

CSD



Context Sensitive Design

THE ROAD BEST TRAVELED

Executive Summary



U.S. Department of Transportation  
Federal Highway  
Administration

CENTER **OF** TRANSPORTATION STUDIES

UNIVERSITY OF MINNESOTA

# Context Sensitive Design



CONTEXT SENSITIVE DESIGN IS THE ART OF CREATING PUBLIC WORKS PROJECTS THAT ARE WELL ACCEPTED BY BOTH THE USERS AND THE NEIGHBORING COMMUNITIES.

More. Better. Within budget.  
Quicker. With public approval.

Today's transportation manager must meet a whole new set of expectations while balancing a full plate of increasingly complex projects.

“What’s going on now is an asphalt rebellion,” says Tom Warne, executive director of Utah’s Department of Transportation and former president of the American Association of State and Highway Transportation Officials (AASHTO).

“The public expects us to do things differently,” he says. “It’s time to engage some unique solutions to make projects successful.”

## Better Solutions

How does that happen? Better solutions come from three simple words—Context Sensitive Design (CSD). More and more transportation practitioners nationwide are turning to the principles of CSD for some of the answers.

Applying the principles of CSD encourages clear identification of issues and use of creative design solutions to balance the often-conflicting components that arise from transportation planning and design.

Minnesota Department of Transportation (Mn/DOT) engineers and designers have used CSD concepts in many projects over the years, though the term CSD is of recent origin.

Mn/DOT remains strong in its desire to continue encouraging and expanding the use of CSD.

“It is the policy and philosophy of this department to put Context Sensitive Design in place as a normal way of doing business,” says Doug Weiszhaar, Mn/DOT deputy commissioner.

## Means to an End

What is CSD? Is it an approach? Is it a result? Is it hard? Is it expensive?

Context Sensitive Design is the art of creating public works projects that are well accepted by both the users and the neighboring communities. It integrates projects into the context or setting in a sensitive manner through careful planning, consideration of different perspectives and tailoring

designs to particular project circumstances.

Context Sensitive Design uses a collaborative, interdisciplinary approach that includes early involvement of key stakeholders to ensure that transportation projects are not only safe and efficient, but are also in harmony with the natural, social, economic and cultural environment. Early involvement of these stakeholders may help reduce rework later on and thus contributes to more efficient program delivery. As a process, it is no more difficult than any other, and, in fact, it can help smooth the bumpy ride that some transportation projects take. It can reduce the need for expensive and time-consuming rework that often results when stakeholder interests have not been addressed successfully.

## The Revolution Begins

*Many national organizations endorse the CSD concept.*

In 1998, the Federal Highway Administration (FHWA) and AASHTO cosponsored a national workshop, “Thinking Beyond the Pavement.” The workshop reinforced the need to encourage CSD throughout the country. The FHWA

chose Minnesota as one of five states to pilot a unique education and outreach initiative on CSD because Minnesota was already a leader in the project development process.

In May 2000, Mn/DOT and FHWA cosponsored a three-day workshop to train participants in CSD concepts. The Center for Transportation Studies (CTS) at the University of Minnesota hosted the workshop with assistance from SRF Consulting Group, Inc. CTS facilitates the advancement of transportation initiatives through research, education, and outreach programs. This partnership advances the understanding and integration of CSD by combining CTS’s education resources and services with Mn/DOT’s operational knowledge and skills in conjunction with the FHWA’s national perspective and leadership.

The workshop highlighted projects that have successfully implemented elements of CSD, and featured presentations by local and national transportation experts. Interdisciplinary teams of participants practiced concepts of stakeholder involvement, design flexibility, and interdisciplinary approaches, as they devised design solutions to case studies and compared those ideas with the results of actual projects.

To meet its commitment to CSD, Mn/DOT has implemented a variety of internal staff training efforts; Mn/DOT is currently developing additional training components and initiating research efforts.

It's easy to see the results of a project that follows CSD concepts, says David Ekern, Mn/DOT assistant commissioner. Such a project yields community acceptance, demonstrates credible engineering and functionality, and is environmentally compatible and financially feasible.

Mn/DOT's policy is to continue to construct and maintain excellent engineering designs that emphasize safety. Adding Context Sensitive Design to the design process will result in more pleasing, mutually acceptable facilities that leave a lasting public works legacy.

## A New Vision

The use of CSD principles to create transportation solutions supports a new vision for the future. As part of that vision, each project belongs as a part of the place where it is built. It fits within its environment. It fits within the community.

The efforts of those who use CSD principles in their work regularly support a new vision for the future. It's a vision of excellence, says Joseph Passonneau, lead designer of the award-winning Glenwood Canyon Interstate 70 project in Colorado.

Transportation professionals play a key role in making this new vision a reality. It is a vision that includes citizen participation, innovative



design solutions, and safe roadways that are an integral part of the community and enhance the beauty of the place.

The two things that most separate CSD from work done under the rules of the Interstate and Defense Highways Act of 1956 are citizen participation and accurate imaging of the entire context, says Passonneau.

## A Lasting Legacy

Part of the challenge in the transportation practitioner's job involves taking into account many perspectives and finding balanced solutions. By meeting that challenge, transportation practitioners are major contributors to a long-lasting legacy of design excellence.

CSD does not necessarily increase costs. CSD encourages appropriate expenditures of resources at the appropriate time in the process. In many projects, CSD offers the most cost-effective approach, because it addresses problems before they become costly mistakes.

CSD relies on skills in many disciplines to build diverse project teams of professionals who are committed to excellence and creative problem solving. The interdisciplinary team helps meet transportation safety and mobility goals by applying creative solutions that meet the specific project needs rather than borrowing solutions from standards manuals and past projects.



## A Successful Project

It works. It fits.  
It looks good. It has balance.

The end product of a CSD project has all these qualities.

It really is all about the context in which a project exists. Roadways never function and never exist entirely by themselves. They are part of an experience.

They are part of a place.

Context, in a nutshell, is everything related to the people and place where your project is located.

Every project has a context, says Charleen Zimmer, workshop presenter and vice president of SRF Consulting Group, Inc. And understanding that context reaps many benefits by:

- protecting environmental assets
- looking and fitting better as a part of the community
- building community support
- helping decrease the time and cost of redoing tasks that might have been addressed earlier in the project

Context Sensitive Design reflects a way of thinking about the impact a travelway makes on the area it transverses. CSD involves the activity of creating a project that leaves a lasting positive

CSD MEANS  
USING THE FULL  
RANGE OF TOOLS  
AND INVOLVING  
THE COMMUNITY.

impact on the community and area. It is a philosophy that defines a successful project as one that is in harmony with the community and the environment.

Some activities are key to gaining thorough knowledge about a project's context, says Zimmer. Those activities include:

- identifying physical, environmental, social, cultural, aesthetic, and transportation elements
- understanding community values before beginning design
- respecting context throughout the design and construction process
- planning the transportation experience

The scope of a project's context may vary. But early in the process it pays to take a close look



## THE TOP 10 FACTORS THAT SHAPE SUCCESS

- Planning and ongoing public involvement
- Perseverance of the individual
- Visionary leadership
- Maximizing funding opportunities
- Integration of interdisciplinary experts
- Flexible and innovative design
- Learning from the successes and failures of others
- Visual and environmental quality without excessive cost
- Presenting and promoting the results
- Attitude that supports tradition and excellence

at factors such as water resources, pedestrian and bicyclist needs, cultural resources, topography, social/community context, architectural features, and the issue of environmental justice, which ensures that the project does not disproportionately impact minority and low-income populations.

CSD means using the full range of tools and involving the community. That involvement does not necessarily begin or end with public hearings; rather it occurs throughout the project—from the very beginning to the end.

CSD offers a framework that helps professionals in their pursuit of excellence, says Del Gerdes, director of Mn/DOT's Office of Technical Support. "Together all of us work to design, construct, and manage transportation projects within Minnesota so the question is how do we go about integrating excellence into the work that we do."

CSD requires project leaders to deal effectively with the community, work in interdisciplinary teams, and welcome new challenges.

The investment in CSD pays off in a job well done. It promotes pride among professionals in the work that they do.



THE SOCIAL  
CONTEXT IS AS  
IMPORTANT AS  
THE PHYSICAL  
CONTEXT

## Saluting Successes

It's a welcome part  
of the neighborhood. In the city of Brooklyn

Center, the four-lane section of 69th Avenue from

Shingle Creek Parkway to Brooklyn Boulevard carries a

high volume of traffic smoothly. The road includes

bicycle lanes and a landscaped median.



But years ago, the situation was quite different. The original two-lane road could not meet the capacity needs of the growing community. The road included driveway access to homes and a particularly dangerous stretch known to local residents as “Dead Man’s Curve.”

As public services director for the city, Diane Spector made good use of CSD principles in undertaking a large road construction project. The city completed a corridor study as part of its planning and also surveyed community members about benefits. The early community input helped shape project goals—to improve traffic safety and enhance the neighborhood.

The project presented many challenges, including rerouting part of the road over the Palmer Lake Basin and building a new stretch of road over more than 50 feet of organic deposit, saving as many existing trees as possible, minimizing left turns, and gaining right-of-way. The project team worked through environmental issues and with the neighborhood resolved right-of-way issues and other concerns, including neighborhood reservations about the visual impact of a four-lane road near their homes.

The use of landscaping techniques helped mitigate visual impact concerns by buffering the impact of that high-capacity roadway, Spector says. In addition, traffic safety improved and the neighborhood experienced less traffic on residential streets that surround the roadway. The project proved so successful that it received an award as city project of the year. According to Spector, paying attention to the environment opens the opportunity to design a project with visual appeal, which does accomplish transportation objectives and creates a real plus for the community.

The I-35E Parkway project in St. Paul offers an additional example of Spector's point. Designers for the I-35E Parkway took into account the environmental impact the roadway would have on its surroundings. They were able to demonstrate a strong sense of visual and physical continuity along the corridor while allowing the facility to blend into the adjacent residential neighborhoods.

The project is unique partly because of its "drip irrigation" watering system, which provides just enough water and plant nutrients to allow vegetation in the raised median to grow in this northern environment. Designers integrated the



roadway into the residential community by using consistent color treatments of roadway structures, planting flowering vegetation and salt-resistant trees in the median, and carefully constructing berms and noise walls. A lower speed limit and truck restrictions were also incorporated into the compromise.

The St. Paul High Bridge and Silver Lake Road in New Brighton also serve as examples of CSD. Robert Benke, former mayor of New Brighton and former director of Mn/DOT's Office of Research Services, was involved with both of these projects.

The social context is as important as the physical context, says Benke, who worked with two neighborhood associations on the design of the St. Paul High Bridge, which replaced the historic High Bridge.

The Silver Lake Road project, which expanded the roadway south of Interstate 694 from two lanes to four lanes, also involved listening carefully to neighborhood concerns. In this case, understanding those concerns helped project leaders determine ways to increase capacity while still making the road "fit" into the neighborhood. Now, as the community considers expanding Silver Lake Road north of Interstate 694, it looks at the previous project as a model.

"You need to develop real relationships with the people affected," Benke says. "The process that is applied and used is as important as the final product."







## Solving the Puzzle

CSD requires an early and continuous commitment to public involvement, flexibility in exploring new solutions, and an openness to ideas. CSD raises some important issues for engineers.

### The Community

Involvement of the community helps build support for the project. In addition, community members play an important role in identifying local and regional problems and solutions that may better meet the needs of all stakeholders.

People need to be well-informed about alternatives and the consequences of alternatives before they can be good participants. Some key principles govern effective community involvement:

- **Listening.** Public involvement is about listening, not just about talking. Public involvement is two-way communication.
- **Honesty.** Public involvement without integrity is worse than no public involvement at all.
- **Attitude.** If you believe in public involvement and respect all involved, it will go a long way to improve trust.

PUT ALL VIEWS ON THE TABLE AND THEN APPLY STRUCTURED TOOLS TO REACH A BALANCED SOLUTION.

- Ownership. Community members who are part of the process also gain a sense of ownership and pride in the project.

Different types of stumbling blocks may hinder progress. It's important for participants to keep an open mind and avoid preconceived solutions. Other issues, such as inconsistent messages, past history, time and funding pressures, hidden agendas, staff turnover, dislike of public speaking, and fears of legal liability, may jeopardize project success.

To identify project stakeholders—or groups of people who have a stake in the project's outcome—study the physical environment for homes, businesses, wetlands, and other factors, and talk to local staff about those who may be affected. Remember to revisit stakeholder lists, because they may change during the project, says Zimmer.

It's also important to speak the language of the community and stay alert and aware of multicultural influences, as well as translate engineering documents into presentations that make it easier for community members to visualize solutions. A good picture is worth a thousand words. By creating a three-dimensional picture, project elements become much easier to understand.

Public opinions will conflict, and new objections may arise, but the public involvement process helps move the stakeholders as a whole toward a well-balanced solution.

“Put all views on the table,” Zimmer says, “and then apply structured tools to build consensus.”

## The View From All Sides

Context Sensitive Design takes into account how the transportation solution looks to the motorist and how the transportation solution looks to the community. It incorporates the idea of aesthetics—the visual quality of the solution—in the earliest part of the project development process and includes aesthetic considerations throughout the design process and the final construction.

Aesthetics reflect the values defined by the project stakeholders, as well as the successful balance of visual elements. One of the first steps in incorporating aesthetics involves completion of a visual impact assessment.

The visual impact assessment identifies and assesses the visual influence of the project on the natural and human-made environments of the corridor and the region. The assessment also explores the visual influence of the project on the adjacent community and what that influence brings to the project in terms of stakeholder values and community values.

An interdisciplinary team that brings together landscape architecture, engineering, and other disciplines can best design solutions that meet these complex needs.

## Flexibility in Design

Context affects the highway project's design speed, says Dennis Eyer of SRF Consulting Group. “Establishing the context is probably the



most important task up front,” Eyer says. The context and objectives guide the design process, because “design is always a series of trade-offs.”

The targeted design speed closely relates to the context. The higher the design speed, the fewer the options, says Eyer. A higher design speed—often used on interstate and interregional corridors—reflects a desire for mobility. Selecting a 70-mile-per-hour design speed for a hilly, wooded, or urban area, though, drastically limits design alternatives.

Traffic flow, driver behavior, design speed consistency, and functionality also are considerations when assessing the context. All parties must understand what is essential and what is optional, he says.

The most effective approach calls for stakeholders to agree on the context and their goals for speed. Sometimes, context may change.

For example, for many years Superior Street in Duluth, Minnesota, served both as the local access to downtown and as access for traffic into and out of the city. With the construction of a freeway, the traffic on the street dropped considerably. When working with the city on the road redesign, Eyer says, other considerations arose, such as the desire to add parking. Today, two 16-foot lanes allow enough room for angle parking.

The roadway cross section consists of lanes, shoulders, curbs, gutters, medians, frontage roads, and right of way—all elements that require critical design decisions.

## Do the Math

The AASHTO “Green Book,” *A Policy of Geometric Design of Highways and Streets*, provides sound guidelines for many aspects of road design

## Money Well Spent

*Joseph Passonneau learned about the importance of community involvement firsthand.*

A fellow of the American Institute of Architects and a member of the American Society of Civil Engineers, Passonneau used the concepts of CSD to shape the award-winning Glenwood Canyon Interstate 70 project in Colorado. Former dean of architecture at Washington University in St. Louis, Missouri,

Passonneau founded Joseph Passonneau & Partners, a firm that works primarily on politically and technically difficult transportation and highway projects.

“In 1967, I became director of what was until that time the largest and most controversial highway/transit/urban design project in history—the Chicago Crosstown Expressway Project. We had two objectives: to design a ‘friendly’ urban highway and to advise the Bureau of Public Roads [the predecessor to the FHWA] on ways to overcome the resistance of citizens to roads/streets for which they only were asked to pay 10 percent.”

The government did not plan to spend money on public involvement, but found that the project required an investment in public meetings.

“When, after three years, we had convinced the federal, state, and city governments and local citizens to build the road, we had spent almost half a million dollars on public meetings. That was the most important lesson from the Chicago Crosstown Project.”

and construction. Because the Green Book is a universally accepted roadway design guide, many of the guidelines it contains have come to be seen as rigid standards, and the Green Book's inherent flexibility has been neglected.

But the Green Book is not intended to impose rigid standards which artificially limit design options for a project. Designers must utilize the flexibility contained in the Green Book and other design aids where appropriate. The challenge to designers is to find solutions that balance often-competing objectives. Design is a series of trade-offs.

At Mn/DOT, engineers study alternatives that mitigate adverse effects and balance safety and mobility with context. When appropriate, they describe the design exception, document their rationale, and submit the proposed solution for approval. For state aid projects, a rules committee reviews requests for variances.

Documentation of design exceptions and variances is important to verify that sound engineering judgement and social/cultural impacts have been considered and that the proposed solution demonstrates an appropriate balance of



these components. Using creative solutions and sound engineering practices, Minnesota has protected the public's interest as a whole, and with good written documentation has avoided undue risk in liability.

"Putting all aspects of the project in writing is also important, because it improves communication among team members and eases the transition when staff change," says Rick Dalton, project liaison engineer from Mn/DOT's Office of Technical Support.

It's equally important not to let fear stop you from the best solutions, says Dalton. "You can't design a perfect highway," he says. "You shouldn't be stymied because of the perceived threat of a lawsuit."

Investigating the principles behind the standards, thinking creatively, and being able to "do the math" instead of relying on "cookbook solutions" will produce a better outcome. The extra effort is a small price to pay when weighed against the life of a product that thousands of people will use every day.





It is a road built into the landscape. It is also a road well traveled.

Minnesota's Highway 61 near Gooseberry Falls is one of the most picturesque stretches of highway in the state.

ULTIMATELY, THE INVESTMENT IN CONTEXT SENSITIVE DESIGN LEADS TO DESIGN EXCELLENCE.

## Commitment to CSD

When the time came to expand the highway's bridge over the Gooseberry River, designers faced numerous challenges. After all, this was not just a bridge, but part of the historical fabric of the landscape of the popular Gooseberry Falls State Park. They not only needed to improve traffic flow, but also meet environmental requirements, address visual concerns, and achieve a host of other goals.

Mn/DOT considered those factors and closely involved other government agencies affected by the project. Designers studied the existing historic bridge form and placement and incorporated materials that maintained the site's historic flavor, and included pedestrian access to accommodate hikers and tourists. The careful consideration of issues and attention to design options resulted in a bridge that does more than simply improve traffic flow—it adds to the experience of the place.

Mn/DOT will continue to advance the use of CSD by adding a chapter on Context Sensitive Design to its *Road Design Manual* and by sharing knowledge about CSD. A recent Technical Memorandum (No. 00-24-TS-03) formally expressed Mn/DOT's policy commitment to the CSD approach.

The workshop demonstrates the importance of Context Sensitive Design to the state, says Del Gerdes, director of Mn/DOT's Office of Technical Support.

"You have the department's permission to be passionate about Context Sensitive Design," Gerdes told the workshop audience. "It's going to mean pushing the limits. It's going to mean some conflict and discussion, not only from the outside but from the inside, because not everybody is going to think that way." Ultimately, though, the investment in Context Sensitive Design leads to design excellence.

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