarks, if appropriate.
5. Summary Totals. On the bottom row of the last sign location and specifications sheet, the designer should sum the following columns for bid purposes:
  - a. sign panel columns (indicate separate totals for the different reflective sheeting types);
  - b. timber pole columns;
  - c. steel post columns;
  - d. sign columns (REMOVE/RESET);
  - e. guide columns (REMOVE/RESET); and
  - f. barricade column.
6. Delineator Totals. On the bottom of the last sign location and specifications sheet, indicate in the delineator table box (found in cell library sign1.cel) the type and total number of each delineator used in the project. The location of the delineators are indicated in the plan sheets. [Section 19.8](#) defines the various types of delineators used by the Department.

### 17.3.2.2 Data Cells

This section defines what information should be included under each of the headers in the sign location and specifications sheet. When completing this sheet, the designer should consider the following:

1. Station. This column is used to define the station at which the sign should be located. The designer should note the following:
  - a. List the signs as they appear along the mainline centerline in increasing stations.
  - b. Signs should be called out to the nearest foot (half meter) (i.e., 1.0 ft (0.5 m)).
  - c. Note whether the sign is left (LT) or right (RT) of the centerline.
  - d. For side roads with minimal signing (e.g., STOP signs, street signs), the sign location can be defined by the mainline station.
  - e. At major intersections where there are numerous signs along the side road that are being replaced, removed, used as is or new signs installed, the mainline stationing should be interrupted and side road signs listed in the order they appear along the side road centerline. Where the mainline stationing is interrupted, the side road should be clearly labeled in the table. As an option, also include the sheet number where the side road signing appears in the plan sheets. When the listing of the side road signing is completed, clearly indicate that the listed signing is again along the mainline.
2. Ramp No. Because ramps often have the same stationing, this column is used to define which ramp the sign is located along.
3. Sign No. List the sign number as it appears in the Manual on Uniform Traffic Control Devices or in the MDT Signs and Signing Materials Catalog. If there is more than one of the same sign at the location (e.g., back-to-back), note the number of the signs. Do not repeat the criteria for each sign.
4. Panel Size. The designer should consider the following:
  - a. In this cell, list the dimensions of the sign. The sign dimension should be according to sizes presented in the FHWA Standard Highway Signs and the MDT Signs and Signing Material Catalog.
  - b. If an existing sign is being removed and not being replaced, note that the sign is "REMOVED" in the cell. The sign size and other information on the sign is not required.

5. Reflective Sheet Type. Note the type of reflective sheeting used for both the background and the legend. [Section 18.1.9](#) presents Department criteria relative to where each sheeting type should be used.
6. Clearance. This is the minimum distance, to the nearest inch (tenth of a meter) (i.e., 0 ft-1 in (0.1 m)), the sign should be located from the edge of the travel lane. The designer should review [Section 18.1.11](#) and the MDT Detailed Drawings to determine the appropriate lateral clearances.
7. Sign Support Spacing. If two or more sign supports are used, the spacing between the supports should be noted to the nearest inch (hundredth of a meter) (i.e., 0 ft-1 in (0.01 m)). This distance is measured from the center of each support. The MDT Detailed Drawings provides additional information for sign spacing. For signs with single supports, this column is left blank.
8. Type of Support. In this column, list the size and type of the sign support to be used (e.g., 4 in (100 mm) DIA. Pole for S3 x 5.7, (S75 x 8)).
9. Cantilever. Use an “X” to denote a standard breakaway, ground-mounted sign. Ground mounted signs that are required to be cantilevered are denoted by a checkmark “✓.” The MDT Detailed Drawings provides additional information on the placement of cantilevered signs.
10. Support Length (Estimated). This is the estimated length, to the nearest inch (tenth of a meter) (i.e., 0 ft-1 in (0.1 m)), of the support based on the terrain and support type. The designer should note the following:
  - a. For wood supports, this dimension is the total length of the pole, including the portion in the ground.
  - b. For steel supports, this length is from the top of the post to the top of the breakaway device.
  - c. For single, perforated square tubular sign supports, this length is from the top of the post to 1.5 ft (450 mm) below the ground line.
  - d. For telescoped square tubular sign supports, this length is from the top of the post to the breakaway device.
  - e. For signs with two supports, the first support nearest the roadway is labeled “X,” the second “Y.” For signs with three supports, the center post is labeled “Z.” Provide separate lengths for each support.

- f. For additional information on determining the support lengths, see the MDT Detailed Drawings.
11. Support Length (Installed). This column is completed by the Project Manager after the sign has been installed.
12. Mounting Height. This is the measured height, to the nearest inch (tenth of a meter) (i.e., 0 ft-1 in (0.1 m)), from the bottom of the sign to the pavement surface as defined in the MDT Detailed Drawings.
13. Foundation Depth. This is the depth of the foundation required for the sign based on the support type and size and is measured to the nearest inch (tenth of a meter) (i.e., 0 ft-1 in (0.1 m)). For determination of the foundation depth, see the MDT Detailed Drawings.
14. Sign Panel. This is the area of the sign in square feet (square meter) and is measured to the nearest tenth of a square foot (hundredth of a square meter) (i.e., 0.1 ft<sup>2</sup> (0.01 m<sup>2</sup>)).
15. Timber Pole. This is the total length of the timber pole used for bid purposes. It should be noted that these measurements are in 2 ft (0.6 m) increments and are always rounded up. Note that the post length is indicated in the appropriate diameter column.
16. Steel Post. The unit weight for the support is noted in the appropriate column for the post type. The weight of the post is determined by multiplying its length by its mass per unit length (lbs/ft (kg/m)). These values should be rounded to the nearest pound (tenth of a kilogram) (i.e., 1.0 lb (0.1 kg)). [Figure 17.3B](#) presents typical mass per unit lengths for the various post types used by MDT. For bid purposes, square tubular posts and anchors will be paid for by the pound (kilogram). For additional information on the support types, see the MDT Detailed Drawings and the MDT Standard Specifications for Road and Bridge Construction.
17. Breakaway. Where a breakaway device is required, the type of breakaway device is noted through the use of symbols in the cell. The appropriate symbol types are shown in [Figure 17.3C](#) and should also be referenced at the bottom of the sheet. For additional information on breakaway devices, see the MDT Detailed Drawings.
18. Signs. These columns denote the number of non-guide signs being removed or reset.
19. Guide. These columns denote the number of guide signs being removed or reset.



20. Blank Column. This column is used to denote information or other items not indicated in the other columns (e.g., type of permanent barricades).
21. Remarks. This column denotes the legend provided on the guide sign and other pertinent information relative to the sign (e.g., 2 signs back-to-back, see special provisions).

Round Pipe		
Nominal Pipe Diameter	lb/ft	Breakaway Device and Stub Post (lb)
3"	7.58	28.03
3 1/2"	9.11	35.85
4"	10.79	38.44
5"	14.62	61.51
6"	18.97	81.54

Structural Steel Post	
Post Size	lb/ft
S3 x 5.7	5.7
S4 x 7.7	7.7
S5 x 10	10
W4 x 13	13
W8 x 18	18
W8 x 24	24
W12 x 30	30

**POST TYPES  
(US Customary)**

**Figure 17.3B**

Round Pipe		
Nominal Pipe Diameter (mm)	kg/m	Breakaway Device and Stub Post (kg)
75	11.28	12.71
89	13.56	16.26
102	16.06	17.44
127	21.76	27.90
152	28.23	36.99

Structural Steel Post	
Post Size	kg/m
S75 x 8	8
S100 x 11	11
S130 x 15	15
W100 x 19	19
W200 x 27	27
W200 x 36	36
W310 x 45	45

**POST TYPES  
(Metric)**

**Figure 17.3B**

X	See <u>MDT Detailed Drawings</u> for breakaway detail.
★	Telescoped square tubes (2.25 in x 2.5 (57 mm x 64) with slip base breakaway required, mounted in heavy-duty stub).
▲	Single square tube required, mounted in heavy-duty stub.
■ ..	Frangible sign post breakaway device required.
●	Single square tube with slip base breakaway.

**BREAKAWAY DEVICES SYMBOLS**

**Figure 17.3C**

## 17.4 DETAIL AND PLAN SHEETS

### 17.4.1 Detail Sheets

Detail sheets are used for those items that require more specific information than can be adequately shown on the plan sheets with the selected scale. Details may be placed on the plan sheet itself, if there is room, or on a separate sheet prior to the plan sheets. Details are used to show:

- structural details (including sign bridges, special foundation designs);
- special signing details;
- blow ups of pavement marking details;
- unusual pavement marking patterns;
- where striping patterns change; and
- other special elements or conditions.

[Chapter Eighteen](#) illustrates several of the Department's signing details that are typically included in the plans. [Chapter Nineteen](#) provides the typical pavement marking details. These figures can also be obtained from the Signing Unit CADD reference files MPLANSHE.TRS and MPLANSH2.TRS for US Customary and metric, respectively.

Details should be provided for all overhead sign structures. In the detail, the minimum vertical clearance should be shown to the nearest inch (tenth of a meter) (i.e., 0 ft-1 in (0.1 m)).

### 17.4.2 Plan Sheets

The plan sheets are the basic design sheets used by the designer to illustrate the types and locations of signs and pavement markings to be installed, removed, reset or replaced. Therefore, the designer must ensure that these sheets are drawn with clarity and are as simple as practical but still provide the necessary information to construct the project.

#### 17.4.2.1 **General**

The following provides guidelines for the preparation of the signing and pavement marking plan sheets:

1. Sequence of Sheets. Mainline plan sheets should be shown first in order of increasing stations. Project stationing typically increases from south to north and west to east. If there is significant signing along a side road, the continuous stationing of the mainline plan sheets may be interrupted to present the signing

plans for the side road facility. These additional signing plan sheets should be inserted after the sheet where they appear along the mainline. They should be clearly labeled.

2. Scales. Selection of an applicable scale will depend on the project and how much signing will be shown. The designer should provide a scale that will clearly show the signing and pavement marking details. For urban projects, the minimum scale should be 1:20 (1:50) and for rural projects 1:50 (1:500).
3. Layout. The scale selected will determine how much of the plan view can be shown on a sheet. There should be no overlap between successive sections (i.e., use match lines). For smaller scales (e.g., 1:50 (1:500)), there may be sufficient room on the sheet to show two sections on top of each other. However, do not show more than two sections per sheet.
4. CADD. The basic plan sheet used by MDT is provided in the following reference files:
  - a. US Customary: PLANE.TRS, and
  - b. Metric projects: PLANM.TRS.

The MDT CADD Standards Manual presents the CADD criteria to be used for plotting the signing and pavement marking information on the plan sheets.

5. Notes. Notes will provide general information necessary for plan users to obtain a complete understanding of the sign and pavement marking plans. Notes on plan sheets should be brief, clear and consistent. Notes should not be used where elements are addressed in the Standard Specifications or Supplemental Specifications or Special Provisions. Examples of information that may be addressed include:
  - a. descriptions of items to be removed by non-contractor personnel,
  - b. instructions for the contractor regarding items not to be disturbed,
  - c. descriptions of work items absorbed in the cost of bid items,
  - d. basis for plan quantities, and
  - e. instructions for interpreting the plans.
6. Note Orientation. All notes and dimensions should be written horizontally from left to right, with the following exceptions:
  - a. Stationing, at 100 ft (100 m) intervals, is placed vertically approximately 4 in (100 mm) above the centerline.

- b. Curve data is placed radially on the inside of the curve. Curve controls, equations and angle points should be placed at right angles to the centerline.
    - c. Where limited space for notes and dimensions makes horizontal placement detrimental to the readability of the plans, they may be placed vertically.
7. Horizontal Alignment Data. Show the following horizontal alignment data on the plans:
  - a. Curve Points. Draw perpendicular lines from the centerline for all curve points. Indicate the curve notation (e.g., PC, PT, SC, TS) and station to the nearest hundredth of a foot (meter) (i.e., 0 + 00.01) along the perpendicular line. The PI station is generally not provided. Also, indicate the deflection angle to the nearest second (i.e.,  $01^{\circ} 01' 01''$ ) and/or the curve radius to the nearest 20 ft (5 m).
  - b. Bearings. Bearing notations should be written below the line to which they apply. The bearing should be written as degrees, minutes and seconds and rounded to the nearest second (i.e.,  $01^{\circ} 01' 01''$ ).
  - c. Equations. Equations are used to correct any stationing differences that may occur along the centerline. They should be shown perpendicular to the centerline similar to that discussed in Comment a. above.
8. Topography. The topography shown should only include those elements that are pertinent to the placement of signing (e.g., bridges, rivers, buildings, railroads). In general, existing elements should be shown as solid lines and proposed elements in dashed lines. However, it should be noted that new signing and pavement marking details will be shown with solid lines. The North arrow should be shown next to the plan view and should be consistent from sheet to sheet.
9. Station Call Outs. Provide station call outs at the following locations:
  - a. beginning and ending points of the project,
  - b. 100 ft (100 m) station increments,
  - c. horizontal curve points,

- d. beginning and ending points of where the pavement markings change, and
  - e. other locations where deemed appropriate.
10. Right-of-Way. Clearly show right-of-way limits on the plan view. Where necessary, note breaks in the right-of-way alignments by the centerline station and offset distances. Easements, construction permits and control of access limits, as applicable, should be clearly shown. Where the control of access limits do not coincide with the right-of-way limits, each should be clearly labeled.

The bearings of the section lines, township lines and range lines crossing the centerline should be clearly shown as should the station at the point of intersection. Angle call outs should not be used.

11. Drafting Details. [Chapter Three](#) provides the topography symbols and other information that should be used in preparing plan sheets. [Figure 3.2A](#) provides the recommended abbreviations that should be used.

### 17.4.2.2 Signing

The following presents the recommended guidelines for placing signing criteria on the plan view:

1. Sign Image. The plan sheets should provide an illustration of the actual sign being installed, reset, replaced, removed or used as is. The sign illustration should be a reasonable facsimile of the original sign as it appears in the Manual on Uniform Traffic Control Devices or the MDT Signs and Signing Material Catalog. The Signing Unit has drafted the majority of these signs, which are included in the CADD cell libraries REG, WARN, SIGN1 and GUIDE1. The image should be sized so that it is readable at a reduced scale. The designer should provide consistent sign sizes throughout the project.
2. Plan Symbol. The cell library SIGN1 provides the typical plan symbols used to indicate the signs on the plan view. The sign face should be orientated to the approximate direction the sign will face the roadway. A leader arrow from the sign image should be provided to the plan symbol to indicate what sign applies to the symbol.
3. Sign Notes. Next to each sign image, provide the sign number as it appears in the MUTCD or in the MDT Signs and Signing Materials Catalog. In addition, also note whether the sign is new, reset, replaced, removed, used as is or any other pertinent information.

4. Guardrail. The locations for new and existing guardrail should be shown on the plan view only if it is applicable to the placement of the signing.
5. Signing By Others. Roadway signs owned and/or maintained by others which are within the State right-of-way limits and are being removed or replaced should be shown and the appropriate action noted. Those items which will be removed by non-contractor personnel should be clearly noted.

### 17.4.2.3 Pavement Markings

The following comments apply to showing the pavement marking details on the plan sheets:

1. Image. All pavement markings in the plans should be a reasonable facsimile of the markings shown in the Manual on Uniform Traffic Control Devices and Chapter Nineteen of the Traffic Engineering Manual, and in the approximate location where they will be located in the field.
2. Notation. The type of marking used should be clearly denoted, whether in the plan sheets or in a separate detail (e.g., 4 in (100 mm) yellow solid centerline, 4 in (100 mm) solid white line). For the proper notation of line types, see [Chapter Nineteen](#).
3. Pavement Marking Details. [Chapter Nineteen](#) provides illustrations for the majority of the typical pavement marking details that are used in the plans. The most up-to-date details can also be found in the Signing Unit CADD reference files PLANE.TRS for US Customary and MPLAN.TRS for metric projects.
4. Lane Widths. All lane widths, including turn lanes, should be noted at least once in each plan view.
5. Station Call Outs. Wherever there is a change in the pavement marking pattern (e.g., intersection, tapers), note the station at each end of the marking pattern. For example, where the centerline is discontinued through an intersection, the stations where the centerline begins and ends on each side of the intersection are noted.
6. Delineators. Delineators should be shown using the symbols illustrated in the MDT Detailed Drawings and cell library SIGN1. [Section 19.8](#) discusses the various delineator types used by the Department.

