Context Sensitive Case Study: Grand Avenue Bridge

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- Joe Elsen, Colorado Department of Transportation - DOT Perspective / Client
- Brian Pettet, Pitkin County - Pitkin County, Director of Public Works, Key Stakeholder Perspective
- Jim Clarke, Jacobs Engineering - Environmental Manager Perspective
- Richard Henderson, Granite Construction - Contractor Perspective
Why the CSS Process?

- Background and History
- Project Need
- The CSS approach

- Use of an EA
- Use of CM/GC as delivery method
Why the CSS Process?

Regional Context
Why the CSS Process?

Project Vicinity
Project Need

1. Improve connectivity between downtown Glenwood Springs, and the Roaring Fork Valley, with the historic Hot Springs pool area and I-70.

2. Address the functional and structural deficiencies of the bridge to improve public safety, including emergency service response, and reliability as a critical transportation route.
Why the CSS Process?

Project Need
Existing Bridge Scour Analysis Report:
“...the bridge is scour critical due to the bridge foundations being unstable for calculated scour conditions. . . .”

Existing bottom of footer: 5712.41’
100 Year Scour Profile (bottom of scour at 5709.02’)

Existing Bridge Pier Scour
Why the CSS Process?

Project History

History and Travel Patterns

- 1998 bridge funding
- Traffic growth

[Graph showing traffic growth from 1988 to 2035 with various growth rates and traffic levels, including a note: "Daily AADT in this range on a 4-lane arterial is very rare in Colorado. Wadsworth and Sheridan in Lakewood are comparable arterials with this traffic level."]
Other Elements of the Process

- Use of an Environmental Assessment for NEPA Clearances
- Use of CM/GC as Project Delivery Method
At project initiation, CDOT opted to use a CSS process:

- CDOT CSS Guidance
- I-70 Mountain Corridor CSS Process

CSS process geared toward engaging varied interests, including:

- downtown business
- bike/ped
- tourists/visitors
- rafting community
- commuters
Why the CSS Process?

CSS Process Used

- CSS Process driven by other challenges
  - Tightly Constrained
  - Highly Visible
  - Highly Aesthetic Environment
Why the CSS Process?

CSS Process Used

- Project Leadership Team (PLT) established, comprised of stakeholders to oversee process
Being on the PLT—View of the Process Development
Whole-Brain thinking for the 21st C

Goals Driven: Analytical Intelligence

Vision Driven: Creative Intelligence

Results Driven: Operational Intelligence

People Driven: Relational Intelligence

Adapted from HBDI

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Purpose and Need

- Improve connectivity between downtown Glenwood Springs and the Roaring Fork Valley, with the historic Hot Springs pool and I-70.
- “the bridge’s condition impairs this connection for a variety of transportation users.”
- “Future traffic increases will worsen the bridge’s ability to provide connectivity.”
Context Statement

- Project Leadership Team developed Context Statement & Critical Success Factors.
- These items led to project criteria/MOE.
- Criteria used to evaluate alternatives.
The Grand Avenue bridge, over the Colorado River, Interstate 70, and the railroad tracks, connects north and south Glenwood Springs, I-70, and State Highway 82, and the historic districts of downtown and the Glenwood Hot Springs.

The bridge stands as a gateway to the city of Glenwood Springs, Glenwood Canyon, the Roaring Fork Valley, and Colorado’s western slope communities. It serves local, regional, and state travel; local commuters; emergency response; bicyclists and pedestrians.

The soaring walls of Glenwood Canyon, the rich history of Glenwood Springs built at the confluence of the Colorado and Roaring Fork Rivers, mining, tourism, and recreation define a splendid and vivid context for the Grand Avenue bridge.
Critical Success Factors

- Meet current design standards
- Safety
- Pedestrian, bicycle, and ADA access
- Iconic structure
- Promote appropriate speeds
- Connection to 6th Street
- Minimize construction impacts
- Solve problems into the future
- Provide for activities and vibrant street life under the bridge
- Avoid and minimize environmental impacts
- Accommodate traffic flow and demand
Critical Success Factors

- Design for sustainability
- Looks like it grew out of the history of Glenwood Springs
- Positive economic impact, short and long term
- Invigorates activity on Wing Street
- Accommodates traffic flow on I-70
- Maintain and enhance recreation on the river
- Affordable
- Doesn’t impact aquifer and hot springs
- Source of community pride
- Engaged public and community
Project Scoping

- Scoping Meetings held with public and agencies
- Helped identify issues to be included in alternatives evaluation & EA

Historic Hot Springs Lodge and Pool
Project Scoping – Historic Properties
Project Scoping – Historic Properties
Project Scoping – Historic Properties
Project Scoping – Historic Properties
Project Scoping – Historic Properties
Project Scoping – Historic Properties
Project Scoping – Geothermal
Project Scoping

- Construction impacts
- Traffic congestion
- Lack of transportation redundancy
**The CM/CG Process**

**Bringing in the Contractor During the EA Process**

*CDOT Project Delivery Selection Flowchart*

<table>
<thead>
<tr>
<th>PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Evaluation Factors</strong></td>
</tr>
<tr>
<td>1. Delivery Schedule</td>
</tr>
<tr>
<td>2. Project Complexity &amp; Innovation</td>
</tr>
<tr>
<td>3. Level of Design</td>
</tr>
<tr>
<td>4. Initial Project Risk Assessment</td>
</tr>
</tbody>
</table>
Supports CSS Process:

- Helps in development of alternatives and options
- Helps in better evaluating alternatives and options
- Helps collaborative decision making
- Helps contractor recognize community context and character prior to construction
- Better supports multi-discipline, multi-interest process
Bringing in the Contractor During the EA Process

• Contractor perspective of coming into the CSS process while the EA was being developed

• Contractor involvement in the Grand Avenue Bridge CM/GC process:
  • allows for highly innovative process through 3 party collaboration
  • provides for inherent VE allowing for enhanced constructability - Design can be tailored to construction method
  • reduces risk of innovation
  • Contractor has better understanding of what outside factors contributed to design and will be able to better accommodate during construction
  • better defines scope of the project
  • provides better environmental stewardship
  • better address third party concerns.
  • Provides resource for owner/designer when weighing out different options under consideration
Working out the Details – The Many Challenges
Challenges & Opportunities

Working out the Details – Proposed Action (Summary)
Challenges & Opportunities

Working out the Details – Competing Needs for the Funding

1979 Bypass Alignment
Working out the Details –
The Role of Elected Officials
Working out the Details – How Travel Patterns Influence Alignment

Approximate Trip Distribution of SH 82 trips
South of Glenwood Springs

- I-70 West, West Glenwood (via Midland Bridge): 13%
- Glenwood Meadows: 9%
- 7th Street Bridge: 14%
- North Midland: 5%
- I-70 West, West Glenwood (via Grand Bridge): 22%
- I-70 East: 6%
- Roaring Fork: 5%
- Downtown Glenwood Springs: 14%
- Hot Springs/Resort Area, Traver Trail, North Glenwood: 33%
- Grand Ave Bridge: 5%
- 27th Street Bridge: 16%
- South Glenwood (Airport Area): 6%
- High School, Hospital, South Glenwood (Wal-Mart area): 20%
Working out the Details – How the Bridge Incorporated a New Roundabout
Challenges & Opportunities

Working out the Details – How the Bridge Incorporated a New Pedestrian Bridge

- Utility relocations
- CDOT Bike and Pedestrian Policy Directive 1602.0
- Historic use of Grand Avenue Bridge
- Current width of pedestrian bridge
- Potential to improve pedestrian and bicycle connections
- Clearances to future I-70 eastbound acceleration lane
- Existing grade on pedestrian bridge
- Aesthetics
- Mitigation
- Context Sensitive Solutions (CSS)
- Cost
Working out the Details – How the Bridge Incorporated a New Pedestrian Bridge
Challenges & Opportunities

Working out the Details – CARmageddon, Glenwood Springs Style

Midland Avenue capacity during detour
Challenges & Opportunities

Working out the Details –
The Role of Models – Some Work for “the Public”
and some Don’t
Challenges & Opportunities

Working out the Details – Access Control Plans and Bridge Width
Working out the Details – Americans with Disabilities Act (ADA)
Working out the Details – Public Input into Design Detail
Working out the Details – The Role of Aesthetics in Finding a Solution

Metaphysics (Natural Sciences)  
Ethics (Social Sciences)  

Truth  
The Good  
Beauty  

Aesthetics (Arts)
Challenges & Opportunities
Working out the Details – Historic Impacts

- Historic Impacts
  - Working closely with Historic Preservation Groups
  - Creative Mitigation (e.g. transparent noise barriers, railroad history documentation)
Challenges & Opportunities

Working out the Details

- Economic/Transportation
  - Construction-related impacts
  - Pedestrian access across river during approx. 2-month full bridge closure
  - ABC techniques to minimize full bridge closure

- Visual
  - New pedestrian bridge and roundabout would create a visual gateway and sense of entry into Glenwood Springs.
  - Structure type for new pedestrian bridge will not obstruct ridge & mountain views
Working out the Details

Water Resources/Aquatic

- Temporary river impacts from construction causeways
- Construction staging to avoid & minimize effects to spawning trout
- Preventative measures to avoid construction impacts to geothermal
- Removal of invasive species in riparian areas and revegetation with natives
Challenges & Opportunities

Working out the Details – Funding Constraints

Colorado Bridge Enterprise bridges (partial map)
Working out the Details –
Keeping the “Hot” in Glenwood Hot Springs
Working out the Details – Detours and New Bridges
Working out the Details – Working with and on top of UPRR

- Approximately 20 trains per day (Freight and Passenger)
- Project will require intimate interaction with the UPRR
- Able to leverage contractor’s previous relationship to develop a crossing plan
  - Initial location was selected based on preferred location by contractor – UPRR did not like location proposed
  - We were able to jointly develop a location that met our needs and satisfied UPRR concerns with minimal impact to construction operations
Challenges & Opportunities

Working out the Details – Working with and on top of UPRR

- Project will require us to “Slide” the bridge over the UPRR tracks
  - Due to involving the contractor early we were able to bring UPRR representatives to the site and explain the process in a more relaxed environment
  - Were able to address their concerns and incorporate into the project requirements
Working out the Details – How Visitor Use Affected Construction Plans

- Rafters affected river access options
- Hot Springs Pool affected river access options
- Tourist season added time constraints to project
- Volume of motorists/pedestrians dictated additional scope and added constraints
Working out the Details –
Construction Phasing and Lack of Redundancy

- Lack of redundancy of utilities on existing bridge required that they be relocated first
- Linear phasing added to project duration
- During design we were able to identify some items that could be changed in order to save duration while still meeting stake holder needs
Working out the Details – Construction Challenges

- Balancing the needs of construction while accommodating the river users and adjacent businesses
- Time constraints due to visitors, fish spawning seasons and river flow
- Historic property constraints
- Tight space constraints
Lessons Learned

From Various Perspectives

- NEPA – Jim Clarke
- PLT (Key Stakeholders) – Brian Pettet
- Design – Craig Gaskill
- Contractor – Rich Henderson
- Client – Joe Elsen