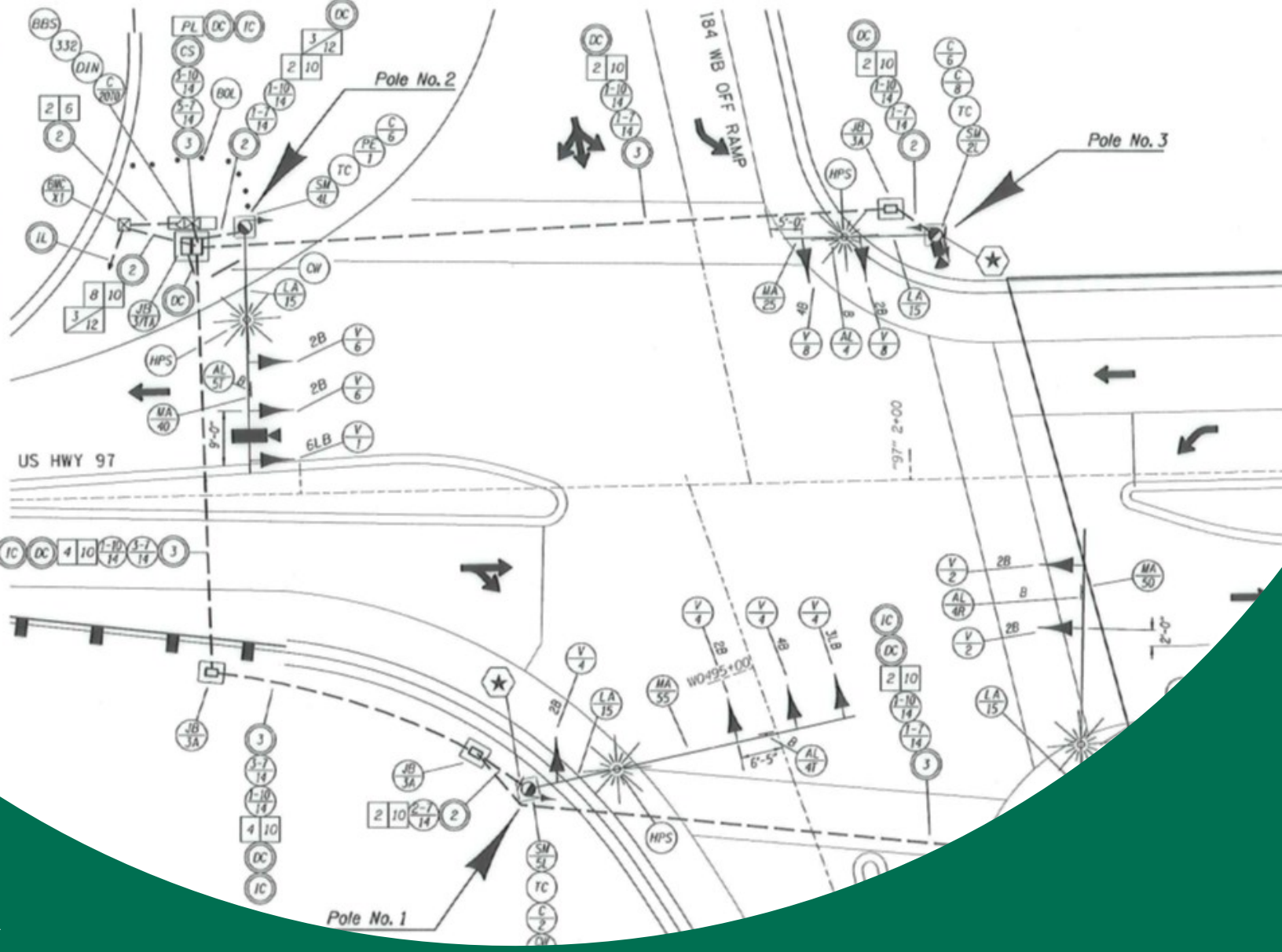

Traffic Signal Drafting Manual

July 2014 Edition

Oregon Department of Transportation
Technical Services
Traffic-Roadway Section
Traffic Standards Unit
http://www.oregon.gov/ODOT/HWY/TS/signals.shtml

Traffic Signal Drafting Manual

July 2014 Edition

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The material contained herein is for information purposes only and may be used to aid new employees and those unfamiliar with ODOT Traffic Engineering practices, in accessing and applying applicable standards and policies related to traffic signal drafting practice.

Oregon Department of Transportation
Technical Services
Traffic-Roadway Section
Traffic Standards & Asset Management Unit
http://www.oregon.gov/ODOT/HWY/TS/pages/signals.aspx

Purpose

This manual relies heavily on graphics to relay information to drafters who are preparing plans for traffic signal projects. This manual was written and drafted to convey information in a style that drafters are accustomed to seeing and are comfortable with.

This manual may also be of value to those who are new to drafting traffic signal plans for ODOT. This manual assumes the user is comfortable using the MicroStation platform and is moderately proficient in its use. Parts of this manual will also be of value to AutoCAD users.

The writers of this manual realize drafting and work flow varies from drafter to drafter. It is also understood that plans from different drafters will have subtle differences. All plans are reviewed for legibility. If your plans are clean and easy to read, your plans will generate fewer comments during reviews. This will make turnaround times for reviews much shorter.

It is the user's responsibility to ensure they are using the latest version of this document. Always check the ODOT Traffic Standards website below for the latest version. ODOT reserves the right to update this manual at any time. Updates will usually occur in January and July to coincide with the Standard Drawing updates.

http://www.oregon.gov/ODOT/HWY/TS/pages/signals.aspx

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1 Quick Reference

The following pages show plan sheets to be used as examples for drafters that have experience preparing plans for ODOT traffic signal contract projects. These sheets are shown with a minimum of explanation. The following sheets are in the correct plan sheet order and show at the time of printing all the correct bubble notes, bubbles, symbols, line styles and line weights for ODOT traffic signal plans.
The Railroad Preemption Plan Sheet shown is not part of the contract documents, but is part of the rail crossing order.

This chapter should not be used as a resource for drafters who are not familiar or uncomfortable with ODOT's drafting standards. More detailed examples start in Chapter 2 of this manual.

For additional information on MicroStation V8i click on the following link:
MicroStation Users Guide.

NOTE: Items in any color other than black are for instructional reference to the reader, unless otherwise noted on that page. These references are not intended to be part of your finished plan sheets.

Figure 1-1 | Typical Line Styles, Scalable Items, and Sheet Cross Reference Notes (1 of 2)

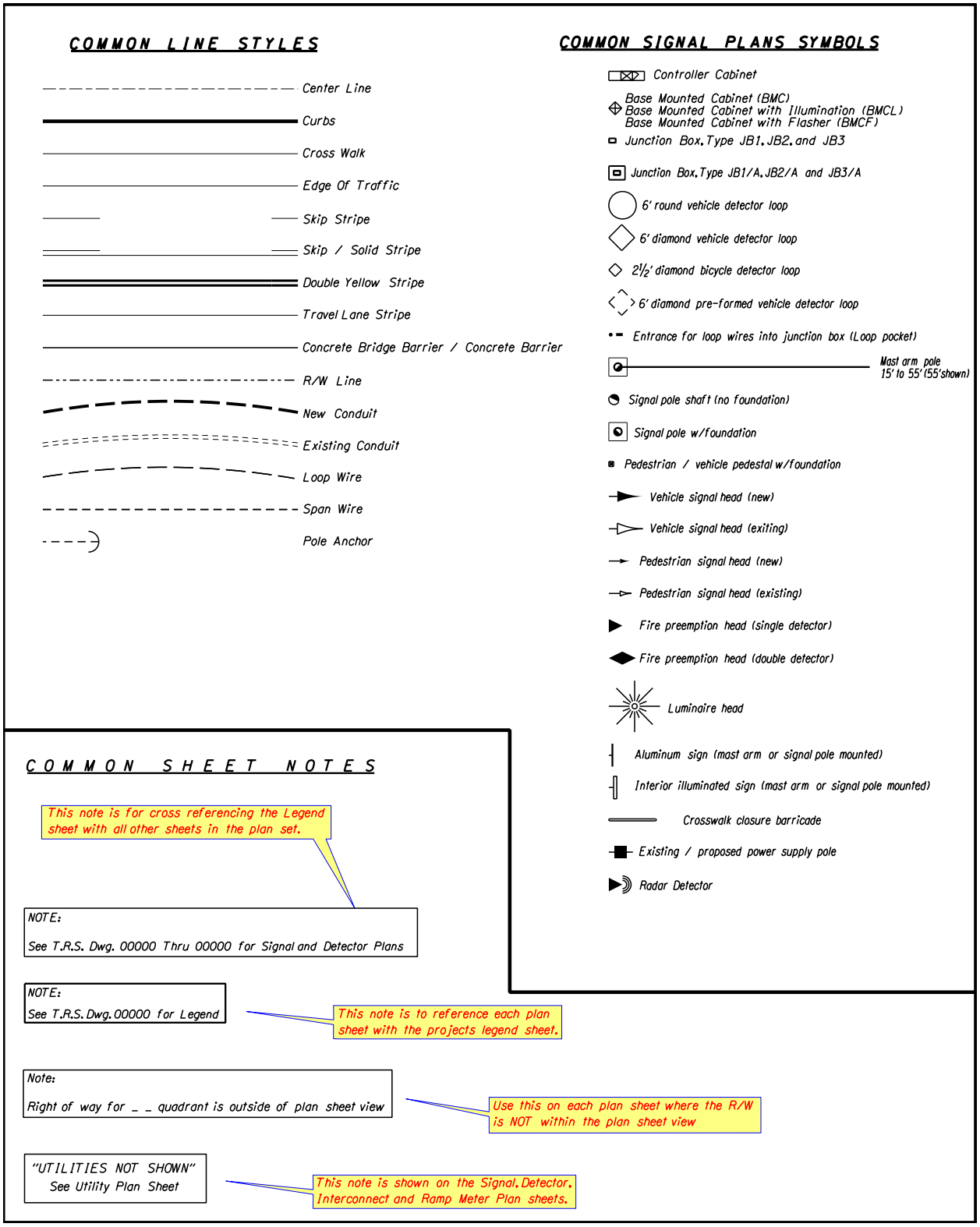


Figure 1-2 | Plan Sheet Headings and Titleblocks (2 of 2)

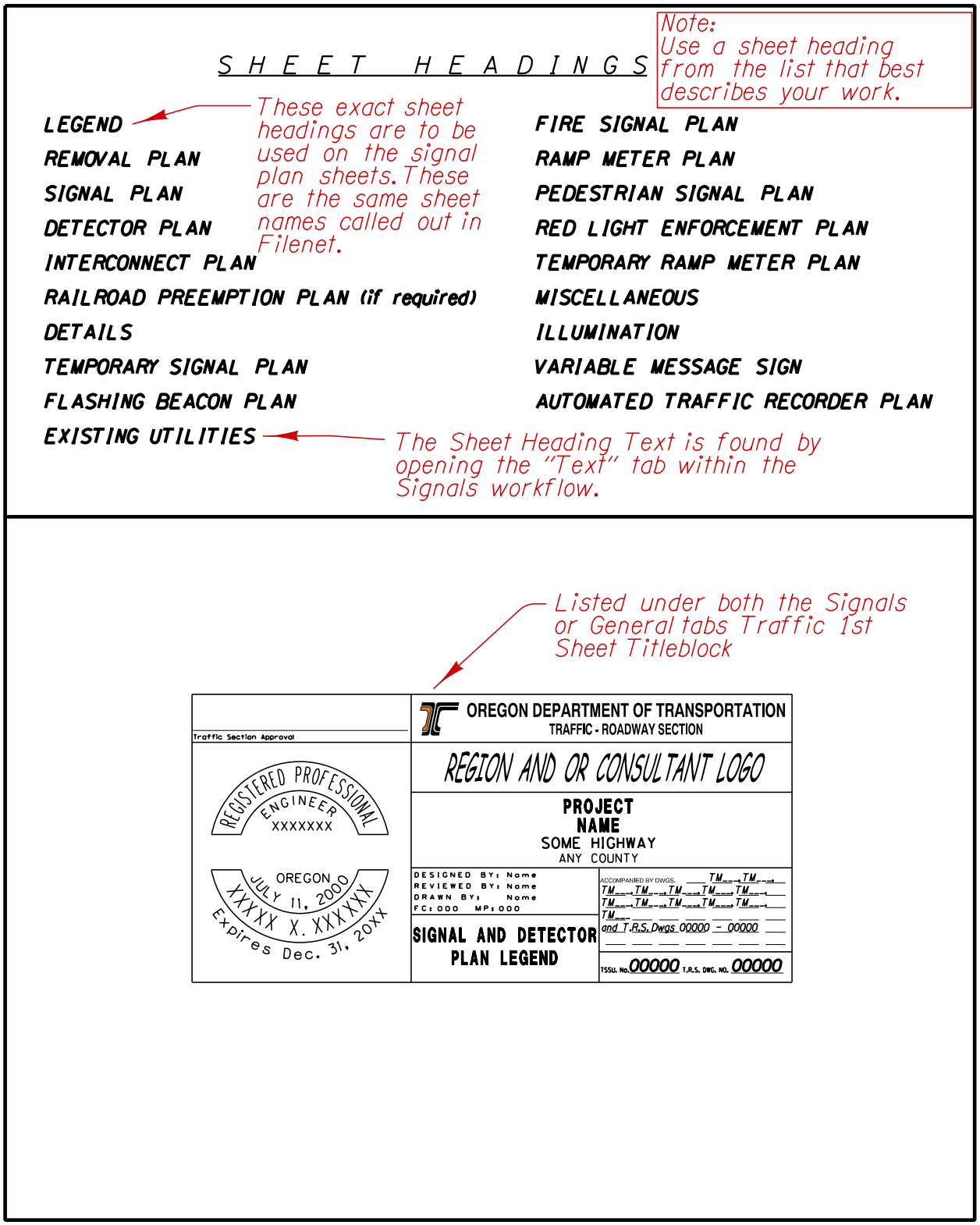


Figure 1-3 | Typical Signal Plan Set (1 of 7)

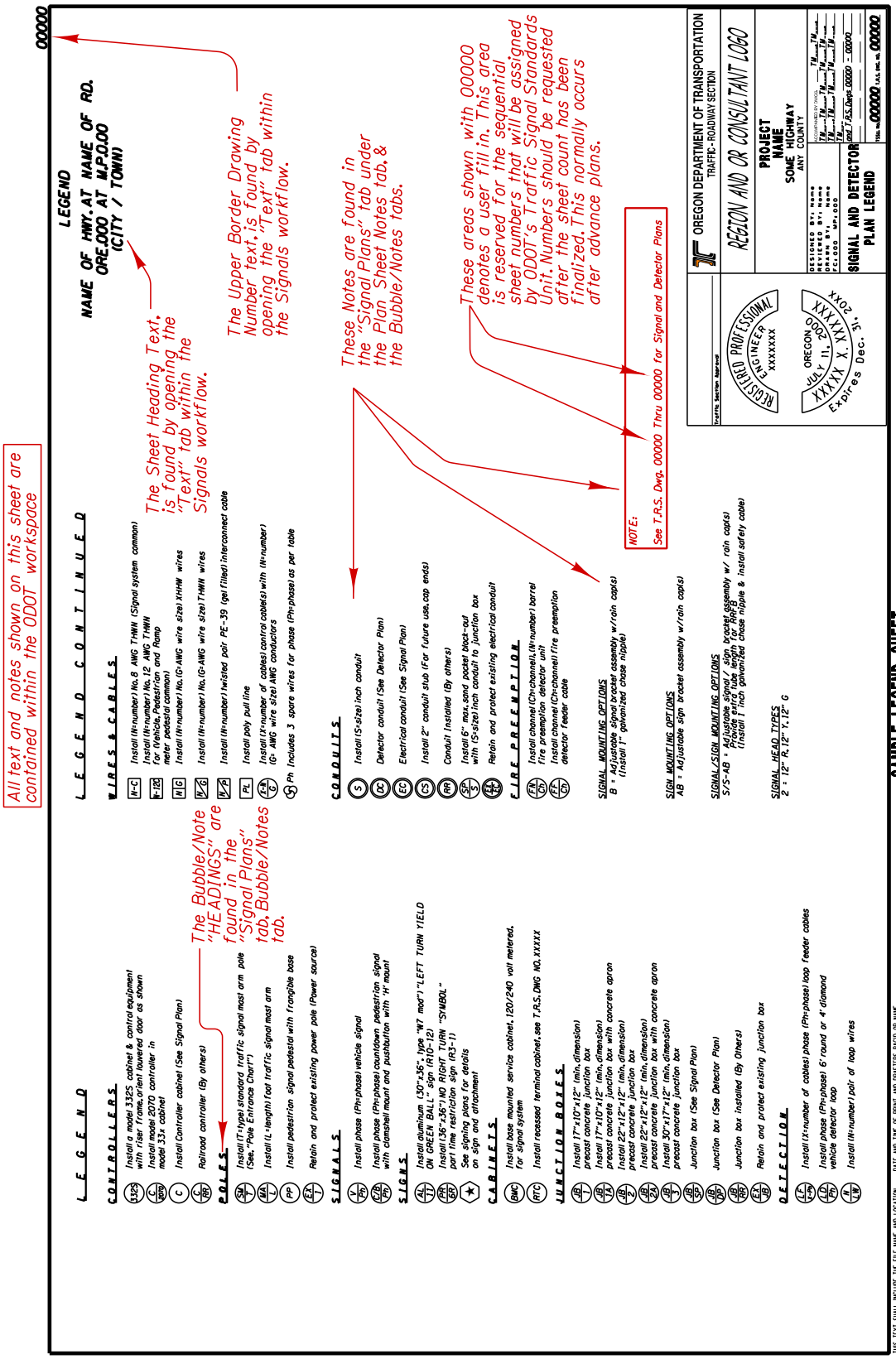


Figure 1-4 | Typical Signal Plan Set (2 of 7)

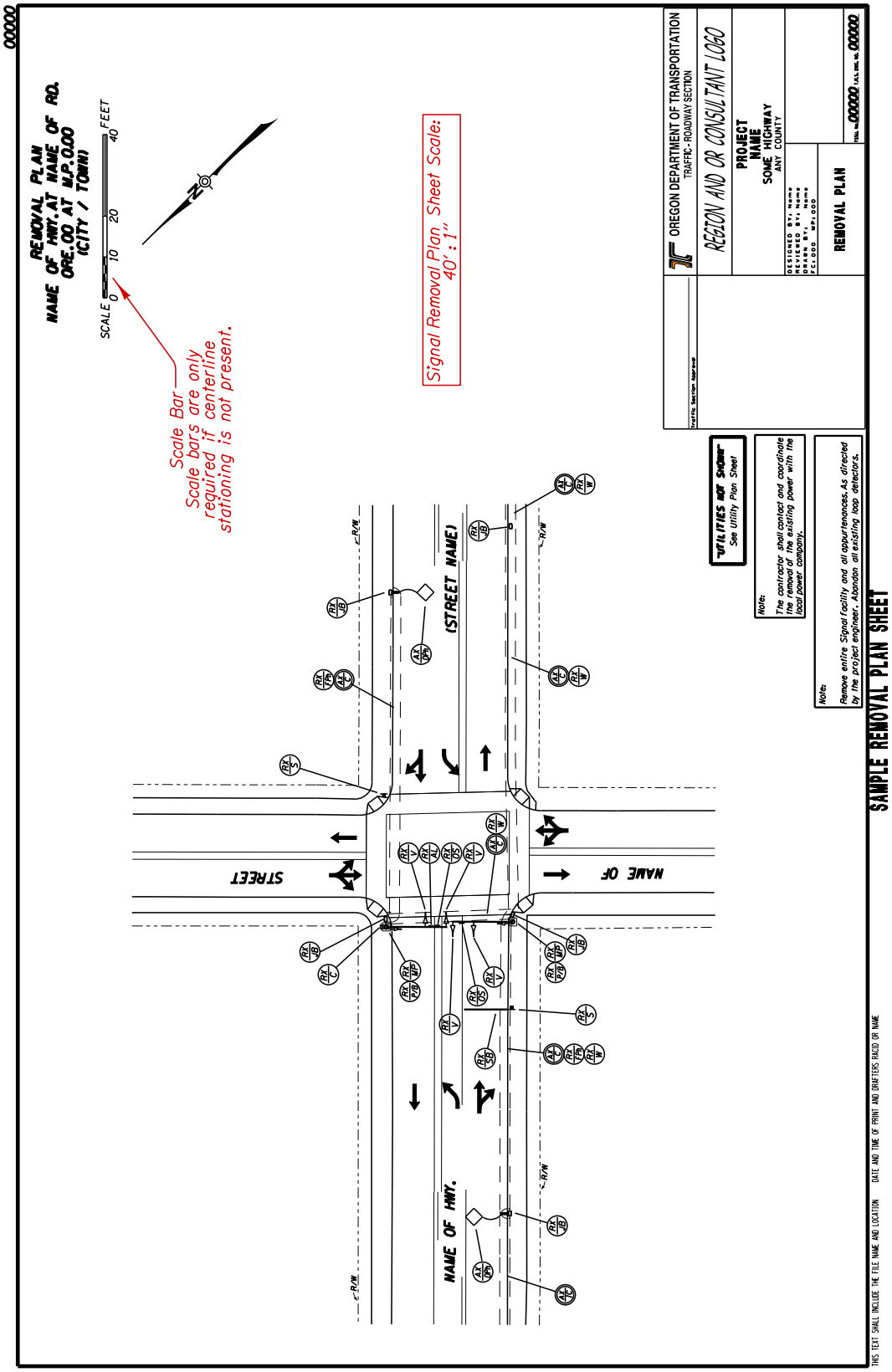


Figure 1-5 | Typical Signal Plan Set (3 of 7)

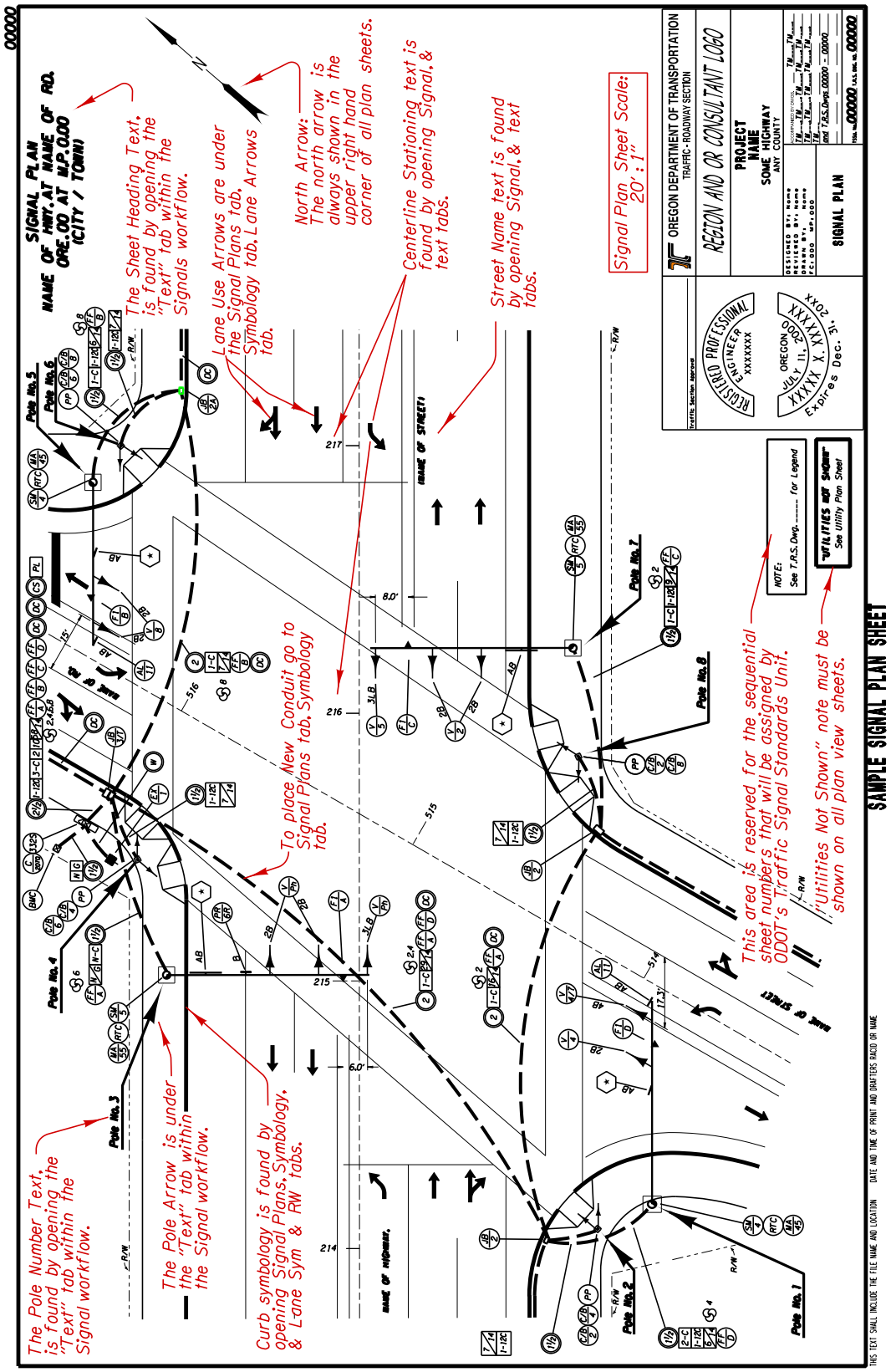


Figure 1-6 | Typical Signal Plan Set (4 of 7)

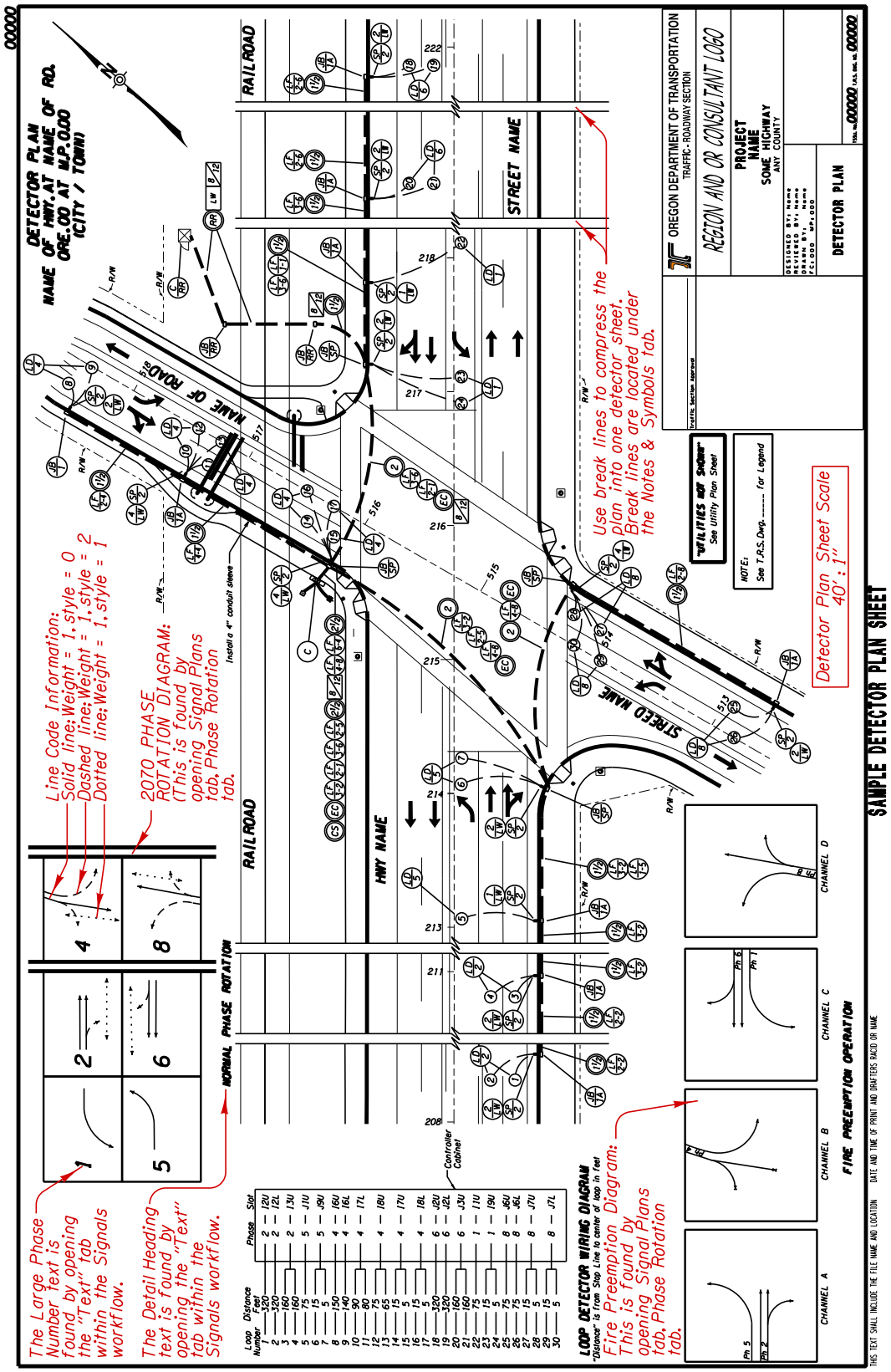


Figure 1-7 | Typical Signal Plan Set (5 of 7)

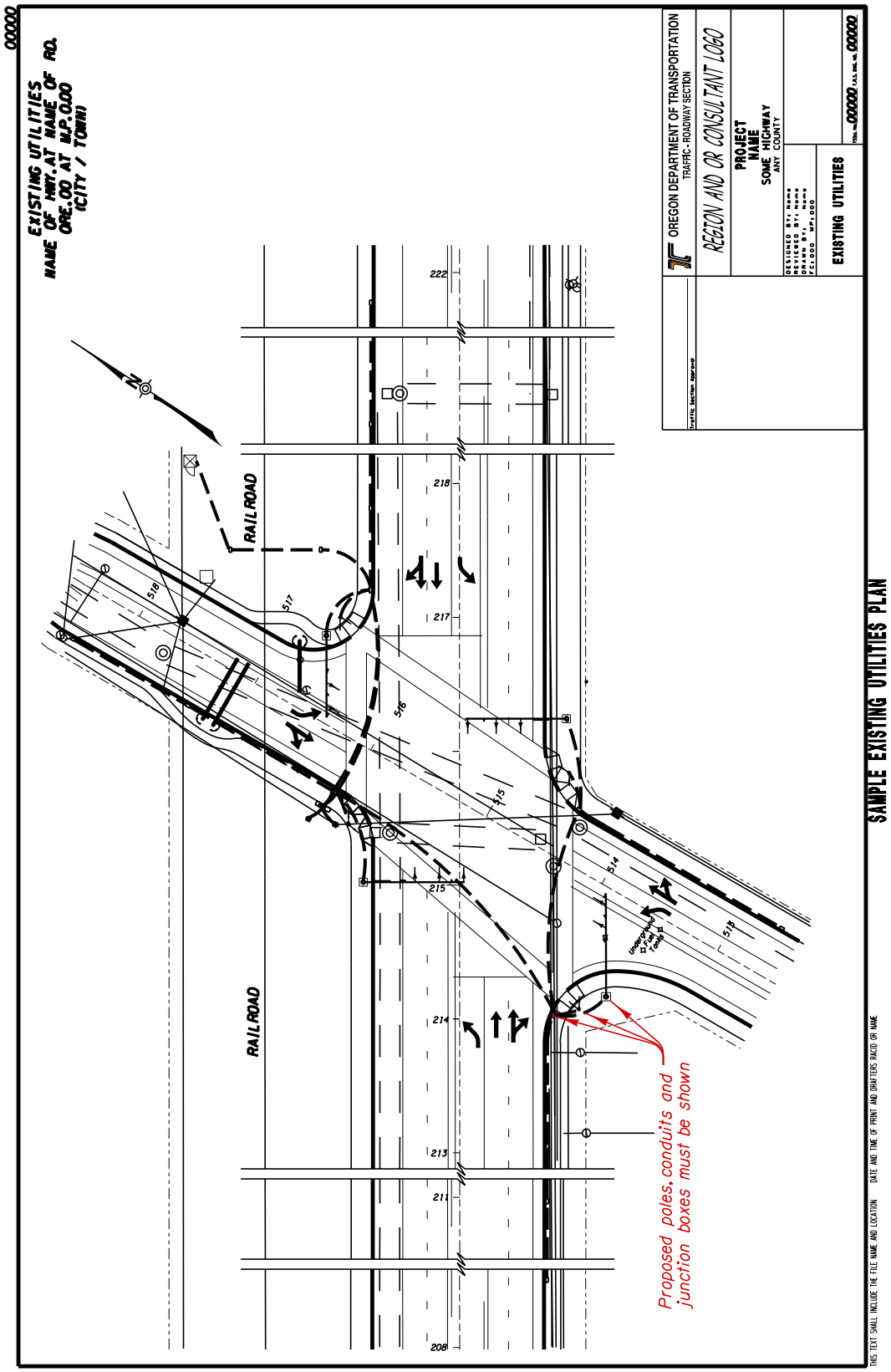


Figure 1-8 | Typical Signal Plan Set (6 of 7)

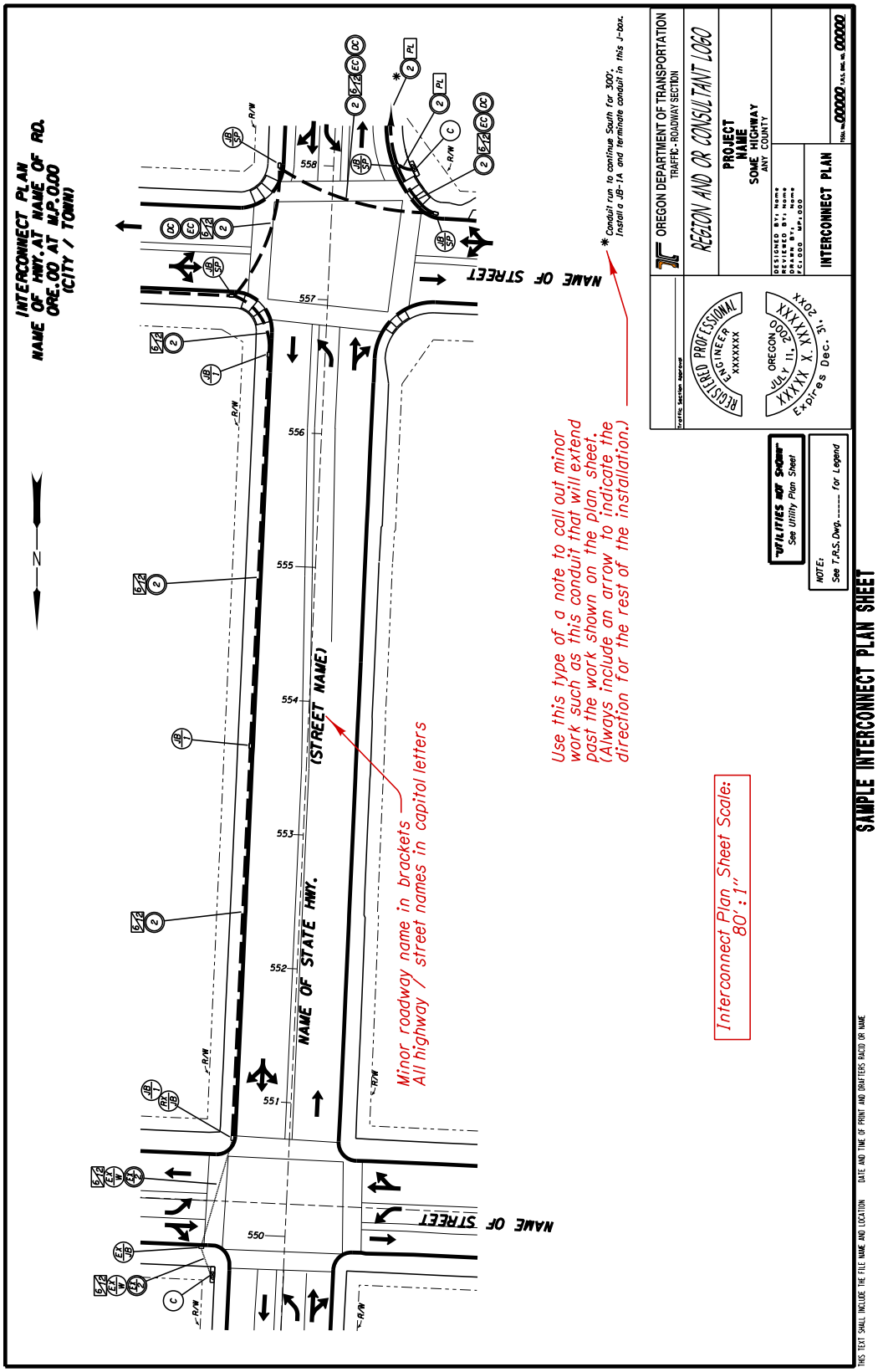


Figure 1-9 | Typical Signal Plan Set (7 of 7)

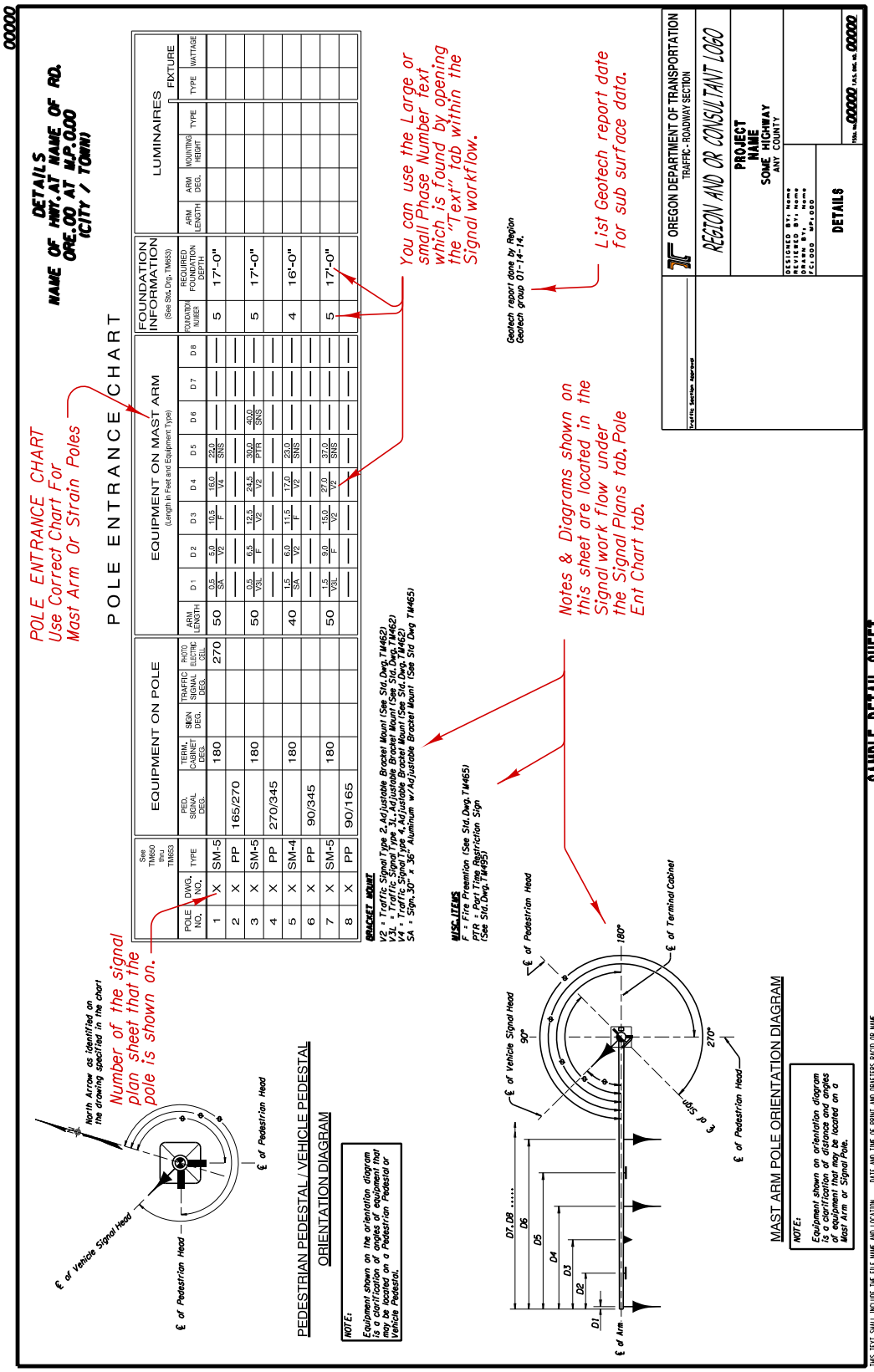


Figure 1-10 | Typical Temporary Traffic Signal Plan Set (1 of 3)

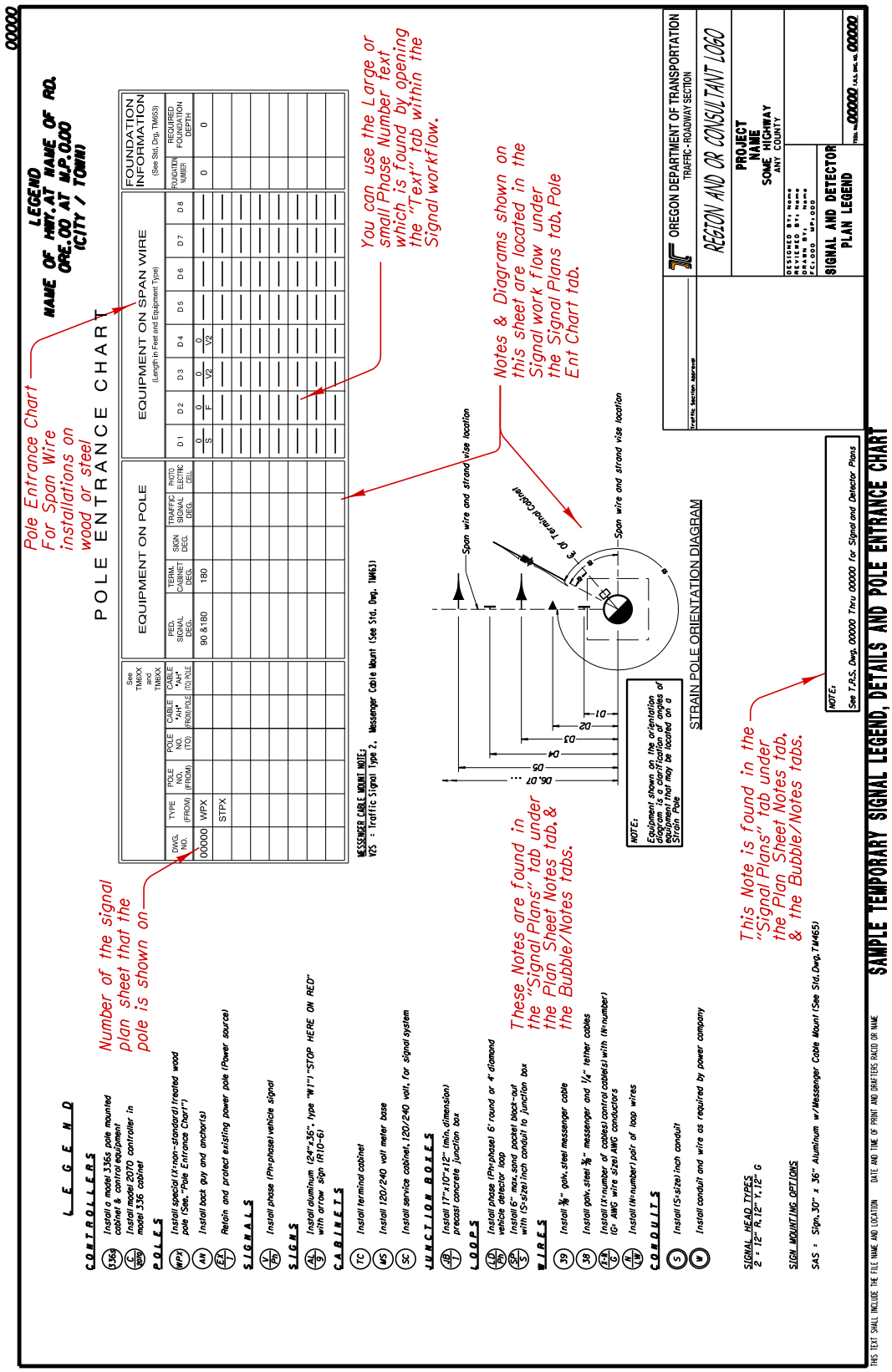


Figure 1-11 | Typical Temporary Traffic Signal Plan Set (2 of 3)

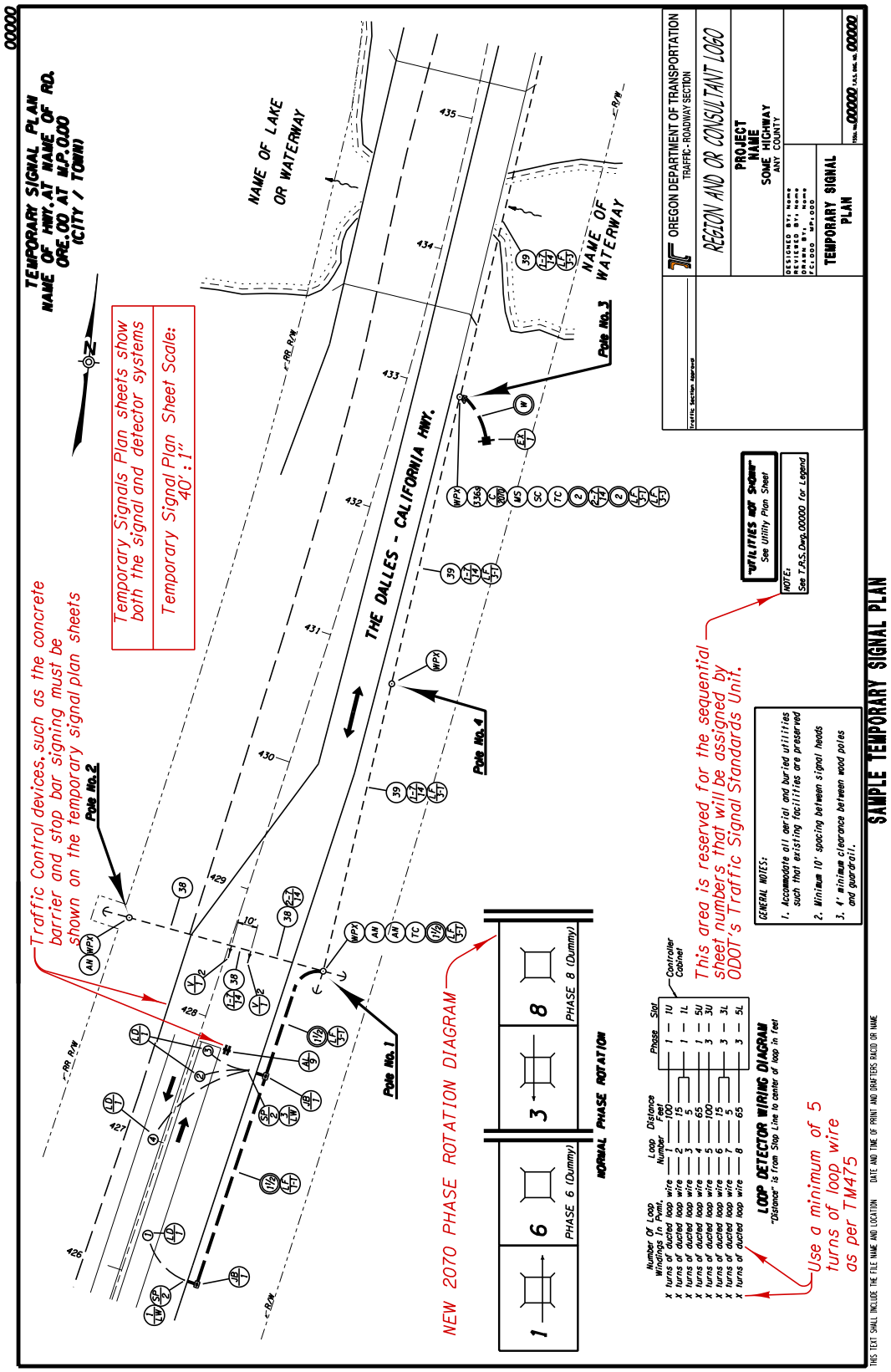


Figure 1-12 | Typical Temporary Traffic Signal Plan Set (3 of 3)

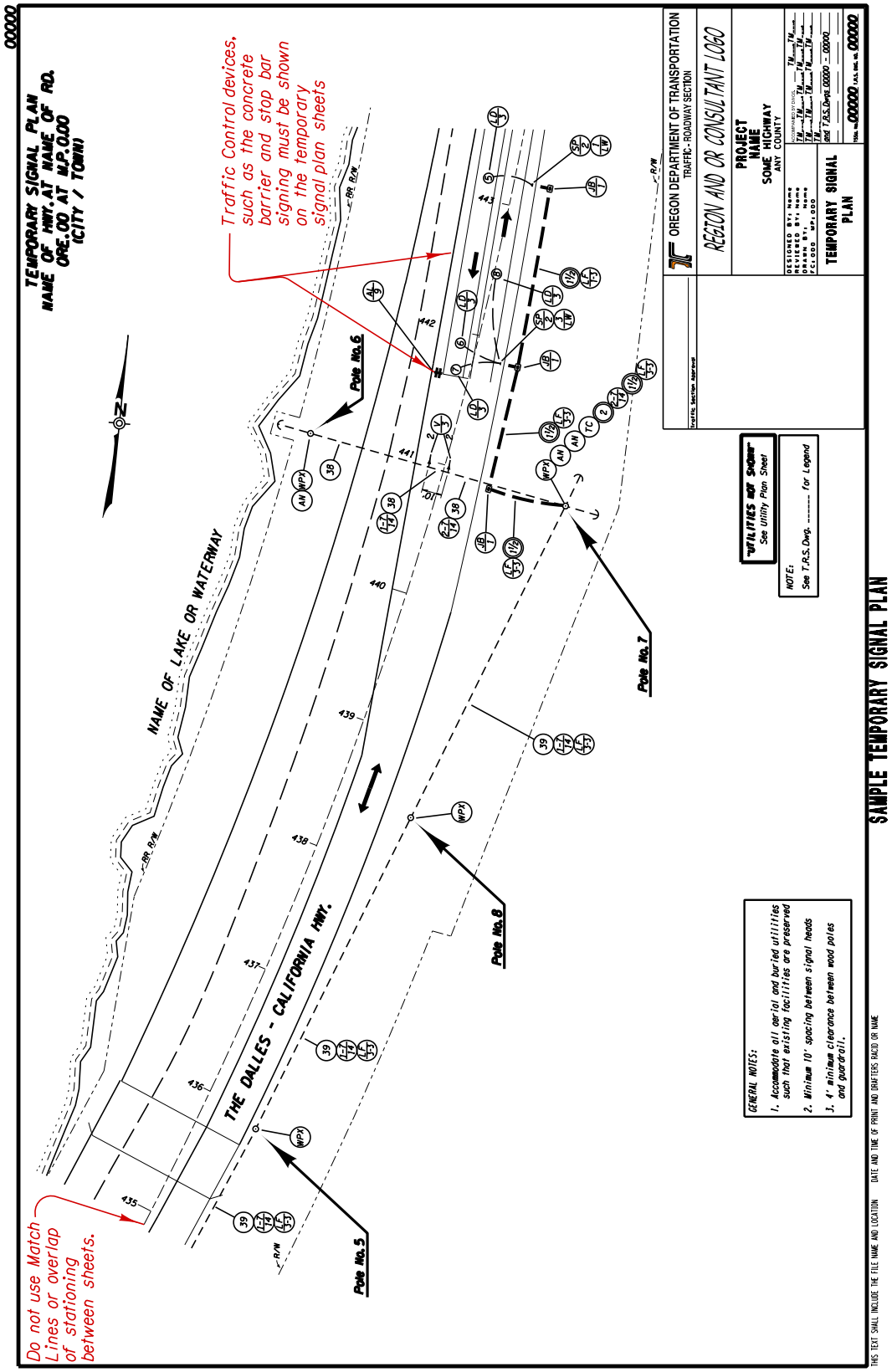


Figure 1-13 | Typical Flashing Beacon Plan Set (1 of 2)

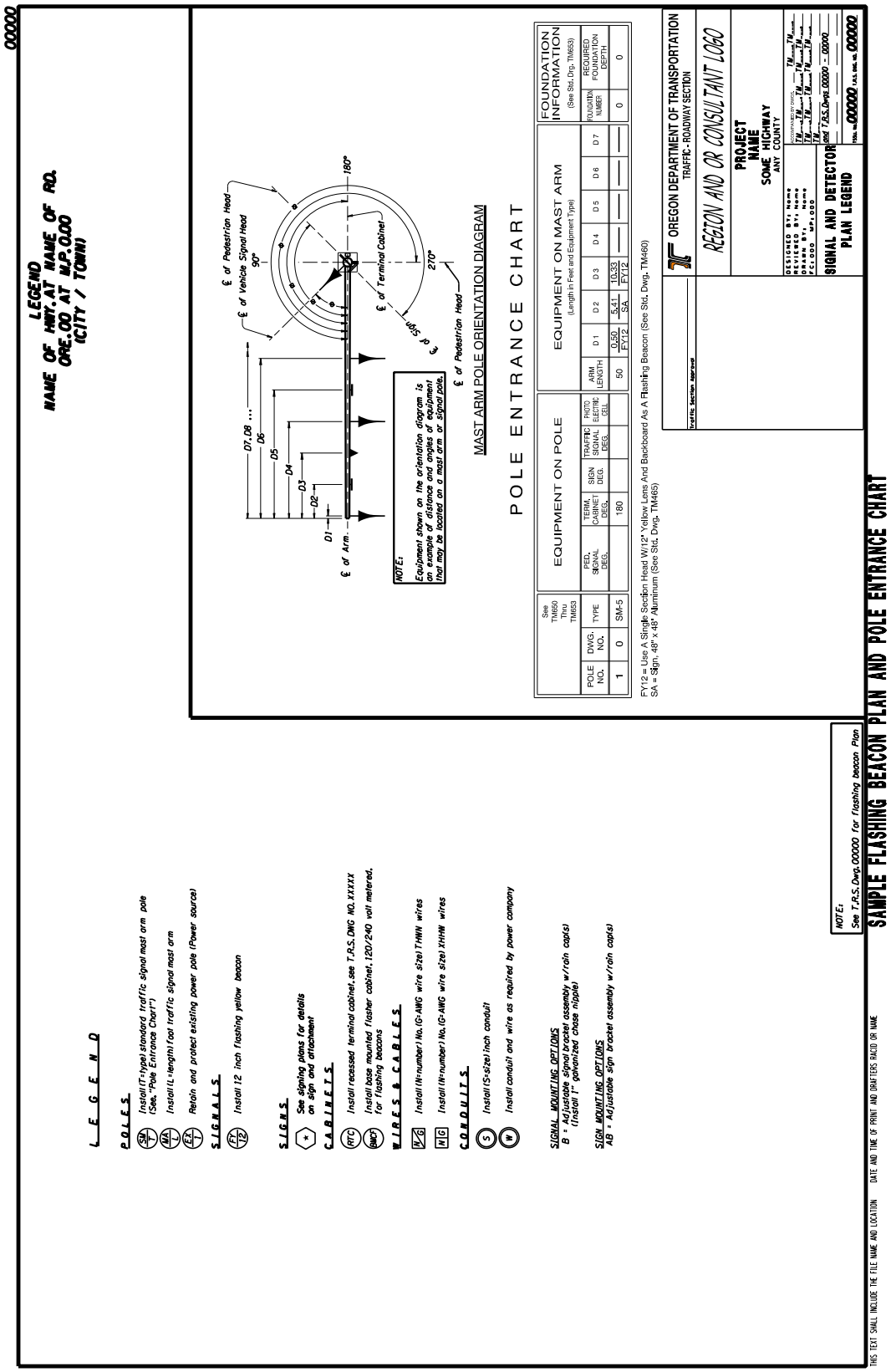


Figure 1-14 | Typical Flashing Beacon Plan Set (2 of 2)

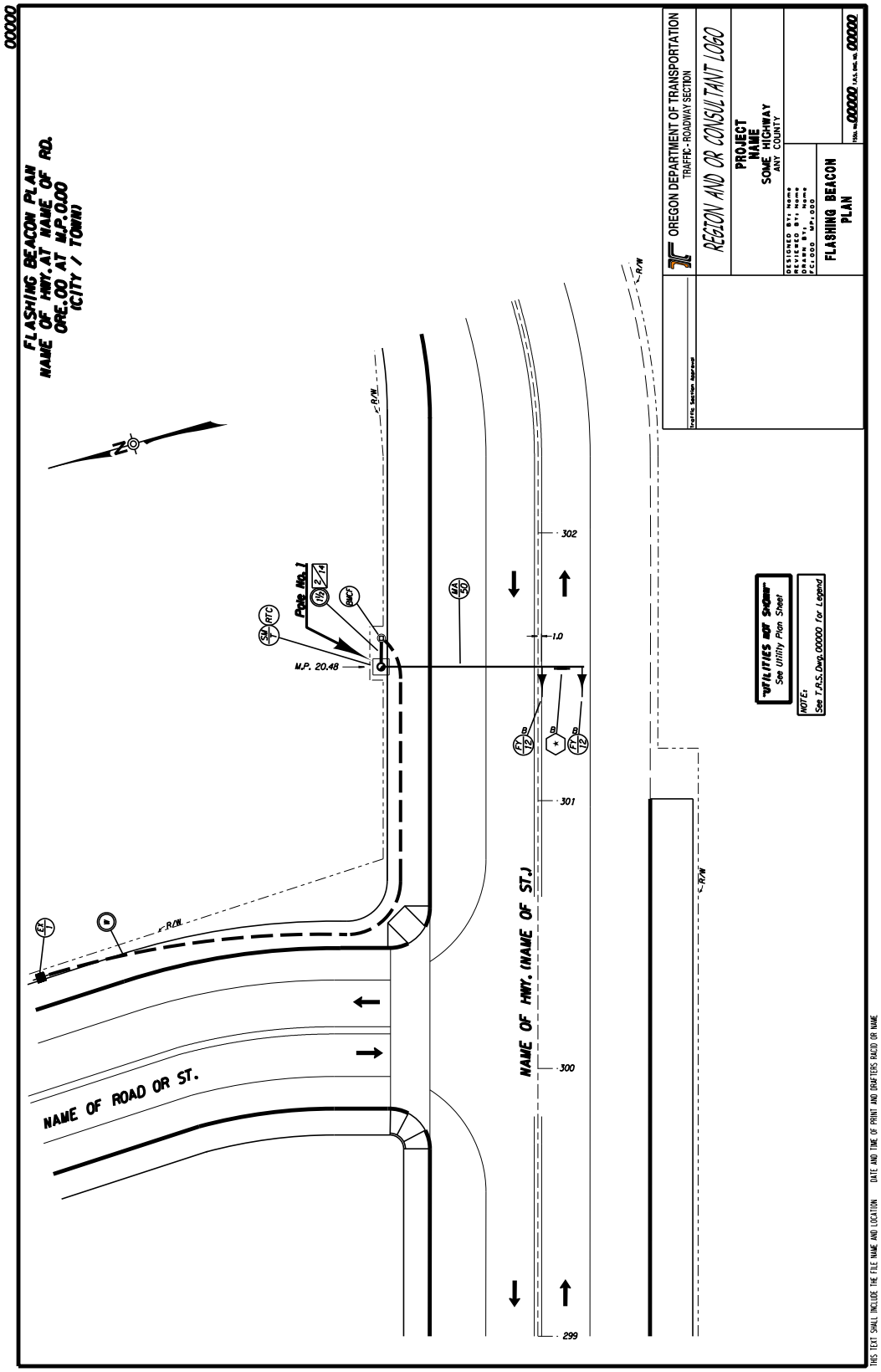


Figure 1-15 | Railroad Preemption Plan

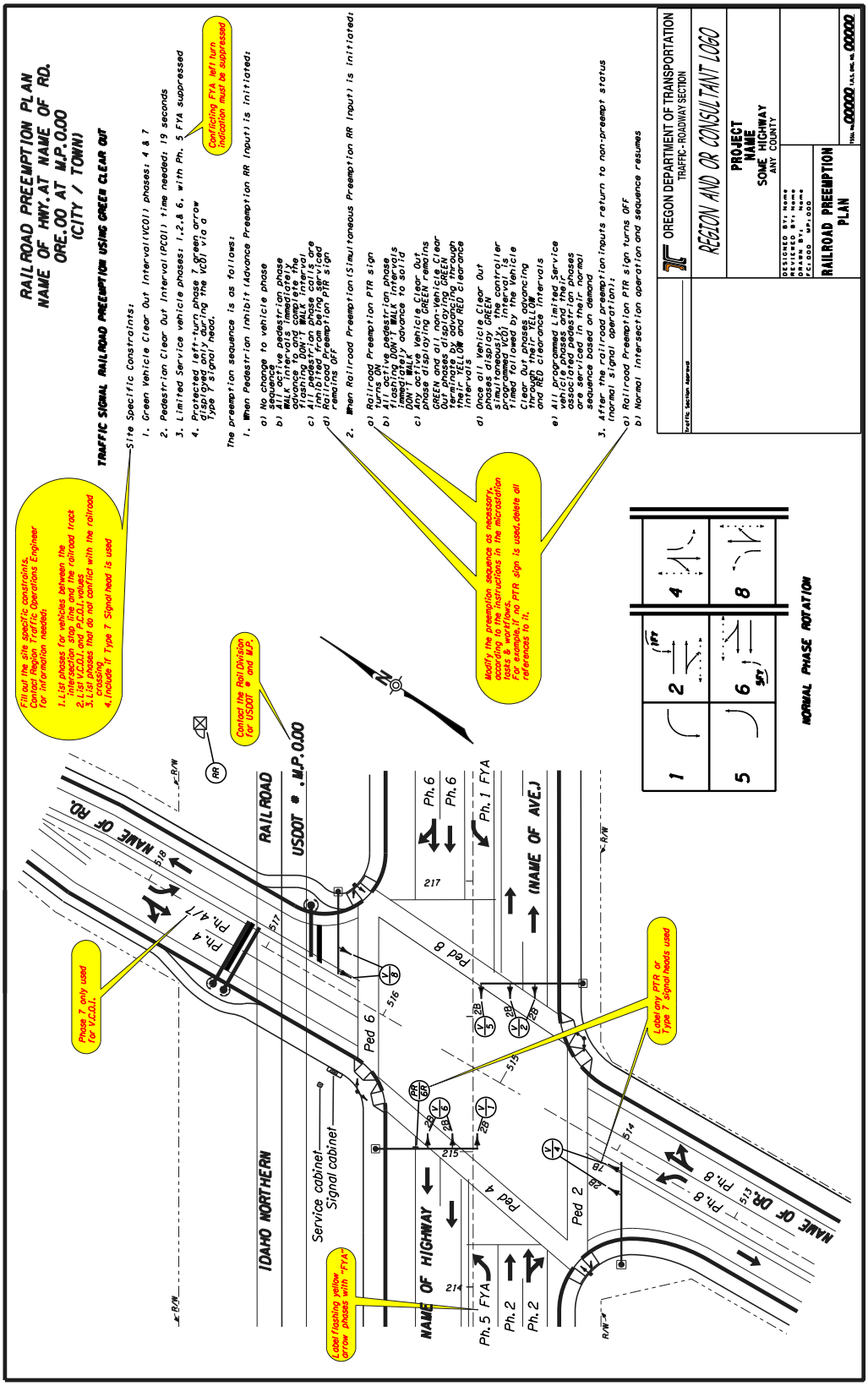


Figure 1-16 | Typical Cabinet Print Sheets Requiring Drafting (1 of 3)

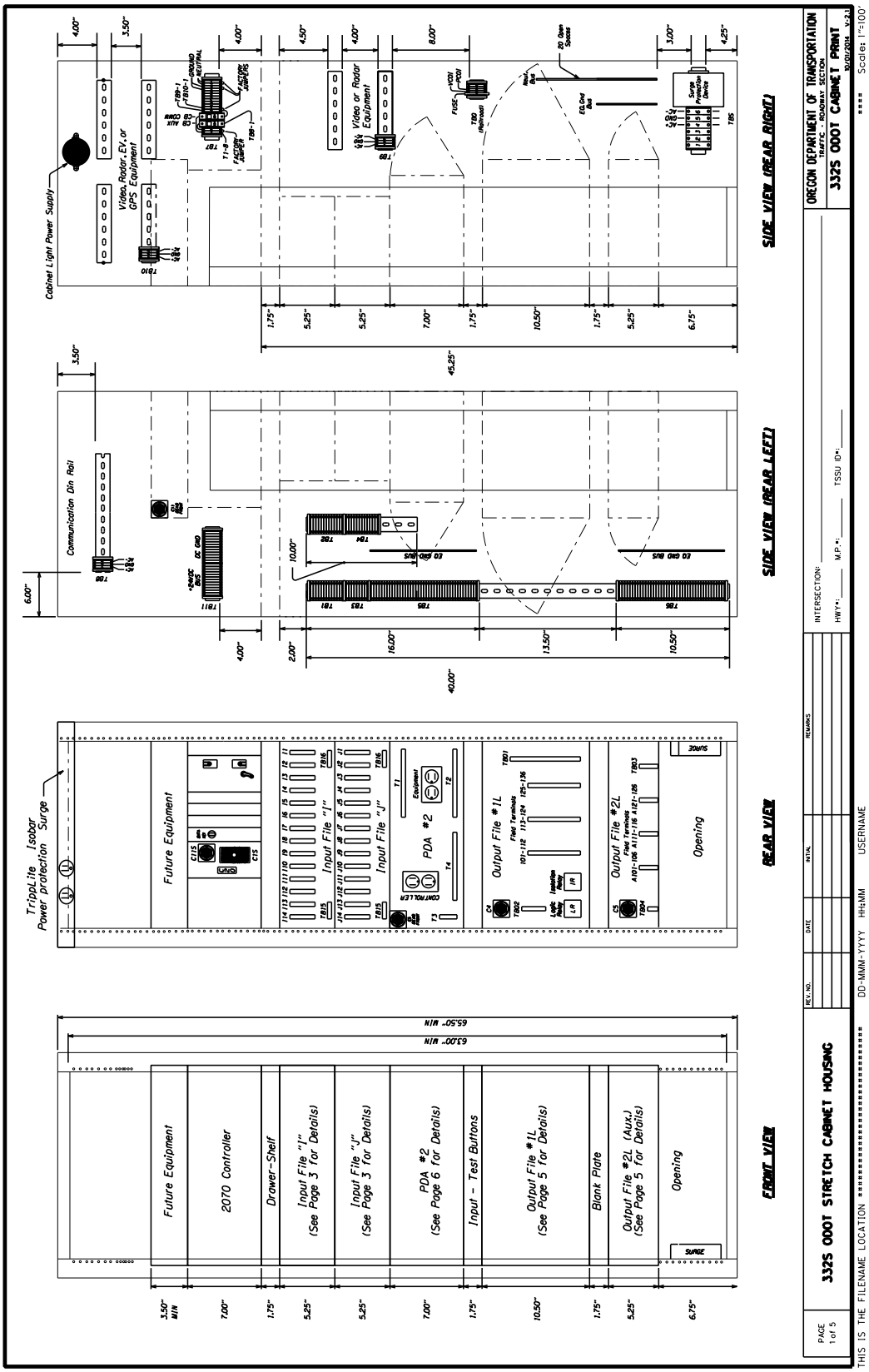


Figure 1-17 | Typical Cabinet Print Sheets Requiring Drafting (2 of 3)

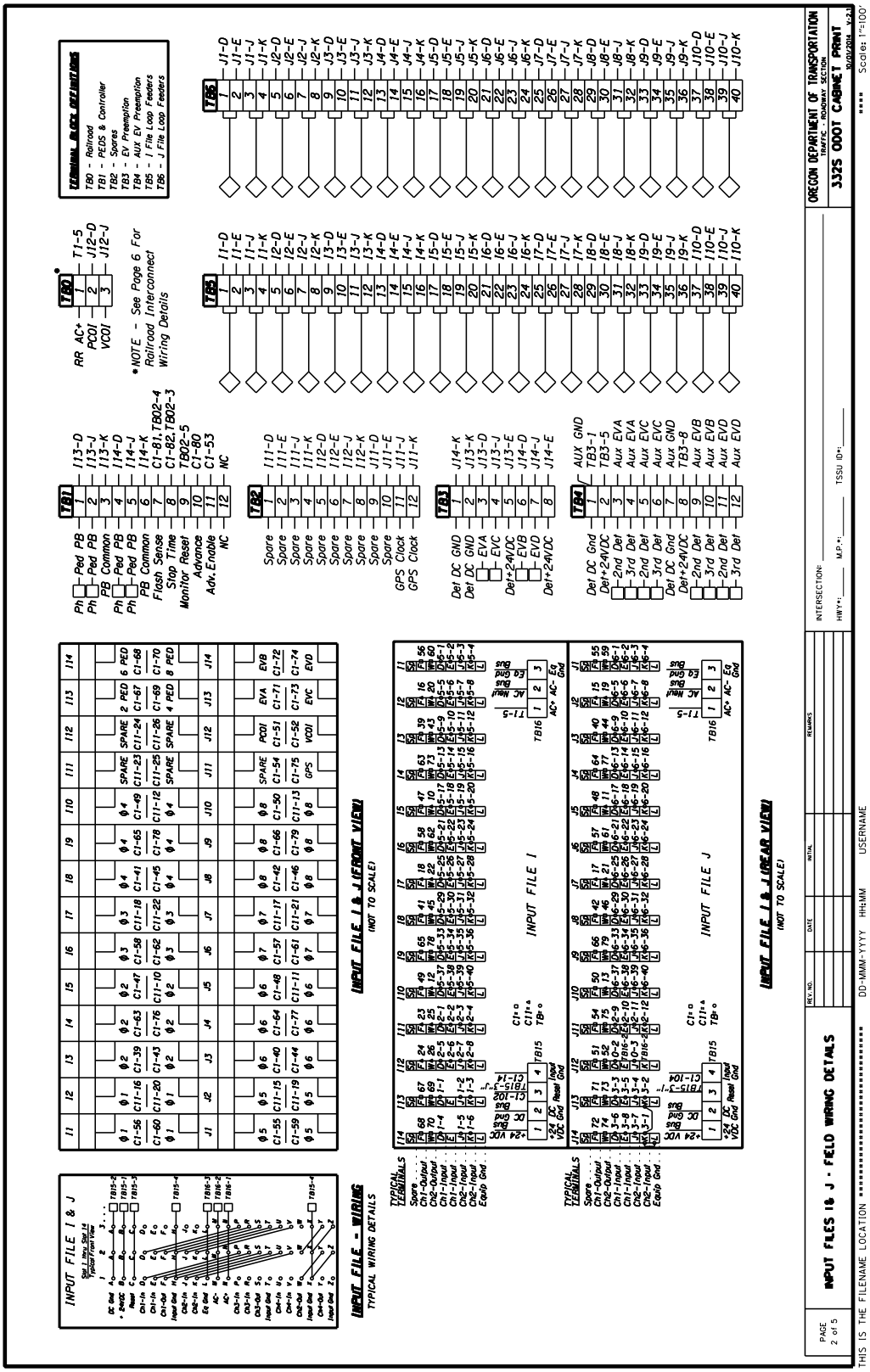
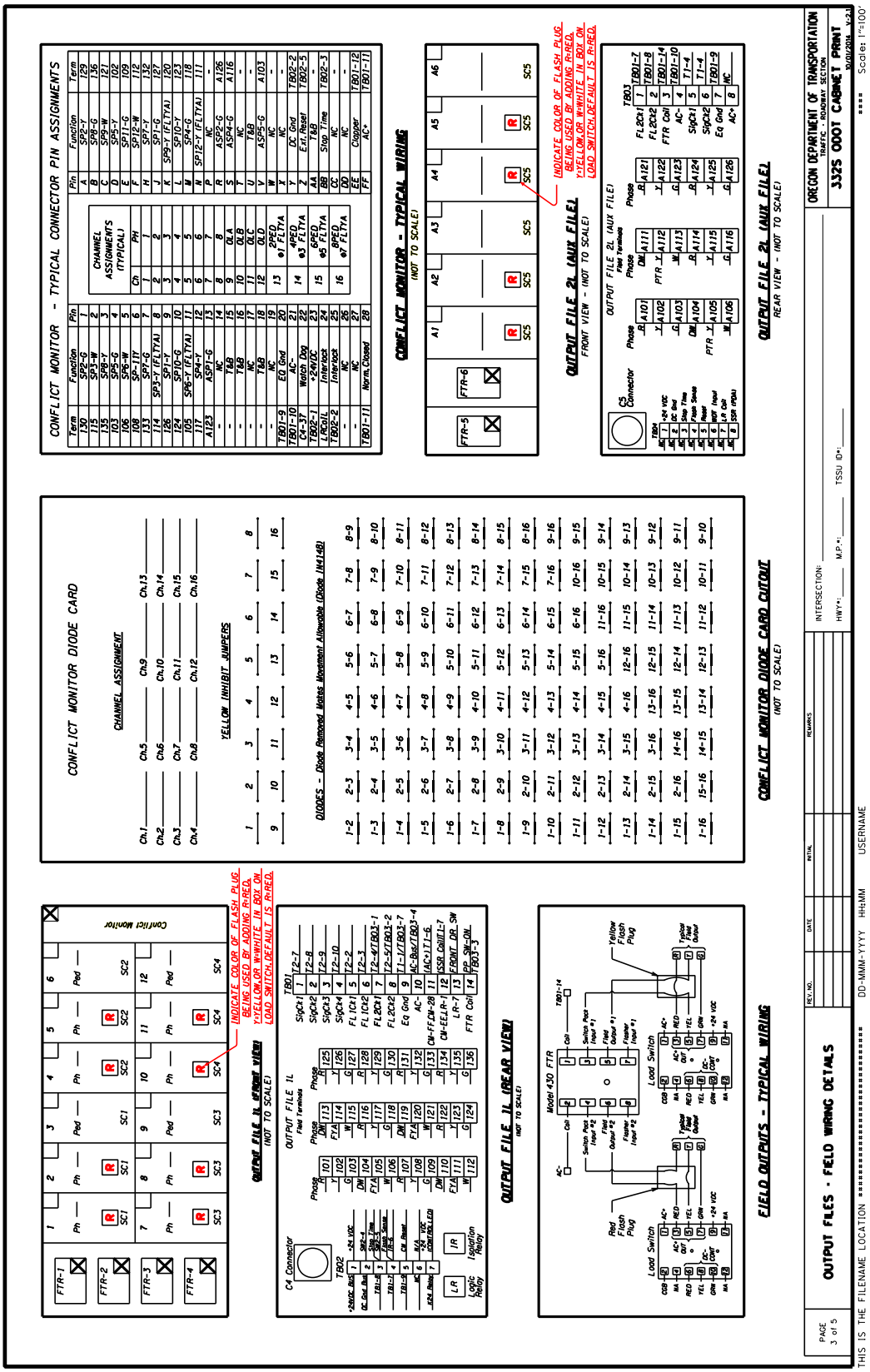


Figure 1-18 | Typical Cabinet Print Sheets Requiring Drafting (3 of 3)



2 Starting CAD Plans

Two separate files should be created by the Signal Drafter/Designer to produce signal plans:

1. The Signal Base Map file.
2. The Signal Plan Sheet file.

The Signal Drafter/Designer is encouraged to find the most efficient way to use the drafting software, which may vary from the methods discussed in this manual. However, the basic drafting philosophy discussed in this manual should be followed:

- Using separate files for design work and for plan sheet detailing work (allows for proper use of Annotation Scale).
- Using separate models within your design files may be beneficial for using Annotation Scale.
- Using standard signal design drafting symbology.
- Using Annotation Scale.

2.1 CAD Naming Convention

Use the following file naming conventions for signal base map and signal plan sheet files. Using these file naming standards makes it easier for Traffic CAD users and other CAD users to know what a file will contain.

- Signal Base Map File: **12345tr_base.dgn**
    - 12345 = Project Key Number
    - tr = Traffic Section Plans
    - base.dgn = Microstation Base Map File

- Signal Plan Sheet File: **12345tr_sg1.dgn**
    - 12345 = Project Key Number
    - tr = Traffic Section Plans
    - sg1.dgn = Microstation Signal Plan Sheet File

If more than one file is needed for signal plan sheets, additional files can be created. Each additional plan sheet file would be named consecutively; sg2.dgn, sg3.dgn, sg4.dgn, etc.

If the project does not have a key number (i.e. maintenance state force work), use the highway number in the standard naming convention as shown below:

- Signal Base Map File: **Hwy10**tr_base.dgn
  (Hwy10 = The ODOT highway number is where the work is occurring)

2.2 Signal Base Map File

This file contains all of the scalable signal design features, such as poles, signal heads, pedestrian heads, junction boxes, cabinets, conduit runs, detection, etc. The process for creating the signal base map file and starting the signal design is described in this section.

The signal base map file is created by starting a new 2D file in Microstation. The file should be named according to Section 2.1 and scaled at 100:1.

Other base map files from different disciplines (roadway, right-of-way, striping, etc.) are then referenced into the signal base map file. If the signal plans are part of a roadway construction project, these referenced base map files should be available from the roadway designer:

- Keynumber_A.dgn (proposed centerline alignment)
- Keynumber_D.dgn (proposed construction features)
- Keynumber_E.dgn (existing features)
- Keynumber_RW.dgn (existing and proposed right-of-way)

To maintain coordinate correct base maps, do not rotate, move or scale any elements in the referenced base map files from the original location within the Microstation Design Plane.

Do NOT change the orientation of the North arrow. Always use the most current version of each base map. This typically requires updating the referenced base map files as needed throughout the design phase of the project; good communication with the other disciplines is essential to ensure the correct base map files are used.

Each referenced base map file should be groomed. This is done because signal plans are printed at a different scale and must emphasize different design features than plan sheets produced for other disciplines. Grooming includes turning off any levels with extraneous information/elements not need for the signal design and modifying the design features to conform to the standard signal design symbology and line styles as shown in this guide. The tools to groom are found in the ODOT Tasks & Workflows under Signal Plans, Symbology, Lane Sym & RW tabs. Common elements that require grooming include:

- Turning off levels:
  - Signs
  - Landscaping, trees and brush
  - Buildings
- Modifying design features:
  - Curbs
  - Crosswalks
  - Centerline
  - Various lane use lines
  - Edge of travel lanes / edge of pavement
  - R/W lines

If a project does not have any base map files that can be referenced into the signal base map file (for example, small scale state force work with no roadway construction), a signal base map will need to be created from the most current data available; paper or electronic vicinity map, original plans or as-built plans. Paper copies can be scanned into Microstation and then retraced. This method is only used as a reference to begin drafting the base map; all information shall be verified in the field. A survey may be needed to verify travel lanes, equipment and R/W locations.

Construction plans and as-constructed PDF plans can be found and downloaded at:
http://www.oregon.gov/ODOT/HWY/TS/Pages/signals.aspx#Drawings_&_Database

This link will take you to Filenet, ODOT's Drawing Number Database that contains historical information on signals that have been constructed on Oregon State highways. Filenet will provide you with existing plan sheets that can be of use for future designs.

Once the signal base map file is created and base map files from other disciplines have been referenced in and appropriately groomed, the Signal Drafter/Designer can start the signal design work in the signal base map file. The signal design work includes placement of all the scalable signal design features, such as, signal poles, conduits, junction boxes, loops, etc.

Once all of the signal design work is completed, the signal plan sheet file can be created and work can begin on detailing the signal plan sheets.

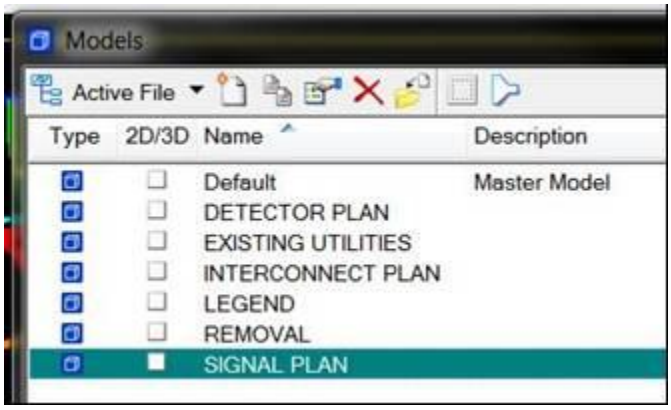
2.3 Signal Plan Sheet File

This file contains the plan sheet borders, bubble notes, and all other notes and details required for the plan sheet. The signal base map file is referenced, as appropriate, into each plan sheet border. The process for creating the signal plan sheet file and starting the plan sheet detailing work is described in this section.

The signal plan sheet files should be created by starting a new 2D file in Microstation. The file should be named according to Section 2.1. Within this file, create a new model for each type of plan sheet that will be needed on the project (see following list).

IMPORTANT: Set the scale of each model to the appropriate scale as shown in Table 1 before doing any work in the plan sheet file. This allows the annotation scale feature to work properly.

Figure 2-1 | Models



All of the common names of plan sheets that you may need are listed below. They are shown in the order that they will be placed in the signal plan set.

1. LEGEND
2. REMOVAL PLAN
3. TEMPORARY SIGNAL PLAN or TEMPORARY RAMP METER PLAN.
4. SIGNAL PLAN, or RAMP METER PLAN, or FLASHING BEACON PLAN, or FIRE SIGNAL PLAN, or PEDESTRIAN SIGNAL PLAN, or RED LIGHT ENFORCEMENT PLAN (Insert the type of plan you are designing on line 4).
5. DETECTOR PLAN
6. EXISTING UTILITIES
7. INTERCONNECT PLAN (if required)
8. DETAILS (one or more sheets – multiple intersections)

If there are multiple intersections or multiple types of installations on a project, the plans shall be arranged so that the signal plan sheets follow the same order as the roadway plan sheets. Roadway stationing should be followed, if available. If stationing is not available, follow mile points (lowest to highest).

Place multiple intersection signal plan sheets as follows:

1. LEGEND (All intersections)
2. REMOVAL PLAN (1st intersection)
3. TEMPORARY SIGNAL PLAN (1st intersection)
4. SIGNAL PLAN (1st intersection)
5. DETECTOR PLAN (1st intersection)
6. EXISTING UTILITIES (1st intersection)
7. REMOVAL PLAN (2nd intersection)
8. FIRE SIGNAL PLAN (2nd intersection)
9. EXISTING UTILITIES (2nd intersection)
10. REMOVAL PLAN (3rd intersection)
11. PEDESTRIAN SIGNAL(3rd intersection)
12. EXISTING UTILITIES (3rd intersection)

Continue with the remaining intersections then:

13. INTERCONNECT PLAN(S)
14. DETAILS (Pole Entrance Chart)
15. DETAILS Miscellaneous

See Table 1 below for various plan sheet scale.

Table 1 | Plan Sheet Scales

Scale	Signal Plan Sheet Type	Model Names
20:1	Signal Plan (may also be at 30:1 if necessary)	Same as plan sheet type
	Railroad Preemption Plan	
	Flashing Beacon Plan	
	Fire Signal Plan	
	Red Light Enforcement Plan	
	Existing Utilities (may also be at 40:1 if necessary)	
40:1	Detector Plan	Same as plan sheet type
	Existing Utilities (may also be at 20:1 if necessary)	
	Ramp Meter Plan	
	Temporary Ramp Meter Plan (may also be at 30:1or 20:1 if necessary)	
	Temporary Signal Plan (may also be at 30:1or 20:1 if necessary)	
	Automated Traffic Recorder Plan	
	Removal Plan	
80:1	Interconnect Plan	Same as plan sheet type
100:1	Legend	Same as plan sheet type
	Details	
	Miscellaneous	

In each model, place the number of plan sheet borders needed for the project. Sheet borders are available in the Tasks & Workflows under the “General” tab, then “Sheet Borders” tab. In each plan sheet border place the traffic signal title block. The traffic signal title blocks are available in the Tasks & Workflows under “Signal” tab, then “Title Blocks” tab.

In each plan sheet border, reference the appropriate area of the signal base map file by using Live Nesting and the reference clip boundary tool. When using the Annotation Scale, there is no need to scale the reference files; (Verify the reference is at a 1:1) they should automatically load at the correct scale (based on the scale that was specified for the model).

When laying out the signal plan sheets, always orient the signal base map file into the signal plan sheet file with the mainline stationing increasing from left to right across the page. This will match the orientation of the roadway plans. If no roadway construction will be accompanying the signal design, orient the mainline horizontally across the plan sheet, with stationing increasing from left to right. If centerline stationing is not available, orient the mainline horizontally across the plan sheet.

Once the signal base map file has been referenced into each plan sheet border as appropriate, the Signal Drafter/ Designer can start the plan sheet detailing work in the signal plan sheet file. The plan sheet detailing work includes all of the non-signal hardware items such as the bubble note, lane use arrows, and any text that is needed for the contract plan sheets. The tools for the plan sheet detailing work are found in the ODOT Tasks & Workflows, Signals and they have been designed to work with the Annotation Scale.

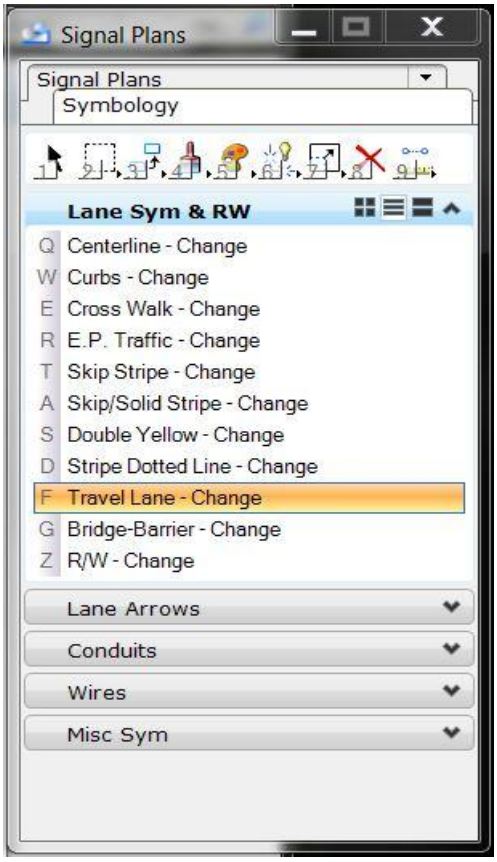
The development of signal plans normally occurs after the roadway design has been well established. Talk with the roadway designer before beginning any layout of the signal plan(s). If there are any anticipated changes, consider how this may impact your work flow.

Some of the items that may change your sheets and need to be considered are:

- **Signal Removal Plan** – for existing signals that are being modified or replaced,
- **Interconnect Plan** – interconnection between two or more signals,
- **Railroad Preemption Plan** – railroad in the immediate area. This Plan sheet is part of the Rail Crossing Order, NOT part of the contract plans.
- **Temporary Signal Plan** – to maintain signalization of the intersection during construction if there is an existing traffic signal.

See Figure 2-2 for the line styles found in the ODOT Tasks & Workflows under the Signal Plans, Symbology, Lane Sym & RW tabs.

Figure 2-2 | ODOT Line Styles



For additional information on traffic signal tasks & workflows click on the following link: MicroStation Users Guide.

2.4 Plan Sheet Examples

Figure 2-3 shows a sheet border with the base map referenced into the sheet. The only elements shown in the "12345tr_sg1.dgn" file are the sheet border, title block cell, and the intersection information in the upper right. The intersection and features shown are located in the reference file.

Figure 2-3 | Base Map Referenced into Signal Plan Sheet Border

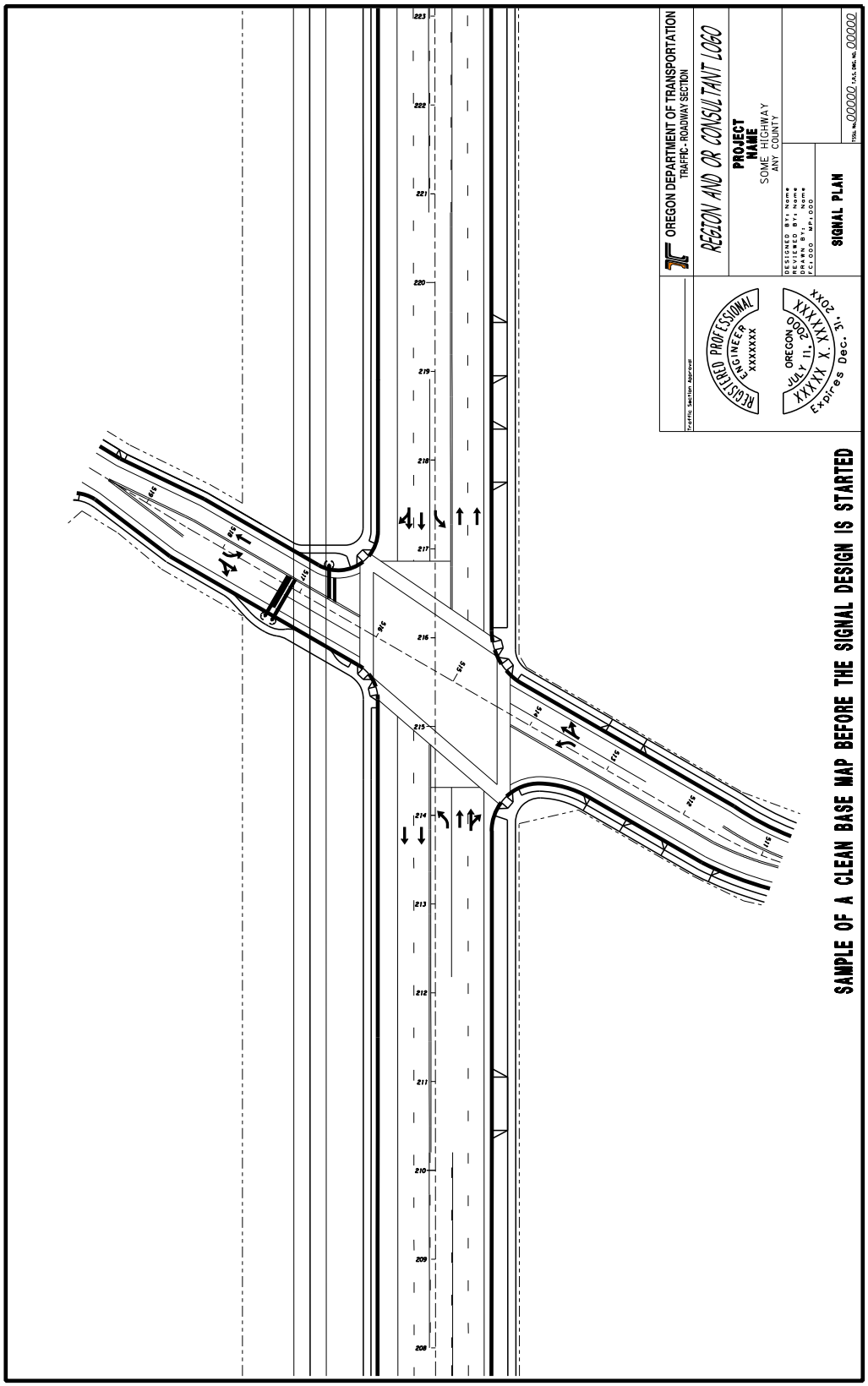


Figure 2-4 is an example of the same signal plan sheet border with the base map referenced into the "12345tr_sg1.dgn" file containing all bubbles, leaders, dimensions and other non-signal features.

Figure 2-4 | Base Map Referenced in with Bubbles, Leaders, Dimensions, and Other Non-Signal Features

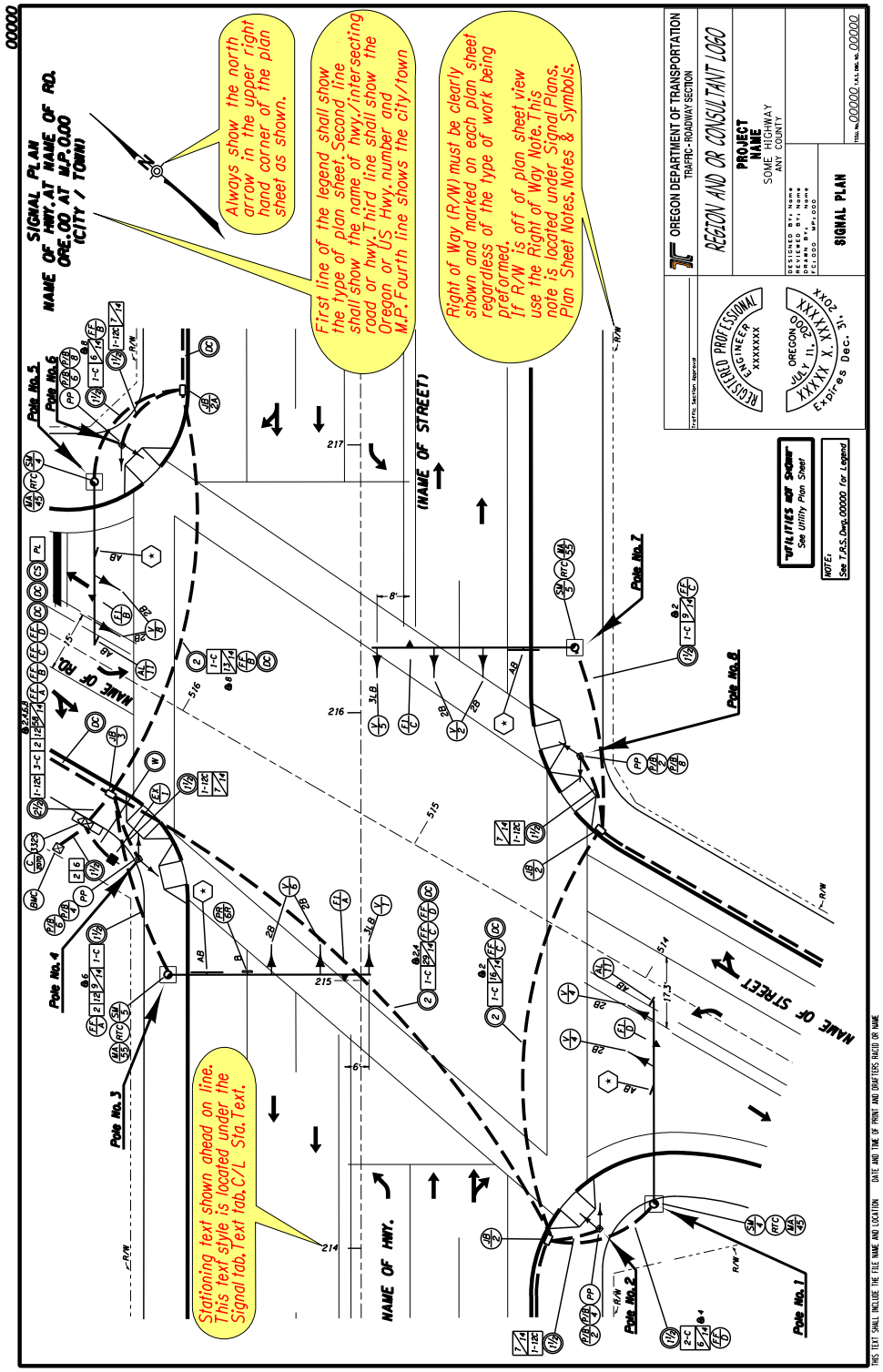


Figure 2-5 below shows an example of a signal plan sheet border with the base map reference file turned off. This illustration shows what is in the “12345tr_sg1.dgn” file.

Figure 2-5 | Bubbles, Leaders, Dimensions, and Other Non-Signal Features with Basemap Referenced Turned Off

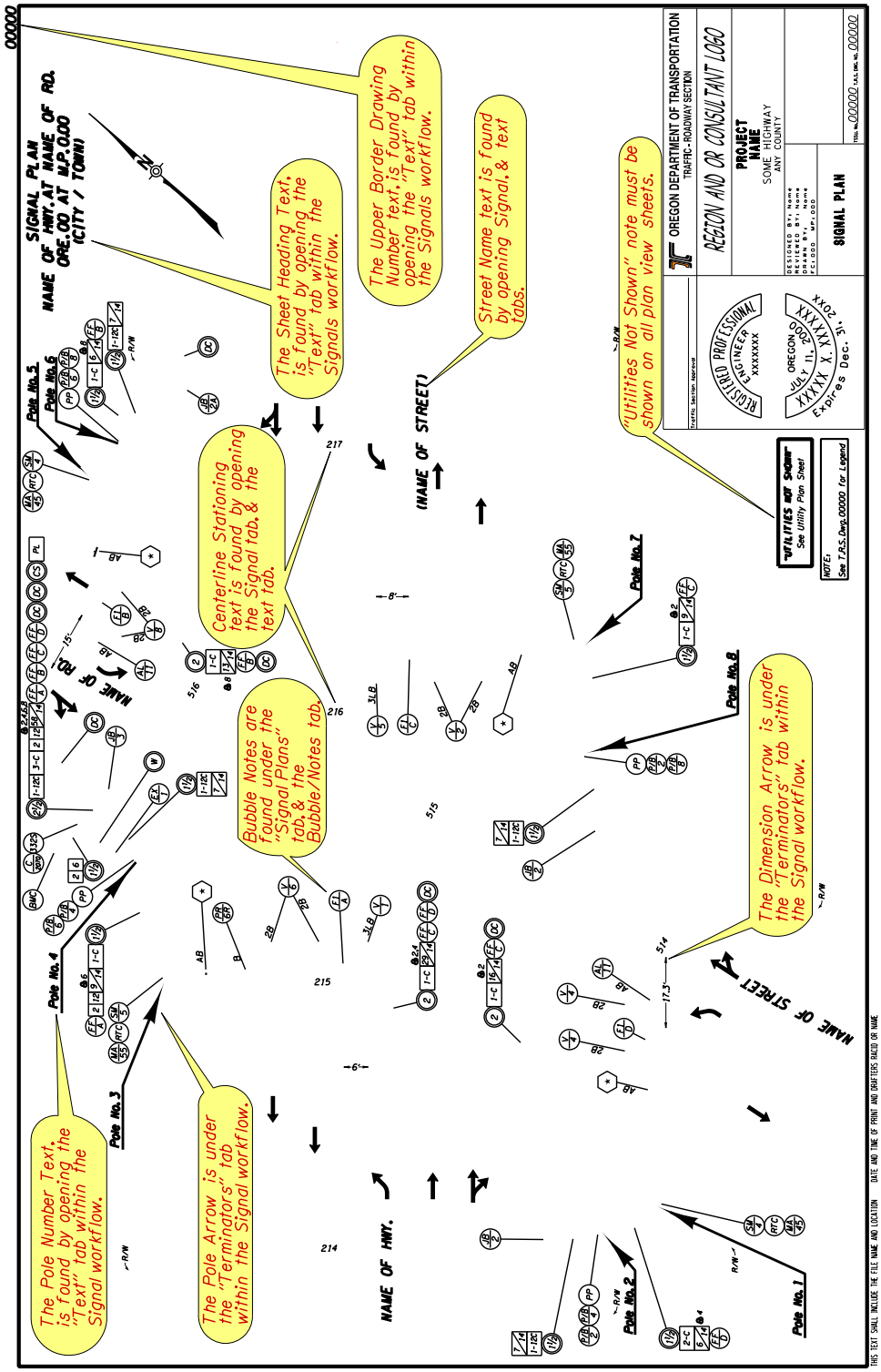


Figure 2-6 below shows a perspective view of a sheet border and its contents above a base map reference file. The contents of the plan sheet are shown in red for clarity. Note that all of the proposed construction is in the base map reference file and all of the bubble notes, pole arrows title block and other non-construction items are in the red plan sheet.

Figure 2-6 | Plan Sheet Perspective View

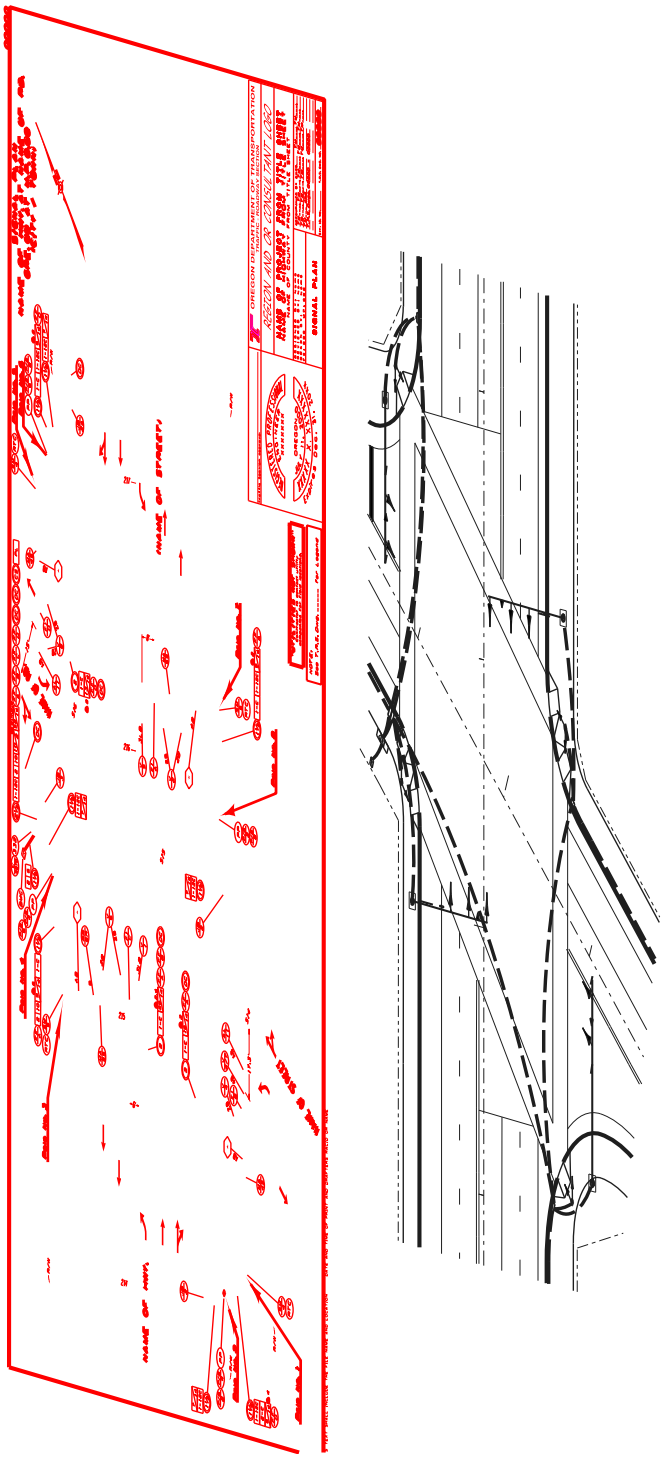
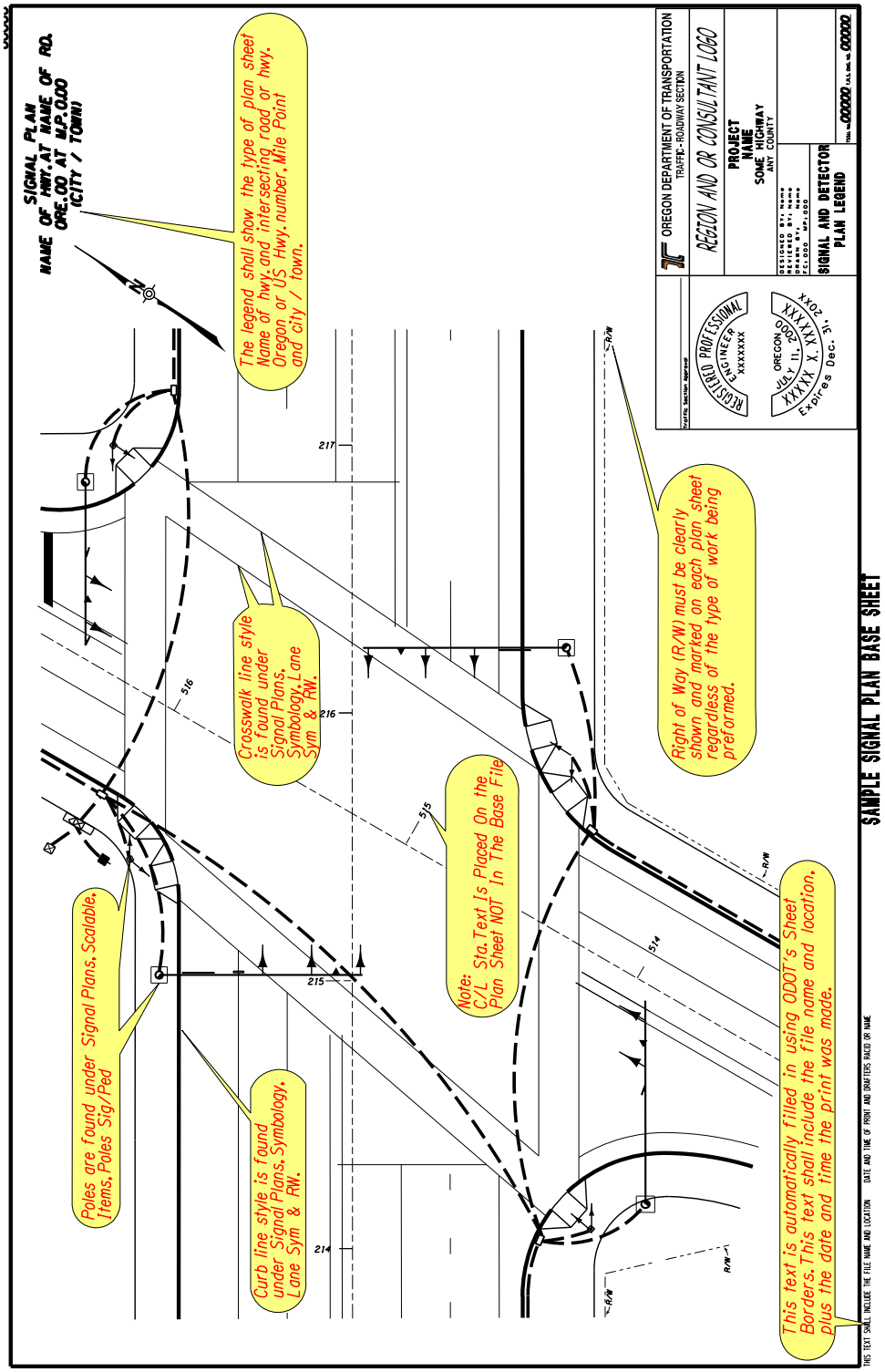


Figure 2-7 shows a base map which has been referenced into a signal plan sheet. The Plan sheet is scaled at 20:1. This sheet is ready to have bubbles and notes placed on it.

Figure 2-7 | Scaled Signal Plan Sheet



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3 Drafting Requirements

3.1 Requirements for Plans Submitted to ODOT

The following are requirements for plans submitted to ODOT:

3.1.1 Plans Produced for ODOT to be Let and Administered by ODOT

- Plans must meet all design and drafting criteria in both the ODOT Design and Drafting Manuals for traffic signals.
- Plans must be drafted and submitted in Microstation V8i format. AutoCAD files are not acceptable.
- Plans must be printed on 11”x17” paper or submitted in PDF format for preliminary, advance, and final plan review submittals. Plans for construction must be submitted to ODOT on 11”x17” Mylar. Each sheet shall bear the engineer’s stamp and be wet-signed by the engineer of record.
- Grey shading on ODOT plan sheets is not permitted. (Grey shading will not reproduce with acceptable results when printed on a high-speed printer.)
- Plans must be approved and wet signed by ODOT Traffic Signal Standards personnel.

3.1.2 Plans Produced for ODOT by Cities, Counties, or Private Developers

- Plans must meet all design and drafting criteria in both the ODOT Design and Drafting Manuals for traffic signals.
- Plans must be legible. If ODOT will print the plans, grey shading on the plans shall not be used.
- Plans must correctly show ODOT standards such as poles and all other hardware.
- Plans must be printed on 11”x17” paper or submitted in PDF format for preliminary, advance, and final plan review submittals. Plans for construction must be submitted to ODOT on 11”x17” Mylar. Each sheet shall bear the engineer’s stamp and be wet-signed by the engineer of record.
- Plans must be approved and wet signed by ODOT Traffic Signal Standards personnel.
- Plans must be drafted and submitted in Microstation V8i format. AutoCAD files are not acceptable.

3.2 Traffic Signal Tasks and Workflows

All of the current drafting standards are available by using the **Microstation Tasks & Workflows**. This menu will help you select the correct notes, text styles, symbols, line styles, line weights, levels and cells.

NOTE: It is the user's responsibility to ensure that the ODOT workspace Tasks & Workflows are the latest version before and during design of all signal projects. ODOT reserves the right to update the workspace and the associated cells at any time. See the links below for access to the ODOT workspace Tasks & Workflows.

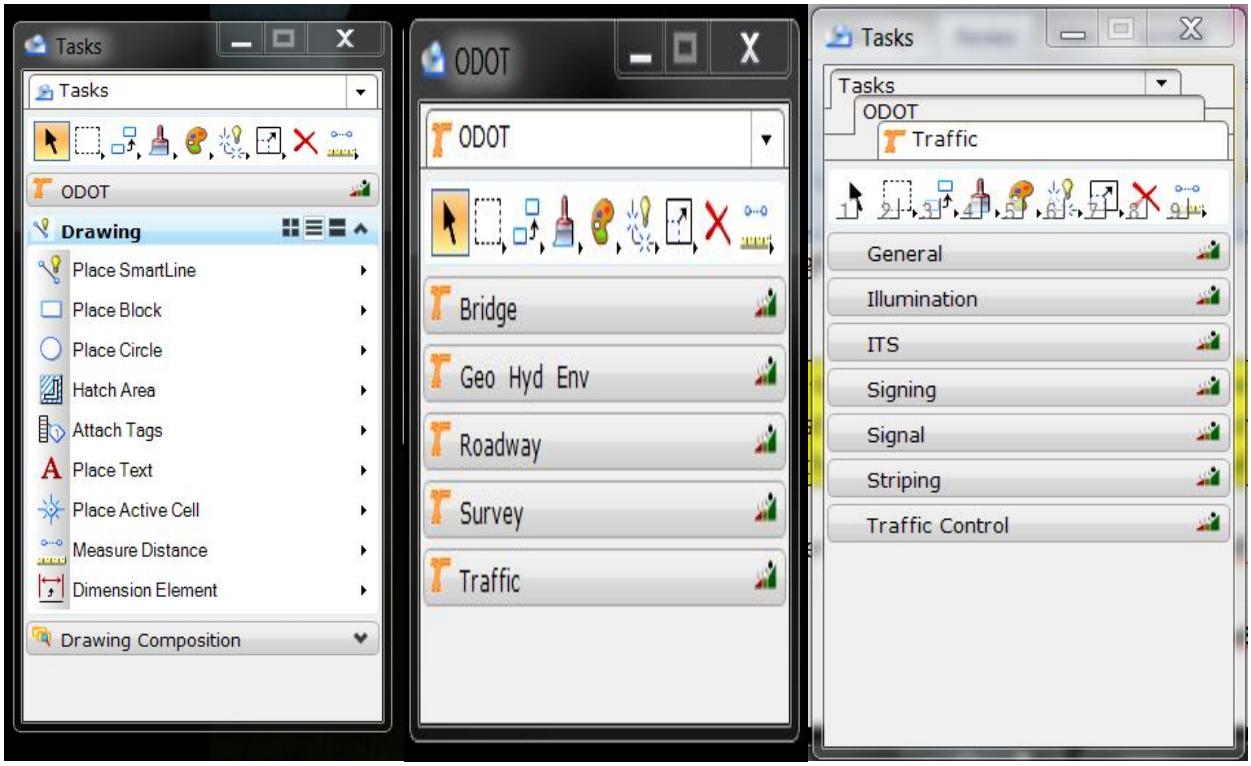
http://www.oregon.gov/ODOT/HWY/CONSULTANT/Pages/Consultants-Portal.aspx

ftp://ftp.odot.state.or.us/isb/appeng/Microstation/V8i/

http://www.oregon.gov/ODOT/HWY/CONSULTANT/Pages/Consultants-Portal.aspx#Consultant_Subscription_Email_List

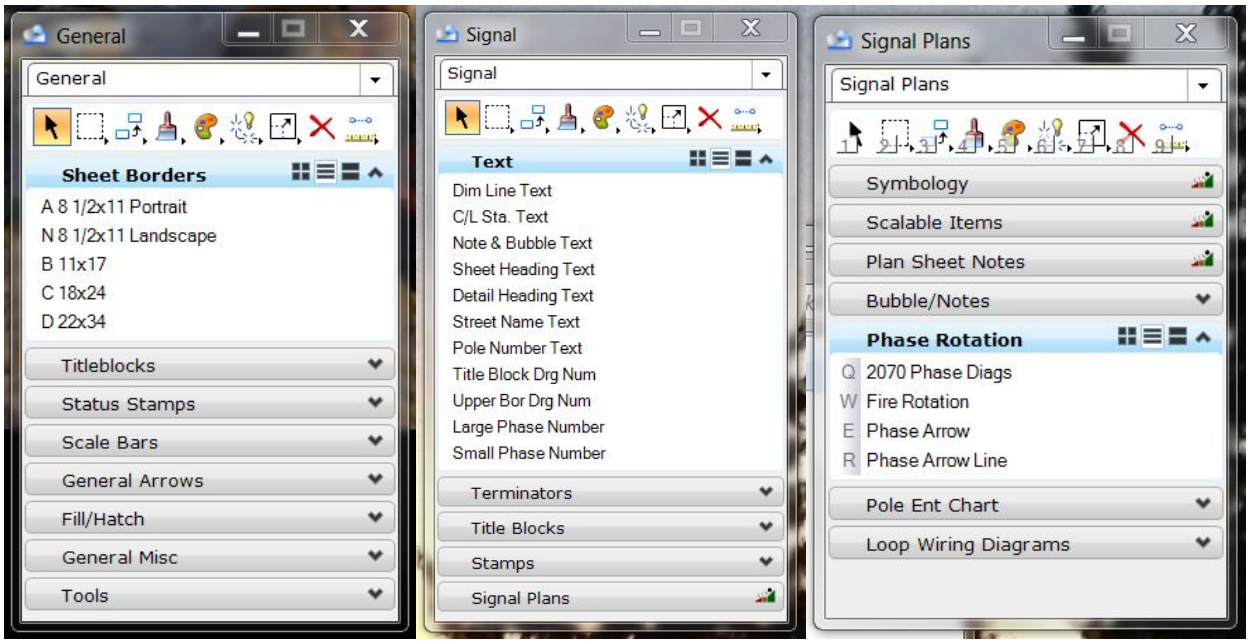
Once the tasks & workflows are opened in Microstation they will look similar to the ones shown below:

Figure 3-1 | Microstation Tasks & Workflows



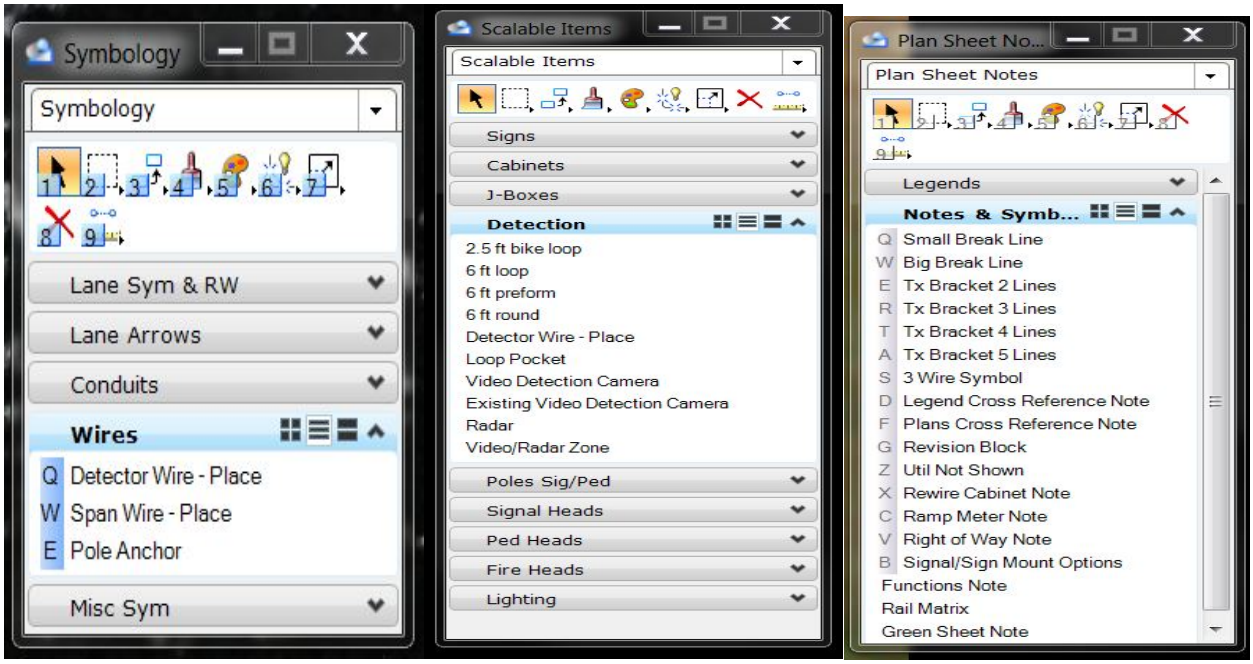
1. Go to Tools on the main menu, Check Tasks, Open the ODOT tab, Open the Traffic tab, Open the General tab. Go to Figure 3-2.

Figure 3-2 | Microstation Tasks & Workflows



2. You should also open the signal tab (See Figure 3-1), Open the Signal plans tab. Go to Figure 3-3.

Figure 3-3 | Microstation Tasks & Workflows



3. Open the Symbology tab, Open the Scalable Items tab, Open the Plan Sheet Notes tab.

4. Drill down into each of the tabs to familiarize yourself with the various sheet borders, text, line styles, & cells, used within the traffic signals discipline.

5. The Place Signals Note Tool is located under the Signal Plans tab, Bubble/ Notes tab. See Figure 3-4

Figure 3-4 | Microstation Tasks & Workflows

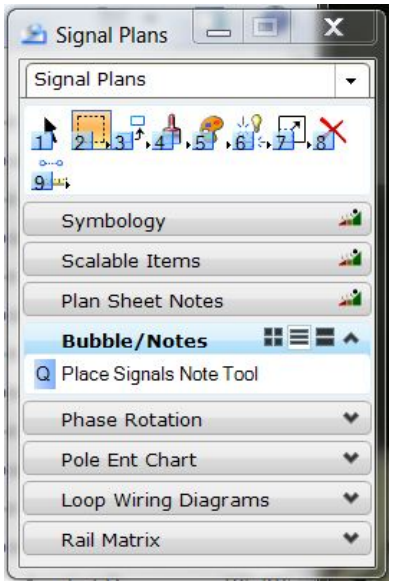


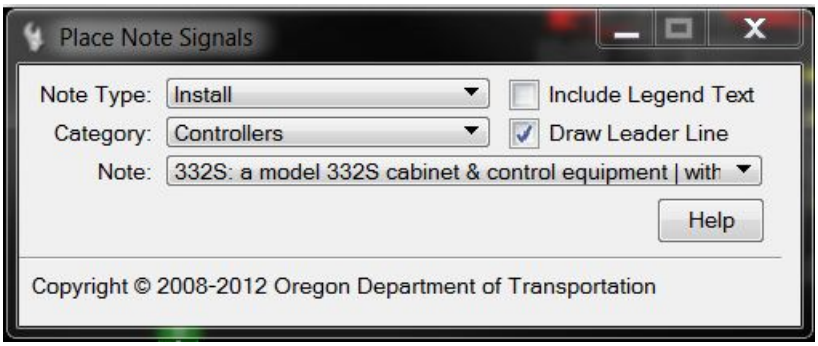
Figure 3-5 | Microstation Tasks & Workflows

6. This tab will give you the Bubble, for Install 332S Controller Cabinet. The bubble by itself is typically used on the signal plan sheet as part of a bubble string.

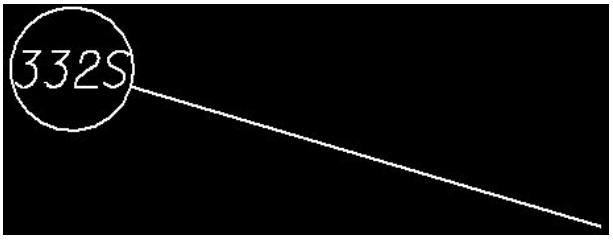
Figure 3-6 | Microstation Tasks & Workflows

7. This tab will give you the Bubble & Note for Install Controller 332S. Bubble & Note is typically used on the Legend sheet.

Figure 3-7 | Microstation Tasks & Workflows



8. This tab will give you a Bubble with Leader Line. This is typically used on the signal plan sheets. This is typically the first bubble in a string pointing to the item being called out. In this case it is the signal controller.



If you are new to ODOT's tasks & work flows, take time to familiarize yourself with them before starting any signal plans for ODOT projects. The tasks & workflows have been developed to aid in the design and

drafting of ODOT traffic signal contract plans. Use of these tasks & workflows will help to insure that the drafting quality will comply with ODOT standards.

For additional Microstation V8i information click the following link: Microstation Users Guide.

4 Title Block

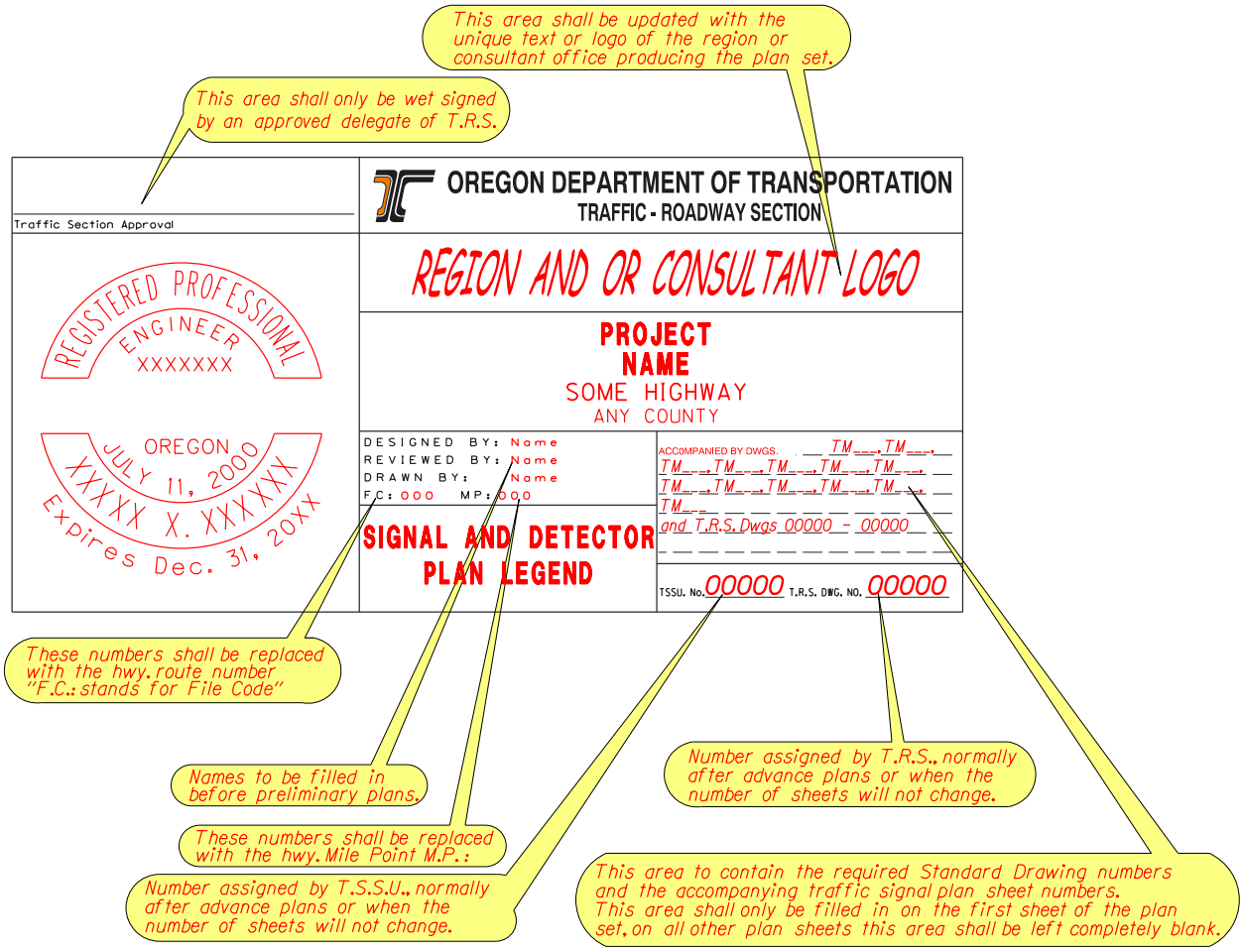
The information entered into the title block (shown below in red) must be the same as the information shown on the first sheet of the contract plans (title sheet). The title sheet's title block will contain most of the information you will need to complete your signal plan title blocks. The information you will need from this sheet is the, project name, the name of the highway and the county name.

Each sheet must be signed and approved by the designee of Traffic - Roadway Section (TRS) before the plans can be used for construction. Each sheet will be given a unique sheet number assigned by TRS. The unique sheet number shall be shown in the T.R.S DWG. NO. area in lower right side of the title block. The TSSU number shall also be entered in the lower right of the title block. The title block shall also have the first initial and last name of the designer, reviewer and drafter. The F.C.: area is to be filled out with the highway number (i.e. the Oregon Coast Hwy is Hwy. 009). The Oregon highway cross references can be found at http://www.oregon.gov/ODOT/TD/TDATA/Pages/otms/Route_Hwy_CrossRef.aspx.

The M.P.: area will be filled in with the mile point. The M.P. can be found on the State Traffic Engineers traffic signal approval letter for each signal. The traffic signal approval letters are available at ftp://ftp.odot.state.or.us/techserv/Traffic-Engineering/Signal_Approval_Scans.

In the figure below, the areas in **RED** require information to be entered by the drafter. Elements and text that are shown in **BLACK** shall not be altered.

Figure 4-1 | Title Block Example



Traffic signal title blocks are available in the tasks & workflows of Microstation V8i.

NOTE: The title block shown above shall not be altered in any area that is not shown in RED. The "REGION AND OR CONSULTANT LOGO" area is provided for ODOT region and consultant logos and contact information.

5 Legends & Bubbles

The legend sheet for all plan types shall contain all definitions for bubbles that are shown on the Signal, Detector, and any other plan sheets. The legend also shows the signal head types along with the signal and sign mounting options. Other items may be included on this sheet if space allows.

Some of the more common bubble notes are shown in the example below:

Figure 5-1 | Common Bubble Notes

L E G E N D

C O N T R O L L E R S

- 332S — Install a model 332S cabinet & control equipment with riser frame, orient louvered door as shown
- C / 2070 — Install model 2070 controller in model 33x cabinet
- C — Install Controller cabinet (See Signal Plan)
- C / RR — Railroad controller (By Others)

P O L E S

- SM / T — Install (T=type) standard traffic signal mast arm pole (See, "Pole Entrance Chart")
- MA / L — Install (L=length) foot traffic signal mast arm
- PP — Install pedestrian signal pedestal with frangible base
- EX / I — Retain and protect existing power pole (Power source)

S I G N A L S

- V / Ph — Install phase (Ph=phase) vehicle signal
- C/B / Ph — Install phase (Ph=phase) countdown pedestrian signal with clamshell mount and pushbutton with 'H' mount

S I G N S

- AL / 11 — Install aluminum (30"x36", type "W7") "LEFT TURN YIELD ON GREEN BALL" sign (R10-12)
- PR / 6R — Install (36"x36") NO RIGHT TURN "SYMBOL" part time restriction sign (R3-1)
- ★ — See signing plans for details on sign and attachment

C A B I N E T S

- BMC — Install base mounted service cabinet, 120/240 volt metered, for signal system
- RTC — Install recessed terminal cabinet, see T.R.S. DWG NO. XXXXX

J U N C T I O N B O X E S

- JB / 1 — Install 17"x10"x12" (min. dimension) precast concrete junction box
- JB / 1A — Install 17"x10"x12" (min. dimension) precast concrete junction box with concrete apron
- JB / 2 — Install 22"x12"x12" (min. dimension) precast concrete junction box
- JB / 2A — Install 22"x12"x12" (min. dimension) precast concrete junction box with concrete apron
- JB / 3 — Install 30"x17"x12" (min. dimension) precast concrete junction box
- JB / SP — Junction box (See Signal Plan)
- JB / DP — Junction box (See Detector Plan)
- JB / RR — Junction box installed (By Others)
- EX / JB — Retain and protect existing junction box

D E T E C T I O N

- LF / X-Ph — Install (X=number of cables) phase (Ph=phase) loop feeder cables
- LD / Ph — Install phase (Ph=phase) 6' round or 4' diamond vehicle detector loop
- N / LW — Install (N=number) pair of loop wires

L E G E N D C O N T I N U E D

W I R E S & C A B L E S

- N-C — Install (N=number) No. 8 AWG THWN (Signal system common)
- N-12C — Install (N=number) No. 12 AWG THWN for (Vehicle, Pedestrian and Ramp meter pedestal common)
- N | G — Install (N=number) No. (G=AWG wire size) XHHW wires
- N / G — Install (N=number) No. (G=AWG wire size) THWN wires
- N / P — Install (N=number) twisted pair PE-39 (gel filled) interconnect cable
- PL — Install poly pull line
- Ph — Includes 3 spare wires for phase (Ph=phase) as per table

C O N D U I T S

- S — Install (S=size) inch conduit
- DC — Detector conduit (See Detector Plan)
- EC — Electrical conduit (See Signal Plan)
- CS — Install 2" conduit stub (For future use, cap ends)
- RR — Conduit installed (By Others)
- W — Install conduit and wire as required by power company
- SP / S — Install 6" max. sand pocket block-out with (S=size) inch conduit to junction box
- EX / EC — Retain and protect existing electrical conduit

F I R E P R E E M P T I O N

- FN / Ch — Install channel (Ch=channel), (N=number) barrel fire preemption detector unit
- FF / Ch — Install channel (Ch=channel) fire preemption detector feeder cable

SIGNAL MOUNTING OPTIONS
B = Adjustable signal bracket assembly w/rain cap(s)
(Install 1" metallic chase nipple)

SIGN MOUNTING OPTIONS
AB = Adjustable sign bracket assembly w/rain cap(s)

SIGNAL HEAD TYPES
2 = 12" R, 12" Y, 12" G
3L = 12" RLTA, 12" YLTA, 12" GLTA
4 = 12" R, 12" Y, 12" G, 12" GLTA

All contract plans shall be plotted “B” size (11”x17”) The Legend sheet is typically scaled at 100:1. This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link:
MicroStation Users Guide.

The legend plan shall include:

- All definitions (Bubble Notes) for bubbles that are present on the signal and detector plan sheets. This must be shown under the correct heading,
- Show all vehicle signal head types, sign types and signal/sign mounting types,
- Show the cross reference note to all other plan sheets in the signal plan set,
- Title block in the lower right hand corner of the legend sheet,
- Show all the TM450 thru TM498 standard drawings that will be needed for the project in the area provided in the lower right hand title block.

  Note: Only the first sheet shall show the standard drawings required for the project. This area on all other signal plan sheets shall be left blank.

See examples on the next 3 pages. The figure below of a Legend sheet shows two legend headings and common bubble note headings already in place. This sheet is ready to have bubble notes placed under the correct headings.

The Headings are in the Install portion of the Place Notes Signals Tool. See Figure 5-3.

The Legend Headings are located under the Signal Plans, Plan Sheet Notes tab. See Figure 5-4.

Figure 5-2 | Sample Legend Sheet

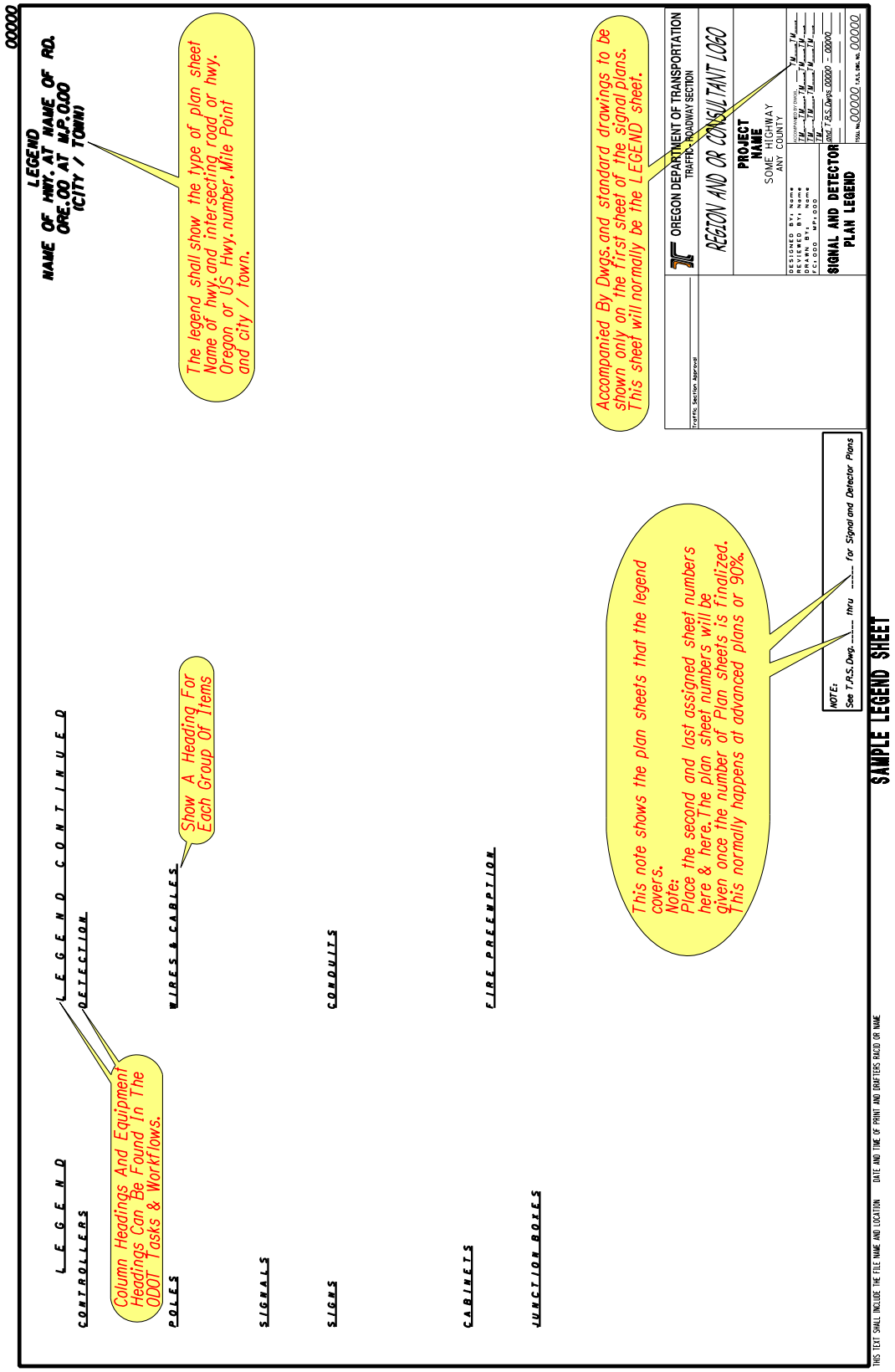


Figure 5-3 | Bubble Note Headings

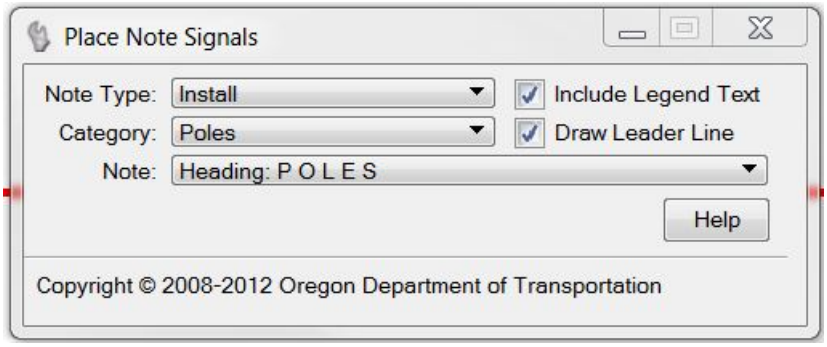
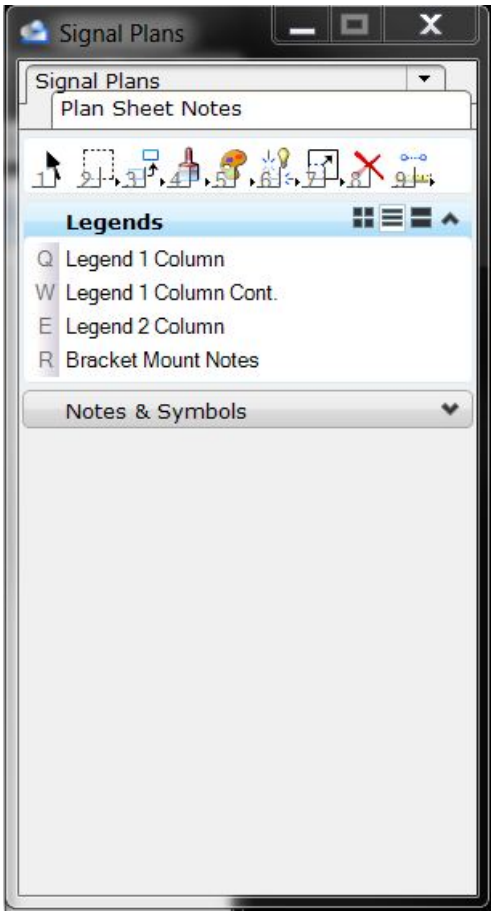
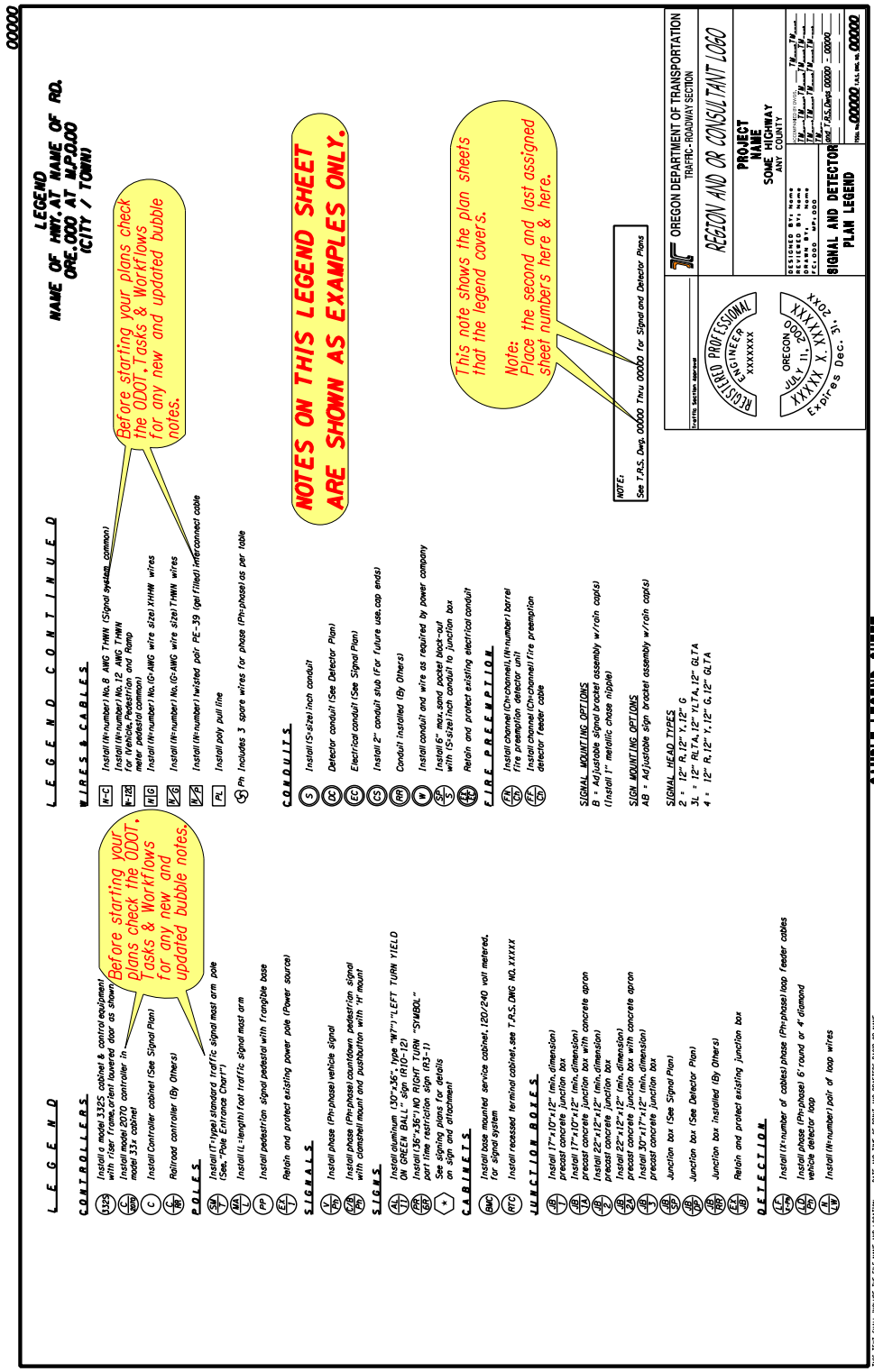


Figure 5-4 | Legend Heading



The example below of a finished legend sheet with bubble notes and mounting options placed under the correct headings.

Figure 5-5 | Sample Legend Sheet



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6 Signal Removal Detail or Full Plan Sheet

All signal contract plans shall be plotted "B" size (11"x17"). If a full plan sheet is desired for clarity, it shall be drawn at a scale of 40:1. If the signal removal is drawn as a detail it does not require a scale (list No Scale on the plan sheet).

The scale is set with Annotation Scale. You can turn this on and off from many different locations including:

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link: MicroStation Users Guide.

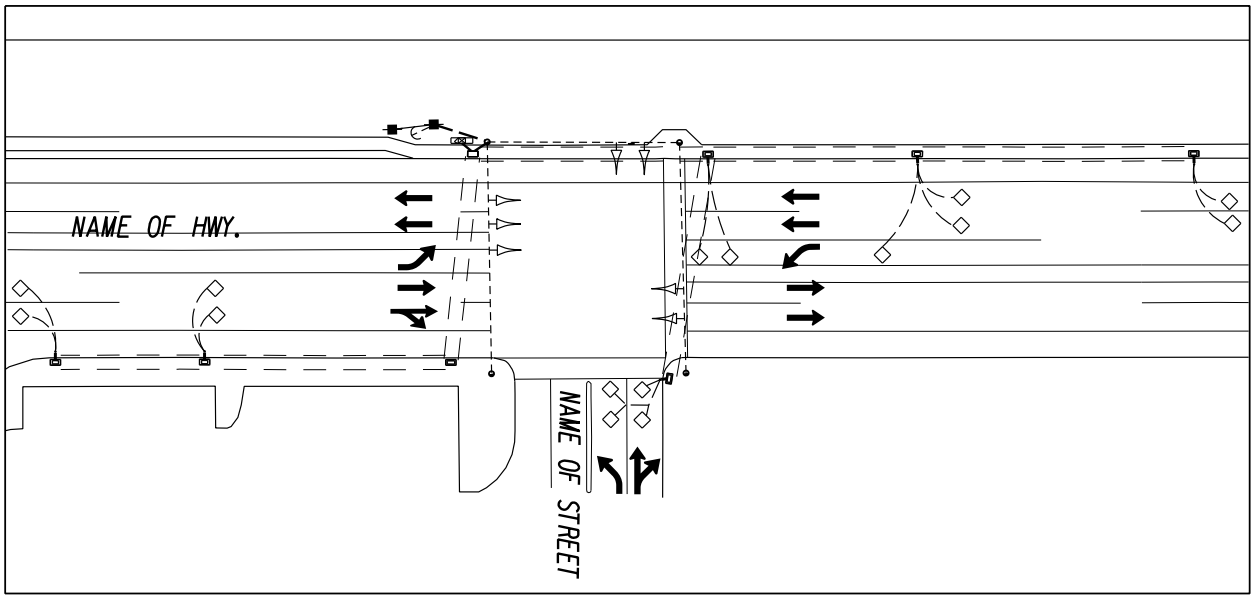
Existing intersection layout is normally drawn showing edge of pavement or curb line, north arrow, and other topographic features as needed.

If drawn as a detail, it shall include the location of:

- existing poles,
- vehicle signals,
- pedestrian signals,
- traffic signal controller cabinet,
- service equipment, and
- all other equipment that is to be removed.

See Figure 6-1 the example signal removal plan on the next page.

Figure 6-1 | Removal Plan Location Example



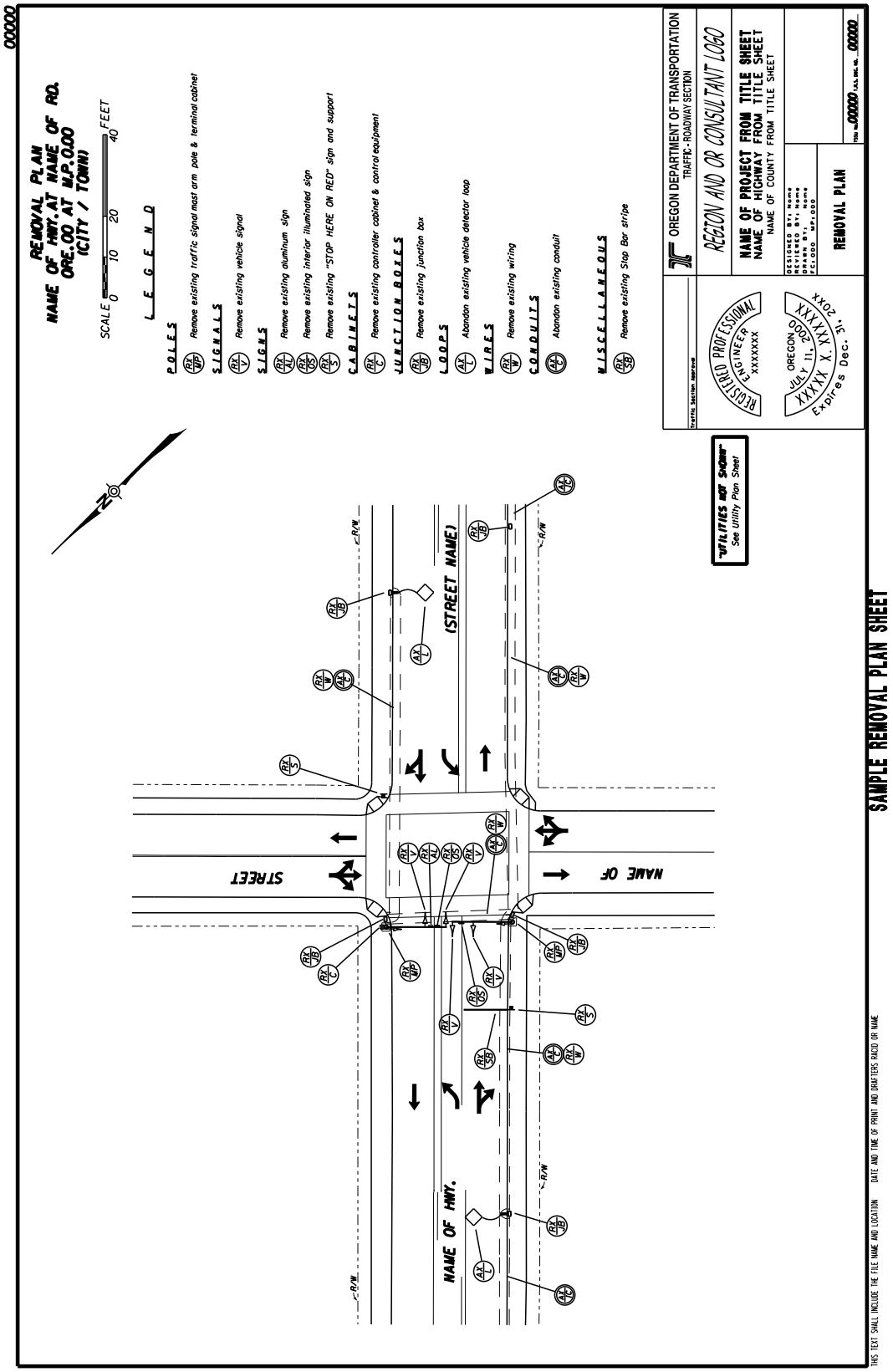
REMOVAL PLAN AT M.P. 0.00
No Scale

If drawn as a full plan sheet, it shall include:

- Location of:
  - existing poles,
  - wiring,
  - vehicle signals,
  - pedestrian signals,
  - overhead signs,
  - traffic signal controller cabinet,
  - service equipment, and
  - all other equipment that is to be removed.
- General notes should state what is to be removed and what is to be done with the removed equipment.
- Each installed, removed, abandoned, or retained item shall have the correct bubble and a leader(s) to the item.

See Figure 6-2 example on the next page.

Figure 6-2 | Sample Removal Plan Sheet



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7 Signal Plan

The signal plan shall be drawn showing:

- Edge of pavement or curb line
- Centerlines with stationing when available
- Lane markings
- Lane use arrows
- Crosswalks
- Sidewalks
- Sidewalk ramps
- Driveways
- Right-of-way lines
- Highway names
- Street names
- North arrow
- Other features as needed

All contract plans shall be plotted "B" size (11"x17") Signal Plan sheets shall normally be drawn at a scale of 20:1. This is set with Annotation Scale. You can turn this on and off from many different locations including:

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link: MicroStation Users Guide.

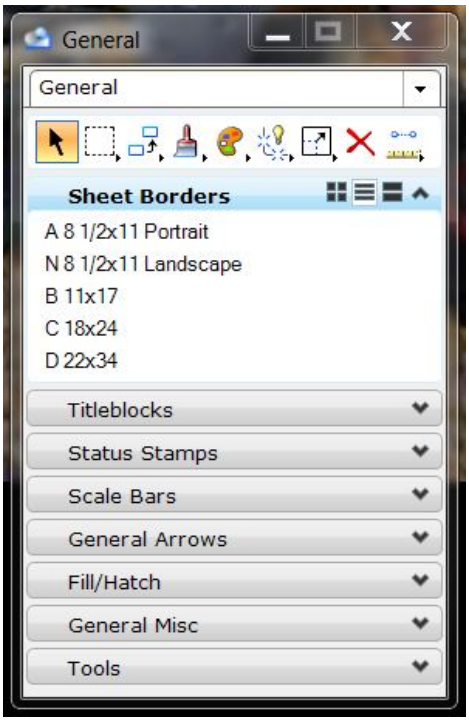
NOTE: Under rare circumstances the scale may need to be modified to a smaller scale of 30:1 or 40:1. Use of these scales may be the only way to get the entire intersection on the plan sheet without match lines. Always use the largest scale possible to maximize the legibility of the finished plan sheet. Altering scales in this fashion is limited to the signal plan sheet, all other plan sheets, use break lines or match lines.

Sheet Borders are available in the Tasks & Workflows under the General & Sheet Borders tabs.

Each plan sheet shall be its own model within the TR.SG1 file.

See Figure 7-1 for the "General" tab description.

Figure 7-1 | Sheet Borders, Tasks, and Workflows

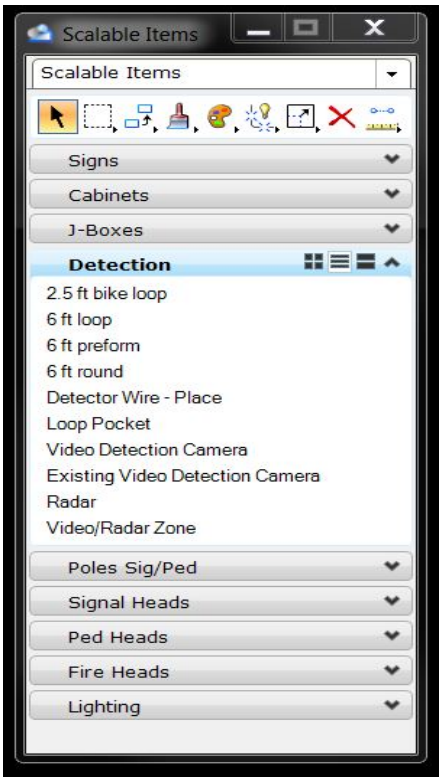


The plan shall include:

- Location of:
  - traffic signal poles
  - underground signal electrical conduits (show conduits at an arc to alleviate clutter)
  - detector and interconnect conduit bubbles added to the bubble string, DC, IC.
  - traffic signal wiring, junction boxes
  - vehicle signals, pedestrian signals
  - pedestrian pushbuttons
  - overhead signs (lane use)
  - traffic signal controller (332)
  - service equipment (BMC)
  - preemption devices
  - existing power sources
  - any other equipment needed to install the signal

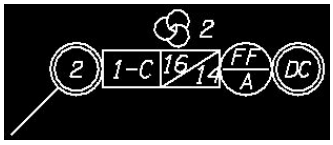
These scalable items are found in the Tasks & Workflows under the Signal Plans, Scalable Items tab. See Figure 7-2.

Figure 7-2 | Sheet Borders, Tasks, and Workflows



The plan shall also include:

- Correct bubble and leader(s) for each installed, removed, abandoned or retained item. The Bubbles shall be arranged so the leader line attaches to the first bubble in the string. See example below:



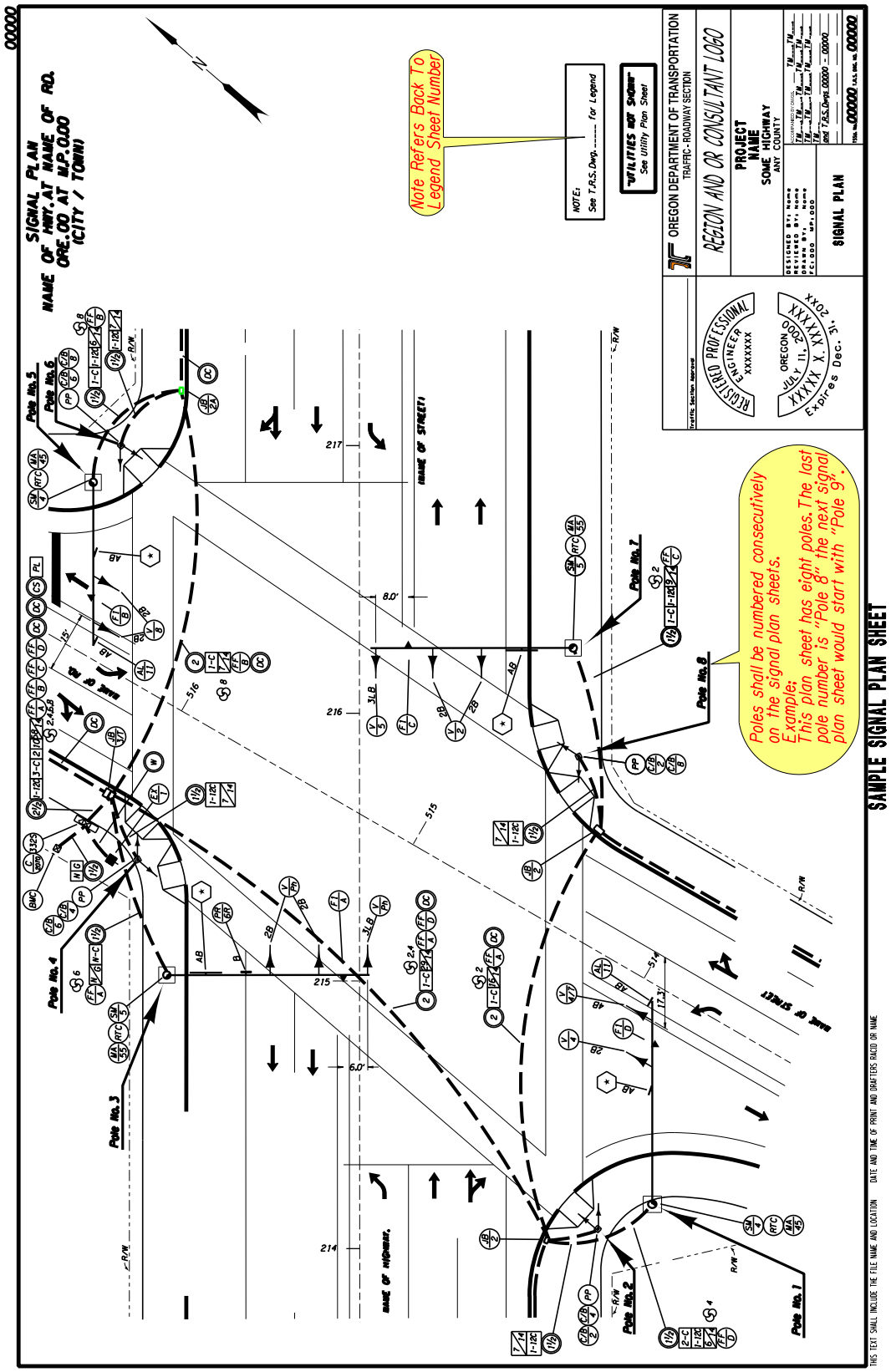
- Pole arrows and pole arrow lines with pole numbers, (numbers shall be sequential and will not be repeated if there is more than one signal plan sheet in the project. Pole numbers shall start in the lower left quadrant of the plan sheet and be numbered clockwise.

- Signs. Show all standard lane use signs and all non-standard overhead signs, such as, street name signs or unique lane use signs mounted on mast arms. Signs shown on signal plans are normally limited to the signs mounted to the mast arm, suspended from the span wire or on the vertical signal pole. One exception to this is advance warning signs that have a flashing beacon wired to the controller. Details for non standard signs shall be shown in the signing plans. Use the octagon bubble and leader pointing to the sign. The bubble note for these signs should refer back to the sign plan sheet.

- The standard drawing area in the lower right hand title block area shall remain blank.

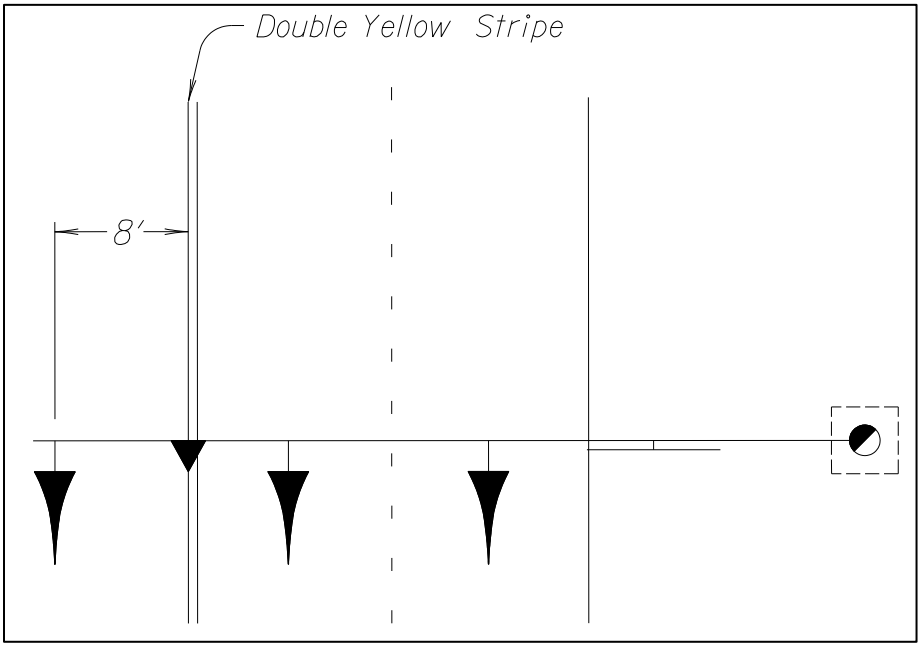
See Figure 7-3 signal plan example on the next page for all items that must be shown.

Figure 7-3 | Sample Completed Signal Plan Sheet



NOTE: One signal head on each mast arm or span wire will be dimensioned from a painted lane line shown on the Signal Plan Sheet (See Example Below). You may also dimension from a skip line or edge of pavement line, etc.

Figure 7-4 | Painted Line Dimension Example



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8 Detector Plan

Intersection layout shall be drawn showing:

- edge of pavement or curb line,
- lane use arrows,
- centerlines with stationing,
- lane markings,
- sidewalk ramps,
- driveways,
- right-of-way lines,
- crosswalks,
- sidewalks,
- street names,
- north arrow, and
- other features as needed.

Detector Plan sheets shall be drawn at a scale of 40:1.

NOTE: Scales smaller or larger than 40:1 are not acceptable for detector plans. The use of break lines to fit the plan on one sheet shall be the only acceptable practice. Break lines can be found in both the traffic signal tasks & workflows and the ODOT pull down menus.

All contract plans shall be plotted "B" size (11"x17") Signal Plan sheets shall normally be drawn at a scale of 40:1. This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

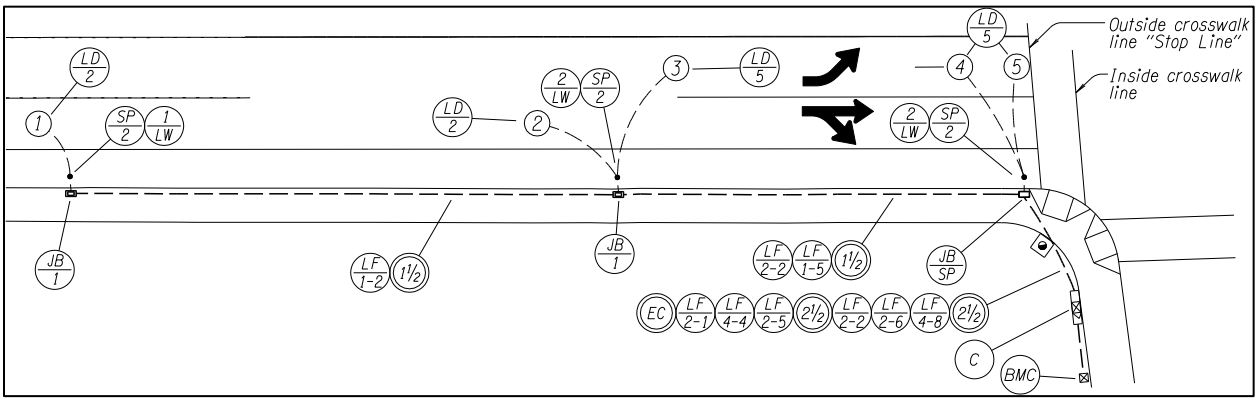
For additional information on using Annotation Scale click on the following link:
MicroStation Users Guide.

The plan shall include:

- Location and type of traffic signal loops, loop wire entrance type, loop number, and notes for symbols and details used.
- All signal pole foundations for; mast arm poles, span wire poles, vehicle signal poles and pedestrian poles shall be shown. Show mast arms if using video detection.
- Underground detector conduit, detector wiring, junction boxes, traffic signal controller, service equipment, and all other equipment needed to install the detector system.
- Each installed, removed, abandoned, or retained item shall have the correct bubble and a leader(s) to the item.
- Use break lines to compress the plan into one detector plan sheet when possible. Break lines are located under the Notes & Symbols tab.
- Loop wiring diagram. The loop wiring diagram shall include each loop number, distance to the center of the loop from the stop bar, splice point (cabinet or junction box), phase, input file slot & channel, Indicate whether it is a bike loop.
- If using video/radar detection, use the Input File Dia. This is located under Signal Plans, Loop Wiring Diagrams tab in the ODOT tasks & workflows.
- If using a combination of loops & video you will need to have both the Input File Dia. and the Loop Detector Wiring Diagram.
- The standard drawing area in the lower right hand title block area shall remain blank.

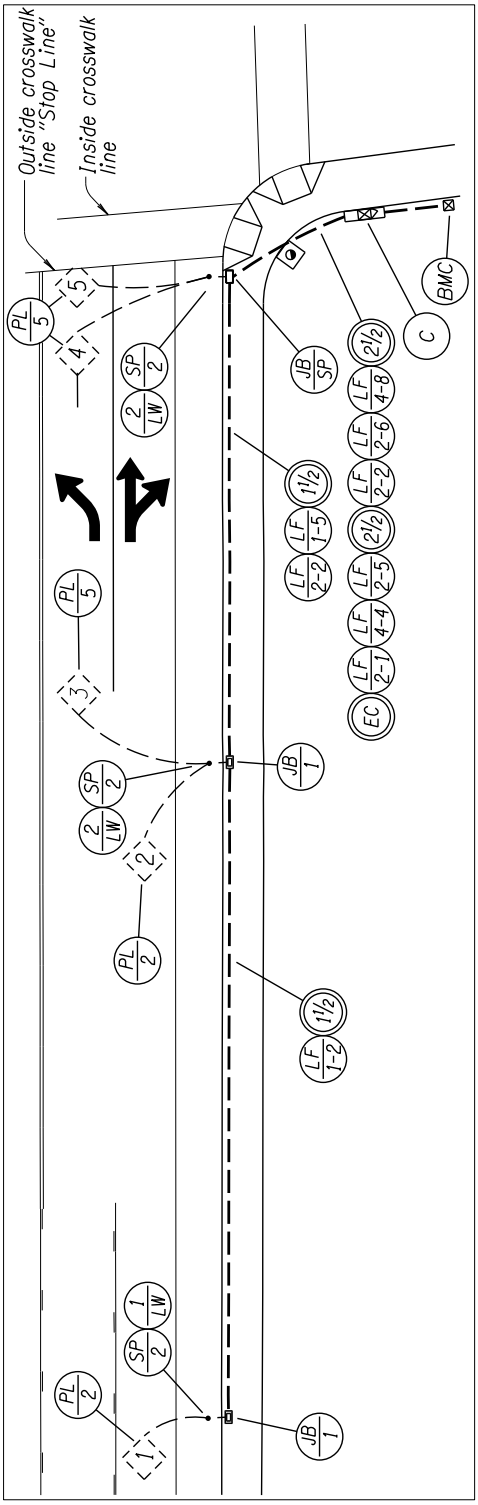
See Figure 8-4 for all items that must be shown. The two diagrams below show the difference between standard saw cut loops and preformed loop installations.

Figure 8-1 | Saw Cut Loop Details



Saw-cut loops are shown on the plans with a light weight solid line. The loop feeder is shown as a light weight dashed line. The loop feeder will enter the junction box through a "Loop entrance point". See Standard Drawing **TM475**.

Figure 8-2 | Preformed Loop Details



Preformed loops are shown as heavy dashed diamonds and loop feeders are shown on the plans as a heavy dashed line; the preformed loop feeder extends from one side of the loop into the junction box.

Figure 8-3 shows four types of loop detector wiring diagrams that are used on ODOT detector plans. Diagram top left is the most common one used for traffic signals. The diagram shown in the top right is for temporary (one-lane, two-way) traffic signals. The middle diagram is used for ramp meter signals and the bottom diagram is used for video/radar.

Figure 8-3 | Loop Detector Wiring Diagrams

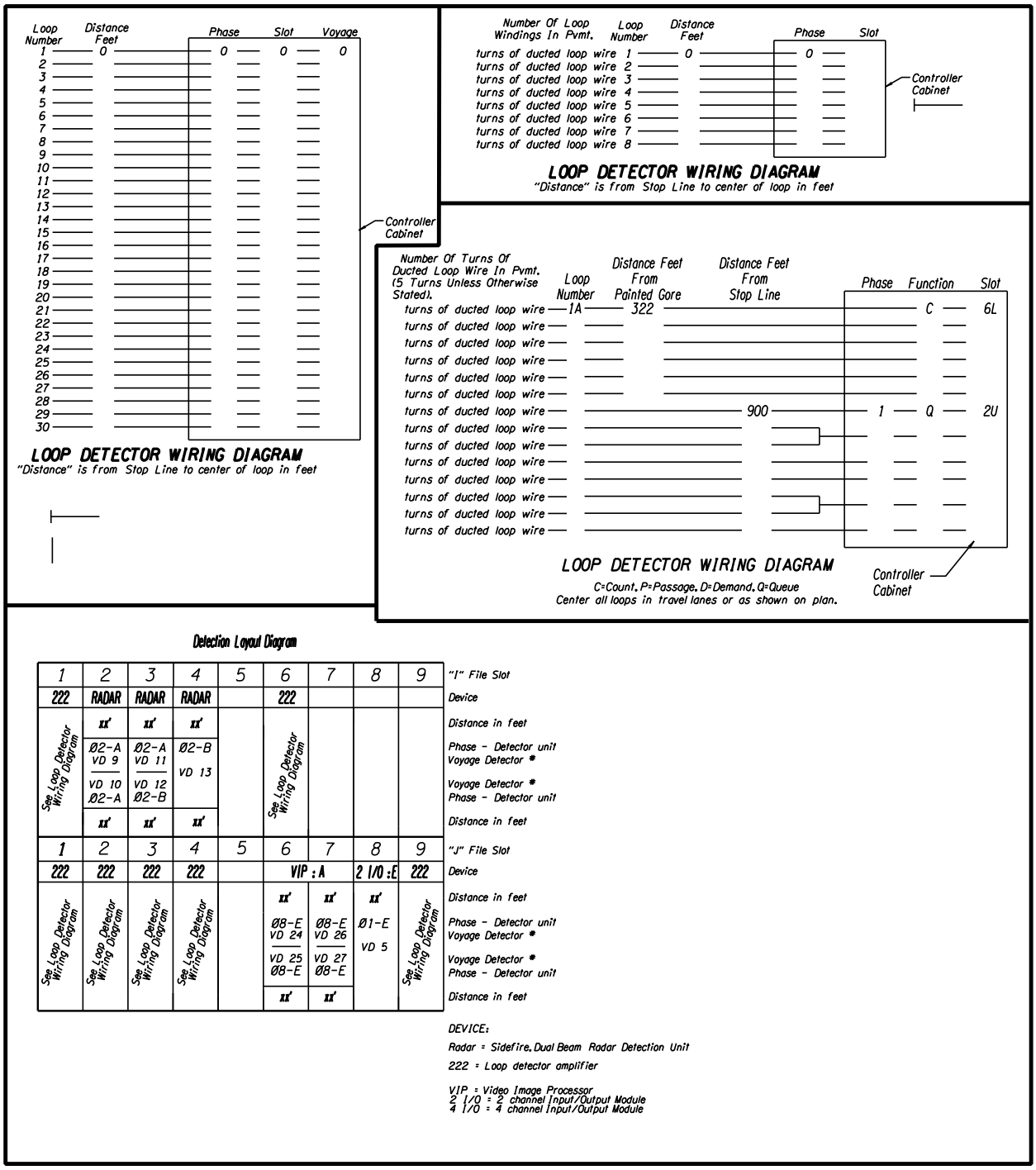
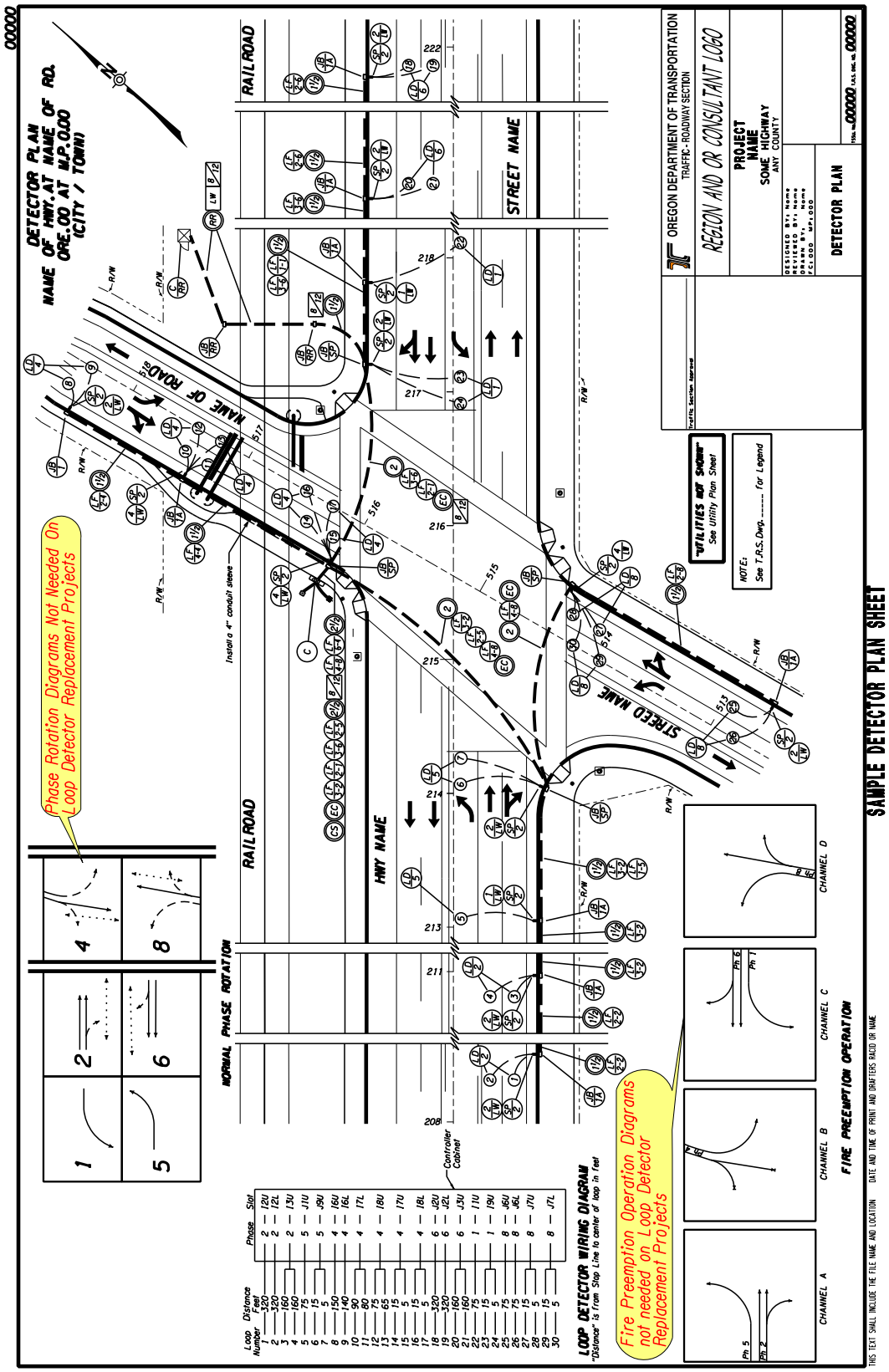


Figure 8-4 | Sample Detector Plan Sheet



Loop Replacement Detector Plans

This type of plan is common when there are traffic signals within the limits of a pavement preservation or pavement rehabilitation project.

The plan must show all standard plan sheet information such as lane use arrows, north arrow, street/highway names, dimensions, project titles, mile posts and routes that are shown on a standard detector plan.

Label your loop replacement plan sheet with the same wording that is used on a standard detector plan. Both title block & Upper right heading shall read DETECTOR PLAN. This is done to denote the fact that loop replacement plans are the most current loop plans and needed to be titled accordingly.

If the plans show replace loops “in-kind”, with no wiring or control cabinet work, show the following on your plan sheet(s):

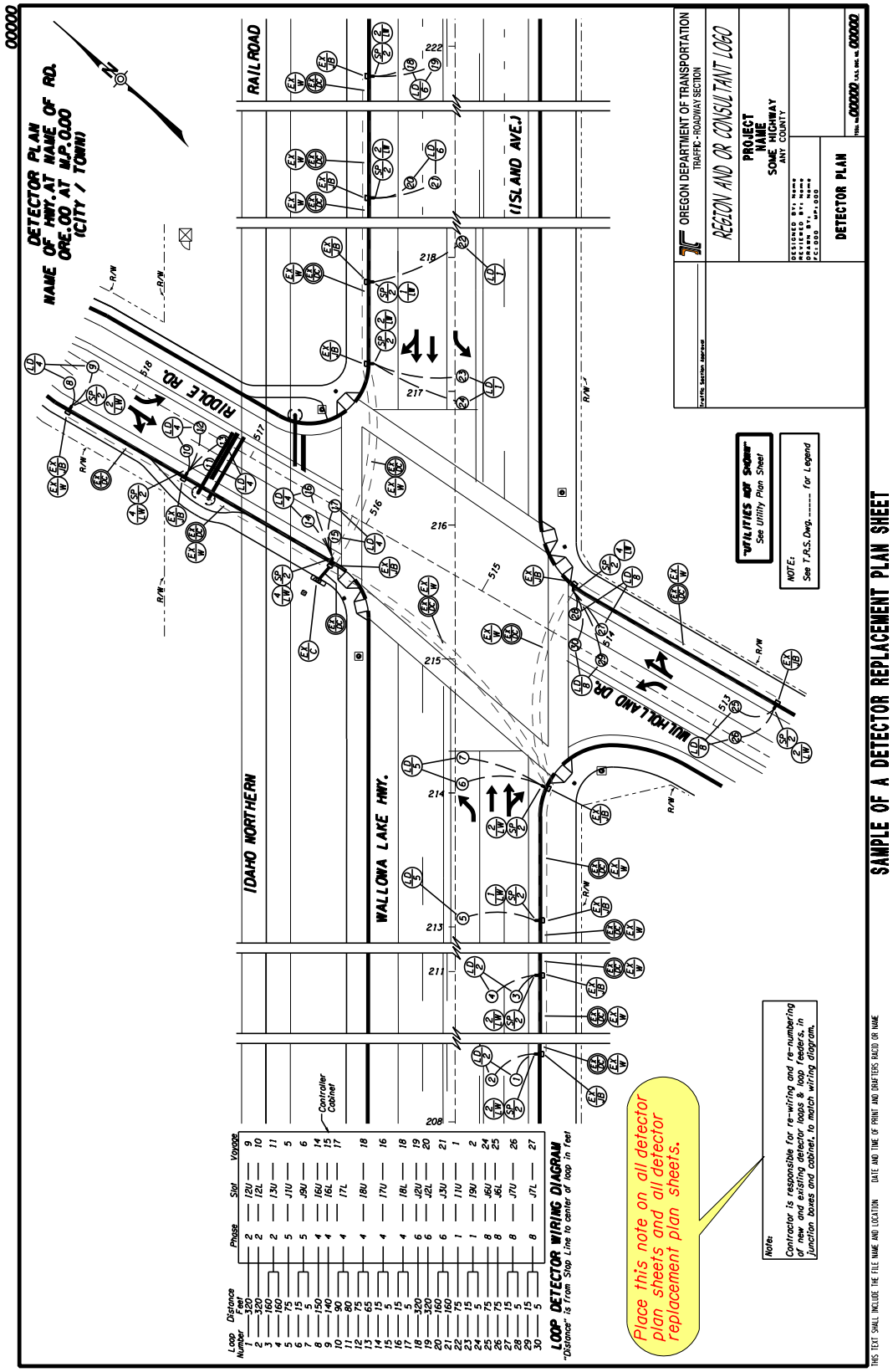
- New and existing loops must be numbered.
- Label all loops with new and existing bubbles.
- Label loop entrances that have adjacent loop work being performed.
- Label existing conduits with the existing electrical or existing detector conduit bubbles.

If the plans include replacing loops and have wiring modifications with cabinet work, show the additional items:

- Label all loops and loop entrances with the appropriate bubble
- Detector conduit bubbles (size required if new wiring is added)
- Loop feeders (phase and number)
- Junction boxes (size and type if known)
- New Loop Wiring Diagram (If loops are not numbered to ODOT’s standard then the loops must be renumbered to show the standard loop number progression. A note on the plans shall be added that instructs the contractor to renumber each end of the loop feeder with the new numbers.
- Place a bracket and “NoWork” next to loop numbers at the loop wiring diagram if no work is being done to those loops.

The plan sheet on the following page is an example of what a detector replacement plan sheet should show.

Figure 8-5 | Sample Detector Plan Sheet - Loop Replacement Project



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9 Interconnect Plan

This sheet shall contain all information that relates to the equipment used in the installation of the interconnect system. Interconnect plan sheets shall be drawn at a scale of 80:1.

All contract plans shall be plotted "B" size (11"x17")

This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

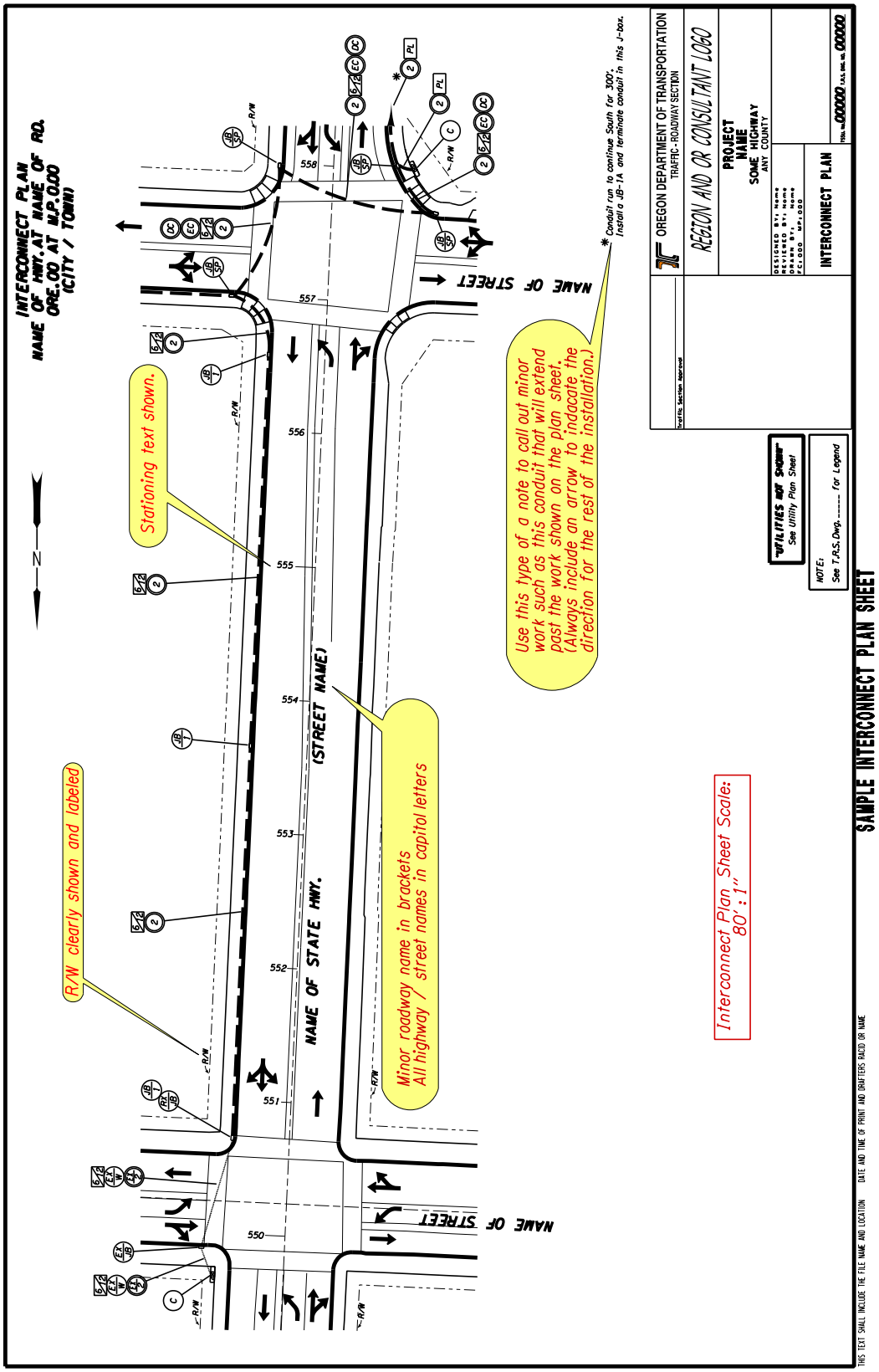
For additional information on using Annotation Scale click on the following link: MicroStation Users Guide.

The plan shall include:

- Interconnect plan sheet is normally drawn showing:
  - edge of pavement,
  - curb lines,
  - underground interconnect conduit,
  - interconnect wiring,
  - north arrow,
  - R/W and controller cabinets that will be interconnected, and
  - all other details needed to install the interconnect system.
- Each installed, removed, abandoned, or retained item shall have the correct bubble and a leader(s) to the item.
- Legend sheet shall contain all definitions for bubbles that are shown on the Interconnect Plan sheet.
- Use break lines to compress the plan into one interconnect sheet when possible. Break lines are located under the Notes & Symbols tab.

See Figure 9-1 interconnect plan sheet example on the next page for all items that must be shown.

Figure 9-1 | Sample Completed Interconnect Plan Sheet



10 Railroad Preemption Plan

All contract plans shall be plotted "B" size (11"x17") Railroad Plan sheets shall normally be drawn at a scale of 40:1. This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link: MicroStation Users Guide.

Intersection layout shall be drawn showing:

- The railroad preemption plan sheet shall contain the following:
- Traffic Signal Title Block and upper right hand title information
- T.R.S. Drawing Number
- T.R.S. approval signature
- North arrow
- USDOT Crossing number and railroad milepoint (obtained from the Rail Division)
- Normal phase rotation diagram
- Traffic signal railroad preemption sequence text, modified to accurately represent the site specific conditions:
- V.C.O.I. green clear-out phases (if they exist)
- P.C.O.I. value (obtained by Region Traffic Operations Engineer)
- P.C.O.I used to serve V.C.O.I phases (contact Traffic-Roadway Section for this text)
- Limited service phases. If a conflicting FYA indication is present, it must be listed
- Use of Type 7 signal heads
- Use of PTR signs
- A plan view of the intersection and railroad crossing (either to scale or graphically represented not to scale) with the following elements labeled:
- Highway and street names
- Signal equipment shown symbolically, but not labeled (signal poles, mast arms, vehicle heads)
- Signal equipment shown symbolically and labeled:
- PTR signs
- Type 7 signal heads
- Pedestrian phases labeled in the corresponding crosswalk
- Vehicular phases labeled in the corresponding approach lanes
- Signs (ground mounted or overhead) that directly related to the preemption operation, shown symbolically and labeled:
    - "STOP HERE ON RED" sign
    - "NO TURN ON RED" sign

The railroad preemption plan sheet may contain the following additional features:

- The RxR cabinet
- The signal cabinet
- The service cabinet
- The pedestrian signal heads shown symbolically, but not labeled
- The RxR gate locations
- Stationing (if the plan view is to scale)
- Right-of-way
- Each installed, removed, abandoned or retained item shall have the correct bubble and a leader(s) to each item.
- Railroad preemption text for the intersection.
- Pedestrian Clear-Out Interval (P.C.O.I.) time required. Consult the signal timing person in your region/ district for this number.
- The grade crossing system is shown, but not detailed, on the signal plan sheets because the contractor will not be doing the work. This work is paid for through Railroad

NOTE: The Railroad Preemption Plan Sheet is NOT part of the contract plan set!

See next 3 pages for railroad preemption plan examples.

Figure 10-1 | Sample Railroad Preemption Plan

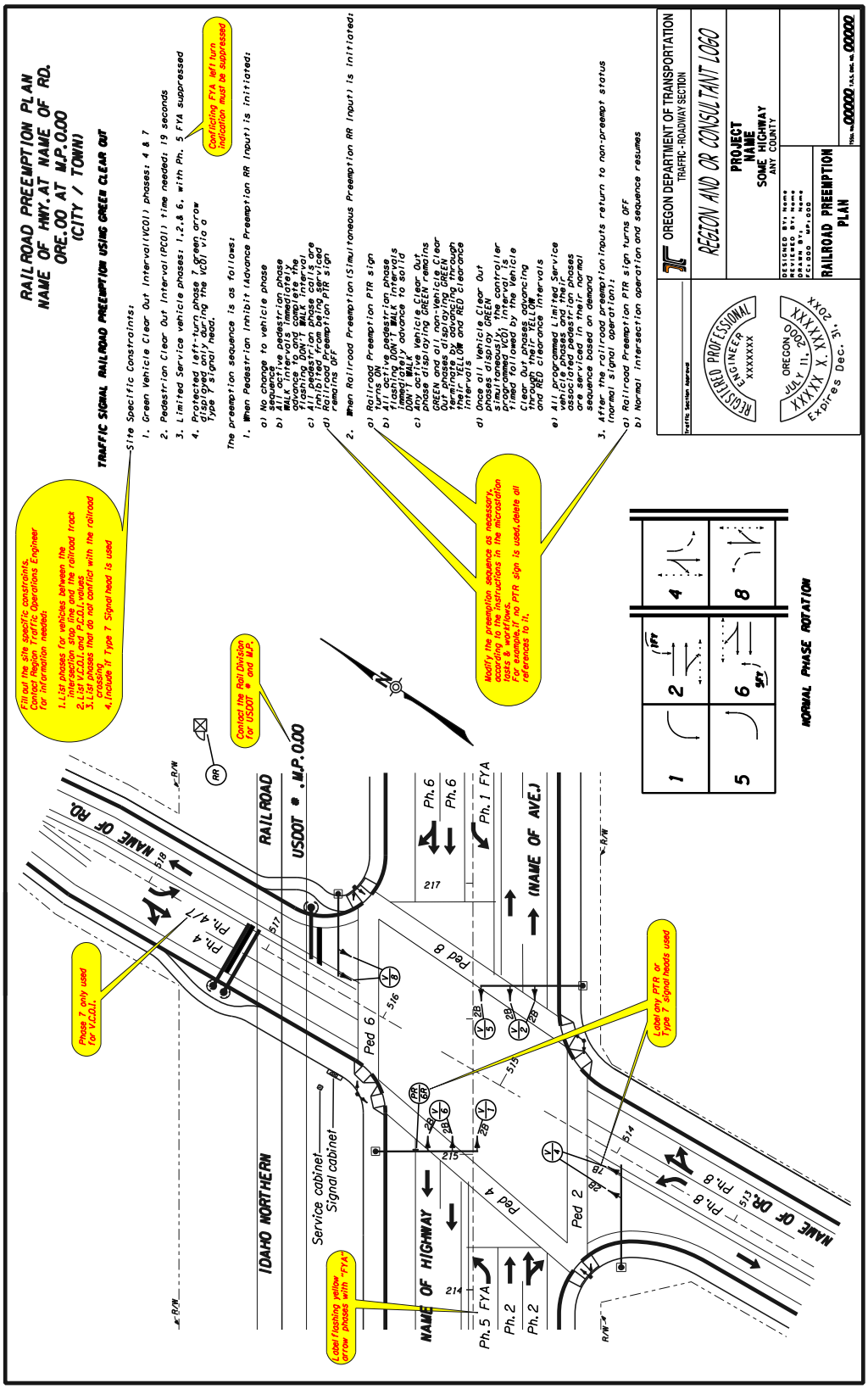


Figure 10-2 | Sample Railroad Preemption Plan

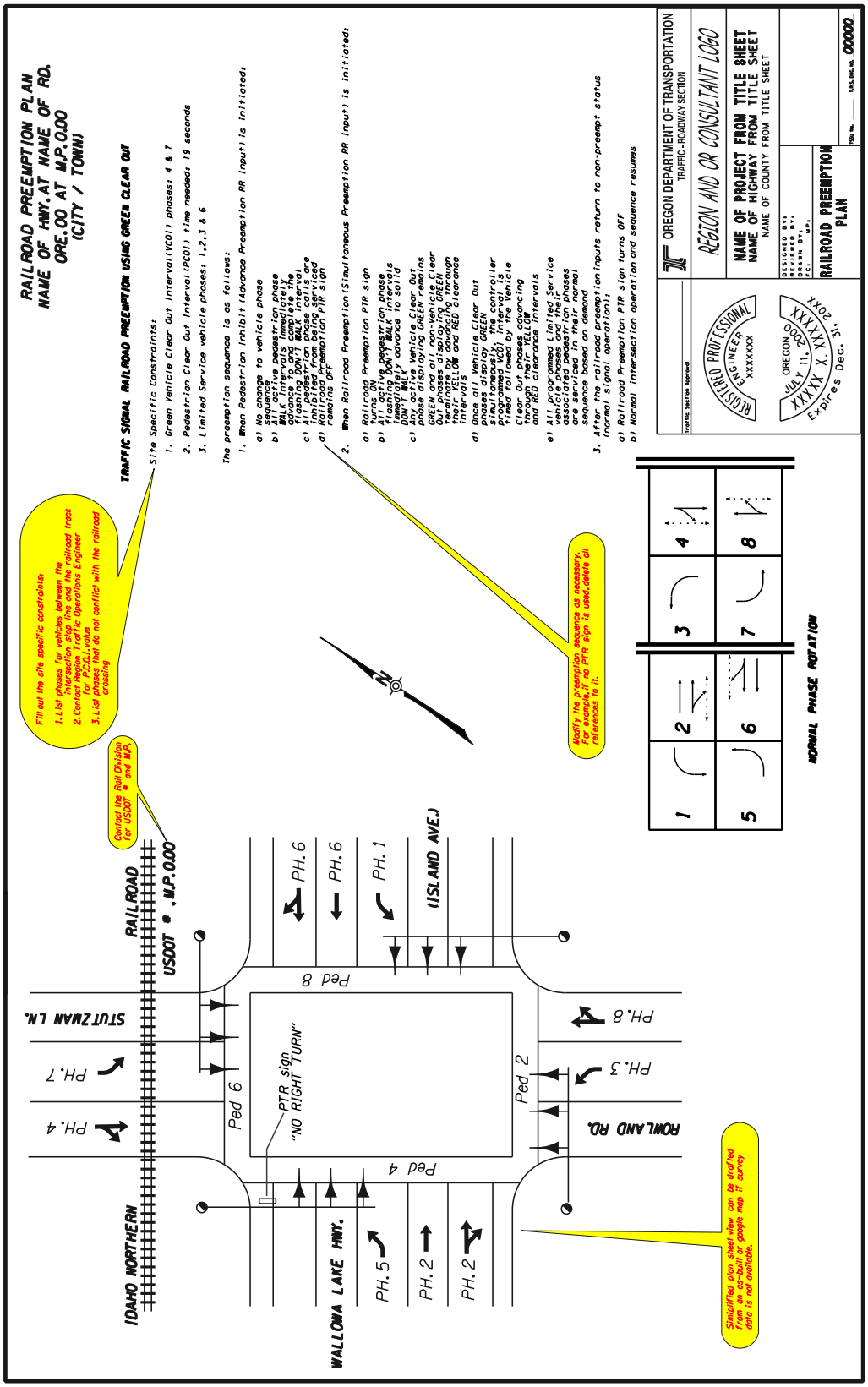
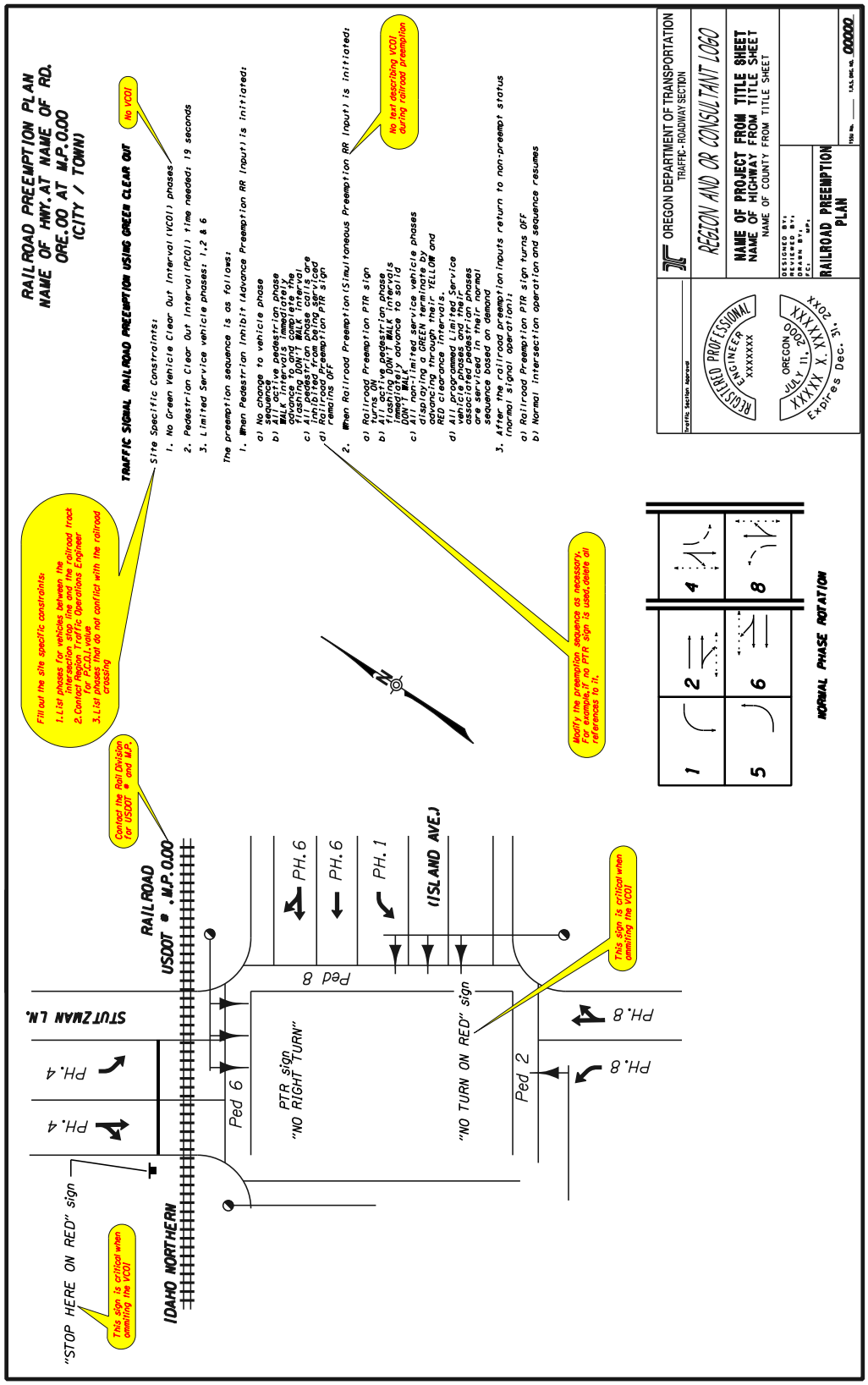


Figure 10-3 | Sample Railroad Preemption Plan



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11 Existing Utilities Plan

The Existing Utilities plan sheet shows an intersection layout showing the underground and overhead utilities, both public and private.

All contract plans shall be plotted "B" size (11"x17"). Existing Utilities plan sheets shall be drawn at a scale of 40:1 or 20:1. If the clarity of the plan at a scale of 40:1 is not sufficient the plan must be drawn at a scale of 20:1. The 20:1 scale would be needed in highly developed urban areas. A majority of the cities west of the Cascades may require the 20:1 scale because of the high density of overhead and underground utilities.

This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

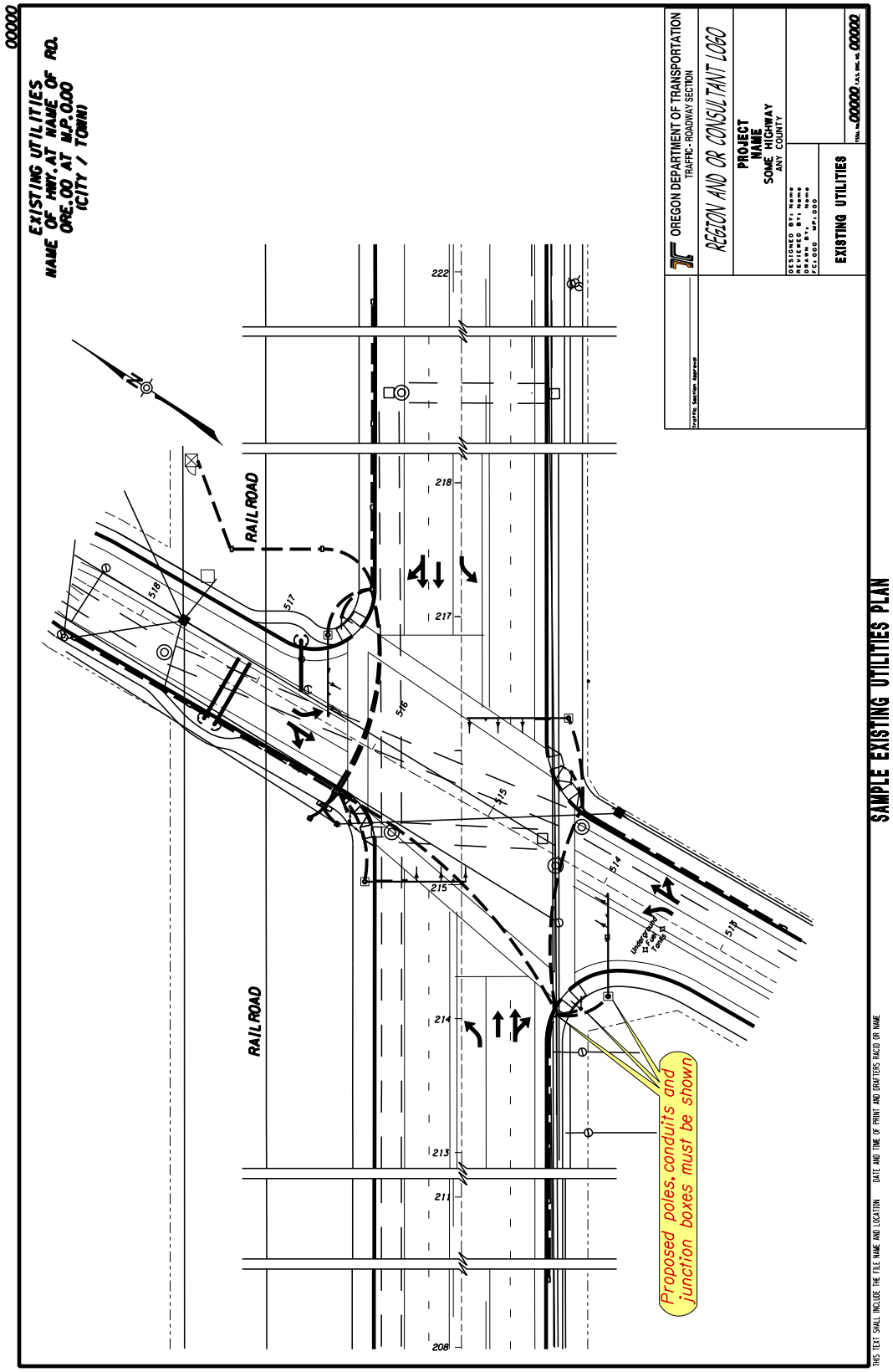
For additional information on using Annotation Scale click on the following link:
MicroStation Users Guide.

The Existing Utilities plan sheet shall include:

- All signal poles, conduits, junction boxes and other items that will be installed per the signal, detector and interconnect plan sheets
- Edge of pavement or curb line.
- Lane use arrows.
- Centerlines with stationing when available.
- Lane markings, lane use, crosswalks.
- Sidewalks, sidewalk ramps, driveways.
- Right-of-way lines (R/W).
- Highway names, street names.
- Overhead and underground telephone.
- Overhead and underground power.
- Natural gas lines.
- Water, sewer, storm sewer.
- North arrow
- Other features that may impact the construction of the signal and detector systems.

See example shown on the next page.

Figure 11-1 | Sample Existing Utilities Plan



12 Signal Plan Details and Pole Entrance Chart

The Detail sheet(s) shall contain all information that relates to the equipment mounted on the signal pole, mast arm, strain pole, span wire, vehicle or pedestrian pedestal. Any other unique details not shown on the standard drawings shall be shown on a detail plan sheet.

All contract plans shall be plotted "B" size (11"x17") The Detail sheet is typically scaled at 100:1. This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link: MicroStation Users Guide.

All pole entrance charts shall include:

- Pole by number
- Drawing number that the pole is shown on.
- Type of pole:
    - SM-1 thru SM-5 (standard mast arm poles)
    - SM-X (non-standard mast arm poles)
    - STP-1 thru STP-7 (standard strain poles)
    - STP-X (non-standard strain poles)
- Strain pole span wire attachment height "AH"
- Pedestrian signal degrees. (Note 1)
- Terminal cabinet degrees. (Note 1)
- Sign degrees, for signs mounted to the pole shaft. (Note 1)
- Traffic signal degrees, for vehicle signals mounted to the pole shaft. (Note 1)
- Photoelectric cell mounting degrees. (Note 1)
- Video camera degrees. (Ped Video)
- Mast Arm Poles:
    - Mast arm length.
    - Distance of equipment from tip of pole. (Signs, Video, Preemption, etc).
- Foundations:
    - Foundation number (from TM653).
    - Required foundation depth (from Geotech report).
- Luminaires:
    - Arm Length
    - Arm degrees (Note 1)
    - Mounting height of the luminaire above the ground.
    - "Type" of Luminaire i.e. High pressure sodium (HPS)

- Fixture:
  - Type of luminaire fixture i.e. M-S-III
  - Wattage of luminaire fixture
- Orientation diagrams for:
  - Mast arm poles
  - Strain poles
  - Pedestrian and vehicle pedestals
- Geotechnical report date

Note: In relation to the mast arm at 0 degrees or the North arrow:

If no mast arm is used, use the North arrow. For stain poles, vehicle pedestals, &pedestrian pedestals. See examples of degree orientation diagrams in the tasks & workflows. Look under Signal Plans tab, Pole Ent Chart.

See the examples on the next 2 pages.

Figure 12-1 | Sample Strain Pole Entrance Chart and Details

POLE ENTRANCE CHART

					See TM6XX and TM6XX	EQUIPMENT ON POLE					EQUIPMENT ON SPAN WIRE (Length in Feet and Equipment Type)								FOUNDATION INFORMATION (See Std. Drg. TM636)		LUMINAIRES				FIXTURE	
DWG. NO.	TYPE (FROM)	POLE NO. (FROM)	POLE NO. (TO)	CABLE "AH" (FROM) POLE	CABLE "AH" (TO) POLE	PED. SIGNAL DEG.	TERM. CABINET DEG.	SIGN DEG.	TRAFFIC SIGNAL DEG.	PHOTO ELECTRIC CELL	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 8	FOUNDATION NUMBER	REQUIRED FOUNDATION DEPTH	ARM LENGTH	ARM DEG.	MOUNTING HEIGHT	TYPE	TYPE	WATTAGE
00000	WPX					90 &180	180				0/S	0/F	0/V2	0/V2	—	—	—	—	0	0	0.0	0	0.0	HPS	M-S-III	000
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Figure 12-2 | Sample Strain Pole Orientation Diagram

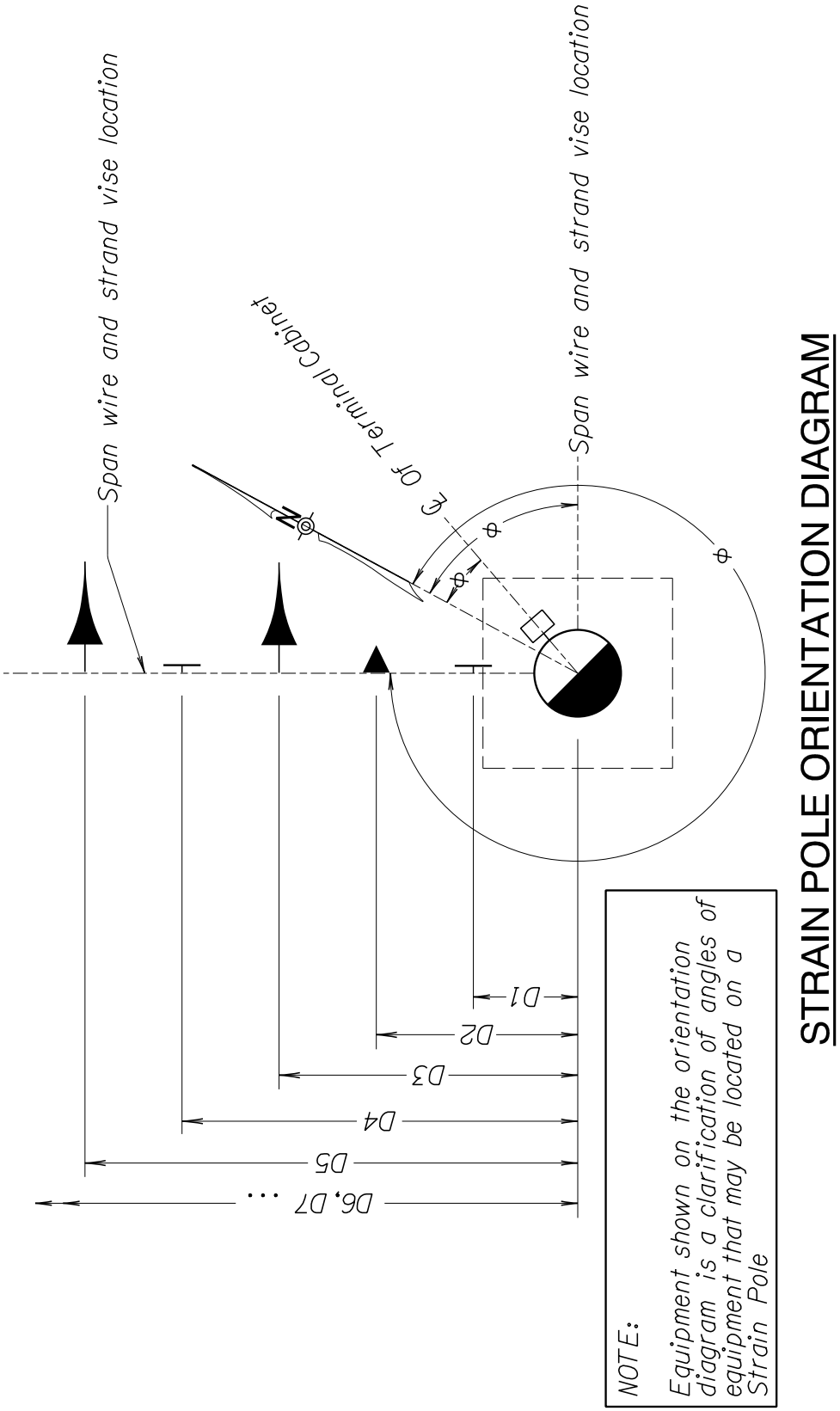
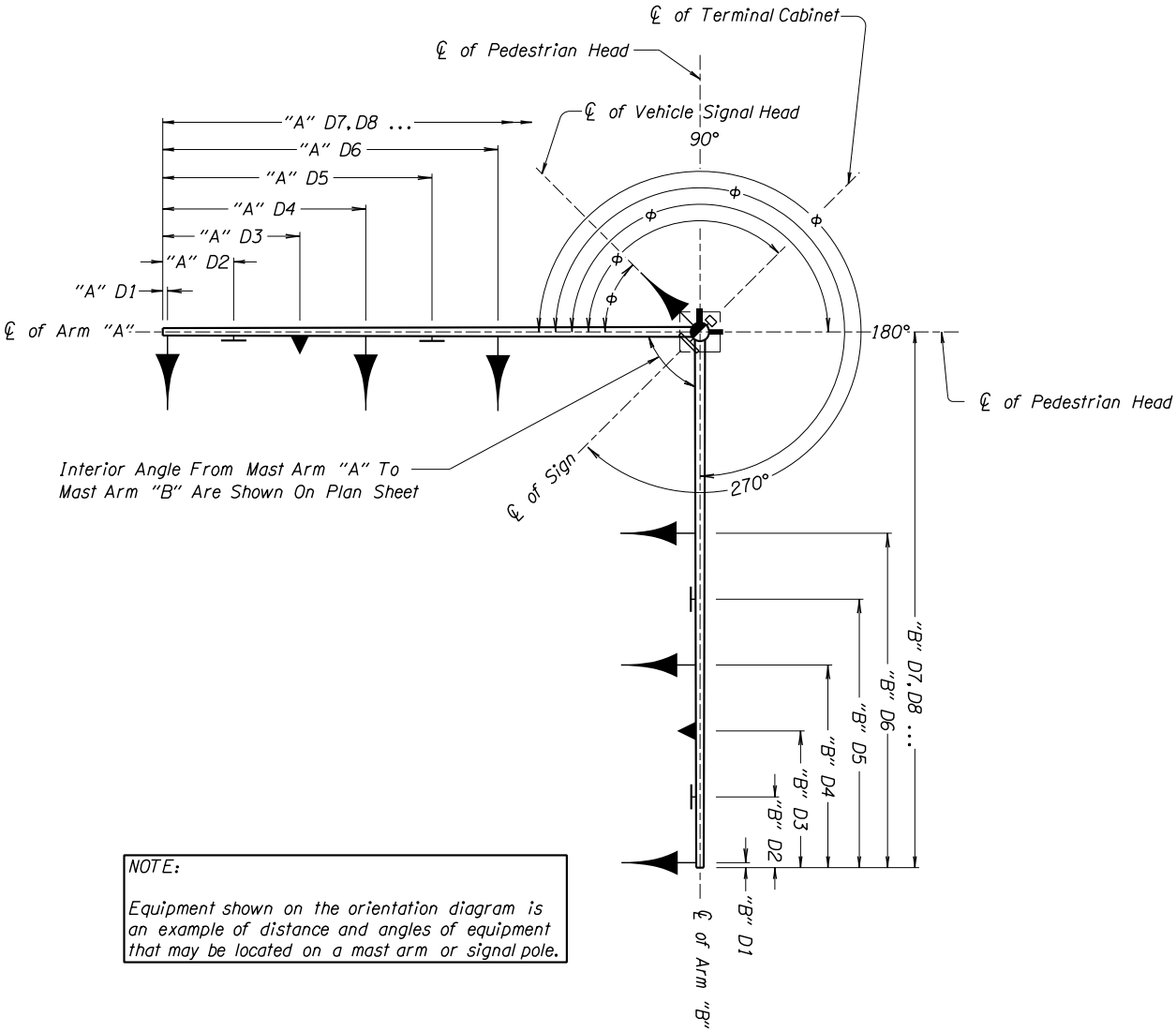
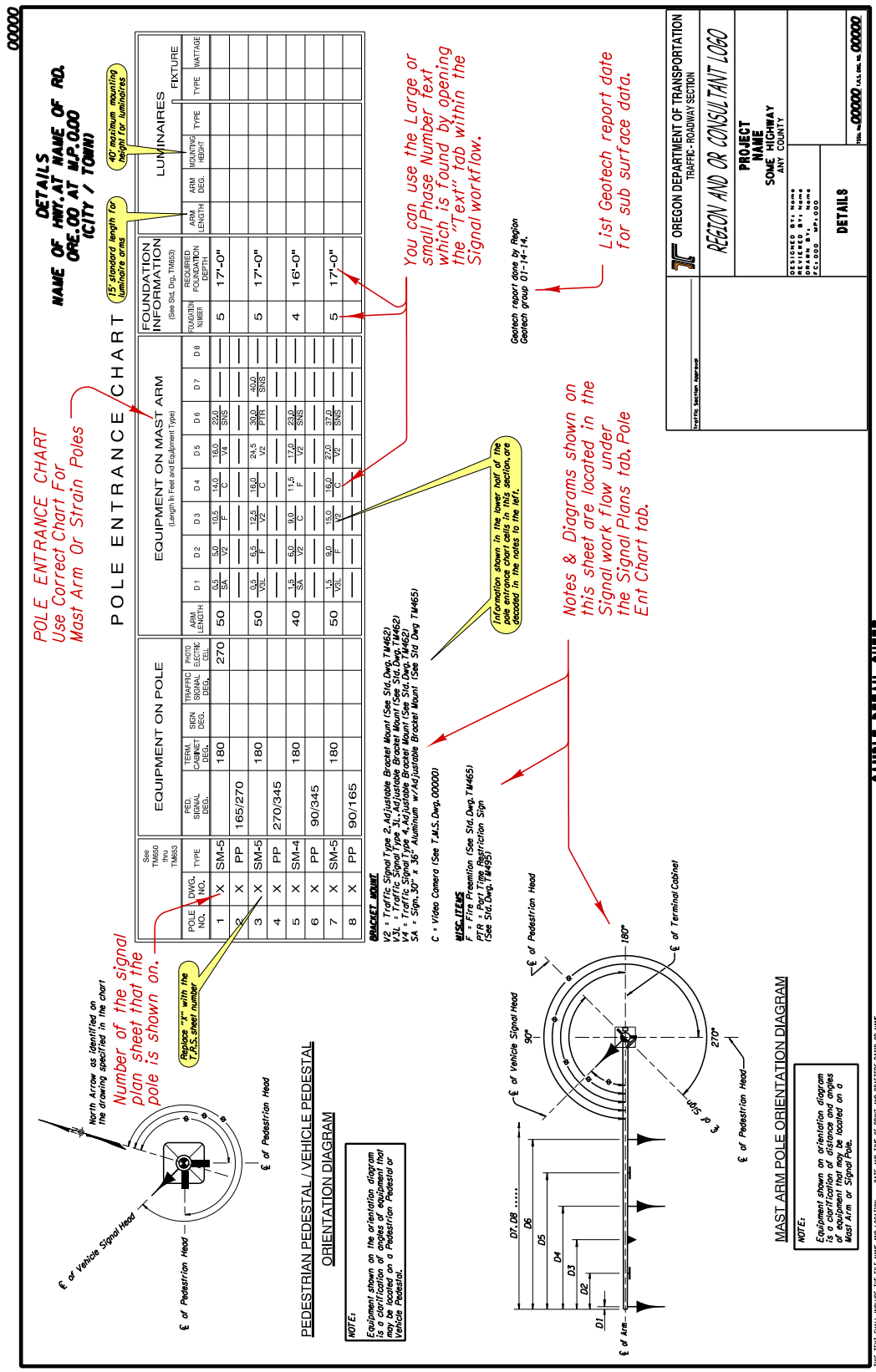


Figure 12-3 | Twin Mast Arm Pole Orientation Diagram



TWIN MAST ARM POLE ORIENTATION DIAGRAM

Figure 12-4 | Sample Pole Entrance Chart and Details

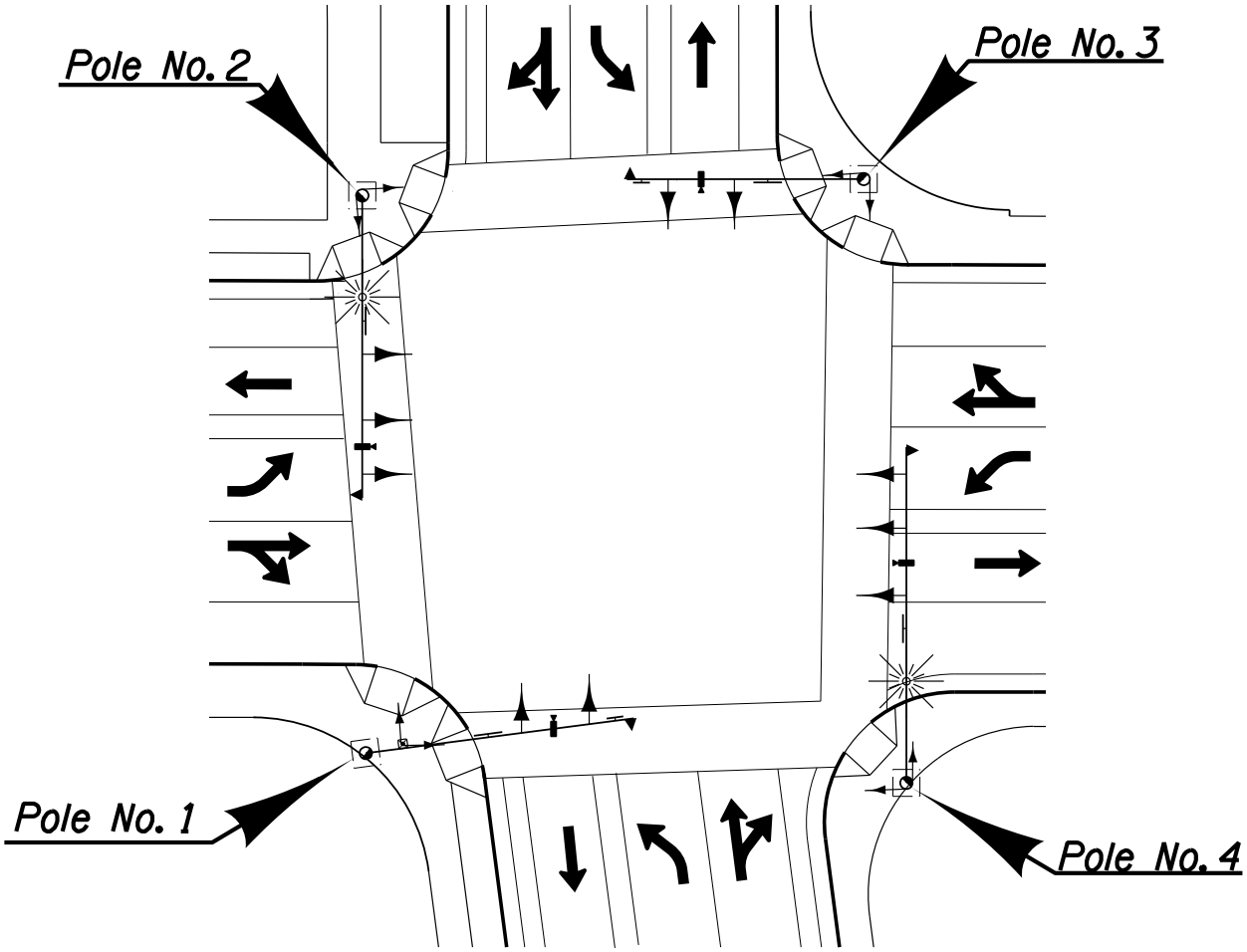


Pole Numbers

Poles and pedestals are numbered starting from the **lower left-hand corner of the intersection in a clockwise direction**. Plans having poles at more than one intersection shall have the **poles numbered consecutively** starting with the first intersection shown in the plans and ending with the last intersection shown in the plans.

This also includes vehicle pedestals, pedestrian pedestals and pushbutton posts.

Figure 12-5 | Pole Numbering Convention



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13 Temporary Signal Plans

This plan sheet shall contain all information that relates to the equipment used in the installation of the Temporary Signal Plan. Temporary Signal Plan sheets shall be drawn at a scale of 40:1. You may use a scale of 30:1 or 20:1 if 40:1 doesn't fit your plan sheet.

All contract plans shall be plotted "B" size (11"x17").

This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link:
MicroStation Users Guide.

The intersection layout is normally drawn showing edge of pavement or curb line, centerlines with stationing, lane markings, lane use arrows, right-of-way lines, crosswalks, sidewalks, highway names, street names, north arrow and other topographical features such as bridges.

Information about staging temporary signals shall match staging shown in the Temporary Traffic Control Plans. Show work zone stage and phase in the upper right corner of plan sheet.

The plan shall Include:

- Location and type of:
    - traffic signal poles,
    - detection equipment, i.e. video
    - underground conduit,
    - traffic signal wiring,
    - junction boxes,
    - vehicle signals,
    - pedestrian signals,
    - pedestrian pushbuttons,
    - overhead signs,
    - traffic signal controller cabinet,
    - service equipment,
    - preemption devices,
    - existing power sources, and
    - all other equipment needed to install the temporary signal.
- Each installed, removed, abandoned or retained item shall have the correct bubble and a leader(s) to the item.
- Normal Phase Rotation diagram for the intersection.

- Fire Preemption operation diagram for the intersection (if needed).

See examples of temporary signal plan sheets on the next 7 pages. The first three plan sheets are of a temporary bridge signal with loop detection. The last four plan sheets are showing different stages for a single signalized intersection.

In some case where there are a lot of minor staging changes a reduced plan sheet version may be used. Traffic Standards will determine which information needs to be on the plan sheet at time of plan review. See Figure 13-3 thru Figure 13-7 for examples.

Figure 13-1 | Sample Temporary Signal & Detector Plan Legend with Pole Entrance Chart

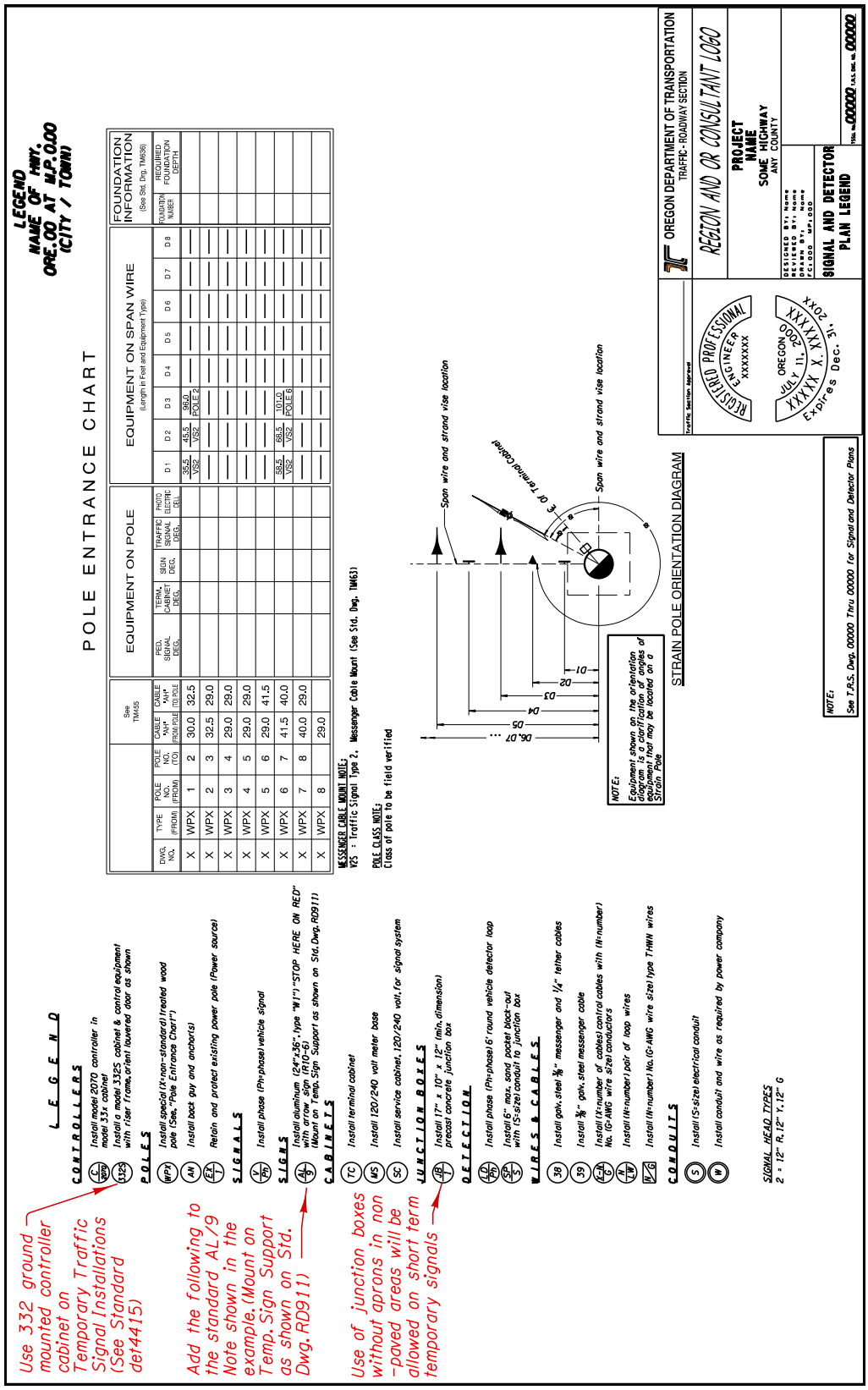


Figure 13-2 | Sample Temporary Signal & Detector Plan

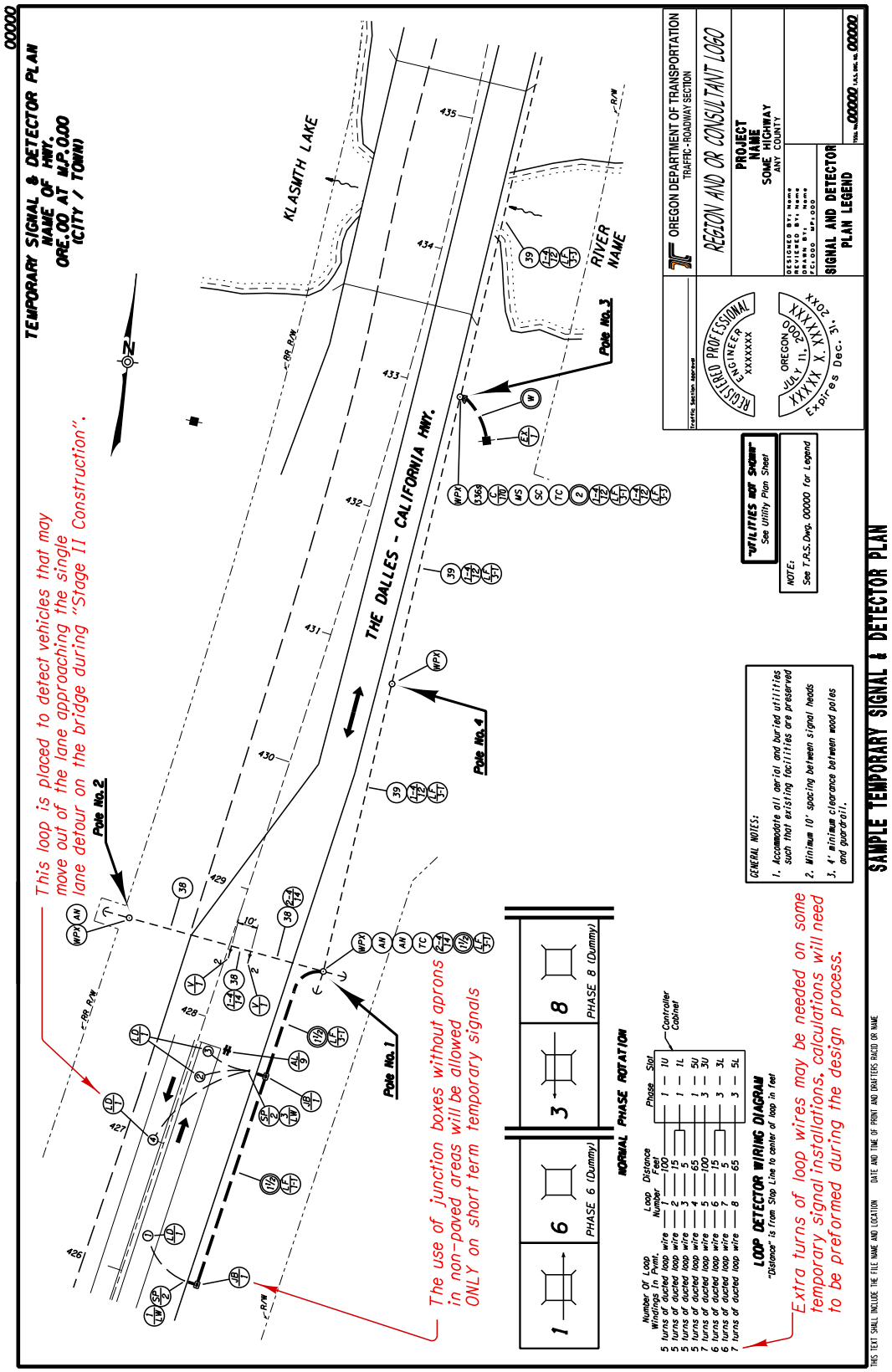


Figure 13-3 | Sample Temporary Signal & Detection Plan

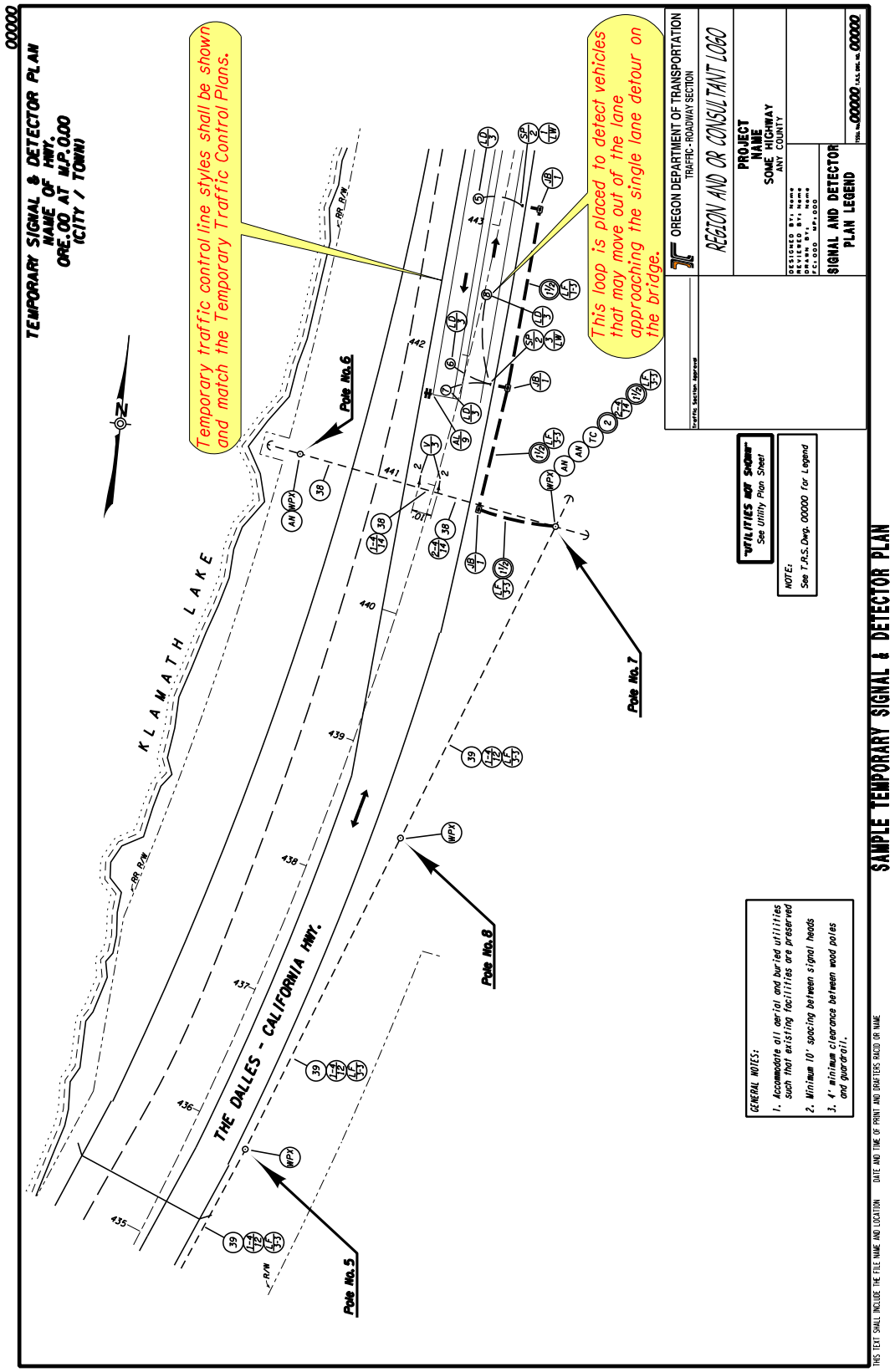


Figure 13-4 | Sample Temporary Signal Plan

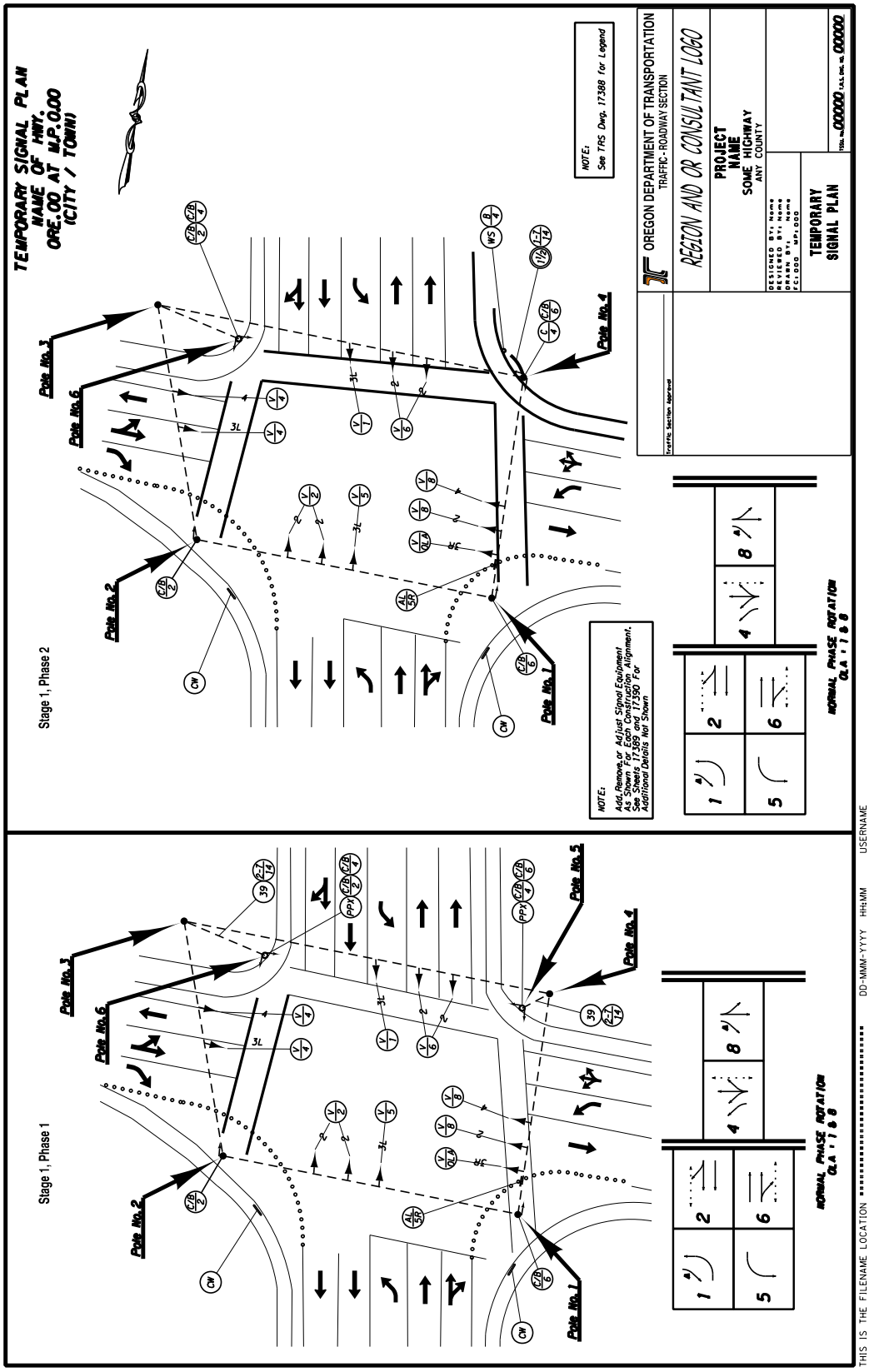


Figure 13-5 | Sample Temporary Signal Plan

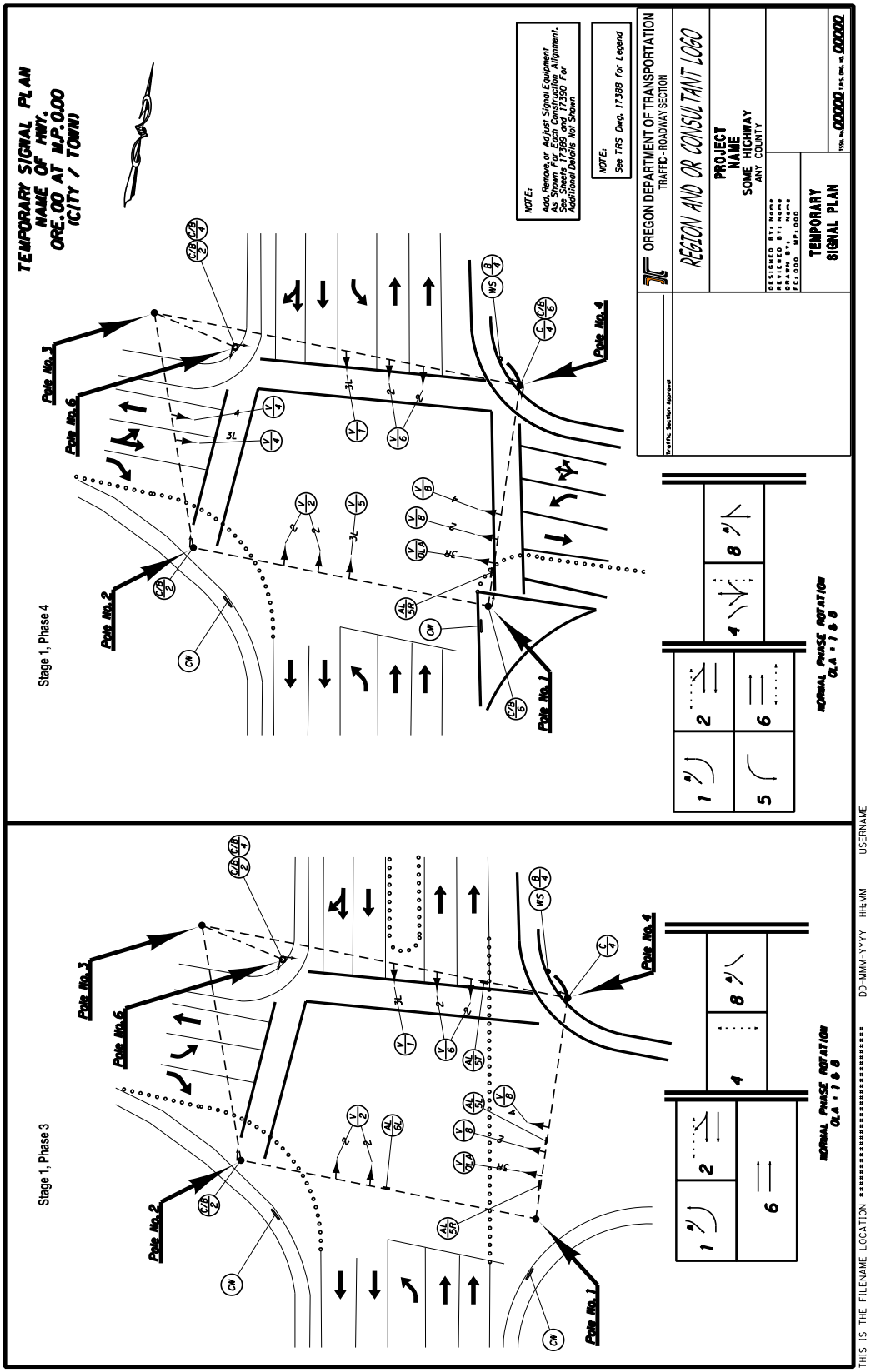


Figure 13-6 | Sample Temporary Signal Plan

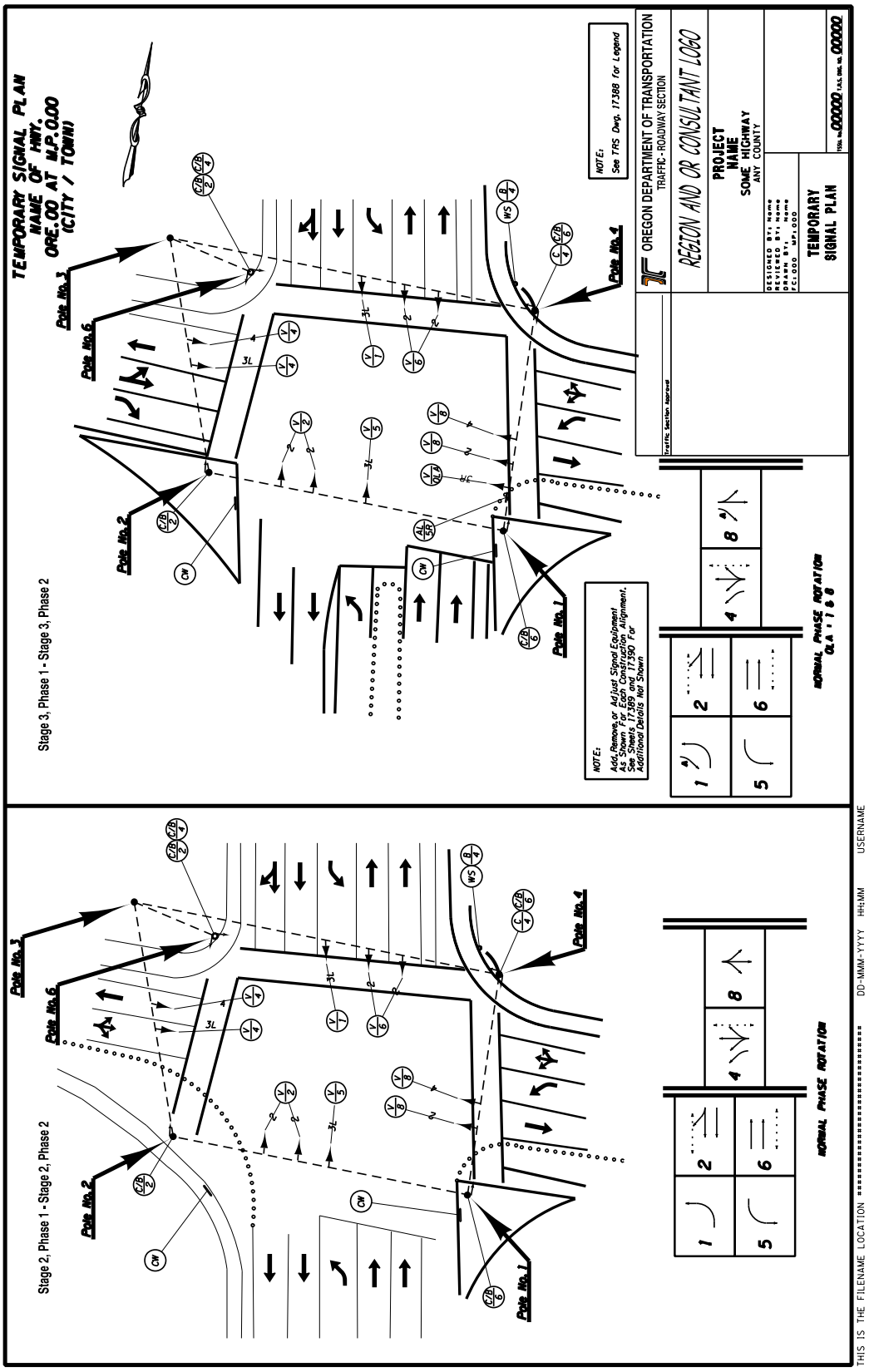
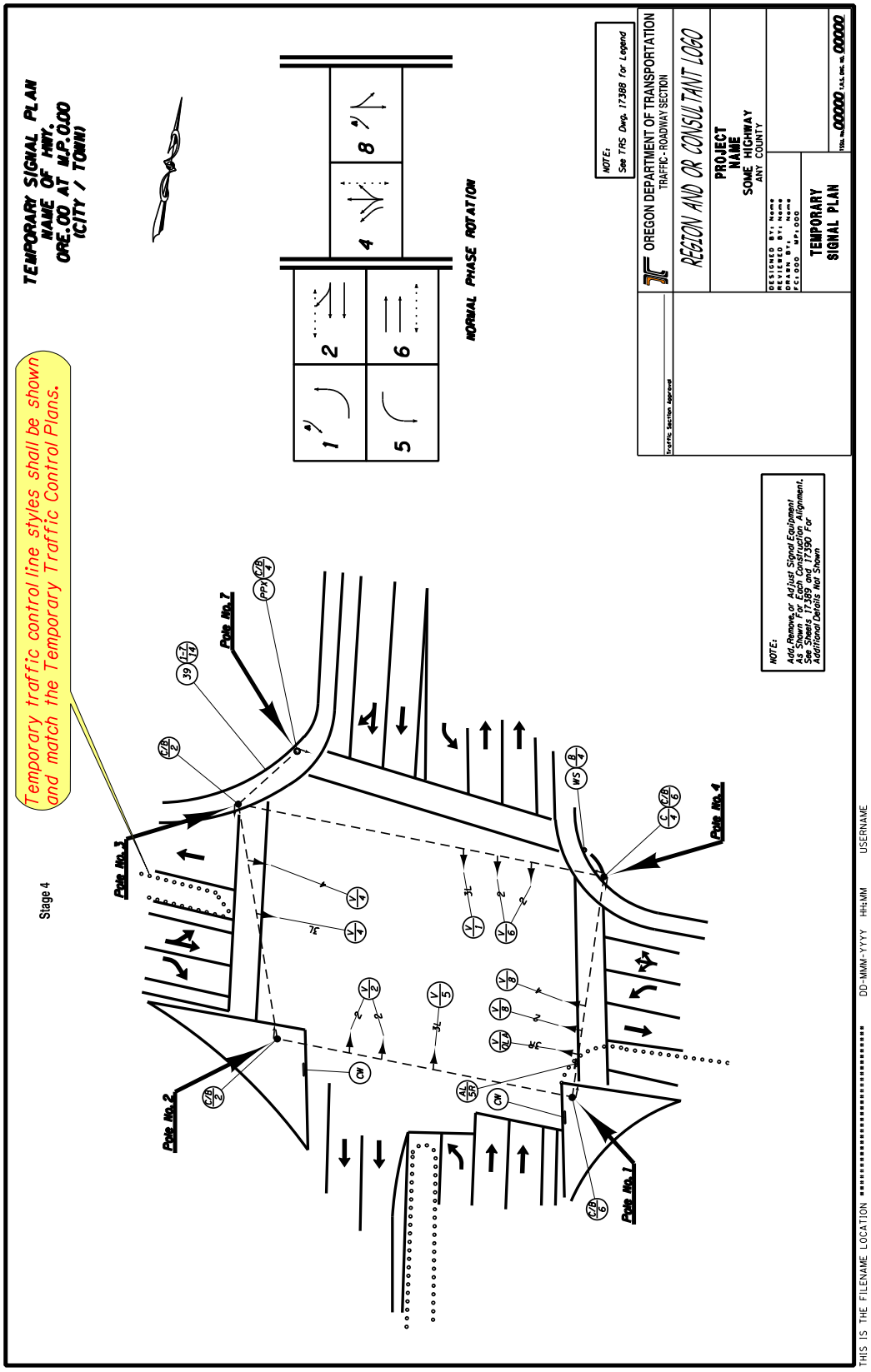


Figure 13-7 | Sample Temporary Signal Plan



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14 Flashing Beacon Plans

The flashing beacon plan shall be drawn showing edge of pavement or curb line, centerlines with stationing when available, lane markings, lane use arrows, crosswalks, sidewalks, sidewalk ramps, driveways, right-of-way lines, highway names, street names, north arrow and shall contain all information that relates to the equipment used in the installation of the Flashing Beacon Plan.

Flashing Beacon Plan sheets shall be drawn at a scale of 20:1.

All contract plans shall be plotted "B" size (11"x17")

This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link:
MicroStation Users Guide.

The plan sheets shall include:

- Legend sheet containing all definitions (Bubble Notes) for bubbles that are present on the Flashing Beacon plan sheets. These must be shown under the correct heading.
- Show the cross reference notes to all other plan sheets in the Flashing Beacon plan set.
- Titles and title blocks in the upper and lower right hand corner of all plan sheets.
- Show all the TM450 thru TM498 standard drawings that will be needed for the project in the area provided in the lower right hand title block of the (Legend) First sheet.

Note: Only the first sheet shall show the standard drawings required for the project. This area on all other plan sheets shall be left blank.

- All of the poles and equipment on the poles shown on the plan sheet(s) shall be listed on the Detail sheet (Pole Entrance Chart).
- Detail sheets for (RRFB's) Rectangular Rapid Flashing Beacons Shall be part of the plan set listed as Detail Sheets.

See Figure 14-1 through Figure 14-8 for example plan sheets.

Figure 14-6 through Figure 14-8 are Standard Details 4436 through 4438 available on the ODOT website.

Figure 14-1 | Sample Flashing Beacon Plan Legend and Pole Entrance Chart

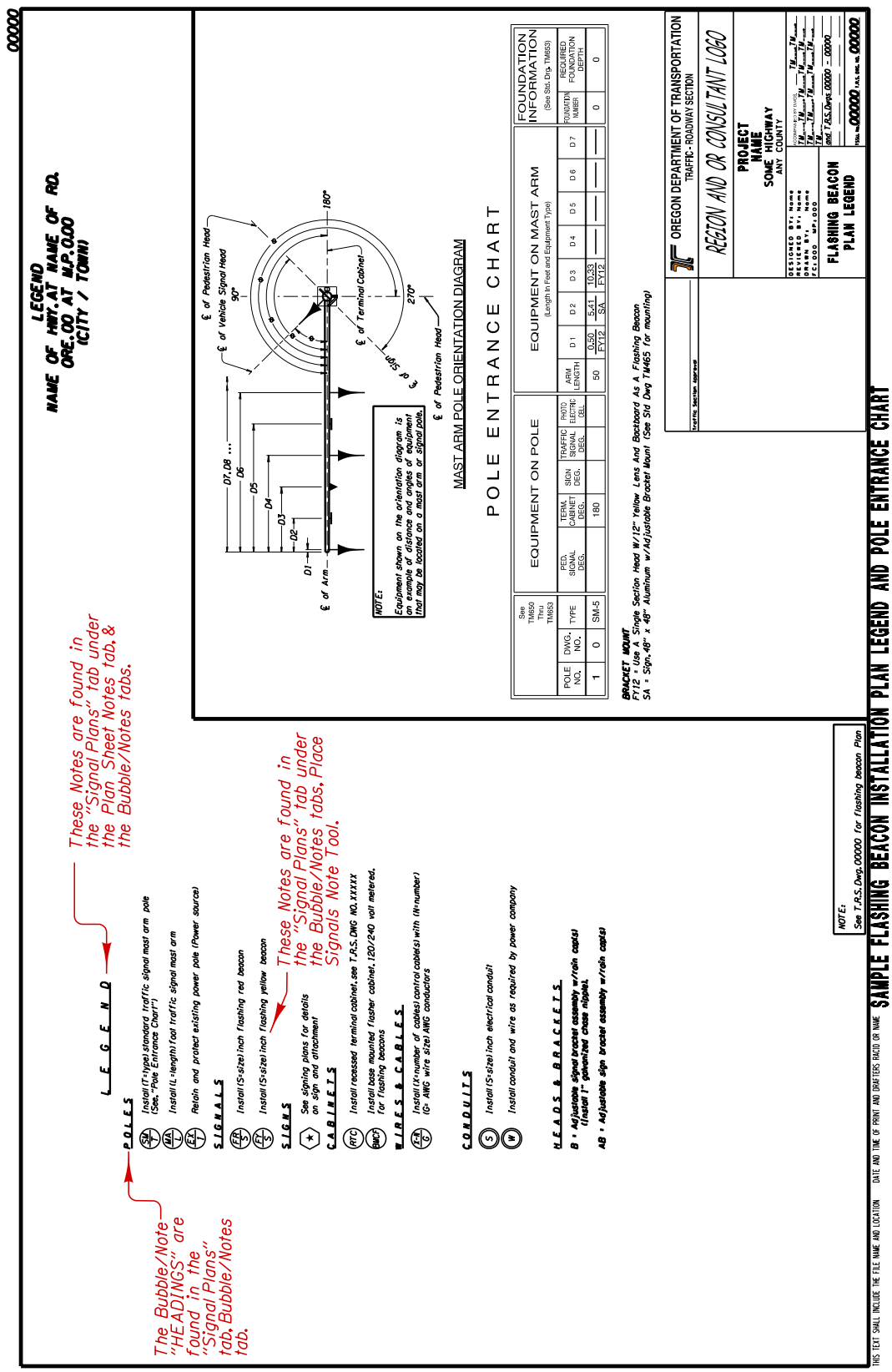


Figure 14-2 | Sample Flashing Beacon Plan

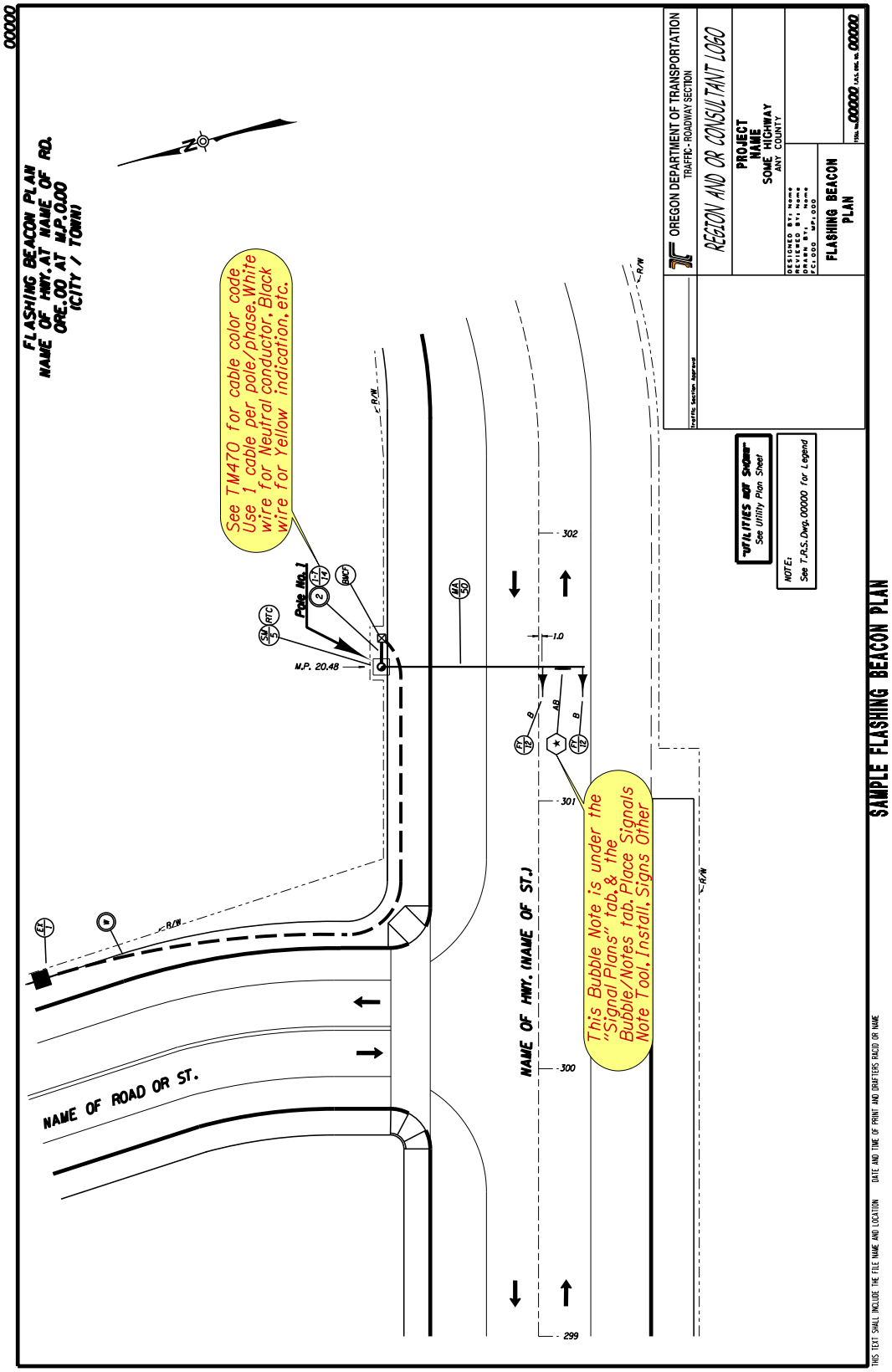


Figure 14-3 | Sample Flashing Beacon Plan with Flashing Removal Diagram

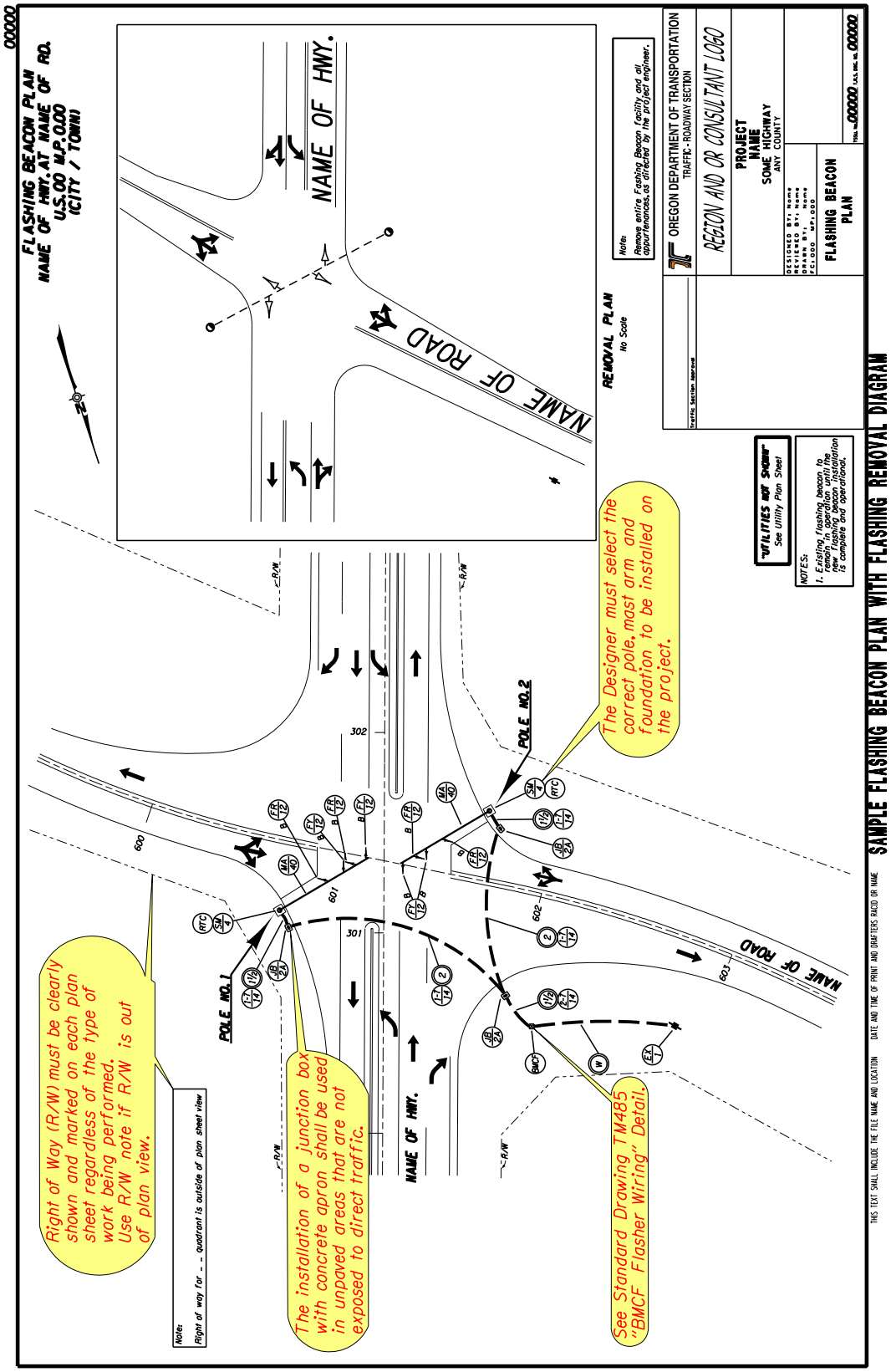


Figure 14-4 | Sample Flashing Beacon Plan RRFB

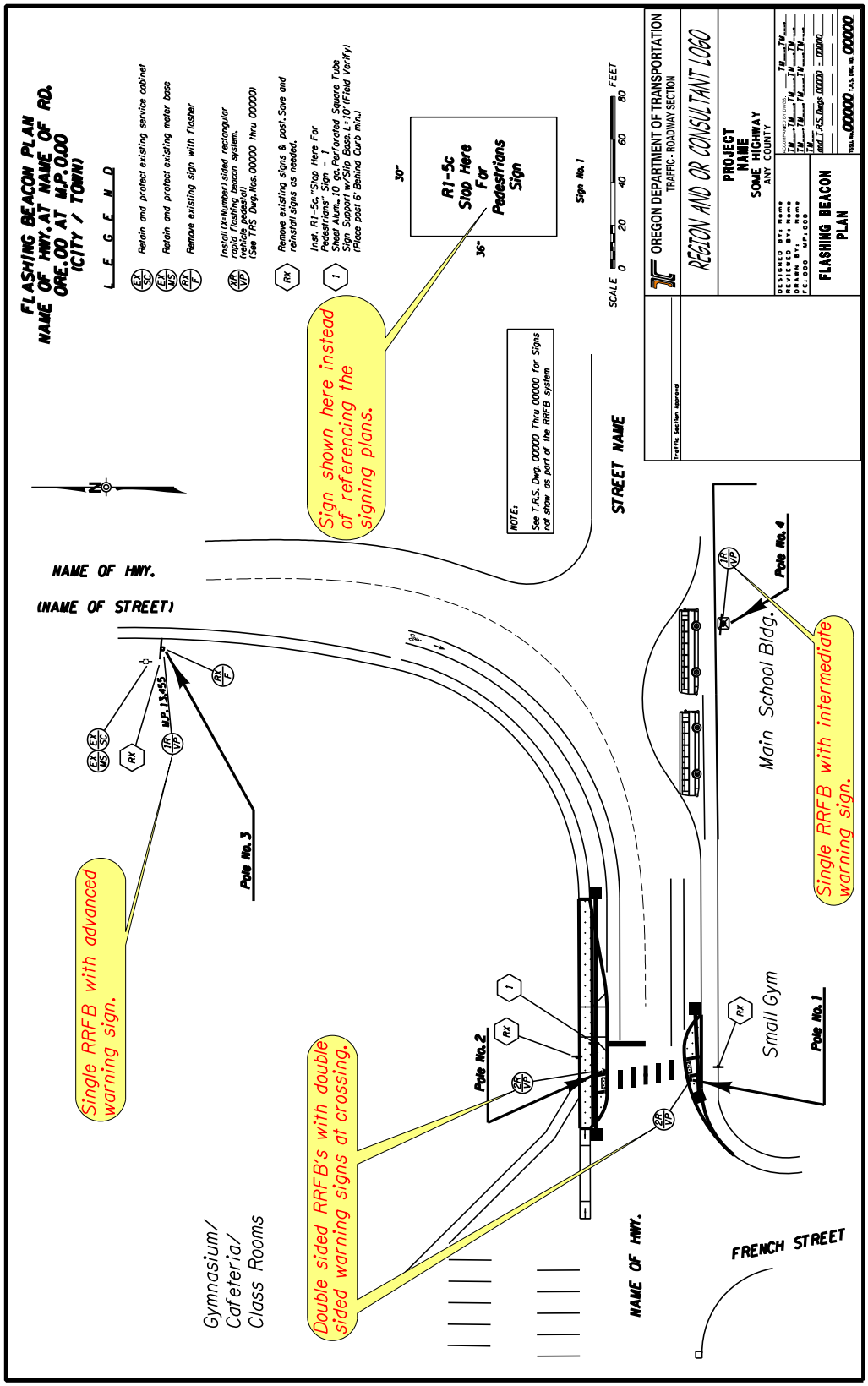


Figure 14-5 | Sample Detail RRFB

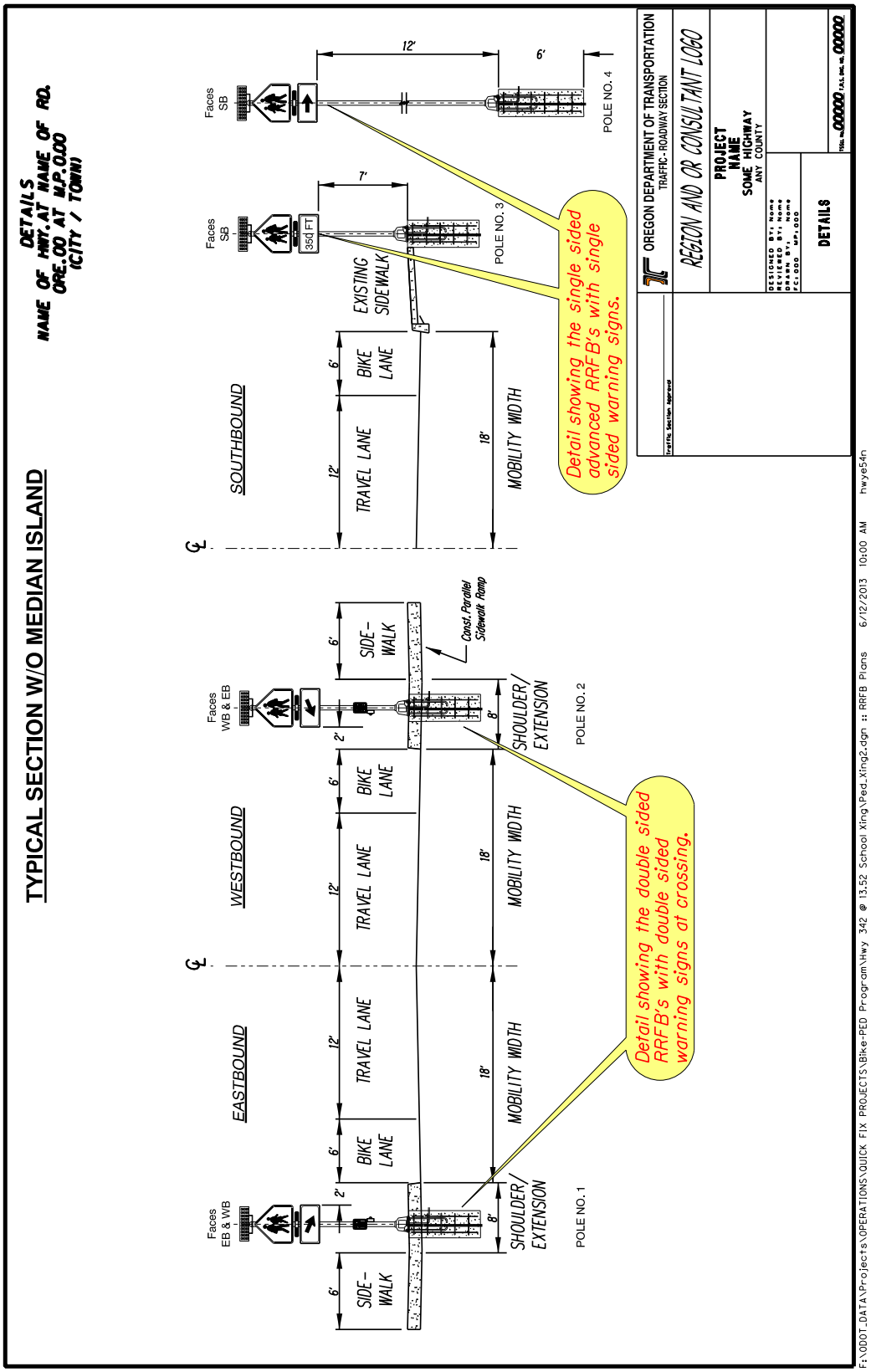


Figure 14-6 | Sample Detail RRFB

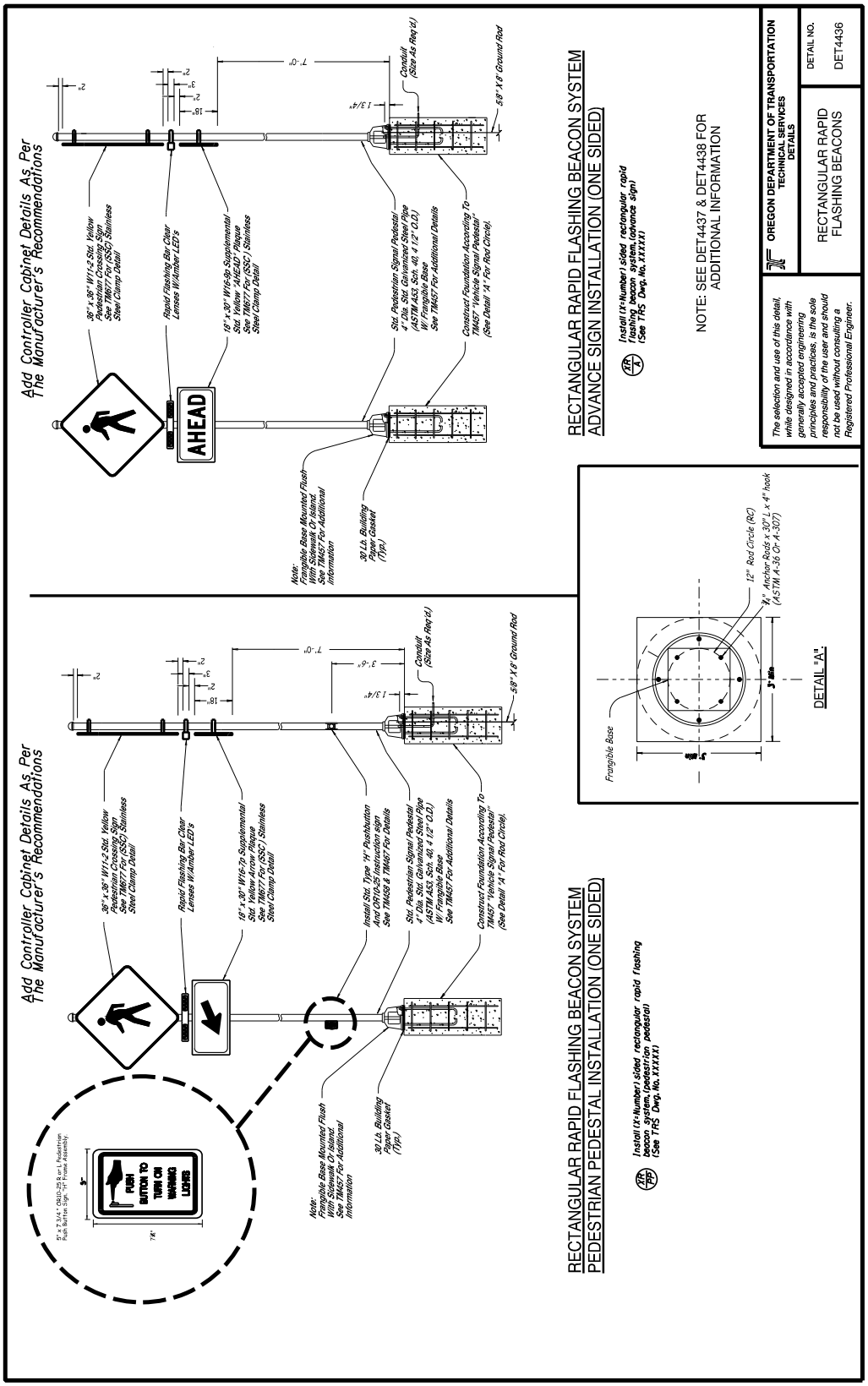


Figure 14-7 | Sample Detail RRFB

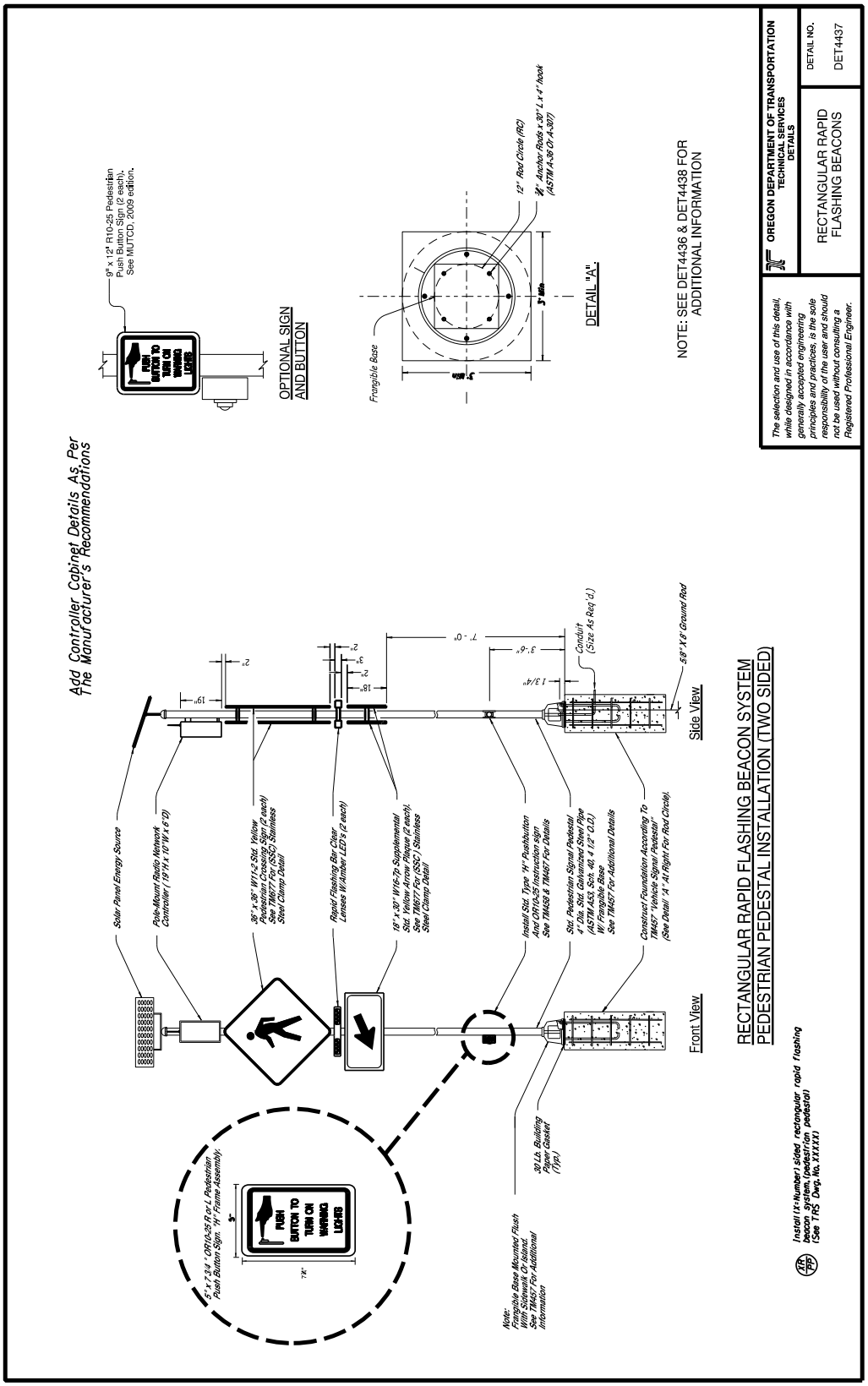
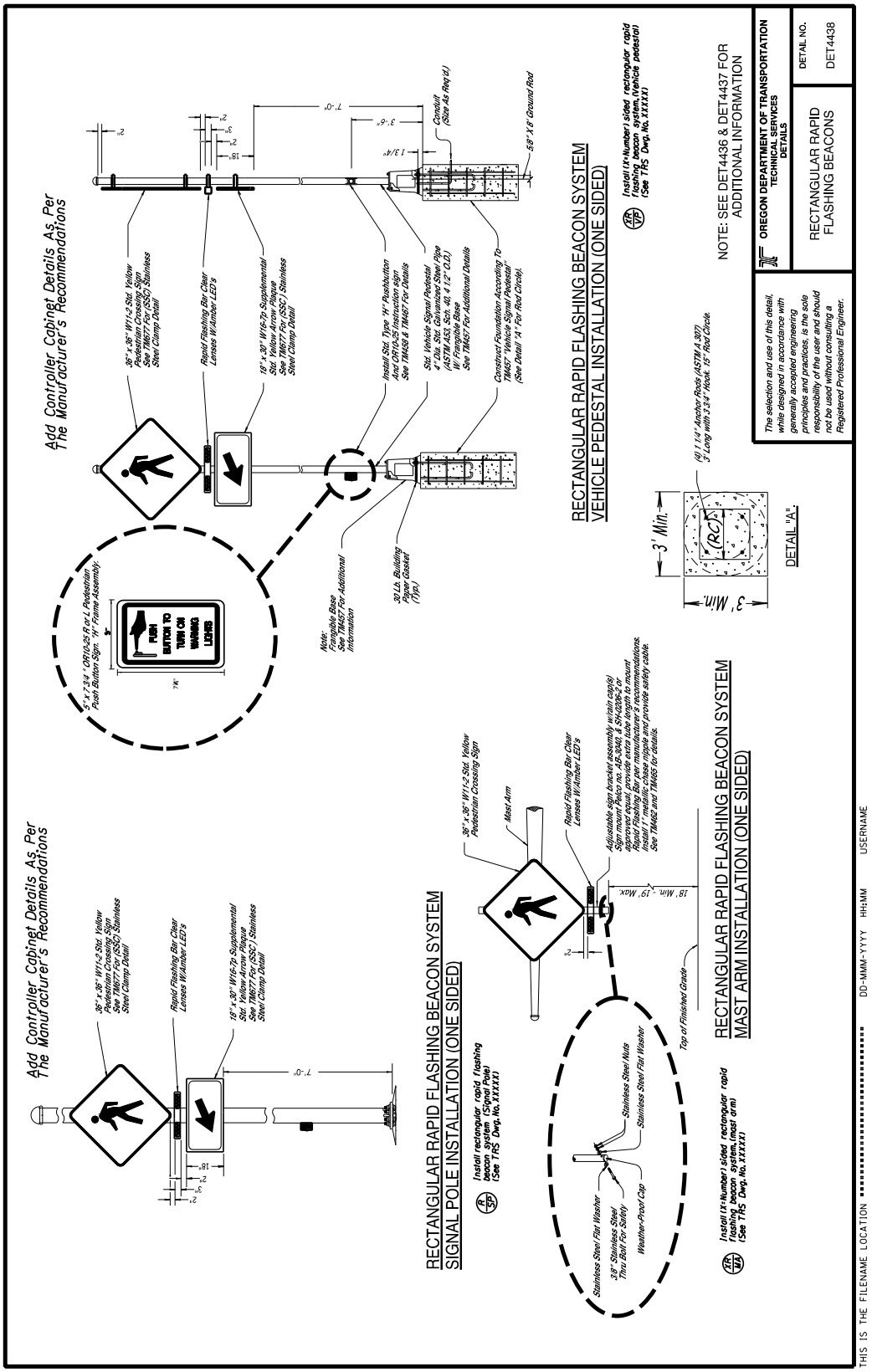


Figure 14-8 | Sample Detail RRFB



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15 Ramp Meter Signals

The ramp layout shall be drawn showing edge of pavement or curb line, lane use arrows, centerlines with stationing, lane markings, right-of-way lines, crosswalks, street names, north arrow and other features as needed.
All contract plans shall be plotted "B" size (11"x17"). Ramp Meter Plan sheets shall normally be drawn at a scale of 40:1. This is set with Annotation Scale. You can turn this on and off from many different locations including

- The drawing scale toolbar
- The place active cell dialog
- The place text dialog

For additional information on using Annotation Scale click on the following link:
MicroStation Users Guide.

NOTE: Scales smaller or larger than 40':1" are not acceptable for Ramp Meter plans. The use of break lines to fit the plan on one sheet shall be the only acceptable practice.

The plan sheets shall include:

- Location and type of ramp meter loops, loop wire entrance type, loop number, notes for symbols and details used and all other equipment needed to install the detector system.
- All signal pole foundations for; mast arm poles and vehicle signal poles shall be shown.
- Underground conduits, wiring, junction boxes, Type 334 ramp meter controller cabinet, service equipment.
- Reference sign plans using the hex star bubblenote for static signs mounted on P.S.S.T. or wood posts. See ramp meter sign list Figure 15.5.
- Each installed, removed, abandoned, or retained item shall have the correct bubble and a leader(s) to the item.
- Pole Entrance Chart Detail sheet showing equipment on poles.
- Loop wiring diagram for ramp meters. The diagram shall include;
    - Number of turns on the loop wire,
    - loop number,
    - distance from the painted gore point to the center of the loop,
    - distance from stop line,
    - splice point (cabinet or junction box),
    - phase,
    - function, and
    - input slot.

See the next three pages for plan sheet examples for items that must be shown.

Figure 15-1 | Sample Ramp Meter Legend and Pole Entrance Chart

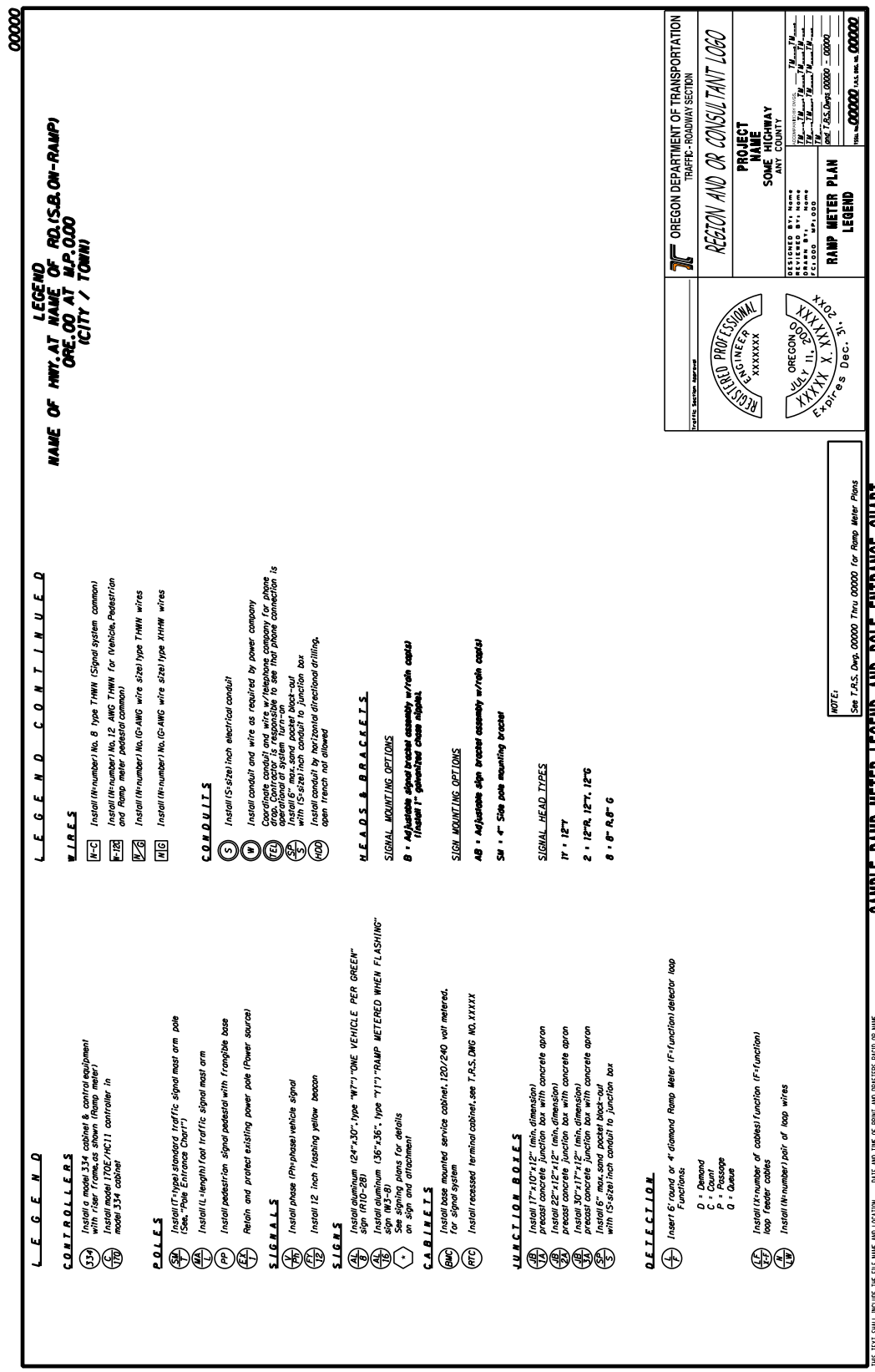


Figure 15-2 | Sample Ramp Meter Plan

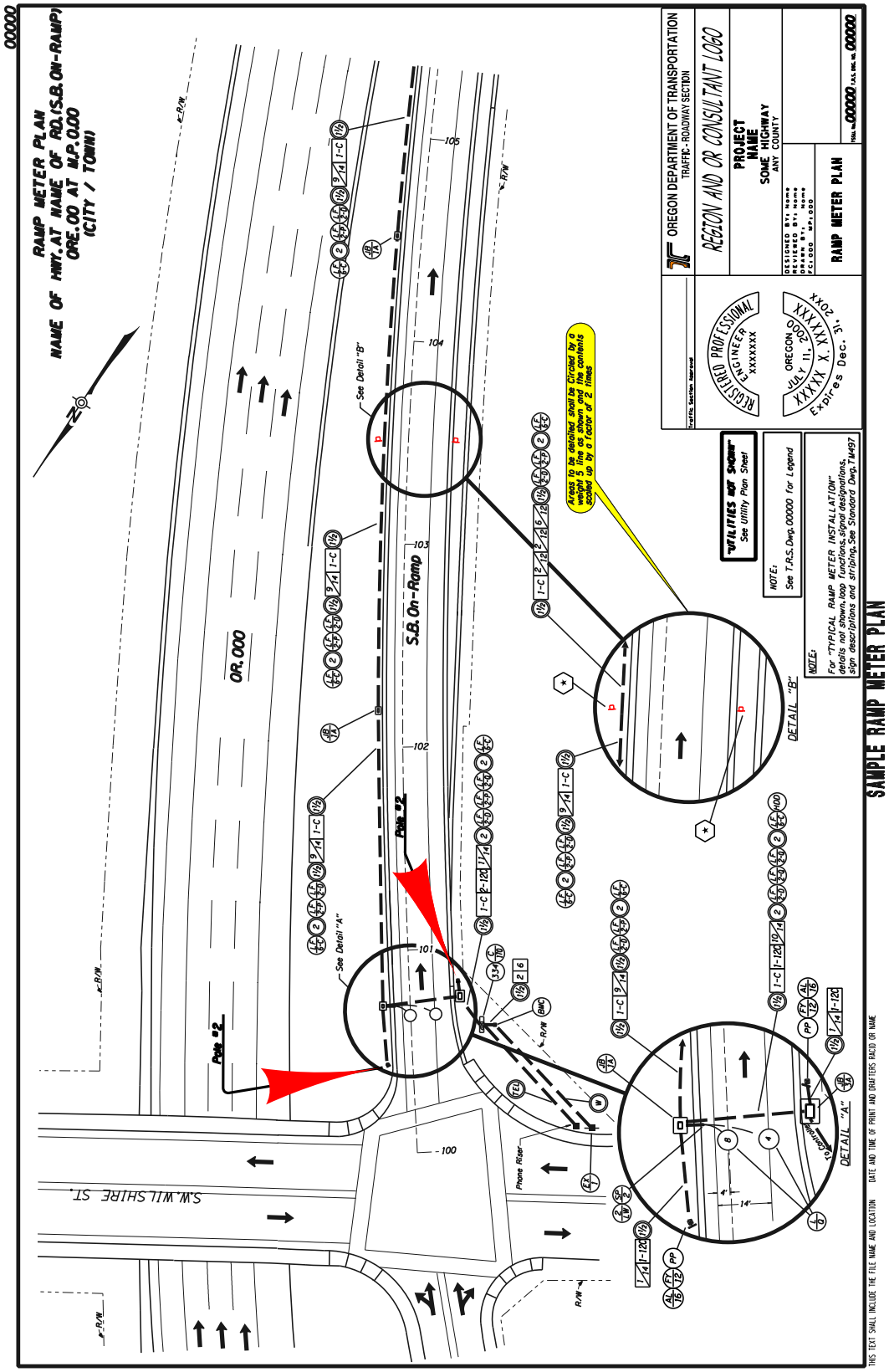


Figure 15-3 | Sample Ramp Meter Plan

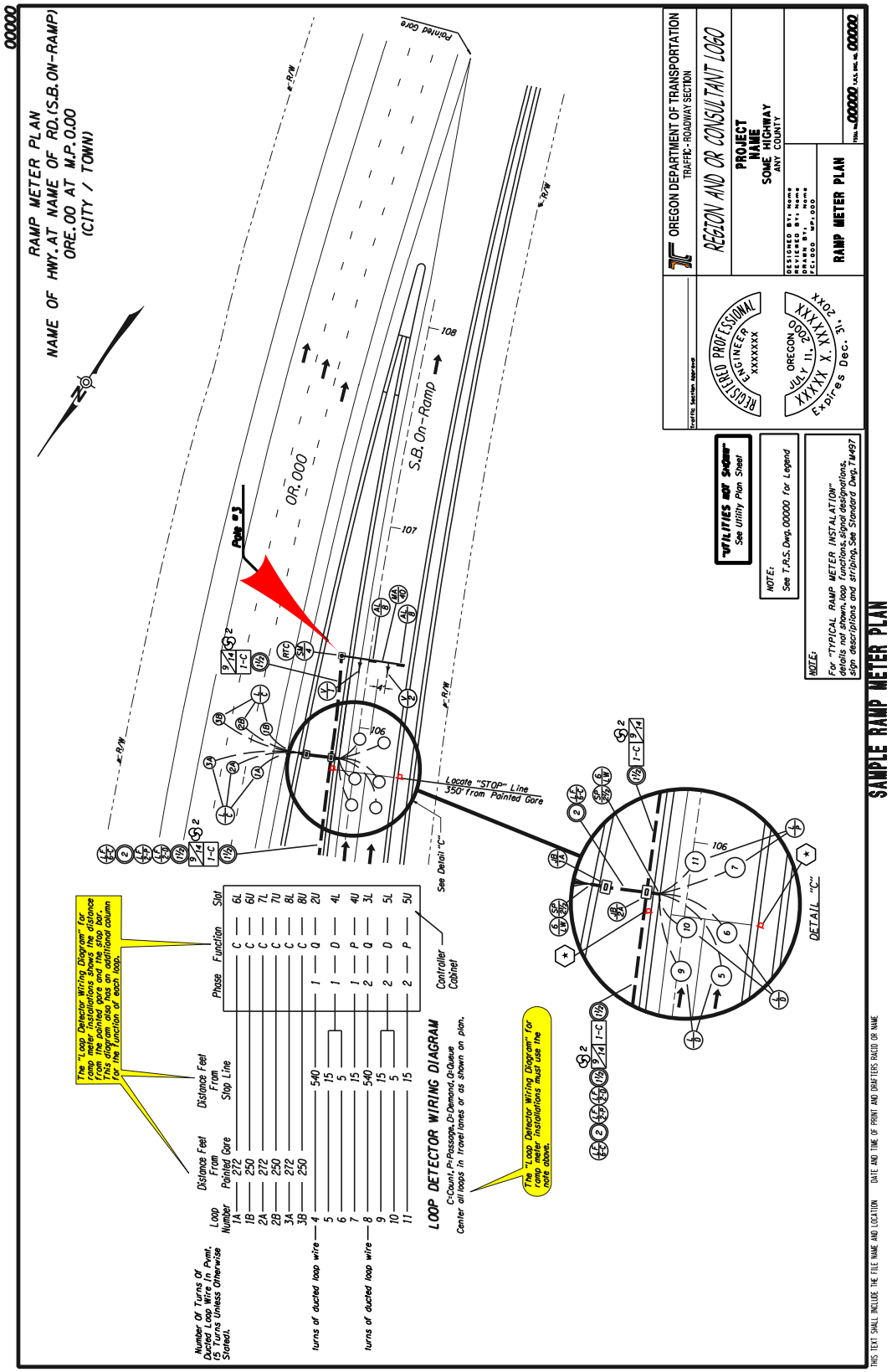


Figure 15-4 | Sample Detail Sheet

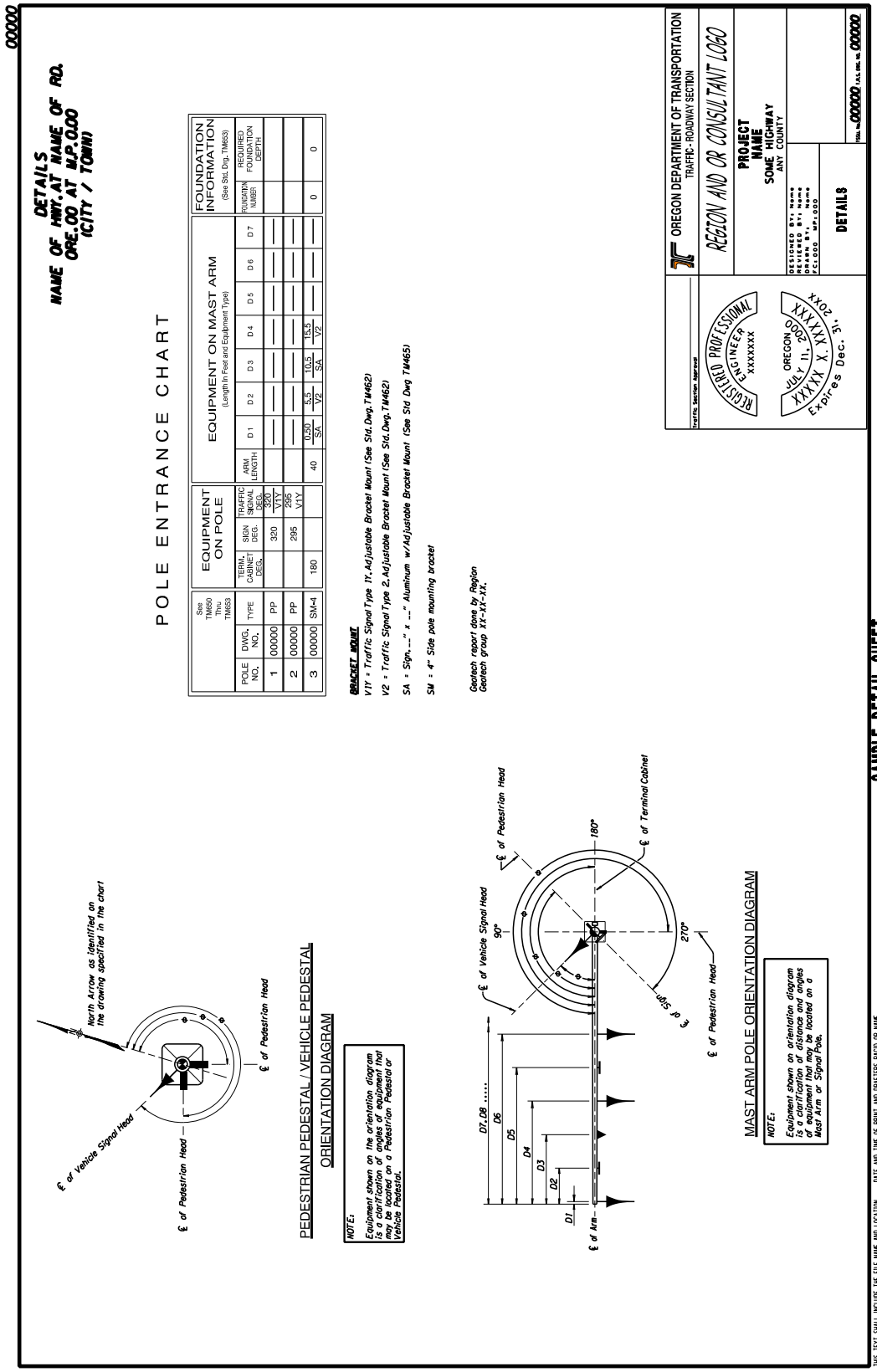


Figure 15-5 | Ramp Meter Signs

R10-28	ONE VEHICLE PER GREEN	AL 8	"ONE VEHICLE PER GREEN" Sign (R10-28) (24"x30")
OR20-1	ONE VEHICLE PER GREEN	AL 8s	"ONE VEHICLE PER GREEN" Sign (OR20-1) (24"x12")
R10-6	STOP HERE ON RED	AL 9	"STOP HERE ON RED" With Arrow Sign (R10-6) (24"x36")
W3-8	RAMP METERED WHEN FLASHING	AL 16	"RAMP METERED WHEN FLASHING" Sign (W3-8) (36"x36")
OR20-5	FORM 2 LANES WHEN METERED	AL 17	"FORM 2 LANES WHEN METERED" Sign (OR20-5) (24"x30")
W3-4	BE PREPARED TO STOP	AL 18	"BE PREPARED TO STOP" Sign (W3-4) (36"x36")
W16-13P	WHEN FLASHING	AL 19	"WHEN FLASHING" Sign (W16-13P) (24"x18")

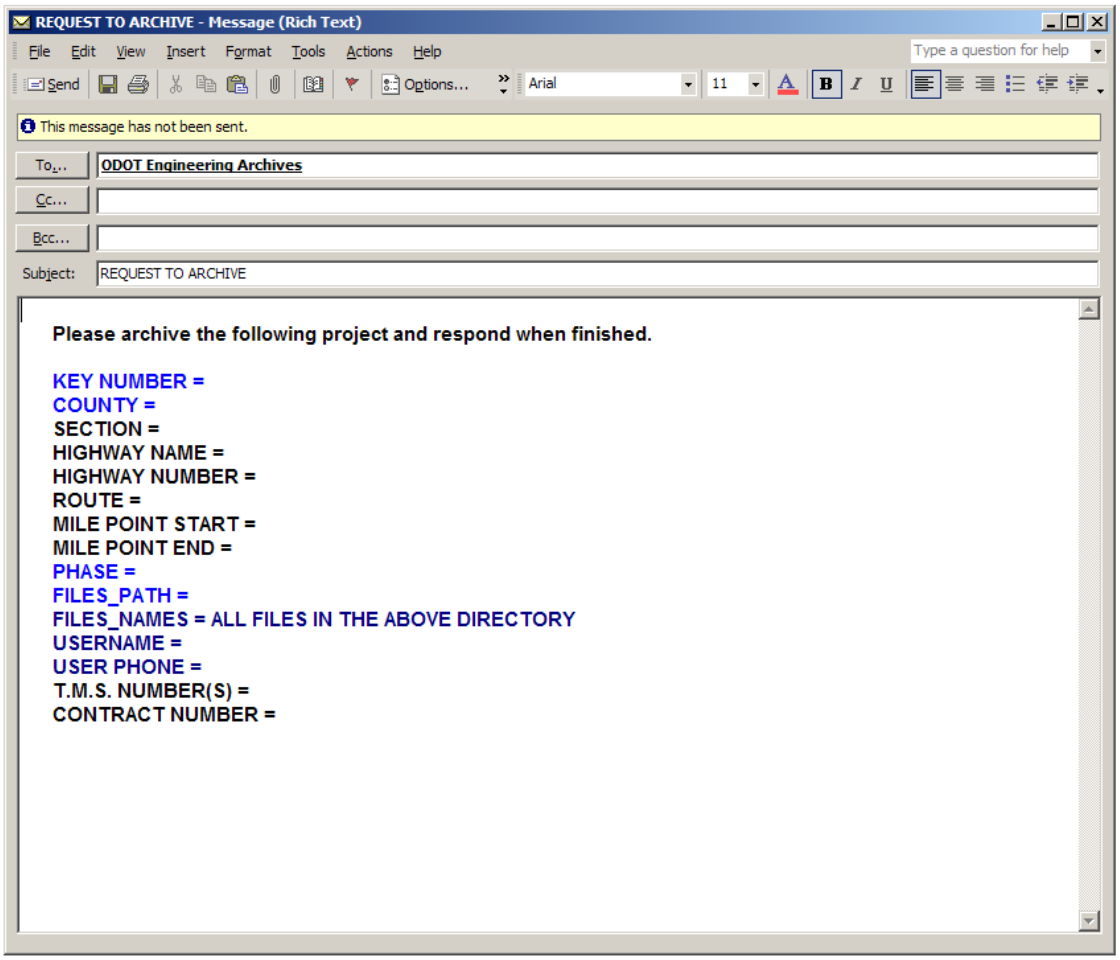
16 Plan Archiving

16.1 ODOT Designers

All CAD files that were used to create contract plan sheets shall be archived after the project has been let. The email below shows the information needed to archive the projects CAD files.

http://highway.odot.state.or.us/TAD/ISEAST/archives/#archive

Figure 16-1 | Archive Email - ODOT Designers



16.2 Consultant Designers

All CAD files that were used to create contract plan sheets shall be submitted to TRS on compact disk to be archived after the project has been let.

Figure 16-2 | Drafting Checklist

DESIGN/DRAFTING CHECKLIST		
Section:		**MP:**
Highway:	**County:**	**Key#**
Designer	**EA:**	

1 GENERAL DESIGN ELEMENTS

- ☐ Letter at Preliminary to Geo/Hydro Group for Foundations
- ☐ Signal Approval Letter
- ☐ Signal Poles, Pedestrian/Vehicle Pedestals
- ☐ Lane Use Signs
- ☐ Signal Heads
- ☐ Fire Preemption
- ☐ Pedestrian Ramps
- ☐ Crosswalks
- ☐ Controller Location
- ☐ BMC/BMCL Location
- ☐ Conduit layout including junction box placement
- ☐ Loop layout configuration

2 LEGEND SHEET

- ☐ Sheet Title
- ☐ Title block information (check roadway plans), file code and drawing number
- ☐ Legend
- ☐ Phase Rotation Diagram
- ☐ Fire Preemption (if room is not available on the Detector plan sheet)
- ☐ Operation Diagram (if room is not available on the Detector plan sheet)

3 SIGNAL PLAN

- ☐ Sheet Title
- ☐ Title block information (check roadway plans), file code and drawing number
- ☐ North arrow
- ☐ Lane use arrows and Street Names; crosswalks & stop lines
- ☐ Stationing or scale bar
- ☐ Conduit size (including DC, IC)
- ☐ Wiring
- ☐ Junction box sizes
- ☐ Fire preemption cable and detectors
- ☐ Pole numbers and types
- ☐ Signal head designations
- ☐ Ped. Head designations
- ☐ Head placement dimensions
- ☐ Controller type
- ☐ Signal removal plan
- ☐ See TRS Dwg. For legend
- ☐ All equipment & equipment segments identified with bubbles

4 DETECTOR PLAN

- ☐ Sheet Title
- ☐ Title block information (check roadway plans), file code and drawing number
- ☐ Lane use arrows and Street Names; crosswalks & stop lines
- ☐ Stationing or scale bar
- ☐ North arrow
- ☐ Conduit size (including EC, IC)
- ☐ Wiring with phase and number of loop feeder cables
- ☐ Junction box sizes
- ☐ Loop numbers and phasing bubble
- ☐ Wiring Diagram
- ☐ Phase Rotation Diagram
- ☐ Fire Preemption

5 POLE ENTRANCE CHART

- ☐ Sheet Title
- ☐ Title block information (check roadway plans), file code and drawing number
- ☐ Pole number and drawing number
- ☐ Pole type and mast arm length
- ☐ Equipment type & location on arm/span
- ☐ Pole equipment angles
- ☐ Orientation Diagrams & Legend

6 INTERCONNECT PLAN

- ☐ Sheet Title
- ☐ Title block information (check roadway plans), file code and drawing number
- ☐ Lane use arrows and Street Names
- ☐ Stationing or scale bar
- ☐ North arrow
- ☐ Conduit size (including EC, IC)
- ☐ Wiring with number and size (6-pair, 12-pair) of interconnect cables
- ☐ Junction box sizes

17 Revised & As-Constructed Plans

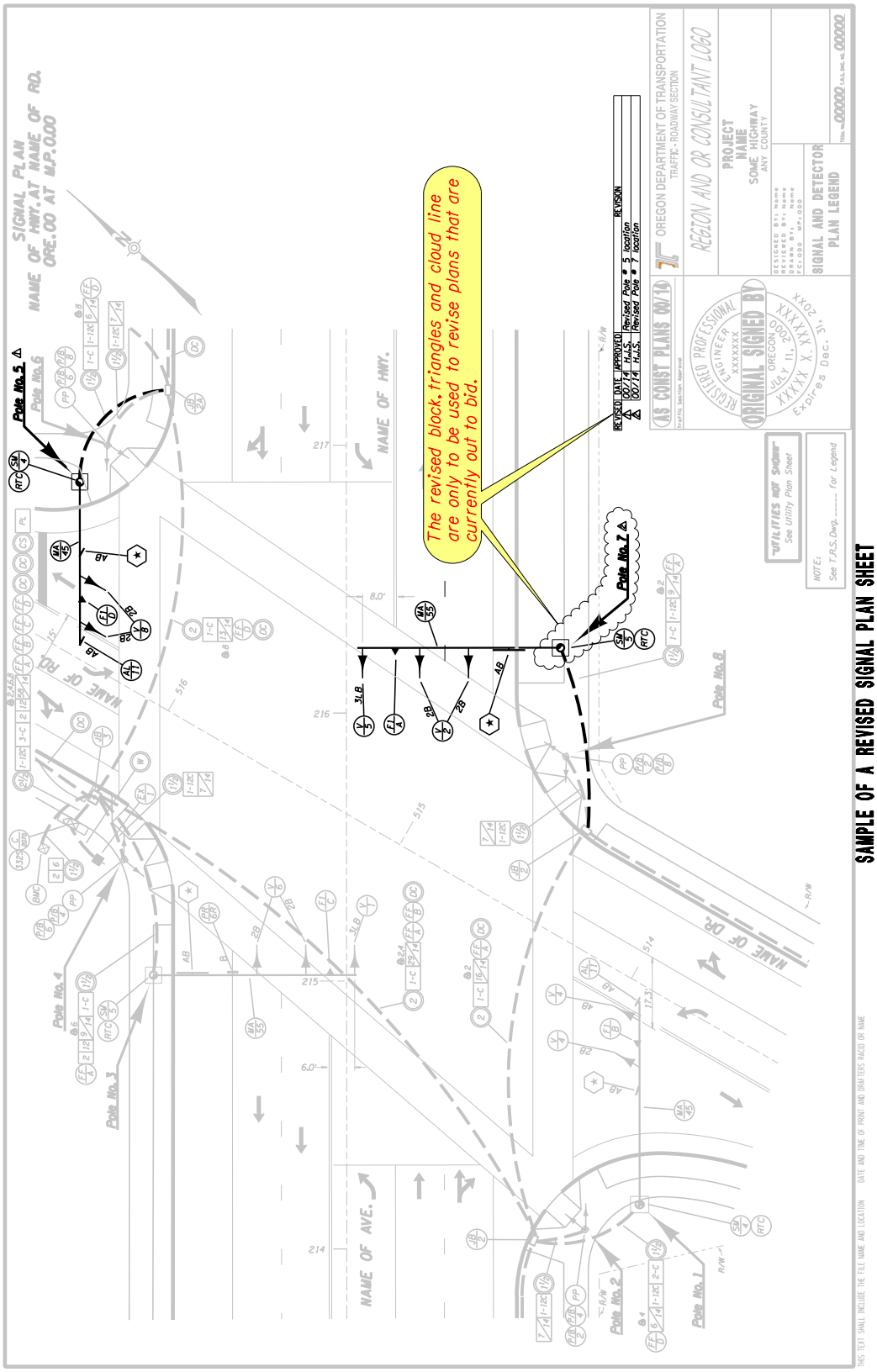
17.1 Revised Plans

Plans may need to be revised during the bidding process. The revision process is only done during this time frame. Plans that are in preliminary, advanced or final plans stage should not be shown with a revision block. A cloud line can be used to help direct the reader to the area(s) that have been revised. This plan sheet shows one revision with the cloud line and one without it. Use one style or the other not both on all plans that have been revised. The plan sheet will also need a revised block. This is placed just above the title block. The revised triangle, date and the revision are noted in this revision block. The revision block can be found in the ODOT Tasks & Workflows under the Signal Plans, Plan Sheet Notes, and Notes & Symbols tabs.

The example on the next page shows how to revise the plans. The gray shading is used to make the areas on the plan sheet that have been revised stand out. There shall be no gray shading on a set of contract plans.

See Figure 17-1 on the following page for revised plan example.

Figure 17-1 | Sample Revised Signal Plan Sheet

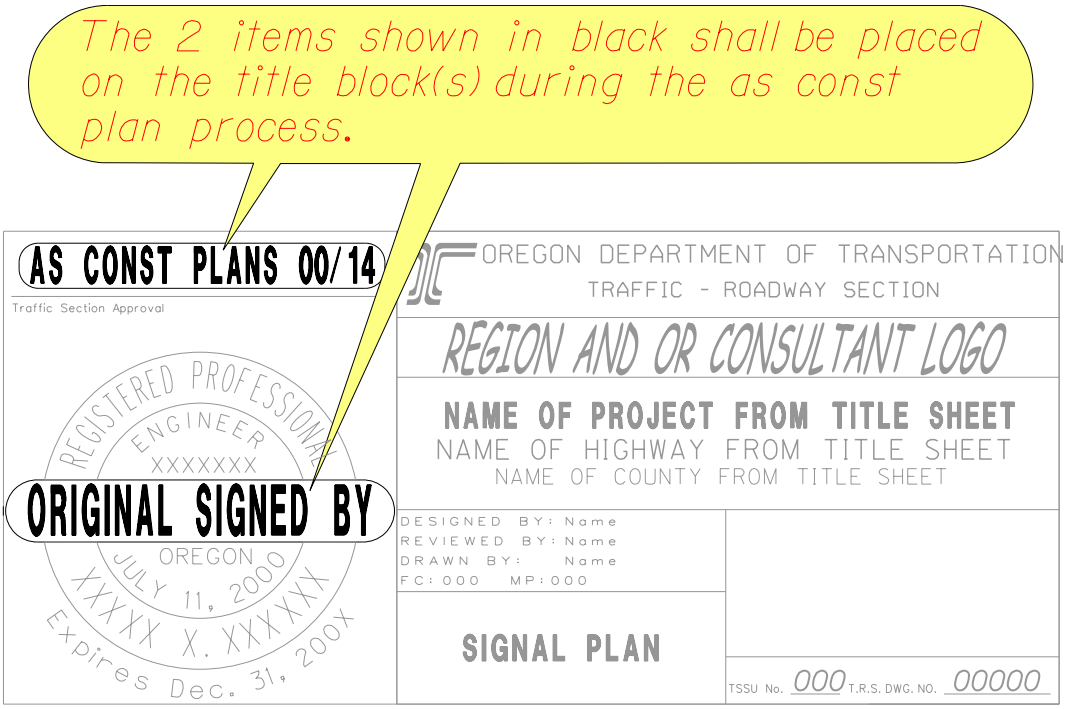


17.2 As-Constructed Plans

The purpose of producing "As Constructed" contract plans is to accurately reflect the actual project as it was constructed in the field.

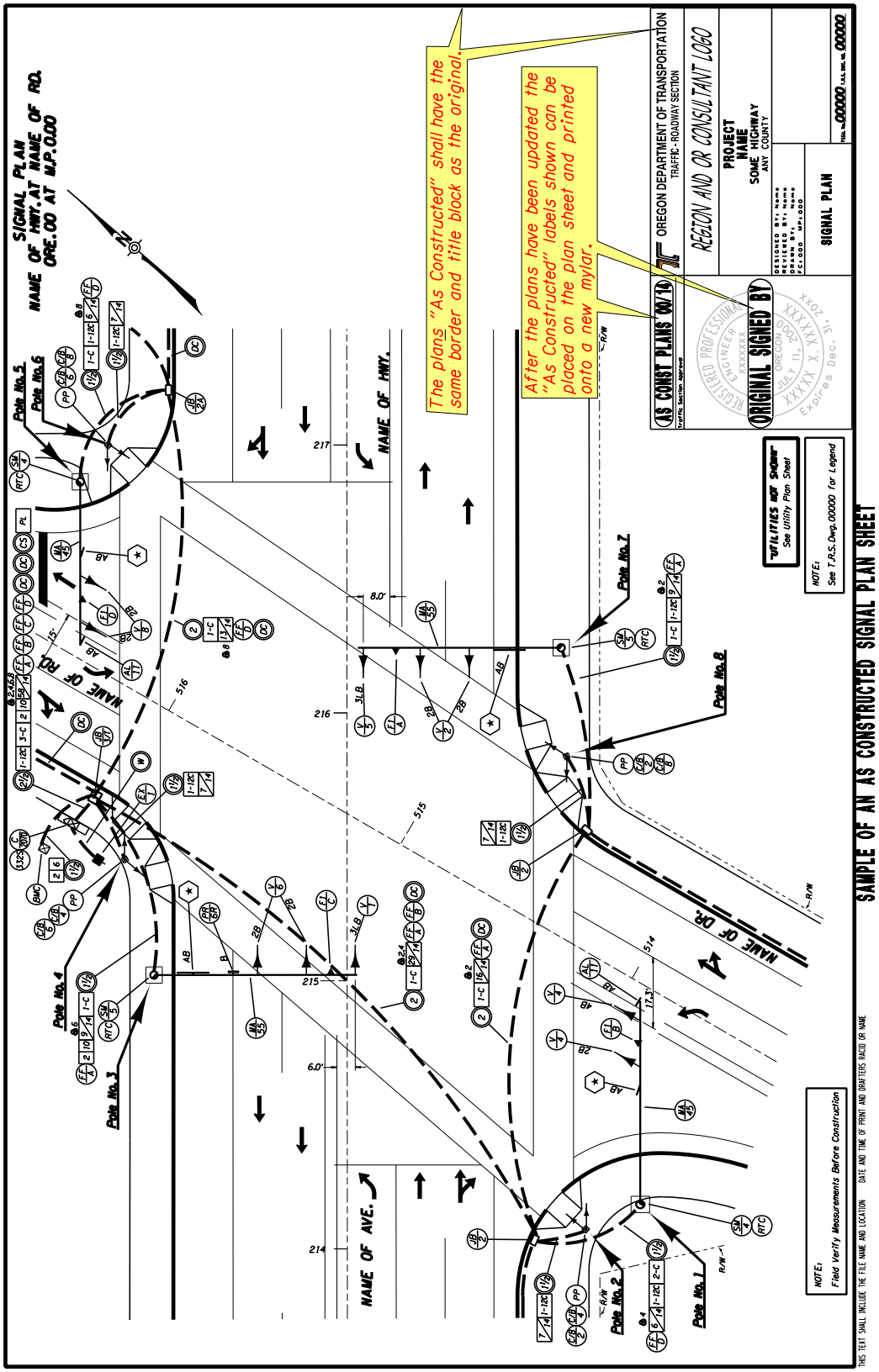
After the files have been completed, the drafter places a stamp on each sheet in the file to indicate when the plan was updated to "AS CONST PLANS 00/00" and the "ORIGINAL SIGNED BY" stamps as shown below.

Figure 17-2 | As-Constructed Title Block



See Figure 17-3 on the following page of the Completed As-Constructed Signal Plan Sheet.

Figure 17-3 | As-Constructed Signal Plan Sheet



The “As Constructed” electronic files and Mylar drawings are retained by ODOT’s Traffic – Roadway Section. See Technical Bulletin TSB08-01(B) for guidance on as constructed drawings.

“As Constructed” files can be used as reference for future work in the same area. For this reason accuracy and clarity are very important in the production of “As Constructed” plans.

Units of measure will be maintained for all “As Constructed” plans. Metric plans shall remain in Metric units, English plans shall remain in English units.

It is expected that the drafter producing “As Constructed” plans will be familiar with and will use the standards set forth in this manual.

For projects produced by the consultant, a developer, or local agency, the consultant shall submit to ODOT Traffic – Roadway Section within 60 working days after completion of the contract work, a complete set of traffic signal plans, labeled and verified as “As Constructed”. The “As Constructed” plans are to be submitted to ODOT Traffic – Roadway Section on 11”x17”, black line, Mylar sheets. The electronic (Microstation format) plans shall be submitted at the same time as the 11”x17” Mylar’s.

ODOT contracted projects require the submittal of electronic (Microstation format) files of the “As Constructed” plan sheets to the Traffic – Roadway Section.

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