Context Sensitive Solutions in a Design-Build Environment: Some Lessons Learned

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Abstract

Compared to the more traditional design-bid-build method of project delivery, the design-build delivery method is being increasingly used by state Departments of Transportation (DOT) to deliver new infrastructure projects quickly to the public. The incorporation of context-sensitive solutions in a design-build environment, and in particular the development of those elements that use aesthetic treatments to help a project fit into the visual context of the area, takes planning and a determination of what method for the development of these designs best fits with the development of the project as a whole. There are two general approaches -- an owner-driven or a contractor-driven method, each with inherent strengths and weaknesses. This paper describes several projects using each method, the issues that developed as the result of decisions made, and the lessons learned in the process.

Background

“Design-build is an integrated approach that delivers design and construction services under one contract with a single point of responsibility.” – Design Build Institute of America (DBIA, 2011)

“Context sensitive solutions (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions.” – AASHTO/FHWA (2007)

The Design-Build delivery method for development of large transportation projects is becoming an increasingly popular technique used by state Departments of Transportation to quickly bring on-line new roadway and transit projects. The Design Build Institute of America (DBIA, 2011) estimates that this method for the design and construction of a project reduces the timeline by an average of 33% compared to the traditional design-bid-build method of procurement. One concern with this faster time frame is understanding how Context Sensitive Solutions (CSS) can be implemented in such an environment.

Churchward and Schroeder (2012) discuss that some advocates of CSS see the increasing use of design-build as a threat to the success CSS has brought to the development of projects. They point out that many state Departments of Transportation think that the contractors’ compelling focus on project delivery would trump the desire for the application of CSS principles on the projects (Churchward and Schroeder, 2012). However, as the design-build method of project delivery has developed over the years, owners are finding increasingly sophisticated ways of ensuring that CSS practices are included as part of the requirements for the contractor.

On a project, CSS can take many forms that allow the project to fit within a community – including designing with reduced lane widths, to addressing safety concerns, to environmental aspects (e.g. animal crossings), to aesthetic concerns and visual context – each of these addressed at various points in the design development process. This paper will explore specifically how the CSS process has been applied to the aesthetics and visual context of a project, how several methods have been used on past design-build transportation projects, and the pitfalls or advantages found in these methods by the author as a design staff lead on the project or as oversight staff ensuring that the contracting team meets the project requirements.


Nature of Design-Build

Design-Build, as a delivery method for major transportation projects, brings a number of benefits to the table. The Design Build Institute of America (DBIA, 2011) reports from a CII/Penn State Study that, compared to a traditional design-bid-build method, the design-build delivery has an approximately 6% lower unit cost, a construction speed that is 12% faster, and an overall project delivery speed that is about 34% faster. The Federal Highway Administration (FHWA, 2013) is encouraging the use of design-build through its Every Day Counts Initiative as a way to speed up the construction of important infrastructure projects.

On a design-build project, the owner is generally responsible for developing the concept and/or preliminary design. Plans are usually developed to approximately 30% completion, except for some particular areas of expertise, such as aesthetics or other contextual elements developed through the CSS process, which might be more developed, depending on the needs and extent of the requirements. In addition, the owner also establishes specific design criteria and construction standards. This is usually accomplished through the development of the contract and the supporting technical provisions, including those for the aesthetic and landscape portions of the project. Last, the owner provides oversight to ensure that the requirements of the contract and technical provisions are being met. The owner is responsible for reviewing and accepting plans as they are developed by the design-build contractor and overseeing construction activities (quality assurance). The contractor is responsible for the design and construction of the project, based on the criteria and standards established in the contract, technical provisions, and preliminary plans. Contracting teams will frequently develop refinements to the plans, some of which are approved by the owner during the bidding process. These are often called alternative technical concepts (or ATCs). Once approved by the owner, the ATCs will become part of the contract with the winning team. The contractor is responsible for quality control of the final plans and all aspects of the construction effort.

In a design-build environment, the application of CSS is often split into two pieces. The owner typically addresses the broader CSS issues, such as the siting of the project within the community and the development of the environmental document as part of the preliminary plan set and the technical provisions. (In its Every Day Counts Initiative, FHWA also is looking to speed up the project development process by clarifying the scope of preliminary design to include a number of design activities that can run parallel to the development of the environmental process). The more detailed CSS concerns, such as contextual design concerns – primarily aesthetics and landscape design – can either be completed by the owner or made part of the contractor’s effort, depending on the approach taken by the owner in the development of the request for proposal.

What is Context Sensitive Solutions?

Context Sensitive Solutions is a broad tent that includes everything from siting of a project within a community to the look and feel of the project’s landscape and aesthetic elements. The common factor is the inclusion of a wide variety of stakeholders – from the general public to elected officials and agency staff members – in the decision making process. The CSS effort leads to outcomes that:

- Are in harmony with the community and preserve the environmental, scenic, aesthetic, historic and natural resource values of the area;
- Are safe for all users;
Incorporating CSS into a project’s development can help speed up the project delivery by addressing community and stakeholder concerns early in the process through a cooperative design process and thereby reducing the likelihood of later lawsuits (FHWA, 2013). CSS encourages clear identification of the issues and allows for design solutions that balance the myriad of conflicting desires, technical requirements, safety issues, sustainability concerns, and livability concerns to be openly discussed and addressed creatively (Kaufman, 2002). Venner, et.al (2007) discuss the process of CSS, in conjunction with value engineering and asset management, as systematic approaches to project development that have significant potential to deliver greater sustainability – of transportation assets, public funding, and support for transportation, and community and natural environments. The benefits of basing the design process on CSS principles, as noted by these authors, can bring substantial benefits to a transportation project – both for the speed of delivery as well as public acceptance of the proposed improvements.

In general, there are two methods to include the aesthetic and landscape elements developed as part of the CSS process in a design-build project. One method emphasizes the owner’s team developing fully detailed design documents for these elements prior to issuing the request for proposal documents for the bidding teams. The alternative method is to have these documents produced during and after bidding by the contractor’s design team, with initial guidance and requirements established by the owner prior to bidding. There are also hybrids between these two general methods that have been used on several design-build projects, more out of default than by choice. These usually involve the owner completing the CSS documents to different preliminary levels before turning them over to the contractor to finalize after winning the project.

**Method 1: Owner Developed CSS Plans**

The first method is to have the owner develop a project specific Aesthetic/Landscape Master Plan that carefully defines the implementation of the required context sensitive design solutions on the project as they relate to the project’s contextual design. These requirements are developed by the owner’s team as part of the technical provisions for the project, so that the owner’s team is responsible for meeting with the stakeholders and the public as part of the CSS process for the contextual design. Experience has shown that the resulting aesthetic and landscape documents needs to be very similar to what is produced for a design-bid-build method of delivery to be sure that the constructed outcome is what was developed during the CSS process and promised to stakeholders.

The primary advantages of this method are that the resulting document has followed the DOT"s requirements for CSS development and the final outcome is a set of known requirements for the contractor to bid on. On the flip side, there are two disadvantages. The first is that the effort of developing aesthetics and landscape documents can be time-consuming. Since one of the main advantages of the design-build method for project procurement is that it shortens the time between completion of the environmental documents and the completion of the project construction, adding time to fully complete the CSS process before the request for proposal can reduce the time advantage. Second, and more critical to the successful outcome, is that the final requirements need to be completely nailed down for the contractor, nearly to the point of being a

- Solve problems that are agreed upon by a full range of stakeholders;
- Meet or exceed the expectations of both designers and stakeholders, thereby adding lasting value to the community, the environment, and the transportation system;
- Demonstrate effective and efficient use of resources (people, time, and budget) among all parties. – AASHTO/FHWA (2007)
traditional design-bid-build set of documents. Any discrepancies in the documents could lead to unforeseen consequences. For example:

**T-REX Project, Denver, Colorado:**
As part of the Request for Proposal document issued for the Transportation Expansion Project (T-Rex Project) on I-25 through portions of Denver, the Colorado Department of Transportation (CDOT) and its consulting team developed a Landscape and Aesthetics Master Plan for the project (called the Southeast Corridor Urban Design Guidelines) that included the results of an extensive CSS process. This Master Plan identified specific aesthetic concepts for elements that were to be included in the design of the project bridges (both highway and light rail). The concept plans were developed to approximately the 65% level. This meant that some information that ended up being critical to the design, such as complete dimensioning, was not included in the concept plans. So when the contracting/design team looked to the document for a determination of the requirements for the bridge monuments to be placed at the corners of the abutment walls on the light rail bridges, they found only a general design, subject to some interpretation. When the contracting side of the team determined that they wanted to reduce costs by using existing forms from a previous project that would create a 2-foot wide by 20-foot tall pilaster, the design team presented arguments of proportionality of the design intent, instead of a specific dimension of what was intended by the design. In addition, the plan sheet that included the image of the monument was labeled “University LRT Bridge Monument”, which can be interpreted to mean that it applied only to that one bridge when the actual intent was to have the monument as an element of all light rail bridges.

- **Lesson Learned:** When developing specific aesthetic design concepts to be followed, the designs should be developed sufficiently to avoid misinterpretation by bidders. However, the design concepts should also allow flexibility so that they can be applied to a range of design solutions developed by the bidders.

**State Route 22, Orange County, California:** State Route 22 project in Orange County is another example of a project with a fully developed set of aesthetic and landscape requirements that were included in the request for proposal documents for the contracting teams who were bidding the project. The set of requirements, entitled the SR-22 Aesthetics and Landscape Requirements, was developed by Parsons and took approximately six months to develop in conjunction with a team of stakeholders from the cities along the corridor – Santa Ana, Orange, Garden Grove, and Westminster – along with Caltrans’ District 12 Landscape Architects. Unfortunately the initial bids for the entire project came in over-budget (the project was bid...
several years ago during a period of rapidly escalating costs), and the contracting teams were asked to reconsider their bids by including value engineering and to submit a best and final offer (BAFO). Many of the aesthetics and landscape items were cut during this cost-saving process, only to be added back in later after contract award as part of a change order on the project. Because change orders are not part of the winning bid documents, their final costs are often higher than anticipated, and this was the case here. The final constructed project reflected everything that was developed within the initial bidding guidelines, but a lot of unforeseen effort and a lot of additional meetings between stakeholders, the contractor and the owner were necessary to achieve that result.

- **Lesson Learned:** Even though, as an owner, you may have done your homework and prepared a strong document to address the contextual elements, unforeseen circumstances may interfere with your well-laid plan. It is important to include each design branch in decision-making to ensure that the final product is what was sold to the stakeholders.

**Interstate 64 Reconstruction, St. Louis, Missouri:** The reconstruction of I-64) in St. Louis was another example of a project for which the owner developed a strong initial document for the project’s aesthetic and landscape elements. The Missouri Department of Transportation (MoDOT) understood that there was not enough money available for all of the desired improvements. Using a design-build delivery method for the first time, MoDOT reached out to the proposer to develop solutions that provided the best value for the available budget. The project was bid as a fixed price procurement -- scope, schedule, and maintenance of traffic were the primary evaluation factors in selecting the best value proposer. Application of concepts from the aesthetic master plan was a secondary consideration in the evaluation process. As part of the bidding process, individual meetings between the owner and each of the teams were necessary for the teams to illustrate which aesthetics and landscape elements would be part of their bid. These elements were considered in determining the team selected to implement the improvements.

Although not generally acknowledged publicly, landscape and aesthetic items are often viewed as extraneous items on freeway projects and not as equals in infrastructure development (after all, infrastructure is all about widening the road and moving cars); with the need to win the project bid paramount to contractors, these items routinely face pressure to be reduced or eliminated, to keep bids low and to build projects quicker. In the case of the I-64 project, without the protection of the original aesthetics plan as a hard requirement and a budget to back it up, it was easy to minimize or eliminate what was originally developed with the stakeholders. However, MoDOT had a strong desire to have a visually pleasing final result. In the end and to the credit of both MoDOT and the contracting team, the final constructed product included many...
of the contextual elements that were originally developed through the CSS process, although many of these were greatly simplified and reduced in character to reduce costs.

- **Lesson Learned: Establish and confirm the budget for contextual and aesthetic elements early in the process so that as designs are developed, they will not need to be value-engineered out of the project. Aesthetic elements need to be considered as equal parts of the overall infrastructure work, not as add-ons to the design.**

- **Lesson Learned: In this case, proposers had too much flexibility as far as incorporation of aesthetics master plan concepts and a better approach would have been to establish a minimum, desirable, and preferred range of concept incorporation as a way to balance costs and desires.**

### Method 2: Contractor Developed CSS Plans

The second method that is frequently used is to have the CSS process managed by the Contractor's design team. Under this method, the design team typically includes landscape architects, who produce a master plan (often included as part of the bid documents) that will be used by design staff to incorporate the contextual design elements into their design. This method can have the advantage of speeding up the time frame required, but also has inherent risks that have to be addressed during the development of the technical provisions for the project. It is a great advantage to this method to identify a specific budget for these elements during the development of the project’s technical provisions to ensure that each bidding contracting team works with the same budget to achieve the same ends. During the development of the technical provisions, the owner’s team must work with stakeholders to develop the general guidance, requirements, and directions for the contracting team to follow for aesthetics and landscape elements. The typical result is a formal project aesthetics master plan that is developed by the winning design-build contracting team. In addition, the technical provisions must define the mechanism that the contractor has to follow to work with stakeholders and/or the public.

The primary advantage of this method is that it reduces the owner’s workload and shortens the timeline for issuing the request for proposals to the contractors. Further, by establishing a budget, it lessens the need for bidding teams to squeeze the aesthetic and landscape elements to reduce costs, which increases the opportunity for a better final product for stakeholders after construction. It allows stakeholders to work directly with those designing the project, helping them to understand the inherent trade-offs associated with any design and giving them direct input with the contractor.

However, for this method to work well, the requirements for the project’s CSS process must be clearly spelled out in the project provisions. An itemization of what can be included in the aesthetics budget and what elements are excluded from this budget is one of the best ways to ensure that the assigned budget is used expressly for the intended aesthetic and landscape elements. The requirements for working with stakeholders must also be established as part of the technical provisions, so the bidders are aware of what is required. For the contracting design-builder, the development of the project master plan is usually an early action item that must be completed before any construction activities can begin, so clear direction in the technical specifications is required to allow the process to flow smoothly. Some examples where this method has been used include:
Coors/Interstate 40 Interchange, Albuquerque, New Mexico: As part of the Coors/I-40 Interchange Reconstruction Project in Albuquerque, the city established a budget of $2.5 million for aesthetic enhancement and landscape items, specifically to address construction impacts on the city. The New Mexico Department of Transportation (NMDOT), through their technical specification, had established the requirements for structural elements and landscape, although these were not clearly identified with what specifically qualified as color, texture, and forms for the structural elements. Included with the enhancement money was the requirement to include an artist as part of the design team to direct a portion of the aesthetic enhancement budget. The artist was hired by the City through their selection process, but the design-build contractor was included on the selection committee. The selected artist was included on the Aesthetics and Landscape Task Force for the project and worked alongside the other design staff to develop artwork that was included on the pedestrian bridges. Lastly, the selection of color was critically important to this community, so the contractor’s public involvement team for the project established an internet voting for the public on three color themes that had been proposed by the artist and the aesthetic design team. This worked exceedingly well and in the end the project received the Gold Cumbre award from the local chapter of the New Mexico Public Relations Society.

- **Lessons Learned:** Remember smooth is a texture, grey is a color, round is a shape; so if all you say in your procurement documents is that the contractor should provide texture, color, and shapes to the a bridge (for example), you will get a bridge with simple round columns, no texture that might deter graffiti, and uncolored concrete.

- **Lesson Learned:** The addition of an artist as part of the project can greatly enhance the inclusion of contextual designs for highly visible project elements. If properly structured, this can be a benefit to the project and the design team. In fact, on this project, the artist ended up leading some of the public involvement through the project’s CSS process.

- **Lesson Learned:** Allowing the public input through internet voting really worked well for this project. Votes were keyed to zip codes, so that votes from locations outside of the affected neighborhoods could be monitored to ensure that these were not unfairly weighting the vote.

I-15 South, Las Vegas, Nevada: The I-15 South Project in Las Vegas employed a design-builder developed CSS Plan approach for the inclusion of the aesthetic and landscape elements. A budget of $7 million was established for these elements, and the technical provision was written to spell out both what was included as well as what was excluded from this budget.
(for example, plantings to replace what was removed, native seeding and erosion control, topsoiling, grading, and other “base elements” are typically excluded from the aesthetic and landscape budget). The Nevada Department of Transportation (NDOT) has developed a series of outstanding set documents, called *Pattern and Palette of Place: A Landscape and Aesthetics Master Plan for the Nevada State Highway System* (available at [www.ndothighways.org](http://www.ndothighways.org)) for a number of its highway corridors; these documents detail the basic thematic approach to the aesthetics for their transportation corridors. They were developed through the CSS process and serve as a precursor to any project aesthetic and landscape master plan, helping contracting teams bidding on the project understand and address the direction their aesthetics need to follow.

On the I-15 South Project, proposing teams were required to include a set of three concepts as part of their proposal submittal. Each concept was to clearly describe all structural aesthetics, groundplane treatments, and landscaping proposed for the budget. After award of the contract, the winning team’s landscape architects refined the three concepts as directed by the owner and stakeholders. The three refined concepts were then presented to the public at an open house. From the public’s reaction to the concepts, the stakeholders selected the preferred concept, which was then finalized into a project aesthetic and landscape master plan. Once the master plan was reviewed and accepted by the stakeholders and the Owner, the final construction drawings could be completed. The overall process took approximately 6 months from start of project to public meeting.

- **Lesson Learned:** By developing the outlining corridor documents through its own CSS process, NDOT has established a basis for the aesthetic and landscape approach to its highways and the level of design expected by the community.
- **Lesson Learned:** Establishing a budget is critical to the success of this method. Doing so eliminates the push from the design-build team to reduce the aesthetic and landscape elements, since each bidder will spend the same amount on these items.

**Conclusion**

One of the elements of the CSS process for projects that is of particular concern to stakeholder communities is the aesthetic considerations of a project. While this is only one segment of the overall design of a transportation project, it is also one of the key ways that users of a transportation project, as well as members of the community in general, interface with the project -- through the visual context of the project within their community. In a design-build type of project delivery method, it is very possible to successfully include a CSS process to develop a contextual aesthetic design either by carefully laying out the requirements for contractors and their design teams through a tight set of technical specifications, or with an owner-developed set
of documents that spells out exactly what the design requirements are for the aesthetic aspects of the project during its delivery. Both methods have their inherent strengths and weaknesses; these are summarized in Table 1-1.

Of the strengths and weaknesses that are part of each process, the fundamental weakness to both is the introduction of errors – either in the design details for the owner-developed method or in technical provision for the contractor-developed method. In either case, errors provide confusion to bidding teams and the push to be competitive will drive costs and inclusion of CSS elements, both aesthetics and others, down, which may in the end reduce intended quality of the final constructed product. As the lessons learned illustrated in this paper indicate, the documents provided during the procurement phase of the work are the most likely area for the introduction of errors. Therefore, those with the job of project development and oversight must recognize that they have to minimize this potential and still plan how to address the issues that will inevitably come up.

One strength that a DOT can provide, which would support either method, is the development of an overall corridor aesthetics and landscape master plan that guides the development of all projects within the corridor, and referencing the document as part of the procurement information. As shown in the I-15 South Design-Build Project in Las Vegas, having this over-riding document, developed through its own CSS process, provides a rich resource for the development of the procurement documents. It can also provide a backstop to the aesthetic and landscape requirements, should there be discrepancies in the technical specifications. While these overall corridor plans usually do not have the specifics and details necessary to be the procurement document, they provide the background and understanding of the visual quality expected by a community, so that the team developing the procurement documents – either with a set of design plans supported by a less complicated technical provision for the owner-developed method, or with the more involved technical provision used in the contractor-developed method – have a basis of understanding to work from.

The design-build approach to the delivery of transportation projects is likely to continue to gain in popularity, given the endorsement of FHWA and the method’s inherent advantages in speed of project delivery. The use of a Context Sensitive Solution process as a part of the project development is also likely to increase as the preferred method for developing projects that communities can support and embrace. It is therefore natural that these two systems will need to work together to deliver projects that not only are designed and constructed more quickly than the traditional design-bid-build method, but that also work within the context of the community in which the project is sited. It is hoped that the lessons learned on these projects will help to inform others on future projects.
### TABLE 1-1
Summary of Strengths and Weaknesses in Design-Build Procurement Methods for Contextual Design Elements

<table>
<thead>
<tr>
<th>PHASE OF WORK</th>
<th>OWNER DEVELOPED AESTHETICS</th>
<th>CONTRACTOR DEVELOPED AESTHETICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STRENGTHS</td>
<td>WEAKNESSES</td>
</tr>
<tr>
<td>Design Develop.</td>
<td>• Follow typical procedures to develop designs - should be close to a level found in design-bid-build type project</td>
<td>• Lessens the contractors ability to apply creative ingenuity to the incorporating designs</td>
</tr>
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<td></td>
<td>• Owner has complete control over outcome (along with stakeholders)</td>
<td>• Usually takes longer to develop due to the use of &quot;standard practices&quot; and can affect the timing of the RFP</td>
</tr>
<tr>
<td></td>
<td>• While a Technical Provision is still required, it is generally less involved due to the supporting design drawings.</td>
<td>• Errors in the design details – missing call-outs, dimensioning, etc -- introduce opportunities for the contractor to exploit shortcomings</td>
</tr>
<tr>
<td>Application of Design</td>
<td>• Completed by Contractor; would not necessarily require weekly task force type meetings during the design process</td>
<td>• Owner is less in touch with the design of aesthetic elements until official submittals at (usually) 65%, 90% and Release for Construction</td>
</tr>
<tr>
<td></td>
<td>• If a template has made with an overall master plan for CSS processes in corridor development, project-specific CSS processes can be reduced.</td>
<td>• Usually takes longer to develop due to the use of &quot;standard practices&quot; and can affect the timing of the RFP</td>
</tr>
<tr>
<td>Speed of Delivery</td>
<td>• Since designs are fully established, costs are usually higher since the contracting teams have less flexibility and creativity to reduce costs for project's aesthetic and landscape elements</td>
<td>• Generally is a faster process, if correctly managed by the Contractor's team.</td>
</tr>
<tr>
<td></td>
<td>• It may be easier to chip away at elements without support by design expert leads during procurement</td>
<td></td>
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<tr>
<td>Costs</td>
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References


