Chapter

1

DESIGN STANDARD POLICIES AND PROCESSES

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1.1 INTRODUCTION

This section provides background information on design standard policies and processes. Information is presented on the appropriate design standards relevant to project type. Project types are defined to assist the designer in applying the proper standards to the project. General information is provided concerning design processes, different design strategies such as urban preservation or interstate maintenance. Other chapters in this document are broken down into specific design areas such as rural, urban, freeway, intersection, bicycle and pedestrian, transit, etc.

1.2 PRACTICAL DESIGN

1.2.1 GENERAL

Over the years, ODOT has taken a proactive approach in project delivery. With the use of multi-disciplinary project teams, a collaborative effort is used in producing efficient and effective projects through the project development process. From a design perspective , ODOT has used and uses a similar approach in developing design guidelines and standards that are flexible and sensitive to the context of the project and surrounding environment. Current urban and rural design guidance in the HDM follows context sensitive design practices and the flexibility of guidance documents such as FHWA's "Flexibility in Highway Design" and AASHTO's "A Guide for Achieving Flexibility in Highway Design".

Practical Design is the next step that ODOT has taken in project development and design guidance and is incorporated in different sections in this manual. From a design perspective, Practical Design is not intended to reduce or take the place of design standards and design guidance. Practical Design is a philosophy and strategy in establishing appropriate project scopes fitted to specific project purpose and need. Critical elements of Practical Design use a systematic approach in efficiently using limited resource dollars to optimize the transportation system using a prioritized management approach. Practical Design requires use of engineering judgment, focusing on the project purpose, evaluating the safety and operations of design tradeoffs, and documenting those design decisions.

1.2.2 PRACTICAL DESIGN GOALS

Practical Design makes use of three major goals:

1. Goal #1 - Direct available dollars toward activities and projects that optimize the system as a whole (See Section 1.2.3).
2. Goal #2 – Develop solutions to address the purpose and need identified for each project.
3. Goal #3 – Design projects that make the system better, address changing needs, and/or maintain current functionality by meeting, but not necessarily exceeding, the defined project purpose and need and project goals.

1.2.3 PRACTICAL DESIGN VALUES, "SCOPE"

There are five key values that help form the foundation of Practical Design. These values support ODOT's mission of providing a safe, efficient transportation system that supports economic opportunity and livable communities for Oregonians. These values should be kept in mind when working through the project development and design process.

1. **Safety** - Overall system safety will not be compromised. The goal is to make the system as safe as practical. This does not mean settling for a lower level of safety, but instead, continue to make choices about safety and use sound engineering judgment when making safety decisions (i.e., look for high value add-ins with minimal cost). Individual projects may look different. But, every project will either make the facility safer or will maintain the existing safety level for that facility.

2. **Corridor Context** - Practical Design takes the concept across a system, down to a corridor level, and apply it to each project. A corridor approach should be used in establishing or evaluating design criteria, and then be applied consistently throughout the corridor. Roadways should respect the character of the community, include the current and planned land uses, and work within the intended corridor use. The unique features of the project and how this "fix" fits with other parts of the corridor and with the natural and surrounding built environment should be considered.

3. **Optimize the System** - Adopting more of an asset management approach to managing pavements, bridges and roadway safety features allows the assessment of the current state of an individual infrastructure asset, and then to develop specific maintenance, repair, rehabilitation and replacement strategies that optimize the life-cycle investment in that particular asset. This, in turn, can allow available funding to be allocated on a priority basis to those assets and/or combination of assets that ensure that the entire highway system is optimized for safety, mobility and financial investment. This optimization for safety, mobility, and financial investment will involve balancing the trade-offs between these competing goals.

4. **Public Support** - ODOT recognizes that public trust is a cornerstone of success and strives to work in partnership with the local communities in making system improvements visible to the traveling public. Working with locals provides opportunities for the community to shape the chosen solution, and consider the needs for pedestrians, bicyclists, transit users, freight and mobility. When working with community interests, it is essential to have clarity about the project purpose, need and alignment of the proposed project with the overall plan for Oregon's transportation system.

5. **Efficient Cost** – ODOT has limited funds to apply to projects and strives to stretch these funds as much as possible and to develop projects that meet the desired purpose, but is open to considering incremental improvements. Practical Design requires applying the appropriate standards to the critical elements in order to meet the project specific purpose and need. This allows for a redistribution of funds that were previously used on other items that may not have been as high of a priority on one project, to be used where they will produce the most benefit to the system. **Practical Design stresses making the best strategic decisions that benefit the overall system**.

1.3 DESIGN STANDARD POLICY

1.3.1 POLICY BACKGROUND

In March of 1993 ODOT management approved a proposal to simplify the use and selection of design standards. This proposal brought ODOT to closer alignment with AASHTO's *"A Policy on Geometric Design of Highways and Streets – 1990"* policy. The decision also involved limiting the design standards to be used, to only three. They are ODOT 4R/New, ODOT 3R, and AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"*. These three standards are generally retained in the 2012 Highway Design Manual, however, the ODOT 3R standards have been expanded to include separate standards for freeways, urban highways, and rural highways, providing, greater clarity and flexibility to the designer for selecting the appropriate standard. Additionally, ODOT has added 1R design standards as part of the preservation program. The five key elements of the design manual are outlined below:

1. Adopts the 2011 AASHTO policy of Geometric Design (AASHTO's "*A Policy on Geometric Design of Highways and Streets - 2011"*) as the basis for the ODOT 4R/New Standard for New Construction and Reconstruction on all State Highways. As modifications to the AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"*, this adopted ODOT standard will retain ODOT spirals, superelevation runoffs, specific design speeds, vertical clearances, and specific design recommendations which are within the ranges specified by the AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"*.

2. Adopts the AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* Policy on Geometric Design as the ODOT Standard for New Construction and Reconstruction with no modifications on local jurisdiction routes.

3. Continues current ODOT 3R standards for 3R type projects on rural state highway routes, and provides separate ODOT 3R standards for freeways and urban areas.

4. Adopts ODOT 3R Rural standards for rural local jurisdiction preservation projects and allows local agencies to use either ODOT 3R Urban standards or AASHTO's "*A Policy on Geometric Design of Highways and Streets - 2011"* standards for urban local jurisdiction preservation projects.

5. Establishes 1R design standards for ODOT jurisdiction preservation projects.

The standards selected for design of all projects are presented in one of the following references:

- *2012 ODOT Highway Design Manual.*
- *A Policy on Geometric Design of Highways and Streets - 2011.*
- *A Policy on Design Standards - Interstate System. (AASHTO 2005).*

- *Transportation Research Board (TRB) Special Report #214 - Designing Safer Roads*
- *Roadside Design Guide (AASHTO, 2011)*

When the use of the ODOT 4R/New standard is indicated by the selection matrix (Table 1-1) then specific criteria given in the 2012 ODOT Highway Design Manual shall govern over any range of values given in AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"* and *TRB #214* Guidelines.

1.3.1.1 STANDARDS BACKGROUND

The different design standards for ODOT facilities are based upon recommendations from the documents listed in Section 1.3. The OTC has delegated the responsibility to approve design standards for ODOT transportation facilities to the Director and Deputy Director/Chief Engineer. Subsequently, the Technical Services Manager/Chief Engineer delegated the responsibility of design standards to the State Traffic-Roadway Engineer.

1.3.1.2 LOCAL AGENCY GUIDELINES

Some projects under ODOT roadway jurisdiction traverse across local agency boundaries. Some local agencies have adopted design standards and guidelines that may differ from the various ODOT design standards. Although the appropriate ODOT design standards are to be applied on ODOT roadway jurisdiction facilities, the designer should be aware of the local agency publications and design practices, which can provide additional guidance, concepts, and strategies for design.

1.3.1.3 PROJECT DELIVERY

The authority and need to develop projects is established through The Oregon Transportation Plan (OTP). The OTP and other programs such as the State Agency Coordination Program outline the primary responsibility of ODOT to provide a safe, efficient, and integrated multi-modal transportation system for the mobility and accessibility of people and goods. In meeting these plans and programs, ODOT shall consider appropriate alternatives for meeting statewide needs and for every project, a number of alternatives, including the no-build alternative, will be evaluated in arriving at the appropriate solution. This section only provides an overview of the project selection and development process. For more detailed information on project development, refer to ODOT's Project Delivery Guidebook.

1.3.1.4 PLANS AND PROGRAMS

ODOT's multiple plans and programs help to identify transportation needs and determine which transportation projects will be developed and constructed. These plans and programs in concert with the Regions and Area Commissions on Transportation (ACTs) help guide the setting of priorities for the *Statewide Transportation Improvement Program (STIP)*.

A. TRANSPORTATION PLANNING RULE

Transportation planning documents provide the framework from which projects are developed. Oregon has developed a Transportation System Plan (TSP) to be in compliance with the Transportation Planning Rule (TPR) (OAR 660-012). The purpose of the TPR is to guide the implementation of the transportation planning goals and to ensure that individual transportation plans, whether state, city, or county, comply with and complement each other while achieving the goals of the TPR. One of the purposes of the TPR related to Transportation is to provide for safe and convenient vehicular, transit, pedestrian, and bicycle access and circulation and to provide for the construction and implementation of transportation facilities, improvements and services necessary to support acknowledged comprehensive plans. States and Metropolitan Planning Organizations (MPOs) are also required to prepare long-range multimodal transportation plans that are consistent with federal transportation policy.

B. OREGON TRANSPORTATION PLAN

The Oregon Transportation Plan (OTP) is the state's long-range multimodal transportation plan. The OTP is the overarching policy document among a series of plans that together form the State transportation system plan (TSP). The OTP considers all modes of Oregon's transportation system as a single system and addresses the future needs of Oregon's airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation and railroads. It assesses state, regional, and local public and private transportation facilities. The OTP establishes goals, policies, strategies and initiatives that address the core challenges and opportunities facing Oregon. The Plan provides the framework for prioritizing transportation improvements based on varied future revenue conditions, but it does not identify specific projects for development.

C. OREGON HIGHWAY PLAN

The Oregon Highway Plan (OHP) is the modal element dealing primarily with the State Highway system that complies with the goals and objectives of the OTP. The 1999 Oregon Highway Plan defines policies and investment strategies for Oregon's state highway system. It further refines the goals and policies of the Oregon Transportation Plan and is part of Oregon's Statewide Transportation Plan. The OHP also provides guidance on highway segment designations that have been incorporated into the Highway Design Manual. The Highway Plan has three main elements:

1. The Vision presents a vision for the future of the state highway system, describes economic and demographic trends in Oregon and future transportation technologies, summarizes the policy and legal context of the Highway Plan, and contains information on the current highway system.

2. The Policy Element contains goals, policies, and actions in five policy areas: system definition, system management, access management, travel alternatives, and environmental and scenic resources.

3. The System Element contains an analysis of state highway needs, revenue forecasts, descriptions of investment policies and strategies, an implementation strategy, and performance measures.

D. TRANSPORTATION SYSTEM PLANS (TSPs)

Cities, Counties, and Metropolitan Planning Organizations are required to have a Transportation System Plan (TSP). The TSP establishes a coordinated network of transportation facilities and services that is adequate to meet state, regional, and local transportation needs. TSPs serve as the transportation element of local comprehensive plans. Local TSPs need to be consistent with the State Transportation Plan. TSPs integrate transportation and land use, provide for long range direction for transportation of all modes, and provide a link to the Statewide Transportation Improvement Program process.

E. STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

The Statewide Transportation Improvement Program (STIP) is the funding and scheduling document for major road, highway, and transit projects in Oregon. Projects are selected for the STIP using federal guidelines compliance with the OTP and OHP and other ODOT planning documents, and from management plans of local jurisdictions. The STIP development process involves prioritization of needs through consultation with the different local jurisdictions throughout the state. Depending on priority of need, projects in the STIP are funded for development and/or construction. (The Highway Design Manual provides information on the design process and design requirements while the Project Delivery Guidebook describes the project development process from project inception through the contract award.)

The STIP lists projects that are funded by different programs. Typical programs funded through the STIP include the following (not inclusive):

1. **Modernization** - Improvements to accommodate existing traffic and/or projected traffic growth. Primary goal is to add capacity by either adding lanes or building new highways.

2. **Pavement Preservation** - Improvements add useful service life of existing facilities and rehabilitative work. Preservation projects add life to the road without adding capacity.

3. **Operations** -Projects that improve the efficiency of the system operations through replacement of infrastructure and implementation of technology, allowing the existing system to meet increased demands.

4. **Bridge Replacement and Rehabilitation** - Improvements to rebuild or extend the service life of existing bridges and structures beyond the scope of routine maintenance.

5. **Safety** - Improvements identified through benefit/cost criteria or top 10% SPIS sites that address high crash locations and corridors in order to reduce the number of fatal and serious injury crashes.

6. **Other Programs** - Some of the other funding programs include:

    - Bicycle and Pedestrian
    - Fish Passage, Large Culvert Improvement, and Stormwater Retrofit
    - Immediate Opportunity Fund
    - Public Transit
    - Transportation Enhancement
    - Scenic Byways

1.3.2 DESIGN STANDARDS IDENTIFICATION

1.3.2.1 GENERAL

Following are brief descriptions of each of the sources of design standards currently in use by ODOT. These standards give design criteria for both state and local jurisdiction roadways. These standards are dependent on the highway's functional classification (See Appendix A) and the project type.

It is important to note that in addition to the standards described below, considerable reference information is available in other publications. A listing of these references is given in this chapter in Section 1.4.4 and is considered to be supplemental to the design criteria given elsewhere in this manual. Procedures for deviating from these standards are outlined in Chapter 14, Design Exception Process.

1.3.2.2 ODOT 4R/NEW DESIGN STANDARD

Generally these standards are found in the ODOT Highway Design Manual, starting in this Chapter and running through the remaining document. The ODOT 4R/New standards give specific values for use in all areas of design. It is intended that all design values given in the ODOT 4R/New standards are to be within the values or ranges given in the AASHTO Publication; *"A Policy on Geometric Design of Highways and Streets – 2011"*. That publication is to be referenced, when a particular design detail is not covered in the ODOT 4R/New standards. ODOT 4R/New standards have been developed for both Urban and Rural areas of the state and are further defined by freeways, expressways, and arterial standards.

The ODOT 4R/New standards also contain the following specific requirements which are not included within *"A Policy on Geometric Design of Highways and Streets – 2011"*.

1. Use spirals on all curves with a degree of curve of 1° or sharper, and use ODOT spiral lengths given in the ODOT Highway Design Manual.
2. Superelevation runoffs shall match the ODOT spiral length.
3. ODOT new construction minimum vertical clearance:

- 17′- 4″ on High Routes
- 17′- 0″ on NHS (not on High Routes)
- 16′- 0″ on non-NHS (not on High Routes)
- For vertical clearance on Local Agency jurisdiction roadways, see Section 4.5.1.1

4. Use ODOT specific design speeds.

The ODOT 4R/New standard is applicable to projects that are considered either Reconstruction (4R) or New Construction.

A. RECONSTRUCTION (4R)

These projects upgrade the facility to acceptable geometric standards and as a result, provide a greater roadway width. The improvements may be in the form of additional lanes and/or wider shoulders and produce an improvement in the highway's mobility. Reconstruction projects normally include the following types of work: Projects which alter the original subgrade; those that construct major widenings that result in the addition of a new continuous lane; the addition of passing lanes or climbing lanes; channelization for signals or left turn refuges; structure replacement; and similar projects. Other modal projects on state highways and bridges such as light-rail, bus-rapid transit, streetcar, and alike are to use 4R standards.

B. NEW CONSTRUCTION

New construction projects are projects constructed in a new location, new alignments, major additions such as interchanges and safety rest areas, or rebuilding an existing facility with major vertical or horizontal alignment changes.

1.3.2.3 AASHTO DESIGN STANDARDS

These standards are contained in the AASHTO Publication *"A Policy on Geometric Design of Highways and Streets – 2011"*. AASHTO standards are specifically for use in the design of new construction and reconstruction projects, when the project is located on routes under local jurisdiction. They are not 3R standards, as the foreword of the book states. The reader is referred to TRB Special Report #214, and related references, for guidance in the design of 3R jobs. However, for local agency urban preservation type projects utilizing federal funding, the local agency has the choice of using the ODOT 3R standard or AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"*.

AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"* Green Book policy is organized in a system so the roadway's functional classification and volume determines which part of the policy applies to that roadway. The AASHTO policy includes chapters in which general design controls and elements are discussed as they apply to all types of functional classifications and provide groundwork to understanding basic design concepts. These chapters cover highway functions, design controls and criteria, elements of design, and cross section elements. The policy also gives specific design information for at-grade intersections, grade separations and interchanges.

The remainder of AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"* policy covers design details as they relate to specific functional classifications. AASHTO Green Book policy provides design direction for the following classifications:

- Rural and Urban Freeways
- Rural and Urban Arterials
- Rural & Urban Collector Roads and Streets
- Local Roads and Streets including Special Purpose Roads

It is imperative that any user of AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* Green Book study and understand the concept of functional classification. The AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"* gives an explanation of this in Chapter 1 (Highway Functions). Section 10.12 of this manual outlines additional information dealing with traffic studies and functional class in urban areas and how it relates to design. The may be occasions, due to functional class definitions, that an urban setting may have a rural functional classification. In these situations the designer should confer with the Region Roadway Manager.

Functional Classifications have been established for all state highways by the ODOT Transportation Development Branch. A directory covering these routes is included in Appendix A. The functional classification should also be checked against the functional classification contained in a local TSP. Design specifics cannot be accurately selected from AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* without the correct functional class being known.

1.3.2.4 ODOT 3R DESIGN STANDARDS

ODOT 3R Design Standards are found in the ODOT Highway Design Manual, Chapters 5, 6 and 7 which contain information dealing with pavement widths, horizontal curvature, superelevation, and other references specific to this type of work. Table 7-3 (Rural 3R) is similar to the table used in *TRB Special Report #214,* and found on page 7 of that publication. It is the minimum acceptable standard for rural 3R projects with federal funding. When ODOT 3R guidelines refer to AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* guidelines, this reference is to *TRB Special Report #214*, in the case of general 3R construction; or *"A Policy on Design Standards - Interstate System"* (AASHTO 2005) for 3R work on the freeway system. ODOT 3R standards have been developed for both Urban and Rural areas and are arranged according to functional class. 3R type projects located on designated expressways are to use the appropriate urban or rural arterial 3R standard.

A. RESURFACING, RESTORATION, AND REHABILITATION (3R)

These are projects that preserve and extend the service life of existing highways and enhance safety, using cost-effective solutions. Improvements include extending pavement life by at least 8 years, safety enhancements, minor widening (minor widening considered to be widening at spot locations, widening at curves, etc.), improvements in vertical and horizontal alignment, improvement in superelevation, flattening of sideslopes and removal of roadside hazards. The scope is influenced by factors such as: roadside conditions, funding constraints, environmental concerns, changing traffic and land use patterns, surfacing deterioration and crash type and rate. 3R projects are not constructed with the intent of improving highway mobility; however it is sometimes an automatic incidental benefit as a result of improving the riding surface and improving safety.

This category includes, but is not limited to the following types of work: overlay projects with or without minor widening to shoulders or travel lanes, Latex Modified Concrete (LMC) overlays, widening for curb, and extending tapers. Also included in this class are projects with site specific vertical or horizontal curve corrections, and left turn channelizations, when included in an overlay project for safety purposes. Scarifying existing surfacing, rebasing and repaving is considered as 3R if the scope of the job does not require the original subgrade to be altered. All project widening in this category is limited to less than a full lane width except when channelization is incorporated.

1.3.2.5 ODOT 1R STANDARD

The ODOT 1R project standard will apply to Preservation projects that are limited to a single lift non-structural overlay or inlay. Many of the safety items that have traditionally been addressed in 3R projects can be more effectively dealt with in a statewide strategic program; for example, a program for upgrading guardrail to current standards along a highway or in a District. The replacement of safety items such as guardrail, guardrail terminals, concrete barrier, impact attenuators, and signs may be included in the 1R project if funding other than Preservation funds are used and the added work will not delay the scheduled bid date. Any existing safety features that are impacted by the proposed resurfacing must be adjusted or replaced by the 1R project.

Following is an outline for the new ODOT Resurfacing 1R project standard.

A. RESURFACING (1R) PROJECT STANDARDS

These are projects that extend the pavement life of existing highways with a single lift non-structural overlay or inlay. Missing ADA ramps must be installed and ADA ramps that do not meet the 1991 standard must be upgraded to current standard on all 1R projects except on chip seals. Other safety enhancements are not required to be included; however, safety features may be added to 1R projects where other (non-preservation) funding is available. Any existing safety features that are impacted by the proposed resurfacing must be adjusted or replaced, thus necessitating some work in addition to paving. Also, since 1R projects will generally not address safety, pedestrian and/or bicycle concerns, in no case shall safety, pedestrian and/or bicycle conditions be degraded. For example, a resurfacing project that is limited to the travel lanes shall not leave a seam, sunken drainage grates or other hazards in the shoulder or bike lane.

When scoping 1R projects, the FACS-STIP tool must be used to indentify opportunities to add safety enhancements with other (non-preservation) funding; and, any obvious safety issues are identified during a drive through of the project. While the criteria for 1R eligibility primarily relate to the paving treatment and the ability to pave without degrading existing conditions, there may be corridors where safety issues indicate that a full 3R project is warranted. Therefore, a Safety Assessment is completed during the Project Scoping phase to screen for 1R eligibility. The 1R Inventory must be completed at the time of project initiation (see section 11.1.5). Also, since considerable time can elapse between Scoping and Project Initiation, the Safety Assessment must be reviewed at the time of Project Initiation to ensure that a 1R project is still appropriate. The 1R Standard is presented in Chapters 5, 6 & 7 for each type of highway facility

1.3.2.6 SINGLE FUNCTION (SF) STANDARD

The specific design standards used for a Single Function Standard project will generally be the same design standards used for a 4R/New Construction project. The difference is that the scope of work is very limited on SF projects, so the SF Standard does not require addressing non-related substandard features of the roadway. For example, if a guardrail upgrade qualifies as a Single Function project, it will not be necessary to address other substandard features on the roadway, such as lane and shoulder width, horizontal and vertical alignment, etc.

A. APPLICATION OF SINGLE FUNCTION (SF) PROJECT STANDARDS

Single Function projects include projects that are within the right of way but do not permanently impact the travel lanes or shoulders of the highway. Generally, projects that only include work outside the edge of pavement will qualify for the SF standard. The SF standard can also be applied to certain within the roadway projects such as re-striping projects as long as the final configuration of the travel lanes and shoulders is not changed in any way. These projects address a specific need. The scope of work is limited to features that are directly impacted as a result of addressing the specific need. For example, a signal upgrade at an urban intersection may impact the sidewalk and trigger the need to provide necessary ADA upgrades. In no case shall safety, operations, pedestrian and/or bicycle conditions be degraded as a result of a SF project. Each feature constructed in a SF project must be built to the applicable standard for new construction. The SF Standard does not apply to resurfacing projects.

1.4 PROJECT DELIVERY PROCESS

The Project Delivery Guidebook outlines the program development and project development processes that are part of the project delivery process. This guidebook provides program development information relating to the project prospectus, scoping teams, draft and final STIP development. The Project Delivery Guidebook also provides guidance on the project development process including project team development, roles and responsibilities, and work plans. Information is provided on the project development milestones including; project initiation, design acceptance, advanced plans, PS&E submittal, and project development closeout. The Project Delivery Guidebook also provides information and guidance relating to stakeholder involvement, regulatory and resource agencies, and project delivery operational notices.

1.4.1 PRACTICAL DESIGN IN PROJECT DELIVERY (PROJECT DEVELOPMENT)

ODOT's Practical Design Strategy is an integral part of the project development, and specifically, the design process. Practical design requires sound engineering judgment and making informed decisions based on a specific project scope, purpose and need. Practical Design typically will require more information requirements during project development allowing for proper decision making when weighing and determining the design elements for a specific project. There are a number key practical design tools that are helpful to designers in keeping the "SCOPE" values in mind during the project development process (See Section 1.2.3).

1.4.1.1 PROJECT DELIVERY LIFE-CYCLE-CRITICAL DECISIONS POINTS

ODOT's Project Delivery Life-Cycle model provides a project path that designers and project teams can continually use to re-enforce the project purpose and need. There are multiple check-in and documentation points that ensure that the project purpose and need, goals and objectives are being met. The check-in points are also used to document project decisions such as design criteria, finalizing the project charter, the DAP (Design Acceptance Package), change management requests, and SCOPE integration elements. Designers should use the check-in points as an opportunity to ensure that the project design is in line with the project purpose and need.

One of the more critical project delivery check-in points is the DAP. DAP occurs at the end of the initial design phase where the different disciplines review the project. Some of the deliverables at DAP include: Environmental documentation, Design Acceptance Plans, design narrative, access management documentation, and project footprint.

1.4.1.2 PROJECT CHARTERS

Project Charters are an effective tool that is used to guide project teams. The project charter outlines project assignment and includes a clear and complete description of the problem or problems to be solved. Besides a concise purpose and need statement, project charters also include; project expectations and outcomes, project parameters, decision making authority, communication methodology, responsibilities of team members and management sponsors. As part of the project team, designers have ample opportunity to evaluate the project direction at the multiple check-in points of the project life-cycle. Listed below are some general questions that project team members should consider as part of the goals and objectives of the project and inserting the practical design values.

- Is the project consistent with ODOT mission, goals and policies?
- Does this project address the purpose and need? Does it meet the project goals?
- Is the improvement or benefit worth the cost? Is this improvement or benefit too expensive, or a throw away?
- Is the solution better than the current conditions? Is doing something better than doing nothing? (consider the opportunity cost to the system)
- What are the design priorities?
- Does it meet the corridor/system context? Does it meet the project context?
- Are we meeting the expectations of the stakeholders?
- Have we analyzed alternatives and conducted value engineering?
- What are the constraints – physical, fiscal, environmental, schedule?
- Is there a feedback loop for continuous improvement?
- What has changed from the original concept and scope?
- Are original assumptions still valid?

1.4.2 PROJECT TYPES

1.4.2.1 GENERAL

The standards used to develop roadway geometric and non-geometric details generally have a major effect on the overall project cost. Factors, which must be taken into consideration when making that selection, are the type of work to be done, and the location and type of roadway.

For purposes of determining the appropriate design standard for use in project development, the project types can be divided into the categories listed below. While the funding type commonly uses a similar name as the project type, it is the type of work that determines the design standard to use and not the funding type.

1. Modernization [New Construction/Reconstruction (4R)]
2. Preservation [Interstate Maintenance/Resurfacing, Restoration, and Rehabilitation (3R)]
3. Bridge
4. Safety
5. Operations
6. Maintenance
7. Miscellaneous/Special Programs
8. Single Function
9. ODOT Resurfacing 1R

1.4.2.2 MODERNIZATION

Modernization projects generally improve transportation safety, add capacity to the highway system to facilitate existing traffic and/or accommodate projected traffic growth. Modernization projects also include new construction activities such as construction of a new segment of highway on new alignment. Modernization projects typically achieve a 20 year service life.

Some examples of modernization projects are:

1. Addition of Lanes including:
    - Through Lanes
    - Passing and Climbing Lanes
    - Turn Lanes
    - Acceleration and Deceleration Lanes
    - High Occupancy Vehicle (HOV) lanes
2. New alignments and/or new facilities
3. Highway reconstruction with major alignment improvements or major widening
4. Grade separations
5. Widening of bridges to add travel lanes
6. Replacing an existing bridge
7. New safety rest areas

Modernization projects use the ODOT Urban or Rural standard for the appropriate highway classification since they are generally reconstruction (4R) or new construction types of activities.

1.4.2.3 PRESERVATION

Improvements to extend the service life of existing facilities, and rehabilitative work on roadways are preservation types of projects. Preservation projects add useful life to the road without increasing the capacity, and may include:

1. Pavement overlays (including minor safety and bridge improvements)
2. Interstate Maintenance (IM) Program (pavement preservation projects on the Interstate system
3. Re-establishing an existing roadway
4. Resurfacing projects

Pavement preservation projects on state highways use the ODOT 3R Urban, Rural, Freeway, or 1R standard depending upon the highway classification and location. Preservation projects preserve and extend the service life of existing highway by at least 8 years. Preservation projects may include small portions of modernization activities as part of the project such as affecting subgrade, re-basing, adding a turn lane, or minor curve modifications. As long as these elements do not account for over 50% of the project length, the appropriate ODOT 3R standard is to be used, otherwise the project is treated as modernization and the appropriate ODOT 4R/New standard shall be used.

There are cases where the designer needs to be aware of funding limitations as they relate to preservation type projects and safety features. This information is more fully discussed later in this chapter.

1.4.2.4 PREVENTIVE MAINTENANCE

Preventive Maintenance is a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deteriorization, and maintains or improves the functional condition of the system without significantly increasing the structural capacity. Examples of Preventative Maintenance include:

1. Chip Seals
2. Thin Overlays

Preventive maintenance projects preserve and extend the service life of existing highways and structures. Preventive maintenance projects are subject to ODOT 1R design standards. Existing widths of lanes and shoulders are almost always maintained.

1.4.2.5 ROUTINE MAINTENANCE

Routine Maintenance consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service. Routine maintenance activities are typically performed by the district maintenance offices.

1.4.2.6 BRIDGE

Bridge projects include improvements to rebuild or extend the service life of existing bridges, tunnels, culverts (over 6′ in diameter) and structures beyond the scope of routine maintenance. Some examples include:

1. New bridges
2. Deck or railing rehabilitation or replacement (Single Function)
3. Major repairs
4. Replacement
5. Widening
6. Overpass Screening (Single Function)
7. Tunnels
8. Large culverts (over 6 feet in diameter)
9. Seismic retrofitting
10. Painting (Single Function)
11. Soundwalls and Earth retaining walls (Single Function)

The applicable standard for Bridge projects is dependent upon the actual work being performed. An evaluation to determine if a bridge should be widened or replaced is conducted to determine the most cost effective treatment. Bridges that are to remain in place shall use the applicable ODOT Single Function, 1R, or 3R design standards. New bridges or bridges to be replaced shall use the applicable ODOT 4R design standards. When a bridge is widened, ODOT 4R design standards are typically used for bridge widths, but there may be conditions where 3R standards are applicable. The standards outlined are associated with the width of the bridge section, not the specific bridge design standards. The 3R design standards in Sections 5.3, 6.4 and 7.6 should be reviewed when determining the appropriate bridge width and issues dealing with bridges to remain in place, long bridges, and bridge cross sections.

1.4.2.7 SAFETY

Safety projects address the Region's prioritized high crash locations and corridors, including the Interstate system, in order to reduce the number of fatal and serious injury crashes. Projects funded through this program typically meet benefit/cost criteria of 1.0 or greater or are on the top 10% SPIS list. Other safety projects include systematic application of low cost, comprehensive safety improvements. Examples of safety projects include:

1. Intersection channelization
2. Climbing lanes, passing lanes, added lanes, medians, and wider shoulders
3. Curve realignments
4. Roundabouts, Traffic signals, illumination, new guardrail, signing, delineation, and continuous rumble strips, or safety edge installation.
5. Railroad crossing improvements (separate funding source)

With the Department's limited resources and practical design approach, safety projects may focus on providing solutions that are proposed to solve most of the safety issues, but not all. For example the primary intent of a left turn channelization project may install the left turn channelization to reduce rear-end crashes but may not address non-standard shoulder and lane widths or install a right turn lane where right turn criteria has been met. These safety projects are focused on a specific improvement that require mitigation but do not require addressing other non-standard features that are unrelated to the specific safety issue identified in the project scope. Limited safety funding is not intended to be used to upgrade features where there is no identified safety issue.

As with all projects, the Practical Design Goals and SCOPE Values (See Section 1.2) should be applied to safety projects. As outlined by Practical Design Goal #3 (design projects that make the system better, address changing needs, and/or maintain current functionality by meeting, but not necessarily exceeding, the define project purpose and need and project goals) safety projects may focus on specific prioritized safety issues, providing an incremental improvement while improving and/or maintaining safety. As with all projects, engineering judgment and the use of the design exception process are a vital element of the development of safety projects.

The use of Single Function, 3R, or 4R standards on a safety project will be determined on a case by case evaluation based on project context and location specifics. Because safety projects are focused on particular concerns at high crash sites, engineering judgment is necessary when evaluating roadway cross-section elements for improvement. In order to provide the greatest improvement in relation to the limited funding available, roadway elements that are directly related to the scope and focus of the safety issue being addressed will be improved. However, it may be acceptable to leave in place existing non-standard roadway elements that do not directly affect the project focus, providing that doing so does not degrade the roadway section or create additional safety concerns. For safety projects that involve channelization, figures 8-9 and 8-21 provide alternative guidance on shoulder width. Safety projects that are considered Single Function include traffic signals, illumination, signing, delineation, pavement marking, removal of fixed objects, pedestrian crossing improvements and continuous rumble strip projects that do not include significant additional pavement. Regardless of which standard is selected, design exceptions may be necessary to meet the project scope values and should be evaluated early in project scoping.

1.4.2.8 OPERATIONS

Operations projects increase the efficiency of the highway system, leading to safer traffic operations and greater system reliability. These types of projects include:

1. ITS: Intelligent Transportation System (includes ramp metering, incident management, emergency response, traffic management operation centers, and mountain pass and urban traffic cameras)
2. TDM: Transportation Demand Management (includes rideshare, vanpool, and park and ride programs)
3. Rockfalls and Slides (chronic rockfall areas and slides; not emergency repair work)
4. Signals, signs, channelization, and other operational improvements such as restriping and minor widening.

Many of the operational work type projects involve installation of system management equipment and operation improvement items such as ramp meters, response equipment or signs and signals. These installations would all use standard equipment. Operational projects such as rockfall and slide projects would use the Single function design standards as this type of project is intended for safety enhancements and not an improvement in roadway width or highway mobility.

1.4.2.9 MISCELLANEOUS/SPECIAL PROGRAMS

These are projects funded through special programs such as grants that do not easily fit into other project types. Determining the appropriate standard for these types of projects can be difficult. Generally, these projects should use the appropriate ODOT design standard. There are times when 3R standards or Single Function guidelines are appropriate. Projects that provide greater roadway width, add capacity, affect curb placement, or improve the level of mobility are to use ODOT 4R/New design standards. Examples of these special programs include:

1. Bike/Pedestrian Grants
2. Transportation Enhancement Grants
3. Fish Passage, Large Culvert Improvement, and Stormwater Retrofit
4. Immediate Opportunity Fund
5. Scenic Byway Grants

1.4.2.10 SINGLE FUNCTION

Single Function projects are projects that have very limited scope and are typically stand alone projects. Single Function projects are also generally within the right of way and do not impact the travel lanes or shoulders of the highway. Although the single function element being upgraded will generally use the 4R standard, the Single Function standard does not require addressing non-related non-standard features of the roadway. Types of Single Function projects include:

A. ROADSIDE BARRIERS

To apply the SF Standard, these projects must not affect the travel lanes or paved shoulders. When determining the placement of roadside barriers take future roadway widening into consideration. Examples of roadside barrier SF projects include:

1. Guard Rail
2. End Terminals
3. Impact Attenuators
4. Median Barrier
5. Cable Barrier

B. BRIDGE

Examples of bridge projects that may use the SF Standard include:

1. Bridge Rail (Must not reduce shoulder or sidewalk width).
2. Soundwalls
3. Retaining Walls
4. Painting
5. Overpass Screening

C. ROCK FALL MITIGATION

To apply the SF Standard, these projects must not impact the travel lanes or shoulders except that they may be used for staging. Examples include:

1. Slope Scaling
2. Rock Bench Cleaning
3. Slope Protection
4. New Rock Slope Excavation

D. DRAINAGE

When determining the placement of drainage features take future roadway widening into consideration. To apply the SF Standard, obstacles must not be introduced in the clear zone. Examples of drainage SF projects include:

1. Culvert Replacement/Repair
2. Culvert Fish Passage Enhancement
3. Storm Water Systems

E. SIGNING

Examples of signing projects that may use the SF Standard include:

1. Sign upgrades/replacements
2. Safety corridors
3. Route changes

F. PEDESTRIAN UPGRADES

To apply the SF Standard, these projects must not impact the travel lanes or shoulders except that they may be used for staging. Examples include:

1. Sidewalk Infill
2. ADA Ramp Upgrades
3. Pedestrian Crossing Improvements

G. STRIPING

To apply the SF Standard, these projects must not change the configuration of the travel lanes or shoulders in any way. Examples of striping projects that may use the SF standard include:

1. Re-striping
2. Durable Striping

H. ITS PROJECTS

Examples of ITS projects that may use the SF Standard include:

1. Cameras
2. Weather Stations

I. TRANSPORTATION ENHANCEMENT PROJECTS

To apply the SF Standard, these projects must not impact the travel lanes or shoulders except that they may be used for staging. Examples of Transportation Enhancement projects that may use the SF standard include:

1. View points
2. Interpretation sites

J. ACCESS MANAGEMENT

To apply the SF Standard, these projects must not impact the travel lanes or shoulders except that they may be used for staging. Examples of access Management projects that may use the SF standard include:

1. Closing or consolidating approaches
2. Installing median barrier

K. OTHER

There are many other standalone projects that may use the SF Standard. These projects must have no permanent detrimental impact on the travel lanes or shoulders of the roadway. Examples include:

1. Illumination
2. Rumble strips
3. Traffic signal installation.
4. Shoulder widening

1.4.3 DESIGN STANDARD SELECTION

The following matrix shows which design standards are applicable for certain projects based on project type, and if the project involves a state route or not. These design standards, when used with an appropriate design speed, are the criteria for whether an exception shall be required for a project.

There are two levels of exceptions for projects. The first level is an exception from the ODOT specific standards for all projects located on a state highway.

The second level of exceptions apply to all projects which are federally funded. This would be either an exception from AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"* design standards in the case of certain New/Reconstruction projects, or an exception to *"A Policy on Design Standards - Interstate System - 2005"* for 3R projects.

See Chapter 14 for further information concerning design exceptions.

Table 1-1: Design Standards Selection Matrix

Project Type	Roadway Jurisdiction				
	State Highways			Local Agency Roads [1]	
	Interstate	Urban State Highways	Rural State Highways	Urban	Rural
Modernization/ Bridge New/Replacement	ODOT 4R/New Freeway	ODOT 4R/New Urban	ODOT 4R/New Rural	AASHTO	
Preservation/ Bridge Rehabilitation	ODOT 3R Freeway	ODOT 3R Urban	ODOT 3R Rural	AASHTO [2]	ODOT 3R Rural [3]
Preventive Maintenance [4]	1R	1R	1R	NA	NA
Safety-Operations-Miscellaneous/ Special Programs	ODOT Freeway [5]	ODOT Urban [5]	ODOT Rural [5]	AASHTO	ODOT 3R Rural

1 For projects on a local jurisdiction route, the local authority may, at its option, use either the appropriate AASHTO's "A Policy On Geometric Design Of Highways And Streets - 2011" standard or select a standard of their own choice. This discretion is given by ORS 368.036. (ORS 368.036 applies to counties only, not cities.). **AASHTO standards shall be used for all local agency jurisdiction roadway projects on the National Highway System (NHS)**.

2 The local agency has the choice to use AASHTO's *"A Policy On Geometric Design Of Highways And Streets - 2011"* or ODOT 3R Urban design standards. Local Agencies may use AASHTO for Vertical Clearance requirements on Local Agency Jurisdiction Roads.

3 The local agency has the choice to use AASHTO's *"A Policy On Geometric Design Of Highways And Streets - 2011"* or ODOT 3R Rural design standards. Local Agencies may use AASHTO for Vertical Clearance requirements on Local Agency Jurisdiction Roads.

4 Federally funded Preventive Maintenance work, which includes Chip Seals and Thin Overlays, will be required to follow 1R standards.

5 The appropriate ODOT 3R standard may be used for some projects. Selection is case by case. Designer to confirm appropriate standard with Region Roadway Manager.

1.4.4 ADDITIONAL REFERENCES

1.4.4.1 AASHTO REFERENCES

The following policies are helpful when developing transportation projects, and are currently available by order from AASHTO:

- *A Policy on Geometric Design of Highways and Streets – 2011.*
- *AASHTO Roadside Design Guide - 2011.*
- *A Policy on Design Standards Interstate System - 2005.*
- *Guide for Development of New Bicycle Facilities – 2012.*

1.4.4.2 OTHER REFERENCES (AVAILABLE FROM OTHER SOURCES-NOT ALL INCLUSIVE):

- *Federal Aviation Regulations, Part 77 (D.O.T., F.A.A.)*
- *Oregon Standard Drawings*
- *Oregon Standard Specifications for Highway Construction – 2008*
- *Contract Plans and Development Guide*
- *Manual on Uniform Traffic Control Devices and Oregon Supplementals*
- *ODOT Traffic Volume Tables*
- *Highway Capacity Manual,*
- *The 1999 Oregon Highway Plan*
- *State of Oregon, Bicycle and Pedestrian Plan - 2005*
- *Oregon Bicycle and Pedestrian Design Guide - 2011, ODOT*
- *TRB Special Report #214, Practices for Resurfacing, Restoration and Rehabilitation*
- *ODOT Soil and Rock Classification Manual,*
- *ODOT Bridge Design and Drafting Manual*
- *ODOT Geotechnical Design Manual*
- *ODOT Hydraulics Manual*
- *ODOT Traffic Manual*
- *ODOT Traffic Control Plans Design Manual*
- *ODOT Right of Way Manual*
- *ODOT Survey Manual*
- *ODOT Project Delivery Guidebook*
- *ODOT Access Management Manual*
- *ODOT Analysis Procedures Manual (APM)*
- *ODOT Traffic Signal Policy and Guidelines*
- *ODOT Traffic Signal Design Manual*
- *ODOT Highway Safety Program Guide*
- *ODOT Construction Manual*
- *Local Agency Guidelines Manual*

1.5 ODOT 3R DESIGN PROCESS (FREEWAY, URBAN AND RURAL NON-FREEWAY)

1.5.1 GENERAL

The information provided in this section relates to the different design processes associated with 3R design (freeway, urban and rural non-freeway). Background information is provided for the different standards, strategies discussed, and required design processes outlined. The specific design standards are located in other sections of this manual. This section is intended to provide the designer with an outline of processes to follow once the appropriate project type has been determined. Section 1.5.2 provides general guidance to be used for both the Freeway and Non-Freeway 3R process, while Sections 1.5.3 and 1.5.4 provide specific Freeway and Non-Freeway 3R guidance respectively.

1.5.2 3R DESIGN CRITERIA

1.5.2.1 BACKGROUND

In 1988, the Oregon Transportation Commission adopted the 3R Geometric Design Standard and modified it in 1998 for development of 3R projects. These standards are not applicable to 4R projects.

The main focus of the 3R design process is to preserve and enhance the highway surface while systematically considering cost effective safety enhancements on a case by case basis.

In 1991 the AASHTO Task Force on Geometric Design, of the AASHTO Highway Subcommittee on Design, prepared a design policy for Interstate freeways. This publication, "*A Policy on Design Standards-Interstate System - 2005* gives 3R and 4R standards for work on the Interstate system. These standards are to be interpreted as supplemental to ODOT Design Standards. Section 5.2 (ODOT 4R Freeway Design Standards) and Section 5.3 (ODOT 3R Freeway Design Standard) provide the standards to be used on Freeway 4R and 3R projects. The development of a freeway 3R project should be responsive to the considerations given concerning purpose, applicability, scope, determination, and design process. The freeway 3R design process has been modified to take into consideration the Interstate Maintenance Preservation Program.

The changes to the 3R design process in 1998 were in response to a shift in the Department's strategy for pavement preservation and were an attempt to maximize the benefit of money invested in preservation projects towards improving surface condition. This manual reflects that strategy, and builds in additional policy guidance concerning 3R and, more recently, 1R (See Section 1.3.2.5 for 1R information). The 3R design process now takes into consideration the

Urban Preservation Strategy Policy (See Section 6.4.12) and the Interstate Maintenance Strategy Policy (See Table 5-4).

1.5.2.2 PURPOSE

The ODOT 3R standards apply to resurfacing, rehabilitation, and restoration (3R) projects that preserve and extend the service life of existing highways. While the primary focus of these projects is pavement preservation, consideration of improvement of safety features is an essential design element. All projects utilizing ODOT 3R standards will be developed and accomplished in a manner that considers and includes appropriate safety improvements. Improvements may include minor widening, flattening side slopes, removal of roadside hazards, delineation, etc.

By their purpose and definition, preservation projects emphasize the economic management of the existing highway system in order to protect the investment and get the maximum economic benefit from available funds. Economic considerations are a major factor in determining the priority and scope of preservation projects using 3R design standards. The scope is influenced by factors such as roadside conditions, cost of correction, environmental concerns, changing traffic and land use patterns, surface deterioration, and crash type and rate. Special emphasis is placed on pavement preservation, recognizing, however, that certain cost-effective improvements for safety and operational purposes may be necessary and desirable.

Major improvements dealing with bridge widening, horizontal and vertical alignments, side slopes and crash reduction at high crash locations, including public road intersections, will normally be funded (depending on their priority and the availability of funds) through the Bridge Management and Highway Safety Improvement Programs. The needs should continue to be identified and addressed during project development and it may be most cost effective to include this work with the project. When a design feature does not meet the 3R standard, a design exception must be requested and low-cost safety mitigations as listed in Tables 6-9 and 7-6 (Low-Cost Safety Measures) shall be considered.

1.5.2.3 APPLICABILITY

The standards apply to geometric design features such as lane and shoulder widths, horizontal curvature and superelevation, vertical curvature and stopping sight distances, bridge width, cross and side slopes, and horizontal and vertical clearances. The standards also discuss other features such as pavement life, traffic control devices, guardrail, and other preservation design features.

The standards do not apply to reconstruction projects (the 4th R) which shall meet new construction standards.

As noted, preservation projects primarily preserve and extend the service life of existing highways and enhance safety through surface improvements. These types of projects generally do not increase the highway mobility of the overall section. Projects may include such items as placement of additional surface material and/or other work necessary to return an existing roadway, including shoulders, bridges, roadside features and appurtenances, to a condition of structural and functional adequacy. Projects utilizing ODOT 3R design standards may also include reworking or strengthening of base materials and minor upgrading of geometric features and appurtenances for safety purposes.

The Urban Preservation Strategy (Section 1.5.4.1) provides additional guidance in determining appropriate 3R work in urban areas. This strategy utilizes all of the guidelines outlined in this section, including the Highway Safety Improvement Program (HSIP) tools and processes, and then provides additional guidance in the Urban Preservation Design Features, Table 6-10.

An active project in development provides an opportunity to provide more mitigation of minor roadside features than would normally be done under the HSIP alone, particularly if a desirable improvement can be made at a minimal cost. Cost effective safety improvements of an individual project should be a major factor in the evaluation for determination of appropriate safety investments. Some projects may require small amounts of right of way in order to address the reasonable and desirable geometric and safety needs.

When upgrading of geometric features becomes a major factor resulting in substantial capacity improvements (adding through lanes, extensive curve realignments, and modification of original subgrade), the project is "reconstruction" (4th R). The threshold for determining if these features are a major factor is if they are over 50% of the project length. Applicable ODOT 4R/New standards will apply to reconstruction projects. The project prospectus will identify the applicable standards, ODOT 3R or ODOT 4R/New, to be used on individual projects.

1.5.2.4 PROJECT SCOPING

The Project Team determines the level of scoping effort. Scoping Teams should consist of a broad based inter-disciplinary team that will vary depending of the needs of the particular project. For example top 10% SPIS site location projects may require additional expertise and representation, such as the Region Traffic Engineer, on the project scoping team due to the significant crash history and safety. The Project Delivery Guidebook and The Project Scoping Best Practices Guidebook should be used to assist in project scoping and determination of appropriate personnel for the scoping team. 3R projects may not require as many team members as a 4R project. Besides the Project Leader, representatives (not exclusive) may include: Design, Bridge, Traffic, Maintenance, Construction, Environmental, Pavements, Utilities, Survey, Geo/Hydro, Access Management, Right of Way, and Local Agency.

The intent of the Scoping Team is to identify the parameters of the project, clearly identify the problem, and identify a range of solutions. These may include some low cost mitigation measures or safety enhancements if funding is available.

To assist in the analysis and scoping trip, Roadside Inventory Items 3, 4 and 5, (see Section 11.1.4.2 Roadside Inventory for 3R) should be completed by the Roadway Designer prior to the site visit. They can then be reviewed on site by the team and compared with the crash history. Major improvements dealing with deficiencies identified in Roadside Inventory Items 3, 4 and

5, (see Section 11.1.4.2 Roadside Inventory for 3R) will rarely be incorporated on this category of project. The analysis and scoping trip should result in the identification of cost effective safety treatments.

The scoping team should determine the level of effort that will be required by the survey crew the during program development and project development phases. Very definite parameters should be set as to which roadside obstacles need to be inventoried. The intent of the inventory is not to survey every fixed object or culvert throughout the project. Only those objects near the roadway that constitute a substantial hazard should be inventoried. Continuous runs of utility poles or trees at the R/W line generally don't need to be inventoried. However, if there is a location with a number of run-off-the-road crashes (i.e. on the outside of a curve), then the effort and the area covered in the inventory should be increased. The ODOT Roadway Departure Safety program can be used to identify locations of high roadway departure locations and proposed countermeasures.

Other than roadside features, the field work should be limited to the amount needed for quantity calculations, in particular leveling for crown and super correction. By their nature, urban projects may require some additional work but every effort should be made to limit the survey work to the minimum needed for the particular project.

During scoping, the need for exceptions from design standards, or for new traffic control devices, should be identified. Design exception requests shall be submitted as early as possible in the project development process. This will minimize the need for redesign should the exception request be denied. For further information on design exceptions, see Chapter 14.

The scope of a preservation project or other project utilizing ODOT 3R standards is determined by many factors. The following shall be considered and discussed as appropriate in the Project Prospectus.

1. **Pavement Condition** - The existing pavement condition and the scope of needed pavement improvements dictate, to a large extent, those improvements that are feasible, prudent, or practical. Significant geometric upgrading might be appropriate if the pavement improvements are substantial, but may not be appropriate or economical if the needed pavement improvements are relatively minor.

2. **Physical Characteristics** - The physical characteristics of a highway and its general location often determine those improvements that are necessary, desirable, possible, practical, or cost effective. Topography, climate, adjacent development, existing alignment (horizontal and vertical), cross-section (lane width, shoulder width, sidewalks, cross slope, side slopes, superelevation, etc.) and similar characteristics along with intersection evaluation should be considered in determining the scope of geometric or safety improvements to be made in conjunction with pavement improvements. Additionally, route continuity is a major determining factor in the overall scope of preservation projects.

3. **Traffic Volumes** - Completing a cursory level Traffic analysis should-be considered. It is an important consideration both in the determination of the appropriate level of improvement (i.e., reconstruction vs. 3R) and in the selection of actual design values for

the various geometric elements. For projects using ODOT 3R standards, the need for a formal forecast of future traffic is greatest when the current traffic is approaching the capacity of the highway, and decisions must be made regarding the timing of major improvements such as additional lanes. On the other hand, formal forecasts are not normally necessary on very low volume roads where even high percentage increases in traffic will not significantly impact design decisions. Transportation Planning and Analysis or Region Traffic can often provide future year Average Daily Traffic (ADT's) for highway segments. This information is also very useful in scoping a preservation project. A detailed traffic analysis of design hour volumes, turning movements, and vehicle composition is at the discretion of the Project Team.

4. **Crash Records** - A review of crash records is an integral part of the preservation project development process. Evaluation of crash records often reveals problems requiring special attention. In addition, relative crash rates can be an important factor in establishing both the priority and the scope of these projects. Regardless of the SPIS ranking, every preservation project using 3R design standards needs to have a full crash analysis completed. Crash listings should be pulled for the last five years and analyzed by the Region Traffic Engineer (or equivalent). The intent of this review is to look for trends, overrepresentation of certain crash types, locations with a high number of non-fatal/injury crashes, and other situations, which may, in the judgment of the Region Traffic Engineer, justify further investigation. This review, when coupled with the on-site visit, may identify some low cost mitigation measures that could generate a significant reduction in crashes or their potential. Therefore, this review may also identify the need for larger scale solutions that may need to be programmed into the project, or identify a future safety funded project.

   There may be cases when a SPIS (Safety Priority Index System) site is located within the project limits. Full analysis is needed of these locations to determine the appropriate solution to the problem creating the crashes. Funding for the top 10% SPIS solutions can come from the Region's Highway Safety Investment Program or other funding sources but a decision to include the work in the preservation project or leave it as a stand alone project must be made by the Project Team.

   - Safety Priority Index System (SPIS) Ranking

     The SPIS is a method of identifying potential locations that have exhibited high instances of crash activity for further investigation. Locations that exhibit a high number of crashes may or may not have remedies to reduce the frequency of crashes. A careful investigation is required to determine the causes or root problem of the crashes and even then a relatively high occurrence of crashes may only be due to the sporadic nature of crashes. The goal of investigating these locations is to systematically investigate sites where there is potential to reduce the risk, occurrence and/or severity of crashes and apply limited safety money to produce the highest benefit.

     The SPIS score is based on three years of crash data and considers crash frequency, crash rate, and crash severity. A roadway segment becomes a SPIS site if a location has three or more crashes or one or more fatal crashes over the three year period. SPIS sites are 0.10 mile sections on the state highway system. The top 15% SPIS sites are shown on the Annual SPIS Maps.

While the predominant analysis technique currently used by the Department relies on historic crash records and a detailed analysis of those crashes and comparisons to the network performance, it is important that designers be aware of the resources at the Region Traffic level to address preventive strategies where historic analysis may not be conclusive or indicative of concerns. Such techniques include road safety audits, assessment of the safety performance of an existing or planned facility by a qualified and independent team, and evaluation of the future safety performance of a facility based on crash data but supplemented by roadway geometric data and volume data. Designers are encouraged to involve Region Traffic staff through the scoping process to determine applicability of these techniques to the project.

5. **Potential Impacts of Various Types of Improvements** - Quite often, the scope of geometric improvements made by preservation projects is influenced by potential impacts to the surrounding land and development. At time, social, environmental, and economic impacts severely limit the scope of preservation projects using 3R design standards, particularly where the existing right of way is narrow and there is considerable adjacent development. The need for additional right of way may determine the upper limit of practical geometric improvements. Although some impacts may be outside the scope of the project, there should always be a review of cost effective safety improvements and an approach that looks at incremental improvement.

6. **Speed** - Evaluation of design features generally requires the determination of the appropriate design speed based upon the highway type, terrain and adjacent land use or regulatory speed. It is important that the design speed selected for a project realistically reflect the speeds at which vehicles can be expected to operate or are actually operating on the highway. On projects using ODOT 3R standards, the design speed is the same as the posted speed in most cases. See Section 2.5 for information on selection of design speed.

1.5.2.5 ROADSIDE INVENTORY

Section 11.1 (Roadside inventory) provides information on the roadside inventory for projects.

1.5.3 3R DESIGN PROCESS - FREEWAY

The design process for Freeway 3R projects requires a roadside inventory as outlined in Section 11.1.4 and should follow the 3R process outline in Section 1.5.2. In addition to the roadside inventory, the Interstate Maintenance Design Features have been added to the Freeway 3R design process.

The Interstate Maintenance Design Features shown in Section 5.3 provide additional guidance in determining appropriate 3R work on freeways. The Interstate Maintenance program utilizes all of the guidelines outlined in Section 1.5.2 (Purpose, Applicability, Project scoping) and then provides additional guidance as shown in the Interstate Maintenance Design Features Table 5-4 located in Section 5.3 (ODOT 3R Freeway Design Standard). The “have to” list is the recommended minimum treatment for the listed project elements. The “like to” list includes treatments for elements which should be considered when economically feasible (i.e. minimum cost, or funds available from sources other than the Preservation Program). Items covered in Interstate Maintenance Design Features include:

1. Guardrail
2. Concrete Barrier
3. Interchange Ramp Surfacing
4. Roadside Obstacles
5. Bridges
6. Delineators
7. Fencing
8. Signing, Illumination, and Signal Loops
9. Attenuators
10. Rumble Strips
11. Pavement Life
12. Striping
13. Drainage

1.5.4 3R DESIGN PROCESSES - URBAN AND RUAL NON - FREEWAY

The design process outlined in Section 1.5.2 provides guidelines for developing an urban or rural non-freeway preservation project using 3R design standards. Roadside inventory requirements are covered in Section 11.1.4. The Urban Preservation Strategy Design Guidelines are to be applied to urban non-freeway preservation 3R design projects (See Section 6.4.12).

1.5.4.1 URBAN PRESERVATION STRATEGY

Due to the number of features that come into play in urban projects, further guidance is required to scope and develop projects appropriately and consistently statewide in an effort to ensure the entire pavement system can be adequately maintained with available preservation funds. To this end, in addition to the SPIS Design Process, urban preservation projects using 3R design standards must also be processed through the Urban Preservation Strategy.

The Urban Preservation Strategy focuses on preserving the life and safety of the pavement system "curb to curb". The Strategy utilizes all of the guidelines outlined in this chapter and then provides additional guidance as shown in Table 6-10, "Urban Preservation Design Features." Section 6.4.12 outlines the Urban Preservation Strategy.

While the same process is applicable and relevant for rural preservation projects, this strategy is not generally applied to them, due to the differing roadside features.

For more information on the Urban Preservation Strategy, see Section 6.4.12

1.6 EMERGENCY RELIEF PROGRAM-BETTERMENTS

1.6.1 GENERAL

The Emergency Relief (ER) program is intended to assist the States and local agencies in repairing disaster damaged highway facilities and returning them to their predisaster condition. In-kind restoration is the predominate type of repair. The purpose of this section is to define betterments, explain the Federal Highway Administration (FHWA) policy on betterments, give examples of betterments and provide guidance on the submittal of betterment requests for FHWA approval.

1.6.2 DEFINITION

A betterment is defined as (1) an additional feature or upgrading, or (2) a change in capacity, function or character of the facility from its predisaster condition. Betterment requests during the last several years have been limited to the first category, with no proposals to change the capacity, function or character of a facility.

1.6.3 POLICY

FHWA policy permits the approval of ER funding for upgrading or additional features to protect the highway from future disaster damage. To receive such approval, it must be shown that the ER expenditure is cost-effective in terms of reducing probable future recurring repair costs to the ER program. It is also FHWA policy that betterments to correct pre-existing conditions, particularly at landslides, will be subjected to a stricture test and it will be considerably more difficult to justify the expenditure of ER funds at such sites.

In general, betterments that change the capacity, function or character of a facility are not eligible for ER funding. Examples of this category of betterment include:

1. Adding lanes
2. Upgrading surfaces, such as from gravel to paved
3. Improving access control
4. Adding grade separation
5. Changing from rural to urban cross-section

One exception is that under special circumstances, ER funding can be used for a replacement bridge that can accommodate traffic volumes over the design life of the bridge, thus potentially allowing ER funding for added lane(s) on the structure.

1.6.4 EXAMPLES OF BETTERMENTS

The following are examples of upgrading or additional features that are considered betterments. Specific FHWA approval is required before ER funds can be used for the following:

1. Stabilizing slide areas (e.g., internal dewatering systems, retaining structures, etc.)
2. Stabilizing slopes
3. Raising roadway grades
4. Relocating roadways to higher ground or away from slide prone areas
5. Installing riprap
6. Lengthening or raising bridges to increase waterway openings
7. Deepening channels
8. Increasing the size or number of drainage structures
9. Replacing culverts with bridges
10. Installing seismic retrofits on bridges
11. Adding scour protection at bridges
12. Adding spur dikes

There will be cases where one of the above features can be added with only a relatively minor expenditure of ER funds. These may include, for example, short and low height retaining structures, small areas of rock inlays for slope stabilization or installation of small amounts of riprap incidental to other repair work. The decision whether this work will be considered a betterment will be decided on a case-by-case basis.

The following are examples of upgrading or additional features that are not considered betterments:

1. Replacement of older features or facilities with new ones,
2. Incorporation of current design standards, and
3. Additional features resulting from the environmental process required as a condition of permit approval.

1.6.5 APPROVAL REQUESTS

To request approval of a betterment, it will be necessary to provide detailed justification. It is important that the request contain information regarding conditions at the site prior to the disaster (including a brief summary of previous problems) and the current conditions at the site. The "do nothing" alternative must be discussed and it is expected that most proposals would include at least two "build" alternatives. Estimated costs for each alternative are needed. The appropriate ODOT unit must review and endorse betterment requests prepared by consultants.

The same basic rules will apply to betterment requests on local agency facilities. These proposals must be reviewed and endorsed by the appropriate ODOT unit and the request to use ER funds for such betterments must be made by ODOT in order to be considered.

As previously noted, if ER funds are to be approved, the betterment must be economically justified based on an analysis of the cost of the betterment versus projected savings in costs to the ER program should future disasters occur. This cost/benefit analysis must focus solely on benefits resulting from estimated savings in future recurring repair costs under the ER program. The analysis cannot include other factors typically included in highway benefit/cost evaluations such as traffic delay costs, added user costs, motorist safety, economic impacts, etc.

If FHWA is unable to provide ER funding for betterment, ODOT or the local agency has the option to include the work in either the ER repair project or a separate project, and fund it with other Federal-aid, State or local funds.