ODOT

SIGNAL DESIGN

M A N U A L

OREGON DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL DESIGN MANUAL

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, statutes, rules, and policies related to traffic control signal operation and railroad preemption design.

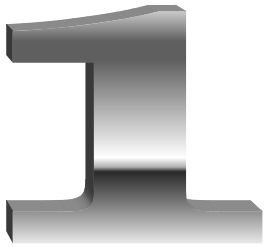
Version 02-07

Traffic Signal Design Manual
Oregon Department of Transportation
Highway Division
Traffic - Roadway Section

http://www.odot.state.or.us/ffp/hwy/traffic/Signal_Design_Manual.pdf

Table Of Contents

List of Drawings, Details & Examples



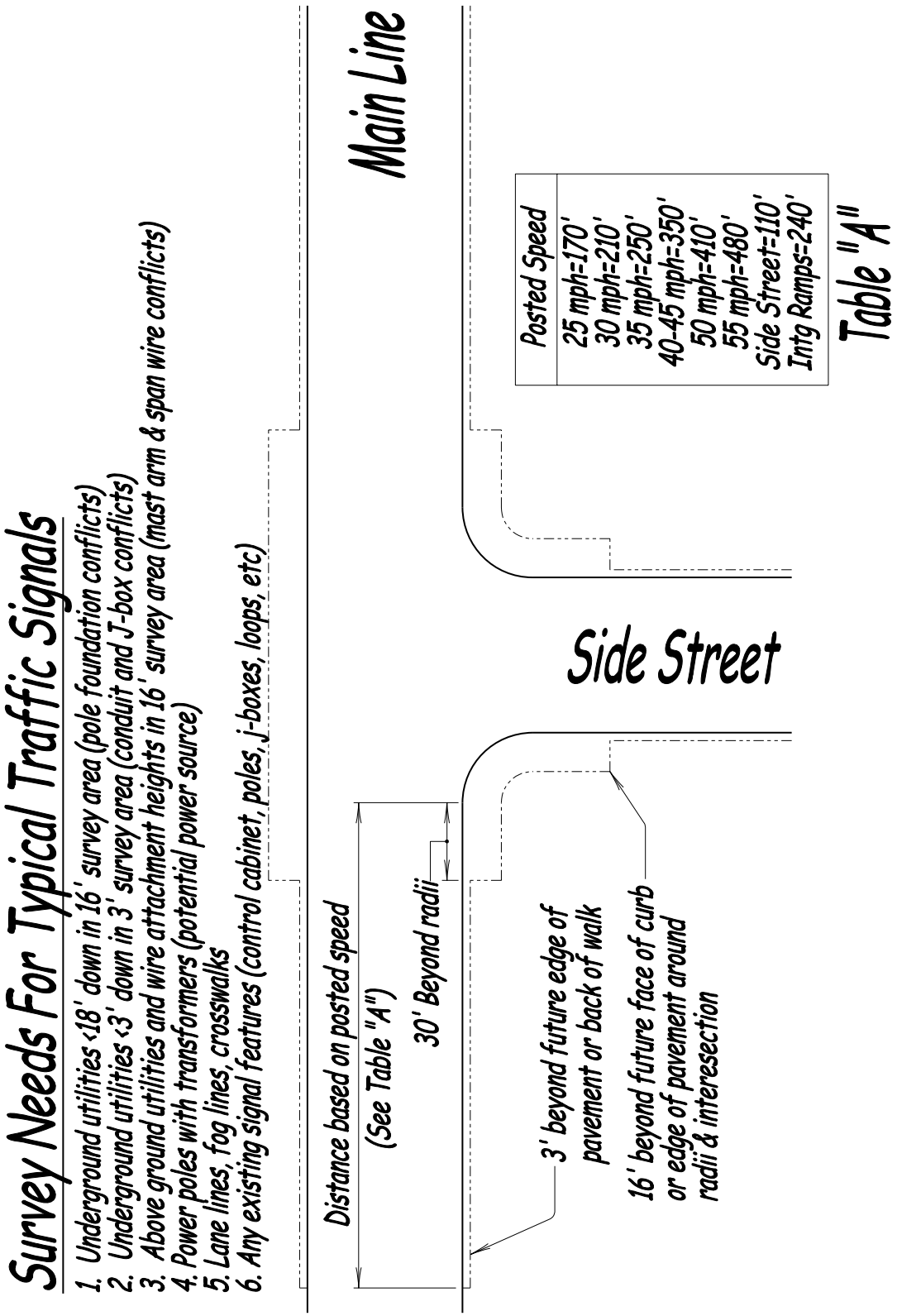
Starting Your Design, the Paperwork

Before starting your design, there are some items listed below that you will need to help guide you in the initial stages of your signal design.

- A copy of the signed signal approval letter from the State Traffic Engineer for all signals to be constructed on the state highway system. This letter should have the specifics regarding signal phasing and any special requirements to be included in the signal design. If left-turn phasing information is not included in the signal approval letter, contact Region Traffic or the Traffic Operations Unit for clarification.
  Signal approval letters are available on the web at:
  ftp://ftp.odot.state.or.us/techserv/Traffic-Engineering/Signal_Approval_Scans
- ODOT is changing to a Type 6L head for protected/permissive left turns (**flashing yellow left turn arrow**). This will replace the Type 4L head (**doghouse**). Contact the Traffic Operations Unit in Salem for guidance on the use of this head.
- ODOT's policy is to pay for the illumination if it is warranted at the intersection. If the illumination is not warranted by an engineering study but it has been requested by another agency (City or County), an intergovernmental agreement (IGA) will need to be in place before the project goes to bid. The IGA shall state who will pay for the extra maintenance and power required for the illumination. If the illumination is not warranted, ODOT will require payment for the signal pole extensions, luminaire arms, luminaire heads, and any extra wiring or equipment from the agency requesting the illumination.
- Check with the Traffic Operations Unit in Salem to see if the signal is within and approved area for fire preemption. If fire preemption has been approved for the signal this will need to be incorporated into your design.
- New signals will require a connection to commercial power; it might also require a telephone connection. Locating the power/telephone supply for the signal will require you to coordinate with the Region Utility Specialist. It is recommended that you contact the Utility Specialist as soon as possible in the design process.
- Signals that are within an urban area may require an interconnect system for coordination with other signals. Check with Region Traffic and the Traffic Operations Unit in Salem to confirm if this will be needed.
- If the signal has an approach that is within 215' of a railroad crossing, the signal shall be interconnected with the railroad crossing. You will need a copy of the railroad crossing order for any design criteria that will impact your traffic signal design.
- If there are any double left or right turns at the intersection there may be a need to close the crosswalk that the double turn crosses. This will require a traffic study and a signed letter from the State Traffic Engineer.
- As soon as the pole locations are defined contact the Region Geo/Hydro manager for a foundation investigation of the proposed site. This information will need to incorporated in the pole entrance chart for pole foundations.

Survey Data

The example below shows the recommended minimums for a survey within the intersection area. If the intersection has not yet been surveyed or additional information is required this table may help guide you in gathering needed data.



The CADD File Naming Convention

Below is the list of file naming conventions and available traffic signal related plan sheet extensions. The use of these file naming standards makes it easier for Traffic CADD users and other CADD users to know what a file will contain.

Example: 01234_T R . D G N

Project Key No.

See list below for acceptable file extensions

TR = Traffic Section

CADD file extensions for Traffic Plans:

01234_TR.DGN — Main Base Map for the Signal, Detector, Interconnect, Flashing Beacon and Signal Removal plans.

01234_TR.SG1 — This file shall contain Legend Plan Sheet, Signal Plans, Detector Plans, Interconnect Plans, Removal Plans, Flashing Beacon Plans and existing utilities for the intersection.
If more than one file is needed, additional files can be created and incremented. In the case of signal plans the extension would be SG1, SG2, SG3 and so on.

Useful Information For Plan Sheet Preparation

Traffic Signal Plan base sheets are available on the Traffic – Roadway website at:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/ZIP/Base_sheets.zip

Other resources that are available on the Traffic – Roadway website are;

The Traffic Signal Plan Sheet Database; plans produced 1941 thru 2006, located at:
http://www.oregon.gov/ODOT/HWY/TRAFFIC/ZIP/Drawing_Number_Index.zip

Scanned traffic signal plan sheets produced from 1941 thru 2006, located at:
ftp://ftp.odot.state.or.us/techserv/Traffic-Engineering/Traffic_Signal_Scans/

Before Starting Your Plans

Before starting your contract plans take a few moments to plan out what your signal plans will need to show.

- How many sheets will you need for your plans?
- How will the Roadway plans be laid out? The signal plans shall have the same orientation as the Roadway plans.
- Review the Standard Drawings for any changes that may affect your design.
- Will you have any unique details that are not covered in the Standard Drawings? If so, you will need to consider where these will be placed in the signal plan set.
- Will there be any removal of existing signal equipment? If the equipment will be permanently removed, where will ODOT want that equipment stockpiled?
- Do you have the required survey data for the proposed signal installation?
- Will you need to design a temporary signal for any stage of construction?

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

Starting the CADD Plans

Create a copy of the most current roadway design base map for your use. To maintain a coordinate correct base map, ***do not rotate or move the base map*** from its original location within the MicroStation design plane. Rename the plan as the keynumber_tr.dgn (shown in the examples on page 3). Delete or turn off any extraneous information and elements not needed for the signal design. Modify the remaining features to conform to Signal Design symbols and line styles.

After the base file is modified to conform to Signal Design standards, place all signal poles, pedestrian poles, conduits, junction boxes, loops, and other signal features needed for the signal installation into the base map. By placing all of your signal features in the base map the plan features will be coordinate correct. This base map will then be attached as a reference file to the plan sheet file to create contract plan sheets.

Create a plans file keynumber_tr.sg1 (shown in the examples on page 3) for your notes to be placed into and your base file to be referenced on to. This file will contain all of the non-signal features such as the notes and bubbles, borders, title block, and any of the text that is needed for the contract plan sheets. Notes and bubbles can be added from the Traffic Signal menu in MicroStation. This menu is available on the web at:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/ZIP/Traffic_Drafting_Toolz.zip

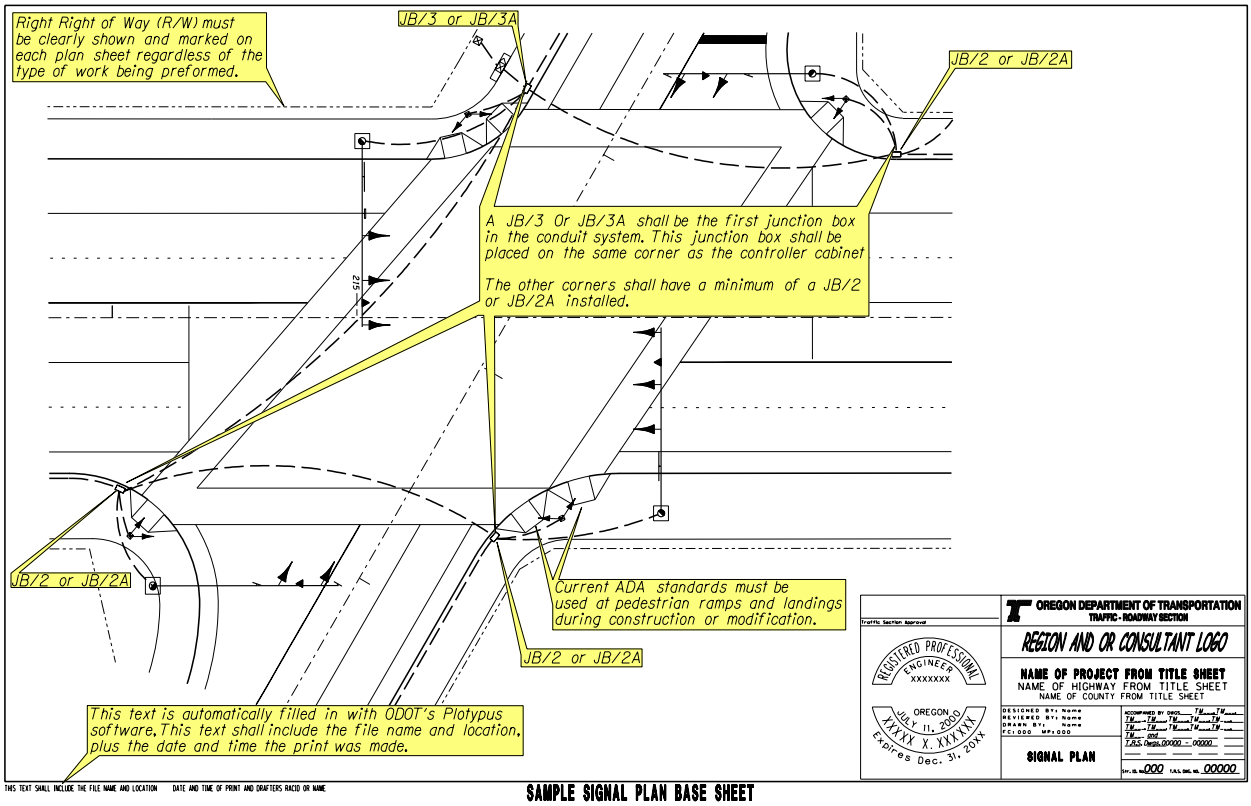
Some of the common plan sheets that you may need are listed below. They are shown in the order that they will be placed in the signal plan set.

1. SIGNAL AND DETECTOR PLAN LEGEND
2. SIGNAL PLAN
3. DETECTOR PLAN
4. INTERCONNECT PLAN
5. RAILROAD PREEMPTION PLAN (if required)
6. POLE ENTRANCE CHART
7. EXISTING UTILITY PLAN (if needed)

If there are multiple intersections in a project, the plans shall be arranged so that the signal plans are shown in the same order as the roadway plan sheets.

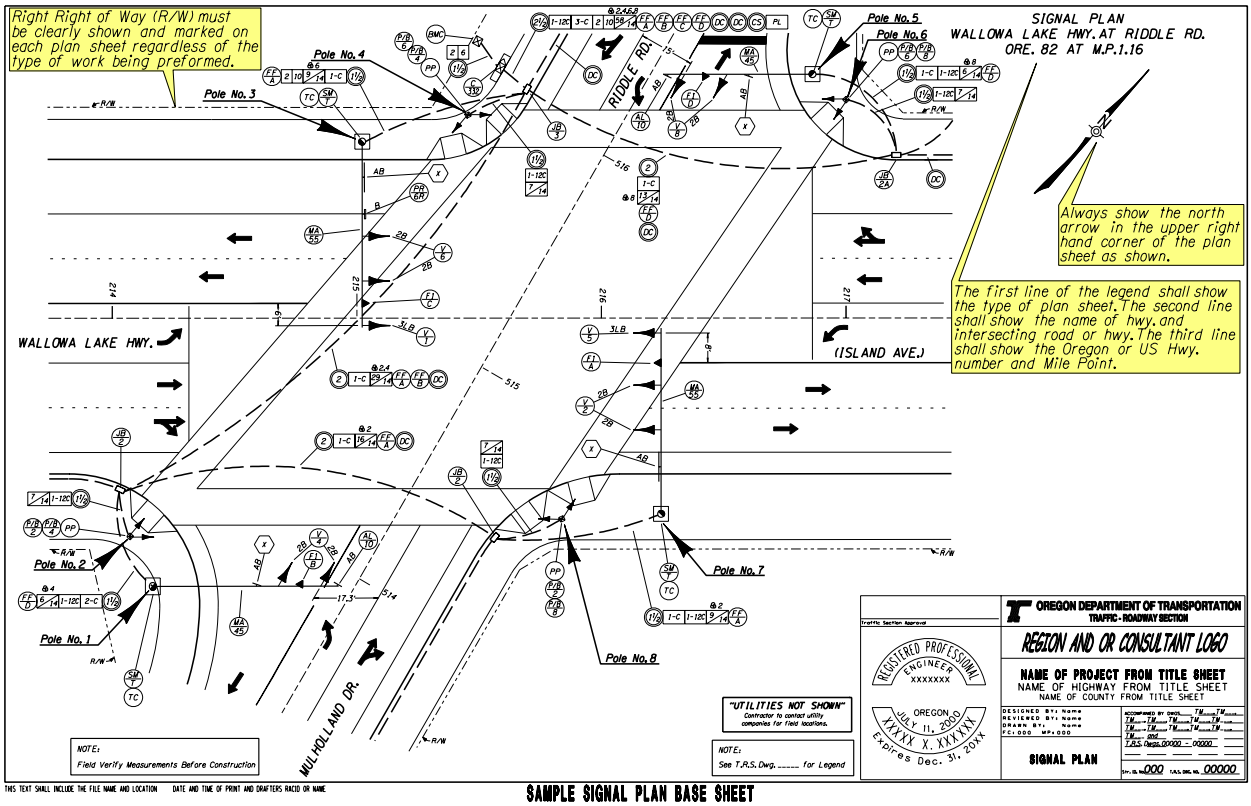
1. SIGNAL AND DETECTOR PLAN LEGEND
2. SIGNAL PLAN (1st intersection)
3. DETECTOR PLAN (1st intersection)
4. RAILROAD PREEMPTION PLAN (1st intersection)
5. SIGNAL PLAN (2nd intersection)
6. DETECTOR PLAN (2nd intersection)
7. RAILROAD PREEMPTION PLAN (2nd intersection)
   Continue with the remaining intersections then:
8. INTERCONNECT PLAN
9. POLE ENTRANCE CHART(S)
10. EXISTING UTILITY PLAN

The Example below shows a sheet border with the base map referenced into the sheet. The only elements shown in the keynumber_tr.sg1 file are the sheet border and the title block cell. The intersection and features shown are located in the reference file.



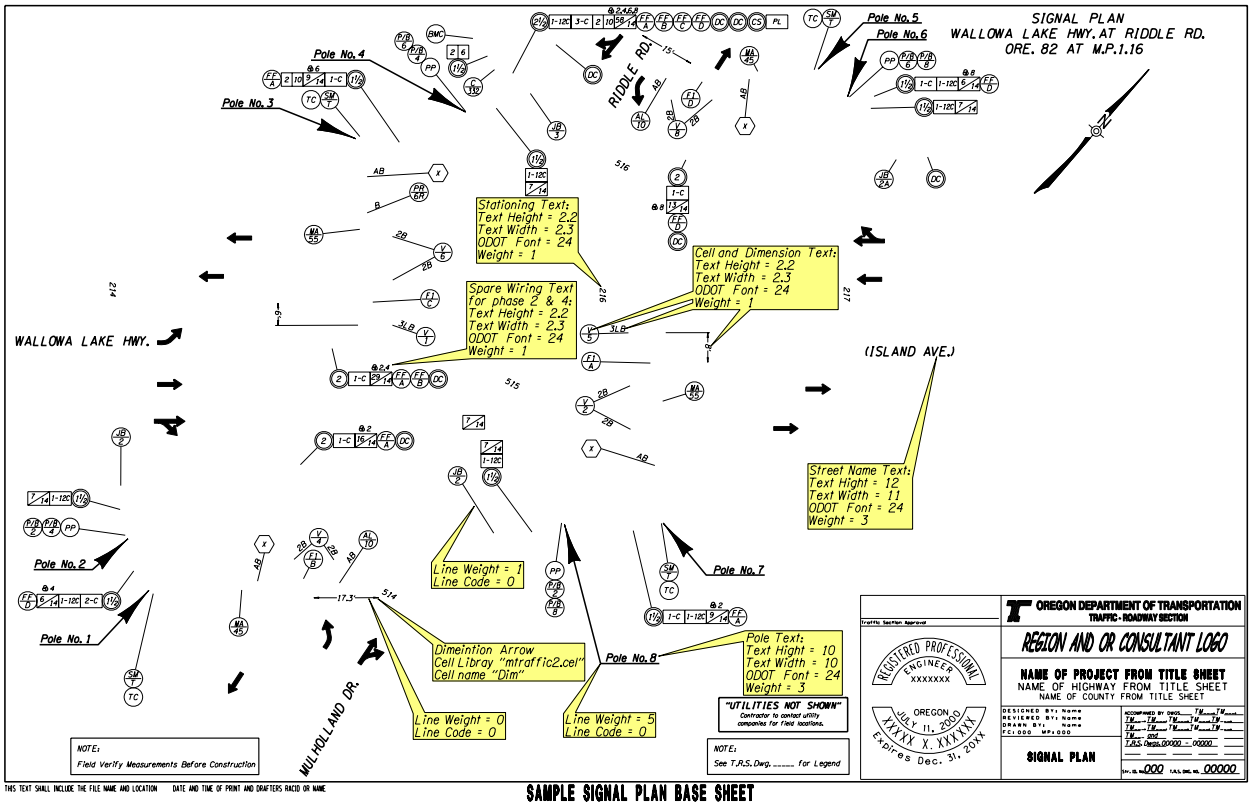
SAMPLE SIGNAL PLAN BASE SHEET

Below is an example of the same sheet border with the base map referenced into the keynumber_tr.sg1 file containing all bubbles, leaders, dimensions and other non-signal features.



SAMPLE SIGNAL PLAN BASE SHEET

Below is an example of a sheet border with the base map reference file turned off. This illustration shows what is in the keynumber_tr.sg1 file.



SAMPLE SIGNAL PLAN BASE SHEET

Drafting & Traffic Cells

All of the current drafting standards are available by using the **MicroStation sidebar menu**. This menu will help you select the correct, Notes, text styles, line styles, line weights, levels and cells.

The sidebar menu and the associated cells can be downloaded from the Traffic – Roadway Section's Website at:

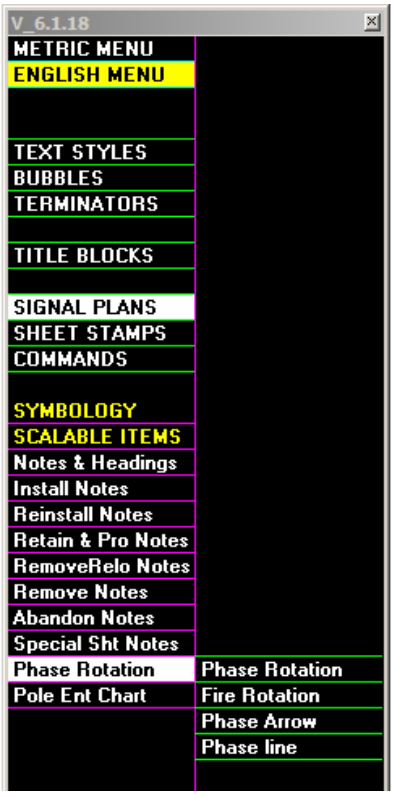
http://egov.oregon.gov/ODOT/HWY/TRAFFIC/Signals.shtml

Scroll down to the section "SIGNAL DRAFTING TOOLS" and download the **Traffic_Drafting_Toolz.zip** file. Open the file and follow the instructions in the **Read Me.doc** file.

NOTE:

It is the user's responsibility to make sure that the sidebar menu and the associated cells are the latest version before and during design of all signal projects. ODOT reserves the right to update the menu and the associated cells at anytime. The current version is shown in the upper left hand corner of the menu.

Once the sidebar menu is opened in MicroStation it will look similar to the one shown below:



If you are new to this menu, take time to familiarize yourself with it before starting any signal plans for ODOT projects. This menu has been developed to aid you in the design and drafting of ODOT signal contract plans. Use of this menu will help to insure that the drafting quality will comply with ODOT standards.

Signal Base Map & Plan Sheets

If the signal plan is to be included as part of a roadway construction project, always orient the signal plan with mainline stationing increasing from left to right across the page. If there is no roadway construction accompanying the signal design, orient the mainline horizontally, with stationing increasing from left to right. If there is no mainline stationing available, orient the mainline (major street or state route) horizontally.

Normally your base design file will come from the Roadway Designer on the project. (Lane configuration and final signal phasing will come from Region Traffic and or Traffic Operations Unit in Salem. Lane configuration may also be part of the stipulations of the formal Signal approval letter.)

If there is no roadway construction, you may be working from a vicinity map of the existing intersection. In this case you will construct a base map from data gathered in the field and available from existing CADD files. If there are no CADD files, you should request a field survey of the intersection from the project leader. A site visit with Region Traffic or Maintenance personnel may help to gather adequate information to produce plans. If no base map for a signal modification project is available, an "As-Constructed" plan may be scanned into a MicroStation file as a beginning point. This is only used as a reference to begin design; all information shall be verified in the field. A survey will be required to verify equipment and R/W locations. (Final lane configuration and signal phasing should be provided by ***ODOT Region Traffic or Traffic Operations Unit.***

If there is an existing signal, much of the information can be obtained from the current set of "As-Constructed" plans.

As-Constructed plans can be found by using the two links below:

The link below will take you to an Microsoft Access Drawing Number Database that contains historical information on signals that have been constructed on State Highways.

http://egov.oregon.gov/ODOT/HWY/TRAFFIC/ZIP/Drawing_Number_Index.zip

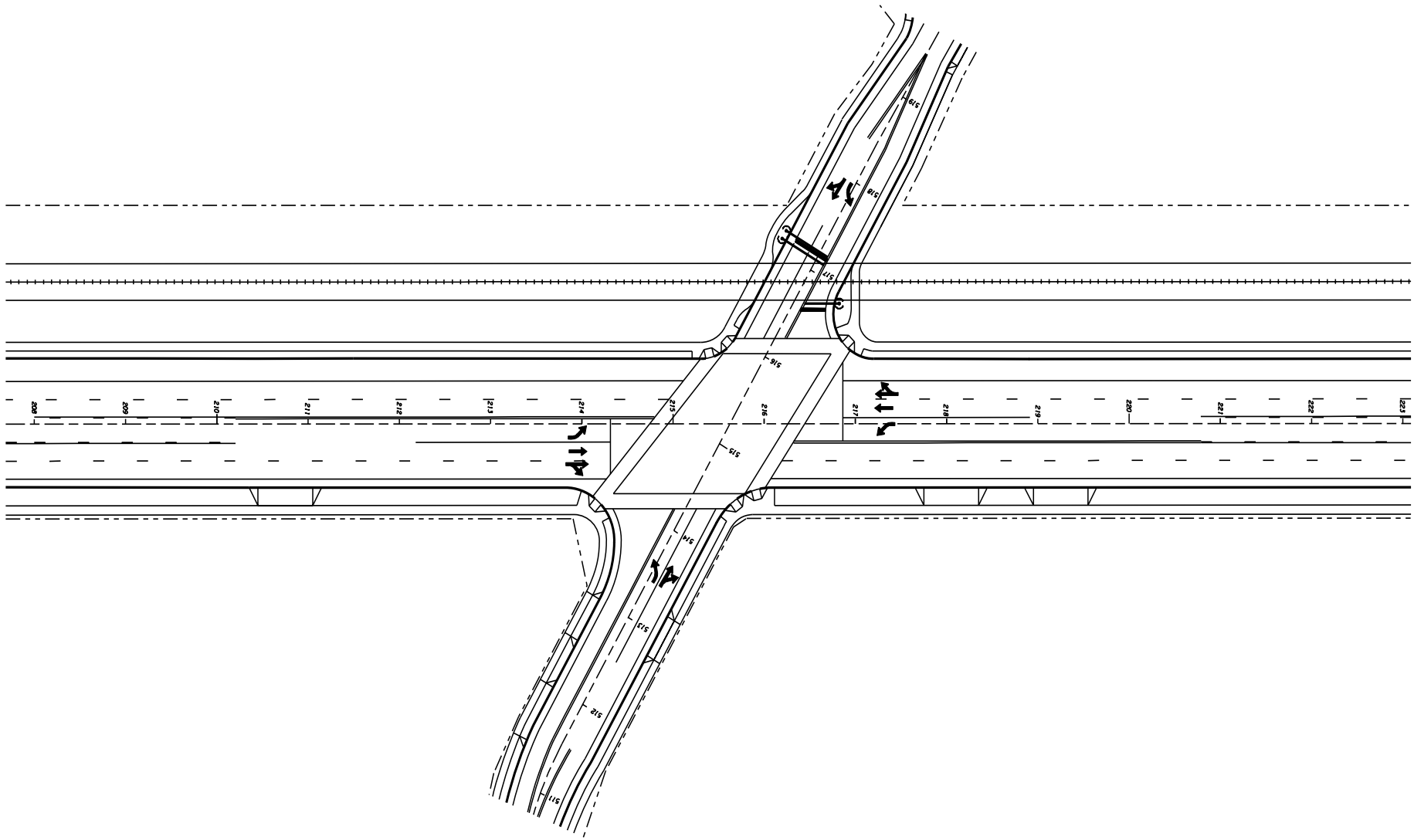
Once the plan sheets have been found in the Drawing Number Database open the link below and navigate to the plan sheets that you need for the project.

ftp://ftp.odot.state.or.us/techserv/Traffic-Engineering/Traffic_Signal_Scans/

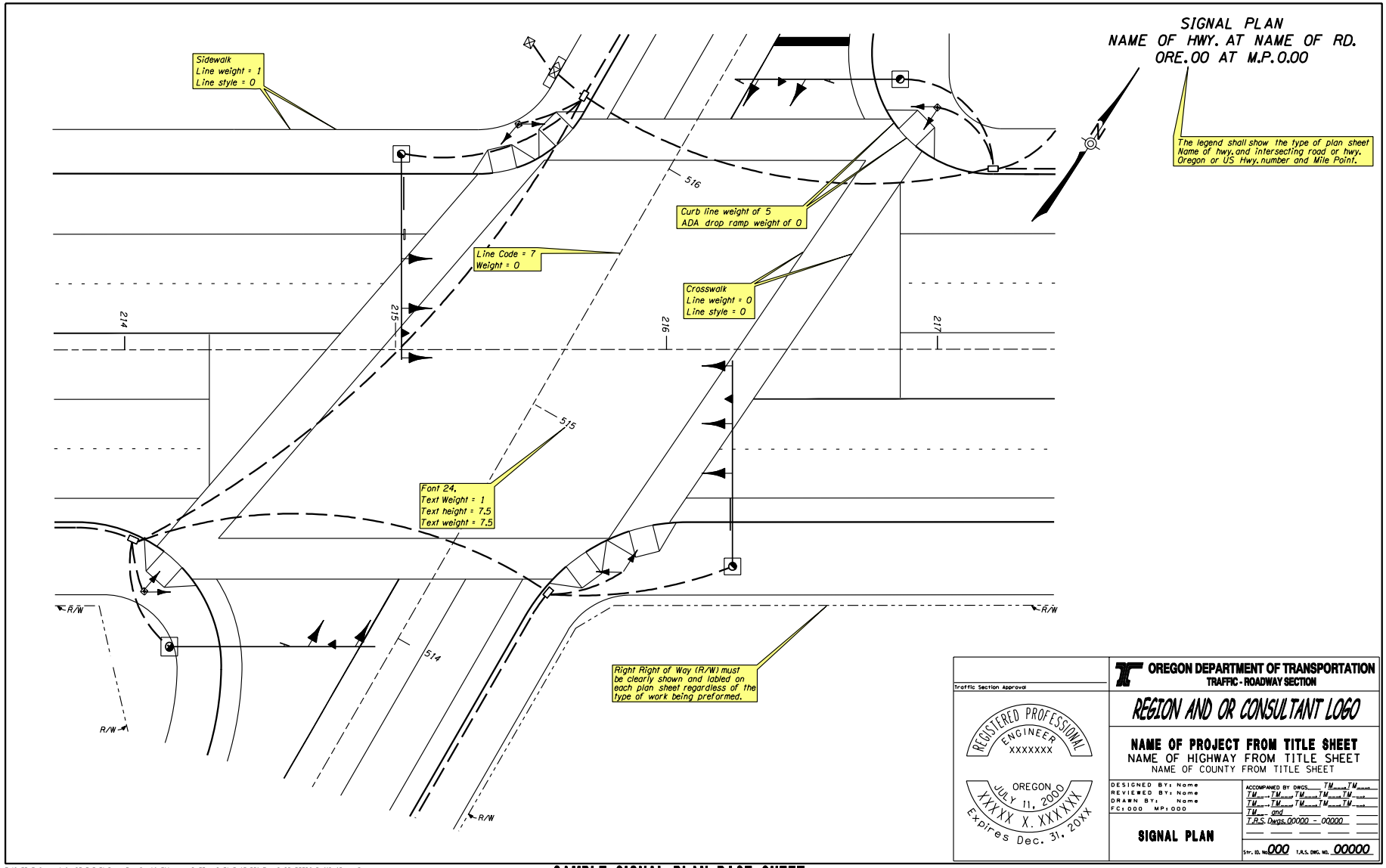
Verify with Region Traffic that no modifications to the original signal have been made. Again an on-site visit may be required. If there have been modifications to the signal, these will need to be shown on the new plans. When an existing signal is modified, some equipment may remain in place or be relocated. This information will be available from Region Traffic. A survey will be required to verify equipment and R/W locations.

An example of a blank base map that shows information needed to start a signal design is shown on page 9.

An example of a base map that has been referenced into a plan sheet and scaled up to 20:1 is shown on page 10. This sheet is ready to have bubbles and notes placed on the sheet.
The plan sheet on page 11 is a Signal Legend sheet. It contains two legend headings and most of the frequently used bubble headings already in place. This sheet is ready to have bubble notes placed under the correct headings.



SAMPLE OF A CLEAN BASE MAP



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE SIGNAL PLAN BASE SHEET

SIGNAL AND DETECTOR PLAN LEGEND
NAME OF HWY. AT NAME OF RD.
ORE.00 AT M.P.0.00

The legend shall show the type of plan sheet
Name of hwy. and intersecting road or hwy.
Oregon or US Hwy. number and Mile Point.

L E G E N D

CONTROLLERS

POLES

SIGNALS

SIGNS

CABINETS

JUNCTION BOXES

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

LOOPS

WIRES

Show Heading for each group of items

CONDUITS

FIRE PREEMPTION

Accompanied By Dwgs. and standard drawings to be shown only on the first sheet of the signal plans. This sheet will normally be the LEGEND sheet.

This note shows the plan sheets that the legend covers.

NOTE:
See T.R.S. Dwg. _____ thru _____ for Signal and Detector Plans

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

SIGNAL AND DETECTOR PLAN LEGEND

ACCOMPANIED BY DWGS. TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ and T.R.S. Dwgs. 00000 - 00000

Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE BASE LEGEND SHEET

Drafting the Traffic Signal Sheets

The examples that appear on the following pages show some of the most common traffic signal related plan sheets. These sheets will help guide you in the production of traffic plans for contract bidding documents. Plans produced for ODOT shall be in a coordinate correct format and produced in MicroStation V8.

All contract signal plan sheets shall be plotted B size (11”x17”). Concept, Preliminary and Advance plans shall be plotted on paper. All Final plans shall be plotted on **11”x17” Mylar**.

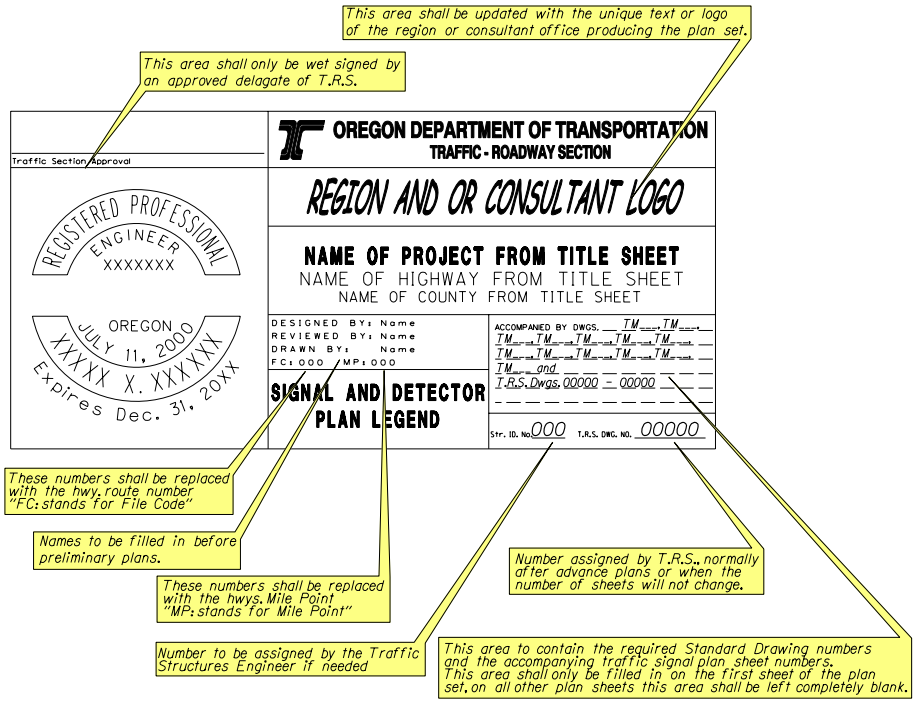
Each final Mylar plan sheet shall be sealed and wet signed by an Oregon Registered Professional Engineer.

Each sheet shall be signed and approved by the designee of Traffic - Roadway Section (TRS). Each sheet shall have a sequential sheet number assigned by TRS. This sequential number shall be shown in the T.R.S DWG. NO. area in lower right side 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/otms/Route_Hwy_CrossRef.shtml

M P will be filled in with the mile point that the signal is located on the highway.

FILLING IN THE TITLE BLOCK



MicroStation V8 format base sheets and title blocks are available on the TRS web site listed below:

http://egov.oregon.gov/ODOT/HWY/TRAFFIC/Signals.shtml

NOTE:

The title block shown above shall not be alerted in any area other than where the words “REGION TRAFFIC & CONSULTANT LOGO INFORMATION” appear. This is the only area provided for region and consultant information.

Title Sheet

The first page of the contract plan set shall contain the type of project; project name; project limits; highway, road, or street names; a vicinity map showing the project location; an index of the sheets; general or special notes; and an area for project plan approval by the appropriate agencies and individuals. The second page shall show a list of drawings in the plan set and the Standard Drawings that will accompany the entire plan set. The ODOT Regions will provide the title sheet for region designed contracts. Consultants will provide a title sheet for each project that they produce.

NOTE:
Examples are shown on the next two pages. These are for reference only. Consult the "*Contract Plans Development Guide*" for more examples and further guidance.

XXV-XX

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

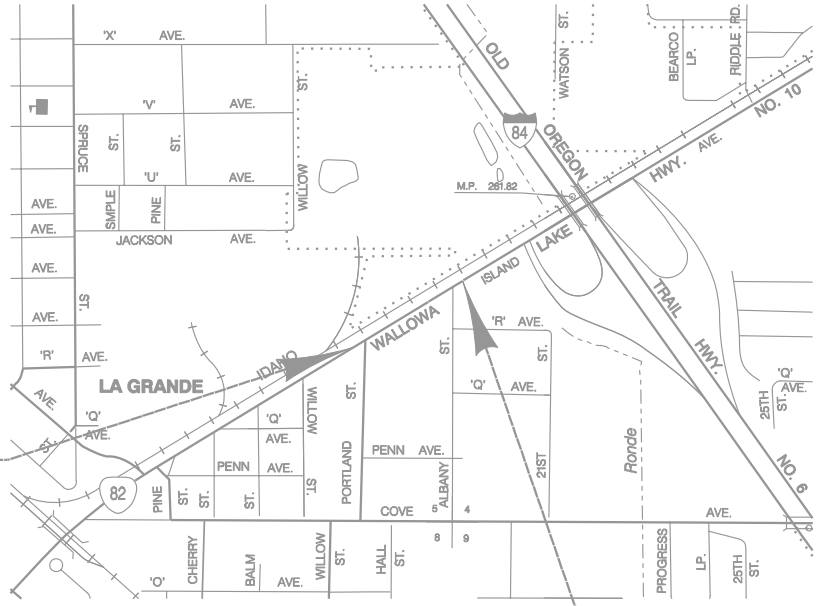
GRADING, PAVING, SIGNING,
SIGNAL, & ROADSIDE DEVELOPMENT

ISLAND AVENUE (LA GRANDE)
TRAFFIC SIGNALS SEC.
WALLOWA LAKE HIGHWAY

UNION COUNTY
DECEMBER 2003

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Standard Drawing Nos.
2, 2A, 2A-2	Typical Sections
2B Thru 2B-4 Incl.	Details
2C Thru 2C-3 Incl.	Traffic Control Plans
2D	Pipe Data
3	Alignment
3A, 3B	General Construction
3C	Alignment
3D	General Construction
3E, 3F	Profiles
4	Alignment
4A, 4B	General Construction
4C	Profiles
	PERMANENT PAVEMENT MARKINGS
ST-1, ST-2	Striping Plans
	ROADSIDE DEVELOPMENT
RD-1	Plan & Plant List
RD-2	Typical Details
	PERMANENT SIGNING
S-5887	Signing Plans
S-5888	Sign Details
S-5889	Sign & Post Data Tables
	TRAFFIC SIGNAL
12803	Signal Plan Legend
12804	Signal Plan
12805	Detector Plan
12806	Railroad Pre-Emption Plan

Your plan sheet numbers shall apper on the title sheet

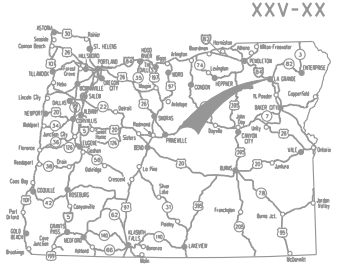


BEGINNING OF PROJECT
X-STP-S010(18)
STA. 0+500 (M.P. 0.56)

END OF PROJECT X-STP-S010(18)
STA. 1+000 (M.P. 0.85)

N

T. 3 S.,
R. 38 E., W.M.



Overall Length Of Project - 0.29 Miles

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center Is (503) 232-1987.)

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

OREGON TRANSPORTATION COMMISSION

Stuart Foster	CHAIRMAN
Gail L. Achterman	COMMISSIONER
Mike Nelson	COMMISSIONER
Randall Papé	COMMISSIONER
John Russell	COMMISSIONER
Bruce A. Warner	DIRECTOR OF TRANSPORTATION

REGISTERED PROFESSIONAL ENGINEER
XX,XXX
OREGON
JULY 16, 1987
CATHERINE M. NELSON
Expires Dec. 31, 2004

Catherine M. Nelson
TECHNICAL SERVICES MANAGING ENGINEER

Use this text to fill in the title blocks on your traffic signal plan sheets.

ISLAND AVENUE (LA GRANDE) TRAFFIC SIGNALS SEC. WALLOWA LAKE HIGHWAY UNION COUNTY		
FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	X-STP-S010(18)	1

SAMPLE TITLE SHEET

XXV-XX

RD258	- Valve Box & Operator Assembly
RD300	- Circular Pipe Backfill/Compaction
RD302	- Street Cut
RD326	- Coupling Bands
RD336, RD356, RD360	- Manholes
RD364, RD366	- Concrete Inlets
RD376	- Misc. Drainage Structures
RD386	- Pipe Fill Height Table
RD610	- Asphalt Pavement Details
RD700	- Curbs
RD705	- Island & Traffic Separators
RD710	- Accessible Route Islands
RD715	- Approaches & Non-Sidewalk Driveways
RD720	- Sidewalks
RD725	- Seperated Sidewalk Driveways
RD730, RD735	- Curb Line Sidewalk Driveways
RD755, RD760	- Sidewalk Ramps
RD815	- Chain Link Fence
RD900, RD905, RD915, RD945	- Traffic Control Plans
RD945, RD950	- Barricades
RD1010	- Inlet Protection
BR963, BR966	- Traffic Signal Supports
TM100	- Temp. Wood Post Sizing Charts
TM105	- Orange Flag Board Mounting Details
TM200, TM201, TM202	- Sign Installation Details
TM206, TM207	- Signing & Mounting Details
TM211, TM212	- Signing Details (Route Shields)
TM214, TM215	- Perm. Wood Post Sizing Charts
TM450	**- Mast Arm Pole Details**
TM450	**- Pole Foundations & Grounding**
TM458, TM460	**- Vehicle Signal Details**
TM457, TM467	**- Pedestrian Signals**
TM465	**- Overhead Sign Details**
TM472	**- Junction Boxes**
TM475	**- Loop Details**
TM470	**- Color Code Charts**
TM482	**- Controller Cabinet & Related Details**
TM485	**- Service Cabinets**
TM488	**- Terminal Cabinets**
TM495	**- LED PTR Signs**
TM510	- Bike Lane & Route Pavement Markings

All Standard Dawings required for the signal instalation shall be shown here.

ISLAND AVENUE (LA GRANDE)
TRAFFIC SIGNALS SEC.
WALLOWA LAKE HIGHWAY
UNION COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	X-STP-S010(18)	1A

SAMPLE ADDITIONAL TITLE SHEET FOR STANDARD DRAWING NUMBERS

Signal Legend Sheet

The Signal Legend sheet shall contain all definitions for bubbles that are shown on the Signal and Detector Plan sheets. Other items may be included on this sheet if space allows.

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

(Plotypus sheet scale 1:1200 English)

The plan shall Include:

- All definitions for bubbles that are present on the signal and detector plan sheets.
- Normal Phase Rotation and Fire Preemption operation diagrams for the intersection may be placed on this sheet **ONLY** if room limits its placement on the Detector Plan sheet.

See example on the next page.

SIGNAL AND DETECTOR PLAN LEGEND
WALLOWA LAKE HWY. AT RIDDLE RD.
ORE. 82 AT M.P. 1.16

L E G E N D

C O N T R O L L E R S

- C / 332 — Install model 170E/HC11 controller and control equipment in a model 332 cabinet with riser frame, orient louvered door as shown
- C — Controller (See Signal Plan)
- C / RR — Railroad controller (By Others)

Before starting any plans check the traffic web site and ODOT Microstation workspace for new and updated notes and drafting menus.

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

S I G N A L S

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

S I G N S

- AL / 10 — Install aluminum (30"x36", type "W7") "LEFT TURN YIELD TO ONCOMING TRAFFIC" sign (OR17-1)
- PR / 6R — Install (30"x36") "NO RIGHT TURN" part time restriction sign (OR3-1)
- N — Install new Type "XX" aluminum sign (N = Number), see sheet 00000 for details

C A B I N E T S

- BMC — Install base mounted service cabinet, 120/240 volt metered, for signal system
- TC — Install terminal cabinet

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

- JB / 1 — Install 17" x 10" x 12" (min. dimension) precast concrete junction box
- JB / 1A — Install 17" x 10" x 12" (min. dimension) precast concrete junction box with concrete apron
- JB / 2 — Install 22" x 12" x 12" (min. dimension) precast concrete junction box
- JB / 2A — Install 22" x 12" x 12" (min. dimension) precast concrete junction box with concrete apron
- JB / 3 — Install 30" x 17" x 12" (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

L O O P S

- LF / X-Ph — Install (X=number of cables) phase (Ph=phase) loop feeder cables
- LD / Ph — Install phase (Ph=phase) 6' round 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

- N / G — Install (N=number) No. (G=AWG wire size) type THWN wires
- N G — Install (N=number) No. (G=AWG wire size) type XHHW wires
- N-C — Install (N=number) No. 8 type THWN (Signal system common)
- N-12C — Install (N=number) No. 12 type THWN (Pedestrian signal system common)
- PL — Install poly pull line (225 ft.lb. min-strength)
- Ph — Includes 3 spare wires for phase (Ph=phase) as per table
- N / P — Install (N=number) twisted pair PE-39 (gel filled) interconnect cable

C O N D U I T S

- S — Install (S=size) electrical 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)
- SP / S — Install 6" max. sand pocket block-out with (S=size) conduit to junction box
- EX / EC — Retain and protect existing electrical conduit size (S=size)

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

- EN / Ch — Install , (N=number) direction, channel (Ch=channel) 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

Place the appropriate assigned sheet numbers here and here.

NOTE:
See T.R.S. Dwg. _____ and _____ for Signal and Detector Plans

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX

OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

ACCOMPANIED BY DWGS. TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ TM_____ and T.R.S. Dwgs. 00000 - 00000

SIGNAL AND DETECTOR PLAN LEGEND

Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE SIGNAL AND DETECTOR LEGEND SHEET

Signal Plan

Intersection layout shall be drawn showing edge of pavement or curb line, lane use arrows, 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 other features as needed. Signal Plan sheets shall normally be drawn at a scale of 20:1.

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

(Plotypus sheet scale 1:1200 English) For a signal plan at a scale of 20:1, scale reference file up by 5 times.

NOTE:

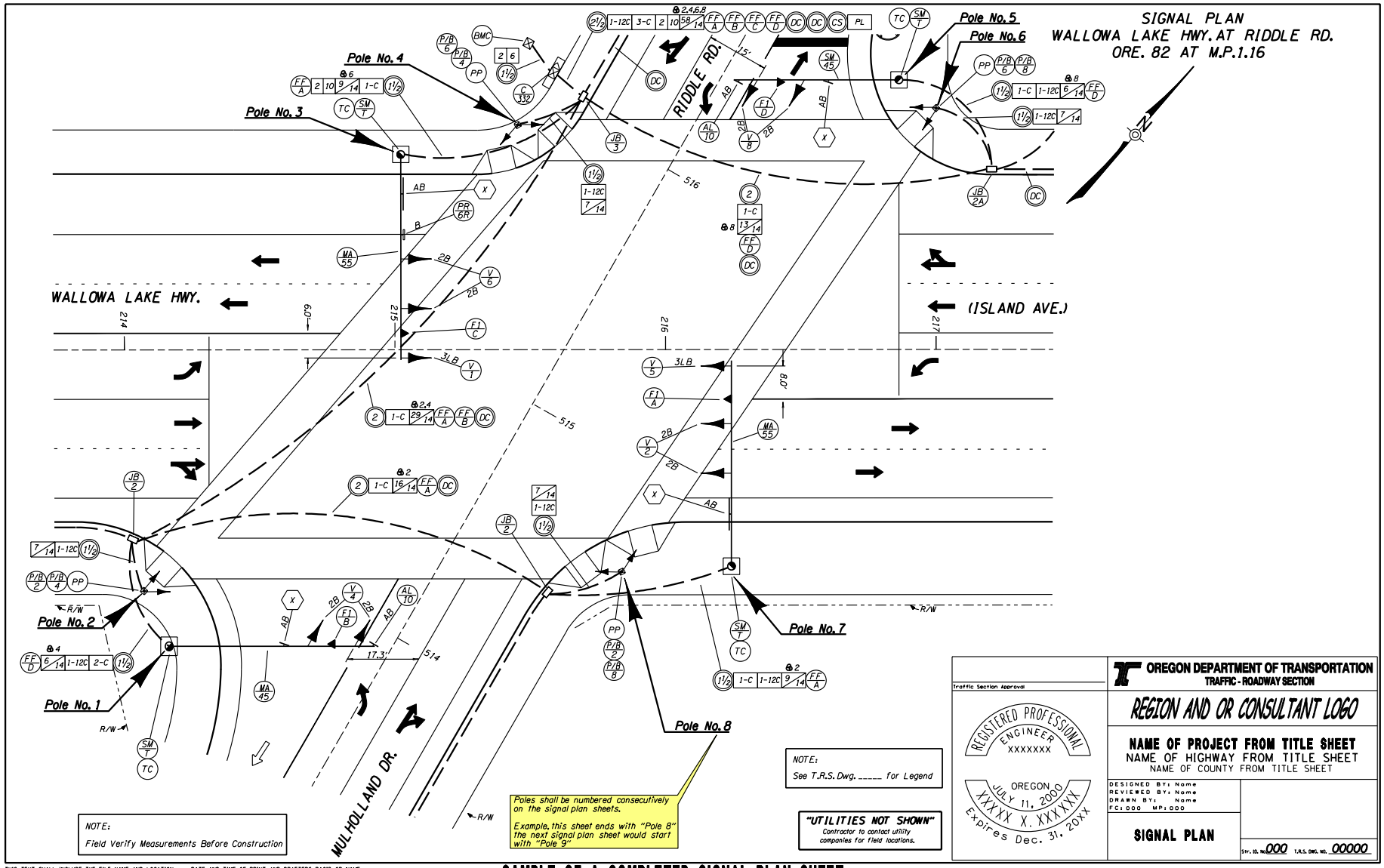
For very large intersections it is acceptable to use a smaller scale for signal plan sheets as outlined below:

(Plotypus sheet scale 1:1200 English) For a signal plan at a scale of 30:1, scale reference file up by 3.25 times.

The plan shall include:

- Location of traffic signal poles, underground signal electrical conduit, traffic signal wiring, junction boxes, vehicle signals, pedestrian signals, pedestrian pushbuttons, overhead signs, traffic signal controller, service equipment, preemption devices, existing power sources, and all other equipment needed to install the signal.
- Each installed, removed, abandoned or retained item shall have the correct bubble and a leader(s) to the item.
- Signing details showing any non-standard overhead signs, i.e. street name signs, unique lane use signs mounted on mast arms.

See example on the next page.



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE OF A COMPLETED SIGNAL PLAN SHEET

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.

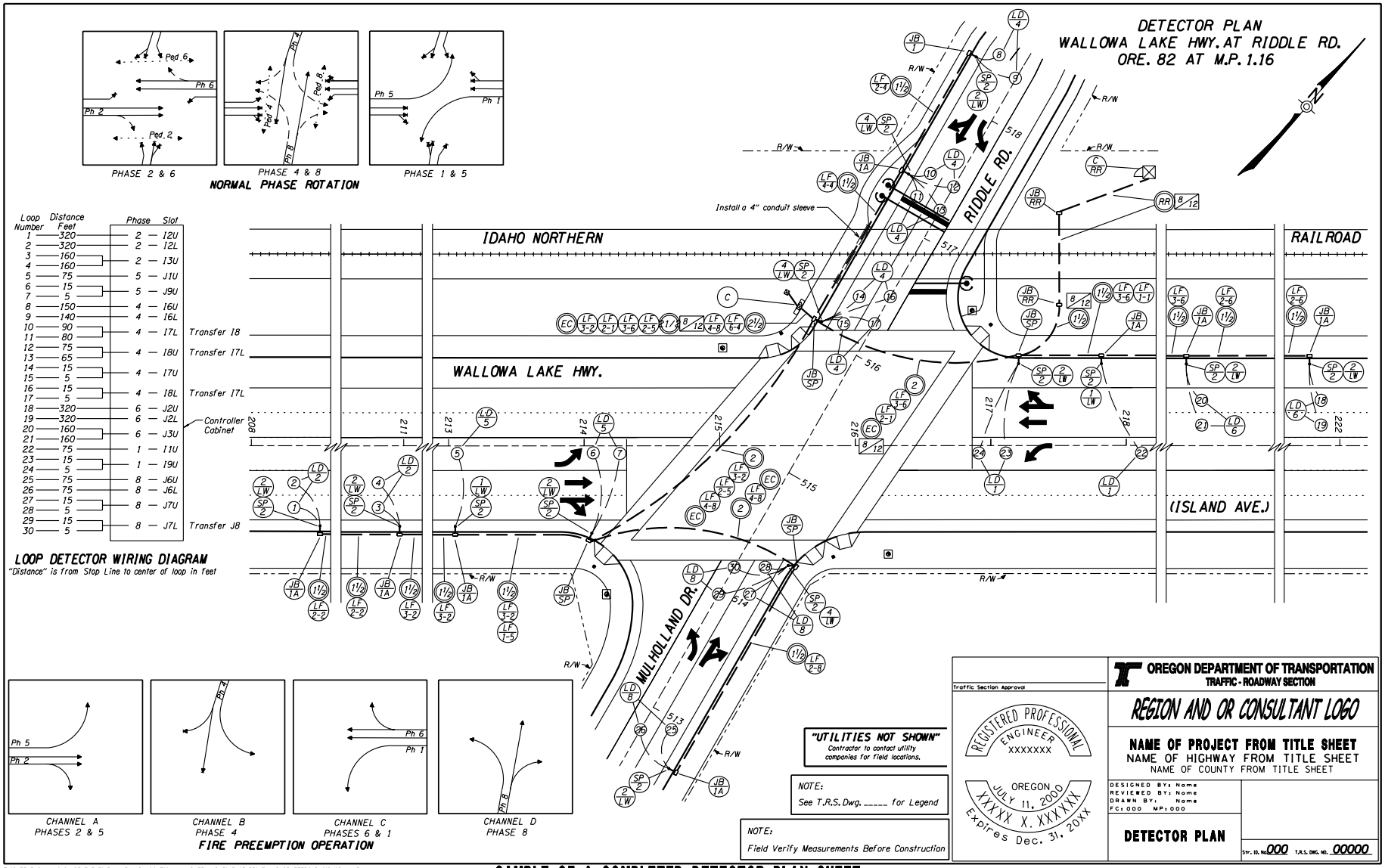
(Plotypus sheet scale 1:1200 English) Scale Reference file up by 2.5 times.

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

The plan shall include:

- Location and type of traffic signal loops, loop wire entrance type, loop number, and notes for symbols and details used.
- Normal phase rotation and fire preemption diagram for the intersection if room allows.
- 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.
- 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 and input transfers.

See example on the next page.



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE OF A COMPLETED DETECTOR PLAN SHEET

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.

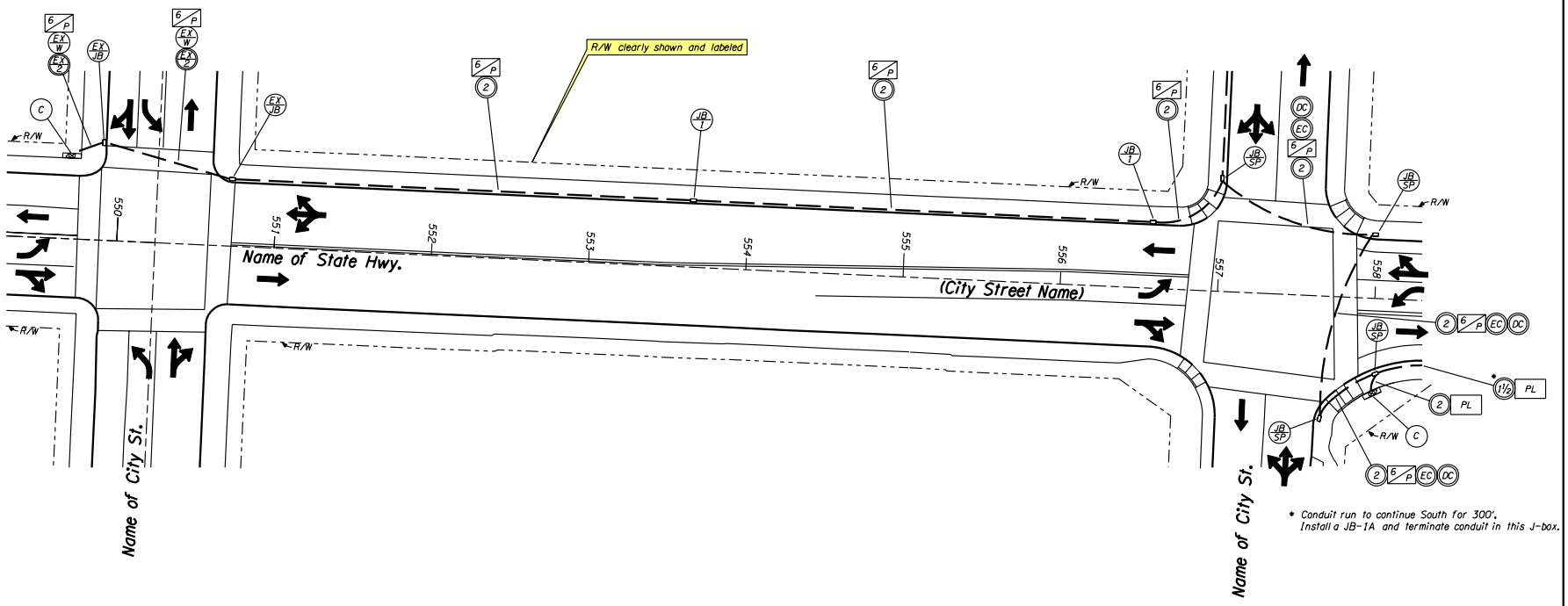
(Plotypus sheet scale 1:1200 English) Scale Reference file up by 1.25 times.

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

The plan shall include:

- Intersection layout is normally drawn showing edge of pavement, curb lines, underground interconnect conduit, interconnect wiring, north arrow, 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 (if not shown on the signal legend sheet) shall contain all definitions for bubbles that are shown on the Interconnect Plan sheet.

See example on the next page.



"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

NOTE:
See T.R.S. Dwg. _____ for Legend

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

INTERCONNECT PLAN

Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE OF A COMPLETED INTERCONNECT PLAN SHEET

Signal Removal Detail or Plan Sheet

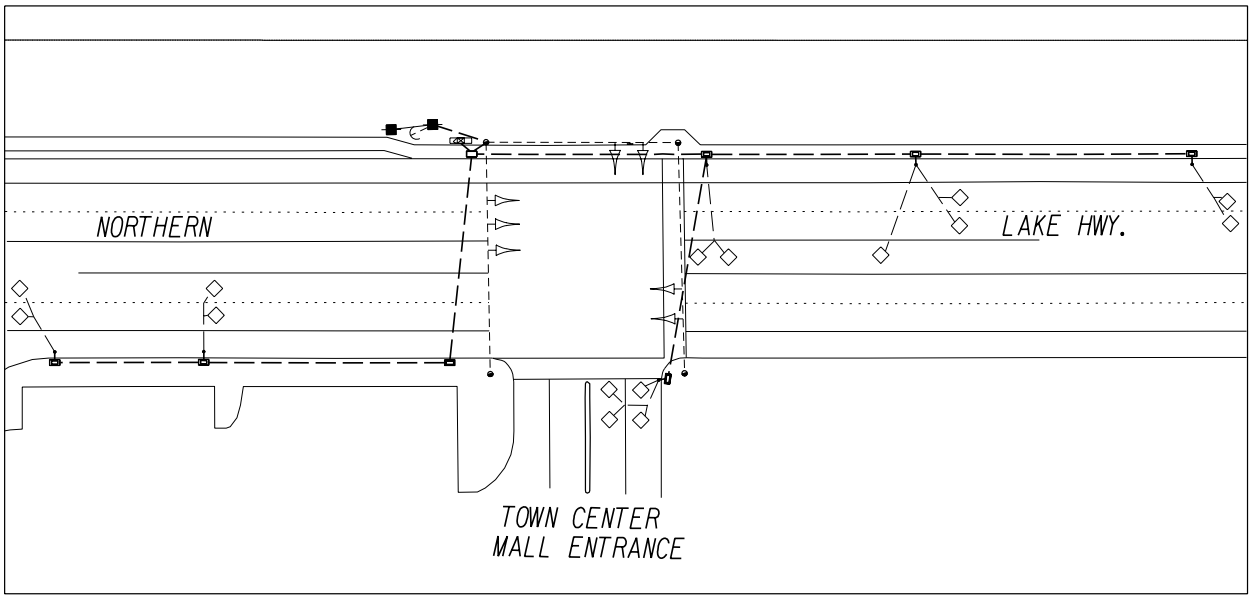
Existing intersection layout is normally drawn showing edge of pavement or curb line, north arrow, and other topographic features as needed. If the signal removal is drawn as a detail it does not require a scale. If a full plan sheet is desired for clarity, it shall be drawn at a scale of 40:1

(Plotypus sheet scale 1:1200 English) Scale Reference file up by 2.5 times.

If drawn as a detail, it shall include:

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

See the example signal removal plan below:



SIGNAL REMOVAL PLAN AT M.P. 0.62

No Scale

Note:

Remove entire Signal facility and all appurtenances, as directed by the project engineer. Abandon all existing loop detectors.

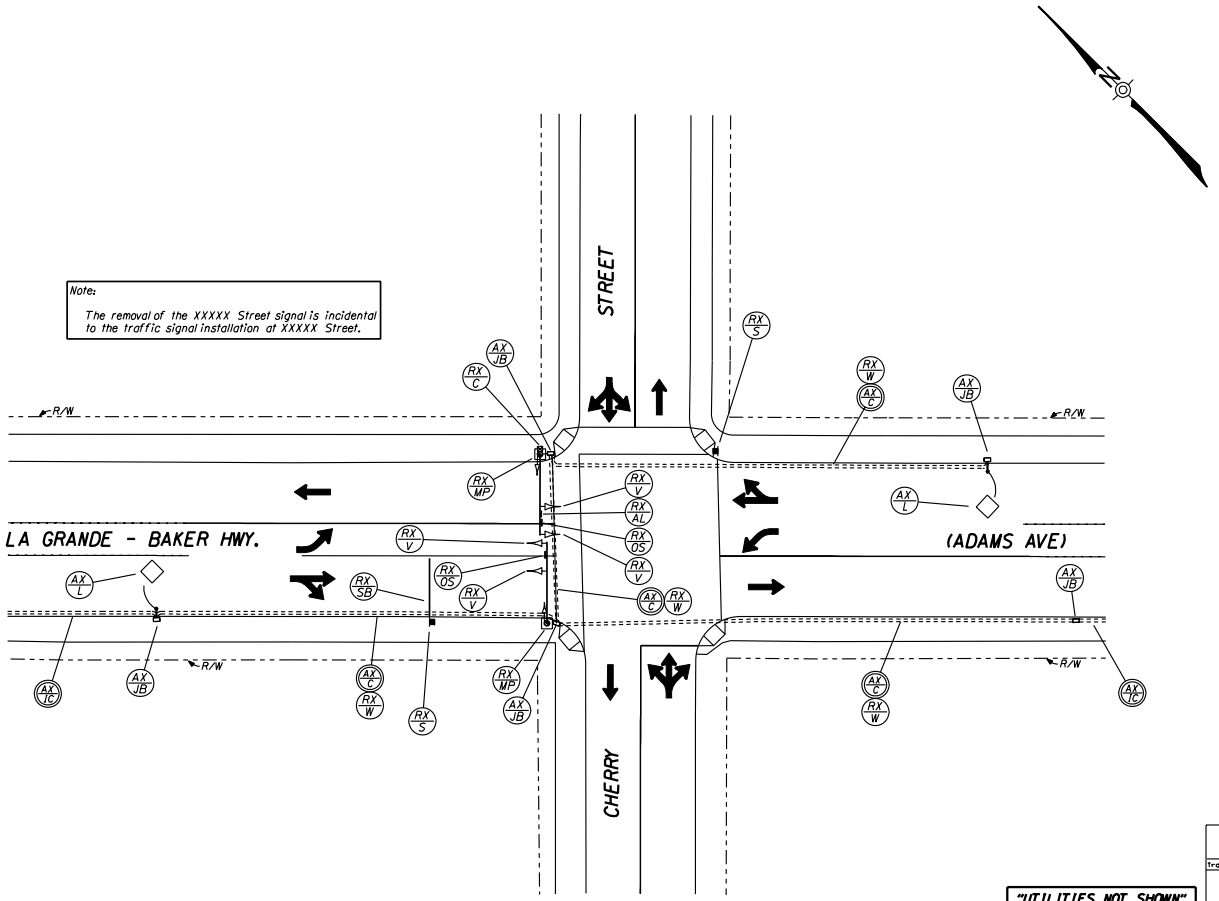
If drawn as full a plan sheet, it shall include:

- 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. Signal Removal Plan sheets shall be drawn at a scale of 40:1.
- Each installed, removed, abandoned, or retained item shall have the correct bubble and a leader(s) to the item.

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

See example on the next page.

SIGNAL REMOVAL PLAN
LA GRANDE - BAKER HWY. AT CHERRY ST.
U.S. 30 AT M.P. 2.43



L E G E N D

P O L E S

- RX/MP — Remove existing traffic signal mast arm pole & terminal cabinet

S I G N A L S

- RX/V — Remove existing vehicle signal

S I G N S

- RX/AL — Remove existing aluminum sign
- RX/OS — Remove existing interior illuminated sign
- RX/S — Remove existing "STOP HERE ON RED" sign and support

C A B I N E T S

- RX/C — Remove existing controller cabinet & control equipment

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

- AX/JB — Abandon existing junction box

L O O P S

- AX/L — Abandon existing vehicle detector loop

W I R E S

- RX/W — Remove existing wiring

C O N D U I T S

- AX/C — Abandon existing conduit
- AX/IC — Abandon existing interconnect conduit

M I S C E L L A N E O U S

- RX/SB — Remove existing Stop Bar stripe

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

Note:
The contractor shall contact and coordinate the removal of the existing power with the local power company.

Note:
Remove entire Signal facility and all appurtenances. As directed by the project engineer. Abandon all existing loop detectors.

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON JULY 11, 2000 XXXXX X. XXXXXX Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

SIGNAL REMOVAL PLAN

STR. ID. NO. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE SIGNAL REMOVAL PLAN SHEET

Pole Entrance Chart

This sheet shall contain all information that relates to the equipment mounted on the signal pole, mast arm, strain pole, span wire vehicle or pedestrian pedestal.

(Plotypus sheet scale 1:1200 English)

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

All pole entrance charts shall include:

- Pole by number
- Drawing number that the pole is shown on.
- Type of pole:
  1. SM-1 thru SM-5 (standard mast arm poles)
  2. SM-1L thru SM-5L (standard mast arm poles with luminaire extension)
  3. STP-1 thru STP-7 (standard strain poles)
  4. STP-1L thru STP-7L (standard strain poles with luminaire extension)
- 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)

Mast Arm Poles:

- Mast arm length.
- Distance of equipment and signs from tip of pole.

Foundations:

- Foundation number (from **TM653**).
- Required foundation depth.

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

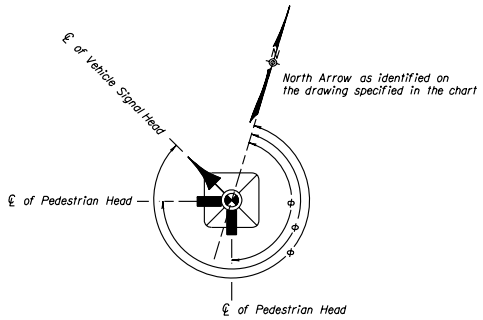
- Orientation diagrams for:
  1. Mast arm poles
  2. Strain poles
  3. Pedestrian and vehicle pedestals.

Note 1:

In relation to the north arrow (if no mast arm) or for stain poles.

See example on the next page.

SIGNAL PLAN DETAILS
WALLOWA LAKE HWY. AT RIDDLE RD.
ORE. 82 AT M.P. 1.16



PEDESTRIAN PEDESTAL / VEHICLE PEDESTAL ORIENTATION DIAGRAM

NOTE:

Equipment shown on the orientation diagram is a clarification of angles of equipment that may be located on a Pedestrian Pedestal or Vehicle Pedestal.

POLE ENTRANCE CHART

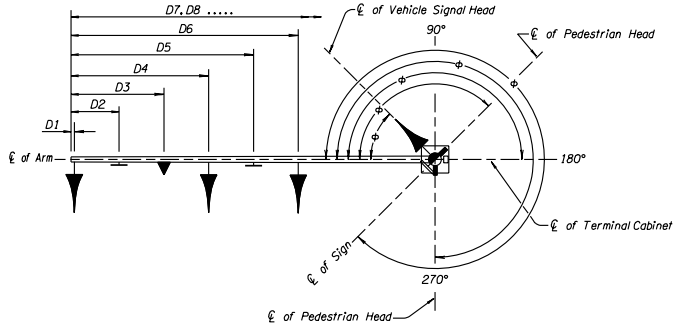
		See TM650 thru TM653	EQUIPMENT ON POLE					EQUIPMENT ON MAST ARM (Length in Feet and Equipment Type)									FOUNDATION INFORMATION (See Std. Drg. TM653)		LUMINAIRES				
POLE NO.	DWG. NO.	TYPE	PED. SIGNAL DEG.	TERM. CABINET DEG.	SIGN DEG.	TRAFFIC SIGNAL DEG.	PHOTO ELECTRIC CELL	ARM LENGTH	D1	D2	D3	D4	D5	D6	D7	D8	FOUNDATION NUMBER	REQUIRED FOUNDATION DEPTH	ARM LENGTH	ARM DEG.	MOUNTING HEIGHT	FIXTURE TYPE	FIXTURE TYPE	FIXTURE WATTAGE
1	X	SM-5			180			50	0.5 SA	5.0 V2	10.5 F	16.0 V2	22.0 ST	——	——	——	5	17'-0"						
2	X	PP	165/270						——	——	——	——	——	——	——	——								
3	X	SM-5			180			50	0.5 V3L	6.5 F	12.5 V2	24.5 V2	30.0 PTR	40.0 ST	——	——	5	17'-0"						
4	X	PP	270/345						——	——	——	——	——	——	——	——								
5	X	SM-4			180			40	1.5 SA	6.0 V2	11.5 F	17.0 V2	23.0 ST	——	——	——	4	16'-0"						
6	X	PP	90/345						——	——	——	——	——	——	——	——								
7	X	SM-5			180			50	1.5 V3L	9.0 F	15.0 V2	27.0 V2	37.0 ST	——	——	——	5	17'-0"						
8	X	PP	90/165						——	——	——	——	——	——	——	——								

BRACKET MOUNT:

V2 = Traffic Signal Type 2, Adjustable Bracket Mount Tenon Not Required (See Std. Dwg. TM462)
V3L = Traffic Signal Type 3L, Adjustable Bracket Mount Tenon Not Required (See Std. Dwg. TM462)
SA = Sign, 30" x 36" Aluminum w/Adjustable Bracket Mount Tenon Not Required (See Std. Dwg. TM465)
ST = Sign, Aluminum w/Adjustable Bracket Mount Tenon Not Required (See Std. Dwg. TM462)

MISC. ITEMS:

F = Fire Preemtion (See Std. Dwg. TM462)
PTR = Part Time Restriction Sign



MAST ARM POLE ORIENTATION DIAGRAM

NOTE:

Equipment shown on orientation diagram is a clarification of distance and angles of equipment that may be located on a Mast Arm or Signal Pole.

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON JULY 11, 2000 XXXXX X. XXXXXX Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

SIGNAL PLAN DETAILS

STR. ID. NO. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE POLE ENTRANCE CHART

Temporary Signal Plan

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

(Plotypus sheet scale 1:1200 English) Scale Reference file up by 2.5 times.

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

The plan shall Include:

- Location and type of traffic signal poles, detection equipment, 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 on the next three pages.

TEMPORARY SIGNAL & DETECTOR PLAN LEGEND
THE DALLES - CALIFORNIA HWY.
US 97 AT M.P. 263.11

L E G E N D

CONTROLLERS

- (C / 336) Install model 170 controller and control equipment in a model 336 pole mounted cabinet

POLES

- (WPX) Install special (X = non-standard) treated wood pole (See "Pole Entrance Chart")
- (AN) Install back guy and anchor(s)
- (EX / 1) Retain and protect existing power pole (Power source)

Add:
(Mount on Temp. Sign Support as shown on Std. Dwg. RD911) to the standard AL/9 Note as shown in the example.

SIGNALS

- (V / Ph) Install phase (Ph=phase) vehicle signal

SIGNS

- (AL / 9) Install aluminum (24"x36", type "W1") "STOP HERE ON RED" with arrow sign (R10-6) (Mount on Temp. Sign Support as shown on Std. Dwg. RD911)

CABINETS

- (TC) Install terminal cabinet
- (MS) Install 120/240 volt meter base
- (SC) Install service cabinet, 120/240 volt, for signal system

JUNCTION BOXES

- (JB / 1) Install 17" x 10" x 12" (min. dimension) precast concrete junction box

LOOPS

- (LD / Ph) Install phase (Ph=phase) 6' round vehicle detector loop
- (SP / S) Install 6" max. sand pocket block-out with (S=size) conduit to junction box

WIRES

- (39) Install 3/8" galv. steel messenger cable
- (38) Install galv. steel 3/8" messenger and 1/4" tether cables
- (X-N / G) Install (X=number of cables) control cables with (N=number) No. (G=AWG wire size) conductors
- (N / TW) Install (N=number) pair of loop wires
- (W / G) Install (N=number) No. (G=AWG wire size) type THWN wires

CONDUITS

- (S) Install (S=size) electrical conduit
- (W) Install conduit and wire as required by power company

SIGNAL HEAD TYPES
2 = 12" R, 12" Y, 12" G

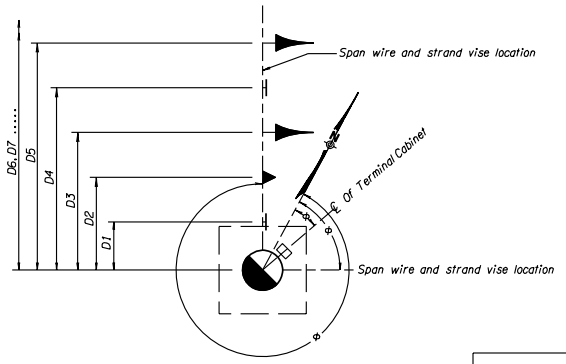
SIGN MOUNTING OPTIONS
M = TSS Temporary Sign Support

POLE ENTRANCE CHART

				See TM455		EQUIPMENT ON POLE					EQUIPMENT ON SPAN WIRE (Length in Feet and Equipment Type)								FOUNDATION INFORSMTION (See Std. Drg. TM836)	
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	D1	D2	D3	D4	D5	D6	D7	D8	FOUNDATION NUMBER	REQUIRED FOUNDATION DEPTH
X	WPX	1	2	30.0	32.5						35.5 VS2	45.5 VS2	96.0 POLE 2							
X	WPX	2	3	32.5	29.0															
X	WPX	3	4	29.0	29.0															
X	WPX	4	5	29.0	29.0															
X	WPX	5	6	29.0	41.5															
X	WPX	6	7	41.5	40.0						58.5 VS2	68.5 VS2	101.0 POLE 6							
X	WPX	7	8	40.0	29.0															
X	WPX	8		29.0																

MESSENGER CABLE MOUNT NOTE:
V2S = Traffic Signal Type 2, Messenger Cable Mount (See Std. Dwg. TM463)

POLE CLASS NOTE:
Class of pole to be field verified



STRAIN POLE ORIENTATION DIAGRAM

NOTE:
Equipment shown on the orientation diagram is a clarification of angles of equipment that may be located on a Strain Pole

NOTE:
See T.R.S. Dwg. _____ & _____ for signal and detector plan

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON JULY 11, 2000 XXXXX X. XXXXXX Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

ACCOMPANIED BY DWGS. TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ and T.R.S. Dwgs 00000 - 00000

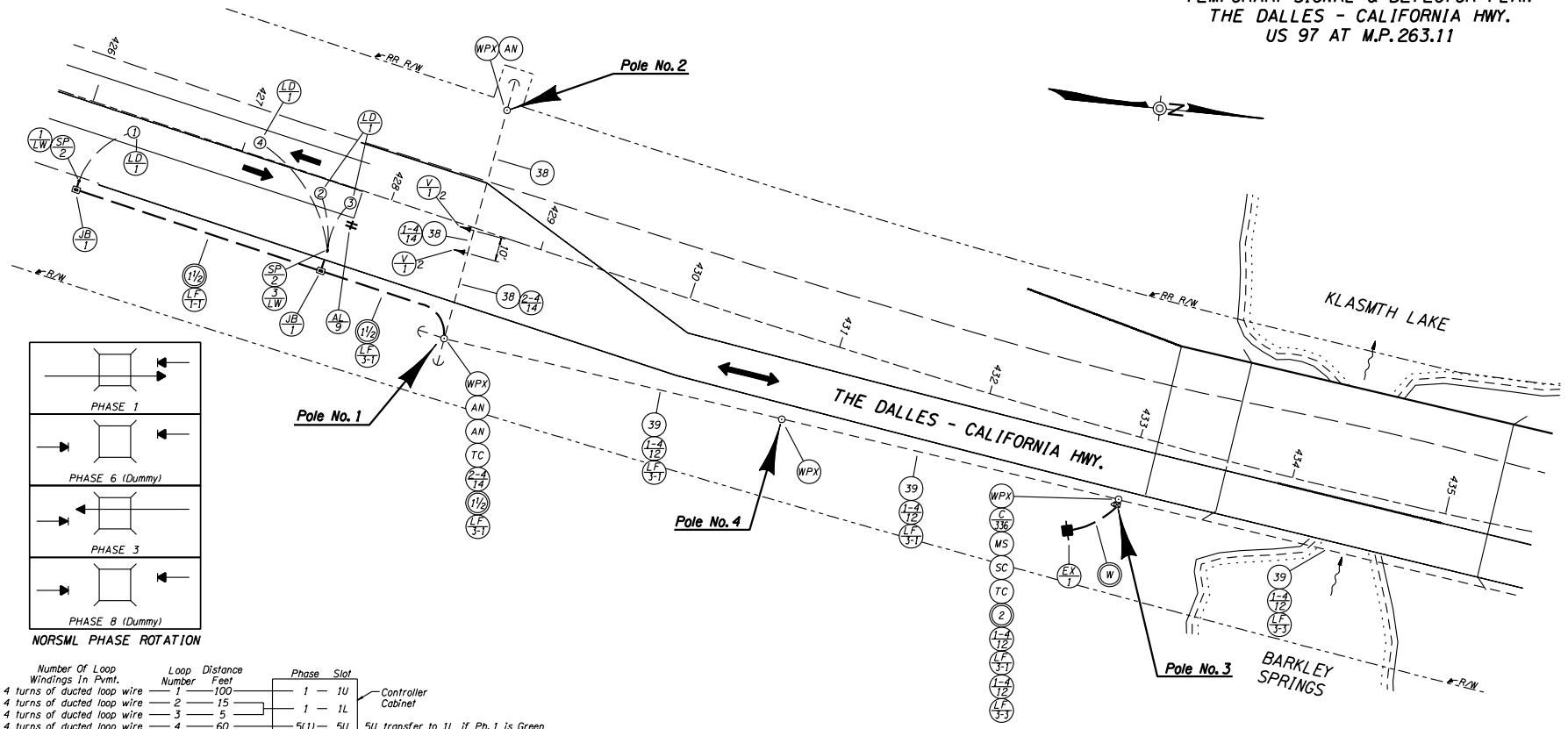
TEMPORARY SIGNAL & DETECTOR PLAN LEGEND

Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE TEMPORARY SIGNAL & DETECTOR PLAN LEGEND WITH POLE ENTRANCE CHART

TEMPORARY SIGNAL & DETECTOR PLAN
THE DALLES - CALIFORNIA HWY.
US 97 AT M.P. 263.11



NORSML PHASE ROTATION

Number Of Loop Windings In Pvmt.	Loop Number	Distance Feet	Phase	Slot	
4 turns of ducted loop wire	1	100	1	1U	Controller Cabinet
4 turns of ducted loop wire	2	15	1	1L	
4 turns of ducted loop wire	3	5			
4 turns of ducted loop wire	4	60	5(1)	5U	5U transfer to 1L if Ph.1 is Green
7 turns of ducted loop wire	5	100	3	3U	
5 turns of ducted loop wire	6	15	3	3L	
5 turns of ducted loop wire	7	5			
7 turns of ducted loop wire	8	60	5(3)	5L	5L transfer to 3L if Ph.3 is Green

LOOP DETECTOR WIRING DIAGRAM
"Distance" is from Stop Line to center of loop in feet

GENERAL NOTES:

1. Accommodate all aerial and buried utilities such that existing facilities are preserved
2. Minimum 10' spacing between signal heads
3. 4' minimum clearance between wood poles and guardrail.

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

NOTE:
See T.R.S. Dwg. _____ for Legend

NOTE:
Field Verify Measurements Before Construction

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

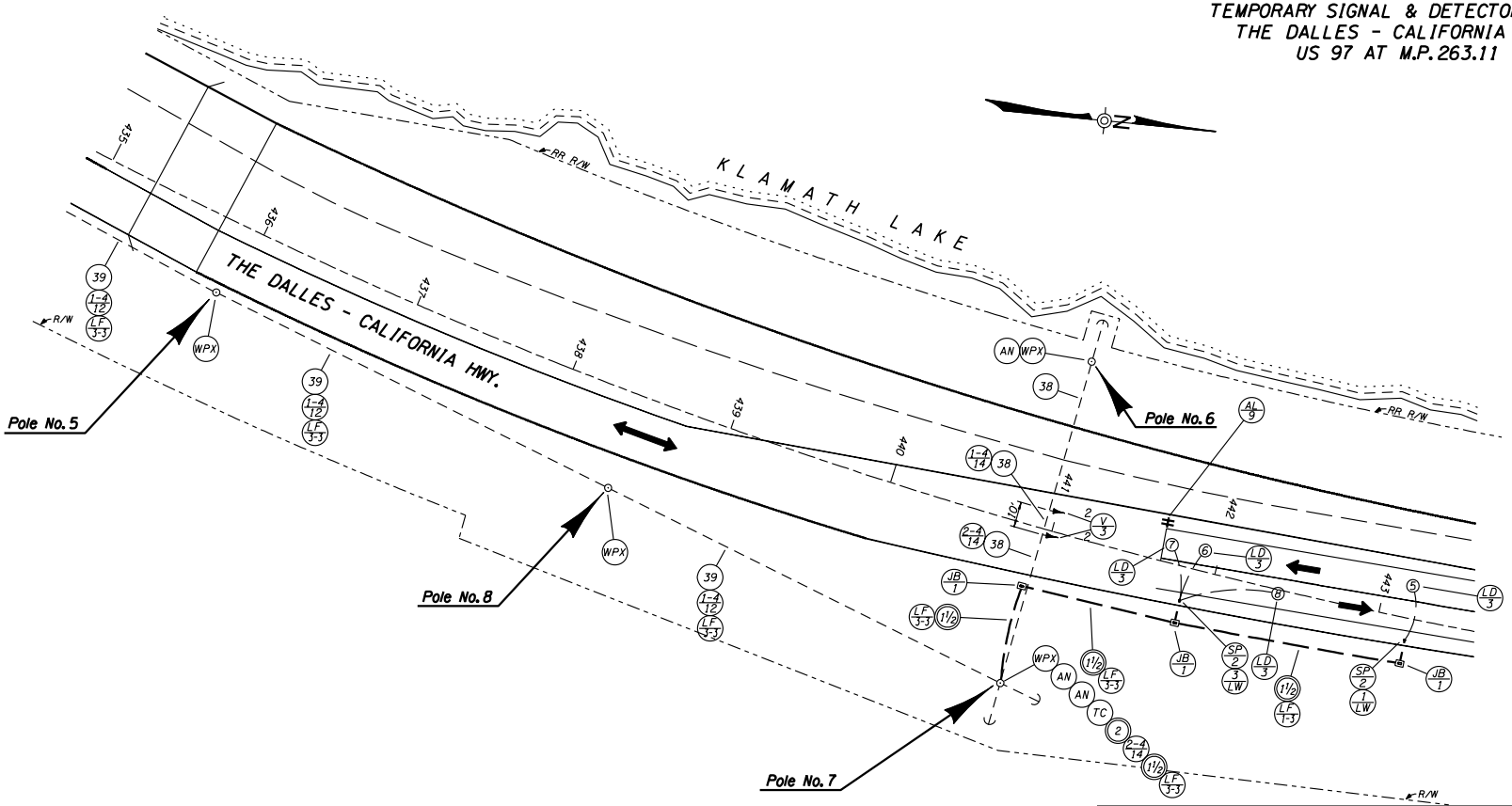
DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

TEMPORARY SIGNAL & DETECTOR PLAN

STR. ID. NO. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE TEMPORARY SIGNAL & DETECTOR PLAN



GENERAL NOTES:

1. Accommodate all aerial and buried utilities such that existing facilities are preserved
2. Minimum 10' spacing between signal heads
3. 4' minimum clearance between wood poles and guardrail.

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

NOTE:
See T.R.S. Dwg. _____ for Legend

NOTE:
Field Verify Measurements Before Construction

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

TEMPORARY SIGNAL & DETECTOR PLAN

Str. ID No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE TEMPORARY SIGNAL & DETECTOR PLAN

Railroad Interconnect Plan

Intersection layout shall be drawn showing 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, highway names, street names, north arrow and other features as needed. Signal Plan sheets shall be drawn at a scale of 40:1.

(Plotypus sheet scale 1:1200 English) Scale Reference file up by 2.5 times.

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

The plan shall include:

- Location of railroad tracks, traffic signal poles, vehicle signals, pedestrian signals, overhead part time restriction signs, traffic signal controller cabinet location and the railroad controller cabinet location.

- Each installed, removed, abandoned or retained item shall have the correct bubble and a leader(s) to each item.

- Railroad preemption matrix diagram for the intersection.

- Pedestrian Clear-Out Interval (P.C.O.I.) time required. Consult the signal timing person in your area for this number.

See example on the next page.

RETURN TO NORSML PHASE ROTATION AFTER PREEMPTION

SIGNAL INDICATION ACTIVE WHEN PED INHIBIT IS INITIATED

Ph. No.	NORSML PHASE ROTATION							
2	G	G	Y	R	R	R	R	R
6	G	G	Y	R	R	R	R	R
4	R	R	R	G	G	Y	R	R
8	R	R	R	G	G	Y	R	R
1	R	R	R	R	R	R	G	Y
5	R	R	R	R	R	R	G	Y
Ped. 2+6	W	FDW	DW	DW	DW	DW	DW	DW
Ped. 4+8	DW	DW	DW	W	FDW	DW	DW	DW
PTR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

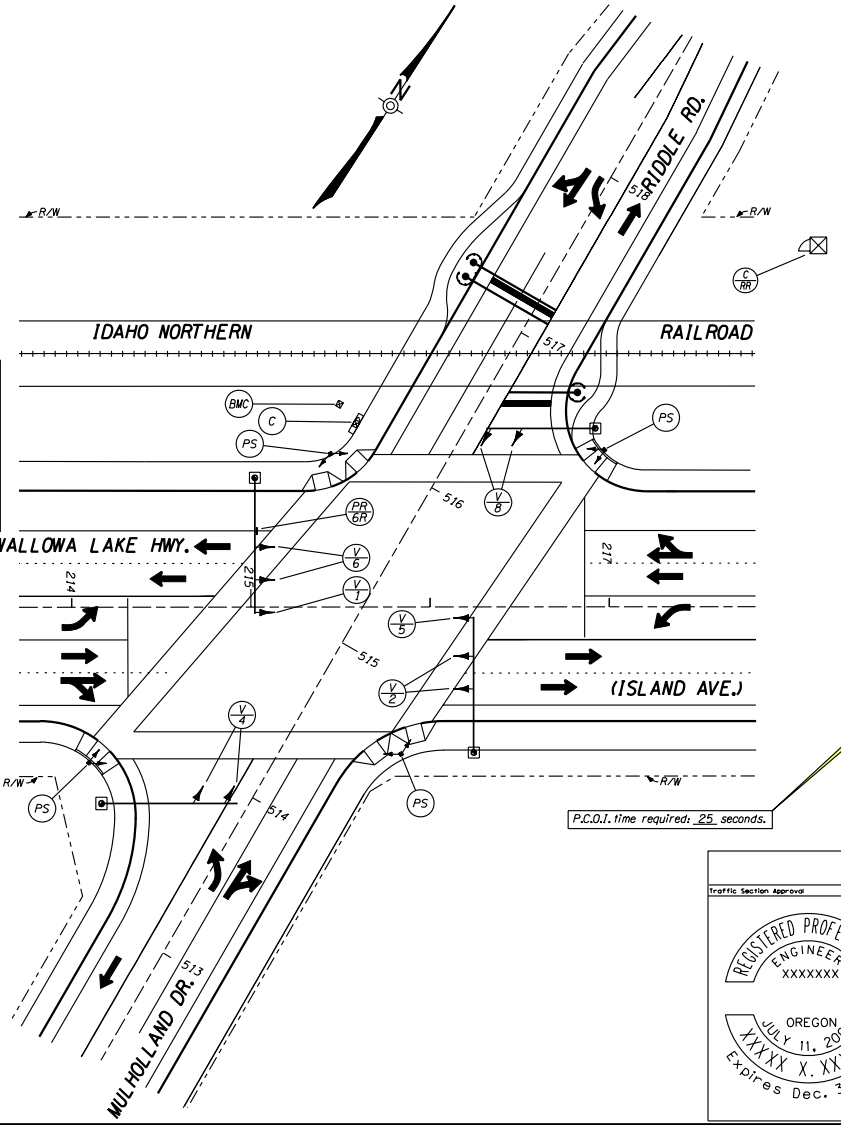
SIGNAL INDICATION ACTIVE WHEN RAILROAD PREEMPTION INITIATED

Ph. No.							
2	G	Y	R	R	R	R	
6	G	Y	R	R	R	R	
4	R	R	G	Y	R	R	
8	R	R	G	Y	R	R	
1	R	R	R	R	G	Y	
5	R	R	R	R	G	Y	
Ped. 2+6	FDW	DW	DW	DW	DW	DW	
Ped. 4+8	DW	DW	FDW	DW	DW	DW	
PTR	OFF	OFF	OFF	OFF	OFF	OFF	

2	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
6	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
4	R	R	R	Y	R	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
8	R	G	Y	G	G	Y	Y	R	G	Y	R	G	Y	R	G	Y	R	G	Y	R	G	Y
1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R	Y	R	R
5	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R	Y	R	R
Ped. 2+6	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
Ped. 4+8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
PTR	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

SERVE ALL NON-CONFLICTING PHASES (PHASES 2, 5, & 6)

6 PHASE
(PH. 4 & 8 CONCURRENT)
RAILROAD PREEMPTION MATRIX
(GREEN CLEAR-OUT)



RAILROAD PREEMPTION PLAN
WALLOWA LAKE HWY. AT RIDDLE RD.
ORE. 82 AT M.P. 1.16

L E G E N D

C O N T R O L L E R S

- (C) Controller (See Signal Plan)
- (C RR) Railroad controller (By Others)

P O L E S

- (EX 1) Retain and protect existing power pole (Power source)

S I G N A L S

- (V Ph) Phase (Ph=phase) vehicle signal (See Signal Plan)
- (PS) Pedestrian signal with clamshell mount (See Signal Plan)

C A B I N E T S

- (BMC) Base mounted service cabinet (See Signal Plan)

S I G N S

- (PR 6R) Install (30"x36") "NO RIGHT TURN" part time restriction sign (OR3-1)

25 seconds is only an example of possible times. Consult the Signal Timing Specialist in your area for this value.

P.C.O.I. time required: 25 seconds.

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON JULY 11, 2000 XXXXX X. XXXXXX Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

RAILROAD PREEMPTION PLAN

Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE RAILROAD PREEMPTION PLAN

Existing Utility Plan

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

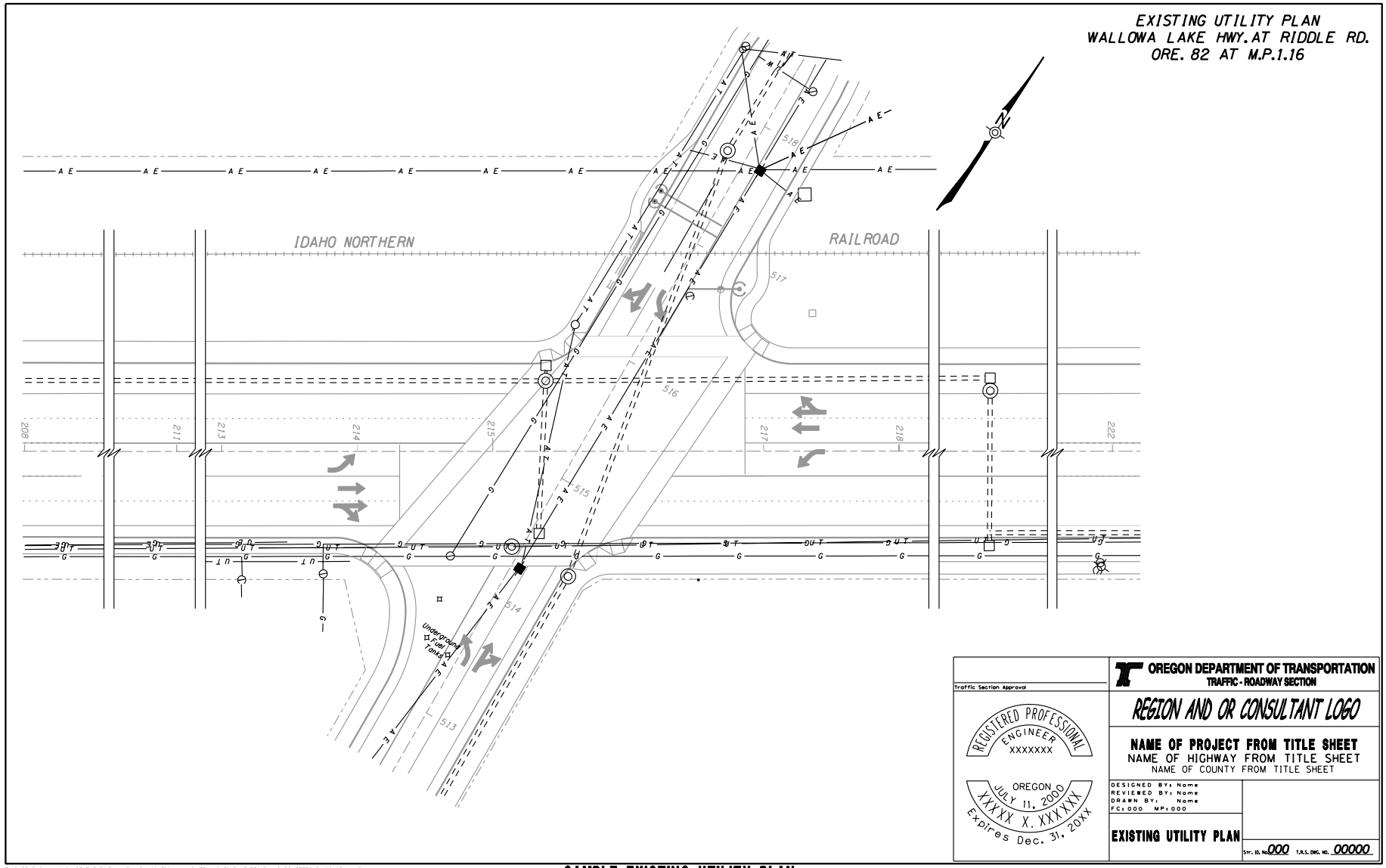
This plan is only required when roadway plans showing utilities will not be part of the contract documents. Existing Utility Plan sheets shall be drawn at a scale of 40:1.

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

The existing utility plan sheet shall include:

- 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.



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE EXISTING UTILITY PLAN

Legend

The legend must contain all definitions for bubbles that are shown on the Signal and Detector Plan sheets with annotation for each equipment bubble, rectangle or wiring symbol shown, along with a definition of abbreviations used on the plan or in the legend. When an abbreviation is shown in the key bubble, it is also shown in parentheses in the accompanying note. On the plan itself, this abbreviation is always replaced by specific information, (i.e. phase no., length, etc).

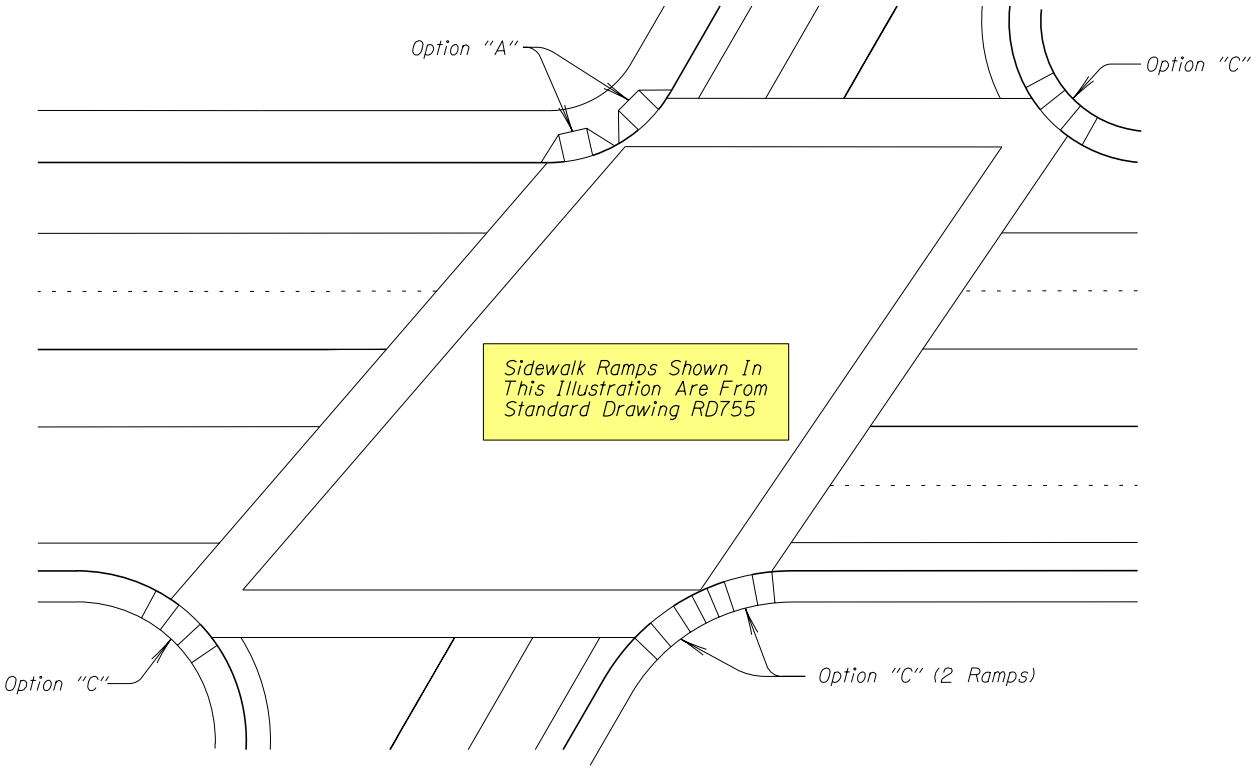
The “3-wire” symbol informs the contractor that the number of wires shown in the 14 AWG rectangle includes three spare wires for the phase shown alongside the symbol (phase 2, 4, 6, 8). These wires are for future use. These wires shall be color coded as shown in the table on Standard Drawing **TM421** and shall be unspliced from the controller cabinet to the terminal cabinet.

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

Crosswalks & Ramp Layout

By Oregon Revised Statute 801.220 all corners of an intersection are defined as a pedestrian crossing (a crosswalk). ODOT Roadway standards and the Department of Justice “28 CFR Part 36” requires a hard surfaced pedestrian landing. This ramp must have a 4’ minimum area that is free of obstructions at each end of an approved ADA sidewalk ramp.

The example below shows two types of ramp treatments that may be used:

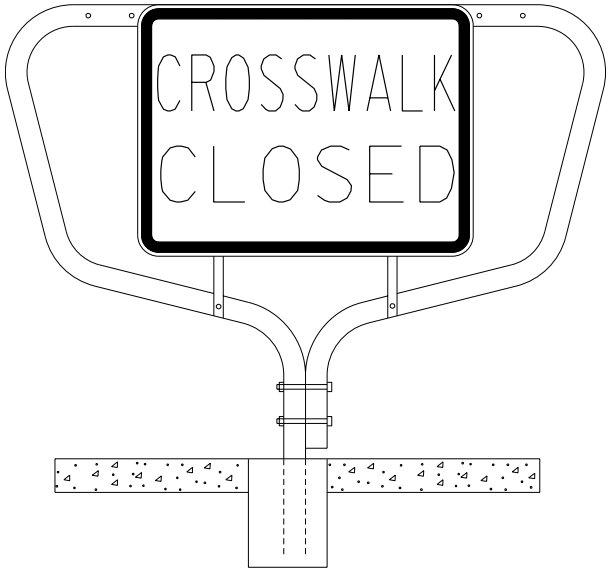


Before starting any design, consult the latest roadway curbs, islands, approaches and ramp standard drawing for current sidewalk ramp configurations. The ramps shall be designed to meet the minimum standards of the ADA requirement.

Before locating the crosswalks, determine which corner treatment (ramp type, landing, etc.) will be required. The parallel sidewalk ramp option “C” shown on standard drawing **RD755** will work on most corners and should meet current ADA standards. If the option “C” ramp is not suited to the sidewalk section you are working with, experiment with the other various ramp types. Locate ramps to provide crosswalks as nearly perpendicular to the travel lanes as possible. Selection and placement of ramps shall be done with the assistance of the roadway designer to determine the ramp type that best addresses all ADA and geometric design issues. Ramp and pedestrian landing details are shown on Standard Drawings **RD755** & **RD760.**

All pedestrian signals shall have clear line of sight from within the painted crosswalk lines from one end of the crosswalk to the pedestrian signal at the other end of the crosswalk. If the signal pole can not be located to accomplish this, install a stand-alone pedestrian pedestal. Push buttons shall be located no farther than **10’** from the curb/pavement ramp intersection to the stand-alone pedestrian pedestal or signal pole.

Crosswalks may only be closed by a formal order by the agency with jurisdiction over the intersection. A closed crossing must have “Crosswalk Closed” signs at each end. These signs shall only be mounted on approved crosswalk supports (See Standard Drawing **TM411**). One example is shown below.



A crosswalk closure may be considered if a pedestrian safety condition exists, such as dual left or right turns. If these movements are part of the intersection design a crosswalk closure or appropriate signing and phasing may be needed.

Mast Arm Poles & Placement

ODOT’s standard is the use of mast arm poles in all new signal and retrofit installations. Span wire installations are allowed if standard length arms will not allow for proper head placement. Local jurisdictions may also request strain poles.

Mast arms come in sizes ranging from 15’ to 55’ in 5’ increments. Mast arm poles are normally positioned with the mast arm perpendicular to the center line. Ideally, the signal designer will try to locate the mast arm in a location so that the pedestrian signal heads can be attached to the pole along with the pedestrian pushbuttons. If this is not possible, a pedestrian pedestal will be required.

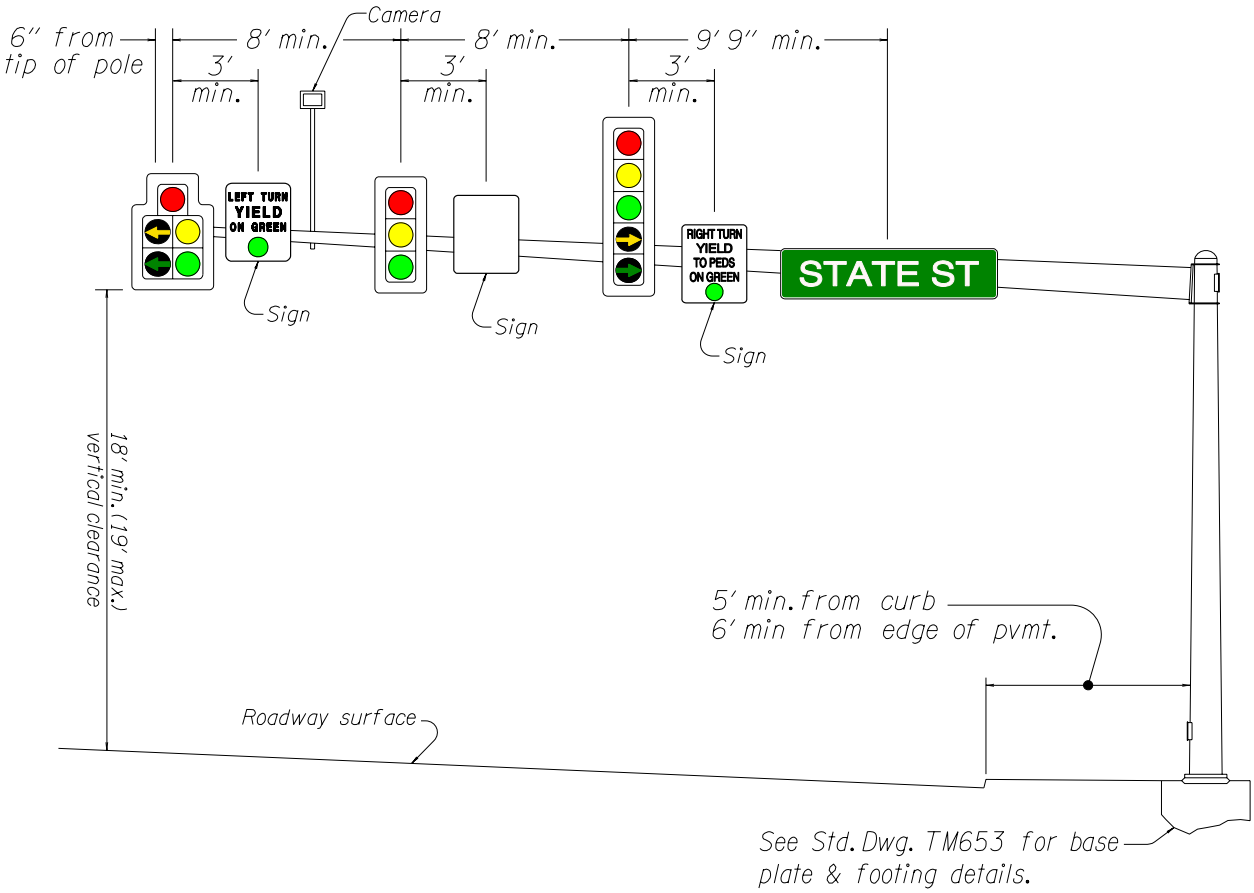
Traffic signal poles are located no closer than 5’ from face of curb to the face of pole or 6’ from normal edge of pavement when curb is not present. See Standard Drawing **TM405 “**GENERAL NOTE #3” for distance behind the curb or edge of pavement. Poles may be located in raised islands if 5’ clearance can be maintained on all sides of the pole.

All equipment (including foundations) must be located within R/W or permanent easements and shall not overhang private property.

The furthermost piece of equipment on the mast arm (i.e. signal, sign or fire preemption detector) is located no closer than 6” from the tip end of the mast arm.

Conflicts with overhead and underground utilities will need to be addressed during the design of the signal. If there are any known conflicts with utilities contact the Region Utility Specialist for help. Utility conflicts shall be addressed and resolved before the design is complete.

Any configuration of signals or signs not shown on Standard Drawing **TM650 and TM651** will result in a mast arm pole that is a “non-standard” pole or an “X” pole. All “X” poles will require the contractor to obtain a stamped design from the manufacturer and a separate foundation design for each “X” pole. All “X” poles will be designated as SMX (mast arm pole without luminaire) or SMLX (mast arm pole with luminaire).



The Traffic Structures Engineer **will not** review non-standard poles until shop drawings and calculations for the poles and foundations are submitted by the contractor during construction.

Poles located behind guardrail must allow clearance for guardrail deflection. Allow 6’ from the face of rail for Type 2A Guardrail and 3’ for Type 3. (See the “***AASHTO Roadside Design Guide***”, and consult the Roadway Designer).

Strain Poles & Placement

Strain poles are only to be used in areas where the use of mast arm poles will not allow for the correct location of signs or signal equipment. Wood strain poles are the standard only in the design of temporary signals.

Possible overhead and underground utility conflicts are more of a factor for strain pole placement since the pole is taller and the foundation is deeper than a mast arm pole.

All equipment must be located within R/W or permanent easements and shall not overhang private property.

Always check to see if there is the possibility of overhead and underground utility conflicts when locating strain poles.

Until the new strain pole designs are completed, all strain poles whether wood or steel will be listed as non-standard or “X” poles. The use of the PoleCalc program, used in the past, shall be discontinued. All “X” poles will require the contractor to obtain a stamped design from the manufacturer and a separate foundation design for each “X” designated strain pole.

The Traffic Structures Engineer **will not** review non-standard “X” poles until shop drawings and calculations for the poles and foundations are submitted by the contractor before construction.

Signal Head Layout

Signal head location is guided by the "***Manual on Uniform Traffic Control Devices***" (MUTCD), the "***Oregon Supplements to the MUTCD***" and the "***ODOT Traffic Signal Policy and Guidelines***".

Some basic guidelines are:

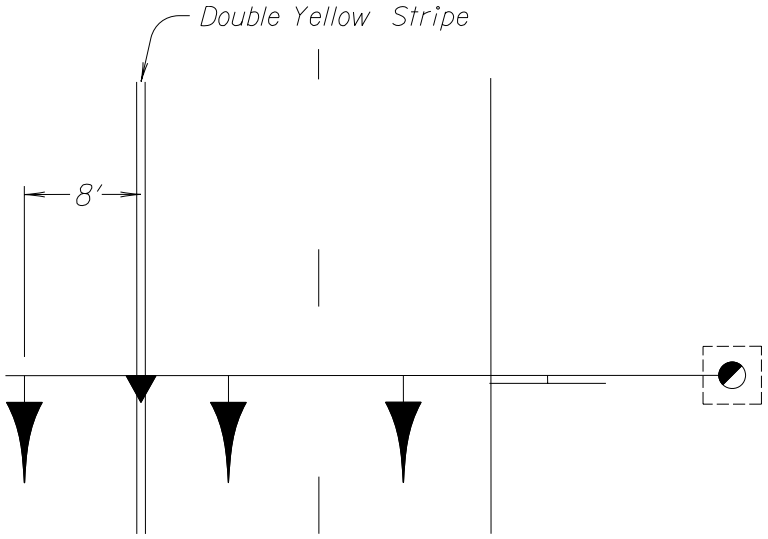
- 12" lenses are standard
- The MUTCD states in section 4D.15 "A minimum of two faces shall be provided for the major movement on the approach, even if the major movement is a turning movement." Two RED-YELLOW-GREEN faces are required for the major movements on each approach.
- Heads for the same *phase shall be no closer together than 10 ft. (8 ft. may be considered in narrow lane situations,*
- Heads shall not be *less than 40 ft. or more than 180 ft. from the "STOP" line. If heads are farther than 180 ft., a near side head is required.*

See "Signal head placement" on the next page for examples of head placement in relation to the lane(s) being served by the signal heads.

Ideally the mainline left-turn (all arrows) head should be centered in the left turn lane but should extend into the turn lane at least 4'. On span wire installations all arrow heads should be located in the center of the left-turn lane (extended).

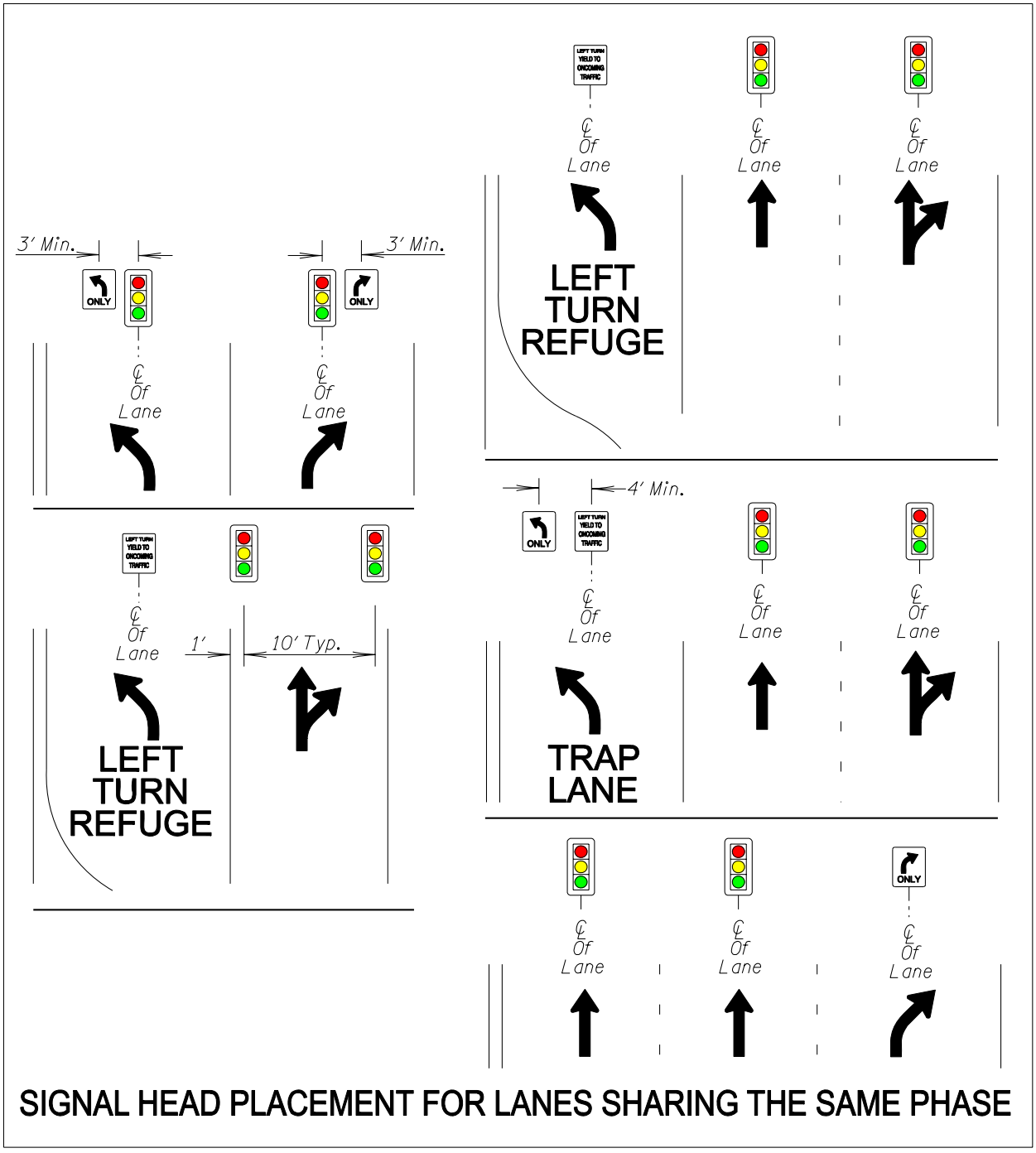
NOTE:

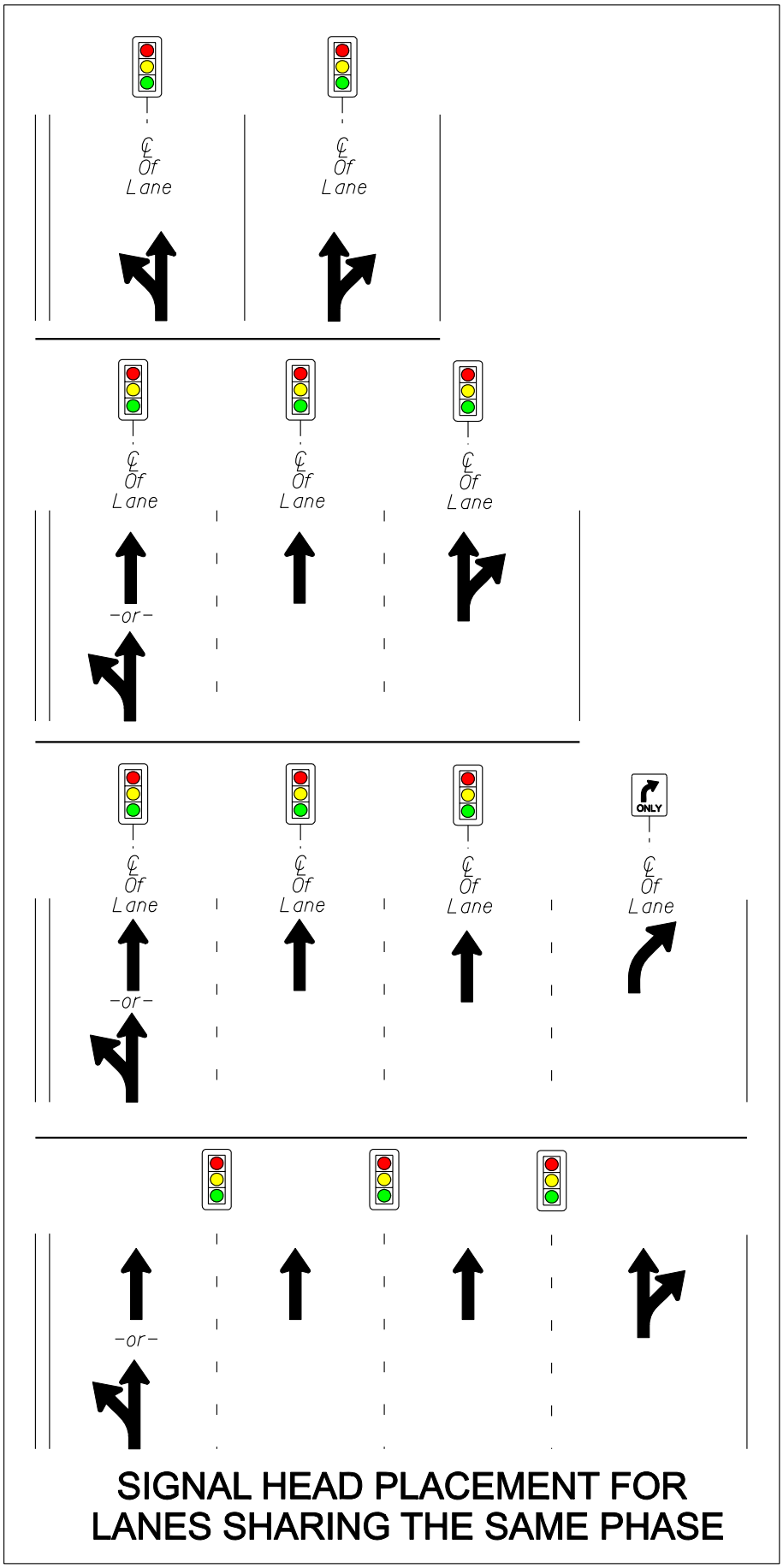
One signal head on each mast arm or span wire will be dimensioned from a painted lane line shown on the Signal Plan Sheet. (See Example Below)



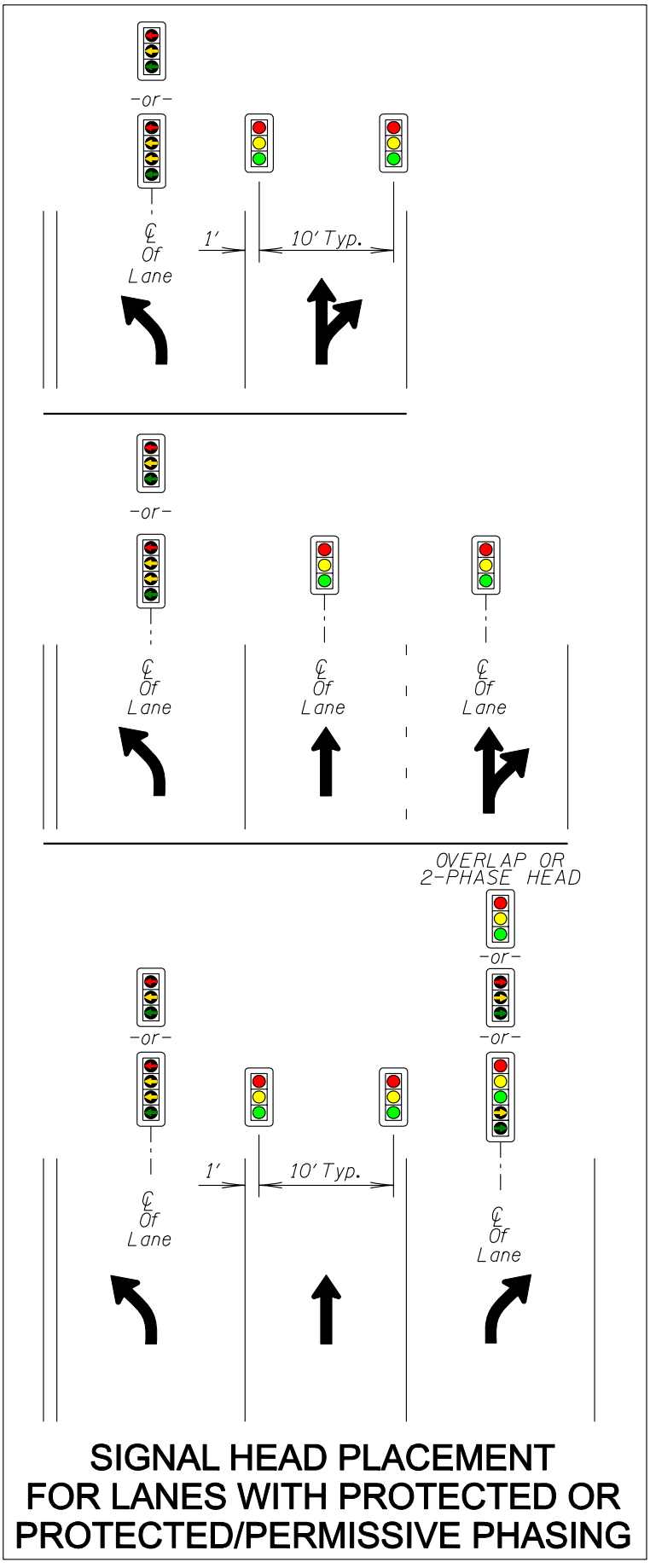
Signal Head Placement

The following three pages of diagrams show some of the most common signal head placements. For a comprehensive list of signal head layouts see the Oregon Department of Transportation ***"Traffic Signal Policy And Guidelines".***





SIGNAL HEAD PLACEMENT FOR
LANES SHARING THE SAME PHASE



SIGNAL HEAD PLACEMENT FOR LANES WITH PROTECTED OR PROTECTED/PERMISSIVE PHASING

Signs on Mast Arms

Aluminum signs with diamond grade sheeting for lane use are the standard for all overhead signing. Signs shall be mounted on adjustable sign brackets whenever possible. Consult the manufacturer's cut sheets for maximum sign sizes. Stainless steel band clamps may be used if the maximum sign size is exceeded for adjustable sign brackets. Interior illuminated signs shall only be used where aluminum diamond grade signs do not achieve visibility standards due to lighting conditions.

The table below shows most of the signs that may be used on various traffic signal installations:

OREGON SIGN NUMBERS	SIGN TYPES: Aluminum	Interior Illuminated	Part Time Restriction	SIGN LEGEND, TYPE AND SIZE
OR6-2L	AL 1L	OS 1L		"ONE WAY" left arrow sign (OR6-2L) (30"x36")
OR6-2R	AL 1R	OS 1R		"ONE WAY" right arrow sign (OR6-2R) (30"x36")
OR10-10L	AL 2L	OS 2L		"LEFT TURN SIGNAL" sign (OR10-10L) (30"x36")
OR10-10R	AL 2R	OS 2R		"RIGHT TURN SIGNAL" sign (OR10-10R) (30"x36")
OR10-11A	AL 3	OS 3		"NO TURN ON RED" Sign (OR10-11A) (30"x36")
OR3-12	AL 3U			"U TURN PERMITTED" Sign (OR3-12) (30"x36")
OR3-5TD	AL 4	OS 4		Left And Right Arrow Sign (OR3-5TD) (30"x36")
R3-6L	AL 4L	OS 4L		Left And Through Arrow Sign (R3-6L) (30"x36")
R3-6R	AL 4R	OS 4R		Through And Right Arrow Sign (R3-6R) (30"x36")
OR3-5TT	AL 4T	OS 4T		Left, Through, And Right Arrow Sign (OR3-5TT) (30"x36")
R3-5L	AL 5L	OS 5L		Left Arrow "ONLY" Sign (R3-5L) (30"x36")
R3-5R	AL 5R	OS 5R		Right Arrow "ONLY" Sign (R3-5R) (30"x36")
OR3-3	AL 6	OS 6		"NO TURNS" Sign (OR3-3) (30"x36")
OR3-2	AL 6L	OS 6L	PR 6L	"NO LEFT TURN" Sign (OR3-2) (30"x36")
OR3-1	AL 6R	OS 6R	PR 6R	"NO RIGHT TURN" Sign (OR3-1) (30"x36")
OR5-1	AL 7	OS 7	PR 7	"DO NOT ENTER" Sign (OR5-1) (30"x36")
OR20-3	AL 8		PR 8	"ONE VEHICLE PER GREEN" Sign (OR20-3) (30"x36")
OR20-1	AL 8s			"ONE VEHICLE PER GREEN" Sign (OR20-1) (24"x12")
OR10-6	AL 9		PR 9	"STOP HERE ON RED" With Arrow Sign (R10-6) (24"x36")
OR17-1	AL 10	OS 10		"LEFT TURN YIELD TO ONCOMING TRAFFIC" Sign (OR17-1) (30"x36")
OR10-12	AL 11	OS 11		"LEFT TURN YIELD ON GREEN ●" Sign (OR10-12) (30"x36")
OR22-14	AL 12	OS 12		"RIGHT TURN YIELD TO PEDS ON GREEN ●" Sign (OR22-14) (30"x36")
OR20-4			PR 13	"RAMP SIGNAL ON" Sign (OR20-4) (30"x36")
OR20-5			PR 14	"FORM 2 LINES" Sign (OR20-5) (30"x36")

Illumination

If illumination is present at the existing intersection it shall be replaced as part of the new signal. If the intersection is changing in geometric shape, contact an illumination designer to review the intersection for correct lighting levels.

When intersection illumination is warranted at a new signal, contact an illumination designer for the proper design of the new illumination. The illumination designer will need a copy of your CADD signal plan to design the illumination. The illumination designer will provide:

- Length of luminaire arm and orientation
- Mounting height
- Type and wattage of luminaire.

Once the illumination design is completed, request a copy of the photometric data printout for your project file.

If the illumination at an intersection is installed as part of a new signal, or is upgraded in a signal modification, the Region Electrical crew shall be contacted to verify the maximum height that can be reached by their equipment and the wattage of the replacement bulbs they normally carry. This information should be considered during this phase of the design.

Fire Preemption

Fire preemption is often included in new signal installations. Check with ODOT Traffic Operations Unit to determine if a jurisdiction has been approved and if a particular equipment manufacturer has been requested. If the project transmittal does not mention fire preemption, verify with Region Traffic that fire preemption is **not** required in the new signal installation.

If fire preemption equipment is planned for the intersection, the detector must be located with a clear line of sight for a minimum distance of 1500'. Preferred placement of the detector is on the back of a mast arm or near side span wire. Remote detectors or alternate locations will be necessary if the roadway curves prior to entering the intersection.

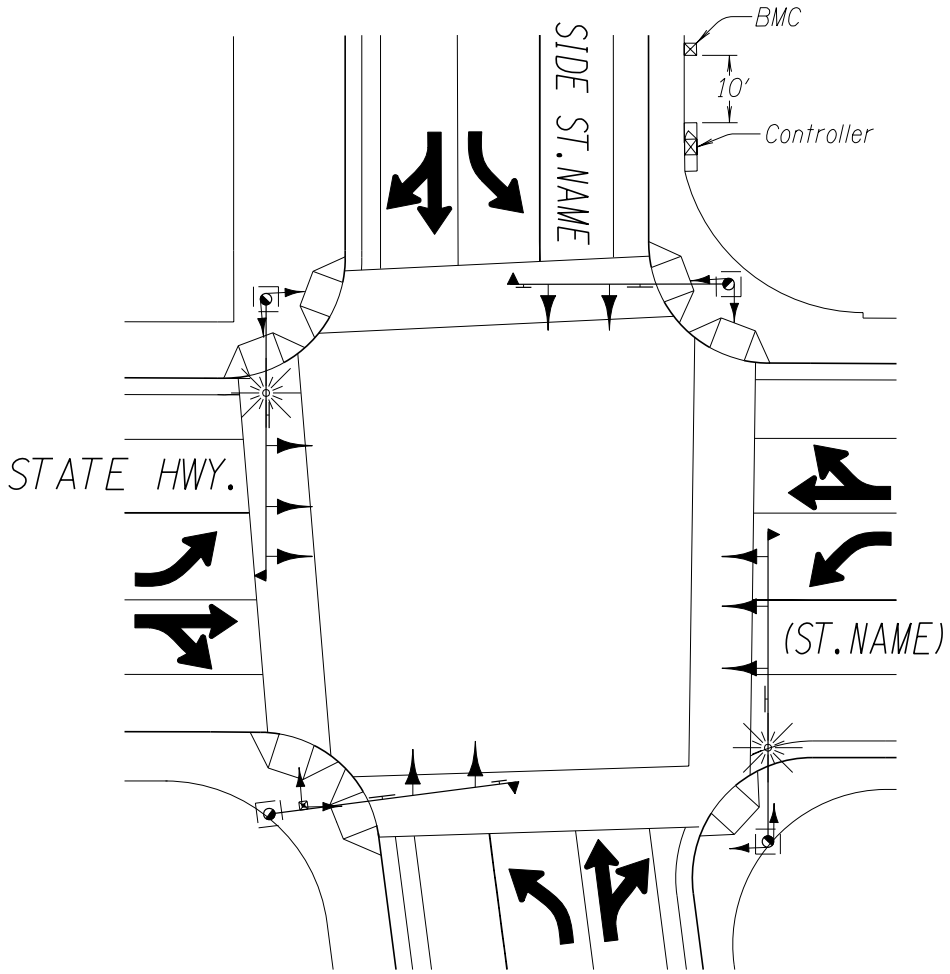
Controller Cabinet Location

If possible, locate the controller on the right-hand side of a side street approach and try to obtain a power source in that quadrant (see example on next page). There may be limitations that preclude this location such as R/W, power source locations, sidewalk, or businesses located in the quadrant. Always contact the region electrical crew for their preference on the location of the controller cabinet.

Locate the controller cabinet so that it does not obstruct the view for a right-on-red vehicle on the side street. Standard controller cabinets are constructed such that the controller side cabinet door (louvered door) swings left. Orient the controller cabinet so that the cabinet doors swing away from traffic. Locate the controller so that when the cabinet is being serviced and the technician is standing facing the louvered door, the technician can see a minimum two phases of the traffic signal operation.

Base Mounted Service Cabinet (BMC)

A Base Mounted Service Cabinet (BMC) shown in Standard Drawing **TM426** shall be installed on all new traffic signal installations. The BMC should be located in the same quadrant as the controller cabinet. This makes the BMC convenient for maintenance personnel working on the signal. Locate the BMC at least 10' away from any other equipment (controller or any poles). The BMC shall be located around the corner on the intersecting side street to mitigate mainline exposure and to avoid obstructing the view of right turning traffic. The example below shows the preferred location of the signal controller and the BMC.



Junction Boxes and Conduit

Signal/Detector junction boxes should be located toward the approaching traffic end of the corner's radius. This provides dual use for signal wiring and detector loop access.

The type of surface that a junction box is to be installed in determines the type of junction box to use (i.e. with or without apron). The total end area (in^2) of conduits determines the junction box size. The 'A' in the designation denotes a 12" wide concrete apron surrounding a precast concrete junction box. The concrete apron provides support to the fragile sides of the box. Type "A" boxes are to be used in non-paved areas (i.e. unpaved shoulders or landscaped areas) where maintenance vehicles may be present. **Do not use a precast concrete junction box within a travel lane or any access where it may be exposed to traffic.** For these areas an approved metal junction box rated for traffic is required. Consult ODOT's ***"Blue Sheets".***

Once the junction box placement is complete, conduit runs can be planned to connect between all equipment. Standard practice is to cross mainline in only one area. This shall be accomplished with conduits installed by Horizontally Directional Drilling (HDD) (preferred method) or run in a common trench. All conduits crossing the mainline or side streets shall be 2" diameter minimum. One spare 2" conduit from the controller cabinet to the nearest junction box shall be installed for future use; shall contain a poly pull line; and be capped at each end.

NOTE: *The illumination circuit is separate and for safety reasons is never routed through the controller cabinet*.

One JB-3 or JB-3A shall be placed nearest to the controller as the first access point. All other corners of the intersection shall have a minimum of one JB-2 or JB-2A junction box placed at the corner.

NOTE: *Do not place junction boxes in the slope or the landing area of an ADA Ramp, Junction boxes shall be placed in or behind sidewalks in a flat area that can easily be accessed by maintenance crews*.

Junction boxes and the guidelines for general use are shown on Standard Drawings **TM417** & **TM418**. Junction boxes containing only low voltage conductors (loop detectors feeder, fire preemption, modem interconnect, etc.) do not require bonding. If 120 volt or greater is present in a junction box, all conduits in the junction box, along with the steel lid must be bonded and grounded.

NOTE:

The ODOT standard is to use concrete junction boxes and sand pockets for loop entrances in Regions 1, 2, 3 & 5.

PVC loop entrances are to be used in Region 4.

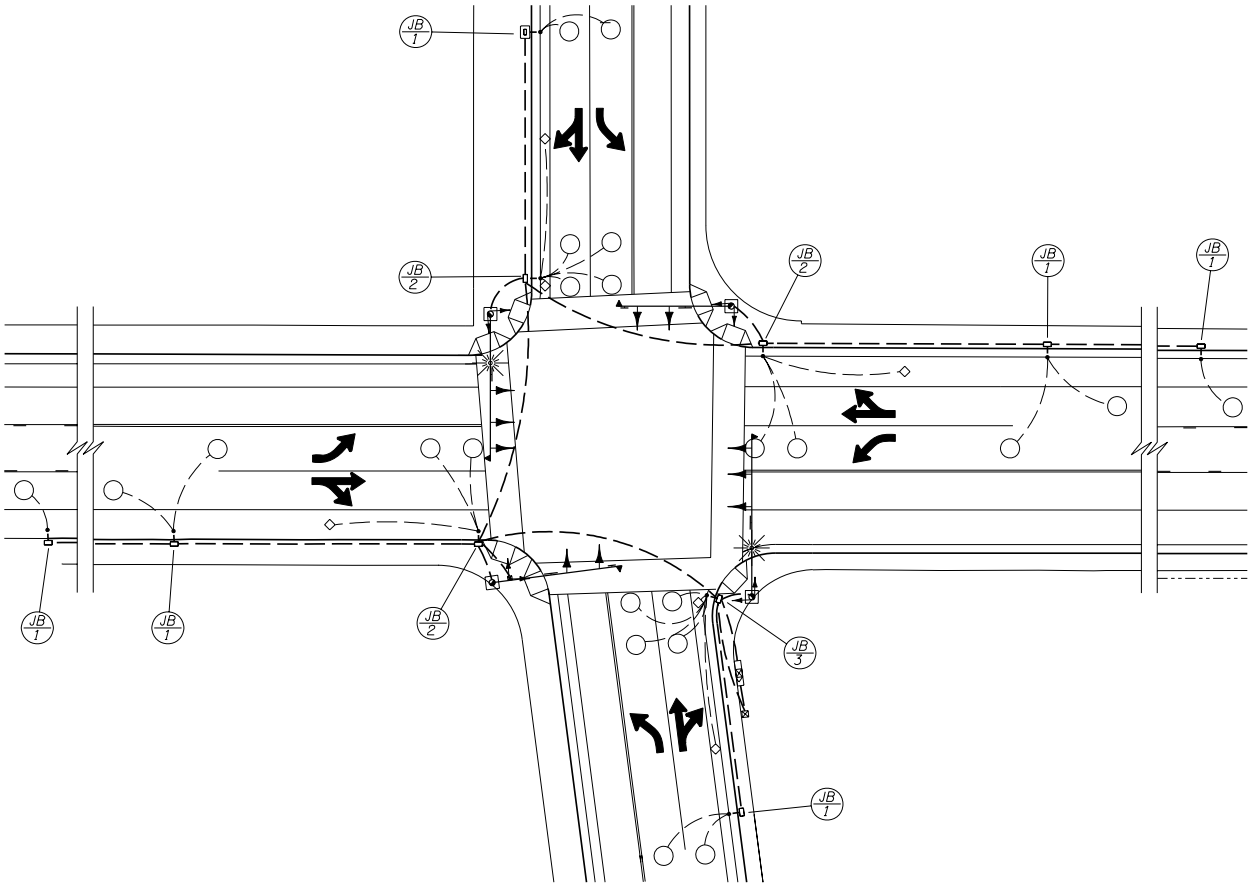
When bringing loops into cast iron junction boxes via saw cuts through the side, the following recommendations should be followed:

- 2 twisted pair of loop wires in 4" deep box in one saw slot
- 4 twisted pair of loop wires in 6" deep box in one saw slot
- 8 twisted pair of loop wires in 8" deep box in one saw slot
- Non-street box: Multiple cuts in same box require 2" spacing away from corners and 2" spacing between cuts
- Street box: Multiple cuts in same box require 1" spacing away from corners and 1" spacing between cuts (two cuts max per side for a total of 4 twisted pair of loop wires per side)

Assumes:

- 2" of cover are required for loops in the pavement
- 2" uncut metal required at the bottom of the box (JB/4, 5, 6, 7, and 8)
- 1" uncut metal required at bottom of street box (4"x4"x4" box)
- Assume 1/2"x1/2" is required cross sectional area of a twisted pair of loop wires
- Saw cut is 1/2" wide

The example below shows a base map that has correct placement of the junction boxes and conduits in relation to the signal poles, pedestrian ramps, and detector loops.



BASIC WIRING GUIDELINES (MAST ARM POLES)

BASIC WIRING GUIDELINES (MAST ARM POLES)
120 volt wiring shall be sized for a maximum 3% voltage drop

120 VOLT AC	SIGNAL SYSTEM COMMON, one #8 THWN wire used to complete the circuit for lamps in Vehicle or Pedestrian Signals PEDESTRIAN PEDESTAL, one #12 THWN wire used to complete the circuit for lamps in Pedestrian Signal Pedestal VEHICLE SIGNALS, require three #14 THWN wires, i.e. one for each indication color (Note: see SIGNAL SYSTEM COMMON) PEDESTRIAN SIGNALS, require two #14 THWN wires, i.e. one for each indication (Note: see SIGNAL SYSTEM COMMON) LUMINAIRES, require two #10 XHHW wires min. from Service Cabinet (never route through Controller Cabinet) PHOTOELECTRIC CELLS, for the Luminaire circuit require three #12 THWN wires from Service Cabinet INTERIOR ILLUMINATED SIGNS, require two #12 THWN wires (multiple signs are wired in parallel) PART-TIME RESTRICTION SIGNS, require two #14 THWN wires for each sign POWER SUPPLY, to Controller Cabinet requires two #6 XHHW wires (minimum AWG, determine wire based on load and distance from service cabinet) XHHW
LOW VOLTAGE DC	PEDESTRIAN PUSHBUTTONS require one #14 THWN wire for each pedestrian phase PUSHBUTTON COMMON is one #14 THWN wire used to complete the circuit for Pedestrian Pushbuttons Interconnect is typically 6 twisted pair cable un-spliced from controller to controller

Loop Detector Placement (referenced from the "Stop" Line)

Speed (MPH)	Loop Spacing (Feet)
25	140
30	180
35	110/220
40	160/320
45	160/320
50	190/380
55	225/450
Side Street/ Left Turn	5/15/75
Interchange Ramps	5/15/75/135
Bikes (Mainline)	50
Bikes (Side Street)	4/50

Junction Boxes

300' max. spacing. Check with the District Electrician for the preferred Junction box spacing

Loop Feeders Allowed in Conduit

Number Loop Feeders	Conduit Size (Inches)
1-2	1"
3-5	1½"
6-9	2"
10-13	2½"
14-21	3"

Pre-Formed Loop Leads Allowed in Conduit

Number Loop Feeders	Conduit Size (Inches)
1-2	2"
3-4	2½"

Loop Wire Access Point

Region 1 Sand Pocket
Region 2 Sand Pocket
Region 3 Sand Pocket
Region 4 PVC Sleeve
Region 5 Sand Pocket

Ducted Loop Leads

Number Loop Feeders	Conduit Size (Inches)
1-4	2" min.
5-8	2½"

Interconnect

Number Cables	Conduit Size (Inches)
1	1½"
2	2"

Standard And Alternate Loop Sizes

STANDARD LOOP	6' Round
ALTERNATE LOOP DESIGN	5' Round may substitute for 6' Round
BIKE LOOP	2½' Diamond
COUNT/CLASS LOOP	6' Round Preferred, 6' Square Optional

FIRE PREEMPTION SYSTEMS	Require an unspliced cable from each Fire Preemption Detector to the termination point in the Controller Cabinet.
TERMINAL CABINETS	Are installed on each Mast Arm Pole. Single Conductors (unspliced) are used from the Controller to the Terminal Cabinet. Individual Control Cable is required from the Terminal Cabinet to each piece of equipment mounted on the mast arm. Pole Mounted Equipment can be wired from the Terminal Cabinet with Single Conductors
PEDESTAL POLES	Do not require Terminal Cabinets. The equipment mount or the equipment itself has a small terminal cabinet or terminal strips to which the separate conductors are connected.
GROUND RODS	Are required for all Poles and Pedestals, and for the Controller Cabinet itself. All conduits containing 120 volt AC circuits are bonded from end-to-end with a #6 bond wire (green insulated) or through a unbroken mechanical connection of the galvanized metal conduit. This Bonding and Grounding is spelled out in the "Oregon Standard Specifications For Construction" and is not shown on the signal system wiring diagram. The designer should consider this #6 wire when calculating conduit sizes.
PEDESTRIAN PHASE CIRCUITS	Are often run "in and out" This can reduce both wiring costs and the number of wires in a conduit, thus easing installation. This "in and out" method is seldom employed for the pole nearest the Control Cabinet
CONDUIT SIZE	Is determined by a calculated area fill using a formula based on an "equivalent number" of #14 wires in the conduit (see NEC). Conduits crossing the roadway shall be at least 2" diameter New installations may be designed to no greater than 70% of max. NEC. Modifications should be designed to 100% of max. NEC.

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING AND OPERATIONS SECTION

LOOP DETECTOR AND ENTRANCE GUIDE SHEET 1.7

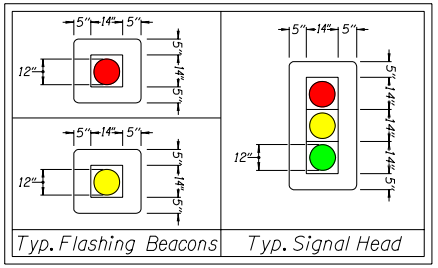
JUNCTION BOX SIZE GUIDE

CONDUIT DIAMETER TOTALS, IN INCHES	JUNCTION BOX	RESMRKS
PRECAST CONCRETE BOXES		
0-12	JB-1	Preferred
0-18	JB-2	Preferred
0-34	JB-3	Preferred
GALVANIZED CAST IRON BOXES		
0-5	JB-4	End of run only
0-8	JB-5	No loop splices
0-8	JB-6	With loop splices
0-13	JB-7	No loop splices
0-13	JB-8	With loop splices

Use concrete boxes whenever possible.
Minimum size for the collector box into the Controller Cabinet is a JB-3.

JUNCTION BOX NOTES

- 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 3A — Install 30"x17"x12" (min. dimension) precast concrete junction box with concrete apron
- JB 4 — Install 8"x6"x6" (min. dimension) galv. cast iron junction box with gasketed galv. steel cover
- JB 5 — Install 12"x10"x6" (min. dimension) galv. cast iron junction box with gasketed galv. steel cover
- JB 6 — Install 12"x10"x8" (min. dimension) galv. cast iron junction box with gasketed galv. steel cover
- JB 7 — Install 16"x12"x6" (min. dimension) galv. cast iron junction box with gasketed galv. steel cover
- JB 8 — Install 16"x12"x8" (min. dimension) galv. cast iron junction box with gasketed galv. steel cover

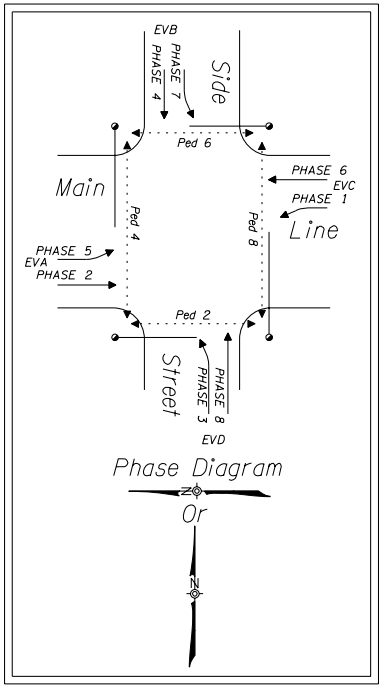


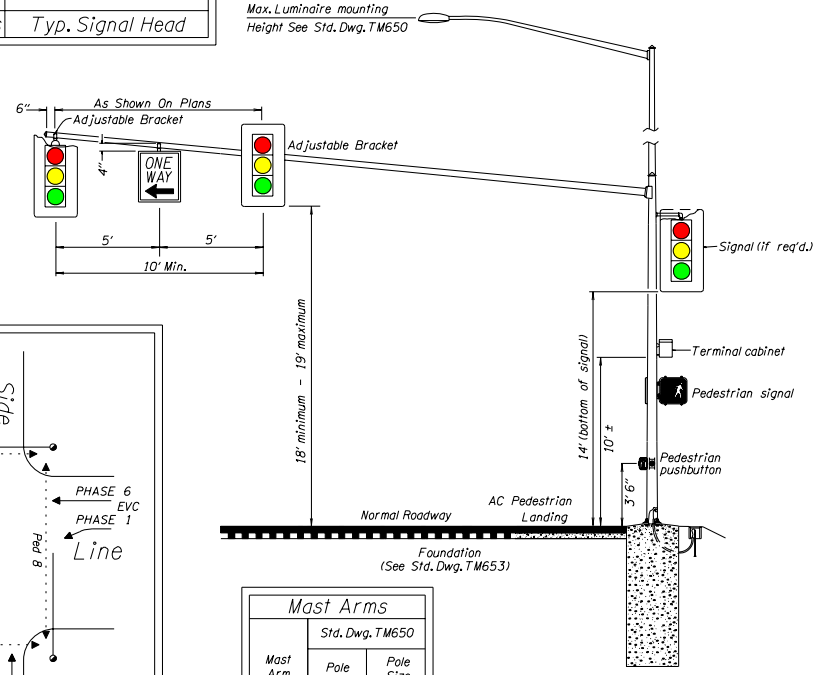
Signal Mounts

"A"	Standard
"E"	Elevator
"B"	Adjustable Bracket
"AB"	Adjustable Sign Bracket

Stop Bars

40' Minimum From Signal Face





MAST ARM POLE
Approx. 20' High

Mast Arms

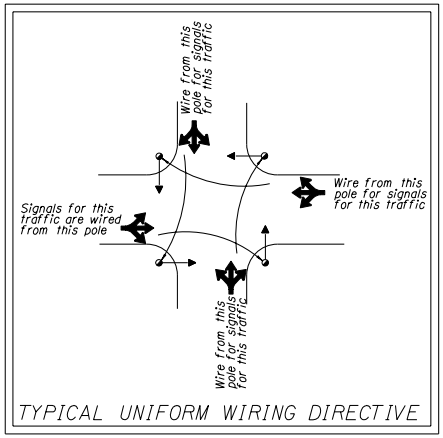
Mast Arm Length	Std. Dwg. TM650 Pole Size	Pole Size w/Illum.
15'	SM1	SM1L
20'	SM2	SM2L
25'	SM2	SM2L
30'	SM3	SM3L
35'	SM3	SM3L
40'	SM4	SM4L
45'	SM4	SM4L
50'	SM5	SM5L
55'	SM5	SM5L

Traffic Signal Special Provisions

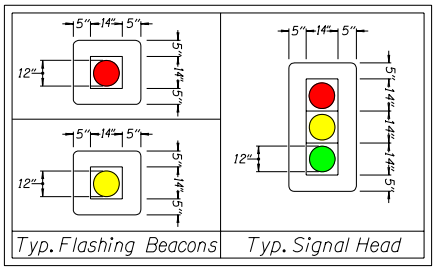
- 00902 Crosswalk Closure
- 00950 Traffic Signal Removal
- 00960 Common Special for Signal and Illumination
- 00970 Illumination
- 00990 Signals
- 02920 Materials

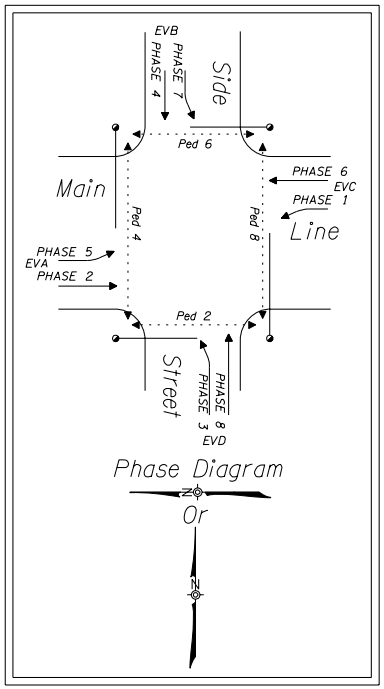
OREGON DEPARTMENT OF TRANSPORTATION

MAST ARM AND JUNCTION BOX GUIDE SHEET | 1.6



TYPICAL UNIFORM WIRING DIRECTIVE



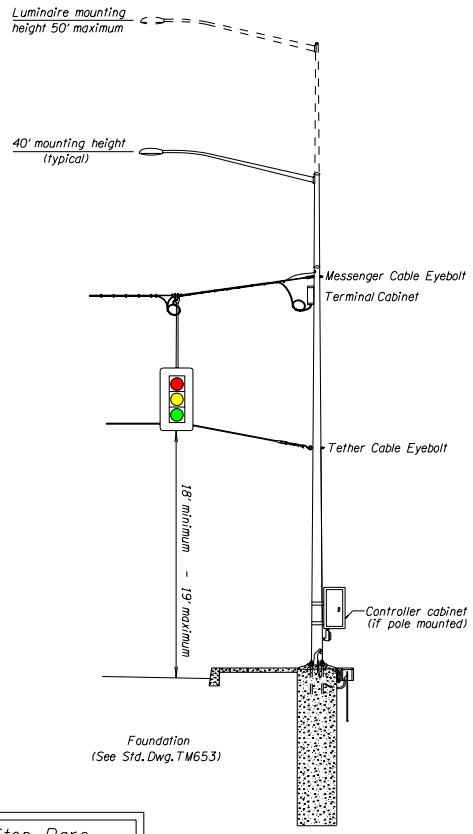


Phase Diagram

Or

CABLE DEFINITIONS & USES

- (X-4 / 14) X number of cables, each with four #14 wires (used for one vehicle phase)
- (X-6 / 14) X number of cables, each with six #14 wires (one pedestrian phase or one doghouse signal)
- (X-10 / 14) X number of cables, each with ten #14 wires (two pedestrian phases or two vehicle phases)
- (X-12 / 14) X number of cables, each with twelve #14 wires (three pedestrian phases or three vehicle phases)
- (X-15 / 14) X number of cables, each with fifteen #14 wires (three vehicle phases with overlap phase)
- (X-2 / 12) X number of cables, each with two #12 wires (wiring for interior illuminated signs)
- (X-2 / 10) X number of cables, each with two #10 wires (wiring for luminaires)
- (FF / Ch) One fire preemption detector feeder cable for preempt channel (Ch).



STRAIN POLE

Pole 28' to 34' high
(Luminaire Extension 2' to 16')

Stop Bars
40' Minimum From Signal Face

Traffic Signal Special Provisions
00902 Crosswalk Closure
00950 Traffic Signal Removal
00960 Common Special for Signal and Illumination
00970 Illumination
00990 Signals
02920 Materials

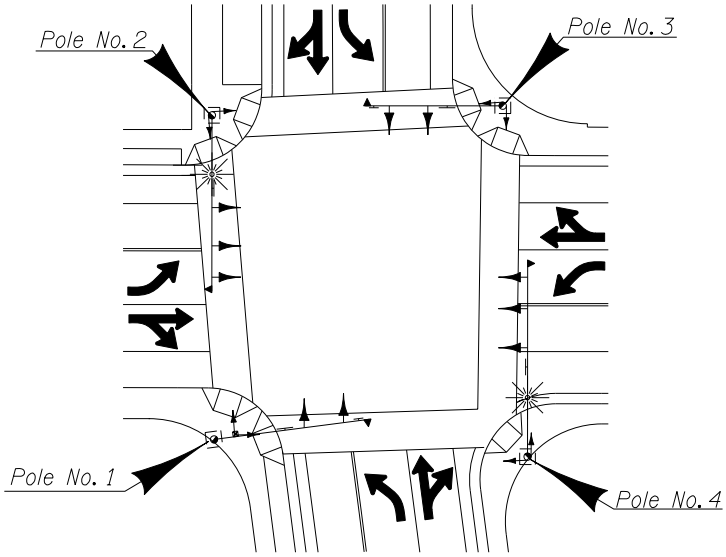
OREGON DEPARTMENT OF TRANSPORTATION

STRAIN POLE GUIDE SHEET | 1.8

2

Pole Numbers

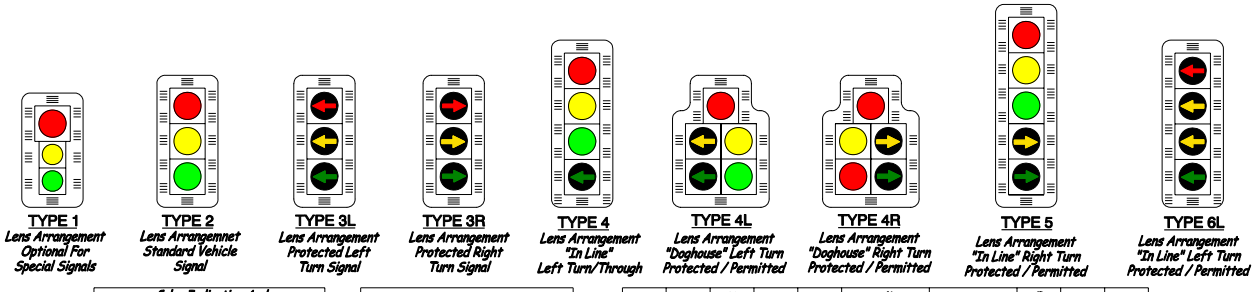
Poles and pedestals are numbered starting from the **lower left-hand corner of the intersection in a clockwise direction**. Plans having poles at more than one intersection shall have the **poles numbered consecutively** starting with the first intersection shown in the plans and ending with the last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



Signal Head Designations

Signal head types are found on Standard Drawing **TM406** and designated by a number or a combination of number and letter for the head type to be used.

All of the common head types and mounting options are shown below:



Color Indication And Nominal Lens Size:	
R	Red Circular
Y	Yellow Circular
G	Green Circular
RLTA	Red Left Turn Arrow
YLTA	Yellow Left Turn Arrow
GLTA	Green Left Turn Arrow
RRTA	Red Right Turn Arrow
YRTA	Yellow Right Turn Arrow
GRTA	Green Right Turn Arrow
FYLTA	Flashing Yellow Left Turn Arrow

Mounting Types:	
A	Standard Plumbizer
E	Elevator Plumbizer
B	Adjustable Bracket Mounting

1	2	3L	3R	4	4L		4R		5	6L	7
12" R	12" R	12" RLTA	12" RRTA	12" R	12" R		12" R		12" R	12" RLTA	Other Configurations
8" Y	12" Y	12" YLTA	12" YRTA	12" Y	12" YLTA	12" Y	12" Y	12" YRTA	12" Y	12" YLTA	
8" G	12" G	12" GLTA	12" GRTA	12" G	12" GLTA	12" G	12" G	12" GRTA	12" G	12" FYLTA	
				12" GLTA					12" YRTA	12" GLTA	
									12" GRTA		

VEHICLE SIGNAL HEAD DESIGNATIONS

Types of mounts for signal heads are shown on Standard Drawings **TM407.** The standard mounting for signal heads on a mast arm is an adjustable bracket. The standard for span wire is a Messenger Cable Attachment**.**

The four types of mounts used are:

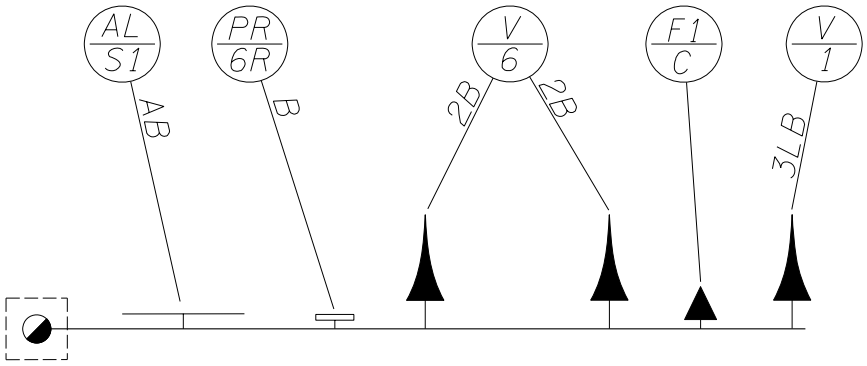
Adjustable bracket_____(B)
Standard plumbizer_____(A)
Elevator plumbizer_____(E)
Adjustable sign bracket_____(AB)

Mount types (B), (A), (E) and (AB) are shown on the plan sheets along the bubble leader line that extends from the vehicle head phase bubble to the signal symbol.

In the example below the mounting type is preceded by the number or number and letter of the signal head type to be used at that location on the mast arm.

Mounting types on the example below from right to left:

3LB = Type 3L head on an adjustable bracket
2B = Type 2 head on an adjustable bracket
B = Part Time Restriction Sign on an adjustable bracket
AB = Street Name Sign on an adjustable sign bracket



Head Locations on Mast Arms & Span Wires

Dimension one of the vehicle heads from a lane line (painted stripe). This will assure proper pole and signal head placement when used in conjunction with the pole entrance chart.

Dimensions between signal heads and all other appurtenances on the mast arm or span wire shall be shown in the pole entrance chart. No equipment shall be installed within 6” of the tip of the mast arm.

Bubbles & Wiring

Each piece of equipment must be identified with a reference bubble, and each type of reference bubble and its definition (annotation) must be included in the legend.

Mast arm and strain poles are wired from the controller cabinet to the poles terminal cabinet with individual wires of THWN (See Standard Drawing **TM421** for color code). ODOT’s standard is to use control cable from the terminal cabinet to each of the signal heads, in both mast arm and span wire installations. The control cables are shown and labeled on all span wire plan sheets between strain poles, the cables within a mast arm are not shown on the plans. See

Standard Drawing **TM421** for wiring guidance on single conductor and control cable color codes.

When strain poles are used, the first bubble in the span wire bubble string is always the messenger cable type and size (38, 39, 40, or 41), followed by the #14 control cables that run the full length of the span. Next in the string should be any #12 or #10 control cables. Last in the string should be any miscellaneous cables (fire feeder, overhead interconnect, specialty power, etc.)

Conduits are represented by a double concentric circle bubble with the conduit information inside. This information may be a number denoting size or it may be a combination of letters specifying use.

Single conductor wiring is shown using rectangles and cable is represented by split circles.

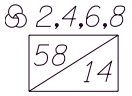
A new conduit run bubble string always begins with a conduit that shows a size within the bubble, followed by wires and cables contained within that particular conduit. A bubble string may include a second conduit followed by the wires and cable contained in it.

Often a conduit bubble string will end with lettered conduits. This informs the contractor that conduits for other uses can be installed in the same trench or drilled across the street from the same drilling pit.

On mast arm installations, alongside or above the 14 AWG wiring rectangle, there will be a "3-wire" ⟲ symbol and phase number(s). This indicates that three spare wires have been included for the noted phase (ODOT's standard is to provide three spare wires for phase 2, 4, 6 and 8).

These wires are for future use. These wires shall be color coded as shown in the table on Standard Drawing **TM421** and shall not be spliced at any point from the controller cabinet to the terminal cabinet on each pole.

See example below right:



The example shown below illustrates a bubble string that could appear on a signal plan. This example shows the electrical conduit size and what is contained in that conduit. Reading from left to right starting with the bubble closest to the leader, the bubbles show: conduit size, number of XHHW # 12 commons, number of # 8 commons, number and size of illumination wires (#10 AWG), number and size of THWN signal wires with the phase spares above it, fire preemption feeder for channel A, fire preemption feeder for channel B, fire preemption feeder for channel C, fire preemption feeder for channel D, detector conduit, detector conduit, conduit spare and a poly pull line.

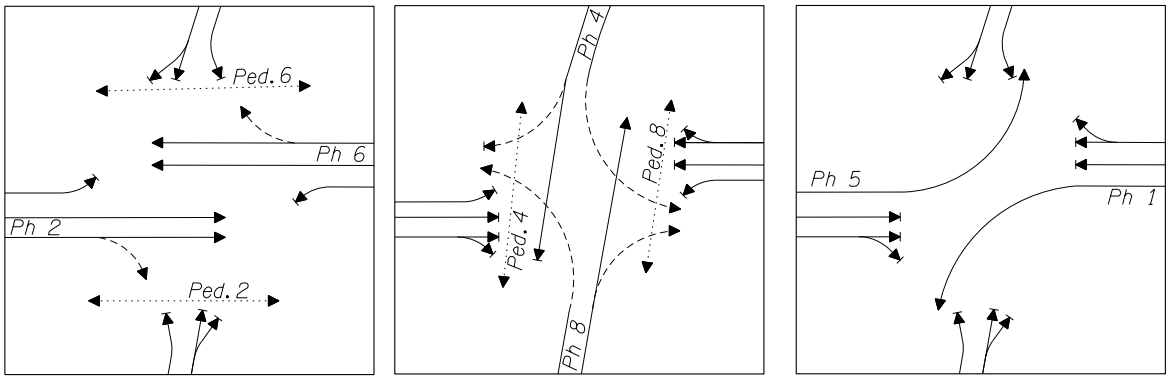
The next example shown below illustrates a bubble string that could appear on a detector plan. This example also shows the conduit size and what is contained in each conduit. This string reads from right to left starting with the bubble closest to the leader: size of detector conduit, loop feeders – (6 loop feeder cables for phase 4), (4 for phase 8), 2 ½" detector conduit, loop feeders (2 for phase 5), (3 for phase 6), (2 for phase 1), (3 for phase 2) and an electrical conduit.

Phase Rotation Diagram

Even-numbered (2, 4, 6, 8) signal phases (typically phase 6 is northbound or westbound) and fire preemption channels normally are assigned beginning on the left and are incremented clockwise. Odd-numbered signal phases typically denote a protected left turn phase. Left turns are strictly paired to the even-numbered phases (i.e. 2 & 5, 4 & 7, 6 & 1, 8 & 3).

The phase diagram for "normal phase rotation" below shows the normal operation of an intersection's phase rotation. This diagram reads from left to right beginning with the "start-up phase(s)" (normally 2 & 6) and progresses through the order in which the phases are serviced.

Protected movements are shown with a solid line; permissive movements (i.e. right turn across a ped, permissive left) are shown with a dashed line; pedestrian movements are shown with a dotted line.

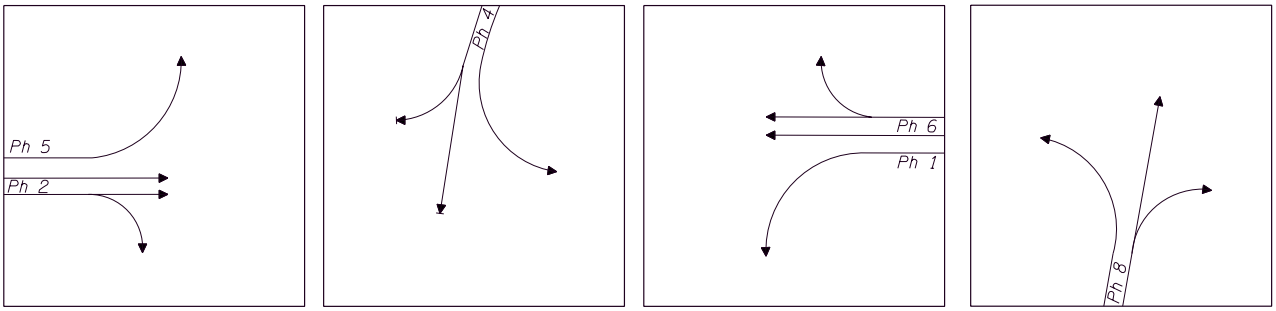


NORSML PHASE ROTATION

Fire Preemption Diagram

Fire preemption detectors must be located with a clear view of the approach being served by the detector for a distance of 1500'. Usual placement is on the back of the mast arm or near side span wire. Remote detectors or alternate locations may be necessary if the roadway curves prior to entering the intersection.

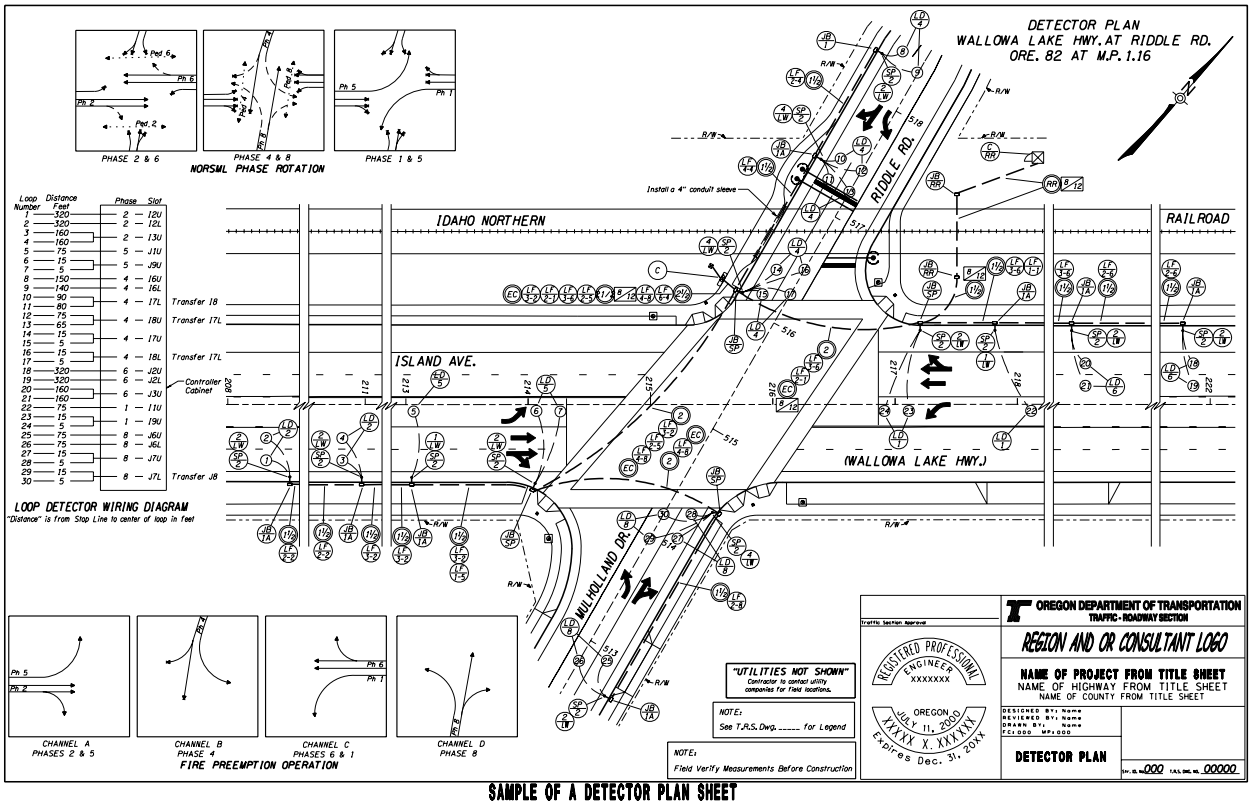
The diagram for "fire preemption operation" below, shows which phase(s) turn green in response to a detection on a particular fire preemption channel. Upon release of a preempt call, the signal returns to the "normal phase rotation" above.



FIRE PREEMPTION OPERATION

The Detector Plan

The Detector Plan typically shows pole foundations, pedestrian pedestals, controller, remote power service post, conduits and junction boxes that apply to the detector system installation and loop detector wiring diagram. Items such as mast arms, signal heads, pedestrian heads, signal conduit and interconnect conduit shall be omitted for clarity. The plan below is scaled 40:1. Cut lines may be inserted to compress the plan so that all mainline loops, junction boxes and conduits will fit on one sheet.



SAMPLE OF A DETECTOR PLAN SHEET

Mainline loop distances are determined by the roadway's posted speed which can be obtained from the OTC (state highways) or SSCB (county road standards (city streets)) files. These files can be found at the following link:

https://keiko.odot.state.or.us/whalecomf839440f71e71a949ce46a399d3edd592434698662/whalecom0/cf/szi/

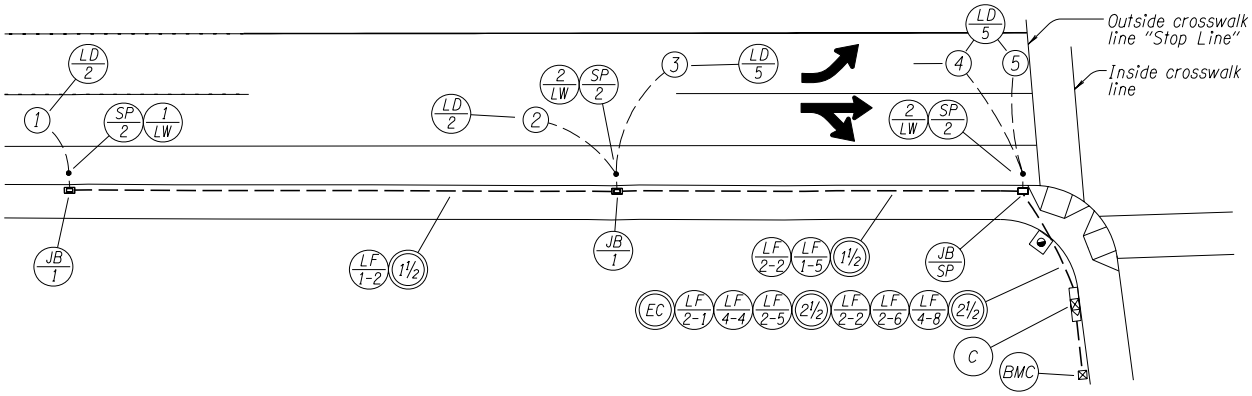
Typical loop spacings are shown in the chart below:

LOCATION	SPEED		LOOP SPACING (from the stop line to center of loop)
	MPH	FT/SEC	FEET
Main Line Note: If the Main Line consists of a single, shared left-through lane, install stop bar loops on the Main Line at 5 & 15 feet in addition to the loop(s) indicated based on approach speed.	25	36.75	140
	30	44.10	180
	35	51.45	110/220
	40	58.80	160/320
	45	66.15	160/320
	50	73.50	190/380
	55	80.85	225/450
Right Turn Lane			140 (or 115 if short lane)
Side Street/ Left Turn			5/15/75
Interchange Ramps			5/15/75/135
Bikes--Main Line	15	22.05	50
Bikes--Side Street	10	14.70	4/50
Main Line Single Lane Temporary Bridge			5/15/100 65**

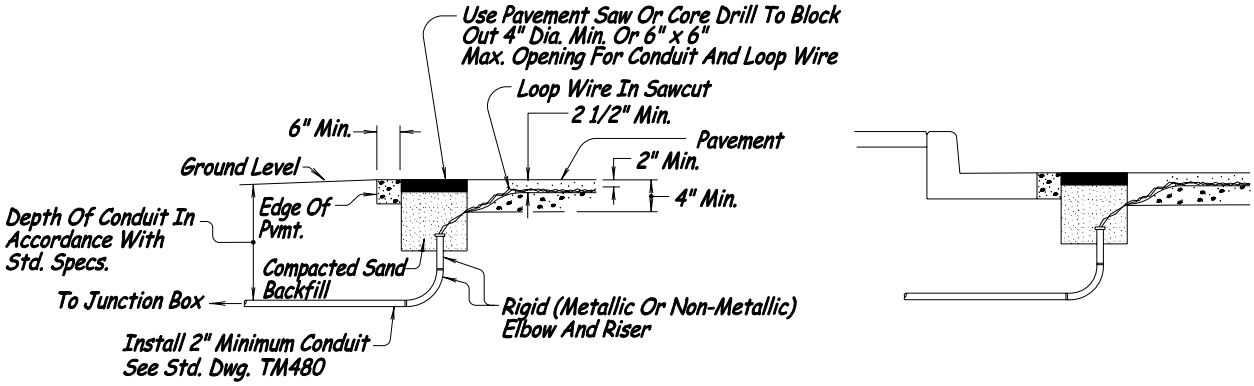
**= A bypass loop may need to be installed in opposing lane 65' from the stop bar.

Loops

Loops shall be centered in the travel lanes. All loops are measured from the "Stop Line" or outside cross walk line to the center of the loop. In the example below a bubble and leader line is provided to identify each piece of loop detector equipment shown on the plan.



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 "Sand Pocket". See Standard Drawing **TM417**

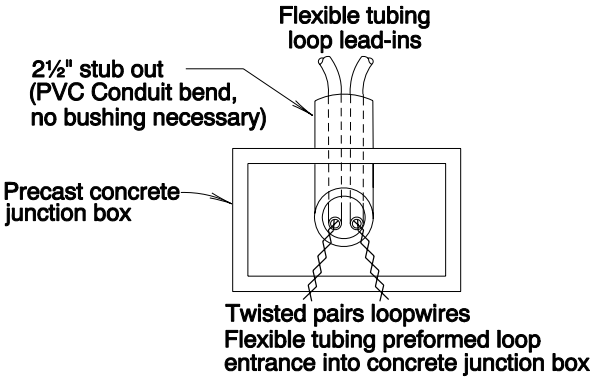


SAND POCKET LOOP ENTRANCE

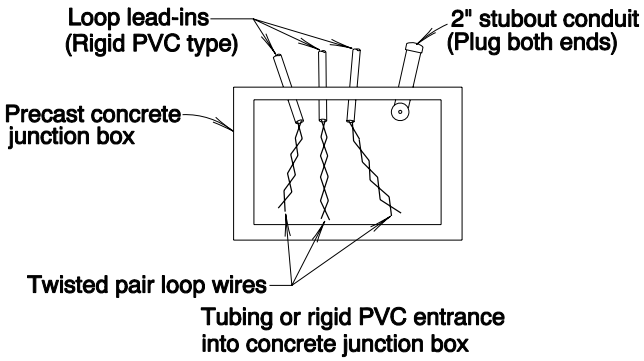
For Details Not Shown See Std. Dwg. TM480

The Sand Pocket (ODOT standard in Region 1, 2, 3 and 5) shown above, PVC stub-out (Standard in Region 4) installations are required to provide sawn in loop wire access into junction boxes that are behind a curb or outside the edge of pavement. The stub-out conduit size is based on the number of loop wires contained within each of the conduits. Minimum conduit size is for loop wire access is 2" on all ODOT projects. The table on page 61 shows the number of loop feeders allowed in a conduit.

Preformed loop wires are less common and used in areas where a saw cut would not be suitable, such as a bridge deck or cracked or broken roadway surfaces. Preformed loops 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. Preformed loop wire returns enter directly into the back-of-curb box (junction box) without a sand pocket/street box/stub-out combination. See Standard Drawing **TM417** Option "A" or "B" and the examples below.



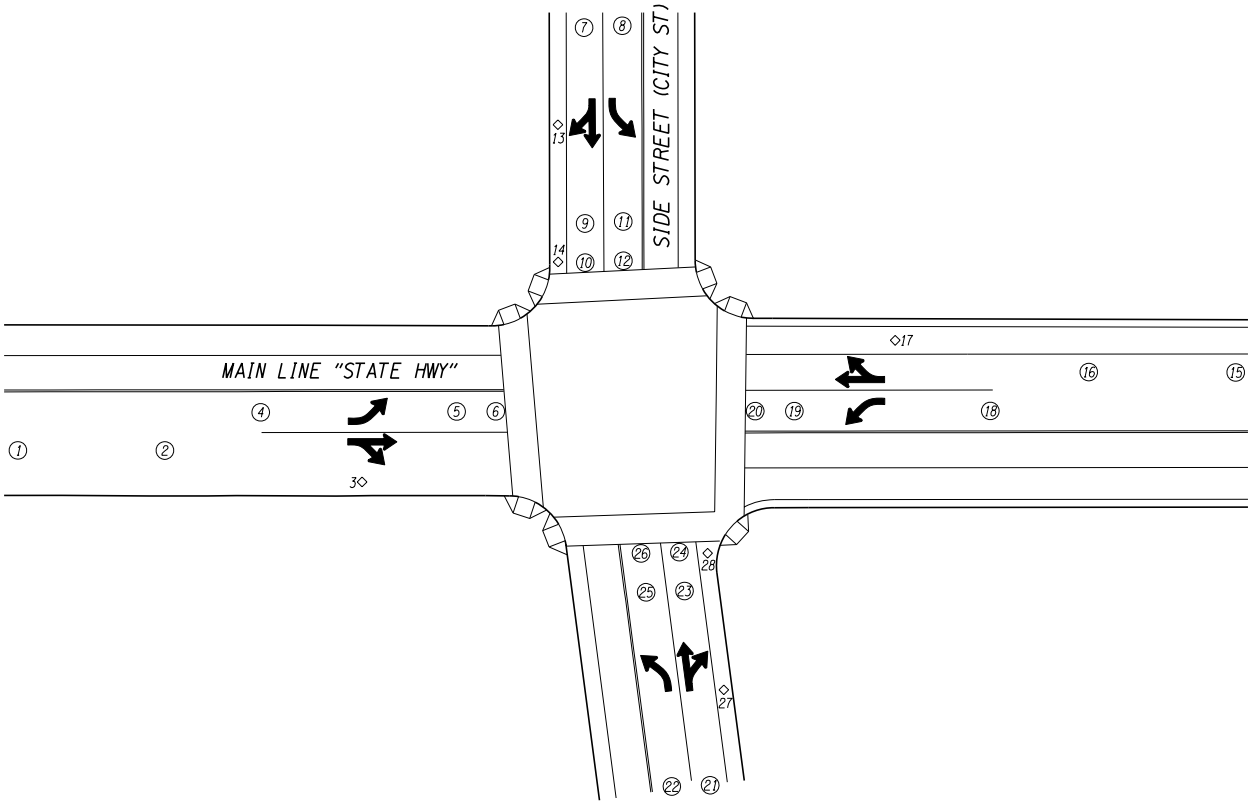
OPTION "A"



OPTION "B"

Loop Numbering

Number the loops starting from the back loops (in the outside lane, loop #1) for Phase 2 and working toward the stop bar, then clockwise around intersection in the same fashion and towards the stop bars as in the example below. Note that mainline loops are numbered before the adjacent left-turn phases, and Side Street numbering of loops is similar to mainline. Bicycle loops associated with the “through” phase are numbered after through phase loops. Loops to be wired in series shall be numbered sequentially to simplify the loop wiring diagram. See Loop Numbering example on page 62.



Loop wire returns are spliced to loop feeder cables only in the junction box (not in a street box). Individual advance loops require a separate loop feeder cable all the way to the controller cabinet for each loop. “Series loops” are spliced together in the junction box (see loops 5 and 6 above) to one loop feeder cable going all the way to the controller cabinet.

After all required loops have been laid out; the conduit sizes can be calculated by determining the loop wires and feeders that will be carried within each conduit. **ODOT's minimum conduit size for all signal installations is 1 1/2"**. The table below shows the number of loop wires and feeders allowed in each conduit size.

Loop Feeders Allowed in Conduit

Number Loop Feeders	Conduit Size (Inches)
1-2	1"
3-5	1½"
6-9	2"
10-13	2½"
14-21	3"

Loop Wires Allowed In Stub-Out Conduit

Number Of Loop Wires	Stub-Out Conduit Size (Inches)
1-4	2"
5-8	2½"

NOTE:

Mainline crossings for loop detector conduits and signal conduits shall be a minimum 2" diameter.

After placing each detector conduit bubble, identify the number of loop feeders contained in each section of the conduit for each phase. The upper half of the bubble will contain the designation "LF" for loop feeder or cable. The number and phase of cables will be shown in the lower half of the bubble.

The loop feeder bubble shown indicates two loop feeders for phase 6.

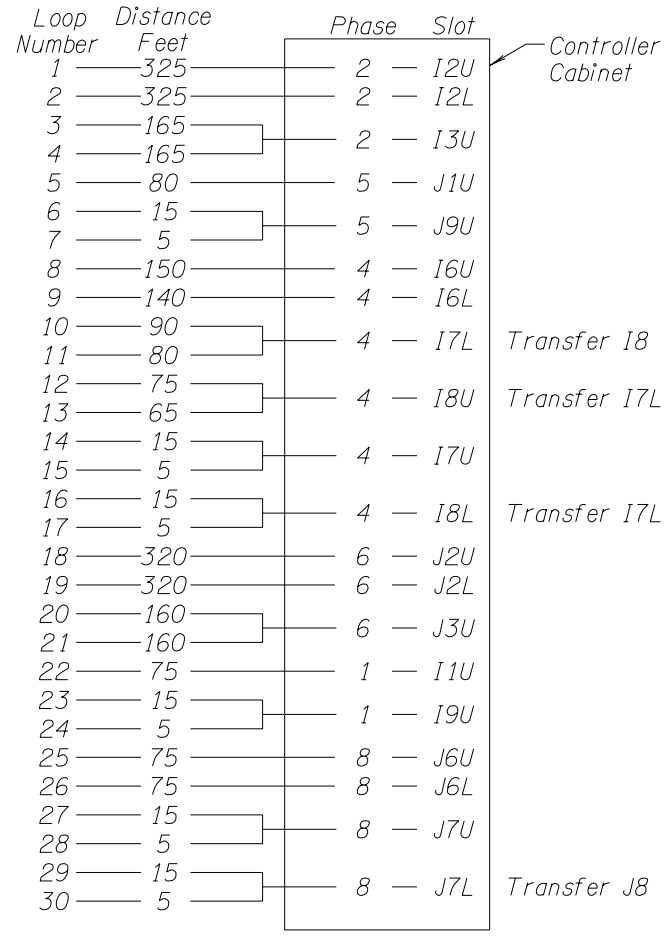
Bike loops on mainline are located 50 ft. in advance of the "Stop Line" and are numbered following the standard rotation for the mainline through (even numbered) phase. Bike loops on side streets are located 4' and 50' in advance of the "Stop Line" and are numbered following the standard rotation for the side street through (even numbered) phase. Both side street bike loops are cut and routed into the same junction box so they can be series-spliced to one loop feeder.

The bike loop bubble consists of "LB" over phase. The bubble shown indicates that it is a bike loop for phase 6.

Loop Wiring Diagram

A loop wiring diagram traces each loop by number back to the controller cabinet. The loop wiring diagram shows the loop that is served in the left-most column. The next column to the right shows distance in feet to the stop bar from the center of that loop. The rectangle shown in the loop wiring diagram represents the controller cabinet. When loops are spliced to join two loops together in a junction box, the wires are shown spliced on the outside of the rectangle. Phase and slot are shown inside of the rectangle (controller cabinet). The phase column shows the phase being served by which loop or loops. The slot column shows where the loop feeder will terminate in the back of the controller. The key to the “Slot” column designations is input file name, input file slot number, slot channel. “I2U” means input file “I”, slot number “2”, and “U” upper channel. Input call transfers are designated to the right of the “controller” rectangle and are a function of the signal controller software. Check with Region Traffic or Traffic Operations Section for the correct transfers for your intersection.

In the loop wiring diagram example below, loops 8, 9, 10, 11 and 13 are spaced according to Traffic Operations Section request because of the unique circumstances on this approach:



LOOP DETECTOR WIRING DIAGRAM

"Distance" is from Stop Line to center of loop in feet

Junction Boxes & Conduit

Junction boxes provide a location to branch circuits from the controller to the detector loops, signal poles, pedestrian poles and to interconnect other signals. They are also necessary for pulling wires through long conduit runs and provide a location for loop wire splices.

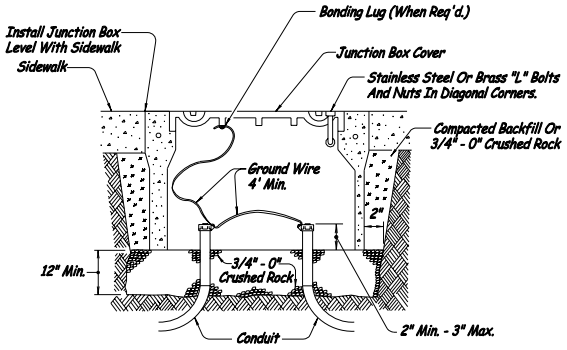
ODOT's standard practice is to place one JB-3 on the same corner as the controller. This will be the first junction box in the branch of the signal, detector and interconnect circuits. The remaining corners shall have a minimum of one JB-2 placed on each corner. Each leg of the intersection that will be served by detectors will also need junction boxes. Normally these can be JB-1's or JB-1A's. Junction boxes shall be spaced a maximum of 300 ft. between junction boxes on a conduit run.

The first junction box that a loop wire enters will be the only place that **a loop splice is allowed.**

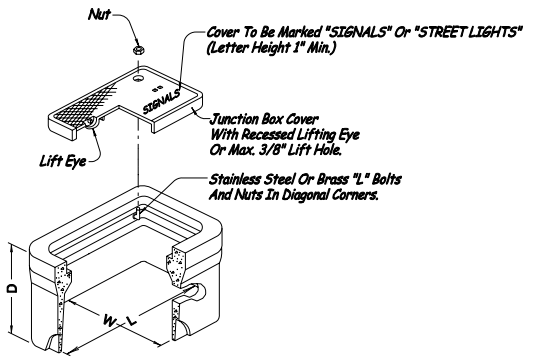
NOTE:

Loop wires will only be spliced to the intended loop feeders in the first junction box that they enter from the street. No other signal wires shall be spliced at any point in junction boxes.

Junction boxes that are placed in the sidewalk and at the back-of-curb that receive loop wires will require a conduit stub and a loop wire access point (sand pocket or PVC sleeve) as shown on Standard Drawing **TM417 and TM418** to provide access under the curb for sawn-in loops.

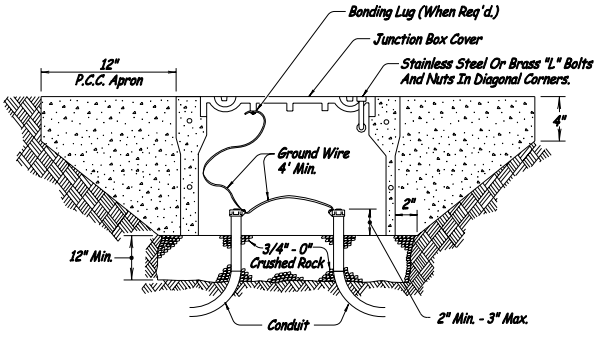


INSTALLATION IN SIDEWALK OR AT BACK OF CURB



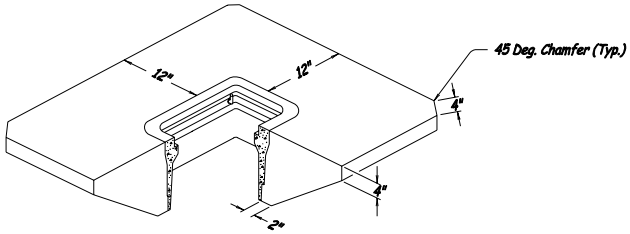
JUNCTION BOX

Not To Be Used In Travel Lanes, Shoulders Or Areas Exposed To Traffic. For Location And Junction Box Dimensions, See Plans.



INSTALLATION WITH PORTLAND CEMENT CONCRETE APRON

(For Incidental Travel Areas Only; Gravel Shoulders, Behind Guardrail, Etc.)



PORTLAND CEMENT CONCRETE APRON

(Approx. 7ft^3 Concrete In Neat Section)

NOTE:

Conduits And Preformed Loop Lead-Ins Always Enter Through The Bottom Of Junction Boxes.

Interconnect & Telephone

Multiple signal installations along a route may be coordinated to help provide an uninterrupted flow of traffic along that route. Coordination is achieved through an interconnect system from controller cabinet to controller cabinet. The standard is to use a “hard wire” system utilizing a multiple twisted pair shielded cable. One controller will be needed to serve as the master controller. Contact ODOT’s Traffic Operations Unit to determine which controller cabinet will serve as the master and how many controllers can be served by a master controller.

Any signal that is located in an urban area that has multiple signals in the vicinity may require an interconnect. Always contact Region Traffic to discuss the need for interconnection to the new signal.

ODOT’s standard is to install a shielded cable containing six twisted pairs of No. 19 AWG. solid wire in a 2” conduit to interconnect all other signal controllers. The 6-pair cable may be installed overhead using existing utility poles if approval from the utility is received. All interconnect cable installed overhead or in underground conduit shall be twisted 6-pair PE-39 (gel filled) interconnect cable.

The designer should take into account controller locations, detector conduit construction, and physical features of the roadway when deciding where to route the interconnect conduit between controller cabinets. By using detector and signal conduit trenches you can greatly reduce the quantity of trenching needed for the interconnect conduits.

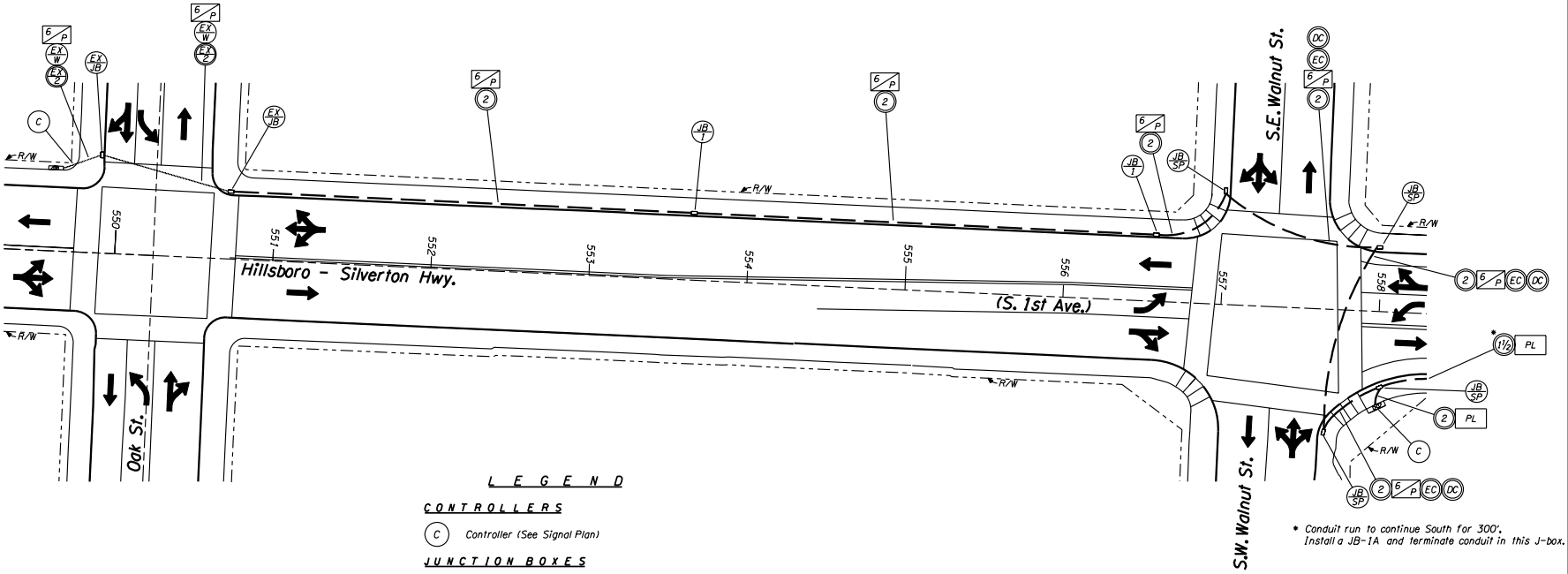
The **Interconnect Plan** is shown at a **scale of 80:1**. Show only the intersection base details, the controller cabinet, junction boxes from signal or detector plans, and the interconnect conduit and junction boxes. Use JB-1 or JB-1A or larger junction boxes. Large cast iron pull boxes (JB-6 or larger) shall be used in areas that are exposed to vehicular traffic.

The Region Traffic office may want a telephone connection provided into the controller cabinet. If a telephone connection is required, the Region Utility Specialist shall be contacted to locate where the nearest telephone access point is available. A land line (hard wire) is ODOT’s standard. Remote locations may require a cell phone. Always check with the Region Utility Specialist to determine if there is adequate cell coverage in the area.

Any additional equipment shall be included in the appropriate special provisions. See Standard Detail **DET4427** for typical controller cabinet cell phone details.

Page 65 shows an example of an interconnect plan.

INTERCONNECT PLAN
HILLSBORO-SILVERTON HWY. OAK ST. TO WALNUT ST.
OR. 219



* Conduit run to continue South for 300'. Install a JB-1A and terminate conduit in this J-box.

L E G E N D

C O N T R O L L E R S

- (C) Controller (See Signal Plan)

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

- (JB 1) Install 17" x 10" x 12" (min. dimension) precast concrete junction box
- (JB SP) Junction box (See Signal Plan)
- (EX JB) Retain and protect existing junction box

W I R E S

- (N/P) Install (N=number) twisted pair PE-39 (gel filled) interconnect cable
- [PL] Install poly pull line (225 ft/lb min-strength)

C O N D U I T S

- (S) Install (S=size) electrical conduit
- (EC) Electrical conduit (See Signal Plan)
- (DC) Detector conduit (See Detector Plan)
- (EX EC) Retain and protect existing electrical conduit

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

INTERCONNECT PLAN

Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE INTERCONNECT PLAN

Railroad Preemption

Railroad preemption is required if a traffic signal has an approach located within 215' of a railroad crossing. A railroad preempt phase is used to clear vehicles off of the railroad crossing at a signalized intersection. The preemption is triggered by the railroad controller that monitors the railroad tracks and detects an approaching train. This preemption impulse is sent to the signal controller cabinet via wiring from the railroad control cabinet. This wiring is provided by ODOT and consists of 8 - #12 wires. This wiring is used to connect the ODOT controller to the railroad controller.

ODOT's standard is a green clear-out. This works with a 'pedestrian inhibit' feature. During the preemption sequence, "WALK" indications are immediately advanced to flashing "DON'T WALK" then to steady "DON'T WALK" before the railroad / vehicle (simultaneous) preemption starts. This requires an advanced railroad detector to preempt the pedestrian indication before the simultaneous preempt input is received. During the simultaneous preempt input signal, all non-clearance phase(s) green(s) and pedestrian interval(s) will be truncated so the controller can advance to the clearance phase(s) to provide a green clear-out interval for the road approach crossing the railroad tracks. The timing of the pedestrian inhibit detector input signal in advance of the regular (simultaneous) detector is determined by a train speed and the longest conflicting pedestrian clearance time. The road authority supplies the railroad company with the Pedestrian Clear-Out Interval (P.C.O.I.) time needed based on the design characteristics of the intersection and the guidance given in the *"ODOT Railroad Preemption Design and Operations"* document.

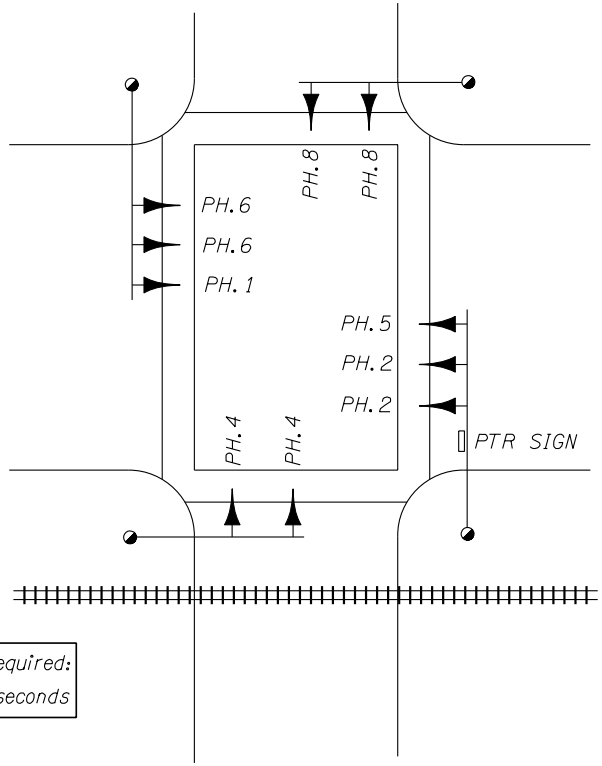
The road authority may submit an engineering study to the State Traffic Engineer to request a deviation from the standards. The State Traffic Engineer in consultation with the ODOT Rail Crossing Program Manager may authorize a signaled intersection operation consistent with the findings of the study. Optional Practices may be found in the (*ODOT Traffic Signal Policy and Guidelines*).

The Public Utilities Commission requires a separate plan sheet with the intersection and railroad crossing shown, along with a schematic drawing of pertinent signal equipment identified as to their phasing. A railroad preemption matrix must be included on the sheet.

Use the following criteria to design a matrix specific to your particular intersection and phasing. The upper table includes basic combinations of signal indications when the railroad preemption is initiated. Always begin the matrix with the intersection "start-up" phase in a green/walk condition (first vertical column) then each successive signal indication is shown in subsequent vertical columns. Do not include the possible left-turn/adjacent through lane signal indication, just show opposing lefts and concurrent through movements.

Each column then drops to a column in one of the lower tables which shows the successive changes in signal indications needed to produce the clear-out phasing called for. When this "clear-out" phase is complete, the cycle then drops out to a service cycle which precludes any phase that conflicts with the active railroad crossing. The signal returns to normal operation when the railroad preemption cycle is complete (railroad crossing opens back up). Examples are shown on the next two pages.

EXAMPLE ONLY



P.C.O.I. time required:
_____ seconds

6 PHASE

(PH. 4 & 8 CONCURRENT)

RAILROAD PREEMPTION SMTRIX

(GREEN CLEAR-OUT)

RETURN TO NORSML PHASE ROTATION AFTER PREEMPTION

SIGNAL INDICATION ACTIVE WHEN PED INHIBIT IS INITIATED

Ph. No.	NORSML PHASE ROTATION							
2	G	G	Y	R	R	R	R	R
6	G	G	Y	R	R	R	R	R
4	R	R	R	G	G	Y	R	R
8	R	R	R	G	G	Y	R	R
1	R	R	R	R	R	R	G	Y
5	R	R	R	R	R	R	G	Y
Ped. 2+6	W	FDW	DW	DW	DW	DW	DW	DW
Ped. 4+8	DW	DW	DW	W	FDW	DW	DW	DW
PTR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

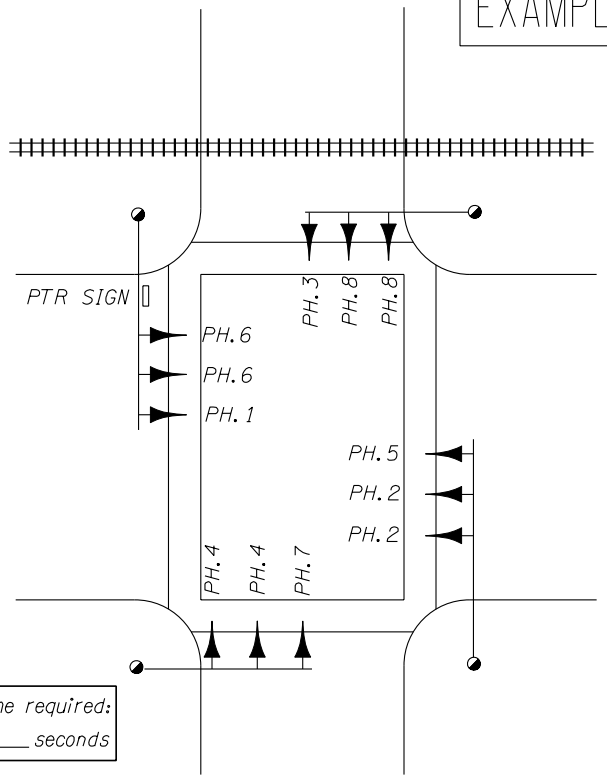
SIGNAL INDICATION ACTIVE WHEN RAILROAD PREEMPTION INITIATED

Ph. No.							
2	G	Y	R	R	R	R	
6	G	Y	R	R	R	R	
4	R	R	G	Y	R	R	
8	R	R	G	Y	R	R	
1	R	R	R	R	G	Y	
5	R	R	R	R	G	Y	
Ped. 2+6	FDW	DW	DW	DW	DW	DW	
Ped. 4+8	DW	DW	FDW	DW	DW	DW	
PTR	OFF	OFF	OFF	OFF	OFF	OFF	

2	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
6	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
4	R	R	R	Y	R	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
8	R	G	Y	G	G	Y	Y	R	G	Y	R	R	R	R	G	Y	R	G	Y	R	G	Y
1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R
5	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R
Ped. 2+6	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
Ped. 4+8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
PTR	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

SERVE ALL NON-CONFLICTING PHASES (PHASES 2, 5, & 6)

EXAMPLE ONLY



P.C.O.I. time required:
_____ seconds

8 PHASE

RAILROAD PREEMPTION SMTRIX

(GREEN CLEAR-OUT)

RETURN TO NORSML PHASE ROTATION AFTER PREEMPTION

SIGNAL INDICATION ACTIVE WHEN PED INHIBIT IS INITIATED

Ph. No.	NORSML PHASE ROTATION									
2	G	G	Y	R	R	R	R	R	R	R
6	G	G	Y	R	R	R	R	R	R	R
3	R	R	R	G	Y	R	R	R	R	R
7	R	R	R	G	Y	R	R	R	R	R
4	R	R	R	R	R	G	G	Y	R	R
8	R	R	R	R	R	G	G	Y	R	R
1	R	R	R	R	R	R	R	R	G	Y
5	R	R	R	R	R	R	R	R	G	Y
Ped. 2+6	W	FDW	DW	DW	DW	DW	DW	DW	DW	DW
Ped. 4+8	DW	DW	DW	DW	DW	W	FDW	DW	DW	DW
PTR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

SIGNAL INDICATION ACTIVE WHEN RAILROAD PREEMPTION INITIATED

Ph. No.									
2	G	Y	R	R	R	R	R	R	
6	G	Y	R	R	R	R	R	R	
3	R	R	G	Y	R	R	R	R	
7	R	R	G	Y	R	R	R	R	
4	R	R	R	R	G	Y	R	R	
8	R	R	R	R	G	Y	R	R	
1	R	R	R	R	R	R	G	Y	
5	R	R	R	R	R	R	G	Y	
Ped. 2+6	FDW	DW	DW	DW	DW	DW	DW	DW	
Ped. 4+8	DW	DW	DW	DW	FDW	DW	DW	DW	
PTR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	

SERVE ALL NON-CONFLICTING PHASES (PHASES 1,2,3,& 6)

2	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
6	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
3	R	R	R	Y	R	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
7	R	G	Y	G	G	Y	Y	R	G	Y	R	G	Y	Y	R	G	Y	R	G	Y	R	G	Y	R
4	R	G	Y	R	G	Y	R	G	G	Y	G	G	Y	Y	R	G	Y	R	G	Y	R	G	Y	R
8	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y
5	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Ped. 2+6	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
Ped. 4+8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
PTR	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON

Flashing Beacons

Intersection Control Beacons are used at intersections to control all directions of travel. They are intended to be used where traffic or physical conditions do not justify conventional traffic signals but where indication of unique roadway conditions is needed.

Flashing beacons can be one or more sections of a standard traffic signal head, having flashing red or yellow circular indications in each face (12" heads are the ODOT standard). Flashing yellow beacons may also be used as Hazard Identification on Speed Limit Signs, Stop Signs, or for Intersection Control. See Section 4K of the MUTCD for further information.

For two-way stop control, locate (12") beacons such that yellow circular indications are visible on the major roadway, and red circular indications for the side approaches. Where an all-way stop is warranted, circular red shall be used on all approaches. A stop sign shall be used on each approach having a red Intersection Control Beacon.

The beacon should be clearly visible for a distance of at least ¼ mile under normal atmospheric conditions. Clearances above the pavement are the same as for 3-section signal heads, 18' minimum 19' maximum.

Standard practice is to mount the flashing beacons on a mast arm pole. The beacons for all directions can then be mounted on a single mast arm. Strain poles and span wires can also be used if the intersection is too wide to be accommodated by a mast arm pole. Mast arm poles can be placed with arms oriented diagonally across the intersection. This may help to place the heads as close to the center of the intersection as possible. If strain poles are used, standard practice is to place two strain poles at opposite corners (diagonally) across the intersection. A tether cable is not required for flashing beacon installations.

For one or two lanes, an Intersection Control Beacon should be suspended over the center of each lane, with the color assigned as in the previous paragraph. For three lanes, a beacon is located over each lane line.

A Base Mounted Cabinet with Flasher option (BMCF) controls the operation. See Standard Drawing **TM425** for the wiring diagram. ODOT uses a Model 204 Flasher, which provides two alternating flash circuits. The Flasher Cabinet contains a dimmer circuit controlled by a photoelectric control relay to provide dimming during nighttime operation. Beacons are typically wired with one 2-conductor #14 AWG control cable for each direction (flash circuit). The cabinet and meter service should be mounted on a BMC (preferred). If the power is to be run overhead to a strain pole, the power service shall run in through a weatherhead mounted on the strain pole.

The next three pages show examples of a two types of flashing beacon installations. Page 70 shows an example of a "pole entrance chart" for a flashing beacon installation.

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

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

(Plotypus sheet scale 1:1200 English) For a signal plan at a scale of 20:1 Scale Reference file up by 5 times.

FLASHING BEACON INSTALLATION PLAN LEGEND
I.O.N. HWY
OR. 95 AT M.P. 20.52 AND M.P. 20.48

L E G E N D

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

(EX/1) Retain and protect existing power pole (Power source)

S I G N A L S

(FR/S) Install (S=size) inch flashing red beacon

(FY/S) Install (S=size) inch flashing yellow beacon

S I G N S

(AL/SP) Install aluminum (48" X 48", Type "Y1" diamond grade sheeting) "CURVE" Symbol sign (W1-9L) (Sign No. 1)

C A B I N E T S

(TC) Install terminal cabinet

(BMCF) Install base mounted flasher cabinet, 120/240 volt metered, for flashing beacons

W I R E S

(N/G) Install (N=number) No. (G=AWG wire size) type THWN wires

(N G) Install (N=number) No. (G=AWG wire size) type XHHW wires

C O N D U I T S

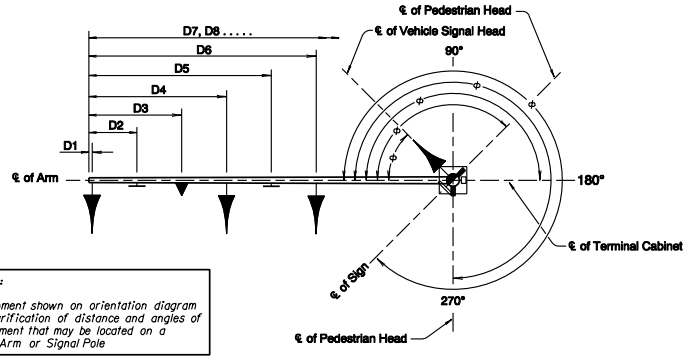
(S) Install (S=size) inch electrical conduit

(W) Install conduit and wire as required by power company

M I S C E L L A N E O U S

(PE/T) Install photocontrol electronic relay on pole, as per T.M.S. Drg. No. TM465

A = Standard pulmbizer
B = Adjustable sign bracket assembly



NOTE:
Equipment shown on orientation diagram is clarification of distance and angles of equipment that may be located on a Mast Arm or Signal Pole

MAST ARM POLE ORIENTATION DIAGRAM

POLE ENTRANCE CHART

		See TM650 Thru TM653	EQUIPMENT ON POLE					EQUIPMENT ON MAST ARM (Length in Feet and Equipment Type)							FOUNDATION INFORMATION (See Std. Drg. TM653)	
POLE NO.	DWG. NO.	TYPE	PED. SIGNAL DEG.	TERM. CABINET DEG.	SIGN DEG.	TRAFFIC SIGNAL DEG.	PHOTO ELECTRIC CELL	ARM LENGTH	D1	D2	D3	D4	D5	D6	D7	FOUNDATION NUMBER	REQUIRED FOUNDATION DEPTH
1	0	SM-5		180			180	50	0.50 FY12	5.41 SA	10.33 FY12	____	____	____	____	0	0

FY12 = Use A Single Section Head W/12" Yellow Lens And Backboard As A Flashing Beacon (See Std. Dwg. TM460)
SA = Sign, 48" x 48" Aluminum (See Std. Dwg. TM465)

NOTE:
See T.R.S. Dwg. 00000 for flashing beacon Plan

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON JULY 11, 2000 XXXXX X. XXXXXX Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

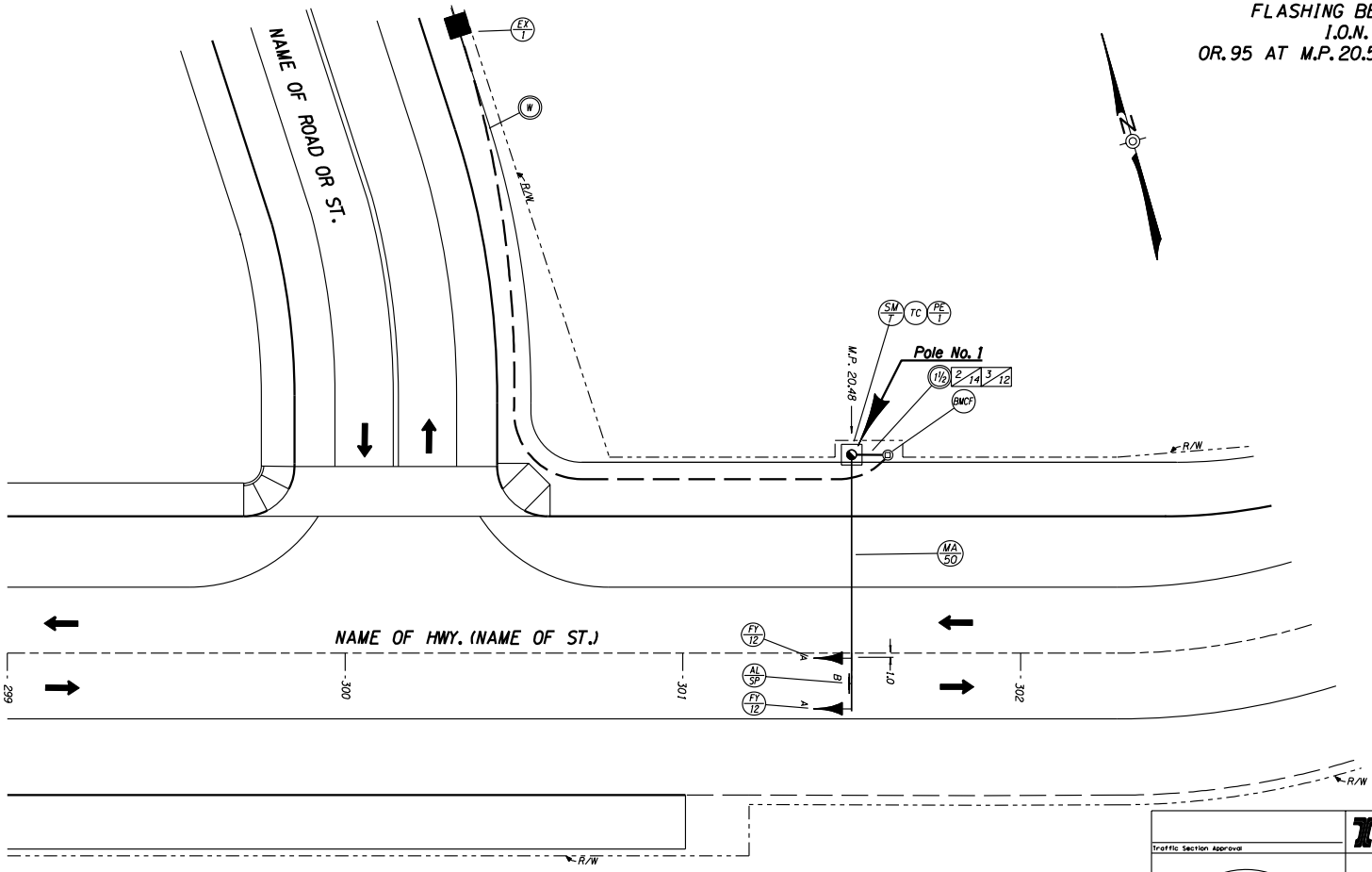
ACCOMPANIED BY DWGS. ____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ and T.R.S. Dwgs 00000 - 00000

FLASHING BEACON INSTALLATION PLAN LEGEND

STR. NO. 000 T.R.S. DWG. NO. 00000

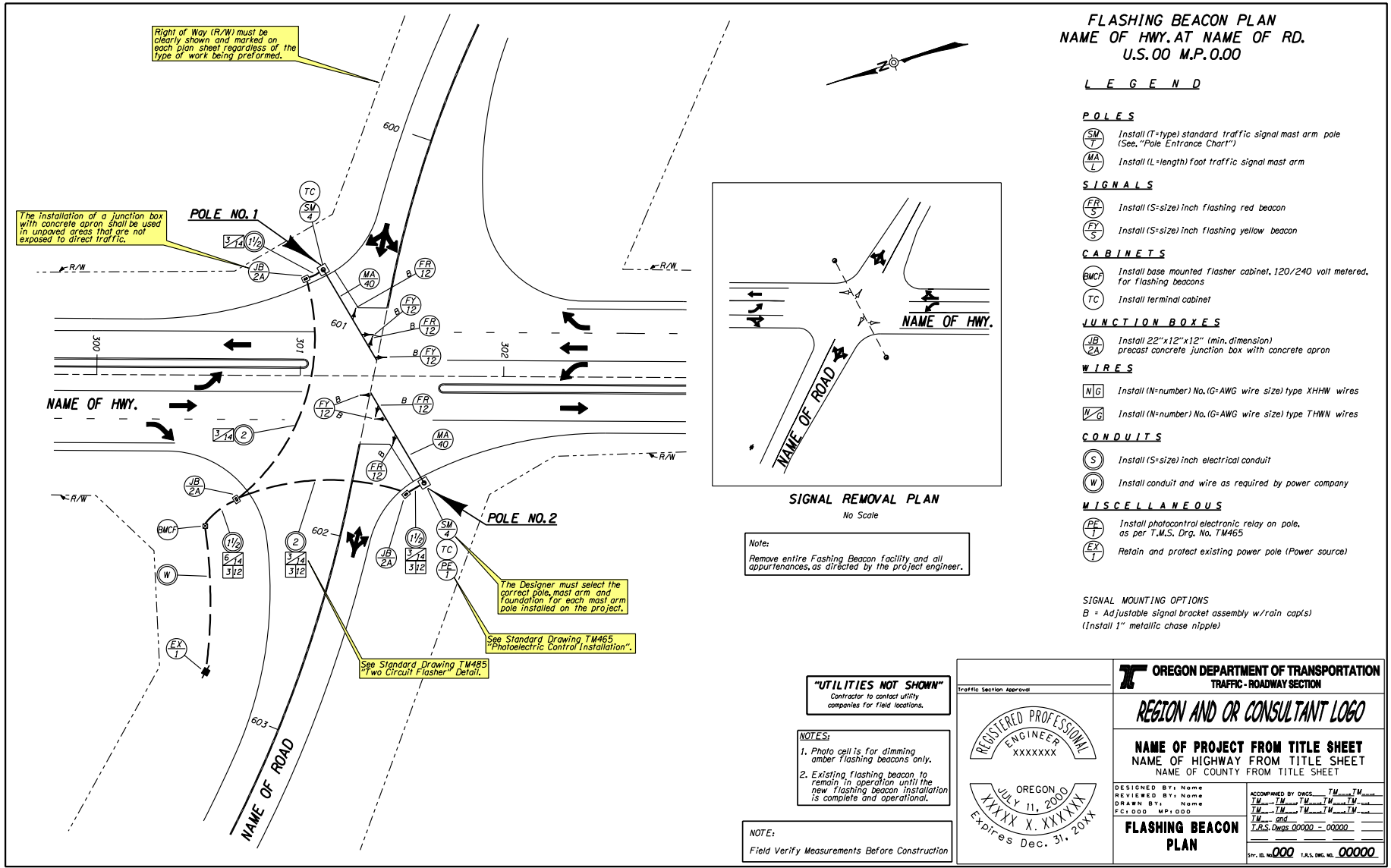
THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE FLASHING BEACON INSTALLATION PLAN LEGEND AND POLE ENTRANCE CHART



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE FLASHING BEACON INSTALLATION PLAN



SIGNAL REMOVAL PLAN

No Scale

Note:

Remove entire Fashing Beacon facility and all appurtenances, as directed by the project engineer.

FLASHING BEACON PLAN
NAME OF HWY. AT NAME OF RD.
U.S. 00 M.P. 0.00

L E G E N D

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

S I G N A L S

- FR/S — Install (S=size) inch flashing red beacon
- FY/S — Install (S=size) inch flashing yellow beacon

C A B I N E T S

- BMCF — Install base mounted flasher cabinet, 120/240 volt metered, for flashing beacons
- TC — Install terminal cabinet

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

- JB/2A — Install 22"x12"x12" (min. dimension) precast concrete junction box with concrete apron

W I R E S

- N/G — Install (N=number) No. (G=AWG wire size) type XHHW wires
- N/G — Install (N=number) No. (G=AWG wire size) type THWN wires

C O N D U I T S

- S — Install (S=size) inch electrical conduit
- W — Install conduit and wire as required by power company

M I S C E L L A N E O U S

- PE/T — Install photocontrol electronic relay on pole, as per T.M.S. Drg. No. TM465
- EX/T — Retain and protect existing power pole (Power source)

SIGNAL MOUNTING OPTIONS

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

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

NOTES:

1. Photo cell is for dimming amber flashing beacons only.
2. Existing flashing beacon to remain in operation until the new flashing beacon installation is complete and operational.

NOTE:

Field Verify Measurements Before Construction

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON JULY 11, 2000 XXXXX X. XXXXXX Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

FLASHING BEACON PLAN

ACCOMPANIED BY DWGS. TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ TM____ and T.R.S. Dwgs 00000 - 00000

STR. ID. NO. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE FLASHING BEACON INSTALLATION WITH FLASHING BEACON REMOVAL DIAGRAM

Temporary Traffic Signals

Temporary signals are intended to be short-term installations, yet their appearance, design and operation are held to the same standards as permanent signals. Motorists expect the same meaning and security from temporary traffic signals as they do from permanent traffic signals, so the installation must meet all applicable MUTCD and ODOT standards. Some guidance can be found in the **"*Oregon Standard Specifications for Construction 2002"*** and the special provisions **"*Section 225.15*"**, shown below:

00225.15 Temporary Traffic Signals - Materials for temporary traffic signals shall conform to Sections 00960, 00990, 02920 and the following:

> **(a) General** - Used materials are permitted except if noted on the plans. Do not use permanent signal equipment as part of the temporary signal installation.
>
> **(b) Cable and Wire** - Use all new cable and wire.
>
> **(c) Wood Poles** - Poles shall be able to support the dead load of the equipment shown and withstand a wind load of 40 m/s (90 mph).
>
> **(d) Traffic Signal Control Devices** - Use new, or like-new, Model 170 controllers and cabinets. Cabinets shall meet the minimum requirements of 02920.40. Repair all damage before delivery to the Project. Maintain a minimum of 600 mm (2 feet) and a maximum of 1800 mm (6 feet) of clearance between the bottom of a pole mounted temporary controller and the ground beneath it, except when work next to the pole is affecting this clearance.

The controller program, PROM will be furnished by the Agency.

When the temporary signal is removed, return the PROM to the Agency.

There are two typical design categories that most temporary signals will fit into. The first is a temporary signal on a bridge during a rehabilitation project. This type of temporary signal alternates traffic across the bridge one direction at a time in a single lane. . Considerations to include when beginning the design are the location of the bridge in relation to on coming traffic and any other accesses within the intersection. All accesses within the "intersection" must be signalized.

The second category is the modification or replacement of an existing signalized intersection. If the new signal can't be built without impacting the existing signal, a temporary signal is required to control the intersection during construction of the new signal. Communication with the roadway designer on this issue is critical.

Another condition that would require a temporary signal plan at a signalized intersection could be the temporary re-alignment of the signal heads to accommodate traffic during construction of a project in the vicinity of the traffic signal.

Temporary signals are typically designed using span wires on wood poles. Equipment such as fire preemption detectors and pedestrian pushbuttons should be evaluated according to their need, and may not automatically be included in the design. Vehicle detection loops are normally used if the signal will not be operated in “fixed time” cycles. Video and microwave detectors have been used in situations where detection is needed and numerous staged lane shifts are expected.

When designing any temporary signal keep in mind you may need to adjust the signal heads and loops for various stages of construction. Signal designers should coordinate their work early in the process with the traffic control designer assigned to the project and Region Traffic (or the Operations Unit). This will assure correct operation of the temporary signal and safe traffic control during the construction phase.

Temporary signals will require modeling of the signal pole, span wires and signal heads that are proposed to pass over the roadway cross section. Cross sections shall be cut and used to design all temporary signal installations. Particular attention shall be given to all cross section areas that have poles and signal heads in the adjacent area. The bottom of the signal heads must not be below 18’ or above 19’ during any phase or stage of construction.

The design procedure for a temporary signal shall follow the same standards and guidelines that would be used for a permanent signal.

Presently, all wood poles are to be considered non-standard or “X” poles. It is the contractor’s responsibility to submit the wood pole certifications to ODOT’s Traffic Structures Engineer for review before construction begins. It is the temporary signal designer’s responsibility to give the attachment height “AH” on the contract plans “Pole Entrance Chart” so that the contractor can obtain the correct length of wood pole.

Temporary signal details are shown on Standard Drawing, **TM400** and **TM401**.

The next three pages show a temporary signal installation including a pole entrance chart for a bridge reconstruction project.

TEMPORARY SIGNAL & DETECTOR PLAN LEGEND
SOME OREGON HWY.
U.S.00 AT M.P.00.00

Use 336 pole mounted controller on Temporary Traffic Signal Installations

Add:
(Mount on Temp.Sign Support as shown on Std.Dwg.RD911) to the standard AL/9 Note as shown in the example.

Use of junction boxes without aprons in non-paved areas will be allowed on short term temporary signals

L E G E N D

C O N T R O L L E R S

(C/336) Install model 170E/HC11 controller in a model 336 pole mounted cabinet & control equipment

P O L E S

(WPX) Install special (X = non-standard) treated wood pole (See, "Pole Entrance Chart")

(AN) Install back guy and anchor(s)

(EX/1) Retain and protect existing power pole (Power source)

S I G N A L S

(V/Ph) Install phase (Ph=phase) vehicle signal

S I G N S

(AL/9) Install aluminum (24"x36", type "W1") "STOP HERE ON RED" with arrow sign (R10-6)
(Mount on Temp. Sign Support as shown on Std.Dwg.RD911)

C A B I N E T S

(TC) Install terminal cabinet

(MS) Install 120/240 volt meter base

(SC) Install service cabinet, 120/240 volt, for signal system

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

(JB/1) Install 17" x 10" x 12" (min. dimension) precast concrete junction box

L O O P S

(LD/Ph) Install phase (Ph=phase) 6' round vehicle detector loop

(SP/S) Install 6" max. sand pocket block-out with (S=size) conduit to junction box

W I R E S

(38) Install galv. steel 3/8" messenger and 1/4" tether cables

(39) Install 3/8" galv. steel messenger cable

(X-N/G) Install (X=number of cables) control cables with (N=number) No. (G=AWG wire size) conductors

(N/LW) Install (N=number) pair of loop wires

(N/G) Install (N=number) No. (G=AWG wire size) type THWN wires

C O N D U I T S

(S) Install (S=size) electrical conduit

(W) Install conduit and wire as required by power company

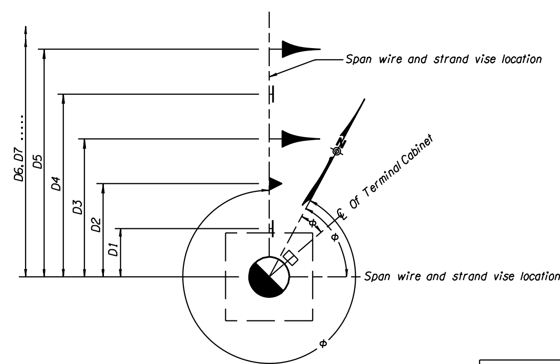
SIGNAL HEAD TYPES
2 = 12" R, 12" Y, 12" G

P O L E E N T R A N C E C H A R T

DWG. NO.	TYPE (FROM)	POLE NO. (FROM)	POLE NO. (TO)	CABLE "AH" (FROM) POLE (See TM455)	CABLE "AH" (TO) POLE (See TM455)	EQUIPMENT ON POLE: PED. SIGNAL DEG.	TERM. CABINET DEG.	SIGN DEG.	TRAFFIC SIGNAL DEG.	PHOTO ELECTRIC CELL	EQUIPMENT ON SPAN WIRE (Length in Feet and Equipment Type): D1	D2	D3	D4	D5	D6	D7	D8	FOUNDATION INFORSMTION (See Std. Drg. TM636): FOUNDATION NUMBER	REQUIRED FOUNDATION DEPTH
X	WPX	1	2	30.0	32.5						35.5 VS2	45.5 VS2	96.0 POLE 2	—	—	—	—	—		
X	WPX	2	3	32.5	29.0						—	—	—	—	—	—	—	—		
X	WPX	3	4	29.0	29.0						—	—	—	—	—	—	—	—		
X	WPX	4	5	29.0	29.0						—	—	—	—	—	—	—	—		
X	WPX	5	6	29.0	41.5						—	—	—	—	—	—	—	—		
X	WPX	6	7	41.5	40.0						58.5 VS2	68.5 VS2	101.0 POLE 6	—	—	—	—	—		
X	WPX	7	8	40.0	29.0						—	—	—	—	—	—	—	—		
X	WPX	8		29.0							—	—	—	—	—	—	—	—		

MESSENGER CABLE MOUNT NOTE:
V2S = Traffic Signal Type 2, Messenger Cable Mount (See Std. Dwg. TM463)

POLE CLASS NOTE:
Class of pole to be field verified



STRAIN POLE ORIENTATION DIAGRAM

NOTE:
Equipment shown on the orientation diagram is a clarification of angles of equipment that may be located on a Strain Pole

NOTE:
See T.R.S. Dwg. 00000 & 00000 for signal and detector plan

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

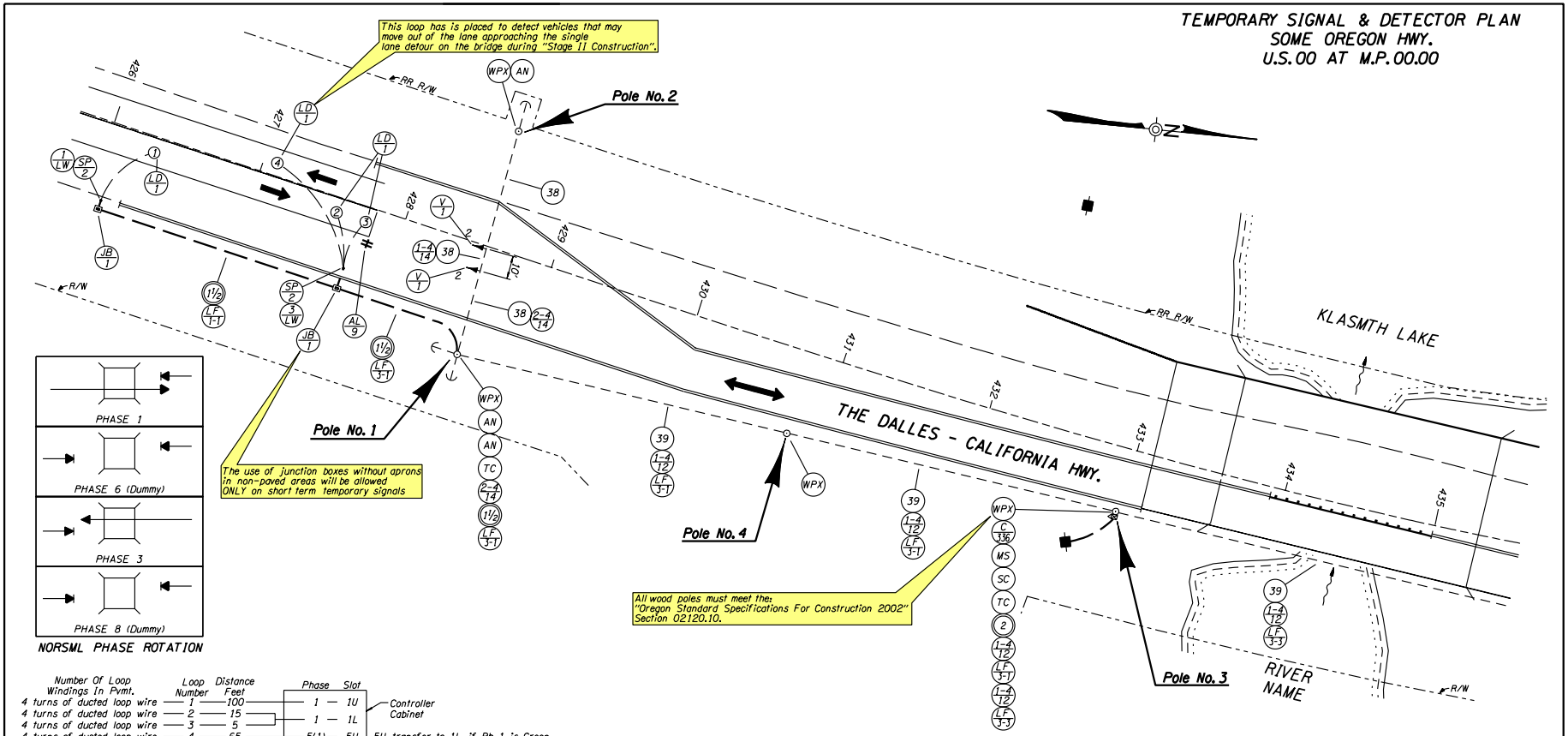
DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

ACCOMPANIED BY DWGS. TM___ TM___
TM___ TM___ TM___ TM___ TM___
TM___ TM___ TM___ TM___ TM___
TM___ and
T.R.S. Dwgs 00000 - 00000

SIGNAL LEGEND & DETAILS

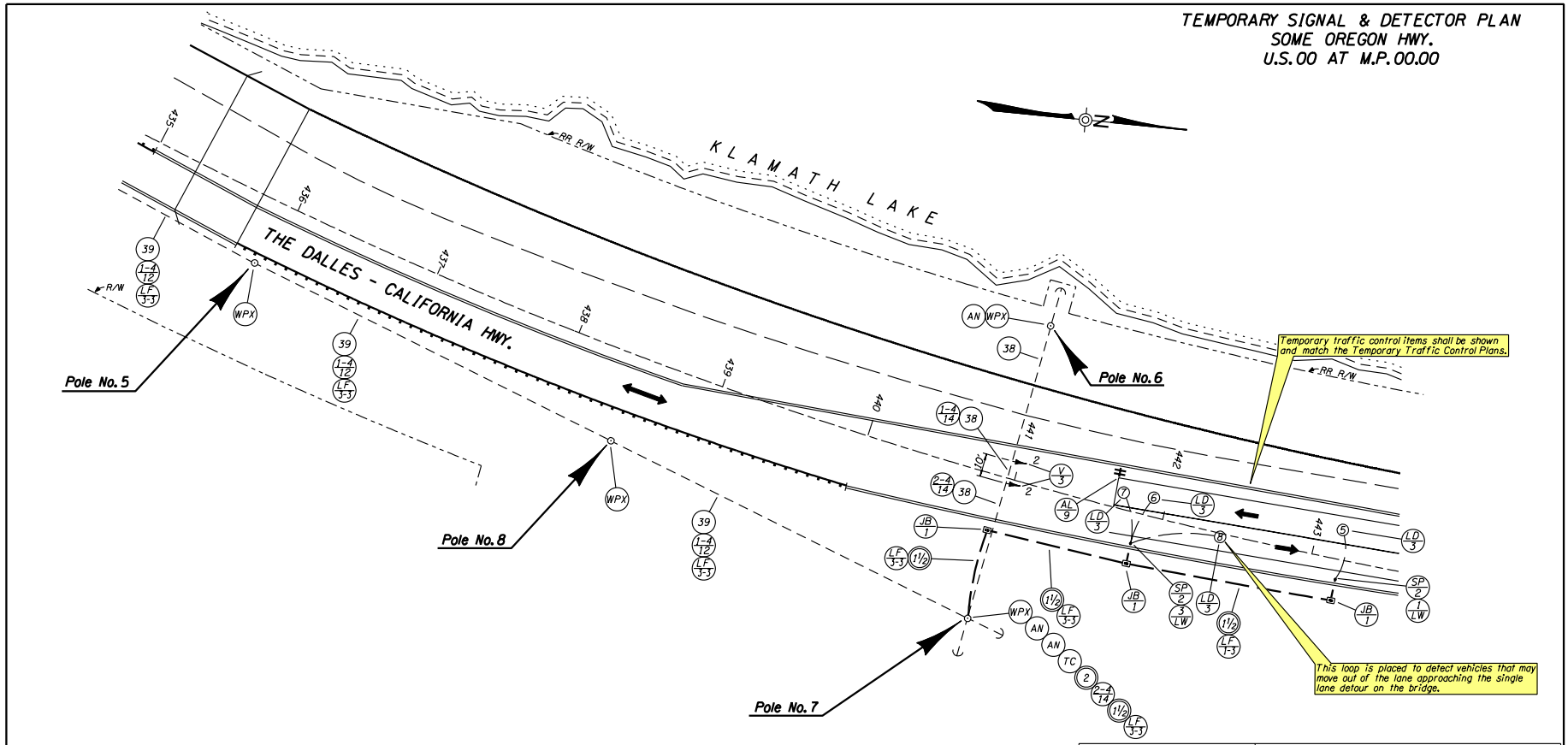
Str. ID. No. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME **SAMPLE TEMPORARY SIGNAL & DETECTOR PLAN LEGEND WITH POLE ENTRANCE CHART**



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE TEMPORARY SIGNAL & DETECTOR PLAN



GENERAL NOTES:

1. Accommodate all aerial and buried utilities such that existing facilities are preserved
2. Minimum 10' spacing between signal heads
3. 4' minimum clearance between wood poles and guardrail.

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

NOTE:
See T.R.S. Dwg. 00000 for Legend

NOTE:
Field Verify Measurements Before Construction

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

TEMPORARY SIGNAL & DETECTOR PLAN

STR. ID. NO. 000 T.R.S. DWG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE TEMPORARY SIGNAL & DETECTOR PLAN

Ramp Metering

Ramp meters are used to control the frequency of traffic entering a highway facility.

Ramp control signals are placed far enough down a ramp to provide reasonable storage but not so near the highway that a physical hazard is introduced to the system. The presence of an exclusive acceleration lane or a downhill vertical grade allows installation nearer the highway, while an abrupt merge or an uphill vertical grade will require additional space between the meter and the merge point. Check with the roadway designer to locate the ramp meter signal(s) at the correct location.

A single-lane ramp requires a signal installation to the left side of the ramp and a dual-lane ramp will require a signal installation on each side. This signal installation consists of a twelve-foot high vehicle pedestal with a three-section head, a "STOP HERE ON RED" aluminum sign, a two-section head (red and green), and a "ONE VEHICLE PER GREEN" aluminum sign. See Standard Drawings **TM432** and **TM433**.

An alternative dual-lane design consists of a mast arm pole with both three-section heads and a "ONE VEHICLE PER GREEN" aluminum sign 60 ft. beyond the stop line with a vehicle pedestal, "STOP HERE ON RED" aluminum sign at each side of the stop line.

Occasionally a single-lane ramp will have abbreviated dual-lane striping at the ramp meter stop line to encourage two-lane storage. This particular treatment requires a dual lane meter with the addition of "FORM 2 LINES" part-time restriction signs upstream from the anticipated queue length.

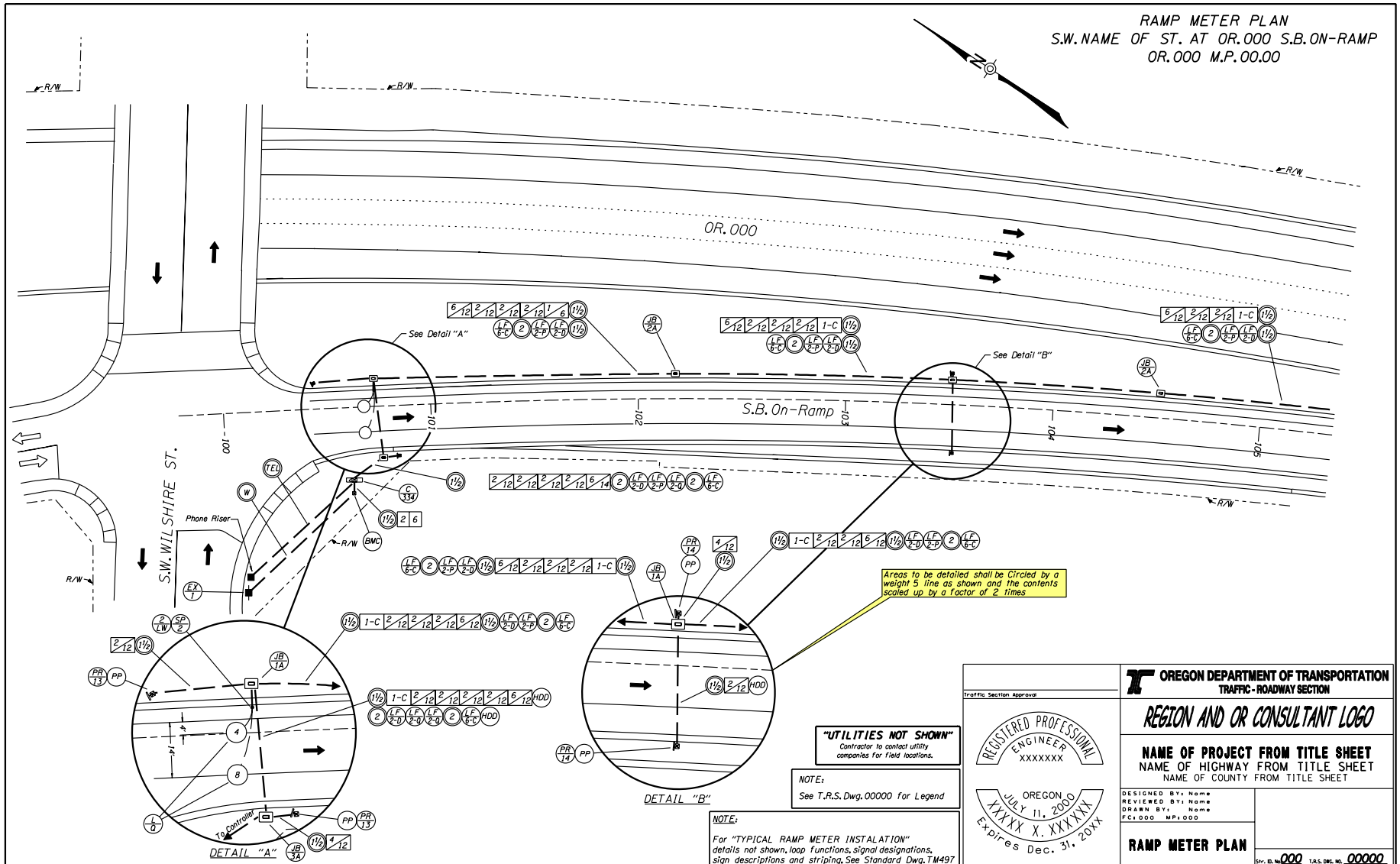
The entrance to the ramp shall display "RAMP SIGNAL ON" part-time restriction signs visible to each legal move that enters the ramp. These signs shall be displayed to provide warning before the motorist commits to entering the ramp, allowing the motorist to seek an alternate route if desired.

All ramp metering devices are controlled by a model 170 controller in a model 334 ground-mounted cabinet. The cabinet is located near the ramp meter itself for maintenance and operations convenience.

Include a maintenance landing pad for maintenance vehicle access near the controller (See Standard Drawing **TM434**).

A loop wiring diagram traces each loop feeder from the splice with the loop wires to the controller. Each loop feeder cable wired to the controller cabinet terminals is shown in the loop wiring diagram with phase served (if applicable), intended functions, and loop amplifier slot and channel.

The next two pages show an example set of plans to help guide you're drafting and design.



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE RAMP METER PLAN

The "Loop Detector Wiring Diagram" for ramp meter installations shows the distance from the painted gore and not the stop bar. This diagram also has an additional column for the function of each loop.

Loop Number	Distance Feet From Painted Gore	Phase	Function	Slot
1A	322		C	6L
1B	300		C	6U
2A	322		C	7L
2B	300		C	7U
3A	322		C	8L
3B	300		C	8U
4	900	1	Q	2U
5	366	1	D	4L
6	353			
7	337	1	P	4U
8	900	2	Q	3L
9	366	2	D	5L
10	353			
11	337	2	P	5U

Controller Cabinet

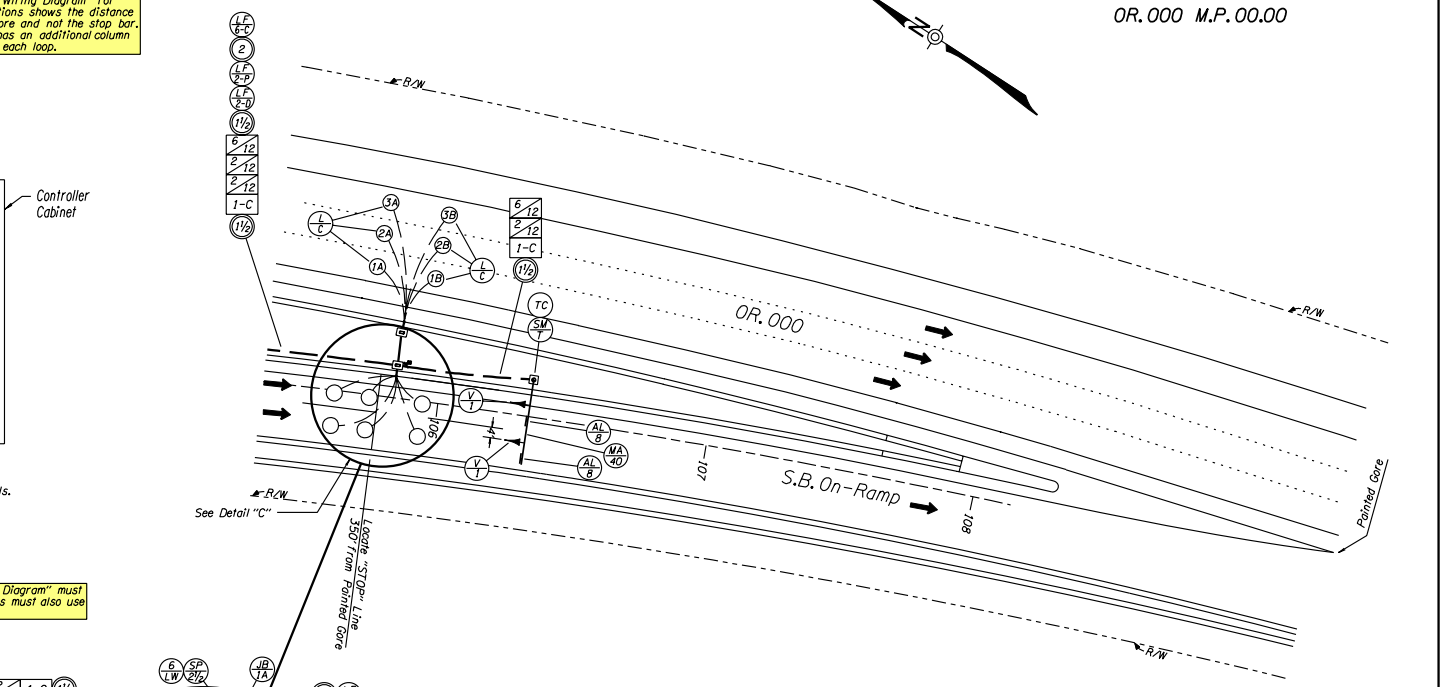
LOOP DETECTOR WIRING DIAGRAM

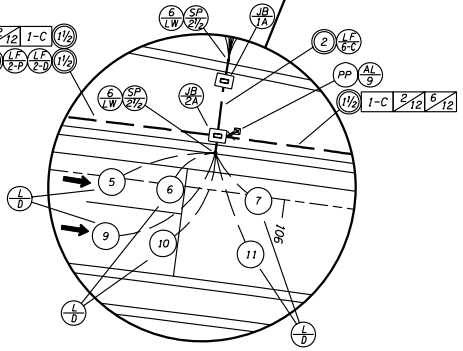
C=Count, P=Passage, D=Demand, Q=Queue

See Std. Drg. No. TM129 and TM478 for loop detector details.
Center all loops in travel lanes or as shown on plan.

The "Loop Detector Wiring Diagram" must for ramp meter installations must also use the note above.

RAMP METER PLAN
S.W. NAME OF ST. AT OR. 000 S.B. ON-RAMP
OR. 000 M.P. 00.00





DETAIL "C"

"UTILITIES NOT SHOWN"
Contractor to contact utility companies for field locations.

NOTE:
See T.R.S. Dwg. 00000 for Legend

NOTE:
For "TYPICAL RAMP METER INSTALATION" details not shown, loop functions, signal designations, sign descriptions and striping, See Standard Dwg. TM497

Traffic Section Approval

REGISTERED PROFESSIONAL ENGINEER
XXXXXXX
OREGON
JULY 11, 2000
XXXXX X. XXXXXX
Expires Dec. 31, 20XX

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC - ROADWAY SECTION

REGION AND OR CONSULTANT LOGO

NAME OF PROJECT FROM TITLE SHEET
NAME OF HIGHWAY FROM TITLE SHEET
NAME OF COUNTY FROM TITLE SHEET

DESIGNED BY: Name
REVIEWED BY: Name
DRAWN BY: Name
FC: 000 MP: 000

RAMP METER PLAN

Str. ID. No. 000 T.R.S. DRG. NO. 00000

THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME

SAMPLE RAMP METER PLAN

Alternate Detection

While loop detectors are the ODOT standard, there might be exceptional circumstances where alternate vehicle detection equipment is a more logical choice. Options include video cameras, 3M “microloops”, and radar or microwave detectors. Requests to use alternate devices should be made in writing to the ODOT Traffic Design Standards Engineer. Check with the Traffic Engineering and Operations Section for the approved models or types.

Video Cameras

Camera systems can provide many features loops cannot, such as incident monitoring and creating new detection zones anywhere in the field of view. They are non-destructive to the roadway surface and can cut traffic control costs when replacement is needed. They also have shortcomings. Sun angle, shadows, rain, fog, dust, and power spikes can cause problems. Heated and pressurized enclosures are recommended.

Camera mounting location is the primary factor for successful operation. Cameras should be mounted on as stable a fixture as possible. For most state highways, cameras should be able to view 450 ft. if mounted at 45 ft. typical mounting is on a luminaire arm. Be sure the maintaining agency can reach the camera with a bucket truck. Accurate vehicle detection is optimized by placing the camera directly over the lane(s) it will be monitoring. Otherwise, occlusion may cause false or missed calls. (Some occlusion may be unavoidable.) Detection zones should be based on speed and convention. Each detection zone should be adequately illuminated for detection at night.

Microloops

Made exclusively by 3M, microloops are a non-invasive conduit system installed by boring under the pavement, whereby sensors are positioned beneath the travel lanes. The boring requires sizeable work areas on either side of the roadway.

This is rather expensive, but can cut traffic control costs significantly when replacement of detection is necessary. A useful application would be multilane highways.

Microloops allow for easy adjustment when adding or moving lanes. Another application is on structures where cutting loops in the deck is not an option. A site survey of intended locations with specialized magnetic field sensing equipment needs to be conducted to confirm efficacy of this sensor.

Microwave Sensors

Microwave sensors use radar to detect the passage of vehicles. Manufacturers claim they are not affected by weather, and require little or no maintenance. Some manufacturer's sensors can be mounted for either perpendicular or head-on detection. Some are designed to monitor traffic in both directions at once. Most units provide directional detection. The unit should be mounted per the manufacturer’s recommendation. These sensors have many possible applications, such as vehicle detection, incident detection, vehicle counting, classification, and activation of warning signs.

10

Specifications and Bid Items

The Specifications

Two separate documents are needed to complete the specifications:

The **"*Oregon Standard Specifications For Construction* 2002"** and project specific special provisions.

The "*Oregon Standard Specifications For Construction*" are also known as Standard Specifications and remain static for 5 to 10 years. In contrast to the Standard Specifications the 2002 special provisions add, modify, and/or delete portions of the "*Oregon Standard Specifications For Construction*" based on projects specific needs. For more background information on specifications:

- The "*Oregon Standard Specifications For Construction*" 2002 version, can be found at http://www.oregon.gov/ODOT/HWY/SPECS/2002_std_specs.shtml
- The special provisions can be found at:
  http://www.oregon.gov/ODOT/HWY/SPECS/special_provisions.shtml

  Note:
  Always download new copies of the special provisions for each project since modifications can occur at any time.

- Additional background information can be found at:
  http://www.oregon.gov/ODOT/HWY/SPECS/

The following is a list of specifications directly related to traffic signals

- 00950 – Removal and reinstallation of highway illumination and traffic signals
- 00960 – Common provisions for highway illumination and traffic signals
- 00990 – Traffic Signals
- 02920 – Highway illumination and traffic signal materials

The following is a list of specifications indirectly related to traffic signals

- 00440 – Commercial grade concrete
- 00442 – Controller low strength materials
- 00970 – Highway illumination
- 02530 – Structural steel

In addition there are numerous calls to other sections of the specifications not highlighted above. For example 02920.33(a) calls out "02560.20" and "02560.40". This is not to say 02560 is not important or unrelated, but it fills a minor role in the overall specifications related to traffic signals.

Preparing The Special Provisions

Below is an outline of the step by step process required in the preparation of the special provisions:

1. Determine which specifications are applicable to your project.
2. Download the current special provisions of each applicable specification.
3. Edit each special provision according to your project needs.

    a. Using Microsoft Word with **"Track Changes"** turned on.
        i. If track changes is not used then review and future modifications become difficult.
    b. Instructions are provided in red italic font within parentheses.
    For example:

(Use the following subsection .42 when removed materials are to be stockpiled. Contact Region electrician for Region number, phone number, and all information regarding equipment to be salvaged. List materials and stockpile locations.)

    c. The instructions shall be removed from the special provisions, and will appear similar to what is shown below:

~~***(Use the following subsection .42 when removed materials are to be stockpiled. Contact Region electrician for Region number, phone number, and all information regarding equipment to be salvaged. List materials and stockpile locations.)***~~

    d. Edits are limited to the instructions provided. Anything other than what's contained in the current special provision **REQUIRES** Traffic Standards review and approval.

The example below according to the instruction set is used on projects with loop splices. If this subsection does not apply to your project remove it.

(Use the following subsection .40(a) on projects with loop splices.)

00990.40(a) General - In the paragraph that begins "Install wire between pole or…", replace the second sentence with the following:

Do not use junction boxes for splicing, except for loop wire splicing of loop wires to loop feeder cables.

For projects where you have loop splices your special provision should look like this.

~~***(Use the following subsection .40(a) on projects with loop splices.)***~~

00990.40(a) General - In the paragraph that begins "Install wire between pole or…", replace the second sentence with the following:

Do not use junction boxes for splicing, except for loop wire splicing of loop wires to loop feeder cables.

For projects where you **DO NOT** have loop splices your special provision should look like this:

> ~~***(Use the following subsection .40(a) on projects with loop splices.)***~~
>
> ~~**00990.40(a) General** - In the paragraph that begins "Install wire between pole or…", replace the second sentence with the following:~~
>
> ~~Do not use junction boxes for splicing, except for loop wire splicing of loop wires to loop feeder cables~~.

If for some reason the current special provision doesn't meet your project needs you can propose modifications. Again this needs review and approval from Traffic Standards. Your request might look something like:

For projects where you have loop splices your special provision should look like this:

> ~~***(Use the following subsection .40(a) on projects with loop splices.)***~~
>
> **00990.40(a) General** - In the paragraph that begins "Install wire between pole or…", replace the second sentence with the following:
>
> Do not use junction boxes for splicing, except for loop wire splicing of loop wires to loop feeder cables and interconnect cable to interconnect cable.

It is important to note that the single line strikethrough for removal and signal line underline for additions are generated by track changes not by changes in formatting. So when "Final" is chosen in the track changes tool all these marks disappear and the final clean document remains. If toggled from "Final" to "Final Showing Markup" all these markups will reappear for review purposes.

The Bid Items

Bid items are defined in the Standard Specifications and Special Provisions typically under 00990.90. You are generally limited to the following bid item list:

- TEMPORARY TRAFFIC SIGNAL INSTALLATION – LUMP SUM
    - By definition a temporary installation complete with detection system.

- TRAFFIC SIGNAL INSTALLATION – LUMP SUM
    - Includes the new permanent traffic signal, detector system, and removal of existing features. Specifically includes what is shown on the “Signal Plan” sheet, “Detector Plan” sheet, and “Removal Plan” sheet. Excludes the interconnect system.

- TRAFFIC SIGNAL MODIFICATIONS – LUMP SUM
    - Used for existing installations where the traffic signal proper is modified. This excludes the detection system and interconnect system.

- RAMP METER SIGNAL INSTALLATION – LUMP SUM
    - Includes the new permanent ramp meter signal, detection system, and removal of existing features. Specifically includes what is shown on the “Ramp Meter Plan” sheet. Excludes the interconnect system.

- LOOP DETECTORS INSTALLATION – LUMP SUM
    - Used for existing installations where the detection system proper is modified. This excludes the signal system proper and interconnect system.

- FLASHING BEACON INSTALLATION – LUMP SUM
    - Includes the new permanent flashing beacon and removal of existing features. Specifically includes what is shown on the “Flashing Beacon Plan” sheet.

- INTERCONNECT SYSTEM – LUMP SUM
    - Includes the new or modifications to the existing interconnect system and removal of existing features. Specifically includes what is shown on the “Interconnect Plan” sheet.

For example if a sign is shown and detailed on the signal plan sheet it is paid for under the Traffic Signal Installation bid item which is Lump Sum. If the same sign is shown and detailed on a signing plan sheet it is paid for by the square foot for that specific sign type (see special provision 00940.90).

The Estimate

Once the appropriate bid items are chosen a cost estimate must be completed. The bid item estimates must be based on historical data, available industry data, manufacturer quotes, and project specific research. ODOT internal estimating tools can not be given to external staff.

Since the bid items are not location specific a title needs to be given to each location, generally the highway and cross street. For example if your project included three new traffic signal installations along US20 at Main St., 9th St. and High St.:

US20 at Main St.

TRAFFIC SIGNAL INSTALLATION – LUMP SUM $255,000

US20 at 9th St.

TRAFFIC SIGNAL INSTALLATION – LUMP SUM $225,000

US20 at High St.

TRAFFIC SIGNAL INSTALLATION – LUMP SUM $240,000

Another example would be a traffic signal modification and loop detector installation at US101 at 21st St and loop detector installation at US101 at 45th St:

US101 at 21st St

TRAFFIC SIGNAL MODIFICATIONS – LUMP SUM $85,000
LOOP DETECTORS INSTALLATION – LUMP SUM $8,500

US101 at 45th St

LOOP DETECTORS INSTALLATION – LUMP SUM $13,000

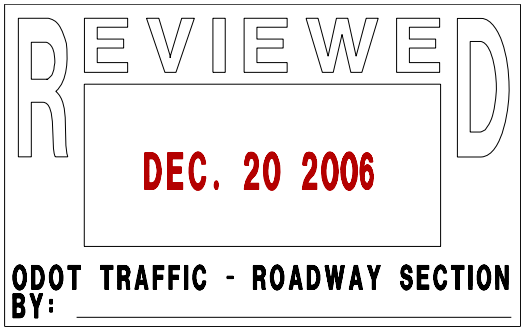
11

Shop Drawing Review

The signal designer may receive different types of shop drawings but currently the only two types that are required are pole drawings and Blue Sheet substitutions. “Blue Sheets” reflect a list of prequalified equipment for use on signal projects.

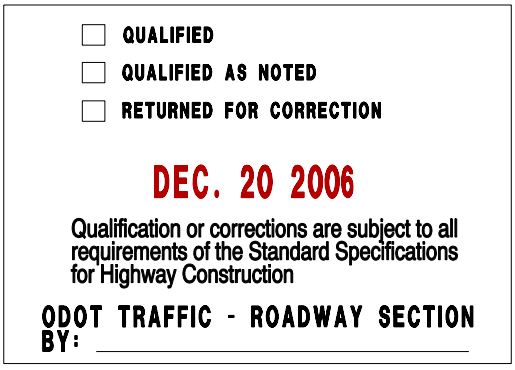
Pole Submittals: When you receive pole submittals, review the mast arm orientation, tenon locations, luminaire arm orientation, and any other appurtenances that you have specified on the plans.

After reviewing the submittals use the **REVIEWED** stamp as shown below. Keep one copy of the pole submittal for yourself and send the rest of the shop drawings with a copy of the signal plan, to the Traffic Structures Engineer for review of the pole design.



Blue Sheet Submittals: You may receive Blue Sheets with non-prequalified equipment listed. Review the material cut sheet, check if the equipment meets the specifications and project needs. Submit the non-prequalified equipment to the TRS Traffic Signal Engineer for review. If appropriate, the equipment will be added to the Blue Sheets.

Use the stamp shown below to approve or reject materials.



12

Loop Replacement

The information below is a general guide of what should be shown on loop replacement plan sheets.

Show all standard information such as lane use arrows, north arrow, street/highway names, dimensions, project titles, mile posts and routes.

Review the phase rotation diagram for your project and compare it to the Signal Operations Unit timing sheets to check to see if any phasing has been modified from the original As-constructed. Also check TSSU's file to see if any changes have been made to the wiring or if equipment has been upgraded or modified.

Label your loop plan **DETECTOR PLAN**.

If you are replacing loops "in-kind", with **no wiring or control cabinet work,** show the following:

- Loops and loop entrances (if necessary)
- Include the existing Loop Detector Plan for information only. Since there are no wiring changes, the existing plan will have the wiring diagram.

If you are replacing loops and have **wiring modifications with cabinet work,** show the following:

- Loops and loop entrances
- Detector Conduit (size required)
- Loop Feeders (phase and number)
- Junction Boxes (type if known)
- Wiring Diagram

Show all existing equipment that is not being affected by the new work in a line weight = 0 and all the revised or replaced equipment in standard weights. Add a note to re-label all existing wiring as necessary at splices (both ends) and at cabinet termination points.

13

Plans Development

Preliminary Plans

Preliminary Plans are typically 70 percent complete at Preliminary Plans distribution. Pole, signal head, controller, and pedestrian head placement should be finalized at this stage of design.

TRS Drawing numbers are not necessary at this time for distribution. Preliminary Plans distribution is determined by the project team and shown in the AMS schedule or supplied by the Project Leader. The traffic drawings need to be ready for the roadway designer one to two weeks earlier than the AMS schedule shows.

Submit one set of clean 11x17 paper prints to the roadway designer. The roadway designer will compile plans from all disciplines for printing and distribution. This is a good time to ask the roadway designer to include your name as the traffic signal designer on the distribution list for preliminary plans.

When plans are distributed to the various groups, Traffic – Roadway Section (TRS) usually receives:

- 1 set for the Traffic Design Engineer
- 1 set for the Traffic Signal Specialist

When traffic signal plans are sent to Traffic Standards & Asset Management for review the Traffic Signal Engineer, Traffic Signal Specialist and personnel in the Traffic Operations Unit will review the plans. Once the plans have been reviewed the Traffic Signal Engineer will combine all comments and return the comments to Region Traffic.

All comments shall be resolved through the Engineer of Record.

Advance Plans

Advance Plans are typically 95 percent complete at Advance Plan distribution. Pole, signal head, controller, and pedestrian head placement should not be changed unless alignment or right of way changes are required. TRS Drawing numbers are not necessary for Advance Plans distribution. If additional drawings will not be added to the package, you may request TRS drawing numbers at this time.

The Advance Plans distributions date is available from the AMS schedule or may be supplied from by the Project Leader. As rule of thumb, the drawings need to be ready for the assigned specifications writer, with Standard Specification Special Provisions and engineers cost estimate ready one to two weeks earlier than the schedule shows.

Submit one set of 11x17 clean paper prints to the assigned specification writer for printing; an electronic copy of your Standard Specification Special Provisions as outlined in the memos to designers dated December 5, 2001 from the Specifications Engineer; and engineers cost estimate. The specification writer will compile plan sheets, Standard Specification Special Provisions and the engineers cost estimate from all the disciplines of the project for printing and distribution. At this time request that the specification writer include the traffic signal designers name on the distribution list. As listed previously the same people will receive a set of plans in TRS. The traffic distribution list for the TRS is the same as for the Preliminary Plan distribution.

When traffic signal plans are sent to Traffic Standards & Asset Management for review the Traffic Signal Engineer, Traffic Signal Specialist and if needed personnel in the Traffic Operations Unit will review the plans. Once the plans have been reviewed the Traffic Signal Engineer will combine all comments and return the comments to Region Traffic.

It is the traffic designer's responsibility to have the Traffic Operations Unit review a set of the Advance Plans. The Operations Unit will review the plans and may make recommendations on the loop locations, loop wiring or phase rotation.

Any comments not resolved by the assigned traffic designer shall be discussed with the Engineer of Record and resolved before the plans are printed on Mylar and signed by the Engineer of Record.

Final Plans (Mylar's)

After the comments have been addressed from Advance Plans, the traffic designer will print a new set of paper prints that will be attached to the review letter. This review letter is located in the Excel signal cost estimating program under the tab "Final Review". At this time, the new set of prints, specifications, review letter and a copy of your cost summary will be reviewed internally by TRS staff before Mylar's are printed.

The following pages contain aids for reviewing drafting and design; and an explanation of the final review of procedures along with the associated forms.

Design/Drafting Check List

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

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

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

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)

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

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

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

FINAL REVIEW OF TRAFFIC PLANS

REGION TRAFFIC REVIEW OF CONTRACT PLANS

(submit this form to the TRS only when signal design is involved)

Comments Are Due By

Project Name
(indicate in the project name whether the signal is off system by using OFF SYSTEM with brackets)

Highway Name **Route No.**

Region **County** **St. Hwy. No.**

Key No. **EA.**

Designed By

Work Stage

☐ Preliminary	☐ Advance	☐ Final	☐ Mylars
Review Date	Review Date	Review Date	Review Date

Non-Signal Work
(any contract work that does not affect a traffic signal does not need to be submitted TRS. This section of the form would only require region review)

☐ Signing ☐ Illumination ☐ ITS ☐ Striping

(all signalized intersections will require submittal of a full set of plans for review including roadway bridge striping, signing and illumination associated with the signalized intersection)

Signal Installation
- ☐ New
- ☐ Temporary
- ☐ Ramp Meter
- ☐ Interconnect

Signal Modification
- ☐ Phasing
- ☐ Lane Configuration
- ☐ Fire preemption
- ☐ Equipment upgrade

Detection
- ☐ New
- ☐ Replacement
- ☐ Alternate

Interconnect
- ☐ New
- ☐ Modified
- ☐ Fire Station
- ☐ Railroad
- ☐ Ramp Meter

Document Attachments
- ☐ Signal approval letter attached
- ☐ Fire preemption letter on file
- ☐ New fire preemption request
- ☐ Bus Priority
- ☐ Traffic Narrative
- ☐ Intergovernmental Agreement

CAD
- ☐ MicroStation Files Submitted (Signal Plans)

(this form will accompany the plans as it moves through the stages of review)

Assigned Drawing Numbers

Engineer of Record _____ Date _____

Region Traffic Reviewer _____ Date _____

STE Designate _____ Date _____

(comments shown on the comment form)

REVIEW COMMENTS

Project Name

Highway Name **Route No.**

Region **County** **St. Hwy. No.**

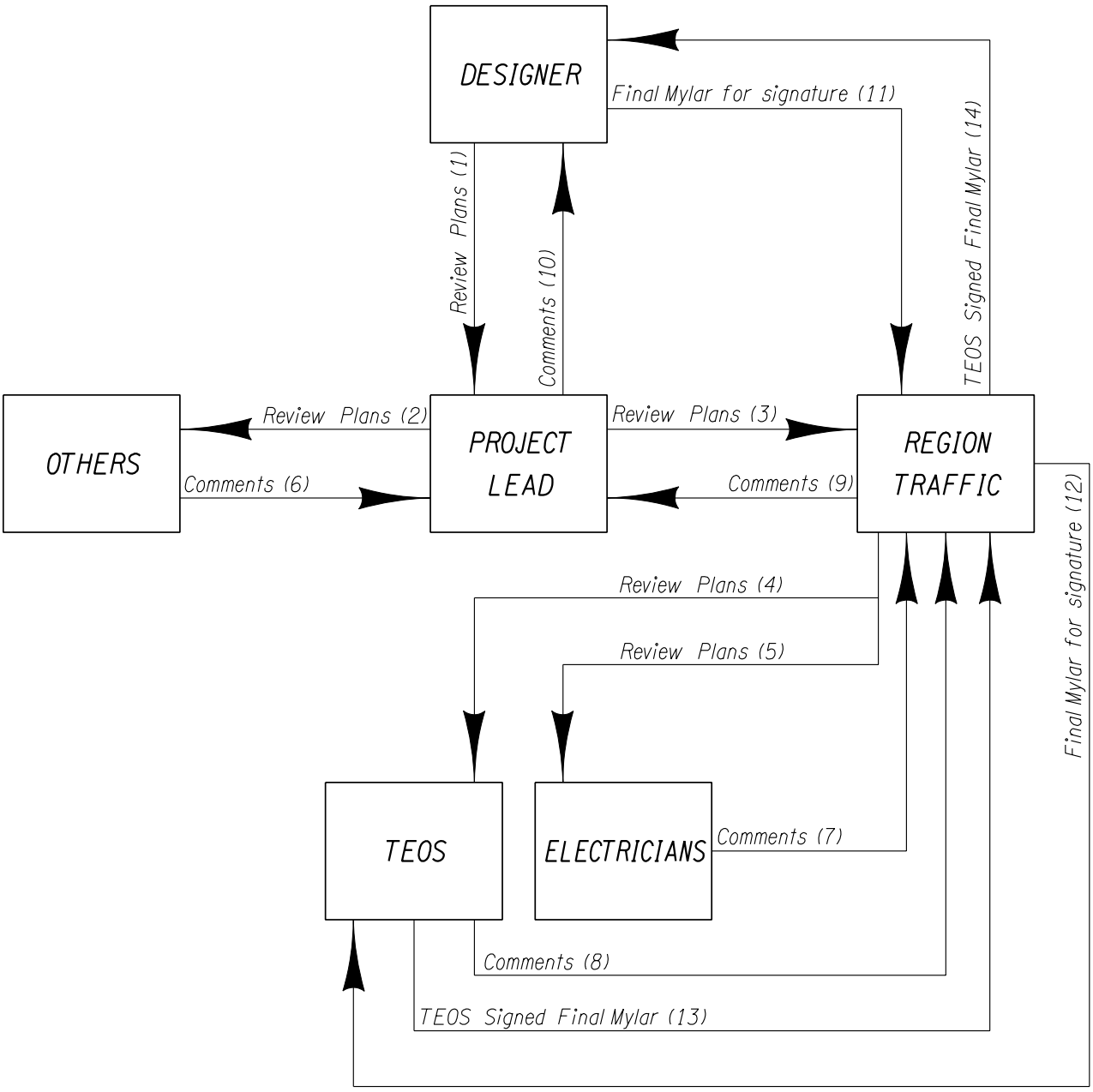
Key No. **EA.**

Designed By

COMMENTS:

TRAFFIC SIGNAL DESIGN APPROVAL PROCESS

(The flow chart boxes and arrows are defined on page 95)



TRAFFIC SIGNAL DESIGN APPROVAL PROCESS

(The flow chart boxes and arrows on page 94 are defined below)

BOXES

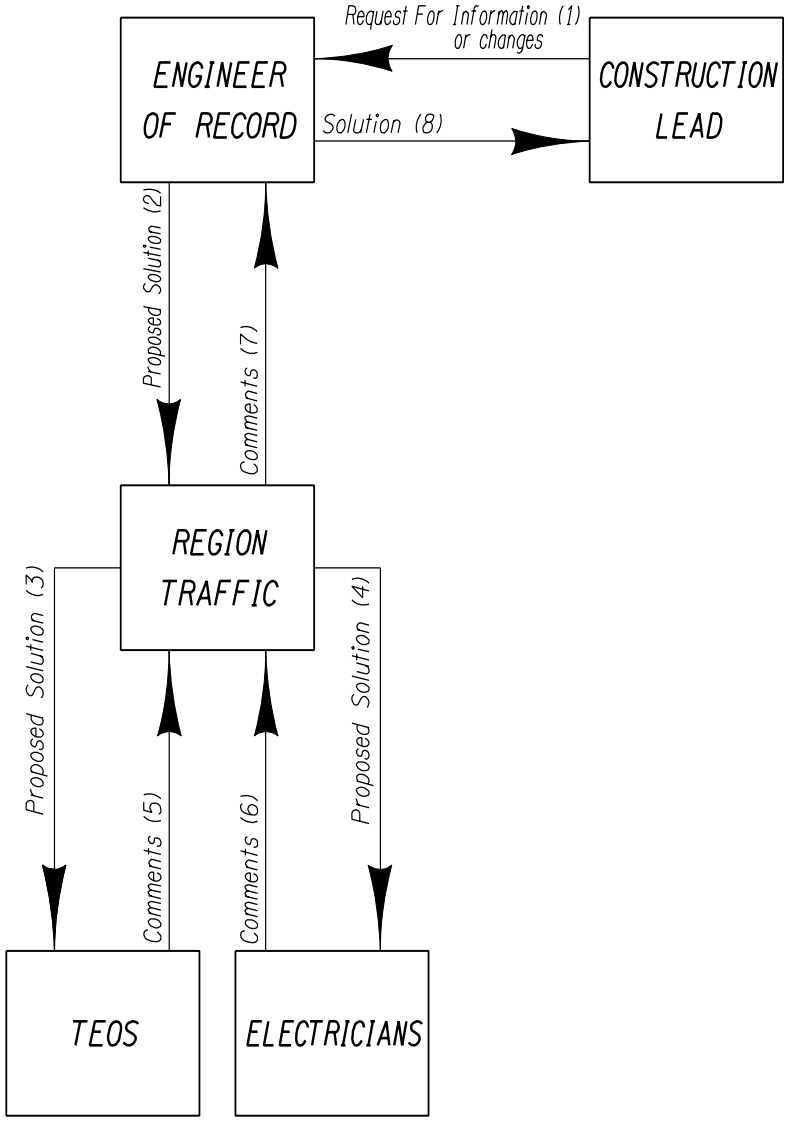
- **DESIGNER** – This is the person or firm that produces the traffic signal plans. This could be ODOT, local agencies, consultants, etc. This person is also the Engineer of Record for the project plans.
- **PROJECT LEAD** – This is the ODOT designated project lead. The could be a Consultant Project Manager (CPM), Project Leader, District Permits, Local Agency Liaison, etc.
- **OTHERS** – These are "other" stake holders that have an interest in the project.
- **REGION TRAFFIC** – This is the ODOT region traffic office.
- **TEOS** – This is the ODOT Traffic Engineering and Operations Section (TEOS). The State Traffic Engineer (STE) leads this section.
- **ELECTRICIANS** – These are the ODOT lead electricians for the specific Region.

ARROWS

- **Review Plans (1)** – This action includes the DESIGNER submitting plans, specifications, estimates, requests to deviate from standards, etc to the PROJECT LEAD.
- **Review Plans (2)** – This action includes the PROJECT LEAD submitting plans, specifications, estimates, requests to deviate from standards, etc to OTHERS for review, comment, and/or approval.
- **Review Plans (3)** – This action includes the PROJECT LEAD submitting plans, specifications, estimates, requests to deviate from standards, etc to REGION TRAFFIC for review, comment, and/or approval.
- **Review Plans (4)** – This action includes the REGION TRAFFIC submitting plans, specifications, estimates, requests to deviate from standards, etc to TEOS for review, comment, and/or approval.
- **Review Plans (5)** – This action includes the REGION TRAFFIC submitting plans, specifications, estimates, requests to deviate from standards, etc to ELECTRICIANS for review, comment, and/or approval.
- **Comments (6)** – This action includes OTHERS submitting review comments, approvals, re-submittal requests, rejections, etc to the PROJECT LEAD to compile.
- **Comments (7)** – This action includes ELECTRICIANS submitting review comments, approvals, re-submittal requests, rejections, etc to REGION TRAFFIC to compile.
- **Comments (8)** – This action includes TEOS submitting review comments, approvals, re-submittal requests, rejections, etc to REGION TRAFFIC to compile. At this stage either TEOS will request revisions and re-submittal or APPROVE the plans and specifications.
- **Comments (9)** – This action includes REGION TRAFFIC submitting combine review comments, approvals, re-submittal requests, rejections, etc to the PROJECT LEAD to compile.
- **Comments (10)** – This action includes the PROJECT LEAD submitting ALL review comments, approvals, re-submittal requests, rejections, etc to the DESIGNER for consideration/revision. If APPROVAL of the plans is given by TEOS then continue to STEP 11. If revisions are required then return to STEP 1.
- **Final Mylar for Signature (11)** – This action includes the DESIGNER submitting final mylar plan sheets for TEOS signature to REGION TRAFFIC to review. This is REGION TRAFFIC's last chance to verify all conditions for APPROVAL have been addressed by the DESIGNER.
- **Final Mylar for Signature (12)** – This action includes REGION TRAFFIC submitting final mylar plan sheets to TEOS for signature.
- **TEOS Signed Final Mylar (13)** – This action includes TEOS submitting final mylar plan sheets to REGION TRAFFIC. The TEOS signature is REQUIRED in the title block space designated as "Traffic Design Unit Approval". This shouldn't be confused with the Engineer of Record signature from the DESIGNER.
- **TEOS Signed Final Mylar (14)** – This action includes REGION TRAFFIC submitting the TEOS signed final mylar plan sheets back to the DESIGNER. The plan sheets are now ready for construction.

CHANGES DURING CONSTRUCTION

(The flow chart boxes and arrows are defined on page 97)



CHANGES DURING CONSTRUCTION

(The flow chart boxes and arrows on page 96 are defined below.)

BOXES

- **CONSTRUCTION LEAD** – This is the ODOT designated construction lead. This could be a Consultant Project Manager (CPM), Project Leader, District Permits, Local Agency Liaison, Project Manager, etc.
- **ENGINEER OF RECORD** – This is the person or firm that produced the traffic signal plans. This could be ODOT, local agencies, consultants, etc. If the Engineer of Record is unreachable, consult with TEOS for guidance.
- **REGION TRAFFIC** – This is the ODOT region traffic office.
- **TEOS** – This is the ODOT Traffic Engineering and Operations Section (TEOS). The State Traffic Engineer (STE) leads this section.
- **ELECTRICIANS** – These are the ODOT lead electricians for the specific Region.

ARROWS

- **Request For Information or Changes (1)** – This action includes the CONSTRUCTION LEAD submitting contractor questions, contractor proposals, errors in the plans and/or specifications, etc to the ENGINEER OF RECORD for review and comment. For clarification of plans and/or specifications, skip to STEP 8. For proposed changes to the plans and/or specifications continue to STEP 2.
- **Proposed Solution (2)** – This action includes the ENGINEER OF RECORD submitting plans, specifications, estimates, requests to deviate from standards, etc to REGION TRAFFIC for review, comment, and/or approval. For minor changes skip to STEP 7. For major changes continue to STEP 3.
- **Proposed Solution (3)** – This action includes the REGION TRAFFIC submitting plans, specifications, estimates, requests to deviate from standards, etc to TEOS for review, comment, and/or approval.
- **Proposed Solution (4)** – This action includes the REGION TRAFFIC submitting plans, specifications, estimates, requests to deviate from standards, etc to ELECTRICIANS for review, comment, and/or approval.
- **Comments (5)** – This action includes TEOS approving, requesting re-submittal, or rejecting the proposed solution to REGION TRAFFIC.
- **Comments (6)** – This action includes ELECTRICIANS approving, requesting re-submittal, or rejecting the proposed solution to REGION TRAFFIC.
- **Comments (7)** – This action includes REGION TRAFFIC approving, requesting re-submittal, or rejecting the proposed solution to the ENGINEER OF RECORD based on TEOS and the ELECTRICIANS comments (for major changes). If the solution is REJECTED start over at STEP 2.
- **Solution (8)** – This action includes the ENGINEER OF RECORD submitting an approved solution to the CONSTRUCTION LEAD. The solution may include revised plan sheets, revised specifications, new plan sheets, and/or revised specifications. The CONSTRUCTION LEAD will then direct the contractor based on the approved solution.

Cabinet Prints

The cabinet print is a schematic representation of the components that are inside the controller cabinet. Two examples of 332 cabinet prints are shown on the next two pages.

Page 99 shows a blank cabinet print. Areas that are gray shaded will not typically require you to enter any information in the cabinet print.

The cabinet print that is shown on page 100 is an example of a 332 print that has been completed after the design of the intersection is complete.

The cabinet prints shown on the following two pages are for reference only. Complete information about completing cabinet prints can be found by following the appropriate links below:

ODOT and consultant designers can use the links below to find the correct "MicroStation Cabinet Prints**"**:

332 Cabinet print:
http://egov.oregon.gov/ODOT/HWY/TRAFFIC/MicroStation/332cabinetV8.dgn

336 Cabinet print:
http://egov.oregon.gov/ODOT/HWY/TRAFFIC/MicroStation/336_cabinetV8.dgn

334 Ramp meter cabinet print:
http://egov.oregon.gov/ODOT/HWY/TRAFFIC/MicroStation/334_Ramp_cabinetV8.dgn

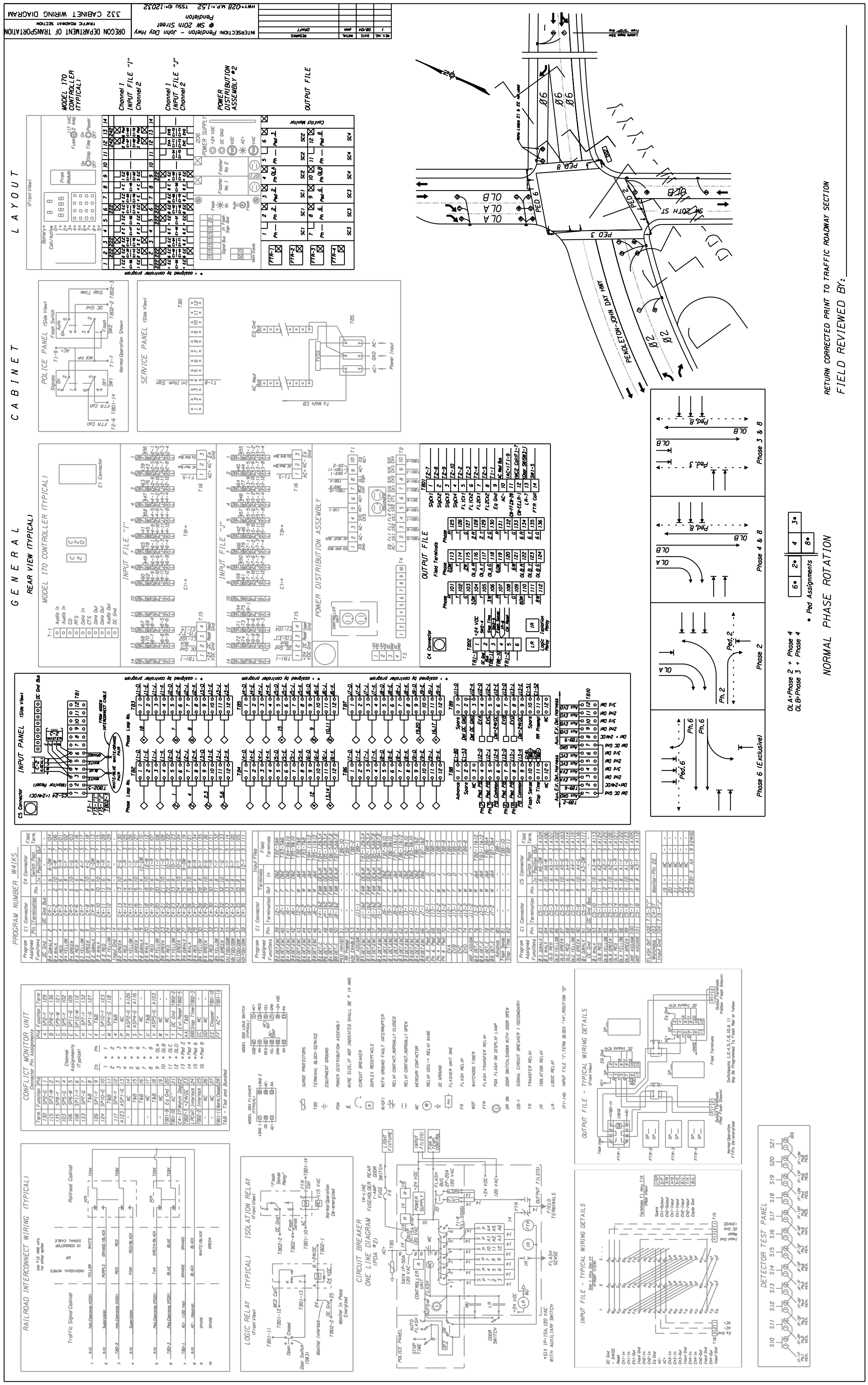
334 Cabinet print:
http://egov.oregon.gov/ODOT/HWY/TRAFFIC/MicroStation/334_Count_cabinetV8.dgn

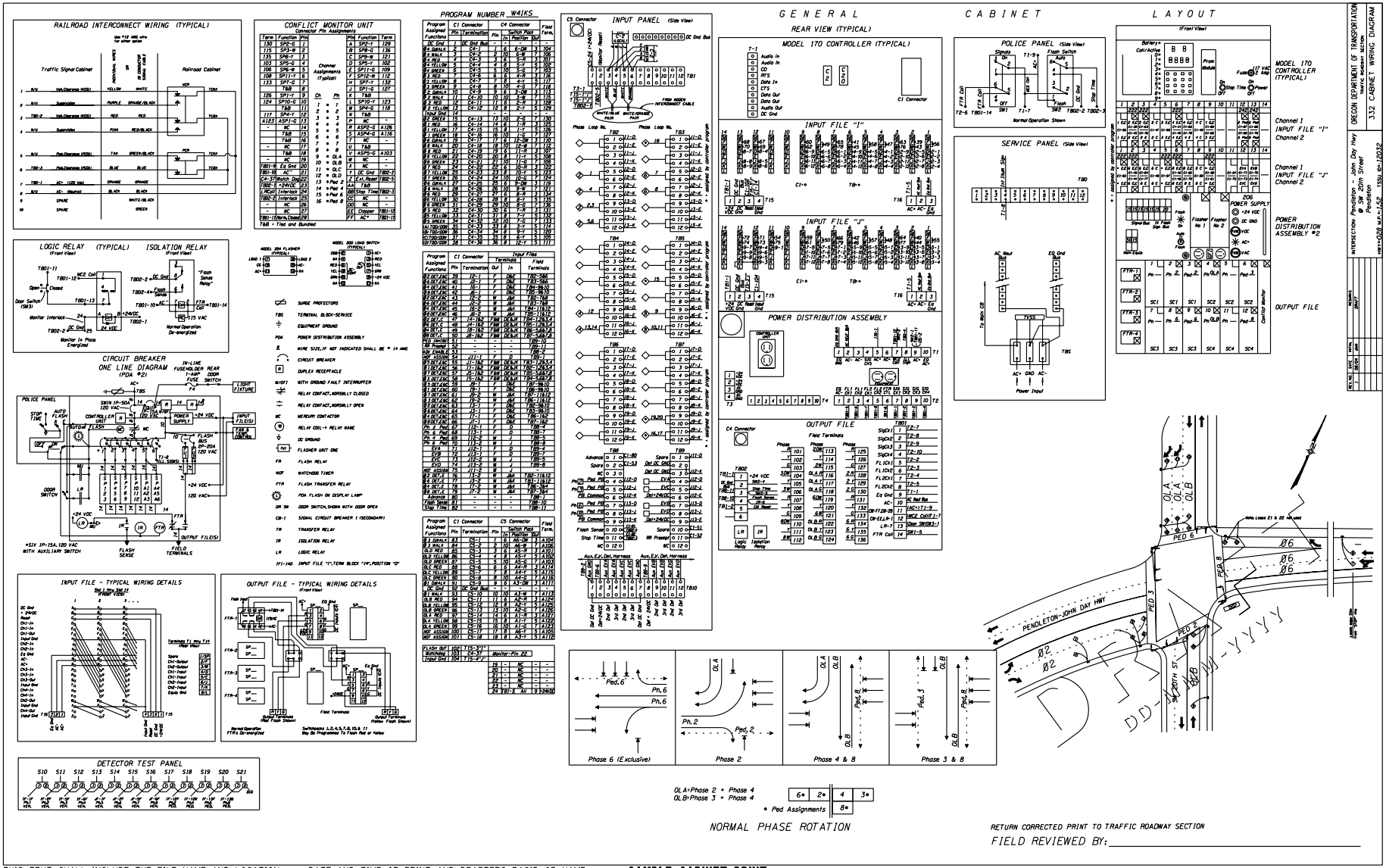
ODOT designers can find instructions to fill out the cabinet prints at:

http://egov.oregon.gov/ODOT/HWY/TRAFFIC/Signals.shtml

Consultant designers can find the instructions to fill out the cabinet prints at:

http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/word/Signal_Cabinet_Print_Guide_for_Consultant_Signal_Designers.doc


OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC ROADWAY SECTION
332 CABINET WIRING DIAGRAM
L A Y O U T
C A B I N E T
G E N E R A L
POLICE PANEL
SERVICE PANEL
MODEL 170 CONTROLLER (TYPICAL)
INPUT FILE "I"
INPUT FILE "J"
POWER DISTRIBUTION ASSEMBLY
OUTPUT FILE
INPUT PANEL
PROGRAM NUMBER WALKS
CONFLICT MONITOR UNIT
RAILROAD INTERCONNECT WIRING (TYPICAL)
LOGIC RELAY (TYPICAL)
ISOLATION RELAY
CIRCUIT BREAKER ONE LINE DIAGRAM
INPUT FILE - TYPICAL WIRING DETAILS
OUTPUT FILE - TYPICAL WIRING DETAILS
DETECTOR TEST PANEL
NORMAL PHASE ROTATION
PENDLETON-JOHN DAY HWY
SW 20TH ST
RETURN CORRECTED PRINT TO TRAFFIC ROADWAY SECTION
FIELD REVIEWED BY:



THIS TEXT SHALL INCLUDE THE FILE NAME AND LOCATION DATE AND TIME OF PRINT AND DRAFTERS RACID OR NAME **SAMPLE CABINET PRINT**

Project File

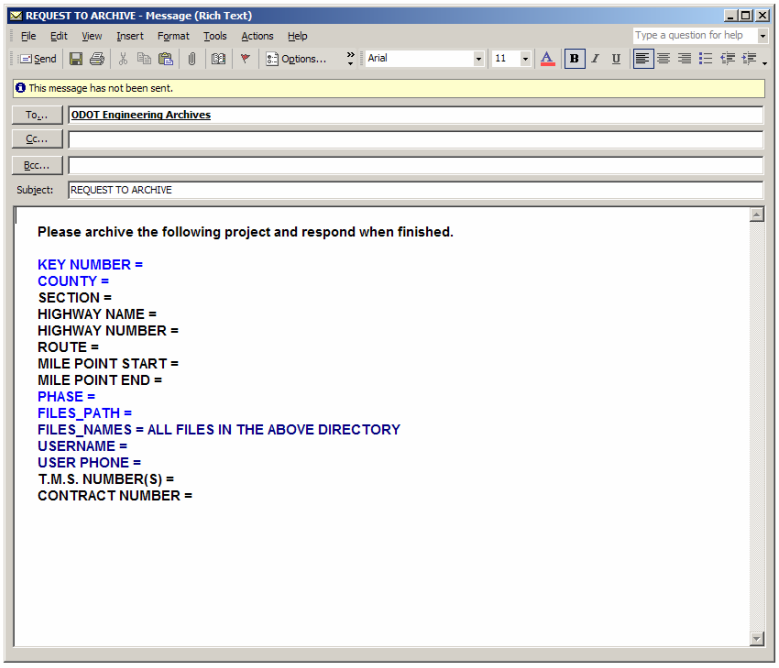
The following information shall be included in the project file (if applicable), when the project contract EA has been closed.

- Signal Approval Letter
- Final Review Copy of plans, specs. and estimate with signed final review
- E-mails concerning design decisions or exceptions
- Official memos concerning design decisions or exceptions
- Pole submittals and shop drawings
- Sign shop drawings
- Manufacture's cut sheet or submittals
- Correspondence between project managers and contractors or consultants
- A clean copy of the title sheet and index
- A clean copy of the signed final signal plans portion of the project used in construction.

Project Cadd File Archive

ODOT Designers:

All CADD 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 CADD files.



Consultant Designers:

All CADD 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.

Distribution List:

(1) - Mylar copy to Traffic - Roadway Section (TRS)

(1) - Copy to Traffic Systems Services Unit (TSSU)

(1) - Copy to District Maintenance Supervisor (except Region 1) or
maintaining agency. Check agreements database to see who maintains the facility.

(1) - Copy to District Electrical Supervisor

Region 1, (5) copies to Region Traffic Section, Traffic Engineer 8 Total Copies

Region 2, (4) copies to Region Traffic Section, Traffic Engineer 7 Total Copies

Region 3, (1) copy to Region Traffic Section, Traffic Engineer 4 Total Copies

Region 4, (1) copy to Region Traffic Section, Traffic Engineer 4 Total Copies

Region 5, (2) copies to Region Traffic Section, Traffic Engineer 5 Total Copies

14

Consultant Traffic Signal Design

All Plan sheets shall have a legend sheet depicting and specifying items to be installed. Standard legend symbols and specifications as used by ODOT shall be used in specifying equipment on the plan legend. Traffic signal plans for locations not on the state highway system do not require review by ODOT, unless ODOT will be providing maintenance services, or if Federal funding is involved. Such "off system" plans will be reviewed for compliance to the MUTCD, functionality and overall design conformity.

All sheets shall have a north arrow, a scale bar (required when no stationing is present on the drawing), highway and milepost or roadway jurisdiction, and a current traffic signal title block containing appropriate registration stamps and project identification. Blank plan sheets and cell libraries along with supporting information have been made available to the consultant thru the following links:

The “ODOT Signal Design Manual”:

http://www.odot.state.or.us/ffp/hwy/traffic/Signal_Design_Manual.pdf

“ODOT Traffic Signal Loop Layout Examples”:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/PDF/Signal_Loop_Layout_Examples.pdf

Blank traffic signal plan sheets:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/ZIP/Base_sheets.zip

Cells and the menu for drafting traffic signal plan sheets:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/ZIP/Traffic_Drafting_Toolz.zip

Traffic signal standard Drawings:

http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/traffic_drawings.shtml#Traffic_400___Signals

Cabinet Print Guide for consultants:

http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/word/Signal_Cabinet_Print_Guide_for_Consultant_Signal_Designers.doc

Any necessary Special Provision and supplemental specifications shall accompany Advance and Final traffic signal plans. Boiler plate copies will be made available to the consultant by ODOT.

Standards

The consultant shall produce traffic signal designs that comply with current editions of: NEC and AASHTO specifications; FHWA “Manual of Uniform Traffic Control Devices”; ODOT "Traffic Signal Policy and Guidelines"; ODOT "Sign Policy and Guidelines"; ODOT "Illumination Policy”; TRS standard legend; TRS standard drawings, ODOT "Standard Specification for Microcomputer Signal Controller"; ODOT Standard Specifications as modified TRS; current Special Provisions and any applicable local agency standards.

Preliminary Information

Consultants will be provided with the following information upon request:

- Existing ‘As Constructed’ intersection signal plans (paper or electronic), if available.
- Existing road design plans (vertical and horizontal alignment). (Paper only.)
- TRS Plan Sheet Borders, available on the TRS webpage at:

  http://www.oregon.gov/ODOT/HWY/TRAFFIC/Signals.shtml

- ODOT’s "Contract Plans Development Guide”, available through the Contractor Plans Unit.
- ODOT’s “Traffic Signal Policy and Guidelines”, available on the TRS website.
- Current copies of the Special Provision changes to the current ODOT " Standard Specifications for Highway Construction", available on the ODOT Traffic Signal Design Unit website at:

  http://www.oregon.gov/ODOT/HWY/SPECS/special_provisions.shtml

- The most recent design or procedural changes, available on the ODOT TRS website at:

  http://www.oregon.gov/ODOT/HWY/TRAFFIC/Signals.shtml

Title Sheet

The title sheet shall contain the contracting agency; type of project; project name; project limits; highway, road, or street names; a vicinity map showing the project location; an index of the sheets; general or special notes; and an area for project plan approval by the appropriate agencies and individuals. Information regarding title sheets can be found in “Contract Plans Development Guide” (CPDG).

Plan Submittal

Projects by Permit (Local Agency-Developer)

The District Office provides a permit for local agency and developer projects that outlines the requirements and provides an expense account for reviews and inspections. The District Permit Specialist receives submittals and distributes to Region Traffic then on to TRS and Maintenance for review.

Region Traffic takes the lead in gathering all ODOT comments and will provide one submittal of review comments back to the District Permit Specialist. The Permit Specialist forwards these comments back to the local agency, developer, or consultant.

This process continues until TRS approves the Plans and Specifications for construction and assigns TRS drawing numbers to each plan sheet.

Projects by consultants (ODOT sourced consultant contracts)

TRS (or other ODOT sections) provide a work order to the consultant. TRS typically receives submittals and distributes to Region Traffic and Maintenance for review. TRS gathers all comments and will provide one submittal of review comments back to the consultant. This process continues until TRS approves the Plans and Specifications for construction and TRS assigns the TRS drawing numbers to each plan sheet.

Submittals

Submittals shall include the following:

Preliminary

- 11”x17” paper plan sheets for review

Advance

- 11”x17” paper plan sheets for review
- Final cost estimate
- Special provisions with track changes highlighted for review.

Final

- 11”x17” Sealed Plan sheets on Mylar once approved for construction. Include electronic files in MicroStation format on CD if required by permit or contract.
- Any proposed non-standard equipment cut-sheets, specifications, and details for review before construction.

Construction

- Any contractor proposed non-listed Blue Sheet or Green Sheet items during construction: TRS approval required.
- Any pole shop drawings and calculations submitted by the contractor during construction: TRS approval required.
- Any significant proposed changes to the plans or specifications during construction, such as controller location, signal phasing or pole placement: District Manager approval required.

As-Constructed

- 11”x17” Sealed Plan sheets on Mylar after construction, labeled “As-Constructed”. Include electronic files in MicroStation format on CD if required by permit or contract.

TRS Drawing Numbers

The consultant shall use ODOT’s approved title block in the lower right-hand corner of each drawing for the TRS drawing number. No changes shall be made to the title block without written consent from TRS. The drawing numbers shall be requested by the consultant and are assigned by ODOT at the advance plans stage. The plans must be submitted to the Traffic Standards and Asset Management unit (TSAM) in ether Adobe PDF format or PowerPoint EMF format. The drawing number shall be placed on the contract plans and the “As Constructed” drawings.

Final Plans

After all comments have been addressed and corrections made, the consultant shall resubmit to the ODOT District Office or the ODOT Region Traffic Office 11" x 17", black line, mylar prints and corrected special provisions of the final plans for the traffic signal installation(s). The plans shall be forwarded to TRS's Traffic Signal Engineer for approval and signature.

After the traffic signal plans are signed "approved" the plans will be ready for use in construction of the project. Projects to be contracted by ODOT require complete, corrected special provisions in electronic format meeting current ODOT Specification Unit Instructions and corrected electronic plan files (in MicroStation format) for plan publishing. The final plans and specifications shall contain all information necessary to construct the project.

Standards Drawings

All Standard Drawings currently available in the Traffic or Bridge Section files that apply to the project should be referenced for incorporation into the contract plans. They must be checked for applicability. If modifications are required, the sheet must be drafted by the consultant and included with the set of plans. A list of the Standard and specific accompanying drawings is to be included as part of the title block on the first sheet on the signal plans.

Signatures and Stamps

The Engineer of Record Professional Engineer stamp, with expiration date and signature shall appear on all plans. The engineer shall be registered in Oregon, and be competent in the discipline of Traffic Engineering.

Special Provisions

The consultant shall be responsible for completing the Special Provisions to the standard specifications. The consultant shall be responsible for their accuracy and completeness.

Material Submittals

Current updated lists of acceptable traffic signal materials used on previous ODOT projects (the "Blue Sheets" and "Green Sheets") are available from the ODOT TRS website at:

Blue Sheets:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/PDF/bluesheets.pdf

Green Sheets:

http://www.oregon.gov/ODOT/HWY/TRAFFIC/PDF/greensheets.pdf

Review and acceptance of listed materials is the responsibility of the project inspector. The Traffic Signal Engineer shall approve any materials not listed on the "Blue Sheets" or "Green Sheets". At State-owned traffic signals, pole drawings and calculations for non-standard (special) traffic signal poles must be reviewed and approved by ODOT.

15

Technical Advisories and Bulletins (TAB's)

Before starting any design for an ODOT project it is recommended that the designer check the TAB's web page at:

http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/tech_advisory_bulletins.shtml

And:

http://www.oregon.gov/ODOT/HWY/TECHSERV/technicalguidance.shtml

Current TAB's

The TAB's listed below are current at the time this manual was printed. It is the designer's responsibility to check the latest TAB's before and during the design process.

TR05-01(B) Pole Entrance Chart Format Change

TR05-02(B) Minimum Conduit Size Change

TR05-03(B) TEOS Drawing Number Requests

TR05-04(B) Traffic Signal Controller Cabinet Prints

TR05-05(B) Loop Detector Spacing

TR05-06(B) 1" Metallic Chase Nipple Wire Entrance on Mast Arms

TR 05-07 Street Name Signs and Guide Signs on Traffic Signal Poles

TR 05-08 Notification of Installation & Removal of Speed Signs on State Highways

TR 05-10 ITS Design Responsibility

TR 05-11 Illumination Design

TR06-01(B) Mandatory use of Traffic Signal Pole Standard Drawings TM650 Thru TM653

TR 06-02 Marked crosswalks at uncontrolled locations

TR06-03(B) Speed Limit Signing in School Zones

TR05-07(A) Loop Wiring Diagram to Show Loop Distance Dimensions (Distance from STOP line to center of loop)

TR05-08(A) Maintenance Pads

TR05-09(A) Traffic Signal Battery Backup

TR05-10(A) Junction Box Spacing

16

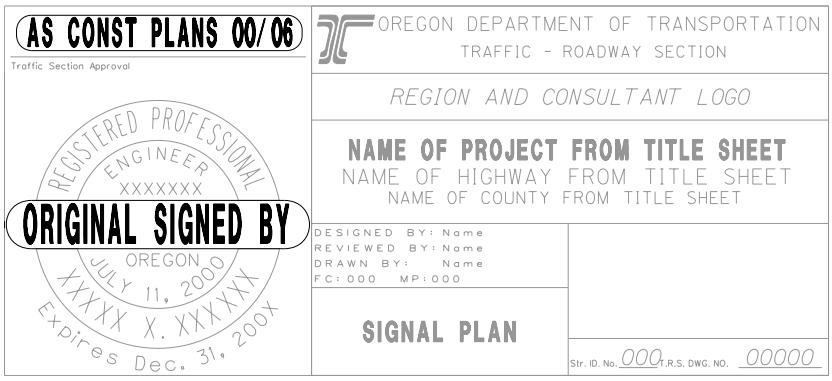
As Constructed Plans

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

The production of “As Constructed” plans is necessary because contract plans are often changed during construction for various reasons.

The Region office is responsible for marking-up contract plans to show how the signal was constructed. These mark-ups provide a guide for the Region or consultant drafter to use in revising electronic files for the project.

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:



The “As Constructed” electronic files and Mylar drawings are retained by ODOT’s Traffic – Roadway Section.

“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 contracted by the consultant, a developer, or local agency, the consultant shall produce 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” x 17”, black line, Mylar sheets. The electronic (MicroStation format) plans shall be submitted at the same time as the 11” x 17” Mylar’s.

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

Traffic Standard Drawings

Standard Drawings are located at:

http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/standard_drawings_home.shtml

The list below shows the Standard Drawings that are used in the design of signal projects.

TM400 Temporary Signal Details

TM401 Temporary Signal Details

TM402 Strain Pole Details

TM403 Mast Arm Details

TM404 Span Wire Details

TM405 Pole Foundations and Grounding

TM406 Vehicle Signal Details

TM407 Vehicle Signal Details

TM408 Vehicle Signal Details

TM409 Pedestrian Signals

TM410 Pedestrian Signals

TM411 Crosswalk Closure Details

TM412 Interior Illuminated Signs

TM413 Interior Illuminated Street Name Signs

TM414 Signs

TM415 Mast arm Mounted Warning Sign

TM416 Overhead Sign Details

TM417 Traffic Signal Junction Boxes

TM418 Ramp Meter Layout & Details

TM419 Loop Details

TM420 Loop Details

TM421 Color Code Charts

TM422 Miscellaneous

TM423 Controller Cabinet and Related Details

TM424 Cabinets

TM425 Flasher Cabinets

TM426 Service Cabinets

TM427 Service Cabinets

TM428 Terminal Cabinets

TM429 Stabilizer Details

TM430 Microloops

TM431 Fiber Optic & Led PTR Signs Typical Details

TM432 Ramp Meter Pedestal Details

TM433 Ramp Meter Layout and Details

TM434 Maintenance Pad Details

TM435 Interconnect

NOTES: