Oregon Department of Transportation

Traffic Sign Design Manual

Delivery & Operations Division | Traffic Roadway Section

August 2023

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Oregon Department of Transportation

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https://www.oregon.gov/odot/Engineering/Pages/Signing.aspx

Revision History

Table 1: Major Updates

Summary of Update	Revision Date
Updates include: • Text edits. • Formatting.	August 2023

DATE: August 12th, 2023

TO: Sign Designers

FROM: Marie Kennedy, P.E.
State Sign Engineer

SUBJECT: 2023 Sign Design Manual, version 03-05

The purpose of this manual is to familiarize new sign designers with their responsibilities and provide them with an organized collection of standards, guidelines, policies, and procedures to design a permanent signing plan for a project on the state highway system. The concepts in the manual work for local roads as well as state highways, so a road authority for a city or county can use this document as well.

The amount of design work consulted out by ODOT has increased dramatically over the last decade. This manual is intended to provide instruction that will not only help in developing ODOT design staff, but will also provide the information necessary for consultants or municipalities to produce PS&E documents for ODOT contracts.

All the information included in this manual is in compliance with the Manual on Uniform Traffic Control Devices with Oregon Supplements, and the Sign Policy and Guidelines for the state highway system.

This manual is not a standalone manual that contains everything needed to know to create a perfect sign design plan. There are links to many different websites and publications in this manual that should be used when mentioned in the text. This information, in combination, will give sign designers the background to put the whole design together.

This manual is not intended to replace any existing ODOT policy. It is intended to supplement existing ODOT policies and enhance the specific discipline of Permanent Signing Plans Design. This manual is to be used as a resource, a guide, a technical reference, and a teaching aide, as well. Please contact the Traffic-Roadway Section for clarification or interpretation of any policies and standards within this manual.

The procedures described in preparing sign plans provide one way of completing a set of contract plans. There are other acceptable ways of completing contract plans. When preparing contract work on a set of ODOT signing plans, it is important to check with the region sign designer prior to beginning design work, to coordinate design expectations for the project.

Email comments to State Sign Engineer Marie Kennedy, P.E.: Marie.Kennedy@odot.oregon.gov.

Contents

Chapter 1 – Developing Plans

1.1 – Project Scope

The first information needed is the planned scope of the work. There are many types of highway construction projects, and the type of work will have a big effect on the scope of the work for the permanent signing.

A preservation overlay, for example, will not directly impact existing signs in the same manner as a modernization project that includes major widening, alignment changes, and changes in grade, yet signing should not be ignored in a preservation project.

Even when existing signing seems to be unaffected, a designer must evaluate whether it meets all minimum standards set for signing on our highway system.

1.1.1 – Project Limits

For most projects, the physical limits (stations, mile points) for the signing plans will coincide with those of the roadway plans. Some projects, however, may not include roadway work and still others may be limited to sign work only. In these cases, the designer should contact the project leader or consultant project manager for information such as project limits, or scope of sign work.

In some instances, the signing limits will extend beyond those of the roadway plans. For example, the project paving limits could end in the middle of a school zone, in which case the designer should include all the signing for the school zone in the sign plans.

A project may only involve realignment of ramps at an interchange, but it may necessitate changes in guide signs a mile in advance of that interchange.

A small widening project to create a left turn lane will require striping and signing changes ¼ mile in advance of each end of the left turn lane.

These are just a few of the scenarios in which the signing limits would exceed the roadway limits. An open dialog between the sign designer and the project manager will help keep signing issues that may not have been considered at the beginning from hampering the project.

1.1.2 – Vertical Clearance

Another consideration for the scoping efforts is whether any project design features will impact vertical clearance in any way such as the addition of any new overhead sign supports. Any time new overhead traffic structures are added or an additional one is modified that alters the

vertical clearance, contact the region mobility liaison. The region mobility liaison will provide the appropriate coordination with the region and Commerce & Compliance Division.

Each project is unique, so the scope of the sign work can vary widely from one project to the next. Identifying the full scope of the anticipated work early on will make the design process smoother.

1.2 – Treatment of Existing Signs and Supports

When gathering information to create a sign plan, first determine which signs need replacing. Consider the next time a project will be in the location of the current project, as signs not replaced on the current project probably won't be evaluated for replacement again until the next project comes to the location.

On some modernization projects, every sign will need to be replaced. This will depend on the scope of work, how it affects existing sign installations, the condition of those signs, and how long until another project can replace the signs.

The sign designer must replace signs that do not meet the minimum requirements of the MUTCD or State Sign Policy. The project could be the only chance for many years to bring signs up to standards. Since the MUTCD and Sign Policy are updated frequently, keep informed of current standards. Refer to the resource manuals listed in Appendix B – Sign Design Resources.

1.2.1 – Design Expectations

Review the sign inventory for non-conforming sign installations. Minimum sign sizes for the state highway system are found in Appendix D – Sign Sizes and the MUTCD. Use Appendix D first as ODOT sometimes requires larger minimums than MUTCD.

The appropriate size of sign depends on speed and type or classification of highway. There are also minimum legend sizes for guide signs that need to be followed (See 2.3 – Designing Guide Signs).

If signs do not meet the minimum size standards shown, replace them with the larger required size, which will usually necessitate replacement of the support as well.

1.2.2 – Service Life of Signs

The service life of a sign on the state highway system is usually about 10 to 20 years unless it is damaged. If signs on the inventory are approaching the end of their life span, consider replacing them as part of the project. It is not fiscally responsible to reinstall a sign that will fail in a few years.

One should do a sign inventory, preferably in the field, and note the condition of signs and take photos for each sign. One can also obtain an inventory through the ODOT sign database. Talk to the region designer to obtain an inventory for the project. The sign database has information such as the date of the post installation that can help determine if the sign and its posts need

replacing. These items help determine which signs are physically in need of replacement. Signs that are broken, dented, cracked, delaminating, or contain scratched sheeting or bullet holes need to be replaced. Once the cell pattern of the sign sheeting has been damaged or compromised, its retro-reflective qualities can deteriorate and be ineffective in the dark or in conditions of limited visibility.

If there is any uncertainty as to the quality of an existing sign, the district sign supervisor or coordinator for that area can provide valuable input as to the age and condition of the signs. A field visit is always a good idea to understand the condition, the layout and how the signs look to the public. Driving the route will help a designer realize physical constraints and obstructions that may hamper sign placement.

1.2.3 – Service Life of Sign Supports

Use the sign inventory to determine if the sign support is new enough that it can stay in place or be removed and reinstalled. Replace small sign supports with unknown remaining service life condition.

1.2.3.1 – Sign Bridges, Cantilevers, Structure Mounts, Etc.

The useful life of a sign support varies with the type of support. Large, manufactured steel sign supports such as sign bridges, cantilevers, structure mounts, butterfly supports, etc. have a service life of about 50 years. Usually, the steel will outlast the galvanizing on the steel. These supports are not breakaway and should be shielded from traffic.

These supports can be reused, unless the size of the sign being replaced changes. If there is any change in sign size, the support must be structurally evaluated to see if the change will require replacement of the support. If the support is over 20 years old, a field inspection should be done on the support before reusing it.

Bridge inspectors inspect large sign structures every six years. They are a good resource to check with about the condition of the support. Check the useful life of the bolted connections and/or galvanizing before new signs are installed on it. If there are indications of deterioration, consider rebuilding or replacing the support.

Figure 1: Truss Sign Bridge

1.2.3.2 – Multi-Post Breakaway

The useful life of steel multi-post breakaway sign supports is up to 50 years. Conduct a field inspection of the supports after 20 years and a decision made whether to reuse or replace the support.

Any change in loading (even simply shifting an exit number panel to the right or left side) requires a reevaluation of structural adequacy of the supports.

Figure 2: Multi-Post Breakaway Supports

1.2.3.3 – Triangular Base Breakaway

The useful life of galvanized triangular base breakaway steel supports is about 50 years. The designs of this support have undergone several changes throughout the years and only the newest version should be considered for reuse. A quick check of the base plate will indicate if the latest version is in use. There should be a 5′ square concrete pad present and the bolt slots on the base plate should be cut out at 90-degree angles and 4″ of minimum clearance of the lower slip plate compared to the surrounding surface. If these features are not present, then the support does not meet current standards and cannot be reused. See TM602 and TM635.

Figure 3: Standard Triangular Base Breakaway

If there are any steel sign supports on the project that do not meet current standards, they must be replaced with a triangular base breakaway sign support or multi-post breakaway sign support.

Figure 4: Triangular base breakaway with a round post; a standard no longer supported by ODOT.

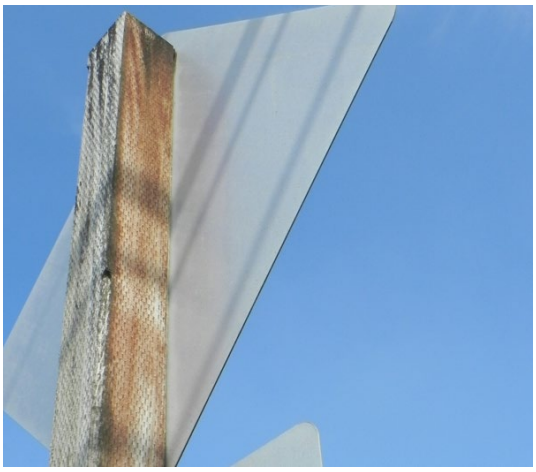
1.2.3.4 – Other Steel

The reuse of other steel supports such as signal pole mounts, bridge rail mounts, etc. should be based on the condition of the existing support. Conduct a field inspection for loss of galvanizing, fatigue cracking, bolted connections, etc. If there is any doubt whether the support will last another 10 years or more – replace it.

1.2.3.5 – Wood Posts, Perforated Steel Square Tube Posts, Etc.

Most small sign supports such as wood posts, perforated steel square tube posts (PSST), etc., should be replaced along with the sign, as the support will probably need replacing long before a new sign will need replacement. Round steel pipes are not allowed on the state highway system because the crash worthiness is not known, and maintenance does not stock round posts. Replace any round steel pipe even if it is in good condition.

Figure 5: Wood Post for a warning sign



1.3 – Critical Sign Locations

1.3.1 – Conventional Highways

The priority for sign placement is:

1. Regulatory.
2. Warning.
3. Guide.

In general, first consider the location of regulatory signs, followed next by the location of warning signs, and then the location of guide signs.

Several regulatory signs have critical locations. For example, the MUTCD is very specific about placing speed zone signs as close as possible to where the speed changes (MUTCD, Section 2B.13). The same logic applies to no-passing zones, school zones, no parking areas, disabled parking, loading zones, etc. Placement of STOP and YIELD signs are also critical placements.

Warning signs have the next highest priority for location placement. These include Stop Ahead or Signal Ahead Symbol signs, curve-warning signs, chevrons, DEAD END, NO OUTLET, object markers, etc.

After the regulatory and warning sign locations have been established, the guide sign locations can be considered. These include placing street name signs on all intersecting roadways, installing route shield assemblies (if required), destination and distance signs, city hall, library, airport, train station, permissive parking and park & ride signs, etc.

1.3.2 – Typical Layouts of Sign Placement

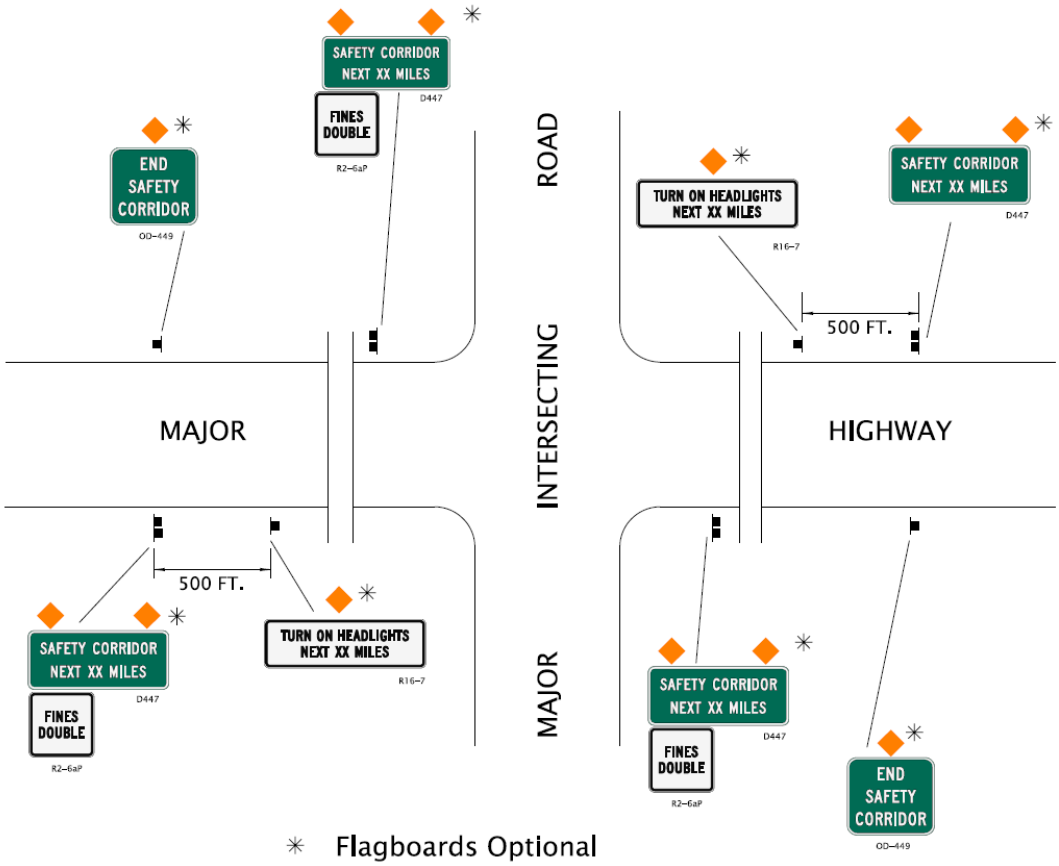
There are also specific situations that require specific placement, sequencing, or combinations of regulatory, warning and/or guide signs. Typical sign locations for various circumstances are shown on Figure 7: Standard Signing for Passing or Climbing Lanes through Figure 15: Low Mount Signing-Ramp Terminal with Concrete Island.

Not all the signs in the figures will be appropriate for every project; only select the signs that meet the particular needs of the project.

1.3.2.1 – Safety Corridors

Safety corridors are stretches of state highways where fatal and serious injury traffic crash rates are higher than the statewide average for similar types of roadways. See ODOT's safety corridor website for more information.

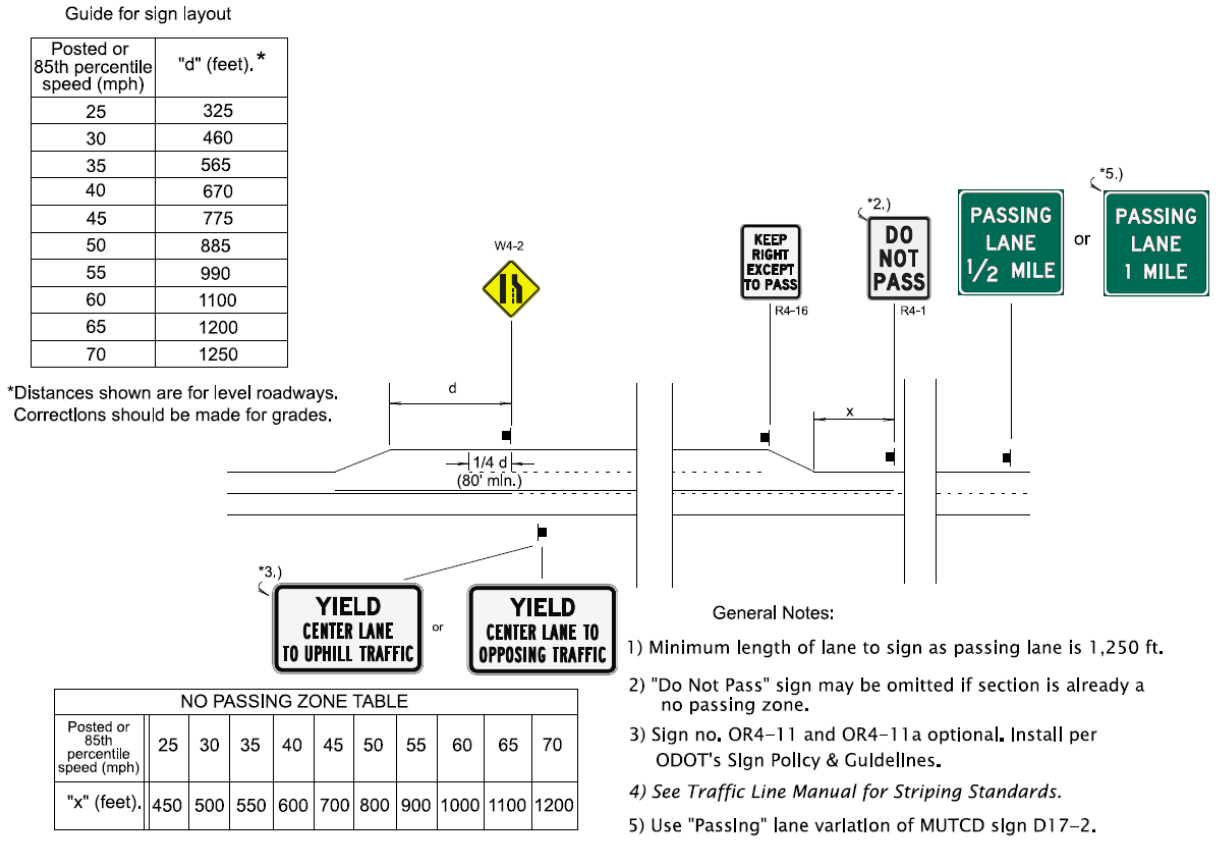
Figure 6: Standard Signing for Safety Corridors



1.3.2.2 – Passing and Climbing Lanes

See the Highway Design Manual for more information on the design of passing lanes and climbing lanes. It is important to place lane reduction signing in accordance with the striping. Below is a typical layout for signs and placement of the signs for these types of lanes.

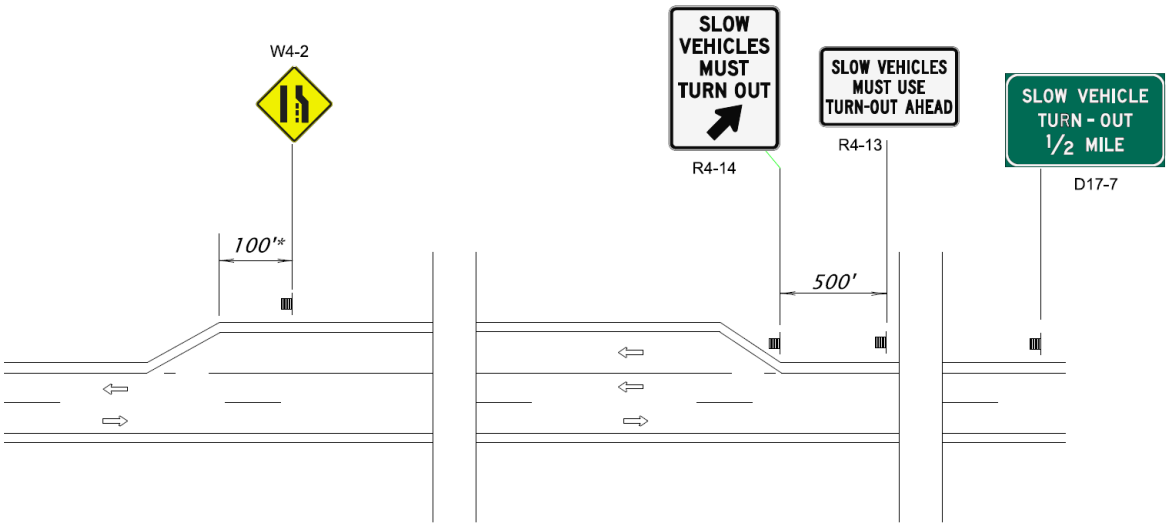
Figure 7: Standard Signing for Passing or Climbing Lanes



1.3.2.3 – Slow Vehicle Turn-out Lanes

Slow moving vehicle turnouts are not routinely installed in Oregon. However, the signs accompanying these turnouts may have to replace existing signing as part of a project.

Figure 8: Standard Signing for Slow Vehicle Turn-outs.



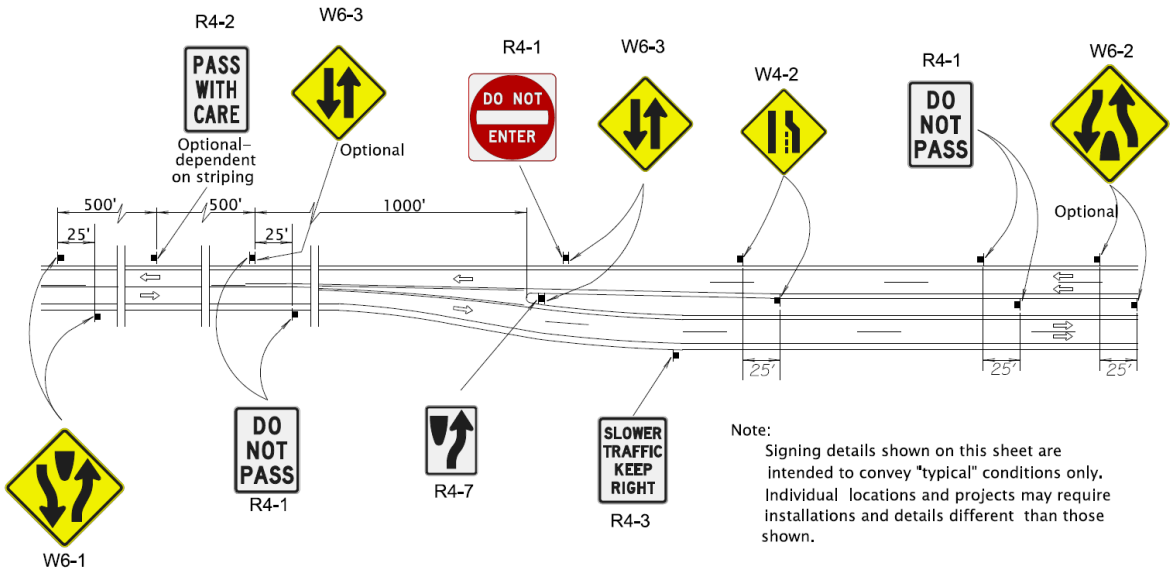
* Minimum spacing – provide more if adequate space is available

1.3.2.4 – Divided Highway Transitions

If a highway design has a transition to a divided highway or it is being implemented as a safety measure, the following sign layout should be used for the transition.

It is important to place lane reduction signing in accordance with the striping. Situations may require engineering judgement, as this is just a typical layout for transitioning for a divided highway transition.

Figure 9: Transition Signing for Physical Separation of Lanes



1.3.2.5 – Freeways and Expressways

For freeways and expressways, several types of signs have critical locations for placement. Most of the critical locations relate to interchanges, as they are the beginning point for measurements. Figure 11 and Figure 13 show the locations mandated for ramp terminal signing. On freeways and expressways, a minimum spacing of 800 feet between all guide signs and other signs, including other guide signs, should be maintained (Reference: MUTCD sections 2E.30 03 and 2E.35 04).

Use figures 10-15 to determine the locations for the DO NOT ENTER, ONE WAY, WRONG WAY, STOP, and Stop or Signal Ahead Symbol signs. The MUTCD allows signs on ramps every 100’ following the EXIT SPEED sign. Review the other existing signs and arrange them in a sequence that gives the driver enough notice that they can get into the appropriate lane to make their turn at the ramp terminal.

Remember the priority for signs is: Regulatory, warning, and then guide signs. Use the back of the posts of the DO NOT ENTER and WRONG WAY signs for signs facing the opposite direction. Even with implementation of low mounted signs, WRONG WAY signs should be installed downstream of the end of the off-ramp.

Figure 10: Regulatory Signing at Exit Ramp

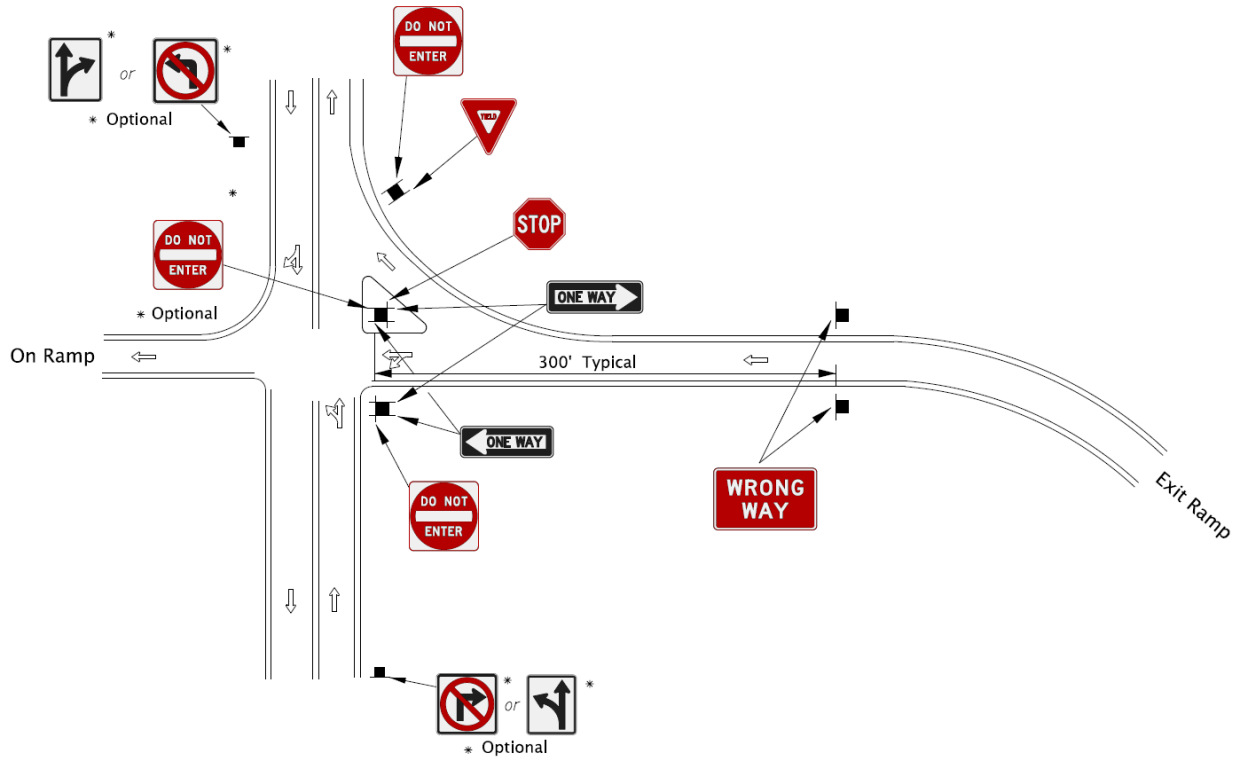


Figure 11: Typical Guide Signing at Exit Ramp

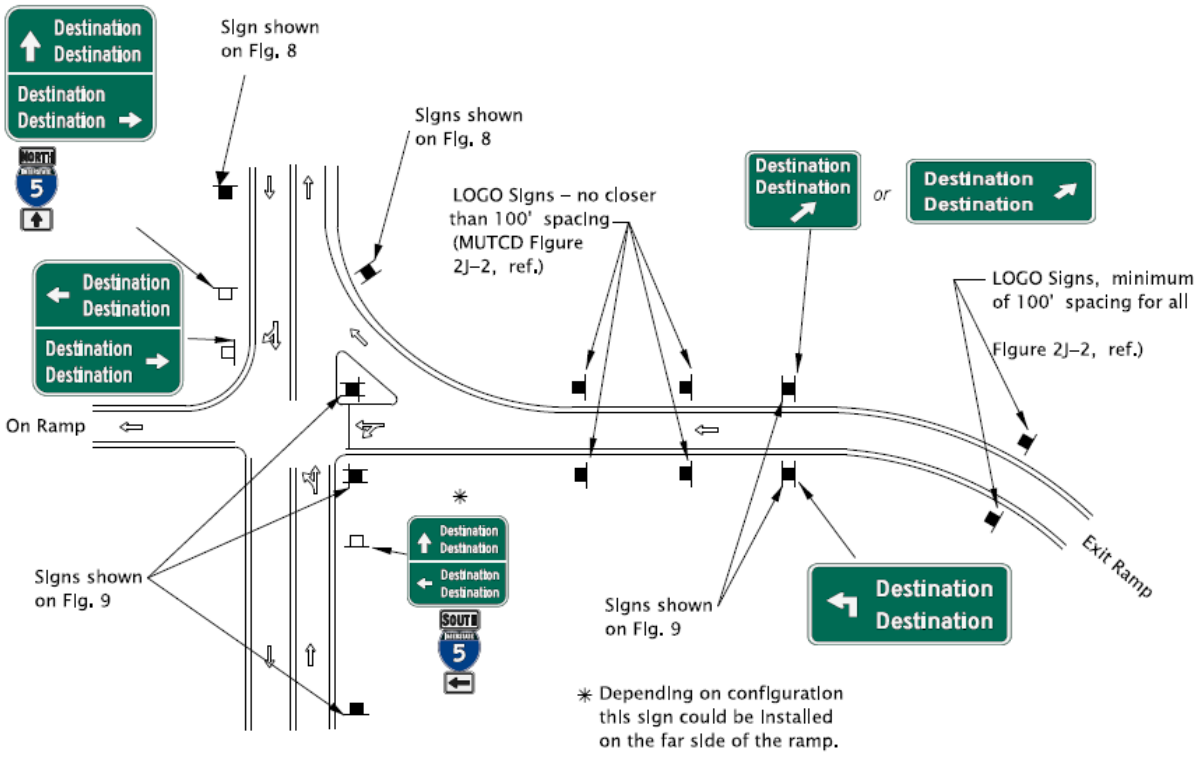


Figure 12: Typical Signing for Exit Ramp with Right Turn Lane

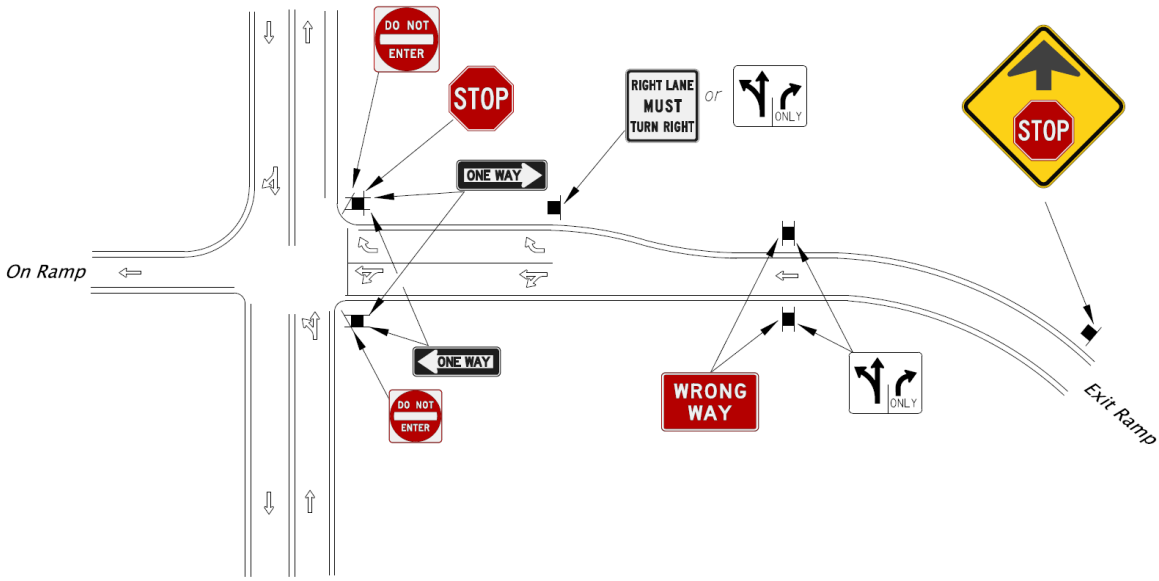


Figure 13: Enhanced Wrong Way Signing-Folded Diamond Ramp Terminal

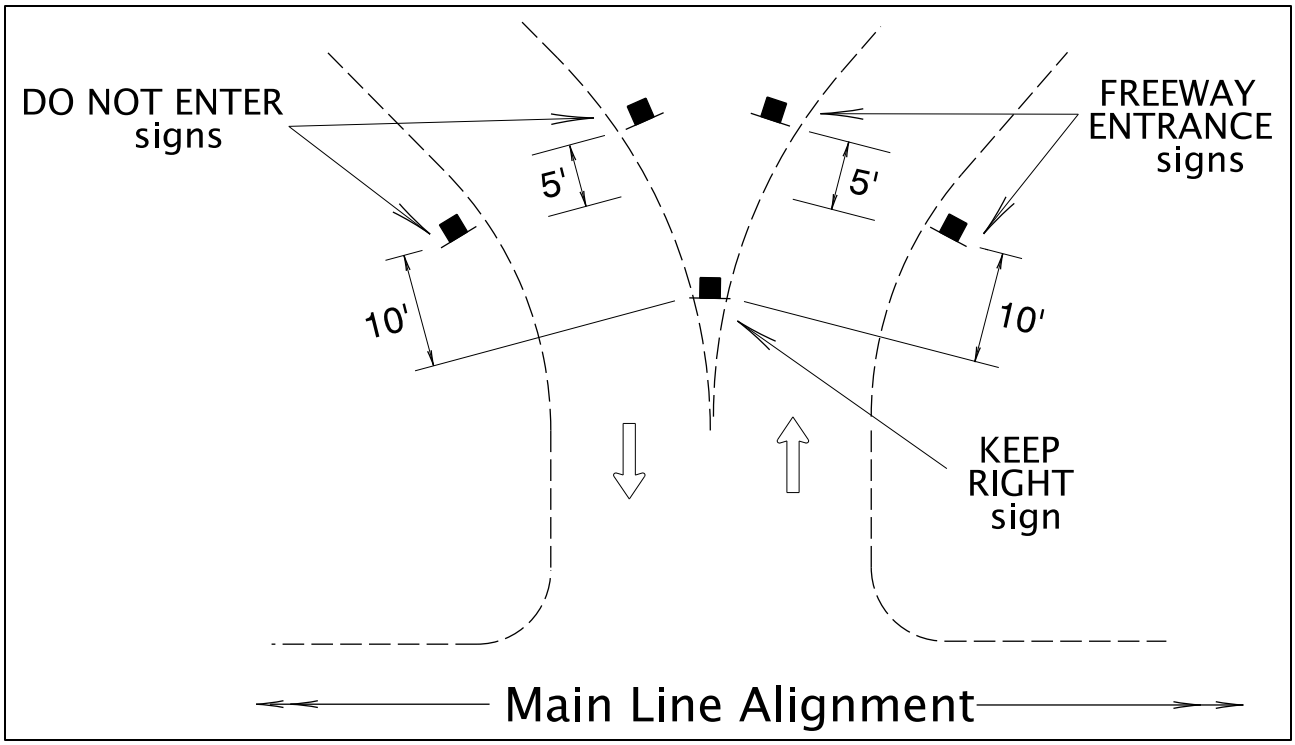


Figure 14: Low Mount Signing-Standard Ramp Terminal through Figure 17: Low Mount Sign ONE WAY Sign Installation provide additional guidance regarding low mounted installations for Wrong Way Entrance signing on the interstate.

Prevention of wrong-way traffic movement is a concern whenever an entire roadway is dedicated to one-way traffic, especially on high-speed facilities like the interstate where instances of wrong way driving often result in very damaging or fatal crashes.

MUTCD Section 2E.53 provides guidance in the placement of signs to discourage wrong way driving. A combination of ONE-WAY, DO NOT ENTER, and WRONG-WAY signs is recommended. It is also recommended for low or no light rural areas to add a red retroreflective strip to the DO NOT ENTER signposts. MUTCD Section 2A.21 provides guidance on the use of retroreflective strips on signposts. MUTCD also allows for lane use arrows and markings. MUTCD Section 2B.41 includes language that would allow for the use of a lower mounting height for signs in locations where an engineering study indicates it would address the issue of wrong way movements.

Low mounted signs at the end of off-ramps to prevent wrong way driving should be installed at interchanges. In order to implement the use of low mounted sign installations to prevent wrong way entrances at freeway exits, ODOT adopted a standard for low mounted installations (Figure 16: Low Mount Sign Do Not enter Sign Installation).

Guidance and examples on where to place the low mounted signs can be found in Figure 14: Low Mount Signing-Standard Ramp Terminal and Figure 15: Low Mount Signing-Ramp Terminal with Concrete Island.

For locations where it is not attainable to construct low mounted signing, note why low mounted signs are not being used. All installations for wrong way entrance signing shall use wide angle prismatic sheeting (ASTM Type IX or better), because:

- Wrong way entrance signs are typically installed at a 45-degree angle to approaching traffic.
- Of the limited performance of high intensity sign sheeting for nighttime retro reflectivity when viewed at angles other than 90 degrees to approaching traffic.

Sign designers are responsible for field inspecting the proposed location to determine if circumstances exist that would impede a driver's ability to view low mounted installations (e.g., barrier, fencing, snow embankment, etc.). If the designer determines the signs will not be clearly visible at the lower mounting height, the signs shall be installed at the standard mounting height.

Figure 14: Low Mount Signing-Standard Ramp Terminal

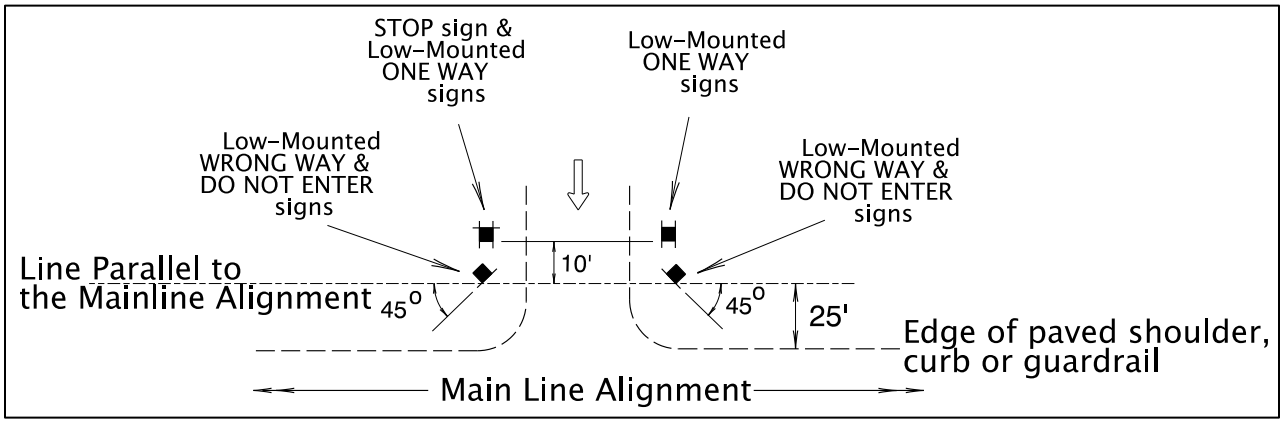


Figure 15: Low Mount Signing-Ramp Terminal with Concrete Island

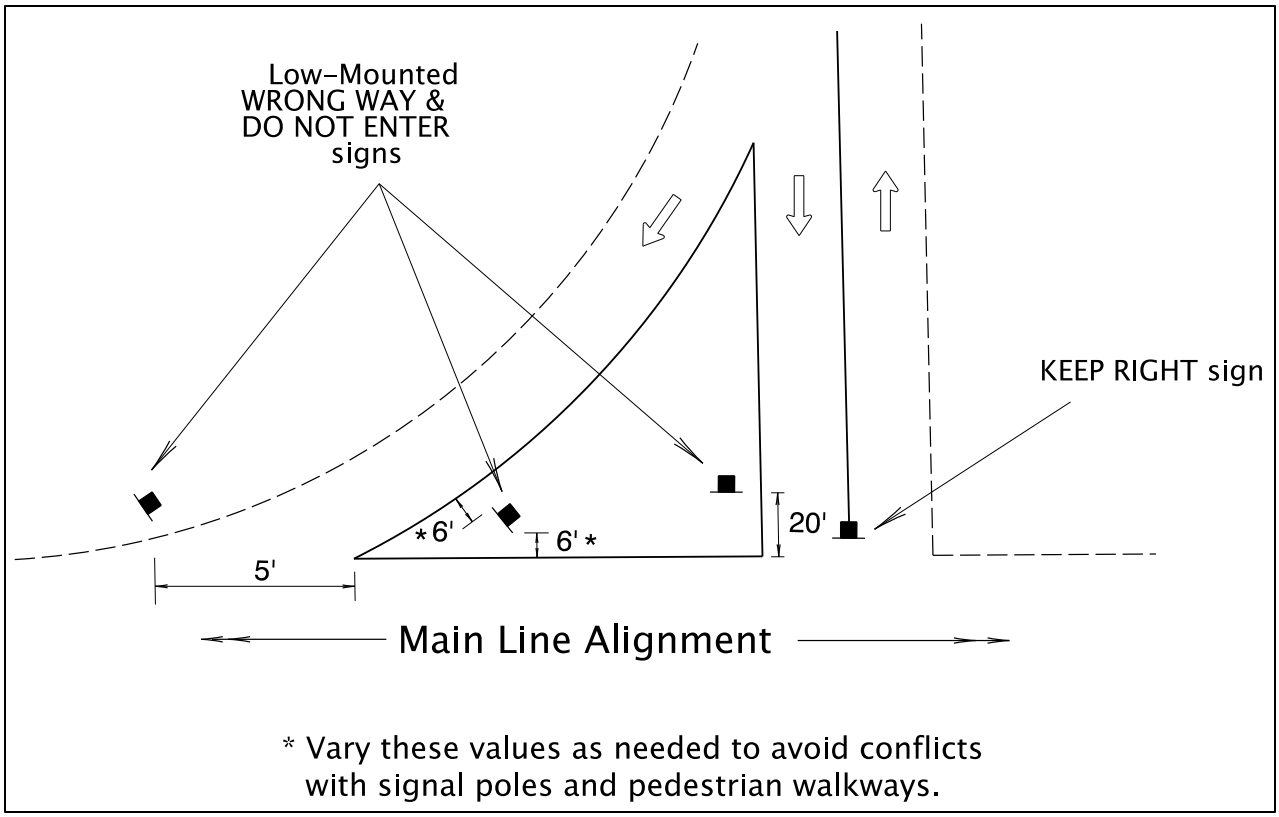


Figure 16: Low Mount Sign Do Not enter Sign Installation

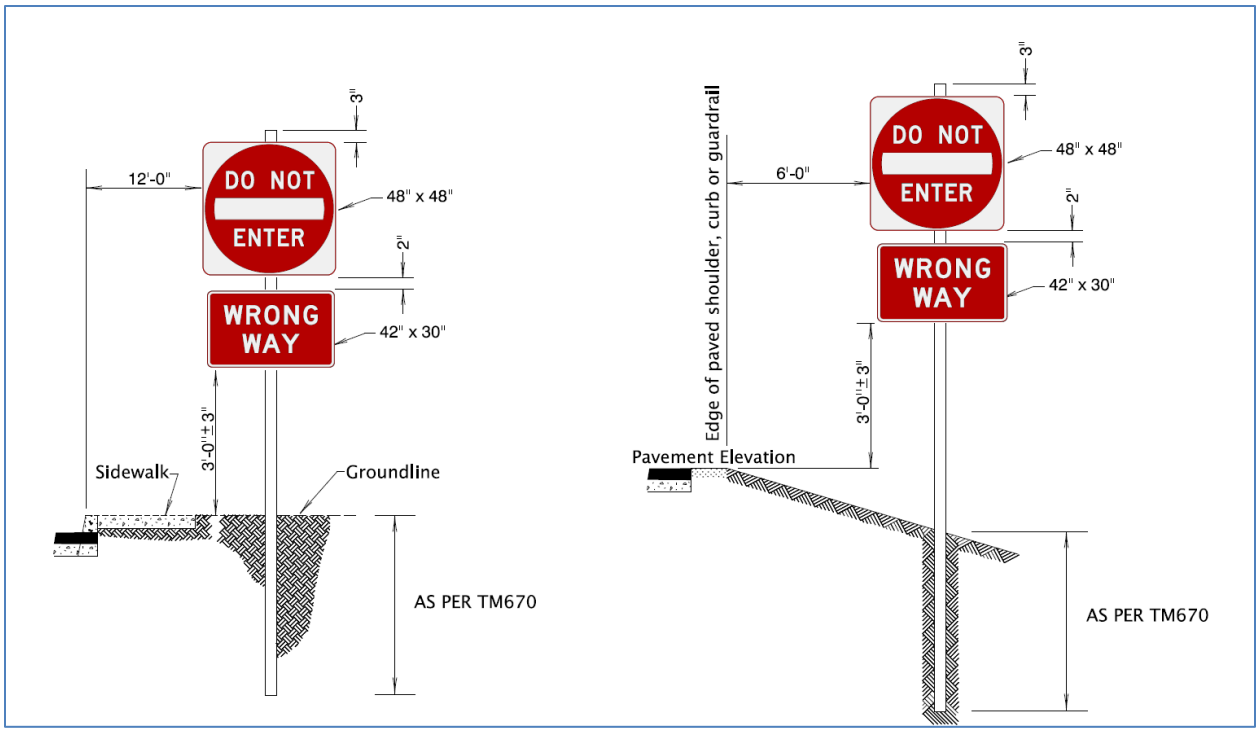
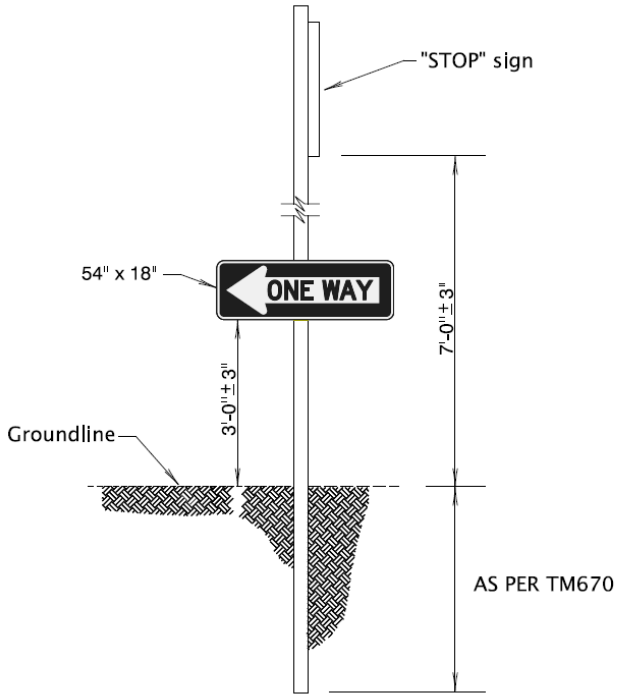


Figure 17: Low Mount Sign ONE WAY Sign Installation



LOW MOUNT "ONE WAY" SIGN INSTALLATION

1.3.2.5.1 – Ramp Metering

Most signs required for a ramp meter are detailed on the ramp meter plans and paid for under the lump sum ramp meter bid item. The STOP HERE ON READ and FORM 2 LANES WHEN METERED signs are the two exceptions; these are detailed on the sign plans and paid for under the applicable signing bid items.

See the ODOT Traffic Signal Design Manual Section 13.3 for more information and ramp meter sign layouts. Coordinate with the signal designer for these plans.

1.3.3 – Sign Spacing

1.3.3.1 – Conventional Highways

Now is a good time to look at the plan sheets and the spacing between signs, both on the state highway and the intersecting roads. Remember some of the regulatory signs cannot be moved from where they are placed. Warning signs should be placed using the "Guidelines for Advance Placement of Warning Signs" listed in the MUTCD (Table 2C-4). Note these are guidelines, not mandatory placement distances.

Warning sign placement should give drivers enough time to determine and take corrective action before they get to the item about which they are being warned. This does not mean place the sign at the exact distance shown on the chart just because it is on the chart. Visibility and applicability of the sign is just as important.

Warning sign legends with small letter size (less than 6″) or more than four words might justify using a longer distance. Too long of a distance will risk the driver forgets about the warning sign. Finding proper placement of these signs is why they should be placed before guide signs.

This leaves other signs subject to moving in order to obtain the proper spacing between the signs to make them readable for the driver. This is also a good time to think about combining some of the signs on the same support to reduce the number of sign installations on the roadway. Do not combine different types of signs on the same post if it can be avoided. Regulatory and warning signs should be installed on their own posts. The following table provides guidelines at various speeds and sections.

Table 2: Distance between Signs

Speed (mph)	Distance Between Signs (feet)
25	100
30	125
35	150
40	200
45	250
50	300
55, 2-lane sections	350
55, multi-lane sections	500
60, 2-lane sections	400
60, multilane sections	550
65, 2 lane sections	500
65, multilane sections	600
70, 2-lane sections	550
70, multilane sections	650

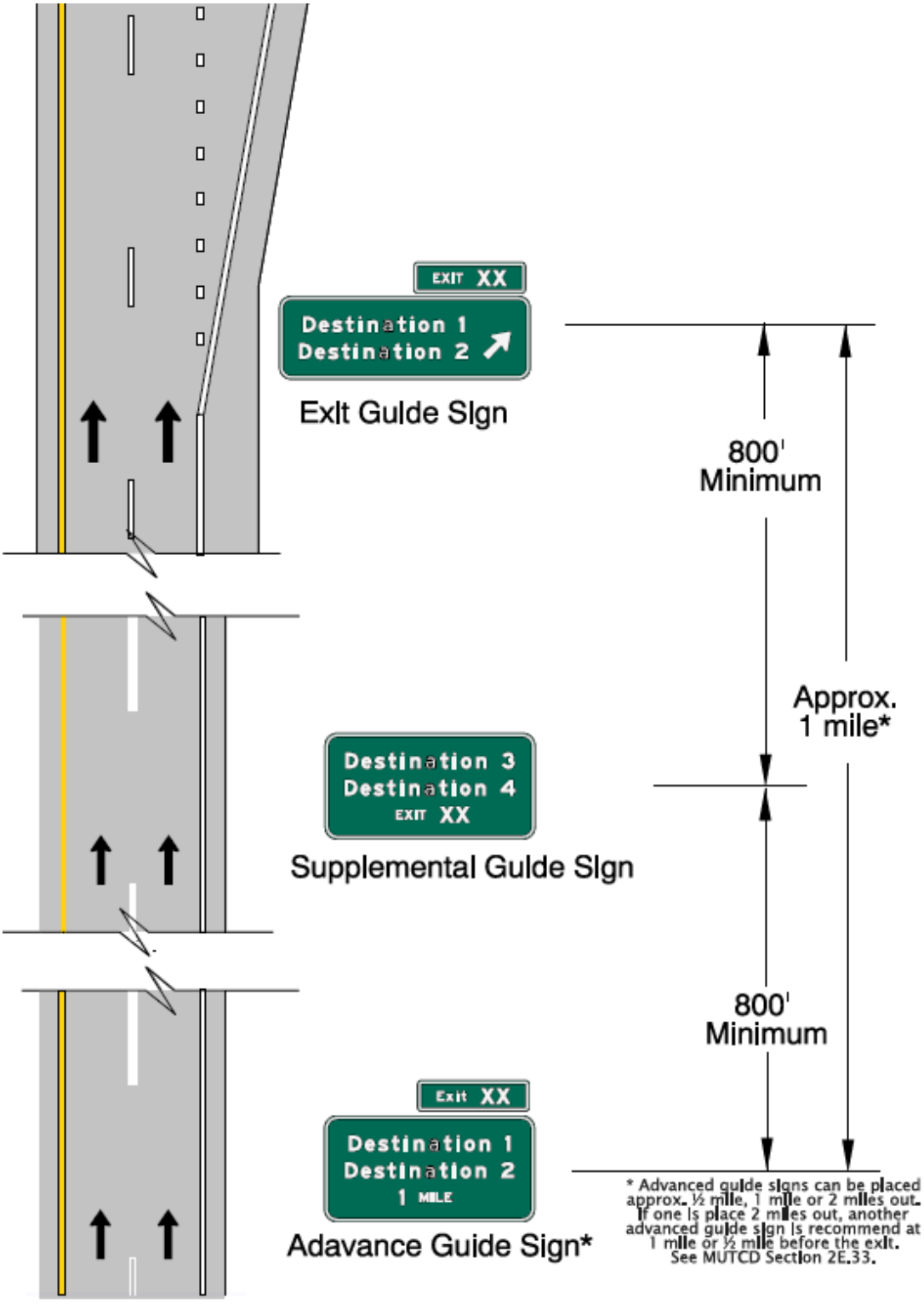
1.3.3.2 – Freeways and Expressways

Starting at the off-ramp Exit Direction Sign, pencil in locations at 800′ spacing between locations on the main line. Existing signs will probably include logo signs in addition to major guide signs. These signs should be at 800′ minimum spacing.

If logo signs are included, there is a sequence they are to be in approaching the interchange. The GAS sign is closest to the interchange, preceded by FOOD, LODGING, CAMPING, and ATTRACTION. There are only four logo signs allowed preceding an interchange, so if all five types of logos are present, one of the signs will have to be a combination of two different services. Any service covered by Specific Service (logo) signing at a particular exit, is not to be included on General Service signing for that same exit.

Pencil in the major guide signs on the sign plan starting at the Exit Direction sign. Going back away from the interchange, they would most likely be: Gas Logo, Food Logo, Supplemental Guide Sign, Lodging Logo, Camping Logo, and Advance Guide Sign. Check to see if there is space available to install a 2 Mile Advance Directional sign if warranted. Usually, any interchange other than a minor one would warrant a 2 Mile Advance Directional sign according to the MUTCD Section 2E.33 02.

Figure 18: Guide sign spacing on a freeway in regard to the exit sign, the supplemental sign and the advance guide sign.



1.3.4 – Sign Specific Needs and Guidance

After taking stock of the existing signs, consider new signing needs. These needs vary depending on the type of project and the type of facility upon which it is located.

1.3.4.1 – Curve Warning

Curve warning signs are recommended when the advisory speed on the curve is at least 5 MPH less than the posted speed on the roadway. Curve warning signs with an advisory speed plaque are required when the advisory speed on the curve is at least 5 MPH less than the posted speed on the roadway.

The standard to check the advisory speed on curves is with a ball bank indicator. Use the ball-bank indicator values in Section 2C.08 07 of the 2009 MUTCD to establish advisory speeds for curves. If paving the roadway with this project, the paving may change the super-elevation on the road, thereby changing the safe speed. The region traffic personnel should ball-bank the curves after the project is paved to determine if the speed riders (as designed) are correct. Use the following rules for evaluation of each curve in each direction:

- The ball bank indicator values in Section 2C.08 07 of the 2009 MUTCD are not-to-exceed values.
- Establishing, changing, or removing an advisory speed plaque requires a ball-bank indicator evaluation using the enhanced ball-banking equipment capable of measuring vehicle speed, curve radius, and side friction. If the curve is located such that these data cannot be collected (e.g.: because GPS signal is lost in a canyon), use an electronic ball-bank indicator.

Sometimes there are circumstances that occur where the required or recommended standards for curve warning signs cannot, or should not, be followed. If it is decided to not use the recommend or required curve warnings for any of the reasons below, document the decision and why it was made, and store it in a place future sign designers will find it.

Special circumstances and locations:

1. Curves in snow zones
    a. In locations where repeated damage to chevrons or arrows from snow plow operations is likely, chevrons or arrows may be installed substantially above the minimum height in the MUTCD section 2C.09 or ODOT's current standard installation height of 7 feet.

       Consider how vertical alignment may affect sign visibility when implementing this measure. Upgrading supports to resist snow thrown by plowing operations and addition of a vertical strip of retro-reflective material to the post are options. 4'x4'posts should not be used in snow zone areas, see TM670.

b. In locations where repeated damage to chevrons or arrows from snow plowing operations is likely and installation at an alternate height is not achievable, chevrons or arrows may be omitted. Alternative warning methods should be considered.

2. Curves for on/off ramps

   a. Advisory speeds for curves on ramps are set using the same criteria outlined in the guidance section.

   b. Guidance for application of horizontal alignment signing is dependent on posted speed and advisory speed. Because ramps are not part of the mainline or crossroad, speed is governed by basic rule when the ramp is not within a designated or statutory speed zone.

   c. In locations where crash history indicates horizontal alignment signing would be beneficial, chevrons or arrows should be installed.

   d. In locations where the crash history is of a type that would not benefit from installation of chevrons or arrows, they may be omitted. Alternative warning methods targeting the crash history should be considered.

   e. In locations without positive separation of on/off traffic or other geometric issues, chevrons or arrows may be omitted. Alternative warning methods should be considered.

3. Multiple Curves

   In some cases, multiple curves in a series may limit driver speed on entering a curve from one or both directions. Chevrons or arrows may be omitted for locations where **all the following are true**:

   a. One or more curves are located between curves having lower speeds that would limit the speed of the interior curve; **and**

   b. The curves meet the criteria in Section 2C.07 04 of the 2009 MUTCD allowing the installation of a WINDING ROAD (W1-5) sign; **and**

   c. The crash history for those specific curves is one of a type that would not benefit from installation of chevrons or arrows.

MUTCD Table 2C-5 recommends or requires the use of different curve warning signs based on the difference between speed limit and the recommended advisory speed. ODOT has taken a more conservative approach, where anything recommend in the MUTCD table will be required for ODOT projects unless a different sign is recommended or allowed by the provisions of the MUTCD and/or this manual.

Table 3. ODOT's Requirements for Table 2C-5 of the MUTCD; MPH designations indicate the difference between speed limits and advisory speeds

Type of Horizontal Alignment Sign	5 mph	10 mph	15 mph	20 mph	25 mph or more
Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment / Intersection (W10-1)	Required	Required	Required	Required	Required
Advisory Speed Plaque (W13-1P)	Required	Required	Required	Required	Required
Chevrons (W1-8) and/or One Direction Large Arrow (W1-6)	Recommended	Required	Required	Required	Required
Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp	Recommended	Recommended	Required	Required	Required

While these requirements are for roadways with an ADT of 1,000 or greater, similar signing can be applied to any location where it may enhance safety.

The Large Arrow sign (W1-6) or chevron markers (W1-8) are required as a supplement to the curve or turn warning signs when the safe speed on the curve is at least 10 MPH less than the posted speed. Placement of these signs or markers should conform with the locations listed in the MUTCD Sections 2C.09 and 2C.12).

1.3.4.2 – Exit Direction / Advance Guide for Freeways

The legend on the Exit Direction and the Advance Guide sign are required to be the same message (MUTCD Section 2E.30). There is a limit of two destinations per guide sign.

If there are more than two destinations for the interchange, use a supplemental guide sign. Only one supplemental guide sign is allowed per exit.

This means only four destinations are allowed per exit for guide signs on freeways. Most exits have all four destinations already signed for and are unable to sign for other destinations.

The MUTCD requires the exit number on the sign face or as an Exit Number sign placed over the guide sign (MUTCD Section 2E.31).

1.3.4.3 – Intersection Signing

Typical intersection signing for cross-roads, T-intersections, and separated roadways is shown in the MUTCD Section 2A.

1.3.4.4 – Milepost Markers

Milepost markers are sometimes replaced as part of the signing plans. Check the location of the existing installations. They are frequently in the wrong location and need to be moved.

Contact the Road Inventory and Classification Services unit (ODOTRICS@odot.oregon.gov), as they keep information on mile points and their markers for ODOT's data system, to let them know of the new locations.

1.3.4.5 – Motorist Service

Motorist service signs may include destinations such as state police, city police, sheriff's office, DMV, DEQ, hospital, rest area, rest rooms, visitor information center, scenic areas or overlooks. These are general service signs maintained by ODOT (MUTCD Section 2I.02). Replace these, as appropriate, as part of standard sign plans.

These should not be confused with specific service signs maintained by the Oregon Travel Information Council (Oregon TIC). These signs are maintained by TIC. See section on Specific Service signs.

1.3.4.6 – No-Parking Resolution

If there are any no-parking resolutions (See Appendix B "B.9 – No Parking Resolution"), draw the locations on the plan sheets. Draw (or describe) the type of restriction on the plan sheet for future reference.

Some NO PARKING signs may not be located according to the no-parking resolution and need to be moved. Some of the NO PARKING signs may have been installed without any recorded resolution on file. NO PARKING signs installed without a no-parking resolution should be removed.

1.3.4.7 – Other Regulatory Signs

These include Lane Use Control signs, Turn Restriction, DO NOT PASS, KEEP RIGHT, DO NOT ENTER, WRONG WAY, ONE-WAY, BEGIN RIGHT TURN LANE, YIELD TO BIKES, etc. In general, these are replaced in the existing location, but designers should make sure the messages are still appropriate.

Check changes in the pavement marking design that would require relocation of these signs.

1.3.4.8 – Post Interchange Sign Sequence for Freeways

Where spacing between interchanges permits, place a route marker assembly (e.g. I-5 shield with NORTH or SOUTH above it) 500 feet beyond the end of the acceleration lane, followed by:

1. SPEED LIMIT XX – After 1,000 feet.
2. Mileage/Destination Sign – After 1,000 feet.

3. EMERGENCY PARKING ONLY – After 1,000 feet.
4. KEEP RIGHT EXCEPT TO PASS – After 1,000 feet (not more often than once every 5 miles).

1.3.4.9 – Ramp Terminal

Review all ramp terminal signs and check for appropriate legends. Check the crossroad for jct. signs, route shield assemblies (may be incorporated in the guide signs), lane use control signs, speed signs, guide signs, etc. Check the on-ramps for lane drops and place the merge or add lane warning sign.

Use Figure 10: Regulatory Signing at Exit Ramp through Figure 15: Low Mount Signing-Ramp Terminal with Concrete Island for guidance on ramp terminal sign placement.

1.3.4.10 – Road Names under Warning Signs / Advanced Road Name Signs

When road names are placed under warning signs in this fashion, the road name must be a yellow background with black legend for the warning sign rider. The road name sign should not exceed the width of the main warning sign. Use guide signs to provide advance road name notice at locations where no intersection or signal ahead warning signs are needed.

1.3.4.11 – Route Signing

All state highways have an official state route assigned to them, but not all of them are signed. Route shield assemblies are required in certain circumstances, such as intersections of two state highways and the beginning of routes, etc.

In the past, route shield assemblies were considered optional in many circumstances. The MUTCD Section 2D.32 01B makes route signing at the beginning of state highways mandatory. Many people navigate by using the route shields, so they should be included whenever a change in direction is required.

The use of route shield assemblies as trail blazers and confirmation signs is also critical to some drivers. Route shields can be placed inside the guide signs, directions for do so is discussed in Chapter 2: 2.3 – Designing Guide Signs.

Review the existing guide signs to ensure the legend is still appropriate for the project. The legend size may need enlarging to meet current MUTCD standards; more on this in Chapter 2. Pencil in the locations and proposed text for all the guide signs. Advance guide signs on conventional highways are encouraged where right of way permits their use.

1.3.4.12 – School Speed Zones

Review the speed zone order (See Appendix B “
https://www.oregon.gov/odot/Engineering/Docs_TrafficEng/Traffic-Manual-2023.pdf

B.8 – Speed Zone Orders") for any school zone exceptions. The school speed limit 20 zones **are exceptions** to the speed zone order, because the school speed is different than the normal posted speed.

The limits shown for the school speed exception are the exact locations for placing the SCHOOL SPEED LIMIT 20 sign for traffic flowing that direction. Directly across the road from the SCHOOL SPEED LIMIT 20 signs (for traffic flowing the other direction), place an END SCHOOL SPEED LIMIT sign, or use an END SCHOOL ZONE sign for zones posted with FINES HIGHER signs. Various school zone scenarios and their associated signing are presented in ODOT's Sign Policy & Guidelines (Chapter 7).

Sign the school zone with the required School Advance Warning Assembly (S1-1). Refer to the Sign Policy and Guidelines, Chapter 7 for their location. Oregon has taken exception to the location of the signing in the MUTCD. The MUTCD recommends placement of the sign with respect to the school grounds or school crossing, but the Oregon supplements require the placement based on the location of the School Speed Limit Assembly (Oregon Supplements to the MUTCD, Section 7B.15)). For the School Crosswalk Warning Assembly (S1-1) the use of the downward pointing arrow (W16-7p) is required (MUTCD, Section 7B.12). The School Crosswalk Warning Assembly (S1-1) shall not be installed on approaches controlled by a STOP sign (MUTCD, Section 7B.12).

1.3.4.13 – Specific Service (TIC & TOD Signs)

In addition to general motorist service signs installed by ODOT, there are other types of blue signs installed by the Oregon Travel Information Council (TIC). Logos are available for gas, food, camping, lodging, and tourist attractions. Tourist oriented directional signs (TODS) are for any business that gets most of their income from people who live outside the local area.

TIC signs are placed on ODOT right of way but belong to the TIC. These signs are usually listed as "maintain and protect" as part of a project, if possible. If existing signs are impacted at all, notify TIC of the project. TIC can be reached at 1-800-574-9397.

If widening the road necessitates moving the logo or TODS, check the new cross section to see if the signs can be removed and reinstalled on the existing supports. The move may require different post heights.

TIC may request new supports or the change in slope may require a new support. TIC needs to review the preliminary, advance, and final plans. The logo and TODS signs need to be maintained during construction and the work zone traffic designer should be reminded to provide for them, if necessary.

There are occasional brown TOD signs for historic districts, museums, or historic properties. The brown signs are limited to three destination groups:

- Historical.
- Cultural.

- Recreational.

These signs can be word messages or symbol signs or a combination of both. Brown background signs would include:

- Historic districts, properties, and highways.
- Museums.
- Parks.
- Recreational Areas.
- Fairgrounds.

On the interstate, brown signs are almost always owned by ODOT. For other state highways, you may need to contact TIC to see if the sign is theirs or ODOT's.

Since TIC signs require payment from organizations, TIC has a much more comprehensive list of the signs they own.

1.3.4.14 – Speed Zones

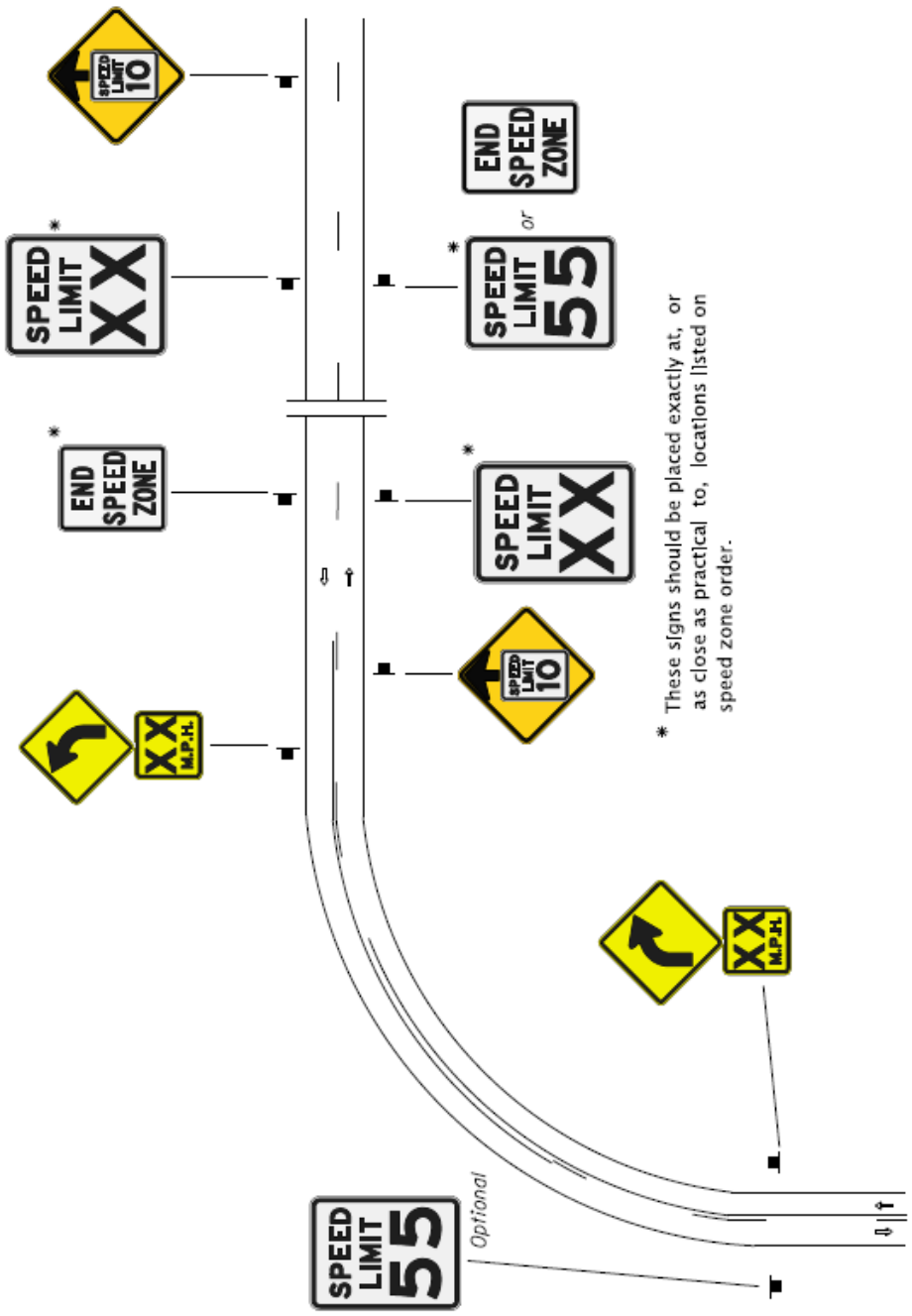
Review the speed zone order(s) (See Appendix B " https://www.oregon.gov/odot/Engineering/Docs_TrafficEng/Traffic-Manual-2023.pdf

B.8 – Speed Zone Orders"), which cover the particular section of highway, and pencil in the limits of the speed zone and place the appropriate speed sign at all changes in speed. If there are major intersections between breaks in the speed zone, allow for one speed sign each direction as close as possible to the intersection. This allows the driver to determine the appropriate speed upon entering the roadway.

Locate SPEED LIMIT XX signs at the points of change from one speed limit to another (MUTCD Section 2B.13) according to the speed zone order. If the location in the speed zone order is not practical, an adjustment of up to 100 feet is permissible. If the location is not suitable for appropriate signing, contact the region traffic section to discuss the possibility of reevaluating the speed zone order.

See the figure below for example of typical speed zone signing.

Figure 19: Typical Speed Zone Signing



1.3.4.15 – State Supplied Signs

Many projects will include signs with unique graphic designs such as scenic byway or tour route signs, State Parks Shields (D-434), and others that require digital printing.

Whenever these signs are needed, it may make sense for them to be designated state-supplied, so they do not enter the bid. If this is the desire, then the subject signs would be noted in the plans as "state supplied." Money is then put into the contract for these signs to be purchased later, during construction, from the ODOT Sign Shop or other appropriate source as an anticipated item.

Anticipated items are discussed in Chapter 6.

1.3.4.16 – Stop Signs

Locate all the STOP sign installations on the plan sheets. Almost all state highways are considered through highways. Meaning the highway has priority over intersecting roads except in those locations where the intersecting roadway has a larger volume or an identified safety issue dealing with alignment. Unless the existing signs show otherwise, assume all public roads leading into the state highway should have a STOP sign. See the Sign Policy and Guidelines for considers on installing stop signs on low volume roads.

Any STOP sign application on the state highway that stops traffic traveling on the state highway requires approval from the state traffic engineer (ODOT Traffic Manual). Decisions for STOP sign applications on cross streets that are not state highways are done by the region traffic manager/engineer (ODOT Traffic Manual).

Private approaches may be signed on state highway right of way due to visibility problems. There is a policy on allowing these signs (Sign Policy and Guidelines). Private businesses are not allowed to place STOP signs and other traffic control devices on state highway right of way.

The standard STOP sign size is 36" for any road 30 mph or greater. This would also be the size of the STOP signs on any cross street that intersects on a road 30 mph or greater. Even if the cross street is 25 mph or lower, the STOP sign should be a 36" sign because of the impact to the traffic on the faster highway.

1.3.4.17 – Stop Ahead / Signal Ahead

Check the alignment of the roads entering the state highway for sufficient, safe stopping sight distance. Place Stop Ahead symbol signs if the stopping sight distance is lacking.

If a new signal is installed as part of the project, a Signal Ahead symbol sign should be considered both on the main line and cross streets. If the new signal is near other signals, a Signal Ahead Symbol sign may not be necessary.

1.3.4.18 – Street Name

Install street name signs for highway and public side streets if the highway has a name. If the highway does not have a name, install route shield assemblies at all the major road connections.

Place street name signs on both sides of the post above the STOP sign. At T-intersections, place street name signs (for the highway name) on both sides of the STOP signpost above the side

street name signs. At cross street intersections, the street name signs for the highway only need to be on the highway side of the STOP signpost.

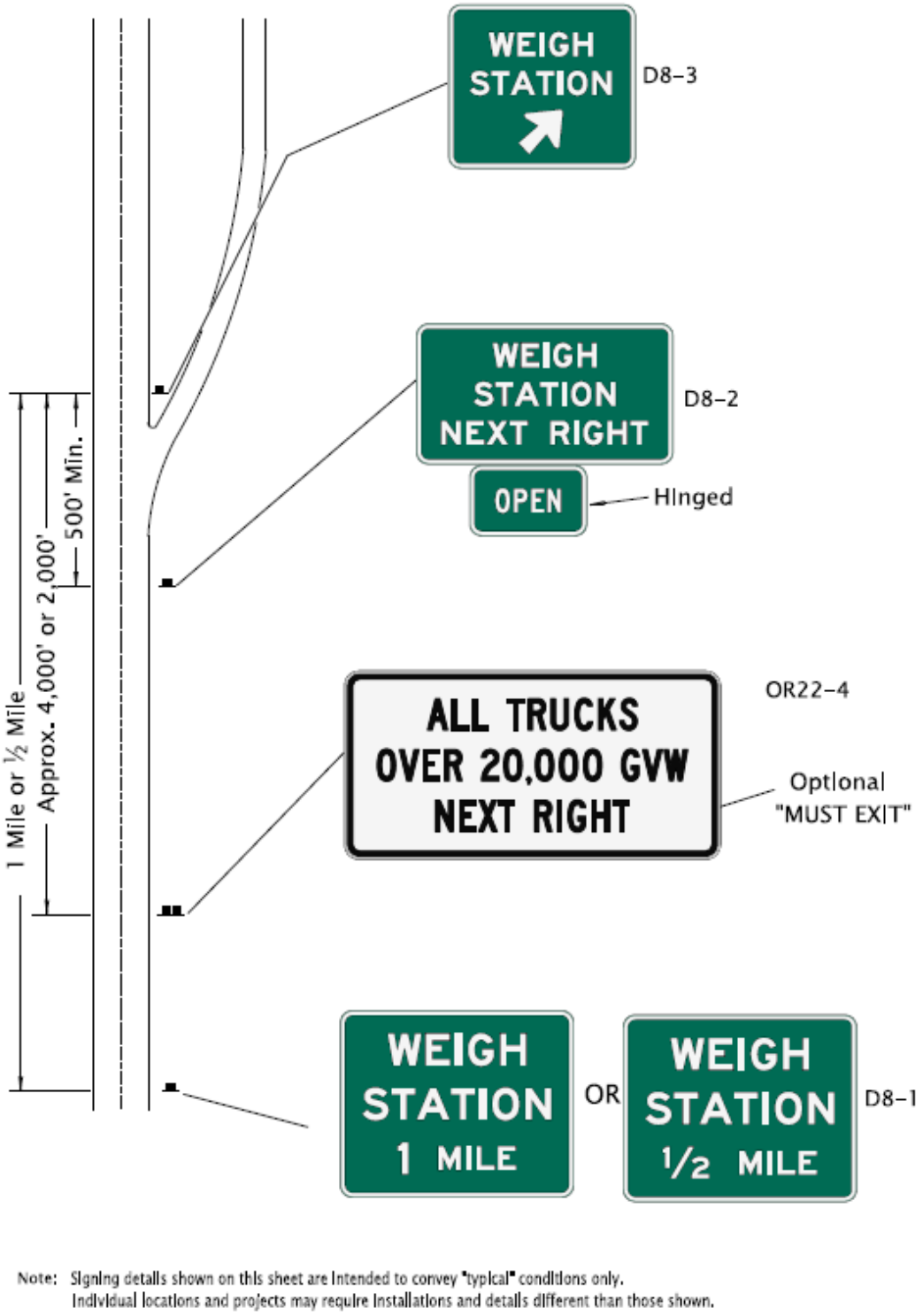
Street name signs mounted on traffic signal mast arms shall be shown and detailed on the signing plans, but only referenced on the signal plans.

Since the signs are shown in the signing plans, they need to be covered under the bid item for the specific sign type. These signs shall not be paid for as part of the lump sum for signal installation bid item.

1.3.4.19 – Weigh Station

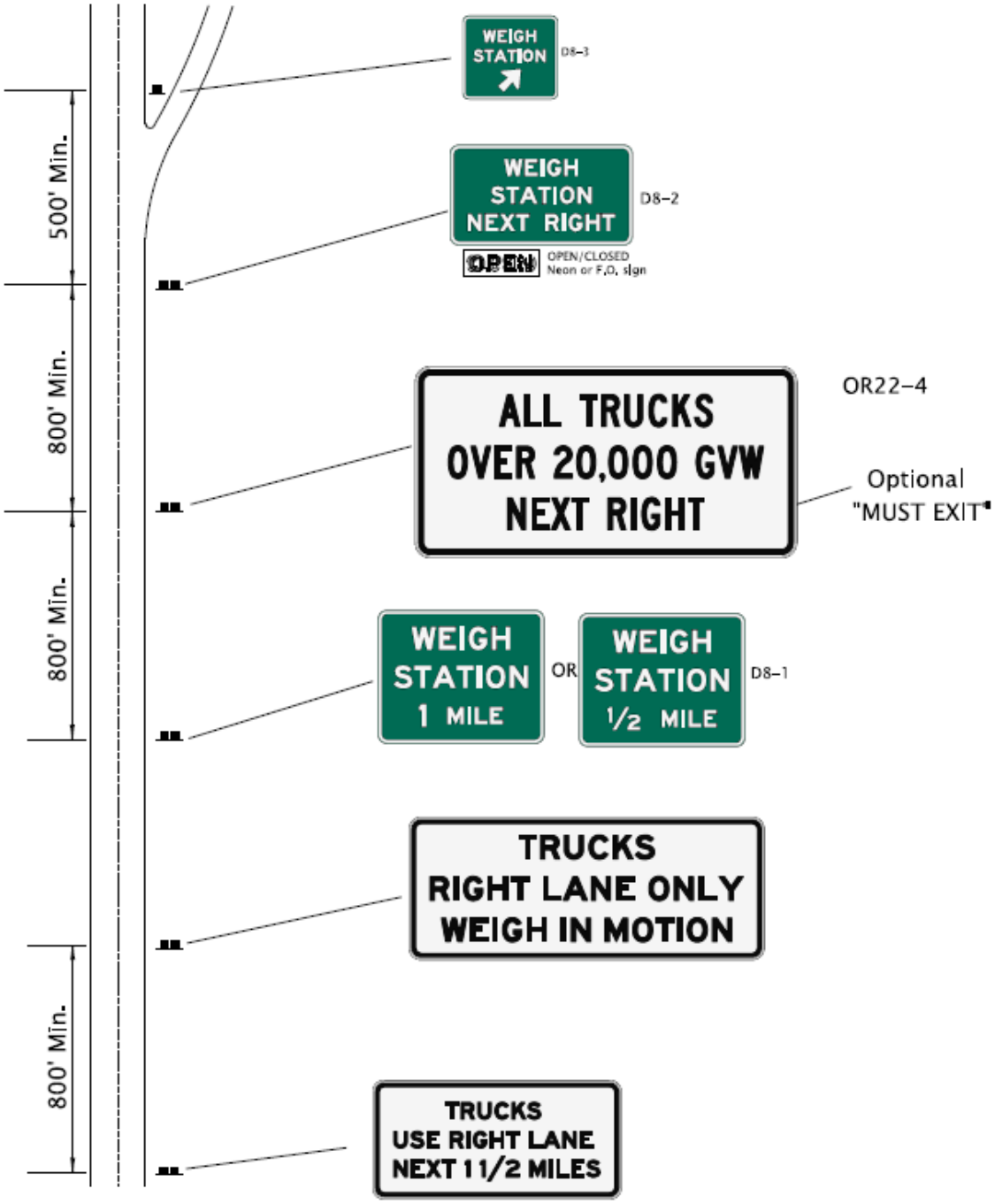
Typical signing layouts for weigh stations off-interstate and those on the interstate with weigh-in-motion are shown in Figure 20 and Figure 21, respectively. The weigh station signs typically have an electronic OPEN/CLOSED changeable part of the sign that requires a bigger support than typical for the size. Designers should make sure to check the crashworthiness of the support.

Figure 20: Weigh Station Signing Off-Interstate (MUTCD Figure 2D-17, ref.)



Note: Signing details shown on this sheet are intended to convey "typical" conditions only. Individual locations and projects may require installations and details different than those shown.

Figure 21: Weigh Station Signing Interstate with Weigh-In-Motion



Note: Signing details shown on this sheet are intended to convey "typical" conditions only. Individual locations and projects may require installations and details different than those shown.

1.3.4.20 – Signs Requiring STRE Approval

Some signs or a traffic control change that results in posting a sign need approval from the state traffic/roadway engineer (STRE). Many times this was not done in the past or there is no paper work to verify it.

Any sign that will be replaced or added that requires STRE approval will need the appropriate paperwork filed at both headquarters and the region office. Check to make sure that the appropriate paperwork is in order. If there is no approval on record, it can slow down the project. A request for STRE approval is recommend to be sent into headquarters before the end of the design acceptance package (DAP) due date.

The following signs require STRE approval:

- UNMUFFLED ENGINE BREAKING PROHIBITED (OR22-11) – see The Sign Policy and Guidelines for the requirements to post this sign. If there is an approval on record, it does not need to meet the requirements again. Check the fee amount to make sure it is correct ($2000 in 2019).

Intelligent Transportation System (ITS) signs that require STRE approval:

- Curve warning systems.
- Road condition warning systems.
- Variable message signs.
- Variable speed limit.
- Travel time VMS.

Traffic control that a sign posting will accompany that require STRE approval:

- CROSSWALK CLOSED (OR 22-7 and OR 22-8) – If any crosswalks are closed that cross the roadway that is part of the project in question, make sure that there is paperwork at HQ allowing these crosswalks to be closed.
- RIGHT TURN PERMITTED WITHOUT STOPPING – ODOT has stopped using this sign on our right of way, and now is using the MUTCD sign R1-10P.
- EXCEPT RIGHT TURN (R1-10P) – Having a STOP sign, but allowing free flow right turns requires STRE approval. Also see above.
- Multi-way stop signs (R1-1) – Installation of a stop sign on the state highway requires STRE approval, although the accompanying sign does not. Make sure there is paperwork that document all installations.
- PREPARE TO STOP WHEN LIGHTS FLASHING (OW15-14).
- School Crossing (S1-1).
- NO TURN ON RED (R10-11).

- U-turn permitted (OR3-12).
- RRFB signing – The RRFB must be approved.
- SPEED LIMIT signs – In conjunction with an approval of a speed zone order.

This is not a comprehensive list of all traffic controls requiring STRE approval. Please see the Traffic Manual for additional items.

Chapter 2 – Designing Signs

2.1 – Choosing Substrate and Sheeting Types

A typical road sign consists of three components:

- Substrate.
- Sign sheeting.
- Sign legend.

This chapter discusses the common construction and materials used in the construction of road signs.

2.1.1 – Sign Substrates

ODOT commonly uses sheet aluminum sign substrate material. However, there are situations where sheet aluminum is not the best choice for sign substrate. The other two materials ODOT may use for permanent sign substrate are extruded aluminum and High-Density Overlay (HDO) plywood. All three of the signs' substrate materials are recyclable.

There are numerous types of substrates for road signs used over the years and new products are being introduced every year. This chapter deals with the substrates currently used in Oregon.

The overall dimensions and location of a sign will often help determine the appropriate substrate material for fabrication.

2.1.1.1 – Sheet Aluminum

Sheet aluminum is ODOT's most common choice of sign substrate at most locations. It has a smooth flat surface and comes in a variety of precut sizes to match most standard sized signs. The thickness of the aluminum is increased as the size increases to maintain the strength of the sign. Sheet aluminum can also be purchased in sheets just like plywood. The Oregon Standard Specifications for Construction lists the allowable thickness for the size of sign and also lists the acceptable types of aluminum sheeting (Specification 02910.10). Using something other than the specified type of aluminum sheeting may result in failed substrate.

Sheet aluminum substrate should not be specified in high wind areas or snowplow areas, as the aluminum is prone to bending. In rural areas with recurring gunshot vandalism, consider using HDO plywood substrate, rather than aluminum, because the plywood can often sustain gunshot damage and remain readable.

Figure 22: Sheet aluminum on a wooden post

Signs designed using sheet aluminum should be designed in width and height that increase in 3″ increments (the same as plywood signs). The maximum size of sheet aluminum signs is 4′ x 5′, due to its tendency to deform or sustain wind damage when used for signs larger than this. Many other states have limited normal sheet aluminum sign use to this dimension for the same reason.

Sheet aluminum overlays on extruded panel signs are not limited in size since the extruded aluminum panels support the sheet aluminum. Mast arm mounted street name signs are limited in size per TM655 to 21.0 sq. ft since the signal mast arm helps support the sheet aluminum. A change in size for a sign attached to a mast arm may require a structural evaluation to make sure the mast arm can handle the extra load.

In some locations of the state, designers must include painting the backs of aluminum signs to blend in with the environment. When required to do this, special provision Section 00940 should be used for this purpose, and it automatically calls up Sections 00593 and 00594 that have the coating specifications. Different locations may call for different colors of paint. Most of these places will also require the metal sign supports to be painted as well.

2.1.1.2 – Extruded Aluminum Panels

Extruded aluminum panels are composed of pre-formed structural shapes bolted together to create the sign substrate. The shape is shown on Oregon Standard Drawing number TM675 in the upper left corner. The extrusions come in 6″ and 12″ tall panels up to 40′ in length. Each extrusion is covered with sign sheeting prior to bolting the panels together to form the sign.

Normally, the border, text, route shields, etc. are placed on a thin aluminum background and then pop-riveted to the preformed sign background. Signs designed using aluminum extrusions should be designed in width and height that increase in 6" increments. Due to size restrictions for plywood and sheet aluminum, extruded aluminum panels must be used for all signs larger than 4' x 8'. The nature of their fabrication requires their fastening to the support by means of post clips rather than bolts. Many of the steel signs supports (Chapter 3) such as triangular base breakaway posts, multi-post breakaway supports, exit number sign mounts, vertical mounts and signal pole mounts are designed specifically for fastening by clips. Where such supports are used, extruded panel signs (regardless of size) should be specified.

Figure 23: Extruded panel sign with fasteners

Occasionally, a legend can be applied directly to the extruded panel if the legend does not span from one extrusion to the other. When applied to two extrusions, direct applied legends will accumulate dirt and other materials where the two extrusions meet, causing a dirt pocket that retains moisture. When it freezes, the sheeting can be damaged by the expanding mass and looks unsightly.

2.1.1.3 – High Density Overlay (HDO) Plywood

HDO plywood is the only plywood allowed for permanent signs on ODOT projects.

HDO plywood has a smooth surface similar to a Formica cabinet face. Primer is not required between the face of plywood and the sign sheeting. HDO plywood does not have the surface blemishes found in the medium density overlay (MDO) plywood, due to the thicker overlay applied when the plywood was made. HDO plywood is very rigid and is an excellent substrate

for signs that must withstand a lot of wind pressure. This substrate should be used in snow zone areas because it holds up well against snow blower and snowplow damage. It should also be used in rural areas where with recurring sign damage from gunshot vandalism, because the plywood can often sustain gunshot damage and remain readable.

Figure 24: Aluminum sign with a bullet hole

This product is available in 4′ x 8′ sheets (maximum size allowed for plywood substrate signs) and is cut to the size needed for a particular sign. ODOT uses ¾-inch HDO plywood. If the project design is not on ODOT right of way, check on the thickness the local agency uses. Signs designed using HDO or MDO plywood (MDO is only for temporary signing – see below) should be designed in width and height that increase by 3″ increments (e.g. 4′-6″ x 3′-9″).

2.1.1.4 – Medium Density Overlay (MDO) Plywood

MDO plywood is allowed on ODOT contracts for temporary signing only. MDO plywood was the standard for almost all the plywood signs in Oregon for years. However, following a massive, statewide product failure (related to the primer), ODOT only uses this material temporarily.

MDO plywood has surface blemishes (plugs) that sometimes distract from the smooth, finished sign face. This plywood is rigid and is an excellent substrate for signs that must withstand a lot of wind pressure. This product is available in 4′ x 8′ sheets and is cut to the size needed for a particular sign.

2.1.1.5 – Other Substrates

ODOT has tried using plastic and fiberglass substrates on signs with little success. Different substrates will likely be available in the future that will fulfill ODOT requirements for a dependable long lasting sign substrate.

When designing a project for a local government on their right of way and they want to use another substrate, include a detail and specifications of what the substrate looks like and the materials specification for each type.

2.1.2 – Sign Sheeting

There are numerous types of sign sheeting available and each type has its advantages and disadvantages. It is important to specify which type of sheeting to use on each sign designed.

2.1.2.1 – ASTM Type III

This sheeting is also known as high intensity. On state highways, this is the minimum reflective sheeting allowed. Almost all ground mounted signs will use Type III or Type IV sheeting for backgrounds and almost all the legends. Type III sheeting is also used for background sheeting on overhead guide signs. This sheeting is warranted for 10 years from the manufacturer.

2.1.2.2 – ASTM IV

This sheeting is multi-layer sheeting, sometimes called prismatic sheeting. Type IV sheeting performs similarly to Type III sheeting.

2.1.2.3 – ASTM Type IX

This is a highly retroreflective sheeting, mainly used for overhead sign installations. This sheeting has a much wider angularity and is not quite as bright as the Type VII used in the past.

It can be used for ground mounted signs but should be reserved for places where high impact is needed. It is commonly used for legend on overhead mounted signs and can be used as background where more high impact is needed.

Viewing distance is up to 800 feet away. The warranty on this sheeting is 12 years. It also comes in fluorescent colors: Yellow, yellow-green, and orange. In the fluorescent colors, a 10-year warranty applies.

2.1.2.4 – ASTM Type XI

This wide angle, highly retroreflective sheeting is mainly used for overhead sign installations and signs placed at angles or locations where a lesser retroreflective sheeting would require illumination.

It can be used for ground mounted signs but should be reserved for places where high impact is needed. Some have commented that this type of sheeting can be extremely bright, especially in rural areas where there are few other light sources at night.

The warranty on this sheeting is 12 years. It also comes in fluorescent colors: Yellow, yellow-green, and orange. In the fluorescent colors, a 10-year warranty applies.

2.1.2.5 – Other ASTM Type Sheeting

The following sheeting types are no longer used on Oregon's state highway system.

- ASTM Type I.
- ASTM Type II.
- ASTM Type V.
- ASTM Type VI.
- ASTM Type VII.
- ASTM Type VIII.
- ASTM Type X.

2.1.2.6 – Non-Reflective Sheeting

Since the MUTCD requires all signs to be retroreflective and the same color at night as during the day, the use of non-reflective sheeting has become extinct except for black.

Black sheeting comes in rolls or as a "tape" that is the common width of most borders. The use of black in Oregon is limited to legends for regulatory and warning signs.

2.1.2.7 – Electronic-Cuttable Film (EC Film)

Electronic-cuttable film (EC film) is a semi-transparent film placed over the underlying sign sheeting to change the color of the sign sheeting. It is an alternate to applying another layer of sheeting (usually for legend but could be a background) in the manufacturing process. Usually, this is not an item that would be specified when building a sign plan, but it is something of which to be aware. There is also a black non-reflective EC film used in lieu of the standard black sheeting mentioned above.

The Sign and Post Data Table sheet provides the sign manufacturer precise information on the construction of the sign specified (See Chapter 4: 4.4 – Sign and Post Data Tables). This doesn't mean there isn't another way the sign can be built and still perform to ODOT standards. One option is the use of EC film not usually listed as a construction method but meets ODOT specifications and performs very well.

The EC film allows light to reflect through to create the colors required on the sign. It is cost effective for unusual designs (such as the Tsunami Series, Oregon Trail, Lewis & Clark, etc.) since it replaces the silk-screening method.

For sign shops that do not silk screen, EC film is a practical method of building signs. EC film is also resistant to vandals trying to remove letters from the legend as the film will come off in tiny pieces.

2.1.3 – Sign Sheeting Identification

View or download a two-page document illustrating the identification marks of several sheeting manufacturers. This is valuable information when designers are asked to identify materials.

Access it at: http://safety.fhwa.dot.gov/roadway_dept/night_visib/sign_visib/sheetguide/.

2.1.4 – Sign Legend

Once the sign sheeting has been applied to the sign substrate, the legend can be applied to the sign face in four different fashions:

- Direct applied.
- Demountable legend.
- Silk-screening.
- EC film.

2.1.4.1 – Direct Applied

Sign sheeting or black tape is cut into letters, borders or whatever else a legend requires. Most sheeting or border tape has a removable backing allowing it to be removed and applied over the background sheeting to form the legend on the sign.

2.1.4.2 – Demountable Legend

Sign sheeting specified for the legend is applied to a thin aluminum and then the letters are cut out with a die or a router. The legend is then laid out on the sign as specified and pop-riveted to the sign.

The advantage of making signs this way is that the legend can be changed on the sign after it is made or erected. This method is required for extruded panel signs if any of the legend on the sign overlaps or crosses the joint between extrusions. This legend is often referred to as "Removable Legend" since the legend can be removed from the sign by drilling out the rivets.

Figure 25: Demountable legend on extruded aluminum

2.1.4.3 – Silk Screening

Smaller signs can have a legend applied by the silk-screening process similar to the way that t-shirts are screen printed. This process is used for many of the standard signs in an effort to keep manufacturing costs to a minimum.

2.1.4.4 – Electronic Cuttable Film

EC film is applied to white sheeting, with the legend cut out of the color portion of the film, letting the white show for the legend.

2.2 – Designing Regulatory and Warning Signs

There are rules for designing signs coming from several different sources including the MUTCD. The Standard Highway Signs manual shows most of the sign designs for standard regulatory and warning signs shown in the MUTCD. If a standard sign is from the MUTCD, the sign design is already complete, but the appropriate size to install must still be determined.

The sizes of standard signs shown for regulatory and warning purposes in the MUTCD (see Tables 2B-1 and 2C-2) vary by highway classification, with larger sizes called for on the wider, higher speed classifications such as freeways and expressways.

In many cases ODOT has decided to use larger minimum standard sizes than what is shown in these MUTCD tables. As a result, ODOT has created standard size chart for regulatory and warning signs, intended to supplement the MUTCD tables; see Appendix D. Sign sizes for use on the state highway system are determined by using this chart. For those regulatory and warning signs not found in Appendix D, sizes are to be determined from use of the MUTCD charts.

2.2.1 – Regulatory Signs

These are almost always rectangles with a white background and black legend (they can also be red or green background or have a red or green legend) and always have a border and a margin, detailed in the following table. Try to use standard sign blank sizes, when possible, to make the signs easier to build.

Table 4: Regulatory Sign Border Dimensions

Sign Dimension	Border	Inset	Radius
<24″	3/8″	3/8″	1-1/4″
24″ to 30″	5/8″	3/8″	1-1/2″
30″ Square	3/4″	1/2″	1-7/8″
30″ to 48″	7/8″	5/8″	2-1/4″
≥48″	1-1/4″	3/4″	3″

Always use a legend size consistent with the speed of the highway. Refer to examples of regulatory signs in the Standard Highway Signs as a guide. Where practical, it is best to use at least a D font or wider for legend on regulatory signs.

It is important to realize that any regulatory sign not in the MUTCD or Sign Policy and Guidelines should be approved by the state traffic engineer. It is important to make sure that a regulatory sign can be enforced.

Regulatory and warning sign sizes for expressways and freeways are larger than conventional highways. The Standard Highway Signs book shows layouts for the larger signs and should be referenced for examples. It is always better to put up a sign that is too big compared to one that is too small.

2.2.2 – Warning Signs

For warning signs, use the same border, margin, and radius sizes as for regulatory signs.

Permanent warning signs should always be yellow with black legend except for school related signs which must be fluorescent yellow-green (see below). Use the standard blank sizes if possible. Fluorescent yellow can be used on warning signs when extra attention is needed, such as curve warning signs and overhead exit only signs.

Always use a legend size consistent with the speed of the highway. Refer to examples of warning signs in the Standard Highway Signs as a guide.

Where practical, it is best to use at least a D font or wider for legends on warning signs. It is always better to put up a sign that is too big compared to one that is too small. Minimum sign size for warning signs on the state highway system is 36″.

2.2.2.1 – Lane Drops (EXIT ONLY)

For lane drop situations (EXIT ONLY), often a yellow overlay is placed on an overhead guide sign. The yellow overlay is typically a rectangle instead of a diamond. Other situations may also require a rectangle instead of a diamond.

Figure 26: Signed lane drop on the freeway

2.2.2.2 – Fluorescent Yellow-Green

ODOT policy reserves the use of fluorescent yellow-green sign sheeting for school zone signing on state highways including the "SCHOOL" portion of the School Speed Limit (S5-1) sign and any supplemental plaques used in association with these warning signs.

Pedestrian and bicycle warning signs should use the standard yellow color. Fluorescent yellow sign sheeting may be used for pedestrian and/or bicycle crossing signs if there is a need to call extra attention to a particular crossing.

The region traffic engineer may allow the use of fluorescent yellow-green for pedestrian and bicycle warning signs on a state highway if the requesting jurisdiction can demonstrate an existing systematic approach to pedestrian signing which includes the fluorescent yellow-green sign background.

However, consider other treatments before choosing fluorescent yellow-green sign sheeting (e.g. curb extensions, pedestrian refuge islands, rapid flash beacons, etc.). Avoid mixing standard yellow and fluorescent yellow-green backgrounds for pedestrian and bicycle signs within a selected site area.

2.3 – Designing Guide Signs

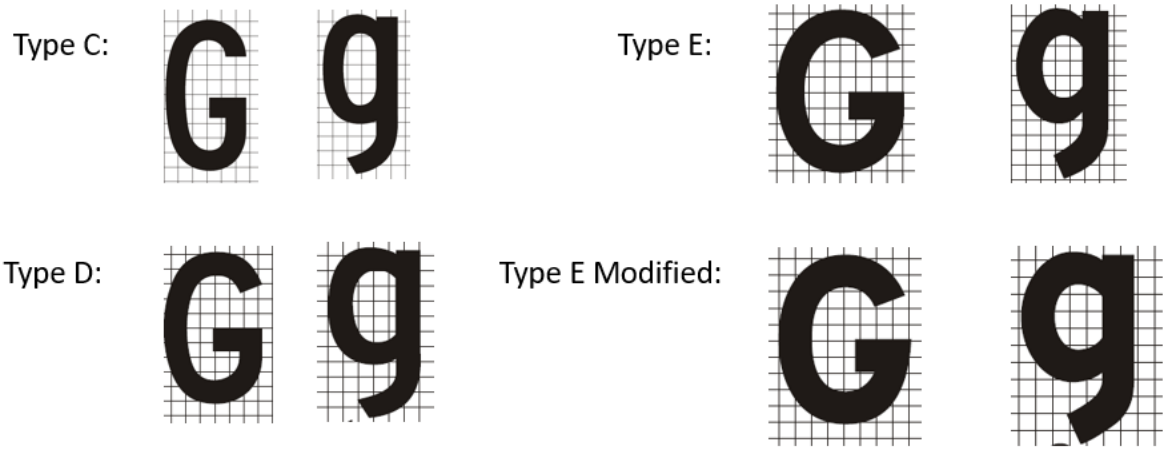
2.3.1 – Legend Sizes and Spacing

Lower-case letters following an initial upper-case letter are the standard primary legend style (destinations) to be used on guide signs. Other secondary legend (directional, guiding) is to consist entirely of upper-case letters. Legend sizes are typically referred to by the upper-case letter size. The lower-case value will be 75% of the upper-case value. For example, 8" legend refers to 8" upper-case along with 6" lower-case, where needed.

The MUTCD allows the use of 4" legend for principal legend on guide signs where the posted speed of the highway is 25 MPH or less (MUTCD, Section 2D.06). On the state highway system, the smallest legend for principal legend on guide signs is usually 5". The exceptions to this are Adopt-A-Hwy signs and riders, historic trail riders, and other riders where the main message is a symbol sign (such as recreational symbol).

The use of 6" legend is required for principal legend on guide signs where the posted speed of the highway is over 25 MPH. The majority of guide signs on conventional highways use a 6-inch C legend. The use of D or wider fonts is a judgment call for the designer. Wider fonts make the signs easier to read but it also makes the sign wider. When a sign width exceeds the maximum permitted for a single post, wider fonts are sometimes used to increase the size of the guide sign to the minimum required for multiple posts.

Figure 27: Different types of MUTCD fonts



The MUTCD recommends the use of 8" legend where the highway is a multi-lane, high-speed facility (MUTCD, Section 2D.43). Larger legend is also warranted for overhead sign locations such as signs mounted on a signal pole, signs viewed from a long distance, or critical signs.

The use of 10"C, 8"-6" EM, or larger can also be used on the multi-lane, high-speed highways. Always make sure that the size of legend is consistent with the speeds, number of lanes and

width of the lanes on the highway. It is always better to put up a sign that is too big compared to one that is too small.

The MUTCD recommends the use of 12" legend for overhead street name signs (Section 2D.43).

Due to the higher speeds and volumes associated with expressways and freeways, the legend on guide signs are larger than on conventional highways. The MUTCD outlines (Tables 2E-2 through 2E-5) the minimum legend size used on these facilities. The tables apply to any highway (or portion of a highway) built to expressway or freeway standards.

When using Tables 2E-2 through 2E-5, determine the interchange classification (from MUTCD Section 2E.32) for the design. In most cases, it will be major, category B or an intermediate. The numbers listed in the tables are for an EM font since that is the standard for guide signs on expressways and freeways (MUTCD, Section 2E.14).

The tables are broken up into sections, so each part of the sign has a specified letter or numeral height, or specific dimensions. Use the correct column for the sign design. The principal legend size of category A and B signs under the major category call for 20"-15" legend for ground mounted signs. The principal legend for overhead signs is 16"-12" legend.

When designing guide signs, the width of the sign is determined by the legend plus the outside (lateral) spacing that normally includes the border. Outside spacing is required on any sign to make them more readable. The ideal lateral clearance is usually one letter height from the side of the sign to the end of the legend, but may be as little as one half the letter height (Standard drawings TM223 and TM224). The average of the upper- and lower-case letters should be used for the vertical clearance from the legend to the top (or bottom) of the sign. The spacing between lines of legend (vertically) ideally would be about ¾ of the legend height. It usually varies between ½ and 1 letter height.

Typical layouts for guide signs can be seen on Oregon Standard Drawings TM223 and TM224, the Standard Highway Signs book, and in the Sign Policy and Guidelines.

Spacing between letters of the legend is a function of the font. Individual spacing also depend on what letters are being used. This information can be found in FHWA's Standard Alphabets for Highway Signs. Most software packages have this information built in, so don't be concerned with figuring these distances unless doing the design by hand.

Spacing between words of the legend is a called out in the ODOT Specifications to be based on the font size (ODOT Specifications Section 00940.45), summarized in Table 5.

Table 5: Font Sizes

Series Font	Word Spacing
"B"	0.531H
"C"	0.625H
"D"	0.836H

Series Font	Word Spacing
"E"	1.000H
"EM"	1.500H

2.3.2 – Arrow Sizes and Design

Arrow types are discussed in Section 2D.08 of the MUTCD. The Type A arrow (tapered, long shaft) is used most for exit direction guide signs, exit gore signs and some "Exit Only" signs. These arrows are typically pointing upward and to the right, usually at a 45-degree angle.

The Type B arrow (tapered, short shaft) is not as commonly used, but has some application for overhead directional guide signs where sign space is limited and use of the Type A arrow may not be appropriate. The Down Arrow is used only for overhead application. It is commonly used for Pull Thru signing and for some "Exit Only" signs.

Type D arrows (straight shaft, extendable) are used for directional guide signs on conventional highways and at freeway/expressway ramp terminals.

ODOT almost exclusively uses Type D arrows for guide signs, with the exceptions mentioned above.

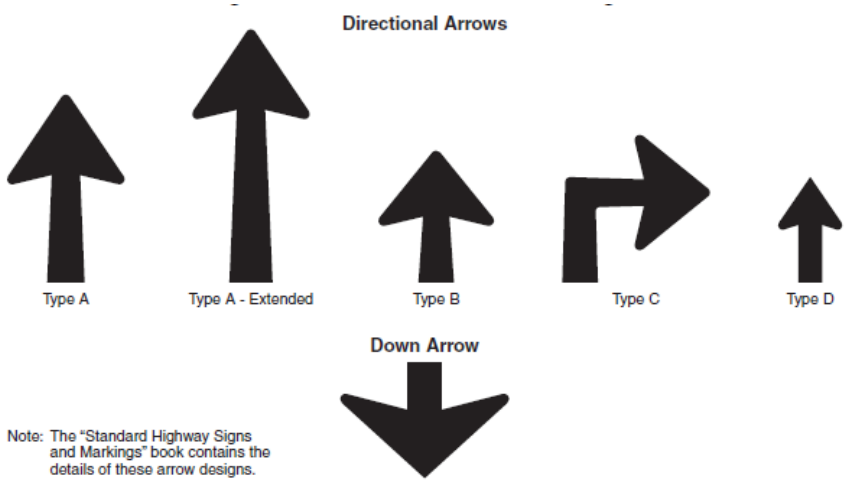
The size of Type D arrows on guide signs is set up to match the upper-case letter height for the primary sign legend (destination), shown in Table 5.

Table 6: Type "D" Arrow Sizes

Upper-Case Legend Height	Arrow Size
4"	4"x6"
5"	5"x7"
6"	6"x9"
8"	8"x12"
10"	10"x16"

These arrows are shown on Oregon Standard Drawing TM233, along with the arrow styles (Types A, B and Down) used for larger legends.

Figure 28: Different types of MUTCD arrows



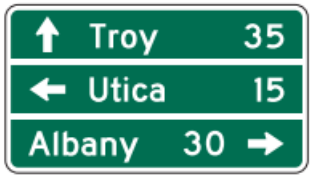
The Type D arrows have a straight (non-tapered) shaft. Therefore, their length can be increased to "balance" the sign. Sometimes when the sign is designed, the arrow will look too small. If the arrow is placed horizontally at the bottom of the sign, increase the arrow length to ½ the width of the sign to make it easier to read.

If using a single arrow at the side of a two-line legend, consider making the arrow longer or increase the arrow to the next legend size to improve the readability of the sign.

Hook arrows (ODOT tends to use a straight shaft version similar to Type D, instead of the Type C arrow shown in MUTCD) are used for advance sign placement where the driver should turn at the next intersection instead of the place where the sign is installed.

There is a hierarchy in the placement of arrows as they appear on a destination sign (Section 2D.37 MUTCD). Destinations that are straight ahead are listed at the top of the sign with the "up" arrow. Below that would be any destinations to the left with the arrow pointing left, followed by any destinations to the right with the arrow pointing right. All destinations in a given direction shall have one directional arrow.

Figure 29: Example from the MUTCD that displays proper order of arrows.



D1-3a

2.3.3 – Design Layout

Separate destinations with a horizontal divider line all the way across the sign, to show groups of destinations in a particular direction. Shorter horizontal lines on the guide sign face can be used to highlight a section of the legend, or separate lines of legend if needed for clarity.

The number of destinations on a guide sign should be as limited as possible. The MUTCD recommends no more than three lines of destinations on standard highways and no more than two destinations on freeway guide signs (MUTCD 2009, 2D.07 02 and 2E.10). If there is a major intersection with multiple destinations of equal importance, consider making two signs with less legend and spacing them apart so drivers have ample time to react to each one.

Advance guide signs on conventional highways are preferable, but not always possible due to right of way constraints. When designing these signs, include a positive guidance message such as: "NEXT RIGHT," "LEFT ½ MILE," etc. This gives the driver more information they can use to make better decisions.

Route shield assemblies are often required since the MUTCD requires their use where the highway has a route number. All state highways have a route number assigned to them, but not all of them have been signed. For single installations, the assemblies are placed on a single support. When placing the route shield assemblies in conjunction with guide signs, either place them on the guide sign face or attach the assemblies underneath the guide sign.

The standard size for a route shield is 24" when used by itself. Use smaller shields when placed on a guide sign. The 18" version is the smallest and should only be used when in an urban area using 6" legend on the guide sign. Use a 24" shield when using 8" legend.

2.3.4 – Freeway and Expressway Design

Legends on all overhead guide signs shall be ASTM Type IX or XI retroreflective sheeting. All "EXIT ONLY" panels on overhead guide signs shall be ASTM Type IX or XI and utilize fluorescent yellow retroreflective sheeting, with black, non-reflective legend.

Guide signs for interchanges may have no more than two destinations on the Advance Guide signs and Exit Direction signs, and the destinations must match on these signs. One supplemental sign with a maximum of two destinations is allowed per interchange. This means that only four destinations total are allowed per exit.

Mount exit number panels flush with the right side of the guide sign for right exits. Exit number panels for left exits are mounted flush with the left side of the guide sign. Standard exit panel sizes for Oregon are different than the standards shown in MUTCD Table 2E-1. Our standards can be found in Oregon Standard Drawing TM225. The Oregon version of these signs is considerably narrower than the MUTCD version, yet it still satisfies MUTCD guidelines for margin spacing (Sec. 2E.15). The ODOT version eliminates excess "green" space that would otherwise make these panels unnecessarily large. Exit numbers on supplemental signs can have the exit number as part of the legend, or as an exit number panel.

Border width for guide signs depends on the legend size, not the sign size.

- Signs having a legend in upper- and lower-case letters with 10 2/3″ or smaller upper-case letters and signs having a 12″ or smaller all capital lettered legend shall have a 1″ border.
- Signs having a legend in upper case smaller than 6″ shall have a ½″ border.
- All signs with a legend larger than specified above shall have a 2″ border.

The exceptions to this would be any standard sign included in the FHWA Standard Highway Signs book.

Table 7: Border sizes for Guide Signs

Upper-Case Legend Height	Lower-Case Legend Height	Border width
<6″	<4″	½″
<=10.67″ and >=6″	<=8″	1″
<=12″	ALL CAPS	1″
>12″	>9″	2″

The corner radii of a sign should be 1/8 of the smaller sign dimension rounded to the nearest of the following numbers: 1.5, 3, 6, 9, and 12. A 12-inch radius should not be exceeded.

There are sample sign designs shown on Oregon Standard Drawing TM224. Exit Gore sign standards are shown on Oregon Standard Drawing TM225 and are consistent with the standards shown in MUTCD Table 2E-1.

Chapter 3 – Designing Supports

3.1 – Choosing a Support Type

There are numerous types of sign supports available that the designer specifies for each sign on the project. This chapter describes the various sign supports used on ODOT projects. The designer should always contact the district sign supervisor/coordinator when deciding which post material to specify for the smaller sign supports.

Sign supports used on the state highway system **must have** breakaway features when used inside the clear zone and **should have** breakaway features when located outside the clear zone. Sign supports without breakaway features are required to be shielded from traffic (when inside the clear zone) with a concrete barrier, guard rail, or some other device to keep errant vehicles from hitting the support.

The standard supports for side mounted signs shown in the Oregon Standard Drawings are all breakaway supports when properly installed to the details outlined in the standard drawings. Overhead signs are not breakaway and need to be installed outside of the clear zone.

3.2 – Wood Posts

This is by far the most common support on the state highway system. ODOT allows only pressure-treated wood posts. Post sizes are computed using the formula shown on standard drawing TM670.

Multiple wood post installations require a distance between the wood posts to maintain the breakaway design. For 4”x4” wood posts, this distance is 3’-6”. Since this configuration is not often used, specify the clearance between the posts in the “Remarks” column of the Sign and Post Data Table (see Chapter 4: 4.4 – Sign and Post Data Tables).

Multiple wood post installations usually utilize 4”x6” or larger posts. These require 7’ clearance between posts to be considered breakaway. If the sign installation is behind barrier, the clearance between posts can be decreased.

All wood posts 4”x6” and larger require holes to be drilled in the post at the base and below the sign that are field treated, according to Specification 0219.30, so they break off at the proper location.

3.3 – Steel Supports-Major

3.3.1 – Truss Sign Bridge

These are engineered supports for supporting large signs over traffic lanes. A structural designer is responsible for designing these supports, with the information supplied by the sign

designer. These supports are not breakaway and require shielding from traffic. New sign bridge design requires the sign designer to contact the region mobility liaison during the scoping phase to determine vertical clearance requirements. See standard drawing TM614 through TM620.

New truss sign bridge installations requires a designer familiar with structural design and details to:

- Include a drawing in the plans.
- Check shop drawing detail submittals.
- Respond to construction manufacturer and field issues.

Figure 30: Sign truss bridge

3.3.2 – Monotube Sign Bridge

These are engineered supports for large signs and/or variable message signs (VMS) over traffic lanes. A structural designer is responsible for designing these supports with the information supplied by the sign designer for the static signs.

These supports are not breakaway and require shielding from traffic. New sign bridge design requires the sign designer to contact the region mobility liaison during the scoping phase to determine vertical clearance requirements. See standard drawings TM621-628.

Figure 31: Monotube sign bridge

3.3.3 – Butterfly Sign Support

These supports are engineered to support large signs overhead, in a confined area. These often support interchange sequence signs. A structural designer is responsible for designing these supports with information supplied by the sign designer.

These supports are not breakaway and require shielding from traffic. New butterfly support design requires the sign designer to contact the region mobility liaison during the project scoping phase to determine vertical clearance requirements.

New butterfly cantilever installations require a designer familiar with structural design and details to:

- Include drawings in the plans.
- Check shop drawing detail submittals.
- Respond to construction manufacturer and field issues.

3.3.4 – Cantilever Sign Support

These supports are engineered to hold large signs projecting out over a lane of the roadway. A structural designer is responsible for designing these supports, with information supplied by the sign designer.

These supports are not breakaway and require shielding from traffic. New cantilever support design requires the sign designer to contact the region mobility liaison during the project

scoping phase to determine vertical clearance requirements. See standard drawing TM621 through TM628.

New cantilever installations require a designer familiar with structural design and details to:

- Include drawings in the plans.
- Check shop drawing detail submittals.
- Respond to construction manufacturer and field issues.

Figure 32: Monotube cantilever sign structure. Monotube cantilevers are now the standard for cantilever sign supports.

3.4 – Steel Supports-Minor

3.4.1 – Multi-post Breakaway Supports

These are steel supports for larger signs usually located on expressways or freeways.

See standard drawings TM600 and TM601.

Figure 33: One support for a large sign that has multi-post breakaway supports

3.4.2 – Triangular Base Breakaway

This is an FHWA approved design for mounting signs up to 15′ in width. The support is multi-directional, meaning that it can be hit from any direction and still performs as a breakaway support. Larger signs use an H-frame to help stabilize the sign.

The design for a triangular base breakaway support is on standard drawing TM602. See Figure 3: Standard Triangular Base Breakaway for more details.

3.4.3 – Special Pipe Sign Support

This is a commercially available round steel support with a triangular slip base.

It can be viewed on standard detail DET4237. This support is not used on the state highway system.

3.4.4 – Perforated Steel Square Tube Slip Base Supports

These PSST supports are sometimes known by their commercial name, "Telespar posts." That is just one of the manufacturers listed on the qualified products list (QPL) for these types of posts.

See standard drawings TM681 and TM688.

Figure 34: Slip base perforated steel square tube sign support

3.4.5 – Perforated Steel Square Tube Anchor Sign Supports

These supports are sometimes known by their commercial name "Telespar posts." That is just one of the manufacturers listed on the QPL for these types of posts.

See standard drawings TM681 and TM687.

Figure 35: Anchor based perforated steel square tube sign support

3.4.6 – Pipe Sign Support

These are the round steel pipes frequently seen in urban areas.

These posts are not used on the state highway right of way since they are not an approved breakaway post.

There is an example of a pipe sign support on standard detail DET4235.

3.5 – Mounts

3.5.1 – Structure Mounts

These mounts are engineered steel brackets bolted to the sides of bridges to hold extruded aluminum signs. A structural designer is responsible for designing these supports, with information supplied by the sign designer.

New structure mount design that alters the vertical clearance requires the sign designer to contact the region mobility liaison during the project scoping phase to determine vertical clearance requirements.

Figure 36: Sign mounted on the side of a bridge

3.5.2 – Bridge Rail Mounts

On occasion, a designer will need to install a small sign mounted from the railing on a bridge. Limit the size of these signs to 30 square feet or less.

Bridge rail mounts are a bid item and the estimated pounds of structural steel in the special provisions should be supplied (see 6.2 – Providing Quantities). A structural designer is responsible for designing these supports with information supplied by the sign designer.

Figure 37: Sign mounted on the side of a bridge

3.5.3 – Exit Number Sign Mounts

These are S3x5.7 members (with 2" x 2" structural tubes attached as sign spacers) used to attach exit number signs on top of large guide signs. Sometimes these supports can be used to hang auxiliary sign under the main guide signs. See standard drawing TM220.

3.5.4 – Signal Pole Mounts

This support is for mounting small to medium sized signs on signal, luminaire, or similar poles. It can be used for signs up to 60 square feet.

These supports attach to a signal pole, luminaire pole, or other steel pole that can support the increased load. The sign designer needs to coordinate their design for a signal pole mount with the signal designer. See standard drawing TM680.

Most signal pole mounts have an "H" frame for mounting the major guide sign. Most of these guide signs are extruded panel signs attached using the post clips shown on standard drawing TM675.

If a sign is larger than 60 square feet, a different type of support is needed.

Guide signs mounted on the vertical post of a signal support at the corner of an intersection can have the edge of the sign 2' from the curb where there is restricted right of way, as shown on TM200. Trucks will sometimes run over the curb performing a sharp turn and can hit the sign.

Guide signs mounted on traffic signal poles shall be shown and detailed on the signing plans, but only referenced on the signal plans. Since the signs are shown in the signing plans, they need to be covered under the bid item for the specific sign type. These signs shall not be paid for as part of the lump sum for signal installation bid item.

Note of caution: Many decorative poles will not handle the added wind load of this support well.

3.5.5 – Mast Arm Street Name Sign Mounts

These supports consist of a group of extruded beams, riveted to the back side of a sheet aluminum sign substrate. Each beam, in turn, is mounted to the signal mast arm using a strap and buckle.

These supports are shown in greater detail on standard drawing TM679.

3.5.6 – Adjustable Sign Mounts

This is a bracket bolted or strapped to a signal pole, mast arm, luminaire pole, or similar support to hold up a sign. There are similar sign supports of this type not shown on the drawing but are available from signal supply companies. This support is also called adjustable sign bracket or adjustable sign clamp.

See standard drawing TM462.

3.5.7 Stainless Steel Clamp and Vertical Sign Mounts on Existing Structures

Vertical signs mounts are usually stainless steel clamps buckled on a luminaire, pipe signpost or a power pole.

A stainless steel clamp (SSC) is a bracket strapped to a vertical pole with a band and a buckle. The SSC shall not be used with signs wider than 36". Use two clamps for signs less than 48" tall and three clamps for signs greater than 48" and up to and including 60".

See standard drawing TM677.

3.5.8 – Secondary Sign Supports

These are supports for signs that are attached to larger extruded aluminum signs. They are needed to attach additional signs to the main guide signs.

See standard drawing TM678.

Figure 38: Secondary sign support

On the sign and post data table, there are columns for secondary sign supports that are used to specify how the secondary signs are attached below the main guide sign.

Refer to standard drawing TM678 for the secondary supports and to standard drawings TM200 and TM678 for installation details.

3.6 – Miscellaneous Sign Supports

3.6.1 – Crosswalk Closure Support

These supports serve two purposes:

1. They act as a shield to block the crosswalk.
2. They provide a sign support for the required signing.

See standard drawing TM240.

Figure 39: Crosswalk closed support and sign

3.6.2 – Milepost Marker Posts

These are supports for mile markers, delineators, and object markers. The design for a milepost marker post is on standard drawing TM222.

Figure 40: Mile post marker

3.6.3 – Route Marker Frame

This is a frame bolted to a sign support with other signs bolted to the frame. It is useful for installing multiple route shield assemblies and can be used for other sign assemblies as well.

The design for a route marker frame is on standard drawing TM678 .

Chapter 4 – Drafting Standards

4.1 – General

4.1.1 – Plan Requirements

All sign plans in a STIP project shall have:

- Sign plans showing where the signs will be physically on the project.
- Sign details that show what the sign looks like.
- The sign and post data table, summarizing the physical aspects to construct the sign, such as:
    - Station of the sign.
    - Type of substrate.
    - Color of the sign.
    - Post information.
    - Other remarks for construction.

4.1.2 – CADD Files

The exact workflow for sign design may differ among designers. This chapter guides a designer through one possible workflow that works for ProjectWise naming conventions for signs.

To begin the process of assembling the signing plans, first obtain the necessary electronic data from the roadway designer or survey. The CADD files needed include, but are not limited to:

- Existing features files.
- Alignment files.
- New construction files.
- Right of way files.

4.1.3 – Design Format

The majority of design work produced for ODOT contracts is done in 11″ x 17″ format using surveyed alignments. This manual focuses on the production of these plans. For some preservation jobs of minor complexity, the roadway designer may select an 8½″ x 11″ format. When this occurs, develop the signing plans using that same format.

In some cases, a surveyed alignment either does not exist for a particular project or may not be available to the sign designer for producing their plans. When this occurs, the designer should create their own "alignment" using straight-line format.

Draft straight segments of roadway, with an assumed centerline, to serve as the alignment for the sign plans. Add center-line stationing or mile point references consistent with those used by the roadway designer.

Always contact the roadway designer or project leader before starting design work to coordinate the proper format. It is difficult to change formats when the design is mostly finished.

4.1.4 – Consolidation of Base File

The first step is to create a "base" file to set up the plan sheets. Set up to include all the features necessary to show on the plan sheets and leave out the unnecessary ones. Begin by merging all the necessary files (e.g. existing features, right of way, alignments, new roadway, and striping design files) together into a single two-dimensional file. This newly created base file will be used later as a reference to the design file.

The file that is usually named TN_K#####_snd_bas_##; where the K###### corresponds to the K-number of the project and the _## is used if the designer would like multiple versions. If multiple versions of any document are used, make sure to fill out the document description in detail so others will know the purpose of each version.

When progressing through the design, keep in mind the roadway designer is also progressing through their design. An open line of communication with the roadway designer will be the best tool for determining when to update the base file. They can let the sign designer know when they are making changes that will significantly affect the base file.

Anytime the plans are printed and distributed for review, they should show alignments and other features consistent with the roadway plans. This is only accomplished by keeping an up-to-date base file.

For some projects, minor in scope and complexity, there either will be no roadway plans, or they may only consist of typical sections. In this case, the usual information is not available to create a base file for the design. There are two other options available.

- The first involves "borrowing" alignment from as-builts of previous projects at that location.
- The second involves using the straight-line format described in the previous section on "Design Format."

4.1.5 – File Clean-Up

After creating the base file, the next goal is to clean out extraneous information. This is accomplished through a combination of turning off levels and deleting unwanted elements. Information such as utilities, easements, curve data and existing signing data isn't needed in the plans, but must be retained as a resource. Take care not to delete these items. The items that should be shown on the plans include:

- Centerline.
- Stationing and station marks.
- Lane lines.
- Edge of pavement.
- Curbs.
- Sidewalks.
- Barriers.
- Bridges.
- Street names.
- North arrows, etc.

Also include lane-use control arrows at intersections to show allowed turning movements. It will prove useful to incorporate actual striping features into the plans, if possible, since the lane lines and markings in the roadway design files won't always match those shown in the actual striping plans.

Items such as landscape features, buildings, and drainage features clutter the plans; for this reason, they should not be shown. In some cases, a lane line may conflict with the center line. In this case, delete the lane line so the center line stands out more clearly.

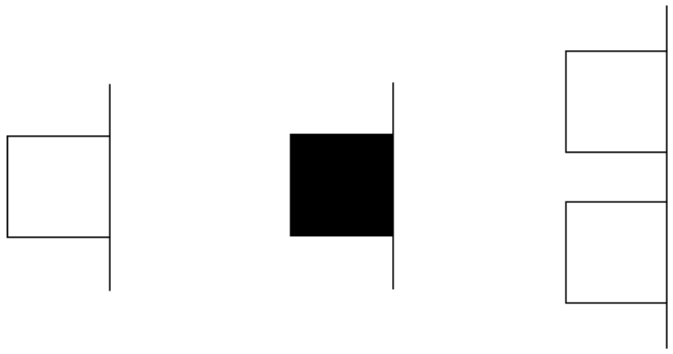
Once extraneous information is removed, some line codes and weights may need to be changed for consistency with ODOT drafting standards. For instance, the centerline in the roadway file is usually a heavy solid line. ODOT drafting standards require a line weight of zero with a line style of seven. The stationing tick marks also have a line weight of zero but would remain a solid line style. One other possible change involves the line style used for new curbs and barriers. These are often shown with a dashed line style in the roadway files, but ODOT standards call for them to be solid.

Do not show existing striping and other pavement markings on the plan sheets unless they are being maintained as is. Do not show both the new and the existing edge of pavement lines on the plans when they are in nearly the same location, as is the case in a project with only minor widening. Instead, reduce the clutter by not showing the old edge of pavement.

In cases where the new and the old edge of pavement differ considerably, as in projects with significant realignment, show both. This can be helpful in eliminating confusion as to why existing signs sometimes are shown in the middle of the new alignment or far beyond the new edge of pavement.

Replace all the existing sign symbols with those included in the ODOT pull-down menu. The sign symbols from the original existing features file are very small and hard to see. The symbols in the pull-down menu are scaled to stand out better on the plan sheets, making it easier to show orientation of sign faces.

Figure 41: Symbols for signs used on sign plans



4.1.6 – Creating and Naming a Design File

Once you're comfortable with the way the base file looks, it is time to start building the design file. Assemble the design in a separate file, referencing the base file as needed to develop the design sheets.

Begin by opening a new two-dimensional design file in MicroStation. If there is a need for more than a single design file, then the suffix would increase with each additional file. In ProjectWise many designers do their work in sign folder and use the name TN_K######_snd_wrk_##. This is considered the working design for sign plans produced.

See Appendix G for Project Wise naming conventions for sign drafting.

4.1.7 – Sheet Borders

Open the named design file. Set up the plan sheets in this file or in the CAD file and reference pieces of the base file to individual plan sheets to cover the entire length of the project. Consultants may have a different method to set up sheet borders and plot sheets than the one ODOT uses. Although the approach may be different, the goal is the same.

Set up the file so that it has organized rows or columns of identical sheet borders placed and identified allowing for quick and easy prints.

ODOT uses a tool within the MicroStation environment called Print Organizer that allows for customization of how the sheets are organized and printed, both on paper and digital. By creating "print set" definitions, a collection of any or all sheets in a design file can be identified for printing (paper or digital) in a selected order, without requiring individual fencing of sheets.

Begin by adding sheet borders for 11" x 17" sheets at a 1200 scale (1" = 100') to the file. The number of borders placed doesn't matter so much at this point, because more can be added or deleted as needed. Eventually there should be enough borders to take care of all signing plan sheets, sign detail sheets, and sign and post data tables.

There are several features common to all sheets in the design file. After creating the sheet borders, place these common features inside of the first sheet border. Copy them to all sheet borders. This way, they will not have to be recreated for each sheet. Among the features common to all or most sheets are:

- Title block (with professional stamp).
- Sheet header (plan sheets only).
- LEGEND notes (plan sheets only).
- General notes (plan sheets only).
- PRELIMINARY (or ADVANCE) COPY "stamp."

These items can be found among the "General" or "Signing" workflows that are a part of the overall "Traffic" workflow. For consultants, the ODOT workspace will include templates for these under the task tab. Consultants can download the ODOT workspace here: https://www.oregon.gov/ODOT/EAST/Pages/ODOT-Workspace.aspx

Whatever LEGEND or general notes are used can usually fit in the area directly above the title block and below the sheet header. After placing this information inside of the first sheet border it can be fenced and copied inside of all other sheet borders. The title block is the same on all sheets. Sheet headers and general notes will be used on all plan sheets and details sheets although the contents will differ slightly.

Sign and post data table sheets have the same spreadsheet style layout. This also is a standard cell, accessible from the "Signing" workflow. The cell can be placed inside of each sheet border that serves as a data table. ODOT has also provided blank data table sheets for consultant use within the same file mentioned above.

4.2 – Plan Sheets

The next step is to lay out the plan sheets. There is more than one way to accomplish this task, but this manual focuses on the method which involves referencing portions of the base file into individual plan sheet borders in the design file. Many designers set the plan sheets in the CAD file, while others use their design file depending on the size of the project and if multiple designers will need to access to a file where plan sheets are made.

All the existing traffic signs should be included on the signing plan sheets, including signs to:

- Maintain and protect.
- Remove.
- Replace.

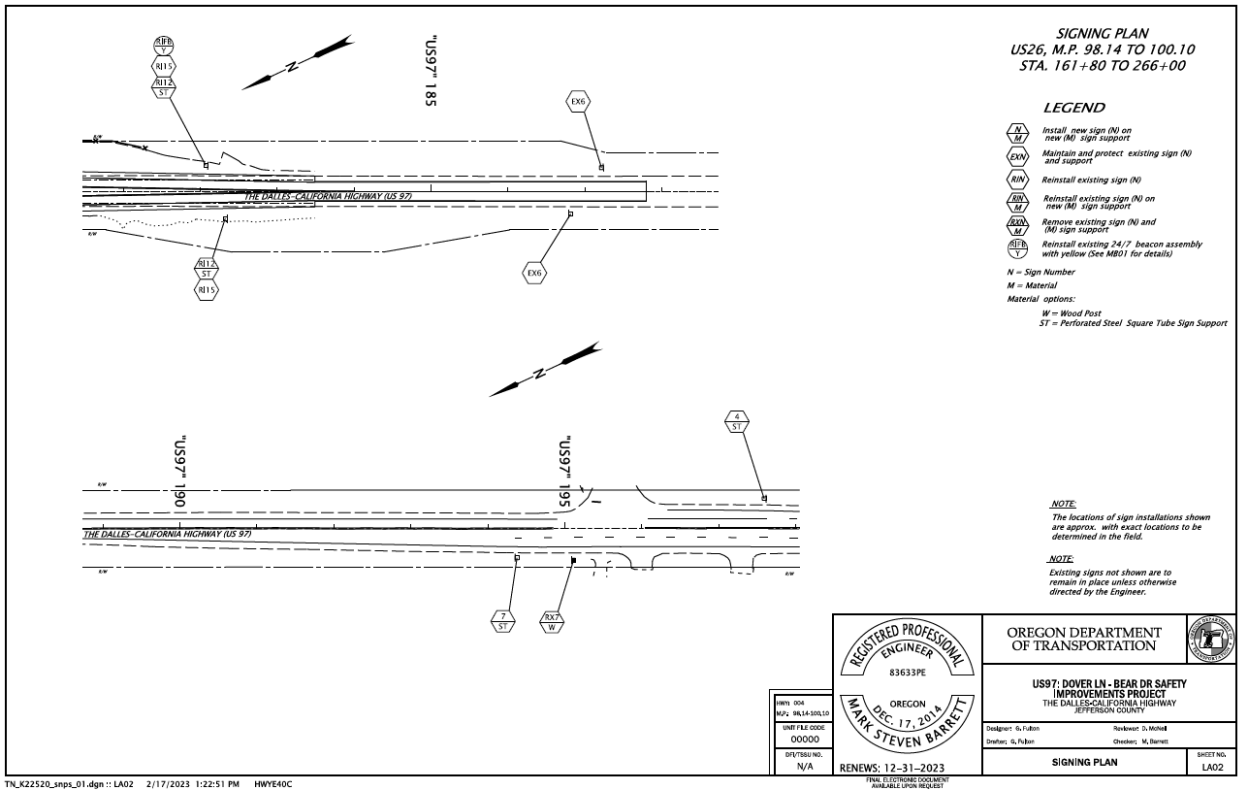
When all signs are on the plan sheets, they can be reviewed with a clear picture of all the sign work planned for within the project limits. This is beneficial when the plans are filed as "as-built" records for that section of highway.

4.2.1 – Clip Boundary and Referencing of Files

On most 11" x 17" plan sheets, the usable design space will be an area of about 10" x 10". Within this space, two different stretches of highway alignment with lengths anywhere from 800 to 1000 feet should be able to comfortably fit.

Begin by creating a box (rectangle) of approximately 4" tall by 9" (400' x 900') wide. Create it on a level which does not need to be turned on for the final prints. The boxes can be made with construction lines and turned off for printing. Place this box over adjoining pieces of alignment in the base file, from beginning to end of the project, such that the entire alignment is covered with minimal overlap. Each box should be rotated, if necessary, such that its length runs (more or less) parallel with the center line of the alignment.

Figure 42: Example sign plans with two segments of highway parallel to the long side of the paper.



If there is an interchange or a crossroad with a considerable amount of work on it, consider:

- Limiting that sheet to only one section of alignment, instead of the two.
- Using a 9″ x 9″ (900′ x 900′) box to mark that alignment section.

Once these boxes are placed end-to-end covering the entire alignment, reposition them as needed to ensure all the important features, including station numbers are encompassed within them. Make sure there is a north arrow to define the alignment orientation within each box. Make sure the text for highway names and any crossroads are present within each box.

The next step is to individually fence around each box and copy their contents as references to the sheet borders within the design file. The fence contents may need rotating on the page as they are referenced to make the boxes run horizontal. Some sheets will have room for two boxes, one above the other. Other sheets will only have room for a single box if it is the 9″ x 9″ (900′ x 900′) variety.

The sheets need to be filled systematically, so the overall alignment stationing increases left to right and top to bottom from first sheet to last, as if reading a book.

To begin the referencing, put a fence tight around the outside of the first box at the beginning of the project alignment. Attach this as a reference to the design file inside the sheet border for the

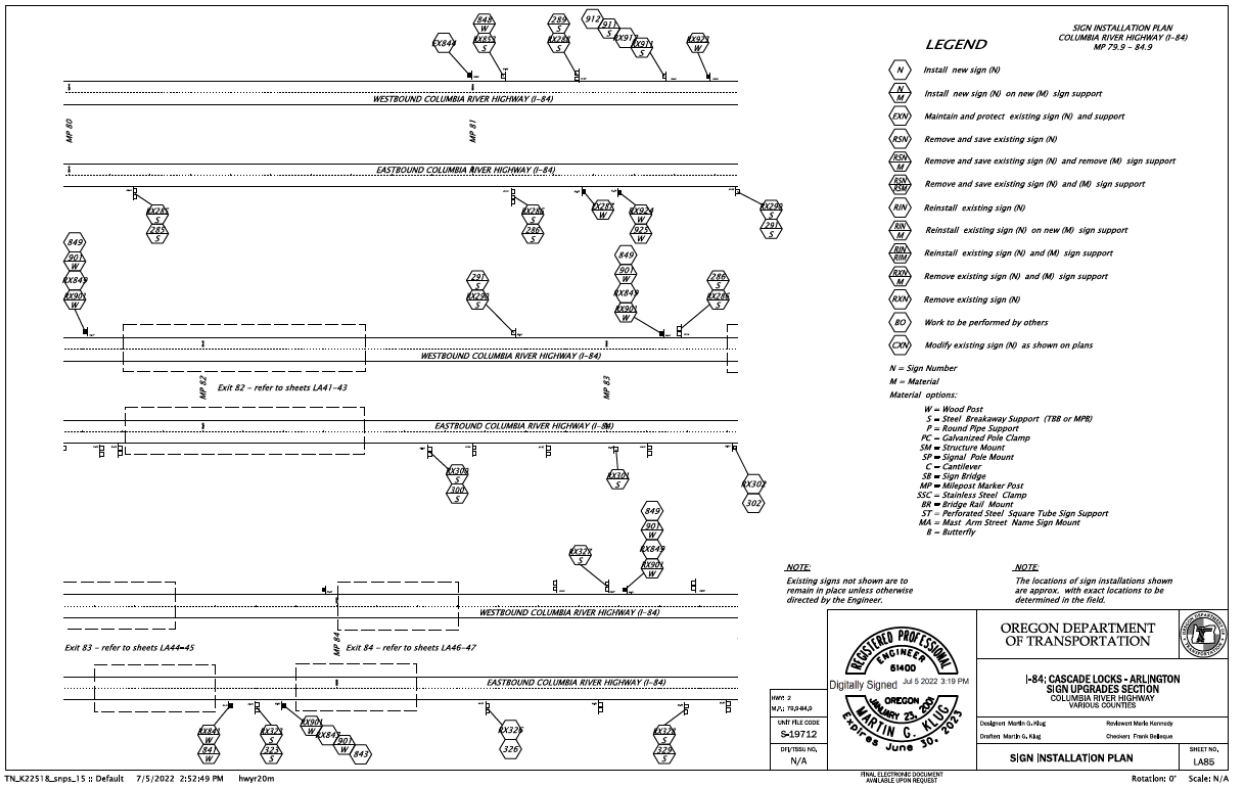
first plan sheet. One way is to name the reference according to the sheet number and whether it takes up the top or bottom portion of the sheet. Remember, most sheets will have two separate portions referenced to them, one on the top and the other on the bottom. Make sure the specified "clip boundary" and the fence setting is on "clip" when moving the referenced material into position within the design sheet border. Rotate this referenced material, as needed, so the alignment is horizontal on the plan sheet and make note of the degree of rotation used.

Repeat this procedure for each of the remaining boxes, in order of increasing stationing until each of the plan sheets with the necessary alignments is filled in. If referenced properly, the boxes themselves will also show up on the plan sheets. If done correctly, these boxes are placed on a unique level, which can be turned off, prohibiting the data from appearing on the printed plan sheets.

As mentioned earlier, for some projects an actual surveyed alignment is not available to the sign designer, and a straight-line format is necessary. In this case, instead of referencing pieces of alignment from a base file into the design file, create horizontal pieces of alignment directly onto each plan sheet and draft a centerline using mile points or stationing to match what is shown on the sign inventory provided.

No particular scale is necessary, but it should use as few sheets as possible without making the sign symbols so crowded the information is difficult to read. If there are long sections of highway with no signs present, the designer may consider leaving out these sections.

Figure 43: Example sign plans that use a straight line method.



4.2.2 – Mapping Existing Signs

After referencing the base sheet alignment to the plan sheets, plot the existing sign locations onto each sheet.

Sign symbols from the original, existing features file will auto-populate the alignment by default. Replace these with symbols found in the pull-down menu.

Compare the sign inventory locations with those shown on the plan sheets. Some of the locations in the inventory maybe missing from the plan sheets or vice-versa. Some of the symbols may not be shown in the exact location as listed in the inventory or some of the symbols are not oriented with the signs facing the same direction shown in the inventory. Resolve any conflicts by looking at the digital video log or by making a trip on-site. Add or move any sign symbols, as needed, according to the most accurate representation of the current signing for that particular location.

After verifying locations of the existing signs, it is time to document their use. Do this for all the signs in the project. Differentiate existing signing from proposed new signing. One option is to make paper prints of all the plan sheets and make notes (in ink) of each existing installation. An alternative is to mark the plans digitally. Place the cell symbols for the signs within the plan sheets on a construction level. Draw a line from each sign face to a blank area on the page where

a rough sketch can be placed of what it looks like or use a brief word message like "speed 35" – whichever is easiest.

Later begin marking in locations for proposed new signing. When working from a hard copy, use pencil because there may be numerous changes before settling on a particular plan. This is why using ink to designate the existing signing is best.

Written indications about the types of supports should not be needed. There are different symbols available in the ODOT pull-down menu, and from other sources, for each of the different types of commonly used supports, such as:

- Wood posts.
- Steel posts.
- Pipe installations.
- Signal pole mounts.
- Cantilevers.

Use the representative symbol for the appropriate type of support used. Also, use symbols which accurately depict the number of posts present in the installation, as well as showing sign faces on all sides of the support where present.

Whether it is an existing installation which might be removed and discarded, or new signing and supports to be installed, it is important to provide an accurate picture of what is currently out there and what is desired to eliminate any confusion later when the plans are read by a contractor or inspector.

4.2.3 – Use of Legend Notes

Once a completed rough layout of all signing, existing and proposed, is on the plan sheets, indicate the action needed for each installation shown.

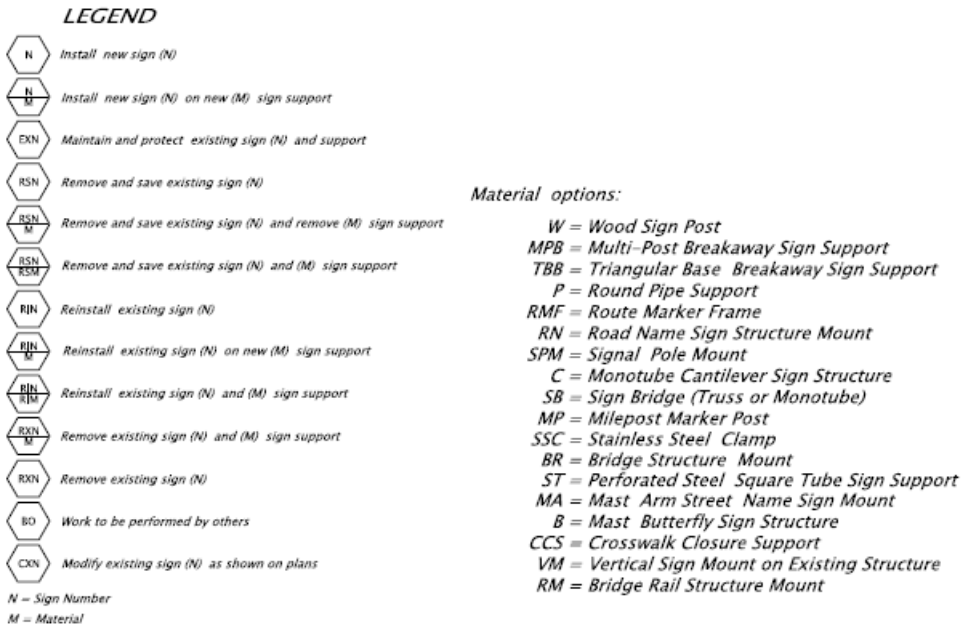
The ODOT pull-down menu contains a complete set of all commonly used legend (bubble) notes. These notes are in the form of hexagons, with enclosed letters and numbers. The alpha numeric designations indicate the action(s) needed for each sign and/or support.

Within each bubble, the number (N) represents the sign number in question. The letter (M) in the bottom half of the bubble represents the type of support. The other letters in the bubble (RX, EX RS, RI, etc.) represent the necessary action(s) for the sign and support.

Each plan sheet should include a list of the legend notes used on the sheet. Edit the legend so that only notes that apply to the sheet they are on are shown.

At the bottom of the list are definitions for each coded message and for the various possible support types. The most common possibilities are included in the ODOT pull-down menu.

Figure 44: The full legend that accompanies all sign plans. Edit the legend to only show notes applicable for that sheet.



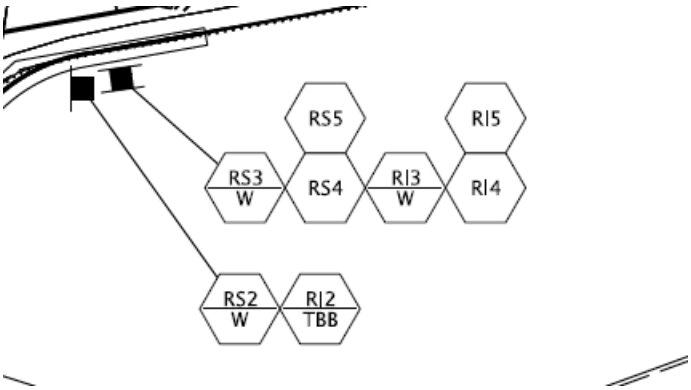
Sign installations may have signs facing only in one direction or facing in two or more different directions.

In using bubble notes, use a separate string of notes for each sign face. Begin by drafting a leader line outward from one of the sign faces. At the end of this leader line, place the string of bubble notes needed to sufficiently describe the planned work for each sign on that face.

The bubbles should be in order, moving outward, so they are representative of how the work would be accomplished. Begin with bubbles showing existing signs being removed, followed by the bubbles showing new signs being installed. Repeat this process for each sign face in the entire installation.

Although an installation may have signs facing in multiple directions, there is only one common support for that installation. Once the removal or replacement of the support has been detailed with one of the bubble strings, there is no need to repeat it on any of the other strings for that installation.

Figure 45: Example sign plans showing the leader line and the instructions for the signs, including the type of new post to be installed.



4.3 – Sign Details

In order to adequately explain the signing work needed for a project, provide the contractor with a detailed description of the signs, both existing and new.

This task is partially accomplished by developing sign detail sheets that include the likeness of each sign. Not only is this necessary for performing the work under contract, but these sheets will prove beneficial later on as a set of as-built records for that area.

4.3.1 – Format of Detail Sheets

Refer to the end of this section for an example sign detail sheet layout.

Start the sign drawing at the upper left corner and then proceed down the sheet in rows until the sheet is full. The signs within a given row are left-justified with respect to each other, and the sign numbers are centered below each respective sign. Allow an adequate amount of space between signs within each column and between each of the columns so that the sheets do not appear cluttered and are easy to read. Refer to the penciled-in plan sheet for sign numbering.

One way to number the project is to start with the first sign at the beginning of the alignment on the first plan sheet and call it number one. The corresponding design should be placed in the upper left corner of the sign detail sheet and labeled Sign No. 1. Working through the plan sheets, the next sign would be numbered 2 and so forth. All the signs on the sign detail sheet are numbered in this fashion.

This is the easiest way to number the project, but it doesn't always produce the best-looking detail sheets. The end result will be some small signs mixed in with some very large signs and will not make very efficient use of the space on the sheets.

Another way to number the sheets and make better, more efficient use of the space on the detail sheets is to begin at the start of the alignment and proceed on the plan sheets numbering the smaller regulatory, warning and other standard signs first.

Once these signs have been covered for the entire project, repeat the process for the smaller guide signs and other small signs requiring custom designs.

Lastly, repeat the process for the larger guide signs and other large signs requiring custom designs. By using this second method, the signs on the detail sheets line up more uniformly and use the space more efficiently. This method places signs requiring custom designs at the end of the sign detail sheets.

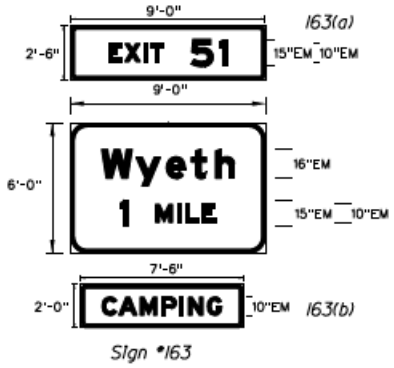
Signs that supplement each other should share the same sign number. Examples include:

- Warning sign with an accompanying speed or distance rider.
- Guide sign with secondary route assemblies or recreational symbols mounted below it.
- Guide sign with an exit number sign mounted above it.

In each of these cases, show the entire collection of signs together in one location on the sign detail sheet and assign a single sign number.

To differentiate between the primary sign and the supplemental signs, each of the supplemental signs are further designated by a suffix. So, if the entire collection was known as sign 1, the supplemental signs accompanying it would be labeled 1a, 1b, 1c, etc. In this manner, the entire collection of signs that supplement each other on that sign face can be referred to as sign number 1 in the bubble notes on the plan sheet. At the same time, each individual sign in that collection has its own unique designation that can be referred to in the Sign and Post Data Tables, when more specific details are required.

Figure 46: Example installation in the sign details that includes three signs, one main sign and two supplemental labeled (a) and (b).



Once a particular sign has been located and numbered on the sign detail sheets, do not show it again. For example, if sign number 1 is a STOP sign, then refer to every other STOP sign on the project as sign number 1.

Any signs that will be removed altogether, or otherwise not replaced with new signs, will be drafted with dashed (broken) borders on the sign detail sheets. Draft others that require new signs with solid borders.

4.3.2 – Regulatory and Warning Signs

Most of the more common regulatory and warning signs are depicted in cell libraries or cache files, for convenience.

The GuideSIGN Sign Design program, used for designing custom signs, also contains a library of cells for the most common regulatory and warning signs shown in the MUTCD. It also includes many styles of route shields and several standard recreational and motorist services symbols.

Any of these cells which apply to the project can be copied to the sign detail sheets. Take advantage of this and other cell libraries to save time and reduce rework. A good source for these standard signs is a cache file in the ODOT workspace.

Download the ODOT workspace: ftp://ftp.odot.state.or.us/isb/appeng/CONNECT/.

Access directions for the ODOT workspace: https://www.oregon.gov/odot/EAST/Documents/CacheFileLocationsAndOtherReferencePaths.pdf

Regardless of what source the sign depictions are from, it is important they closely resemble the actual signs needed on the project. This way there is no question on the part of the contractor as to what signs they need to install.

These depictions should be drafted at a scale large enough to be easily recognized, but small enough to allow a reasonable number of them on a sheet. With these smaller standard signs, 25 to 40 signs can fit on a single sheet. Scale them with respect to each other, such that signs which are the same size appear the same size on the sheet. If one sign is twice the size of another, draft it such that it is twice the size on the sheet. If there is not an exact depiction of a particular standard sign, find a similar sign and modify its legend to suit the need. Once done, consider creating a cell of this sign for future use.

4.3.3 – Guide Signs

Most guide signs are unique to a particular location. There are standard layouts for signs such as exit gore signs and exit number signs, but even though the overall dimensions for these signs are set, the spacing of the legend will vary with the exit number.

Because of this, a unique design layout should be worked up for each guide sign. Using the sign design software, produce likenesses of each guide sign for placement onto the sign detail sheets. As best practice, use the software in a separate design file, rather than the project design file. This protects the existing plan sheet data and offers a clean space to work with.

As each sign is designed, copy it into the project design file using the clipboard feature. Copy the necessary dimensioning text along with each sign. Ideally, each guide sign should include:

- Dimensioning text showing the overall height to the left of the sign.
- Overall width above the sign.
- Letter sizes and fonts as well as arrow and shield sizes to the right of the sign.

Do not show any dimensions below the signs, if possible.

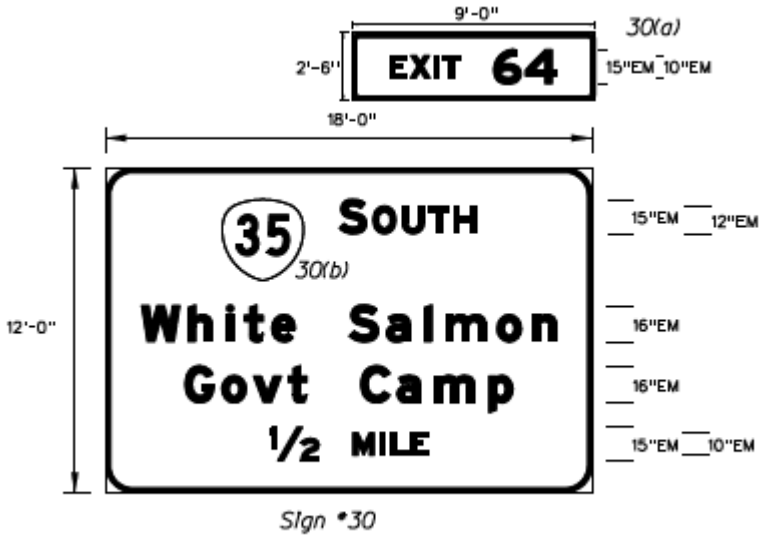
Begin with the smaller guide signs such as street name signs and work up to the larger signs as the sheets are built. The signs will fit more uniformly on the sheets and space will be used more efficiently by doing this. Refer to Chapter 2 for information on the actual design of the sign.

Copy the signs onto the sign detail sheets and be sure to scale them appropriately so they are proportionately sized with respect to the regulatory and warning signs already placed on the sign detail sheets.

Place the text for the sign dimensions such that its size is consistent from sign to sign. Use a text size that is easy to read, but does not take up a lot of room or interfere with the depiction of the sign.

Show all signs on a particular face that are installed together as a single sign number. Use suffixes for each sign, other than the primary sign, within each sign number. As an example, if a primary guide sign contains two route shields has an exit number sign mounted above it and has an “exit only” panel at the bottom of it, refer to the entire collection as sign number 1. The exit number sign might be referred to as 1a, the “exit only” panel as 1b, and the route shields as 1c and 1d. By doing this the entire installation can be referred as sign 1 on the plan sheet(s) and also be able to identify each sign separately when more detail is required in the Sign and Post Data Tables, which will discussed later in this chapter.

Figure 47: Example sign installation in the sign details showing an exit panel with the (a) suffix and a route shield with a (b) suffix. All parts of the sign are referred to by a single sign number in the sign plans.



In most cases, a guide sign will be one of three colors:

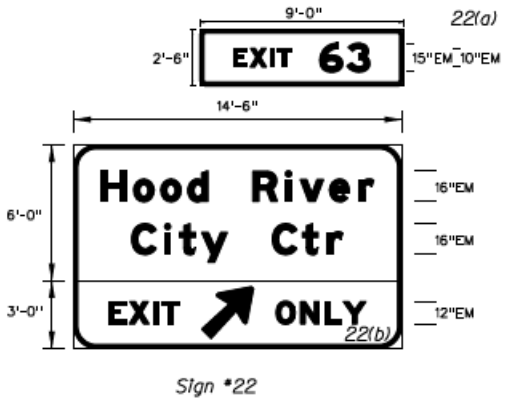
- Green.
- Blue.
- Brown.

The color depends on the type of destination(s) to which the sign is directing people.

In some cases, a guide sign needs to be partly green and partly brown or blue. In other cases, a guide sign will include a yellow "EXIT ONLY" message at the bottom. For either of these scenarios, it is best to label with the suffixes "a" and "b" to differentiate between the two colors on the same sign.

Later, in the Sign and Post Data Table give more specific details as to the type of sheeting and the dimensions involved for each color. Using these suffixes allows the details of the two-colored portions of one sign to show separately.

Figure 48: Example sign installation in the sign details showing an exit panel with the (a) suffix and an EXIT ONLY panel with a (b) suffix. The EXIT ONLY panel is a different color than the guide sign and has a suffix in the details to help call out that difference.



4.3.4 – Sign Design Software

There are several programs available to design and draft the signs not available in the signing cell library.

> ODOT uses "GuideSIGN" sold by Transoft Solutions, https://www.transoftsolutions.com/signage/guidesign/?setRegion=en.
>
> "SignCAD" from Bentley Systems is another similar system that will help design and draft the sign, https://www.bentley.com/software/openroads-signcad/.

The advantage of using software to design signs is the speed of the design, plus the drafting is to scale so what is seen on the design is an exact replica of what the finished sign will look like.

If using software to design signs for a project, printing the design for each sign out individually for the shop drawings is required with the sign plan. The sign designer will be asked to send these drawings to the construction project manager's office, and they will provide them to the contractor for the project.

The sign manufacturer uses the drawings to build the signs according to their design. Make sure the sign numbers on the drawings match those shown on the sign details sheets. Also, validate the information on the drawings regarding sizes, sheeting types and colors, etc. matches the information entered into the Sign and Post Data Tables (see next section).

4.4 – Sign and Post Data Tables

Refer to the end of this section for a layout example of a Sign and Post Data Table.

This section explains the Sign and Post Data Tables column by column, explaining what type of data needs to be entered in each case. Examples are provided along the way, and the completed

data table at the end of the chapter should also be examined while reading through the instructions for each column. Read this entire section prior to filling out a Sign and Post Data Table for the first time.

Before filling in the data tables, tally up the number of each individual sign needed to complete the work shown in the plans. Count entries only where a new sign and/or support are to be installed or where an existing sign and/or support are to be removed, saved and reinstalled, or somehow modified. Do not count signs and supports removed and not replaced, or signs and supports maintained and protected in their existing location.

Once the tally is completed, fill in the first data table. Leave a few empty lines after each sign number, especially if additional signs are expected in the future.

4.4.1 – Sign Number & Sign Location

Start with sign number 1 and make the entries in numerical order. If there are three installations tallied for sign 1, then fill in data in three different rows, one line for each location.

In this case only entering the number "1" for the first row is needed. It is understood that the other following rows were also number 1 unless otherwise numbered.

If the sign 1 has a secondary sign (1a) along with it, then fill the data in six different rows. The entries in the sign number column would read "1, 1a, 1, 1a, 1, 1a" down the column. Entries are only needed in the sign location column for the rows next to number 1 (not 1a), because the location of 1 and 1a would be the same in each case.

For the sign location column, it is preferred the entry consist of an alignment name, engineering station and a designation of "lt." for left of centerline or "rt." for right of centerline, when looking ahead on line. If the installation is in the median, then use the designation "ctr."

If engineering stationing is not available, as is the case in some preservation overlay projects, then enter mile points, to the nearest one-hundredth of a mile, into the sign location column. A directional suffix (EB, WB, NB, SB) should accompany it to indicate which side of the highway the installation is on.

After completing each of the rows for sign 1, skip a row and begin making entries for signs numbered 2, then 3 and so on until all numbers have been covered.

It is best to leave a blank row after finishing the entries for a particular number. This provides a little separation and makes the data easier to read.

4.4.2 – Sign Dimensions

The sign dimension entries are simply the width and height for each sign.

For all custom designed signs, enter these values in terms of feet and inches, as determined by the custom sign design software used in their design.

For all standard signs (regulatory signs, warning signs, shields, arrow boards, rec. symbols, milepost markers, etc.) show the dimensions in inches only.

Dimensions for most of the more common regulatory and warning signs are included in Appendix D. Please note that many of the standard sign sizes for ODOT are larger than the MUTCD. Always check Appendix D before using the MUTCD for proper sizing. Dimensions for other standard signs can be found in FHWA's Standard Highway Signs, our Sign Policy and Guidelines, and our standard drawings (TM200 series).

When detailing a sign that already exists in the field, bracket each dimension with parenthesis to differentiate it from the new signs. It is not always necessary to show dimensions for existing signs, but it will prove useful if the existing sign needs a new support. Sign sizes are needed for the contractor or project inspector to be able to field verify sizes of new supports.

4.4.3 – Sign Type

Sign types were removed with the 2018 Oregon Standard Specifications for Construction.

4.4.4 – Substrate

ODOT accepts only three types of substrate material for permanent signing on the state highway system:

- Sheet aluminum.
- HDO plywood.
- Extruded aluminum panels.

Place a checkmark in the appropriate column for each row to designate the desired substrate material for each sign.

As a general rule of thumb, ODOT only uses extruded aluminum panels for signs that are too large to be made of plywood. This would be anything larger than what can be fabricated out of a 4′ x 8′ sheet of plywood. Some signs that would otherwise be small enough to go on plywood should instead use extruded aluminum panels if they have structural steel supports. These supports are designed for signs mounted to them with post clips, instead of being thru-bolted.

Extruded aluminum panel signs are designed in 6-inch increments for overall height and width, whereas plywood and sheet aluminum signs are designed in 3-inch increments.

Plywood can be used as a substrate for signs up to 4′ x 8′ in size. Sheet aluminum can be used for ground-mounted signs up to 4′ x 5′ in size and is also used as an overlay material riveted to extruded aluminum panels (route shields and EXIT ONLY panels on large guide signs).

Because of its relatively light weight, sheet aluminum is also used for virtually all street name and lane use control signs mounted on signal pole mast arms.

Plywood is sturdy and therefore is resistant to bending or warping around the support in high wind conditions or in snow-blowing operations. Because of this, plywood may make for a better substrate material than sheet aluminum for signs wider than 3 feet which would be the most susceptible to bending or warping in severe conditions.

4.4.5 – Background Color

Abbreviations for each of the colors are listed in footnote 1 at the bottom of each Sign and Post Data Table.

Enter the color abbreviation into whichever column is appropriate for that sign type, be it standard sheeting (known as ASTM Type III or type IV) or wide-angle sheeting (known as ASTM type IX or XI).

4.4.6 – Legend Color

There are three columns where legend color information can be entered. Choose only one of these columns for the sign legend and enter the appropriate legend color.

- "ASTM Type III or Type IV" column.
- "ASTM Type IX or Type XI" column.
- "Non-Reflective" column.

Whenever the legend color is black, enter the abbreviation "BK" into the "Non-Reflective" column. Black legend is always non-reflective. No other colors will be entered in the "Non-Reflective" column.

For all other legend colors, use the same abbreviations referred to previously in footnote 1. Enter the abbreviation for the sign color into whichever column is appropriate.

4.4.7 – Legend Type

Enter a checkmark into one of the two columns.

- If the sign is to be made of **plywood or sheet aluminum**, then the legend type is direct applied and will always be considered "permanent."
- If the sign is to be made of **extruded aluminum panels**, then the legend is riveted on and will always be considered "removable."

4.4.8 – Sign Number

This column is a repeat of the first column. Copy the first column directly over to this column. It makes the table easier to read if the sign numbers repeated in this location near the center of the sheet.

Steel Multi-post Breakaway Installations

For steel multi-post breakaway installations, incorporate individual designations for each post into this column. Provide extra rows to accommodate the total number of posts in the installation. This allows you to enter design details for each steel breakaway post in its own specific row. This is necessary because each post might have its own unique length and offset distance to specify.

As an example, for a steel multi-post installation (assume sign number 1) using three posts, allow for three rows to detail each individual post. In the first column the first row would have the number "1" entered, but the next two rows would be left blank.

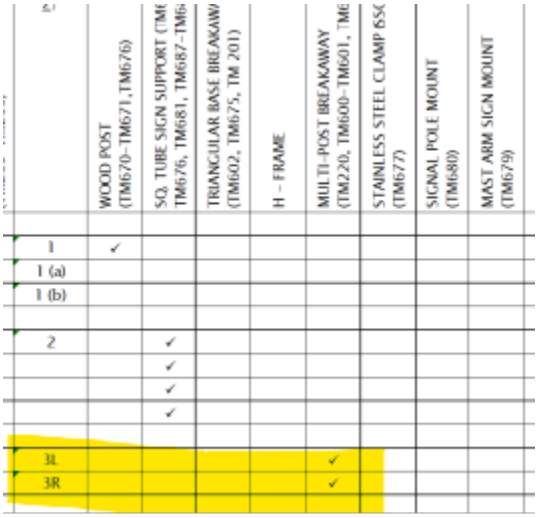
The corresponding sign number column in the middle of the sheet would have the following entries: 1L, 1C, and 1R, respectively in those same three rows to represent the left, center and right posts. This allows each posts to be detailed individually.

The information specific to the sign would only need to be entered in the first row. There is no need to repeat it in the other two rows.

Multiple Wood Post Installations

It is not necessary to detail posts separately for multiple wood post installations. For those installations, the posts can all be detailed in a single row.

Figure 49: Example sign and post data table entry, where the two supports for a sign are listed.



4.4.9 – Type of Support

These columns include all the primary and secondary support types common to permanent signing on ODOT's highway system.

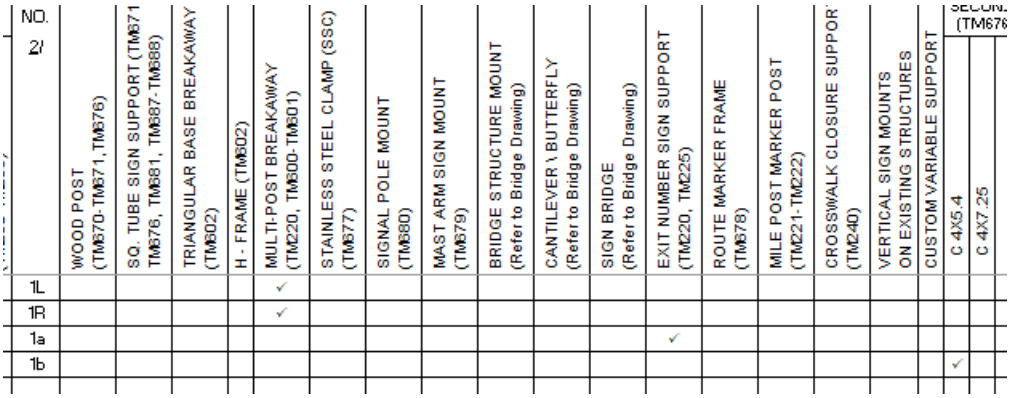
Enter a check mark in the appropriate column for each sign. In most cases, check no more than a single column for any given row. Rarely, check more than a single column. For example, a

triangular base breakaway support may or may not have an "H" frame associated with it; if so, insert checks in both of these columns. Many installations will have a primary support and some secondary supports, as well. In such cases, make sure the check marks for each column are in the appropriate row corresponding to the sign it supports.

As an example, a primary guide sign (number 1) may have two steel multi-post breakaway supports (1L, 1R), and it may have a secondary exit number sign above it (1a) supported by an exit number sign support and another secondary sign (1b) mounted below it using a C4x5.4 channel support. In this case,

- Rows 1L and 1R (for sign number 1) would each have a check entered in the multi-post breakaway column.
- The row for sign number 1a would have a check entered in the exit number sign support column.
- The row for sign number 1b would have a check entered in the C4x5.4 column under secondary sign supports.

Figure 50: Example sign and post data table entry where the two main supports plus an exit number support and C4x5.4 support.



NO. 2/	WOOD POST (TM670-TM671, TM676)	SQ. TUBE SIGN SUPPORT (TM671 TM676, TM681, TM687-TM688)	TRIANGULAR BASE BREAKAWAY (TM602)	H - FRAME (TM602)	MULTI-POST BREAKAWAY (TM220, TM600-TM601)	STAINLESS STEEL CLAMP (SSC) (TM677)	SIGNAL POLE MOUNT (TM680)	MAST ARM SIGN MOUNT (TM679)	BRIDGE STRUCTURE MOUNT (Refer to Bridge Drawing)	CANTILEVER \ BUTTERFLY (Refer to Bridge Drawing)	SIGN BRIDGE (Refer to Bridge Drawing)	EXIT NUMBER SIGN SUPPORT (TM220, TM225)	ROUTE MARKER FRAME (TM678)	MILE POST MARKER POST (TM221-TM222)	CROSSWALK CLOSURE SUPPOR (TM240)	VERTICAL SIGN MOUNTS ON EXISTING STRUCTURES	CUSTOM VARIABLE SUPPORT	SECON. (TM676 C 4X5.4	C 4X7.25
1L					✓														
1R					✓														
1a												✓							
1b																		✓	

Some sign numbers and their corresponding rows will have no check marks entered in the support columns. This is because each support, whether primary or secondary, is only to be detailed once in the data table. This eliminates confusion when calculating actual material quantities needed.

For example, if a single wood post supports a STOP sign (number 1) and street name signs for two different streets (numbers 2 and 3), then the wood post column would only be checked in the row for sign number 1. The other signs (2 and 3) would not have any check marks in their rows for support types. They would, however, contain notes in the remarks column (discussed later) indicating their support is detailed with sign number 1.

Detail each support only once, but make cross references so it is obvious how each individual sign is supported.

4.4.10 – Post Size and Length

The post size and length columns are only filled in for the following types of supports:

- Wood posts.
- Perforated steel square tube sign supports.
- Triangular base breakaway sign supports.
- Multi-post breakaway sign supports.
- Exit number sign supports.
- Milepost marker posts.

Lengths for secondary sign supports are also required in the data table. However, there is a separate column for this data located next to the other columns which are specific to secondary sign supports.

In the post size column, enter information specific to the cross-sectional size of the support. In the post length column, enter the length of the support, usually in feet and inches. The actual design of supports and determination of sizes and lengths is detailed in the Traffic Structures Design Manual.

Post sizes for wood posts and perforated steel square tube sign supports have nominal cross-sectional size in inches. ODOT uses wood post sizes of:

- 4″x4″
- 4″x6″
- 6″x6″
- 6″x8″

Perforated steel square tube sign supports come in the following cross-sectional sizes:

- 2″
- 2.25″
- 2.5″

Post lengths for wood posts are calculated in even two-foot increments, which is consistent with how they are sold on the market (14′, 16′, 18′, etc.). The lengths shown represent the total length of post from the bottom of the embedment (4′ to 7′ below the surface) to the top of the three-inch reveal above the sign(s) supported.

Calculate post lengths for perforated steel square tube sign supports to the nearest inch and show them in terms of feet and inches. The lengths shown represent the total length of the main square tube post from the bottom of the embedment (18″ below the surface) to the top of the sign(s) supported.

Milepost marker posts all have a specific size detailed in standard drawing TM222. The designer can either enter the specific size or "SEE TM222" in this column to specify post size for milepost marker posts.

Post lengths for milepost marker posts can be found on standard drawing TM222. These values vary with the size of the milepost marker supported. Enter the appropriate measurement (in feet and inches) from the chart.

Post sizes for triangular base breakaway, multi-post breakaway, and exit number sign supports, have industry recognized structural member names. All exit number sign supports are short flange members of a specific size (S 3x5.7). Use them in pairs and indicate the need for two of them in the entry.

All multi-post breakaway sign supports are wide flange members which come in a range of sizes shown on standard drawing TM601 (W 6x9, W 6x12, W 6x15, etc.). All triangular base breakaway sign supports are tubular steel members made of three-sixteenths inch thick steel. The available sizes are shown on standard drawing TM602 (range from TS 3x3 thru TS 8x8).

Enter lengths for multi-post breakaway and triangular base breakaway sign supports in units of feet and inches, in each case to the nearest inch. Unlike some of the other supports the length indicated does not include the portion of the support below the surface in the concrete footing. Lengths shown for the multi-post supports represent the entire post beginning at the top of the base plates and working up to the top of the post at or just above the top of the primary sign.

Lengths shown for the triangular base supports represent the entire post beginning at the top of the base plates and working up to the top of the post. The top of the post will not always coincide with the top of the sign(s). If a triangular base breakaway support has an "H" frame, then the length is only calculated up to where the post ends at the "H" frame. This coincides with a distance halfway up the back of the sign. If the support does not have an "H" frame, then the top of the post coincides with the top of the sign and the length shown should reflect that.

Exit number sign supports are used in pairs and will almost always be 7' in length. This is the length required for a standard application of this support which involves supporting a 30-inch-tall exit number sign above a primary guide sign, with the supports also running a length of nearly 4 feet 6 inches down the back of the primary sign. These supports, however, are also used for signs other than exit number signs, so the length needed could vary. It is also possible that the primary sign may be shorter than 4 feet 6 inches, requiring the exit number sign supports to be shortened so as not to extend below the primary sign. Enter the appropriate length in feet and inches.

4.4.11 – Footing Location and Minimum Depth

The footing location and minimum depth columns are only for ground-mounted installations that specifically require concrete footings. That limits it to:

- Multi-post breakaway sign supports.

- Triangular base breakaway sign supports.
- Perforated steel square tube sign supports.

The location column should show an offset value, in feet and inches, representing the distance from a particular point of reference to the center of the desired footing location. Use a point of reference most appropriate for the circumstance, such as:

- Edge of pavement.
- Edge of travel lane (fog line).
- Face of guardrail or concrete barrier.
- Face of curb.
- Back of sidewalk.

Include a note in the remarks column to specify which point of reference to measure from. This specified distance will allow the contractor to accurately stake the location of the footing to ensure that it gets installed where it needs to be.

The minimum depth column includes a measurement in feet and inches representing the total minimum depth required for the concrete footing. The perforated steel square tube sign support foundation depth values can be found on standard drawings TM687 and TM688. For multi-post and triangular base breakaway supports, the minimum footing depths vary with the size of the support. Depth values can be found in the same charts referred to earlier in standard drawings TM601 and TM602.

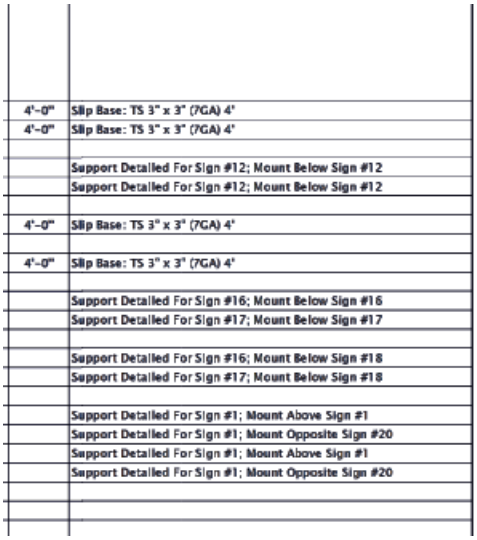
4.4.12 – Remarks

The last column is reserved for any remarks needed to further explain the installation of the sign or support detailed within the row. Sometimes further explanation is needed to supplement the location or offset of a sign or footing.

Reasons to include remarks:

- Installations containing several signs, especially those facing different directions, to document the orientation.
- When the support for a sign has already been detailed for one of the other signs.
- Sign supplied by an agency other than ODOT, such as state parks.
- Reference other drawing numbers (plan sheets) relating to some of the signs, i.e., signal poles, cantilevers, sign bridges or other supports.

Figure 51: Example sign and post data table remarks entry, where some signs are on a support already listed and larger slip base for a PSST was requested.



4'-0"	Slip Base: TS 3" x 3" (7GA) 4'
4'-0"	Slip Base: TS 3" x 3" (7GA) 4'
	Support Detailed For Sign #12; Mount Below Sign #12
	Support Detailed For Sign #12; Mount Below Sign #12
4'-0"	Slip Base: TS 3" x 3" (7GA) 4'
4'-0"	Slip Base: TS 3" x 3" (7GA) 4'
	Support Detailed For Sign #16; Mount Below Sign #16
	Support Detailed For Sign #17; Mount Below Sign #17
	Support Detailed For Sign #16; Mount Below Sign #18
	Support Detailed For Sign #17; Mount Below Sign #18
	Support Detailed For Sign #1; Mount Above Sign #1
	Support Detailed For Sign #1; Mount Opposite Sign #20
	Support Detailed For Sign #1; Mount Above Sign #1
	Support Detailed For Sign #1; Mount Opposite Sign #20

4.5 – Sheet Numbers

All sign plan sheets, sign detail sheets, and sign and post data table sheets require unique sheet numbers assigned by the Traffic-Roadway Section. These numbers are used to archive all the signing sheets on a project.

Request sheet numbers when the sign plans are finalized, and no more changes will occur. This usually occurs sometime between the advanced plans and printing of the PS&E plans for construction projects. The unique sheet numbers run consecutively; once a set of numbers is assigned, it is difficult to simply add or delete plan sheets from the project. If a sheet is added or deleted later, often a completely new set of numbers is assigned and the old numbers voided.

Projects on freeways or expressways or in urban areas frequently include overhead sign supports, requiring the production of structural design drawings. If these drawings are for standalone supports, such as sign bridges, cantilevers or butterfly supports, they must be assigned signing sheet numbers. If they are for supports that attach to a bridge structure, such as structure mounts or bridge rail mounts, the drawings must be assigned bridge drawing numbers from Bridge Engineering Section.

Ideally, bundle structural drawings needing signing sheet numbers with the signing plans when requesting sheet numbers. This takes some coordination and cooperation among the different designers to get it done right. Place the structural sheets related to the signing plans immediately after the Sign & Post Data Tables, so they are assigned numbers consecutive with the signing plans.

All sheets can then be sent in together as part of a single request. If they come in separately there are no guarantees the numbers assigned will be consecutive. This may seem like a small

matter, but it makes a big difference down the line when somebody searches our records for as-built information. It is much easier to find information on overhead support structures when the sheets are part of the same run of numbers as the signing sheets to which they relate.

If it is not possible or practical to request these sheet numbers together as one group, then cross reference the related sheets to one another. For example, a note might be inserted in the remarks column of the Sign & Post Data Table referencing a particular drawing number for the sign structure relating to the subject sign number from the data table.

To request sheet numbers for all the plan sheets on the project, call 971-372-0590 or email Jason.MOTLEY@odot.oregon.gov.

4.6 – Quality Control, Assurance and Verification

Each region at ODOT has a quality control quality assurance (QA/QC) plan in place to ensure ODOT designs undergo a QA/QC review before submittal to the Project Controls Office (PCO).

Consultants working on ODOT projects are also required to have a QA/QC plan. More information for consultants can be found at Statewide Project Delivery Quality Management Plan (oregon.gov). ODOT does not perform QA/QC on consultant work, the consultant is expected to do that. ODOT verifies the QA/QC has been done.

A sample check list for quality control of sign designs is included in Appendix H – Example of a QA/QC Check List for Sign Design. This is not a comprehensive list of all things that can or need to be checked in sign plans submitted, but an example of what some regions have chosen to focus on.

Figure 52: Example sign plans sheet.

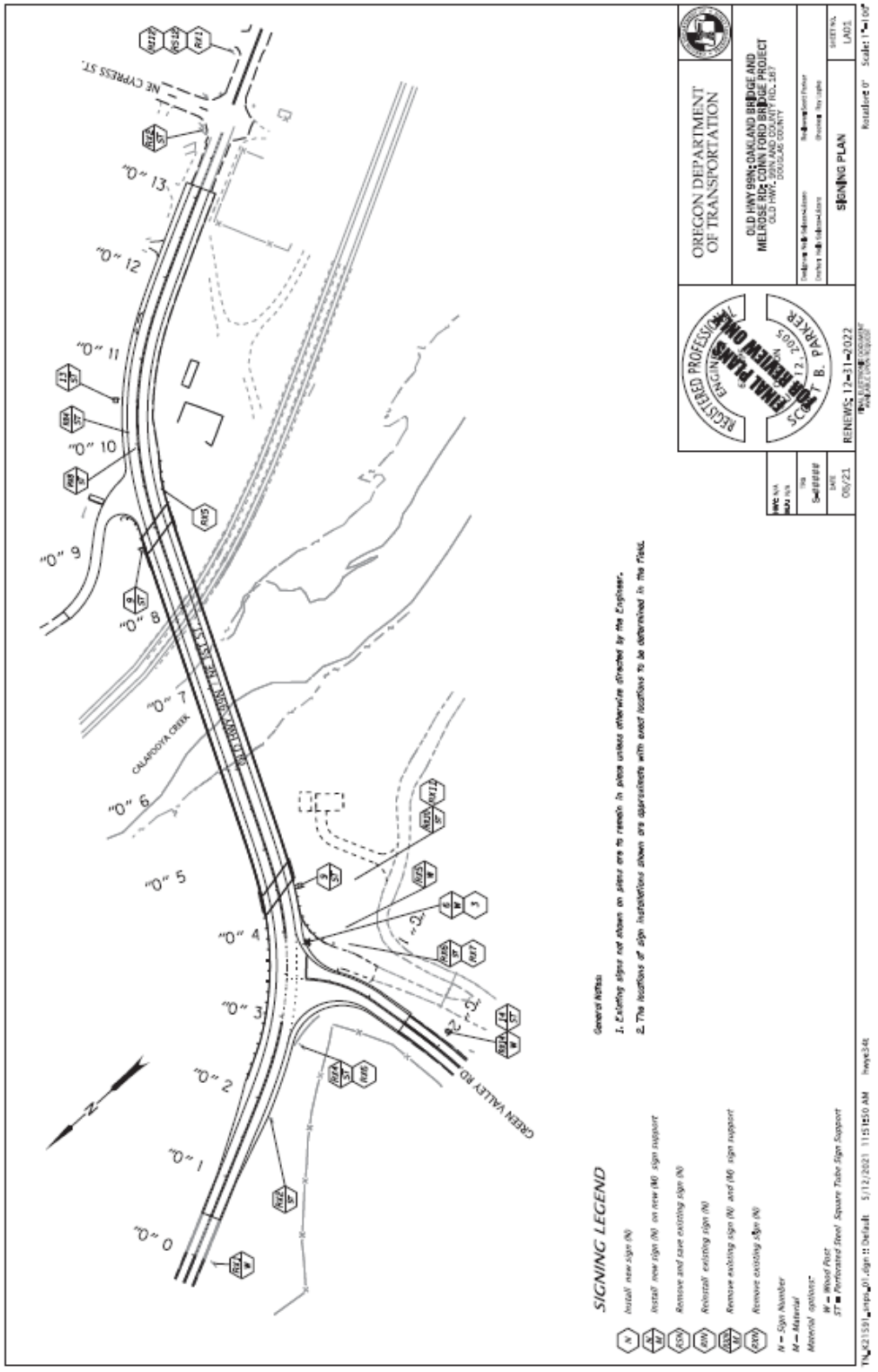


Figure 53: Example sign details sheet.

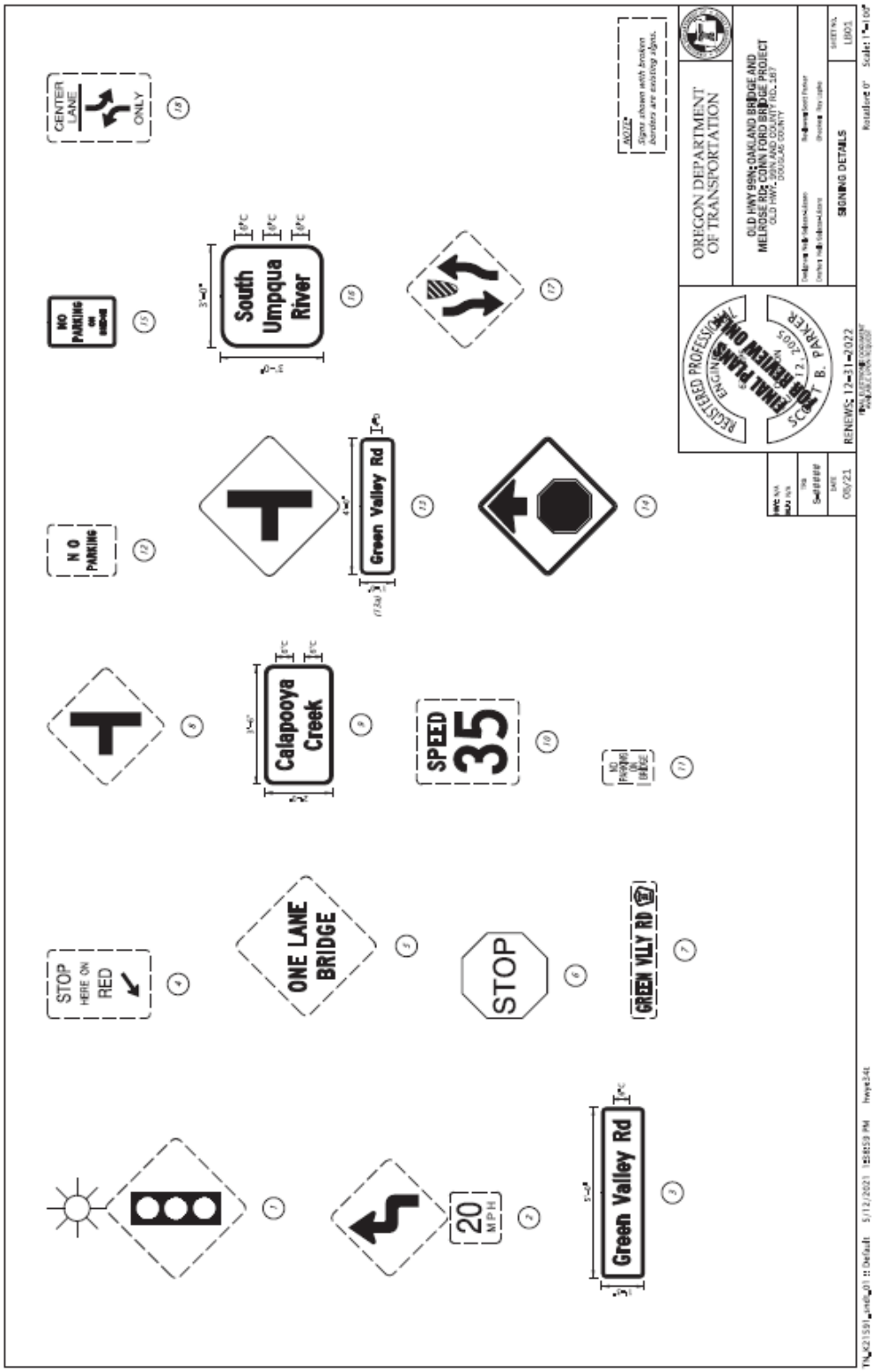
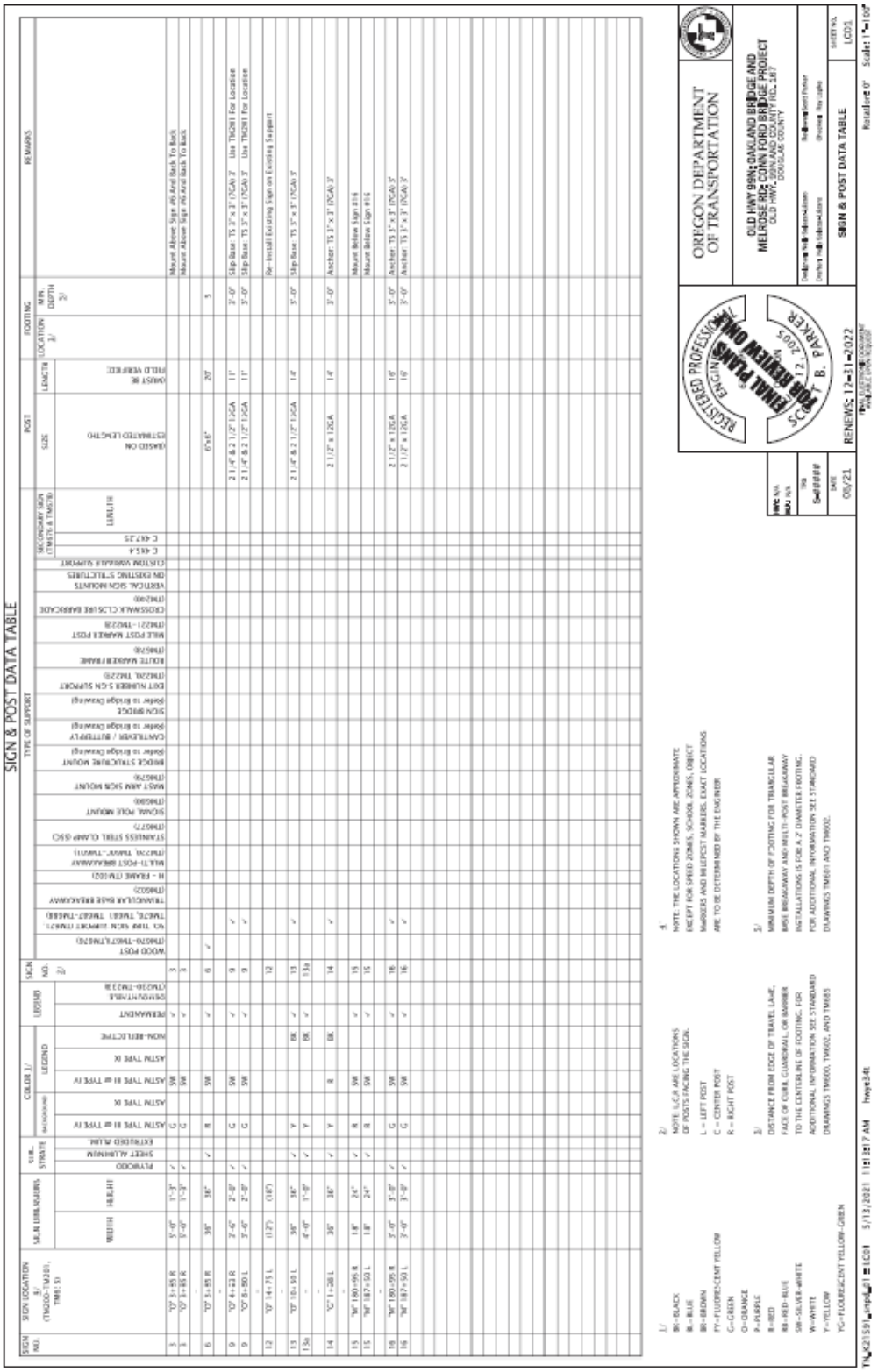


Figure 54: Example sign and post data table sheet.



Chapter 5 – Standards

5.1 – Standard Drawings and Standard Details

The standard drawings which support permanent signing are located in the TM200 and TM600 series of drawings, accessible at: http://www.oregon.gov/ODOT/Engineering/Pages/Drawings-Traffic.aspx.

Many of these standard drawings were discussed in chapter 4. Others not previously mentioned include:

- TM211, TM212 – Interstate, U.S. and Oregon route shields.
- TM221 – Mile post marker signs.
- TM223-TM225 – Guide signs, conventional and freeway/expressway.
- TM230-TM233 – Demountable legend.

As part of the final submittal of PS&E documents to the spec writer, list all standard drawings that apply to the work described in the plans. List them as "Accompanied by Drawings" in the lower right corner of the title block on the first plan sheet, just above the sheet number. The spec writer will also include this information in their index, which appears just after the title sheet. All sheets listed will be added at the end of the set of contract plans.

5.2 – Standard Specifications and Special Provisions

Oregon Standard Specifications for Construction are located at the following website: https://www.oregon.gov/ODOT/Business/Pages/Standard_Specifications.aspx.

Most of the specifications dealing with permanent signing are in Part 00900 – Permanent Traffic Control and Illumination Systems and Section 02910 – Sign Material.

For each section of this book on standard specifications, there is a corresponding document containing information that has been updated, modified or deleted since the publication of the current spec book. These documents, or special provisions, can be found at: https://www.oregon.gov/odot/Business/Pages/Special-Provisions.aspx

Boilerplate special provisions supplement or supersede the corresponding information shown in the standard specifications.

Any special provision covering an item or a type of work shown in the plans must be included in the contract documents for that project. Some of the boilerplate special provisions do not

contain any updated information, but simply make reference to the corresponding standard specification. These boilerplate special provisions must still be included in the contract documents.

In some cases, the boilerplate special provisions may contain some information that does not apply to a particular project. In this case, delete that information from the boilerplate before submitting it to the spec writer. Turn on track changes before editing, so the spec writer can see the changes.

If there is a need to change or add to the content of the boilerplate special provision, consult with the technical resource of the specification first.

> **For permanent signing issues**, contact the ODOT Sign Engineer who can be reached at marie.kennedy@odot.oregon.gov; 503-986-4013.
>
> **For issues with structural steel supports or their footings/foundations**, contact the ODOT Senior Traffic Structures Engineer, who can be reached at scott.jollo@odot.oregon.gov; 503-510-2204.

Table 8: Commonly Used Special Provisions

Section	Project Details
840	Milepost marker post installations
905	Removals or reinstallations of existing signs and/or supports
910	Installation of new wood posts
920	Installation of sign support footings
930	Installation of any metal sign support
940	Fabrication and installation of new signs

Many of these special provisions refer to other related provisions which must also be included in the final submittal to the spec writer. Among these are sections 440, 2110, 2190, 2530, 2910 and 2920. There are still other special provisions such as Section 941 (Sign Covers) which apply to items not frequently used on ODOT contracts.

Special provision section 160 (Source of Materials), subsection 160.30, deals with agency-furnished materials. Whenever the project includes the installation of certain specialty signs provided by ODOT or another agency, then a list of these signs is to be provided in this subsection along with an indication of where these signs will be delivered. These agency-supplied materials are usually signs that have a graphic or unique design and would therefore be difficult for a sign supplier to reproduce. These are almost always signs which are part of the standard stock at the ODOT Sign Shop.

Of the permanent signing special provisions mentioned above, only a few typically require any modification. In most cases the special provision is sufficient in its boilerplate version. Notable

exceptions are sections 920 and 930. They contain subsections requiring the designer to list materials quantities for certain bid items.

Other notable exceptions are present in sections 930 and 940, which contain language specific to painting of metal sign supports and the backs of aluminum substrate signs. This is generally not done except for under special circumstances, as requested by other agencies or jurisdictions. Therefore, delete these subsections from the special provisions to ensure the work is not performed, unless it was specifically requested.

Submit all special provisions pertaining to the design, along with the plan sheets and an engineer's estimate showing a breakdown by bid item, to the spec writer. This is first done at the advance PS&E stage of design. There may be some modification required after the review process, and the final special provisions package will be submitted at the final PS&E stage.

The special provisions are MS Word documents and should be submitted electronically. They are typically attached to and submitted with an email message.

Chapter 6 – Estimates

6.1 – List of Bid Items

As part of the submittals to the spec writer at both advance and final PS&E, include a detailed cost estimate broken down into individual bid items.

Organize the bid items, in order, by item code (section number from standard specs). For each item, indicate the official bid item name and associated unit of measure, as shown in the standard specifications and special provisions. Other information needed for the estimate includes item code, quantity, unit cost, and total cost for each bid item.

Most regions and consultants have their own way to calculate and store estimations. These are often spreadsheets with simple macros to organize all the bid items for a project. Download the bid item list to make use of the most current and accurate specs and quantity units. The sign and post data table can also estimate quantities and provide estimates if using a macro-enabled version.

ODOT is deploying AASHTOWare Estimation, a program that helps streamline our estimation process. More information on this effort can be found here: https://www.oregon.gov/odot/Business/Pages/AW-Estimation.aspx.

6.2 – Providing Quantities

Each of the bid items used for permanent signing falls into one of three categories for payment:

- Per each.
- Per unit of measure.
- Lump sum.

Look in the standard specifications and the corresponding special provisions for the subsections defining measurement and payment to determine which of the three applies to a particular bid item. This information is found at the end of the section corresponding to each bid item, respectively.

There will be language specifying how the item is to be measured, to what degree of accuracy, and how it is to be paid for. Mile post marker posts, for example, are paid for per each post. Wood signposts are paid for per foot board measure (FBM). An individual FBM is calculated for each wood post detailed in the plans, then the sum of these is provided as the quantity on the cost estimate for that bid item. FBM is calculated for each post by multiplying the nominal cross-sectional dimensions in inches and dividing the resulting value by 12. Multiply the resulting value by the length of the post in feet to get the number of FBM for that post. A 6”x6” post of 20-foot length equals 60 FBM.

Each type of sign is paid for by the square foot. The easiest way to tabulate quantities for these is to go through each sign and post data table and calculate a square footage for each new sign by multiplying together the dimensions (converted to feet). Once complete, tally up a total square footage for each sign type and enter the amount as quantities onto the cost estimate spreadsheet.

Sign (and post) removals are lump sum bid items, as are removal and reinstallation of existing signs. Although quantities do not required for either of these items for bid purposes, it is necessary to tally the number of removals and reinstallations for the project so an estimate of the lump sum amount is included in the overall estimate.

For removals, categorize by size of removal, number of footings involved and whether the sign is ground mounted or overhead. The cost of removal will vary considerably depending on:

- How large it is.
- Whether there are concrete footings to break up and remove.
- Whether special equipment is needed to remove signs from overhead supports.

After assigning a reasonable amount of money for each type of removal, or removal and reinstallation, total up the projected costs and enter them into the appropriate location on the cost estimate spreadsheet.

Sign support footings is another lump sum bid item, but unlike sign removals, it requires that a quantity be provided in the Section 920 Special Provision for bid purposes. There are several types of steel sign supports that require concrete footings.

1. **Cantilevers and sign bridges** require custom design work. List footing quantities (excavation, concrete, rebar, and backfill) individually per location, by the bridge designer. Each of these locations is also listed as a separate bid item for sign support footings (specifying the type of footing and the location).
2. **All ground-mounted steel supports that have footings** (including triangular base breakaways (TBB), multi-post breakaways (MPB), perforated steel square tube (PSST) sign supports) are combined as a single bid item called "Sign Support Footings." Although a single cost value is entered onto the cost estimate spreadsheet, list the footings for these three types of supports separately (by the sign designer) along with their quantities in the Section 920 special provision. If all three support types are present on the project, show three separate quantities. These quantities show the amount of concrete only (in cubic yards). There is no need to include amounts for excavation, rebar or backfill for ground-mounted supports.

Look at the sign and post data tables and tally up a total number of supports estimated for each type and size of support. Multiplying these numbers by the standard values shown for each corresponding size and type listed on the spreadsheet and adding the resulting numbers will give the quantities (separately for TBBs and MPBs) that are needed to show in the special provision.

For concrete footings, use the sign material quantity calculation sheet to help with the estimation. That can be found here: https://www.oregon.gov/odot/Engineering/Documents_TrafficStandards/Signs_Material-Qty-Calc-Sheets.xls

Except as otherwise stated in the standard specifications and special provisions (Section 930), list each type of steel support separately as its own lump sum bid item. Provide quantities of steel (in pounds) in the special provision for estimating purposes. A total quantity for each bid item (type of steel support) is necessary. Use the same website location mentioned above for calculating concrete quantities for calculating steel quantities. There are calculation sheets for each size of TBB, MPB, and for signal pole mounts.

After calculating quantities for each individual support, total by type of support and list the resulting quantities in the special provision. Quantities of steel for PSST sign supports are a little tougher to figure, because there are several different cross-sectional sizes and varying wall thicknesses available. Some are designed to break away (slip bases), and some are designed to yield (anchor tubes). The perforated steel square tube manufacturers can provide information regarding the unit weight of steel (pounds per lineal foot) for each of the varying sizes and wall thicknesses they provide. Use these values multiplied by the length of each post and the corresponding sleeve(s) to calculate a total quantity of steel for each installation.

Add all the numbers for each "breakaway" installation to give a total quantity of steel for all PSST breakaway sign supports. Likewise, add all the numbers for each "yielding" installation to give a total quantity of steel for all PSST sign supports. List these values in the special provision for estimating purposes. They are two separate bid items; show the quantities separately.

Exit number sign mounts are used in pairs. They are commonly used in 7-foot lengths, but this may vary depending on the heights of the primary and secondary signs involved. These supports weigh roughly 5.7 pounds per lineal foot, so it is a simple calculation for figuring the weight of any single pair of exit number sign mounts. Add the weights of all such supports together and place this resulting value in the special provision for estimating purposes.

Structure mounts and bridge rail mounts are custom designs provided by a structural designer. The structural designer is responsible for providing quantities for bidding purposes on these items. Likewise for cantilevers and sign bridges, except that the quantities for these must be listed separately and shown as separate bid items for each individual location. After estimating quantities for each steel bid item, select appropriate unit costs (per pound installed) for each type of steel to calculate a lump sum cost estimate for each item.

6.3 – Unit Costs and Regional Factors

ODOT's Cost Estimating Unit stores historical project bid data (1998 and after) available at: https://www.oregon.gov/ODOT/Business/Pages/average_bid_item_prices.aspx.

This site has data available with either a statewide or a regional focus.

Bid items are listed by the standard specification section number within which they fall. For example, wood signposts are listed by the number 0910 since they are covered by Section 910.

Costs for certain bid items vary from region to region. Focus on the data available within the specific region of the state for the past 2-3 years. When little data is available within the region, look to adjacent regions. If necessary, look to the statewide listings for data.

Generally, good data is available for items bid per each or per unit of measure. Finding relevant data for items bid in lump sums is more difficult, because the data available does not indicate the quantity of material covered by the bid amount.

6.4 – Anticipated Items

When the project includes signs with unique, hard to reproduce graphic features such as scenic byway signs, tour route signs, Historic Columbia River Highway, Lewis and Clark Trail, Oregon Trail, and state parks shields, they are usually noted on the plans as "State Supplied Signs." These signs can prove difficult for some sign suppliers to accurately reproduce, and the signs are readily available through ODOT's Sign Shop.

If state supplied signs are called out, then it should be noted as such on the sign details sheet next to the applicable sign(s) and in the remarks column of the sign and post data table. In the special provisions (00160.30), list the items supplied, including the number and size of each type of sign.

At the bottom of the bid item/estimate spreadsheet, enter a dollar amount to cover the purchase and installation of these signs. This anticipated item amount enables the project manager to purchase the signs from the ODOT Sign Shop when needed and to have them delivered to the contractor at the job site for installation. The amount provided should cover the cost of installation by the contractor as well as the purchase price of the signs. There may be occasions where anticipated items are necessary to cover items other than state supplied signs, but they are uncommon.

Justification is needed to support the decision to use anticipated items. There is a process to follow for providing this justification in writing. The Cost Estimating Unit website offers a couple of letter templates that are required submittals within this process.

Letter of Approval for Anticipated Items –
https://www.oregon.gov/ODOT/Business/Documents/Anticipated_Item_Template.docx

Letter of Public Interest Finding –
https://www.oregon.gov/ODOT/Business/Documents/LPIF_Template.docx

Chapter 7 – Design Follow-Up

7.1 – Construction Support

Providing that the plans, specs, and estimate are clear enough that none of the bidders have questions, the work required to get the project out to bid is complete.

Usually, bidder questions are directed to the project manager or resident engineer (PM/RE) overseeing the contract. If the PM/RE gets a question they can't answer, they will contact the designer. Keep a copy of the documents submitted close by until the bid is opened.

After the bid is opened, send a copy of all sign drawings to the PM/RE and the Materials Inspection Section. The sign drawings will be used to build all the non-standard signs on the project.

Sometimes unexpected things occur as part of construction. It is not unusual to get a call from the PM/RE asking for a design for a sign that has been hit by a vehicle and destroyed. Sometimes signs disappear off a project and need replacing. These requests require immediate attention since time is critical and permanent signing is one of the last installations. The contractor may be subject to liquidated damages if they run over the scheduled contract completion date.

Expect to answer questions about sign placements. There are locations in the state with little soil cover over solid rock. The contractor may want to move sign placement(s) to make drilling the sign footing hole easier. Be aware of proper sign distances. Do not approve a sign relocation(s) if it violates spacing requirements. Several other signs may require relocation to accommodate the change.

Another common construction request is to change the type of support included in the original design. Some of these requests make good sense and should be approved. Ensure there is a bid item for the new support or have the PM/RE write a contract change order (CCO) to accommodate the revision.

It is difficult to plan for what might occur before a sign is installed; be flexible in allowing changes. Moving a sign to a signal pole mount to avoid blocking a new commercial sign is a good example of an unanticipated, but reasonable change.

7.2 – Shop Drawings / Submittals

Sign designs for typical MUTCD signs and standard Oregon signs can be found in the FHWA Standard Highway Signs Manual and the Oregon Sign Policy & Guidelines (see Appendix B). Signs that appear in these books do not require shop drawings since the designs are already available.

7.2.1 – Signs

The sign fabricator needs material submittals (shop drawings) for non-standard signs prior to fabrication. Section 940 of the 2021 Oregon Standard Specifications for Construction requires the engineer of record to supply these to the contractor upon request.

The request will usually come from the PM/RE office. The designer provides the PM/RE with enough copies of shop drawings for each non-standard sign to ensure that all interested parties receive copies, including:

- Project manager or residential engineer.
- Prime contractor.
- Signing sub-contractor.
- Sign supplier (fabricator).
- ODOT Materials Inspection Unit in Portland (for inspecting and approving of the signs upon fabrication).

It is easiest to produce shop drawings for non-standard signs at the same time the sign detail sheets are created. Since you'll need the GuideSIGN design software to design these signs for the data tables, it only requires a few more steps to create a report for each sign.

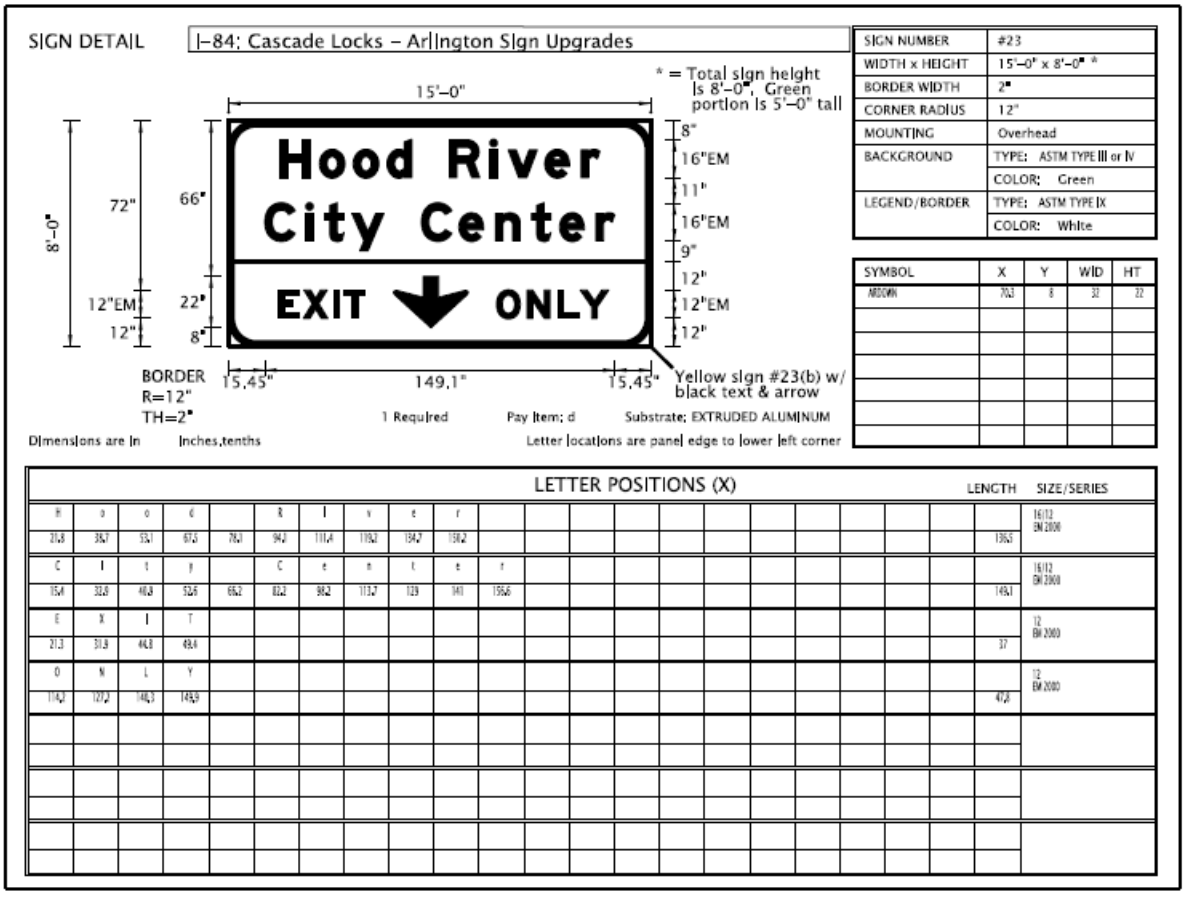
ODOT users have a custom sheet style and report form set up for shop (contract) drawings within GuideSIGN. It shows the following information on an 8½" x 11" print for each individual sign:

- Project name.
- Sign number.
- Dimensions.
- Border width.
- Corner radius.
- Color and type of background sheeting.
- Color and type of legend.
- Sign type.
- Substrate material.
- Number required.

Each sheet also shows a to-scale likeness of the sign along with detailed dimensioning for all pieces of legend and the spacing in between. The included spacing chart specifies positioning for each individual letter, shield or arrow based on an x-y coordinate system.

The program fills in most of this information automatically, but some text may need manual modification. Be sure to keep a complete set of these drawings. They may be needed for reference when an inspector or fabricator calls.

Figure 55: Example sign shop drawing



Circumstances often change from project design through construction. Occasionally, designers must add or subtract signs from the project. The final decision to add or subtract signs lies with the engineer of record (the person who stamped and signed the plans), since they are legally responsible for the signing installed according to the plans.

If additions or subtractions are made, notify the Material Inspection Unit as soon as possible. Email a copy of the design to the Material Inspection Section for added signs that are sent out for fabrication. This streamlines the sign inspection process at the manufacturing location.

Include changes to the plans in the as-constructed drawings made after the project is completed.

7.2.2 – Steel Supports

Since sign supports lengths are estimated in the design stage, field verification is necessary before the sign supports are ordered. Specification section 00930.02 covers the requirements for steel sign support field verification and working drawings.

Typically, field verification of the wood posts and perforated steel square tube sign supports is done by the project managers office; the designer may never see it. Occasionally, they send them in for verification. A list of verified post lengths is given to the contractor so they can order the right size posts before showing up on the project (most permanent signing is done by a sub-contractor).

Field verify the multi-post breakaway (MPB) and triangular base breakaway (TBB) sign supports specified prior to fabrication, based on cross-sectional information provided by the project manager's office. The cross-sections are taken at the locations specified in the sign and post data tables, and sent to the designer. The designer calculates and verifies the post size based on the field verification forms and creates a steel support shop drawing, called the working drawing in the specification. The steel support shop drawing can be downloaded from the sign design standards website or created from the MPB and TBB design spreadsheets that can be downloaded from the Traffic Structures website.

Signal pole mount and secondary sign support shop drawing forms are available for download from the sign design standards website. These include exit number sign mounts, route marker frames, and "C" channels. These shop drawings do not require cross-sectional information to complete.

Provide steel shop drawings to the residential engineer's/project manager's office for distribution to the prime contractor, signing sub-contractor, and steel fabricator. File all field verification forms, shop drawings, and design verification spreadsheets in ProjectWise.

The contractor will have the posts fabricated based on these drawings. This ensures the proper size, length, and details of the support is used for each sign installation. The contractor should not begin fabricating any steel supports until they receive shop drawings from the engineer of record.

Steel shop drawings are not necessary for the following types of metal sign supports:

- Perforated steel square tube sign supports.
- Milepost marker posts.
- Adjustable sign mounts.
- Mast arm street name sign mounts.

Shop drawings required for cantilevers, sign bridges, structure mounts or bridge rail mounts are provided by the manufacturer and submitted by the prime contractor to the resident engineer for review by the engineer of record responsible for the support design.

Chapter 8 – Special Design Considerations

8.1 – Review Requirements for Interstate Signing

The uniform appearance and application of signing on the interstate highway system is critical. Concerns and problems on projects designed on the interstate have elevated the importance of taking steps to assure there is a level of quality control implemented in the review of installations for interstate signs.

Because the cost of fixing potential mistakes is more extensive on the interstate, and because providing guidance to designers needs to be done in a timely manner to avoid conflicts with project deadlines, a set of interstate review requirements has been established.

8.1.1 – Project Delivery

For all STIP or construction projects with proposed changes to permanent signing on the interstate highway system the following review steps are required:

- DAP review.
- Final plan review.

8.1.1.1 – DAP Review

- Sign designers submit preliminary plans through the region traffic office to the Traffic Standards Unit.
- Plans will include the locations, sign content (text & symbols), estimated sizes, and anticipated support requirements for all new or revised signs. See Appendix C – Level of Development.
- The Traffic Standards Unit shall review and make comments on the submitted preliminary signing plans within ten business days of receipt.

8.1.1.2 – Final Plan Review

- Advance signing plans shall be submitted through the region traffic office to the Traffic Standards Unit along with shop drawings prior to the PS&E. See Appendix C – Level of Development.
- Any discrepancies between designers' concerns and review comments shall be resolved prior to, or as part of, the final plans review.
- If a design project does not have an advanced plan review as part of its project schedule, the sign designer shall submit the plans (with the sign shop drawings) four weeks prior to PS&E plans for review and acceptance by the Traffic Standards Unit. The Traffic Standards Unit will reply with comments within ten business days.

8.1.2 – Maintenance Sign Changes and Additions

Any modifications to non-standard signs on the interstate as part of maintenance activities must be designed by a sign designer and approved by the Traffic Standards Unit. According to the following steps:

- Sign designers will submit plans showing sign content, location, size, support and sign shop drawings to the Traffic Standards Unit for review and approval.
- The Traffic Standards Unit shall review and make comments back to the designer on the submitted designs within two weeks.
- The Traffic Standards Unit will indicate final approval by sending an email to the sign designer indicating the sign designs have been approved.

For the purpose of this manual, non-standard signs shall be considered any sign design not detailed by a sign design included in the FHWA Standard Highways Signs Manual or the Oregon State Sign Policy and Guidelines Manual.

Appendix A – Signing Contracts

Before starting the design, a designer may find it beneficial to assemble a list of personal contacts involved in individual aspects of the project.

The following is a list of position titles that may be useful to add to the list for any given project. Along with each position is some insight into how that person may be of benefit as a contact. The names and phone numbers that correspond with these positions can be obtained from the appropriate ODOT region tech center.

A.1 – Project Leader / Consultant Project Manager /Resident Engineer for Consultant Projects

The project leader, consultant project manager, or the resident engineer for consultant projects (RECP) provides information about project scope and plan format. They are active in the design phase of the project. RECPs may continue to lead ODOT staff in the construction of the projects (See appendix A.14). Additionally, they:

- Provide information about the design schedule and the critical project deadlines. This person will also coordinate needed design resources such as a sign inventory or photos.
- Often provide the names of other contacts for the specific project.

A.2 – Roadway Designer

The roadway designer provides all CADD files necessary to begin the design. Additionally, they:

- Provide files for existing features, new construction, right of way, alignments, etc.
- Provide information about project scope and plan format.
- Distribute preliminary plans.

A.3 – Specification Writer

The specification writer is responsible for assembling the plans and specifications from each of the project disciplines and creating a single set of contract documents. Additionally, they:

- Are typically involved after the preliminary plans phase and just prior to the advance plans and specifications phase.
- Submit the plans and specifications for both advance plans and final plans.
- Distribute the plans and specifications for review.
- Reviews and approves any unique language added to the boilerplate special provisions.

A.4 – Region Sign Designer

The region sign designer is responsible for the sign designs created in the region. Additionally, they answer questions about design standards and signing policy.

Each region also has either a traffic manager or a traffic engineer.

A.5 – Traffic-Roadway Section Staff

Traffic-Roadway Section staff provides technical assistance on signing issues for ODOT design staff as well as consultants and local agencies. Additionally, they:

- Publish the Traffic Sign Design Manual and the Sign Policy and Guidelines.
- Maintain as-constructed plans, speed zone orders and no parking resolutions.
- Provide sheet numbers for all contract signing plans.

Traffic-Roadway Section information: https://www.oregon.gov/odot/Engineering/Pages/Traffic-Roadway.aspx.

A.6 – District Sign Supervisor/Coordinator

The district sign supervisors and district sign coordinators are responsible for maintenance of all state-owned signs and supports within their maintenance district. Additionally, they:

- Maintain databases of their entire sign inventory within their district. (These useful databases supplement the project sign inventory and photos.)
- Provide information regarding the age and condition of existing signs and supports.
- Provide comments during the plan review process. (It is highly recommended designers check with district reps for their preferred type of posts and other aspects of signs that the district has to maintain.)

A.7 – State Parks

Oregon State Parks and Recreation sign contact provides guidance related to new or replacement state park facility signs. Include the park sign representative in the plan review process for any project involving state parks signing.

Contact information: OPRD.Signs@oprd.oregon.gov.

A.8 – Oregon Travel Information Council (TIC)

The Oregon Travel Information Council (formerly the Oregon Travel Experience) owns and maintains all tourist oriented directional signs (TODS) and motorist informational signing

(LOGOS) on our state highway system. Oregon TIC owns signing programs affecting resort areas, museums not on the freeway, and private golf courses.

Include Oregon TIC representatives in the plans review distribution and invite their comments regarding the appropriateness of any planned activities affecting their signs.

Notify Oregon TIC when:

- Any work on our system impacts their signs in any way.
- Any TOD or LOGO signs are affected by work zone staging.

Contact information: 503-378-4508; https://oregontic.com/.

A.9 – Right of Way

The region right of way office obtains right of way or easements needed to accommodate permanent signing installations on the project. They'll need detailed information from the sign designer to complete their work.

They can provide accurate right of way CADD files if the roadway designer is unable to do so.

A.10 – Sign Structures Designer

Assistance from a structural designer for several different types of steel sign supports is required on many projects.

Cantilever and truss sign bridges use standard drawings, but these installations require a structural designer for the project-specific design, review of steel shop drawings, and construction support.

Bridge rail mounts, structure mounts, and other non-standard sign support designs require a structural designer to perform the work.

The sign designer works with the project leader to communicate the structural resources needed for the sign support designs. The sign designer needs to provide detailed sign size, sign type, proposed structure type, and location information early in the project for the sign structures designer resource to be selected and for this person to be able to complete their design.

In addition, there are other resources needed like survey, geotechnical, and right of way that need early notification to perform the required project work. The sign designer needs to call out in the signing plans and tables the sign structure designs.

A.11 – Geotechnical Engineer

The geotechnical engineer can help determine foundation exploration needs for overhead supports, along with scheduling of any drilling and testing of soil samples and creates a geotechnical report.

A.12 – Landscape Designer

If landscaping is part of the project, coordinate with the landscape designer to ensure no conflicts exist with the sign plan.

Routinely, landscape plans to include trees at or near proposed sign locations. If not addressed, those trees will eventually grow and block the view of nearby signs.

A.13 – Other Traffic Designers

Traffic designers are responsible for related disciplines such as signal, striping, illumination, or traffic control plans. Coordinate with other traffic designers to ensure no conflicts occur among discipline plans. For example, signs installed behind a luminaire pole, or a DO NOT PASS sign installed at a location conflicting with the striping plan.

As appropriate, include reference to other discipline plans in the sign plan. Communicate with other disciplines when cross-references occur. For example, refer to a signal design sheet for details about signs that will mount to signal poles, and notify the signal designer to ensure their design satisfies loading requirements.

A.14 – Project Manager, Inspector, Resident Engineer, Assistant Resident Engineer

The project manager, or project inspector, or residential engineer will contact the sign designer throughout construction for clarification about plans, questions about contract change orders and price agreements, and other issues.

The PM or RE provides the sign designer with cross-sectional information used to calculate the final steel post sizes and lengths included in the working drawings.

Provide technical assistance when needed. Provide the PM working drawings for fabrication of non-standard (custom) signs, steel sign supports, secondary supports, and route marker frames. They, in turn, forward copies to the contractors for manufacture.

A.15 – Bicycle & Pedestrian Design Engineer

The bicycle and pedestrian design engineer can answer questions about the effectiveness of existing or proposed signing as it relates to bicycle and pedestrian facilities, i.e., bike lanes, bike paths, multi-use paths.

They also set policy and standards for handling of bicycle and pedestrian issues and for matters relating to design of bicycle and pedestrian facilities.

Contact information: 503-986-3554.

A.16 – Construction Materials Inspection Lab

ODOT's Construction Materials Inspection Lab is responsible for inspecting custom sign designs fabricated for ODOT construction projects.

Be sure to provide copies of shop drawings to the lab.

A.17 – Survey Crew

The survey crew inventories the existing signing as they complete the topographical survey for a project. It is a good idea to contact survey crew members to help them understand the information that needs to be collected.

A.18 – Region Mobility Liaison

The region mobility liaison plays an important role in coordinating vertical clearance requirements with region and ODOT Commerce and Compliance Division.

Contact the region mobility liaison early in the scoping process for projects that includes any new overhead sign supports or other features that may impact vertical clearance over the roadway.

Appendix B – Sign Design Resources

The following is a list of resources to aid in the development of plans and specifications. This is not intended as a complete list of every resource necessary or available, but it includes those used regularly.

B.1 – Existing Sign Inventory & Photos

In order to produce a complete set of permanent signing plans, you'll need an inventory of the existing sign installations.

The best and most complete inventory is obtained when the survey crew inventories the existing signing as they are doing the topographical survey of the project. The exact location of the signs can be determined and mapped into the project plans.

The Highway Design Manual explains roadside inventory needs for the various project classifications (1R, 3R, 4R).

Access the HDM: https://www.oregon.gov/odot/Engineering/Documents_RoadwayEng/HDM-0000-Full.pdf

B.2 – Digital Video Log

The digital video log consists of digital photos snapped every .005 mile (roughly 25 feet). Exact sizes of signs and supports are nothing more than a guess on the part of the designer. The digital video log will give a designer a start on what is in the field already; however, conducting a field visit to verify asset sizes is highly recommended.

Access the digital video log: https://dvlprod-ordot.msappproxy.net/cf/dvl/

B.3 – Manual on Uniform Traffic Control Devices

State law requires all traffic control devices placed on Oregon highways comply with the federal Manual on Uniform Traffic Control Devices (MUTCD) and Oregon Supplements to the MUTCD (OAR 734-020-0005). Signs placed on the state highway system should also comply with the Sign Policy and Guidelines for the state highway system.

Existing signs and supports need to be reviewed for compliance with the current MUTCD. Once the Oregon Transportation Commission adopts a new version of the MUTCD, all traffic control devices placed in service from that date forward must comply with the updated guidance.

Access compliance dates for the MUTCD: http://mutcd.fhwa.dot.gov/kno-compliance.htm.

Access the MUTCD: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm.

B.4 – Standard Highway Signs Manual

The Standard Highway Signs book contains sign layouts for almost all signs shown in the MUTCD.

Access the manual: http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

B.5 – Oregon Supplement to the MUTCD

The Oregon Supplement to the MUTCD covers deviations between Oregon law and the MUTCD. Oregon adopts these deviations through the OAR process and with permission from FHWA.

Access the guide:
http://www.oregon.gov/ODOT/Engineering/Documents_TrafficStandards/MUTCD-OR-Supplement.pdf

B.6 – Sign Policy & Guidelines for the State Highway System

The Sign Policy & Guidelines manual contains information that supplements or, in some cases, takes exception to the information in the MUTCD. The document is generally updated once a year to keep up with current changes in policy.

Access the manual: http://www.oregon.gov/ODOT/Engineering/Pages/Sign-Policy.aspx

B.7 – ODOT Traffic Manual

The ODOT Traffic Manual covers the traffic policies, practices, and organization within ODOT. It includes information on where to find specific policies, procedures, warrants, and design consideration for traffic items.

Access the manual: https://www.oregon.gov/odot/Engineering/Docs_TrafficEng/Traffic-Manual-2023.pdf

B.8 – Speed Zone Orders

Speed zone orders are official documents that set out the limits of speed zones that differ from the statutory speeds listed in state law.

Obtain any existing speed zone orders for the sections of highway inside the limits of the project. Any new speed zone sign installations shown on the plans must be consistent with the speeds and locations spelled out in the speed zone order(s). Existing installations that are improperly located or are otherwise inconsistent with the order must be corrected. This is

necessary for proper enforcement. New speed zone orders do not necessarily contain school speed 20 information; check with the road authority.

Request copies of speed zone orders through the Traffic-Roadway Section: 503-986-3568. Be prepared to provide the highway name and mile point limitations.

Access speed zone order information:
http://www.oregon.gov/ODOT/Engineering/Pages/Speed-Zones.aspx

B.9 – No Parking Resolution

Check for any no-parking resolution for the state highway with the region traffic unit. Provide the name of the highway and the mile point limits of the project.

On city streets and county roads, the local jurisdiction controls the no-parking sections of roadway. Usually, the public works department can get this information.

No-parking resolutions are like speed zone orders in that signing in the field must reflect the language of the resolution in order to allow for proper enforcement. If "No Parking" signing is present in a location not covered by the resolution, it is there illegally and should be removed.

Signing which permits on-street parking in urban areas is allowed on our highway system, but it is the responsibility of the local jurisdiction to set the limits and to install, maintain and enforce the signing.

B.10 – Contract Plans Development Guide

This two-volume document provides the designer with all the technical information, such as standards and drafting standards, to produce plans that will be bid through a Transportation Commission Services Contract. There is a charge for this publication.

Access this guide: http://www.oregon.gov/ODOT/Engineering/Pages/CP-Development-Guide.aspx

B.11 – Standard Specifications and Special Provisions

Obtain the Oregon Standard Specifications for Construction:
http://www.oregon.gov/ODOT/Business/Pages/Standard_Specifications.aspx

The standard specifications are supplemented by special provisions:
https://www.oregon.gov/odot/Business/Pages/Special-Provisions.aspx

B.12 – Standard Drawings

Standard drawings pertaining to permanent signing are in the TM200 drawing series. Those pertaining to structural steel sign supports can be found in the TM600s.

Access Oregon Standard Drawings:
https://www.oregon.gov/odot/Engineering/Pages/Standards.aspx

B.13 – As-Built Plans

The Traffic-Roadway Section maintains sets of as-built plans as we receive them from our construction field offices. As-builts are not available for all projects that include permanent signing, but we keep those we receive on file.

They can prove useful in the absence of a good sign inventory and photos. You can collect information such as overall sign dimensions and letter sizes used on guide signs, especially those that are overhead and otherwise hard to measure in the field.

Do not rely on as-built plans for accuracy if more than 10 years old. After 10 years, there is a strong possibility signs and/or supports have been replaced through normal maintenance activity. If this is the case, there is no guarantee they were replaced with something of like size. It is always better to get actual field data on-site, whenever possible.

As-builts should be considered as a last resort for inventory purposes. FileNet is our repository for all plans.

Accessed FileNet: Traffic Plan Search - Traffic Plans (state.or.us).

B.14 – Oregon Bicycle and Pedestrian Plan

The Oregon Bicycle and Pedestrian Plan contains information about the design and maintenance of bicycle and pedestrian facilities. There is a section that focuses on appropriate signing for bicycle facilities, whether they are located on or off the state highway system.

Access the Oregon Bicycle and Pedestrian Plan:
https://www.oregon.gov/odot/Planning/Pages/Plans.aspx

B.15 – OARs and ORSs

Oregon Administrative Rules (OARs) and Oregon Revised Statutes (ORS) provide important guidance in the use of permanent signing.

Enforcement of many traffic signs and the associated fines are governed by OARs and ORSs. It is important to use sign language defined by statute and the appropriate fines established.

Access OARs: https://sos.oregon.gov/archives/Pages/oregon_administrative_rules.aspx

Access ORSs: https://www.oregonlegislature.gov/bills_laws/Pages/ORS.aspx

B.16 – Qualified Products List

The qualified products list (QPL) is a comprehensive list of all finished products which have been evaluated by ODOT for use on state highways.

Sign designers are frequently asked by district crews and region traffic to investigate new products to implement on the state highway system. It is important to check with the QPL to ensure that products are approved. New products not listed can be referred to the ODOT Materials Laboratory for possible acceptance.

Access the QPL: http://www.oregon.gov/ODOT/Construction/Pages/Qualified-Products.aspx

B.17 – Traffic Control Devices Handbook

The Traffic Control Devices Handbook is produced by FHWA. It augments the MUTCD and links MUTCD standards and warrants with the activities related to complying with the standards.

The document is not available online but can be purchased through different traffic-related organizations.

B.18 – Interstate Highways Control Cities List

AASHTO's "List of Control Cities for Use in Guide Signs on Interstate Highways" identifies major destinations along an interstate route. Control cities are determined by AASHTO, with input from states.

Use these control city legends in the following situations, along a freeway, to provide consistency and continuity in directional guide signing:

1.) Interchanges between freeways.

2.) Separation points of overlapping freeway routes.

3.) Directional signs on intersecting routes, to guide traffic entering the freeway.

4.) Pull-through signs.

5.) Bottom line of post-interchange distance signs.

Access the list: https://transportation.org/traffic/interstate-control-cities/

B.19 – Non-Field-Tested Materials Acceptance Guide

The Non-Field-Tested Materials Acceptance Guide (NTMAG) provides guidance for documentation required for material acceptance on ODOT construction projects.

B.20 – TransGIS

TransGIS is a powerful tool to see locations of signs in the ODOT sign database. However, not all signs are in the database, so a field visit is still best to determine what signs may be affected by the project. TransGIS can give a person a good idea though.

The sign layer must be turned on. It is under the "equipment – highway" category.

Access TransGIS here: ODOT TransGIS (state.or.us).

Appendix C – Level of Development

Access the Project Delivery Handbook: SBS-Guidebook.pdf (oregon.gov)

Access the Phase Gate Delivery Manual: Phase-Gate-Delivery-Manual.pdf (oregon.gov)

C.1 – Draft Design Acceptance Package

The draft design acceptance package, often called D-DAP, is a preliminary stage to design acceptance package.

During this stage of the development process, determine the right of way needed for signs, along with which sign structures are needed for the project, as these tasks will take the longest.

C.2 – Design Acceptance Package

The design acceptance package is a standard part of Statewide Transportation Improvement Program projects.

STIP projects may require the use of large overhead guide signs. When this occurs, the earlier major signing needs are identified the better. Installations requiring right of way purchases or overhead structural support design should be identified early on so that others affected (right of way agents, structural designers, foundations exploration crew) have plenty of time to complete their work within the overall project schedule.

During this stage, provide signing plan and sign details sheets to show location, size, and type for major guide signs. A rough estimate of permanent signing costs may be warranted particularly where overhead supports are required, as these are quite expensive compared to typical ground-mounted sign installations.

C.3 – Preliminary Plans

Items usually completed for the preliminary review include:

- Signing plan sheets.
- Sign detail sheets.
- Completed sign and post data table sheets.

The specifications, special provisions, and estimate are usually completed with the advance plans, but these items may be requested on occasion at the preliminary plans stage.

If pressed for time, it is acceptable to send out preliminary plans with incomplete sign and post data tables. Although it is better to include them, the most important information to show at this point is the type of signs and supports and where they are going. This can be accomplished with the signing plans and sign details.

It is not uncommon for major changes to occur as part of the preliminary plans review so preparing specs and estimate at this design stage may not be useful. Wait until later in the process for specs and estimate to ensure all items are thoroughly covered in the plans.

The preliminary plans are usually submitted to the roadway designer for review distribution. Request the road designer send copies of the package to additional parties, including the district manager and the district sign crew for review. Make sure these people are included in the distribution list, as they are not always automatically listed.

Remember, these are the people who will maintain the product. The district sign crew review is important, as they know what signs are in the field and the condition they are in. Depending on who is impacted by the project, it may be necessary to send plans to additional parties, such as:

- Oregon Travel Experience (required when logo or specific service signs are impacted).
- State Parks and Recreation.
- National Park Service.
- US Forest Service.

If there is an entity that needs a set of plans after the distribution is sent out, request a copy from the contractor plans unit and mail them to the requestor. The more review interested and impacted parties have in signing, the better the plans will be. This would be the time to have the plans reviewed by another sign designer if one is available.

Comments should come back within a few days. Take time to review all the comments to see if they apply to this situation. A note back to the person submitting the comments is sometimes in order, especially if you've chosen not to incorporate the changes requested.

C.4 – Advance Plans and Specifications

After receiving the comments on the preliminary plans, check with the project's roadway designer to see if there are any changes in the roadway plans. Quite often, changes occur to the alignment, stationing, or another item without notice. Incorporate any identified changes from the designer and preliminary plans review. The new set will be sent out as advance plans.

The special provisions and estimate will accompany the advance plans. Submit these electronically at the same time as the plan sheets. Include completed sign and post data tables if not already provided.

Package the revised plans, special provisions, and estimate together and deliver it to the specifications writer. They will incorporate the material with the items from the other designers and send out the advance PS&E documents. Plans are hand-delivered or mailed. Specials should be electronically "red-lined" (using track changes) and sent to the specifications writer attached to an email. Estimate can be hand-delivered or sent electronically.

Once the advance plans are sent, review the roadway and striping plans to make sure they match with the permanent signing. If not, change the plans or send the respective designer a

message informing them the plan sets do not match. The sign designer, roadway designer or the striping designer may need to make changes so everything matches for the final plan.

C.5 – Final Plans

After receiving the comments on the advance plans and specifications, check with the roadway designer to see if there are any changes in the roadway plans. Again, changes to the alignment, stationing, or some other item may occur without notice. Last minute changes in the plans sometimes result from the review at advance plans stage. Incorporate all necessary changes, including those resulting from the advance plans comment period, into the plans.

Once all changes have been made, the plans sheets are printed on mylars, signed by the engineer of record and sent out as final plans in the bid documents.

The specifications writer receive stamped, final mylars for publication. Plans without a PE stamp and signature will be returned. Make any final changes to the special provisions and estimate, based on comments received during advance plans and specifications, and submit these electronically to the specifications writer at the same time that mylars are submitted.

When special provisions from all disciplines are assembled into a single document, the spec writer will send out signature sheets for each engineer of record to sign and stamp.

C.6 – PS&E

The final stage of review of the plans, specifications, and estimates. This is usually the last review and only small changes are incorporated to the project before it is submitted to the Project Controls Office (PCO). There is usually a final PS&E check list to make sure everything is ready to be reviewed by PCO.

Appendix D – Sign Sizes

Table 9: Sign Sizes for Conventional Single and Multi-Lane Roads, Expressways, Freeways, along with Minimum and Oversized Dimensions

Sign or Plaque	Sign Designation	Single Lane	Multi-Lane	Expressway	Freeway	Minimum	Oversized
Stop	R1-1	36 x 36	36 x 36	36 x 36		30 x 30	48 x 48
Speed Limit	R2-1	36 x 48	36 x 48	48 x 60	48 x 60	30 x 36	48 x 60
Do Not Pass	R4-1	36 x 48	36 x 48	48 x 60	48 x 60	24 x 30	48 x 60
Slower Traffic Keep Right	R4-3		36 x 48	48 x 60	48 x 60	18 x 24	48 x 60
Keep Right	R4-7, 7a, 7b	36 x 48	36 x 48	48 x 60	48 x 60	24 x 30	48 x 60
Keep Left	R4-8, 8a, 8b	36 x 48	36 x 48	48 x 60	48 x 60	24 x 30	48 x 60
Do Not Enter	R5-1	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Wrong Way	R5-1a	36 x 24	42 x 30	42 x 30	42 x 30	30 x 18	42 x 30
Emergency Parking Only	R8-4	30 x 24	30 x 24	48 x 36	48 x 36		48 x 36
No Stopping on Pavement	R8-5	36 x 48	36 x 48	48 x 60	48 x 60	18 x 24	48 x 60
No Stopping Except on Shoulder	R8-6	36 x 48	36 x 48	48 x 60	48 x 60	18 x 24	48 x 60
Horizontal Alignment	W1-1, 2, 3, 4, 5	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Chevron Alignment	W1-8	24 x 30	30 x 36	36 x 48	36 x 48	18 x 24	36 x 48
Comb. Horizontal Alignment / Intersection	W1-10, 10a, 10b, 10c, 10d, 10e	36 x 36	36 x 36	48 x 48			48 x 48
Hairpin Curve	W1-11	36 x 36	36 x 36	48 x 48	48 x 48		48 x 48
Truck Rollover	W1-13	36 x 36	36 x 36	48 x 48	48 x 48		48 x 48
270-degree Loop	W1-15	36 x 36	36 x 36	48 x 48	48 x 48		48 x 48
Intersection Warning	W2-1, 2, 3, 4, 5, 6, 7, 8	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Advanced Traffic Control	W3-1, 2, 3	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48

Sign or Plaque	Sign Designation	Single Lane	Multi-Lane	Expressway	Freeway	Minimum	Oversized
Hill	W7-1	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Hill with Grade	W7-1a	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Hill Blocks View	W7-6	36 x 36	36 x 36	48 x 48	48 x 48		48 x 48
Bump or Dip	W8-1, 2	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Soft Shoulder	W8-4	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Slippery When Wet	W8-5	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Truck Crossing	W8-6	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Loose Gravel	W8-7	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Rough Road	W8-8	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Low Shoulder	W8-9	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Uneven Lanes	W8-11	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
No Center Line	W8-12	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Bridge Ices Before Road	W8-13	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Fallen Rocks	W8-14	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Grooved Pavement	W8-15	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Metal Bridge Deck	W8-16	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Shoulder Drop-Off	W8-17	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Road May Flood	W8-18	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Gusty Winds Area	W8-21	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Fog Area	W8-22	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
No Shoulder	W8-23	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Shoulder Ends	W8-25	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Left (Right) Lane Ends	W9-1	36 x 36	36 x 36	48 x 48	48 x 48	30 x 30	48 x 48
Bicycle	W11-1	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Pedestrian	W11-2	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Large Animals	W11-3, 4, 16, 17, 18, 19, 20, 21, 22	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48

Sign or Plaque	Sign Designation	Single Lane	Multi-Lane	Expressway	Freeway	Minimum	Oversized
Farm Vehicle	W11-5	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Snowmobile	W11-6	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Equestrian	W11-7	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Emergency Vehicle	W11-8	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Handicapped	W11-9	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Truck	W11-10	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Golf Cart	W11-11	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Horse-Drawn Vehicle	W11-14	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Bicycle / Pedestrian	W11-15	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Trail Crossing	W11-15a	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Double Arrow	W12-1	36 x 36	36 x 36	48 x 48		30 x 30	48 x 48
Advisory Speed (Plaque)	W13-1P	24 x 24	24 x 24	30 x 30	30 x 30	18 x 18	30 x 30
Advisory Exit or Ramp Speed	W13-2, 3	36 x 48	36 x 48	48 x 60	48 x 60	24 x 30	48 x 60
Dead End, No Outlet	W14-1, 2	36 x 36	36 x 36			30 x 30	48 x 48

Appendix E – Mileage Control Table

Table 10: Mileage Control Table

City	Highway	M.P.	Description	County
Adair Village	091(1W)	75.70	Jct. Pacific Highway West 091 & Arnold Ave.	Benton
Adams	008AA	11.90	Jct. Cayuse-Adams Front. Rd. 008AA (Old Oregon Washington Hwy) & Preston St.	Umatilla
Adrian	450	11.98	Jct. Succor Creek Hwy. 450 (1st. St.) & Main St.	Malheur
Albany	058	2.25	Jct. Albany-Junction City Hwy. 058 & Albany-Corvallis Hwy. 031 (Pacific Blvd.)	Linn
	031	11.28		
Amity	091(1W)	44.68	Jct. Pacific Highway West 091 (Trade St.) & Bellevue-Hopewell Hwy. 153 (5th St.)	Yamhill
	153	6.23		
Antelope	291	7.96	Jct. Shaniko-Fossil Hwy. 291 (Main St.) & Antelope Hwy. 293	Wasco
	293	13.52		
Arlington	002	137.59	Jct. of Columbia River Hwy. 002 & John Day Hwy. 005	Gillam
	005	0.00		
Ashland	063	19.11	Jct. Rogue Valley Hwy. 063 (Main St.) & Water St.	Jackson
Astoria	092(2W)	98.13	Jct. Lower Columbia River Hwy. 092 (Marine Dr.) & 14th St.	Clatsop
Athena	334	17.34	Jct. Athena-Holdman Hwy. 334 (Main St.) & 3rd St.	Umatilla
Aumsville			Jct. Main St. & 1st St.	Marion
Aurora	081(1E)	25.01	Jct. Pacific Highway East 081 & Main St.	Marion
Baker City	071	50.96	Jct. Whitney Hwy. 071 (Main St.) & La Grande-Baker Hwy. 066 (Bridge St.) & Auburn Ave.	Baker
	066	52.04		
Bandon	009	273.94	Jct. Oregon Coast Hwy. 009 (2nd St.) & Elmira Ave.	Coos
Banks	102	82.97	Jct. Nehalem Hwy. 102 (Main St.) & Market St.	Washington
Barlow	081(1E)	22.89	Jct. Pacific Highway East 081 & Barlow Rd. (Irving St)	Clackamas
Bay City	009	59.93	Jct. Oregon Coast Hwy. 009 & C St. (Hayes Oyster Dr.)	Tillamook

City	Highway	M.P.	Description	County
Beaverton	029	3.95	Jct. Tualatin Valley Hwy. 029 (S.W. Canyon Rd.) & S.W. Broadway	Washington
Bend	017	20.99	Jct. McKenzie-Bend Hwy. 017 (E. 3rd St.) & Central Oregon Hwy. 007 (Greenwood Ave.)	Deschutes
	007	0.51		
Boardman	002	164.16	Columbia River Hwy. 002 overcrossing Boardman Conn. 002GX	Morrow
	002GX	2C164.15		
Bonanza	023	6.97	Jct. Dairy-Bonanza Hwy. 023 (Market St.) & Central St.	Klamath
Brookings	009	357.08	Jct. Oregon Coast Hwy. 009 (Chetco Ave.) & Pacific Ave.	Curry
Brownsville	212	6.23	Jct. Halsey-Sweet Home Hwy. 212 (Bishop Way) & Main St.	Linn
Burns	007	131.50	Jct. Central Oregon Hwy. 007 (Broadway Ave.) & Steens Hwy. 442 (Monroe St.)	Harney
	442	0.00		
Butte Falls			Jct. Broad St. & Fir Ave.	Jackson
Canby	081(1E)	21.14	Jct. Pacific Highway East 081 (1st Ave.) & Ivy St.	Clackamas
Cannon Beach	009	29.53	Oregon Coast Hwy. 009 overcrossing Sunset Blvd.	Clatsop
Canyon City	048	1.94	Jct. John Day-Burns Hwy. 048 & Main St.	Grant
Canyonville			Jct. Main St. & 1st St.	Douglas
Carlton	029	37.99	Jct. Tualatin Valley Hwy. 029 (Main St.) & Pine St.	Yamhill
Cascade Locks			Jct. NW Wa Na Pa St. & Forest Lane	Hood River
Cave Junction	025	28.95	Jct. Redwood Hwy. 025 & Oregon Caves Hwy. 038	Josephine
	038	0.00		
Central Point			Jct. S. Front St. & Pine St.	Jackson
Chiloquin	488	4.58	Chiloquin Spur Hwy. 488 (Chocktoot St.) at east end of Williamson River Bridge	Klamath
Clatskanie	092(2W)	61.70	Jct. Lower Columbia River Hwy. 092 & Mist-Clatskanie Hwy. 110	Columbia
	110	0.00		
Coburg			Jct. Van Duyn Rd. & Pearl St.	Lane
Columbia City	092(2W)	31.02	Jct. Lower Columbia River Hwy. 092 & E St.	Columbia

City	Highway	M.P.	Description	County
Condon	005	38.07	Jct. John Day Hwy. 005 (Main St.) & Wasco-Heppner Hwy. 300 (Walnut St.)	Gilliam
	300	40.68		
Coos Bay	009	238.31	Jct. Oregon Coast Hwy. 009 (Broadway) & Anderson Ave.	Coos
Coquille	035	11.14	Jct. Coos Bay-Roseburg Hwy. 035 (Birch St.) & Main St.	Coos
Cornelius	029	16.56	Jct. Tualatin Valley Hwy. 029 (Adair St.) & 12th Ave.	Washington
Corvallis	091(1W)	83.42	Jct. Pacific Highway West 091 (4th St.) & Corvallis-Lebanon Hwy. 210 (Van Buren Ave.)	Benton
	210	-0.10		
Cottage Grove	226	14.79	Jct. Goshen-Divide Hwy. 226 (9th St.) & Main St.	Lane
Cove	342	13.52	Jct. Cove Hwy. 342 (Main St.) & French St.	Union
Creswell	226	5.78	Jct. Goshen-Divide Hwy. 226 (Front St.) & Oregon Ave.	Lane
Culver	361	8.98	Jct. Culver Hwy. 361 (1st Ave.) & C St.	Jefferson
Dallas	191	3.40	Jct. Kings Valley Hwy. 191 (Main St.) & Washington St.	Polk
Damascus	174	2.60	Jct. Clackamas-Boring Hwy. 174 & SE Foster Rd.	Clackamas
Dayton	150	0.48	Jct. Salem-Dayton Hwy. 150 (3rd St.) & Amity-Dayton (Ferry St.)	Yamhill
	155	9.19		
Dayville	005	131.14	Jct. John Day Hwy. 005 & South Fork Rd.	Grant
Depoe Bay	009	127.46	Jct. Oregon Coast Hwy. 009 & Collins St.	Lincoln
Detroit	162	50.28	Jct. North Santiam Hwy. 162 & Forest Ave.	Marion
Donald			Jct. Main St. & Donald-Gervais Rd.	Marion
Drain	045	50.25	Jct. Umpqua Hwy. 045 (B St.) & Cedar St.	Douglas
Dufur	004	13.22	Jct. The Dalles-California Hwy. 004 & Boyd Loop Rd. /1st St.	Wasco
Dundee	091(1W)	26.11	Jct. Pacific Highway West 091 & S.W. 9th St.	Yamhill
Dunes City	009	195.98	Jct. Oregon Coast Hwy. 009 & Clear Lake Rd.	Lane
Durham	141	8.32	Jct. Beaverton-Tualatin Hwy. 141 (Upper Boones Ferry Rd.) & Bridgeport Rd. / Rivendell Rd.	Washington

City	Highway	M.P.	Description	County
Eagle Point	022	9.42	Jct. Crater Lake Hwy. 022 & Nick Young Rd. / S. Royal Ave.	Jackson
Eastside			Jct. D St. & 6th Ave.	Coos
Echo	320	35.70	Jct. Lexington-Echo Hwy. 320 (Main St.) & Thielsen St.	Umatilla
Elgin	010	20.25	Jct. Wallowa Lake Hwy. 010 (8th Ave.) & Weston-Elgin Hwy. 330 (Division St.)	Union
	330	40.84		
Elkton	045	36.44	Jct. Umpqua Hwy. 045 (A St.) & Elkton-Sutherlin Hwy. 231	Douglas
	231	0.00		
Enterprise	010	65.02	Jct. Wallowa Lake Hwy. 010 (North St.) & Enterprise-Lewiston Hwy. 011 (1st St.)	Wallowa
	011	43.19		
Estacada	161	33.49	Jct. Woodburn-Estacada Hwy. 161 & Clackamas Hwy. 171	Clackamas
	171	23.36		
Eugene	091(1W)	123.37	Jct. Pacific Highway West 091 (7th Ave.) & Eugene-Springfield Hwy. 227 (Washington St.)	Lane
	227	0.00		
Fairview	123	17.62	Jct. Northeast Portland Hwy. 123 (Sandy Blvd.) & Fairview Ave.	Multnomah
Falls City			Jct. North Main St. & Mitchell St. & 4th St.	Polk
Florence	009	190.23	Jct. Oregon Coast Hwy. 009 & Florence-Eugene Hwy. 062 (Ninth St.)	Lane
	062	0.02		
Forest Grove			Jct. Pacific Ave. & College Way	Washington
Fossil	005	58.15	Jct. John Day Hwy. 005 (7th St). & Shaniko-Fossil Hwy. 291 (Washington St.)	Wheeler
	291	42.95		
Garibaldi	009	55.56	Jct. Oregon Coast Hwy. 009 (Garibaldi Ave.) & 7th St.	Tillamook
Gaston	029	25.45	Jct. Tualatin Valley Hwy. 029 (Front St.) & Main St.	Washington
Gates	162	33.11	Jct. North Santiam Hwy. 162 & Horeb St.	Linn
Gearhart	009	18.83	Jct. Oregon Coast Hwy. 009 & Pacific Way	Clatsop
Gervais	081(1E)	36.22	Jct. Pacific Highway East 081 & Gervais Rd.	Marion
Gladstone	064	11.05	East Portland Freeway 064 overcrossing Washington St.	Clackamas
Glendale			Jct. Molly St. & Pacific Ave.	Douglas

City	Highway	M.P.	Description	County
Gold Beach	009	328.48	Jct. Oregon Coast Hwy. (Ellensburg St.) & Moore St.	Curry
Gold Hill	271	2.36	Jct. Sams Valley Hwy. 271 (2nd Ave.) and Gold Hill Spur Hwy. 486 (2nd Ave.) & Dardanelles St.	Jackson
	486	2.36		
Granite			Jct. Main St. & Center St.	Grant
Grants Pass	025	-0.79	Jct. Redwood Hwy. 025 (6th St.) & G St.	Josephine
Grass Valley	042	28.36	Jct. Sherman Hwy. 042 (Mill St.) & Sherars Bridge Hwy. 290 (Krusow St.)	Sherman
	290	28.42		
Greenhorn			Jct. Main St. & Greenhorn Rd. & Bonanza Rd.	Baker
Gresham			Jct. Powell Blvd. & Main Ave.	Multnomah
Haines	066	40.69	Jct. La Grande-Baker Hwy. 066 (Front St.) & 4th St. (Anthony Lakes Hwy.)	Baker
Halfway	481	54.70	Jct. Baker-Copperfield Spur Hwy. 481 & Halfway-Cornucopia Hwy. 413 (Main St.) & Pine Creek Hwy. 414 (Record St)	Baker
	413	11.45		
	414	0.00		
Halsey	058	19.36	Jct. Albany-Junction City Hwy. 058 (2nd St.) & Halsey-Sweet Home Hwy. 212 (American Dr.)	Linn
	212	0.00		
Hammond	104	0.10	Jct. Fort Stevens Hwy. 104 (Pacific Dr.) & Lake Dr.	Clatsop
Happy Valley			Jct. King Rd. & 129th Ave.	Clackamas
Harrisburg	058	28.59	Jct. Albany-Junction City Hwy. 058 (3rd St.) & Smith St.	Linn
Helix	335	0.00	Jct. Havana-Helix Hwy. 335 (Main St.) & Columbia St.	Umatilla
Heppner	052	45.89	Jct. Heppner Hwy. 052 (May St.) & Wasco-Heppner Hwy. 300 (Main St.)	Morrow
	300	84.12		
Hermiston	054	5.46	Jct. Umatilla-Stanfield Hwy. 054 (1st St.) & Main St.	Umatilla
Hillsboro	029	13.29	Jct. Tualatin Valley Hwy. 029 (Baseline St.) & Hillsboro-Silverton Hwy. 140 (1st Ave.)	Washington
	140	0.00		
Hines	007	129.12	Jct. Central Oregon Hwy. 007 & Barnes Ave.	Harney

City	Highway	M.P.	Description	County
Hood River	002	63.92	Columbia River Hwy. 002 undercrossing Hood River Front. Rd. 002DS (2nd St.)	Hood River
	002DS	1F63.92		
Hubbard	081(1E)	29.54	Jct. Pacific Highway East 081 & J St.	Marion
Huntington	449	5.89	Jct. Huntington Hwy. 449 & Snake River Rd (E. Washington St)	Malheur
Idanha	162	54.54	Jct. North Santiam Hwy. 162 & Main St.	Wallowa
Imbler	010	12.20	Jct. Wallowa Lake Hwy. 010 (Ruckman St.) & Main St.	Union
Independence	043	2.35	Jct. Monmouth-Independence Hwy. 043 (Monmouth St.) & Independence Hwy. 193 (Main St.)	Polk
	193	6.34		
Ione	052	27.88	Jct. Heppner Hwy. 052 & Green St.	Morrow
Irrigon	002	175.57	Jct. Columbia River Hwy. 002 (Main Ave.) & Division St.	Morrow
Island City	010	2.41	Jct. Wallowa Lake Hwy. 010 (B St.) & Cove Hwy. 342 (1st. St.)	Union
	342	0.00		
Jacksonville	272	33.23	Jct. Jacksonville Hwy. 272 (California St.) & Oregon St.	Jackson
Jefferson	164	6.12	Jct. Jefferson Hwy. 164 & Main St.	Linn
John Day	005	162.29	Jct. John Day Hwy. 005 (Main St.) & John Day-Burns Hwy. 048 (Canyon Blvd.)	Grant
	048	0.00		
Johnson City			Jct. Roots St. & 81st. Ave.	Clackamas
Jordan Valley	456	20.44	Jct. I.O.N. Hwy. 456 (Main St.) & Bassett St.	Malheur
Joseph	010	71.42	Jct. Wallowa Lake Hwy. 010 (Main St.) & Joseph-Wallowa Lake Hwy. 351 (Main St.) & Little Sheep Creek 350 (Wallowa Ave.)	Wallowa
	350	0.00		
	351	0.00		
Junction City	091(1W)	109.47	Jct. Pacific Highway West 091 (Ivy St.) & 6th Ave.	Lane
Keizer			River Rd. N. & Chemawa Rd.	Marion
King City	091(1W)	11.19	Jct. Pacific Highway West 091 & Royalty Parkway	Washington
Klamath Falls			Jct. Klamath Ave. & 5th St.	Klamath

City	Highway	M.P.	Description	County
Lafayette	091(1W)	32.29	Jct. Pacific Highway West 091 (3rd St.) & Madison St.	Yamhill
LaGrande	010	0.00	Jct. Wallowa Lake Hwy. 010 (Island Ave.) & La Grande-Baker Hwy. 066 (Adams Ave.)	Union
	066	2.19		
Lake Oswego	003	6.13	Jct. Oswego Hwy. 003 (State St.) & A Ave.	Clackamas
Lakeside	009	222.73	Jct. Oregon Coast Hwy. 009 & Airport Way	Coos
Lakeview	019	143.03	Jct. Fremont Hwy. 019 (G St.) & Klamath Falls-Lakeview Hwy. 020 (4th St.)	Lake
	020	96.37		
Lebanon	016	13.32	Jct. Santiam Hwy. 016 (Main St.) & Grant St.	Linn
Lexington	052	36.45	Jct. Heppner Hwy. 052 (Main St.) & Lexington-Echo Hwy. 320 (E St.)	Morrow
	320	0.00		
Lincoln City	009	114.88	Jct. Oregon Coast Hwy. 009 & D River.	Lincoln
Lonerock			Main St. & Robinson Ave	Gilliam
Long Creek	028	90.26	Jct. Pendleton-John Day Hwy. 028 & Kimberly-Long Creek Hwy. 402 (Main St.)	Grant
	402	34.88		
Lostine	010	54.89	Jct. Wallowa Lake Hwy. 010 (State St.) & Wallowa St.	Wallowa
Lowell			Jct. Pengra Rd. & Moss St.	Lane
Lyons	211	24.41	Jct. Albany-Lyons Hwy. 211 (6th St.) & Main St.	Linn
Madras	004	92.46	Jct. The Dalles-California Hwy. 004 (4th St.) & Culver Hwy. 361 (D St.)	Jefferson
	361	0.05		
Malin	050	24.25	Jct. Klamath Falls-Malin Hwy. 050 (Broadway St.) & Rosicky Ave.	Klamath
Manzanita	009	43.18	Jct. Oregon Coast Hwy. 009 & Laneda Ave.	Tillamook
Maupin	004	45.20	Jct. The Dalles-California Hwy. 004 (Deschutes Ave.) & 4th St.	Wasco
Maywood Park	064	23.25	Jct. East Portland Freeway 064 & Prescott St.	Multnomah
McMinnville	091(1W)	37.72	Jct. Pacific Highway West 091 (Adams St.) & 3rd St.	Yamhill
Medford			Jct. Central Ave. & 8th St.	Jackson

City	Highway	M.P.	Description	County
Merrill	050	13.99	Jct. Klamath Falls-Malin Hwy. 050 (Front St.) & Main St.	Klamath
Metolius	361	4.27	Jct. Culver Hwy. 361 (Jefferson Ave.) & 6th St.	Jefferson
Mill City			Jct. Broadway St. & 1St. Ave.	Marion
Millersburg	001NH	7C235.64	Jct. Murder Creek Conn. 001NH & Murder Creek Conn. 001NF (Old Santiam Rd.)	Linn
	001NF	5C235.90		
Milton-Freewater	008	30.62	Jct. Oregon-Washington Hwy. 008 (Main St. & Columbia St.)	Umatilla
Milwaukie	081(1E)	5.46	Jct. Pacific Highway East (McLoughlin Blvd.) & Clackamas Hwy. 171	Clackamas
	171	0.11		
Mitchell	041	65.94	Jct. Ochoco Hwy. 041 & Service Creek-Mitchell Hwy. 390	Wheeler
	390	24.32		
Molalla	161	12.76	Jct. Woodburn-Estacada Hwy. 161 (Main St.) & Molalla Ave.	Clackamas
Monmouth	091(1W)	63.42	Jct. Pacific Highway West 091 (Pacific Ave.) & Monmouth Hwy. 194 (Main St.)	Polk
	194	7.56		
Monroe	091(1W)	101.15	Jct. Pacific Highway West 091 (5th St.) & Territorial Hwy. 200	Benton
	200	-0.03		
Monument	402	13.74	Jct. Kimberly-Long Creek Hwy. & 2nd St.	Grant
Moro	042	18.19	Jct. Sherman Hwy. 042 (Main St.) & 1st St.	Sherman
Mosier	002	69.79	Columbia River Hwy. 002 undercrossing Mosier Interchange Conn. 002IC	Wasco
	002IC	4C69.65		
Mt. Angel	140	46.13	Jct. Hillsboro-Silverton Hwy. 140 & Main St.	Marion
Mt. Vernon	005	154.03	Jct. John Day Hwy. 005 (Main St.) & Pendleton-John Day Hwy. 028 (Mountain Blvd.)	Grant
	028	120.51		
Myrtle Creek			Jct. Main St. & 2nd Ave.	Douglas
Myrtle Point	035	20.58	Jct. Coos Bay-Roseburg Hwy. 035 (8th St.) & Spruce St.	Coos
Nehalem	009	44.98	Jct. Oregon Coast Hwy. 009 (H St.) & 7th St.	Tillamook
Newberg	091(1W)	23.45	Jct. Pacific Highway West 091 (Hancock St.) & Hillsboro-Silverton Hwy. 140 (College St.)	Yamhill
	140	20.15		
Newport	009	140.36		Lincoln

City	Highway	M.P.	Description	County
	033	0.00	Jct. Oregon Coast Hwy. 009 & Corvallis-Newport Hwy. 033 (Olive St.)	
North Bend	009	235.41	Jct. Oregon Coast Hwy. 009 (Sherman Ave.) & Cape Arago Hwy. 240 (Virginia Ave.)	Coos
	240	0.00		
North Plains	047	57.16	Jct. Sunset Hwy. 047 & N. Plains Conn. 047AK (Glencoe Rd.\1st St.)	Washington
	047AK	2C57.22		
North Powder	006	285.68	Old Oregon Trail Hwy. 006 overcrossing La Grande-Baker Hwy. 066	Union
	066	32.29		
Nyssa	007	265.97	Jct. Central Oregon Hwy. 007 (Main St.) & Succor Creek Hwy. 450 (Adrian Blvd.)	Malheur
	450	0.02		
Oakland			Jct. 1st St. & Locust St.	Douglas
Oakridge	018	35.48	Jct. Willamette Hwy. 018 & Crestview St.	Lane
Ontario			Jct. Oregon St. & Idaho St.	Malheur
Oregon City	081(1E)	12.56	Jct. Main St. & Pacific Highway East 081 (5th St.)	Clackamas
Paisley	019	98.36	Jct. Fremont Hwy. 019 (Main St.) & Mill St.	Lake
Pendleton	067	3.39	Jct. Pendleton Hwy. 067 (Dorion Ave.) & Main St.	Umatilla
Philomath	033	50.63	Jct. Corvallis-Newport Hwy. 033 (Main St.) & 13th St.	Benton
Phoenix	063	11.49	Jct. Rogue Valley Hwy. 063 (Main St.) & 4th St.	Jackson
Pilot Rock	028	15.58	Jct. Pendleton-John Day Hwy. 028 (Birch St. & Birch Pl.)	Umatilla
Portland			Jct. Burnside & Front St. (Naito Parkway)	Multnomah
Port Orford	009	300.99	Jct. Oregon Coast Hwy. 009 (Oregon St.) & Port Orford Hwy. 251 (9th St.)	Curry
	251	0.76		
Powers	242	18.50	Jct. Powers Hwy. 242 (1st Ave.) & Poplar St.	Coos
Prairie City	005	175.26	Jct. John Day Hwy. 005 (Front St.) & Main St.	Grant
Prescott			Jct. Graham Rd. & Blakely St.	Columbia
Prineville	041	18.75	Jct. Ochoco Hwy. 041 (3rd St.) & Crooked River Hwy. 014 (Main St.)	Crook
	014	0.00		
Rainier	092(2W)	46.97	Jct. Lower Columbia River Hwy. 092 (B St.) & 1St. St.	Columbia

City	Highway	M.P.	Description	County
Redmond	480	121.29	Jct. Redmond Spur Hwy. (6th St.) & Evergreen Ave.	Deschutes
Reedsport	009	211.58	Jct. Oregon Coast Hwy. 009 & Umpqua Hwy. 045	Douglas
	045	0.00		
Richland	012	42.15	Jct. Baker-Copperfield Hwy. 012 (Main St.) & 1st St.	Baker
Riddle			Jct. Main St. & 5th Ave.	Douglas
Rivergrove			Jct. Childs Rd. & Pilkington Rd.	Clackamas
Rockaway Beach	009	50.82	Jct. Oregon Coast Hwy. 009 & 1st Ave.	Tillamook
Rogue River	001	48.82	Pacific Hwy. 001 overcrossing Depot St. Conn. 060AF (Depot St.)	Jackson
	060AF	1C8.96		
Roseburg	001	124.14	Pacific Hwy. 001 overcrossing North Umpqua Hwy. 138 (Harvard Ave.)	Douglas
	138	-0.89		
Rufus	002	109.95	Jct. Columbia River Hwy. 002 overcrossing Rufus Conn. 002FK (John Day Dam Rd.)	Sherman
	002FK	2C109.95		
St. Helens	092(2W)	28.56	Jct. Lower Columbia River Hwy 092 & Columbia Blvd.	Columbia
St. Paul	140	28.11	Jct. Hillsboro-Silverton Hwy. 140 (Main St.) & Church Ave.	Marion
Salem	030	26.14	Jct. Willamina-Salem Hwy. 030 (Center St.) & Willamina-Salem Hwy. Conn. 072AC (Commercial St.)	Marion
	072AC	1C4.96		
Sandy	026	24.40	Jct. Mt. Hood Hwy. 026 (Pioneer Blvd.) & Eagle Creek-Sandy Hwy 172 (Meinig Rd.)	Clackamas
	172	5.88		
Scappoose	092(2W)	20.91	Jct. Lower Columbia River Hwy. 092 & Columbia Ave.	Columbia
Scio	211	9.80	Jct. Albany-Lyons Hwy. 211 (1st Ave.) & Main St.	Linn
Scotts Mills			Jct. 3rd St. & Grandview Ave.	Marion
Seaside	009	21.05	Jct. Oregon Coast Hwy. 009 (Roosevelt Dr.) & Broadway	Clatsop
Seneca	048	25.26	Jct. John Day-Burns Hwy. 048 (Barnes Ave.) & 1st St.	Grant

City	Highway	M.P.	Description	County
Shady Cove	022	20.09	Jct. Crater Lake Hwy. 022 & Rogue River Dr.	Jackson
Shaniko	291	0.04	Jct. Shaniko-Fossil Hwy. 291 & D St.	Wasco
Sheridan	157	7.13	Jct. Willamina-Sheridan Hwy. 157 (Main St.) & Bridge St.	Yamhill
Sherwood			Jct. Pine & Oregon St. (1st St.)	Washington
Siletz	181	23.81	Jct. Siletz Hwy. 181 (Gaither St.) & Buford Ave.	Lincoln
Silverton	140	(2)50.50	Jct. Hillsboro-Silverton Hwy. 140 (1st St.) & Cascade Hwy. South 160 (Oak St.)	Marion
	160	29.65		
Sisters	015	92.50	Jct. McKenzie Hwy. 015 (Cascade St.) & Elm St.	Deschutes
Sodaville			Jct. Main St. & Ash St.	Linn
Spray	005	92.57	Jct. John Day Hwy. 005 (Main St.) & Willow St.	Wheeler
Springfield	015	1.57	Jct. McKenzie Hwy. 015 (South A St.) & Springfield Hwy. 228 (2nd St.)	Lane
	228	1.40		
Stanfield	054	11.03	Jct. Umatilla-Stanfield Hwy. 054 (Main St.) & Coe Ave.	Umatilla
Stayton			Jct. Washington St. & 1st Ave.	Marion
Sublimity			Jct. Starr St. & Center St.	Marion
Summerville			Jct. Main St. & 4th St.	Union
Sumpter	410	0.50	Jct. Sumpter Hwy. 410 (Mill St.) & Granite St.	Baker
Sutherlin	231	25.39	Jct. Elkton-Sutherland Hwy. 231 (Central Ave.) & Calapooia St.	Douglas
Sweet Home	016	27.07	Jct. Santiam Hwy. 016 (Main St.) & Halsey-Sweet Home Hwy. 212	Linn
	212	21.40		
Talent	063	14.20	Jct. Rogue Valley Hwy. 063 & W. Valley View Rd.	Jackson
Tangent	058	8.81	Jct. Albany-Junction City Hwy. 058 & Birdfoot Dr.	Linn
The Dalles			Jct. 3rd St. & Union St.	Wasco
Tigard	091(1W)	8.65	Jct. Pacific Hwy. West 091 & Beaverton-Tigard Hwy. 144	Washington
	144	5.90		
Tillamook	009	65.74		Tillamook

City	Highway	M.P.	Description	County
	037	0.00	Jct. Oregon Coast Hwy. 009 (Main Ave.) & Wilson River Hwy. 037 (3rd St.) & Netarts Hwy. 131 (3rd St.)	
	131	9.08		
Timberline	173	0.12	Beg. Of Timberline Hwy. 173	Clackamas
Toledo			Jct. Main St. & 3rd St.	Lincoln
Troutdale			Jct. Historic Columbia River Hwy. (Columbia Blvd). & SW 257th. Ave (NW Graham Rd)	Multnomah
Tualatin	001	289.50	Jct. Pacific Hwy. 001 undercrossing Nyberg Rd.	Washington
Turner			Jct. 3rd St. & Chicago St.	Marion
Ukiah	341	1.24	Jct. Main St. & Camas St.	Umatilla
Umatilla	002	182.96	Jct. 6th St. & G St.	Umatilla
Union	066	16.51	Jct. La Grande-Baker Hwy. 066 (Main St.) & Beakman St.	Union
	340	0.00		
Unity	005	212.45	Jct. John Day Hwy. 005 (Main St./1st Ave.) & South Burnt River Ln. (S. Fork Rd.)	Baker
Vale	005	278.21	Jct. John Day Hwy. 005 (Glenn St.) & Central Oregon Hwy. (A St.)	Malheur
	007	246.39		
Veneta	062	46.92	Jct. Florence-Eugene Hwy. 062 and Territorial Hwy. 200	Lane
	200	19.49		
Vernonia	102	62.09	Jct. Nehalem Hwy. 102 (Bridge St.) & State Ave.	Columbia
Waldport	009	155.90	Jct. Oregon Coast Hwy. 009 & Alsea Hwy. 027 (Hemlock St.)	Lincoln
	027	0.00		
Wallowa	010	47.31	Jct. Wallowa Lake Hwy. 010 (1st St.) & Ellen St. & Whiskey Creek Rd.	Wallowa
Warrenton	104	3.32	Jct. Ft. Stevens Hwy. 104 (Main Ave.) & Warrenton-Astoria Hwy. 105 (Harbor St.)	Clatsop
	105	0.00		
Wasco	300	-0.09	Jct. Wasco-Heppner Hwy. 300 (Clark St.) & Celilo-Wasco Hwy. 301 (1st. St.)	Sherman
	301	15.57		
Waterloo			Jct. Gross St. & 4th St.	Linn
West Linn	064	8.82	E. Portland Freeway Hwy 064 overcrossing Oswego Hwy. 003 (Willamette Dr.)	Clackamas
	003	11.17		

City	Highway	M.P.	Description	County
Weston			Jct. Water St. & Main St.	Umatilla
Wheeler	009	47.39	Jct. Oregon Coast Hwy. 009 (Nehalem Blvd.) & Gregory St.	Tillamook
Willamina	157	2.28	Jct. Willamina-Sheridan Hwy. 157 (S. Main St.) & NW Main St.	Yamhill
Wilsonville	001	283.88	Jct. Pacific Hwy. 001 overcrossing Wilsonville Conn. 001RD (Wilsonville Rd.)	Washington
	001RD	2C283.88		
Winston	035	73.37	Jct. Coos Bay-Roseburg Hwy. 035 (Douglas Blvd.) & Main St.	Douglas
Woodburn	140	37.87	Jct. Hillsboro-Silverton Hwy. 140 & Boones Ferry Rd./Settlemier Ave.	Marion
Wood Village	002	15.96	Jct. Columbia River Hwy. 002 undercrossing NE 238th Ave. Conn. 002IO (238th Dr.)	Multnomah
	002IO	5C15.99		
Yachats	009	164.46	Jct. Oregon Coast Hwy. 009 & Yachats River Rd.	Lincoln
Yamhill	029	34.47	Jct. Tualatin Valley Hwy. 029 (Maple St.) & Yamhill-Newberg Hwy. 151 (Main St.)	Yamhill
	151	0.00		
Yoncalla			Jct. Eagle Valley Rd. (Front St.) & Applegate Ave.	Douglas

Appendix F – Abbreviations

Table 11: Abbreviations

Word	Abbreviation
Canyon	Cyn
College	Coll
Creek	Cr
Lake	Lk
Loop	Lp
Mount	Mt
Park	Pk
Peak	Pk
River	Riv
State	St
Springs	Spgs
University	Univ

Appendix G – ProjectWise Naming Conventions for Signs

Table 12: ProjectWise (PW) Naming conventions for sign files

Document Name	PW Folder	Document Name Format	Document Description
sndt	2_Plan_Sheets	TN_K#####_sndt_##	<Sheet-No> - Plan Sheet - Sign Details Plan
snpl	2_Plan_Sheets	TN_K#####_snpl_##	<Sheet-No> - Plan Sheet - Sign Legend
snpr	2_Plan_Sheets	TN_K#####_snpr_##	<Sheet-No> - Plan Sheet - Sign Removal Plan
snpd	2_Plan_Sheets	TN_K#####_snpd_##	<Sheet-No> - Plan Sheet - Sign & Post Data Table Plan
snps	2_Plan_Sheets	TN_K#####_snps_##	<Sheet-No> - Plan Sheet - Sign Plan
PSET	Signing	TN_K#####_PSET_##	Sign Print Set
LnkDoc_cad	3_Base_Files	TN_K#####_LnkDoc_cad_##	Sign Notes/Table <Title> Linked to DGN
sn_cad	3_Base_Files	TN_K#####_sn_cad_##	Sign CAD File for Plan Sheets
snd_bas	3_Base_Files	TN_K#####_snd_bas_##	Sign Design Base File
dDAPSignPlan	Signing	TN_K#####_dDAPSignPlan_##	Sign Plans Submitted at dDAP
DAPSignPlan	Signing	TN_K#####_DAPSignPlan_##	Sign Plans Submitted at DAP
PreSignPlan	Signing	TN_K#####_PreSignPlan_##	Sign Plans Submitted at Prelim
AdvSignPlan	Signing	TN_K#####_AdvSignPlan_##	Sign Plans Submitted at Advance Plans
FinalSignPlan	Signing	TN_K#####_FinalSignPlan_##	Sign Plans Submitted at Final Plans
Inv	Signing	TN_K#####_Inv_##	Signing Inventory
ShDSN	Signing	TN_K#####_ShDSN_##	Shop Drawings - Signs
ShDSTL	Signing	TN_K#####_ShDSTL_##	Shop Drawings - Steel
snd_wrk	Signing	TN_K#####_snd_wrk_##	Sign Working
AdvEst	Signing	TN_K#####_AdvEst_##	Advance Signing Estimate
DAPEst	Signing	TN_K#####_DAPEst_##	DAP Signing Estimate

Document Name	PW Folder	Document Name Format	Document Description
dDAPEst	Signing	TN_K#####_dDAPEst_##	dDAP Signing Estimate
FinEst	Signing	TN_K#####_FinEst_##	Final Signing Estimate
PrelimEst	Signing	TN_K#####_PrelimEst_##	Prelim Signing Estimate
Est_wrk	Signing	TN_K#####_Est_wrk_##	Signing Estimate - Working
Misc	Signing	TN_K#####_Misc_##	<Title> Miscellaneous Document
ScopeEst	Signing	TN_K#####_ScopeEst_##	Scoping/Proof of Concept Sign Estimate
PSEEST	Signing	TN_K#####_PSEEST_##	PSnE Signing Estimate
photo	4_Photos	TN_K#####_photo_Y####M##D##_##	Signs Photo - <Location>

Appendix H – Example of a QA/QC Check List for Sign Design

Although not a thorough list, an example of a QA/QC check list for sign design at DAP.

Table 13: Example check list for QC review of sign plans

	DAP	Checked by
General	R/W locations Identified	
	Sign Conflicts with work done identified	
	Sign inventory in project area, identify signs/supports needing replacement	
	Identify need for any new signs or change in signing	
	Pre-liminary Cost estimates	PE
	Get requests needed for STRE approval in	Region Traffic Engineer
	Send plans on Interstate to sign HQ	PE
	Non-MUTCD or Non-SP&G compliant signs into HQ	PE
	Identify TIC signs impacted	
Sign Design	North arrow has proper orientation	PE
	Alignment names and stations shown	PE
	All road names/highway names shown	PE
	Base map is current to roadway and striping plans	PE
	Standard drawings listed and checked	PE
	Legend notes checked	PE
	General construction notes checked	PE
	Title Block/proper project name checked	PE
	All exiting signs borders show as dashed	PE
	A note for existing signs shown as dashed	PE
	Custom Signs: Font and sizes shown	PE
	Overhead street name signs fit on signal mast arm	PE
	Signs larger than 4'x8' made on extruded aluminum	PE
	All comment logs addressed	PE
	Sign and Post Data table matches design plans	PE
	All applicable specs checked	PE
	boiler plates used are up-to date	PE

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