

Institutionalizing Flexibility in Transportation Design-Washington

WA-RD 634.1

Research Report
November 2005



**Washington State
Department of Transportation**

Washington State Transportation Commission
Research Office:
U.S. DOT - Federal Highway Administration

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO. WA-RD 634.1	2. GOVERNMENT ACCESSION NO.	3. RECIPIENTS CATALOG NO	
4. TITLE AND SUBTITLE Institutionalizing Flexibility in Transportation Design – Washington		5. REPORT DATE 11/15/2005	
		6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S) Anna St. Martin Samih Shilbayeh John Milton		8. PERFORMING ORGANIZATION REPORT NO.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Washington State Department of Transportation P.O. Box 47329 Olympia, Washington 98504-7329		10. WORK UNIT NO.	
		11. CONTRACT OR GRANT NO.	
12. SPONSORING AGENCY NAME AND ADDRESS		13. TYPE OF REPORT AND PERIOD COVERED	
		14. SPONSORING AGENCY CODE	
15. SUPPLEMENTARY NOTES This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.			
16. ABSTRACT <p>The Washington State Department of Transportation (WSDOT) has initiated a multi-faceted, multidisciplinary approach to institutionalizing the processes of Context-Sensitive Design/ Context-Sensitive Solutions (CSD/CSS) into all highway projects. The concepts of CSD/CSS are not always fully understood and have been construed at times as a license to drop the level of safety standards regardless of the needs and contexts of the facility. As a state highway agency WSDOT, with its partners has focused on defining the philosophy and concepts of CSD/CSS, creating a consistent approach to developing and implementing projects and training staff and partner agencies to improve understanding and to allow for the dissemination of information to stakeholders regarding the CSD/CSS approach.</p> <p>This paper emphasizes the necessity of CSD/CSS as a way of doing business, ensuring that the practice of designing transportation facilities involves an informed, balanced approach that considers safety, aesthetics, and community needs.</p> <p>Experience has shown WSDOT that to be successful requires support from the top of the agency. This was memorialized in an Executive Order detailing WSDOT's CSD/CSS approach. Two documents were developed. The first to improve stakeholder and partner interaction and communication and the second to better define the concept, trade-offs, and considerations when flexibility in design is part of the project development process. Preliminary results of research on CSD have shown that safe and aesthetically attractive features and contextual designs can be developed to meet the varied needs of project stakeholders.</p>			
17. KEY WORDS Context sensitive design, flexibility in transportation design		18. DISTRIBUTION STATEMENT	
19. SECURITY CLASSIF. (of this report)	20. SECURITY CLASSIF. (of this page)	21. NO. OF PAGES	22. PRICE

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Revised version submitted November 15, 2005

Originally submitted July 31, 2005

Word count: 4,825 (excluding references and figure, including abstract)

Tables and figures: 1 (equivalent of 250 words)

Total, words and figures: 5,075

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The Washington State Department of Transportation (WSDOT) has initiated a multi-faceted, multidisciplinary approach to institutionalizing the processes of Context-Sensitive Design/Context-Sensitive Solutions (CSD/CSS) into all highway projects. The concepts of CSD/CSS are not always fully understood and have been construed at times as a license to drop the level of safety standards regardless of the needs and contexts of the facility. As a state highway agency WSDOT, with its partners has focused on defining the philosophy and concepts of CSD/CSS, creating a consistent approach to developing and implementing projects and training staff and partner agencies to improve understanding and to allow for the dissemination of information to stakeholders regarding the CSD/CSS approach.

This paper emphasizes the necessity of CSD/CSS as a way of doing business, ensuring that the practice of designing transportation facilities involves an informed, balanced approach that considers safety, aesthetics, and community needs.

Experience has shown WSDOT that to be successful requires support from the top of the agency. This was memorialized in an Executive Order detailing WSDOT's CSD/CSS approach. Two documents were developed. The first to improve stakeholder and partner interaction and communication and the second to better define the concept, trade-offs, and considerations when flexibility in design is part of the project development process. Preliminary results of research on CSD have shown that safe and aesthetically attractive features and contextual designs can be developed to meet the varied needs of project stakeholders.

INTRODUCTION

The Washington State Department of Transportation (WSDOT) is guided by a statewide vision for transportation of livable communities, which is part of the Washington Transportation Plan, (1). WSDOT develops projects in rural and urban areas by working with its partners to foster multi-modal transportation systems that enhance communities, and to develop collaborative transportation actions sensitive to community values (1).

To truly optimize safety, aesthetics, and other competing transportation elements for a highway facility and its surrounding components requires an understanding of the region's transportation needs. It also requires an understanding of the local issues, transportation modes, environment, and the changing contexts through which highways run. Flexibility means balancing the trade-offs between competing needs. To achieve optimization, the WSDOT initiated numerous efforts within a Context Sensitive Design/ Context-Sensitive Solutions (CSD/CSS) program to ensure that all needs and desires associated with the facility were considered early and for all modes.

WSDOT's multi-faceted approach to projects is an institutionalized way of doing business, and has in other forms been around for many years. While recent emphasis in the CSD effort has brought a considerable desire of advocates to vary from adopted standards, WSDOT has recognized that these simple philosophies are not consistent with optimal designs or decisions. WSDOT has maintained focus on defining the concepts, creating a consistent approach to developing context-sensitive projects, training staff, and disseminating information to stakeholders regarding the context-sensitive design process. This paper describes those efforts.

WSDOT's Background

WSDOT has worked to include participation from stakeholders; manage the environmental resources; accommodate design deviations when appropriate; and design, construct, and operate safe and efficient highway facilities with as few negative impacts on the local community as possible. However, frequently each of these elements was approached independent from the others and some of them might be initiated late in the project development process. For example, the WSDOT design criteria states that for highways with speeds of 35 mph or less, there must be at least 10 feet from the edge of the outside lane to any object greater than 4 inches in diameter (2). This criterion is supported by research that correlates the speeds of vehicles and the distance to fixed objects, with the severity of collisions (3). It does not however, explicitly consider the trade-offs and context for which the fixed object might be placed. By establishing a minimum distance to fixed objects, the severity of accident might be reduced. However, this standard of design effectively limits Washington cities from placing trees in the locations they desire: in close proximity to the roadside and within landscaped medians, even in locations where trade-offs are great or probability of crash occurrence is low.

Because of tort concerns, limited safety research, and project plan modifications that would be required by the proposed changes, there existed limited desire to deviate from standards. This was the case even when aesthetic, environmental, surrounding community, or other benefits were quantitatively shown. On the other hand, anecdotal evidence and conjecture was often presented as the definitive source to illustrate the safety benefits of trees for one mode over another, even when those locations had quantified accident severity and frequency concerns directly attributed to high frequency of run off road and fixed object accidents. The rhetorical

battle between highway safety experts and engineers with community groups would often reach points of impasse and consternation. Disagreements between WSDOT and local agencies were common, which contributed to a sense of distrust between parties. In addition, projects were often delayed and run over budget, and the projects that were constructed were not optimal for the location, safety, environment, or aesthetics. Altogether there was no consistent or efficient approach to developing projects with consideration for the unique context.

WSDOT evaluated their approach to project design, and perceived the need for institutionalizing CSD principles based on the conflicts resulting from their inconsistent approach to developing projects to meet the varied needs of the stakeholders. Facilitating change at the end of the project development process, when disagreements and project plans were solidified was not conducive to producing optimal results or designs.

As noted at the *Thinking Beyond the Pavement* workshop in 1998,

Barriers to context-sensitive design are many. Traditional organizational roles tend to segment responsibility rigidly, narrowing the range of potential responses and boxing participants into conventional solutions. The application of uniform design standards creates a powerful implication that anything different is somehow sub-standard when, in specific cases, just the opposite may well be true. Communities either have not clearly articulated their values and vision, or are not asked to do so until too late in the process, when their only recourse is to protest—strenuously. (4)

Understanding these complexities, WSDOT led a number of efforts to initiate a formal CSD approach within the transportation community. These efforts included forming several workgroups comprised of WSDOT staff and local and national-level transportation professionals. The products of their efforts are illustrated in Figure 1 and are discussed below.

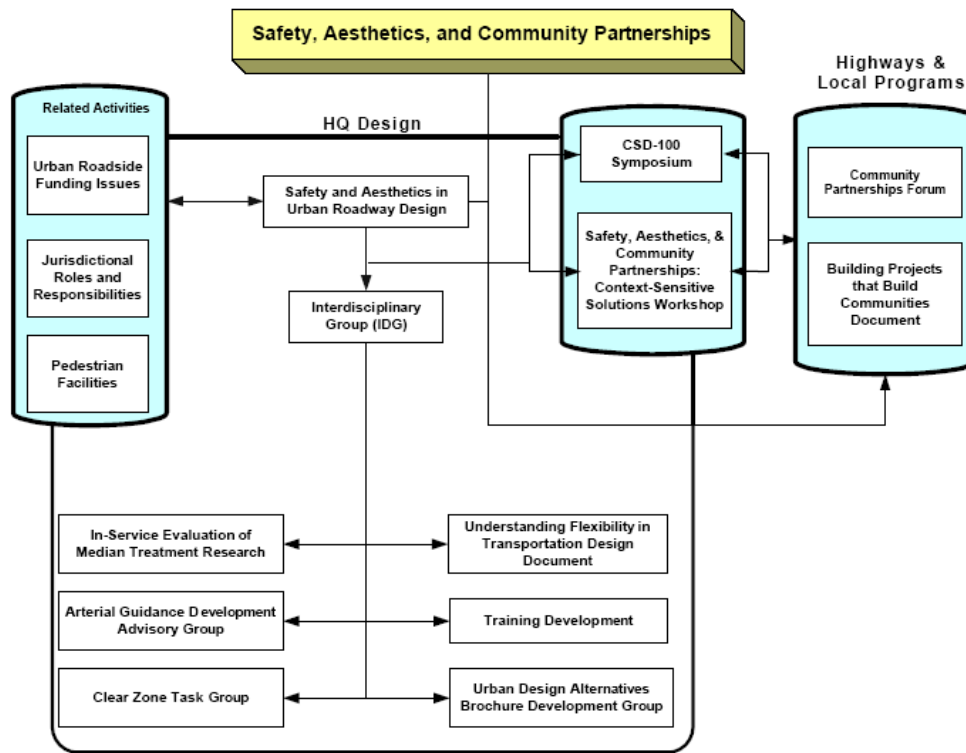


FIGURE 1 Flowchart of Safety, Aesthetics, and Community Partnerships CSD efforts

In March 2001 a team of transportation professionals from cities in the greater Seattle area and from the Department of Transportation gathered to participate in a Value Engineering (VE) Study focusing on the needs for and options available to address urban median and roadside treatments. The purpose of the team was to “develop recommendations for design standards that can be applied to the development of landscape medians and roadsides in 35 to 45 mile per hour (posted) facilities to enhance safety, function and aesthetic characteristics” (5).

The team began by investigating the issues and concerns regarding landscaped medians and roadsides in the urban environment. They identified five functions of landscaped medians and roadsides, and brainstormed 173 options, ideas and elements that addressed safety, aesthetics, stormwater, and multiple modes of transportation. They then evaluated the ideas by listing the advantages and disadvantages of each, carrying forward a shorter list that warranted further development. The development phase concentrated on landscaped medians, and resulted in a list of eight recommendations. These recommendations included listing the known acceptable treatments for mitigating fixed objects (such as street trees) within the design clear zone as well as what typical treatments (such as 6-in. curb) that do not adequately mitigate fixed objects. They detailed what research needs to be undertaken to provide additional alternatives for landscaped medians, and defined the need for an in-service evaluation policy for landscaped medians already installed. During the VE Study process the team sketched ideas for landscaped medians, concluding that a brochure illustrating the final ideas in detail would be helpful, and recommended that WSDOT produce such a pamphlet. The most extensive VE Study recommendation focused on developing policy for landscaped median designs that would address the competing needs of the complex issues in the urban environment. The outcomes of several of the VE Study recommendations are discussed below.

Community Partnership Forum

The Community Partnerships Forum was formed to improve relationships and communication between local agencies and WSDOT. The Community Partnerships Forum was a multi-jurisdictional group.

This team had representatives from FHWA, WSDOT, Sound Transit, Association of Washington Cities, county and city representatives, and private engineering firms.

They were charged with:

- Identification of project barriers,
- Expediting project development processes, and
- Promoting partnerships to address needs.

This group helped bring in the CSD Training program, presented recommendations to Executives, and most notably, produced the *Building Projects that Build Communities* guidebook discussed below (6).

Interdisciplinary Group (IDG)

The Safety and Aesthetics in Urban Roadway Design Interdisciplinary Group (IDG) was formed in 2001 to help identify and articulate priorities and potential issues. Membership includes representatives from local and federal agencies and various disciplines within WSDOT, including planning, project development, local programs, and landscape design.

The group, and the effort it supports, was initiated based on the Value Engineering Study team recommendation to develop comprehensive policy guidance for aesthetic urban roadway designs. The mission of the Safety and Aesthetics in Urban Roadway Design effort is to:

- Perform a comprehensive evaluation of urban roadway design issues (considering the values for safety, operations, community and aesthetics, natural and built environment, and jurisdiction) and
- Support the evaluation and development of design policies and standards related to urban roadway design.

This was to be accomplished by working with local agencies to determine guidelines and policies that provide functional, safe, and aesthetic transportation facilities that meet local and state needs.

The IDG designated subgroups in order to better understand the issues and who they are important to, identify short- and long-term opportunities to find solutions, and determine the best ‘who’ and ‘how’ to implement the solutions (7).

OUTCOMES OF WSDOT CSD EFFORTS

To date, the principle outcomes of WSDOT’s CSD effort include:

- An Executive Order detailing WSDOT’s CSD/CSS approach;
- Two guidance documents, focusing on
 - 1) Improving stakeholder and partner interaction and communication and
 - 2) The concept, trade-offs, and considerations when flexibility in design is part of the project development process; and
- A training course on CSD for WSDOT staff and transportation professionals.

In addition, WSDOT has continued to provide support for current research, including studies investigating the impacts of trade-offs made in context-sensitive projects, and a new median barrier that is considered aesthetically appealing and appropriate for more urban contexts.

Each of these products is discussed below.

Executive Order E 1028.00

WSDOT’s Context Sensitive Solutions Executive Order was published in December 2003. It states that WSDOT endorses the CSD/CSS approach for all projects, large and small, from early planning through construction and eventual operation and that these transportation projects must be planned for impacts on the aesthetic, social, economic, and environmental values, needs, constraints, and opportunities of the broad community setting, in addition to the traditional physical aspects as a facility serving specific functional objectives.

The Executive Order directs WSDOT employees to engage in the following activities during all stages of project design, construction, and operation:

- Engage representatives of affected communities, including elected and appointed officials and a widely representative array of interested citizens, early and continuously.

- Clearly describe and discuss transportation project objectives with local communities in a process that encourages reciprocal communication about local views and needs in the overall project setting.
- Pay attention to and address community and citizen concerns, and
- Ensure the project is a safe facility for both the user and the community.

The emphasis the CSD processes place on stakeholder involvement focus on seeking, and if possible achieving consensus to help avoid delay and other costly obstacles to project implementation (8).

Building Projects That Build Communities

To implement the context-sensitive vision, the WSDOT Community Partnership Forum developed a best practices guidebook, *Building Projects That Build Communities* (6). This document focuses on effective community-based designs and collaborative decision-making. The concept of a true community partnership is good in theory, but can be difficult to put into practice, particularly when a state highway essentially serves as the “Main Street” for a community. It is developed with an understanding that WSDOT remains concerned about delivering its project “on time and within budget” and often places priority on maintaining regional mobility, traffic speeds, and safety on for its highways. It recognizes, that the local community in which the highways run, may be equally interested in slower speeds, traffic calming devices, pedestrian access, and aesthetic enhancements to the downtown that will contribute more to community character and the local economy and at times, these perspectives may create opposing views with different priorities and solution sets.

The document encourages stakeholders to consider and allow for collaborative approaches to developing a vision, philosophy of design, and means to implement the design to meet the multiple project goals. The key is to strive for balance that allows for sound engineering practices and incorporation of jurisdictional needs.

Understanding Flexibility in Transportation Design – Washington

The document *Understanding Flexibility in Transportation Design – Washington* (9) constitutes the most recent and extensive portion of WSDOT’s efforts to institutionalize and provide for a greater understanding of the CSD principles. Developed as a companion to the WSDOT *Design Manual*, this document assists engineers, architects, local participants/stakeholders, and planners in decision-making by focusing on the various elements associated with transportation design and their influences in the CSD realm.

The IDG was responsible for collaboratively developing the scope, tone, content, and appearance of the document. The efforts focused on the challenging process of defining the “right” concept and scope for the project based on the purpose and need as perceived by the members of the IDG. The primary authors were WSDOT employees from various disciplines, including design, environmental, and local programs.

The “Flexibility Document” was created in order to present the true nature of CSD through information centering on the rationale for decision-making and the trade-offs associated with many elements included in transportation projects. It is a repository for ideas and considerations that can be included in project development and design. The document provides a compilation of the issues that are associated with transportation facility design; discusses the trade-off considerations related to each issue; and prompts the user to think about how a

particular consideration impacts other factors related to highway design. Some of the topics covered are summarized below. The informational focus will equip decision-makers with the tools needed to design facilities that meet the unique needs of each project. The content of this document does not constitute design standards; rather, it is a learning tool to assist in the development of projects that are sensitive to their contexts.

By encouraging the early consideration of the variable treatments and their trade-offs the document will assist in developing projects that meet the needs of the project and desires of the users and stakeholders with fewer significant setbacks and disruptions.

Legal Liability Issues

The Flexibility Document addresses the issues concerning legal liability, and how the CSD approach can be applied judiciously in order to minimize the exposure to this liability. One of the important components in this risk minimization is the full documentation of all options considered, the trade-offs identified, and the rationale behind the decisions made. It advises the early consultation with legal advisors in order to avoid or mitigate liability whenever possible. In addition, it advises that the discussion of safety concerns and considerations be initiated early in the design process. These discussions help ensure that all stakeholders gain an understanding of the safety issues and needs, and the measures that may be required to mitigate them. This in turn will reduce the perception that some standard measures are applied as a strict matter of fact.

Consideration of Facility Users

Within any context there will be a variety of roadway users although this is not explicitly consider in the determination of functional class of a highway. The Flexibility Document highlights the need to identify the specific set of users within the project context and to address the needs of each user group, and the concept that a roadway functional class may change its context throughout the corridor. This process will frequently entail making trade-offs in order to provide a safe and functional facility for all users. Many of the trade-offs that should be considered for pedestrians, bicyclists, motorized vehicles, and transit vehicles are discussed.

Environmental Considerations

The Flexibility Document identifies a wide variety of environmental, scenic, aesthetic, historic, and natural resource values that should be considered and addressed in the planning, design, and environmental review processes of project development in order to avoid, minimize, or otherwise mitigate project impacts in a context sensitive manner. It indicates that the sponsor or sponsors of a project should gather information about the environmental context, issues, and needs of a community, and address them appropriately in design, or when selecting between alternatives and mitigation options in the environmental review process. They should also strive to protect environmental resources (wetlands, cultural resources, etc.) and ensure that environmental conditions (air, water quality, etc.) are left better off than they were before the project was initiated. The integration of environment-specific elements into the overall project is highlighted.

The document also provides guidance on, and encourages the use of, “environmental partnering” to address any environmental issues or needs that may be related to or appropriately addressed through a transportation project. Partnering opportunities may arise in the process of identifying and analyzing potential compensatory mitigation options; project sponsors should

also seek out unrelated environmental needs that can be addressed through partnering in order to maximize a project's benefit for the community and the environment.

Design Considerations

The physical design of a roadway facility is frequently based on the design standards developed nationally or by the State. The CSD approach emphasizes considering all design alternatives that are available and appropriate given the context of the transportation project. The Flexibility Document focuses on providing unbiased information regarding many of the available design alternatives for roadways and intersections. The trade-offs associated with each alternative are discussed in order to provide the transportation professionals with information on which to base their decisions. The tone of "good" and "bad" is avoided, and instead the discussions center around the perceived benefits and drawbacks of features depending on the objective of those interested in the project.

Community Involvement and Project Development

The process of CSD is based on a realization that the consideration of community values is important with regard to the design and implementation of transportation projects in a wide variety of contexts. As a result, this document presents trade-offs based on the needs of safety and mobility associated with highway design, and of livability, natural environment, and aesthetics associated with community character and values. The discussion included seeks to inform all parties of the needs and expectations of the other involved parties, and of the benefits and drawbacks to many of the elements frequently included in transportation projects.

The document advocates including stakeholders in the project development process, and will be used to educate staff in the context-sensitive design process. An example of a specific area where the document may assist in outreach to the community involves ways to make transportation improvements more attractive and accepted through the use of effective and appropriate landscaping, aesthetic considerations, habitat preservation and enhancement, and innovative features. This document encourages the consideration of all appropriate features, which are vital to the concept and conduct of context-sensitive design. These features are frequently the keys that effectively fit the needed transportation improvements into the context of the area, and often turn ardent opposition to transportation improvements into at least willing acceptance, and occasionally into enthusiastic support.

Case Studies

Appendix A in the Flexibility Document contains case studies discussing projects within Washington State that illustrate the use of the CSD approach. The case studies presented are from the six WSDOT regions, and represent a variety of contexts from a rural town center to a high-speed urban corridor. The discussions include who was involved, the challenges faced, and the solutions identified. They serve as examples of how the CSD approach can be implemented in all contexts and on projects of varied intent and scale. Including these case studies helps planners and designers understand how the process is implemented; what results can be achieved; potential partnership opportunities; and that context-sensitive projects can be developed without sacrificing safety and mobility.

Long-Term Impacts

The Flexibility Document discusses in detail the trade-offs associated with many elements that may be included in designs and the liability issues that may arise due to inappropriate designs. The tone in the document is informative, and encourages thoughtful consideration of the trade-offs associated with the varied treatments. This approach recognizes that comprehensive guidelines on safety and aesthetics within each context may even be applicable to non State Highway road improvement projects.

Because the focus of this document is not to prescribe how to do a specific evaluation or apply standards, users will be able to take the principles and address specific considerations and factors that this document was unable to cover. Thus this document will encourage the perpetuation of the CSD concepts.

CSD Training Program

In order to institutionalize the CSD principles, the individuals responsible for implementing them must be fully informed. An important component of WSDOT's CSD efforts is the context-sensitive training. The training includes modules on communication techniques, conflict resolution, design options, and risk and tort liability. Several case studies were included in the training material to illustrate to participants that CSD principles lead to successful projects.

Crash Testing of Median Barrier Designs

WSDOT has performed crash tests with vehicles on three types of innovative median designs in accordance with NCHRP 350 (10). These tests have been completed on various berm slopes and treatments. Included in this testing was a 3 dimensional simulation of a crash test of a small truck with a rigid 4-in. object performed at 42 mph. Testing provided engineers with opportunities to modify design characteristics to better collision performance. The testing also provided a valuable visual aid in design discussions (11).

In-Service Evaluations

A number of cities have inherited arterials that are considered by some to have undesirable characteristics as a city street, particularly given the traffic volume, intensity of land use, and level of pedestrian traffic on these higher speed principle arterials. The desire is to develop the existing arterial into a "boulevard-type" street while maintaining the highway's important regional function. Proposals normally include landscaping involving the placement of trees and other objects in close proximity to the road. Because little is known about the magnitude and extent of trade-offs made between safety and the community values in this urban context, WSDOT initiated an In-Service Evaluation of Urban Median Design Concepts. A number of projects recently completed and under construction are used as case studies for the In-Service Evaluation on several new urban median design concepts. The results of the evaluation will be used to develop new urban median designs suitable for use on high-speed facilities. The research team includes the University of Washington's Transportation Center (TRAC), WSDOT, and local agency representatives from each of the cities (12).

The data set includes the following elements both before and after project construction:

- Catalogue of individual median treatments (widths, presence and type of trees)
- Roadway and roadside geometry
- Accident experience (types, locations, severities)

- Average traffic volumes
- Posted speed limits and 85th percentile speeds (when available)
- Pedestrian crossing behavior at specific locations

The analysis focuses on identifying the roadway and roadside characteristics that affect the frequency and severity of accidents occurring within the project limits, and distinguishing any significant differences in these characteristics.

The perceived value of performing an In-Service Evaluation of innovative median and roadside designs includes the opportunity to evaluate the actual impacts of the design elements within the context, given that these outcomes can never be replicated within a controlled testing situation. The formal agreement between WSDOT and the local cities also ensures that if the outcomes are unacceptable from a safety or operational perspective, mitigation strategies are available to address the concerns.

Urban Design Alternatives Brochure

In accordance with the recommendation of the VE Study, WSDOT has produced a brochure that illustrates the principle alternatives for landscaped median and roadside designs. The aesthetically attractive illustrations show the Design Clear Zones (DCZ) based on the facility's speed, in addition to what elements are required to mitigate for fixed objects within the DCZ given prevailing conditions such as posted speed, and the presence of elements including on-street parking, bike lanes, and sidewalks. The cross sections depicted are consistent with current WSDOT and AASHTO standards. The intent of the brochure is to provide a visual aid for discussions with local communities if trees are desired on a state urban arterial project. It is not intended to be comprehensive, and in line with the CSD principles of flexibility, it states, "other configurations may be appropriate depending on roadway geometrics, operating speeds, and other variables" (13).

CURRENT STATUS OF EFFORTS TO INSTITUTIONALIZE CSD

Continued and Future Efforts

Institutionalizing change in the approach to how any business is conducted requires a long-term commitment on the part of those instigating the change. WSDOT has shown this commitment by continuing to listen to those who have been instrumental in the change process. Particular elements that illustrate this commitment include the continued training efforts and a forthcoming document discussed below. WSDOT also maintains a website to publicize the CSD approach, circulate WSDOT CSD publications, highlight successful projects within Washington, and provide local and national resources for those pursuing context-sensitive projects. Staff from the Design Office travel around the State to present information to local agencies, university students, and WSDOT project staff, and are involved with national-level research and information-sharing. These activities are part of the overall effort to ensure that the CSD approach is incorporated into every aspect of how transportation projects are developed in Washington State.

Summary Document

To supplement the Flexibility Document a condensed reader friendly document was developed for the non-professional audiences. (14).

Expected/Desired Outcomes

The goal of WSDOT's CSD efforts is to mainstream the approach, so no one asks if a design process will be context-sensitive anymore; to make it the foundation of how WSDOT does business, ensuring that the practice of designing transportation facilities involves an informed, balanced approach that considers safety, aesthetics, and community needs.

The expected long-term impacts of institutionalizing CSD principles include:

- Enhancing the understanding of CSD concept in the transportation industry
- Strengthening WSDOT/Local Agency partnerships for project delivery
- Minimizing cost and time delays associated with re-work and re-design
- Reducing investments in mitigation
- Improving stakeholder satisfaction

CONCLUSIONS

The goal of WSDOT's CSD effort is to establish a workable process by which stakeholders can identify the needs and desires associated with a project; discuss and reach consensus regarding the elements to include based on a full understanding of the trade-offs, resulting in transportation projects that meet the needs and desires of the stakeholders.

Projects developed in this way have many qualities that contribute to the sense of permanence within the project context, and enhance the livability of the area. Frequently features are included that represent the local environment and values. The process includes the participation of stakeholders during the project development. The needs of all users within the context are considered early on and continuously. In addition, the Flexibility Document emphasizes evaluating the trade-offs of all of the elements proposed for the project. All of this contributes to the acceptance of the project and the livability of the area through which it runs, while maintaining the safety and functionality of the facility. Projects that are developed in this manner will likely result in fewer project delays due to change-orders and disputes, and will result in projects that are more compatible with the local needs and desires.

The objective is to explore strategies and techniques that help foster respectful communication between highway agency project personnel and the communities they serve. The goal is to avoid many of the traditional pitfalls that so often lead to adversarial, confrontational, "us versus them" relationships. Instead, an open dialogue among all interested parties encourages mutual trust, and a candid exchange of ideas helps everyone feel a sense of project ownership – with all of its rights and responsibilities. The end result is a project that reflects the diverse values of all parties.

As these methods are employed in the field, the measures of the effectiveness of the principles of CSD will be the projects that are developed with the cooperation of the varied stakeholders. Projects that function well within the local context and meet the needs of the local community and the wider regional users.

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