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SH 285: Kipling to Sheridan Reconstruction Project
CDOT Project No. BR 2854-113 SAP No. 231001260

LESSONS LEARNED

US 285 DESIGN BUILD PROJECT
CDOT Project No. BR 2854-113 SAP No. 231001260

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EXECUTIVE SUMMARY

Overview

The US 285 Design Build Project was a \$40.1 million Colorado Department of Transportation (CDOT) safety and mobility improvement project on US 285 between Federal Boulevard and Kipling Boulevard. The project replaced three structurally deficient bridges and reconstructed a portion of US 285 that was in poor condition, as well as other improvements.

As an agency CDOT has experienced success with the design build contract delivery method on large multi-million dollar projects. With CDOT’s goal of applying innovative contracting methods to 50% of all future project funding, it is critical that CDOT staff and the contracting industry understand the lessons learned from projects that employ such methods. The US 285 Design Build Project led the way in demonstrating that design build can be successfully applied to a smaller project.

Design Build Observations

Following a lengthy process where the project evolved from a \$10 million bridge replacement to a \$40 million reconstruction, CDOT elected to procure the US 285 project using the design build process. CDOT established project scope, goals, design criteria and budget. The winning team was selected based on “best value” rather than low bid, which had been originally considered as part of the modified design build approach.

CDOT selected Concrete Express and Tsiouvaras, Simmons, Holderness (CEI/TSH) to complete both the design and construction of US 285 based on their innovative design solutions and added project elements. CDOT was responsible for completing the job according to our high standards.



Innovative contracting methods make many promises regarding project execution. Just because a project is designated design build, however, does not mean that it immediately reaps the anticipated benefits. In reality, projects, regardless of their use of innovative or more traditional contracting methods, rely on the commitment and implementation of the owner, designer and contractor. The US 285 Design Build Project succeeded in merging a high level of buy-in and dedication from the project team with an innovative contracting method like design build, resulting in the efficiencies and benefits typically found on much larger projects. Specifically:

DESIGN BUILD PROMISES	US 285 DESIGN BUILD PROJECT EXPERIENCE
Optional procurement selection approaches	Because of the integrated nature of design build, we were able to move away from a low bid selection and towards a value-based selection. The moment we chose to use value-based selection, CDOT was a mile ahead in scope and the quality of the team assembled.
Expanded scope within a set budget	As a result of the design build process and best value selection, our contractor provided the maximum possible scope to fit within our set budget. We not only got an additional mile of roadway reconstruction added to the project, we were able to include wider shoulders, new sidewalks and enhanced operational and safety features totaling many millions in added scope. In the end, using design build expedites project completion, allows for maximum innovation and often provides maximum scope.
Design innovations	In a traditional design-bid-build, there is less room for flexibility in design, or

	should it happen, it comes with contract change orders that often result in impacts to the schedule. On the US 285 Design Build Project, there were design innovations as part of the bid process and during the project. For example, the US 285 Project bidding process resulted in a clear span bridge that both cut costs and minimized the impact to the travelling public. During the project we were able to create design efficiencies such as a split lane configuration during construction, an innovative collaboration between the designer, contractor and the owner.
Positive schedule impacts	The faster you finish the project the better for everyone involved. When the contractor and owner (designer met on weekly basis) are co-located and sitting together on a daily basis, we had the capacity to quickly move to address any issues. The integrated nature of the process likely saved two years over a traditional design-bid-build.
Maximized budgets	Not only did we gain additional scope within the set budget amount, the nature of the collaboration and the roles between the owner, designer and contractor resulted in significant budget savings. CDOT was able to realize extremely low overhead due to successful implementation of the QMP, specifically 2% – 3% overhead whereas standard for design-bid-build is 8% - 12%.
More efficient owner involvement	Design build requires a paradigm shift from the designated CDOT staff used to more traditional design-bid-build processes. On the US 285 Design Build Project our co-located team successfully adapted to its overall quality assurance, owner verification and approval role. It is also critical that the specialties who are not as integrated into the project team be supported in adapting to their roles.
Effective teaming and partnering	The very nature of design build encourages teams to work more closely together. On this project, we required co-location of the core partners, from the owner to construction to quality assurance. This resulted in staff truly becoming one team who spoke with one voice about the project.
Increased accountability to the project and team	By eliminating the traditional separation between the design process, construction and quality, we saw that each team member had a far more vested interest in the level of the quality in design and construction. In many cases, team members felt that this project has the highest level of quality they have seen on other comparable projects.
Shared risk	Realizing the benefits of shared risk relies primarily on the ability of the owner, designer and contractor to trust each other in the execution of the contract. We found that three elements are critical in helping to build that trust: <ol style="list-style-type: none"> 1. Focus on removing any ambiguity from the specs. 2. Plan ahead with the specialties. 3. Require an Issue Resolution Process (IRP) as part of partnering and implement it quickly.

The US 285 Design Build Project showed that in order to successfully complete a project on time and on budget, the critical element is the entire team’s commitment to collaboration and partnering. As CDOT moves toward more using innovative contracting methods, the US 285 Design Build Project should serve as a model that was successful in developing processes, procedures, plans and the staff who can apply this knowledge to future design build projects.

TOP PROJECT SUCCESSES

From the outset, the US 285 Design Build Project focused on its project goals to help guide the collaboration and teaming necessary for a successful project. The project goals included:

- Make safety our top priority
- Effectively plan processes to ensure safety, quality, and production
- Manage impacts to the public
- Manage environmental impacts by avoidance, minimization, mitigation
- Achieve financial success and meet the schedule for the US 285 Team.
- Streamline and follow the conflict resolution process.
- Maintain open and respectful communications.
- Maintain a quality system that is continuous and dynamic
- Proactively share information among shareholders
- Benefit from stakeholders' expertise and innovation
- Design build a project that will be a recognized as a leading example



Developed in a comprehensive partnering process, the project team and respective executives from the owner, designer and contractor regularly met for partnering sessions to discuss progress towards these goals and implement a comprehensive Issue Resolution Process that was successful in resolving all issues in front of the project, avoiding costly delays and dispute resolution.

Project Successes

Project successes were facilitated both by the partnering and project goals as well as by the flexibility gained by using design build as the contracting process. As a result, the project realized project wins in every critical component of the job, from project management to construction, design, quality, disadvantaged business participation, traffic, safety and communications. The top ten successes on the project included:

1. Value-based selection made all the difference.
 - Value-based selection allowed innovation and increased scope from selected contractors including:
 - i. Provide ARE#1 which includes more than a mile of reconstructed concrete pavement.
 - ii. Provide bridges at Federal, Pierce and Wadsworth that are constructed to the ultimate 6 lane section requirements as detailed in ARE #2.
 - iii. Provide three lane facility from Federal to Sheridan in each direction in partial fulfillment of ARE #3 (Six lanes total). Constructed with 10 foot shoulders in each direction.
 - iv. Provide some additional 12' inside shoulders that provides better safety and better integration with long-term widening of the project
 - v. Provide improved intersection alignment at Lowell and an additional turn lane for southbound to eastbound movements maximizing traffic operations at the only signalized intersection along the project corridor.
 - vi. Provide for six lanes during construction activities at the US 285/Lowell intersection to minimize inconvenience to the traveling public.
 - vii. Clear span all bridge construction to maximize visibility and minimize impacts to the traveling public during construction.
 - viii. Roadway alignments selected to facilitate ultimate future long-term widening of the project.
 - ix. Provide many enhancements that offer partial fulfillment of ARE #3
 - x. Replacement of sign panels along the corridor to enhance reflectivity.

- xi. Add partial interchange lighting at Federal
 - xii. Extend bridge length at Federal and add sidewalk at along Federal (No sidewalk today).
 - xiii. Extend bridge length at Pierce and add sidewalk at along Pierce (No sidewalk today).
 - It also enabled best qualified individuals and companies to come together in a collaborative situation versus low bid.
2. Collaborative effort between contractor, engineer, and owner resulted in higher quality in design and construction.
 - Solutions to design challenges were easier to arrive at working with the contractor.
 - There is a continuous constructability feedback process. Proof of concept is much more implementable with optimized construction processes.
 - Process-level involvement vs. 30% design review and 90% design review guarantees more success than percentage complete review.
 - More collaboration between construction, design and maintenance resulted in improved design as it relates to future maintenance and maintenance of the corridor during construction.
 3. Integration of different team members had a significant impact on quality, schedule and budget.
 - Many aspects of the project were facilitated by having Quality Assurance (QA) as part of the design team instead of having an independent 3rd party.
 - Surveying was integrated into design and construction. The surveyor was the design surveyor for the drainage engineering and was integral to the team structure.
 - CDOT was able to leverage a small staff for this huge project.
 4. By having construction and design contracted at the same time, we were able to effectively use partnering with more degrees of freedom and success.
 - An effective Issue Resolution Process allowed for issues and perspectives to be communicated and allowed problems to be solved in an organized fashion. As a result the project never entered dispute resolution.
 - Communication and problem solving was more instantaneous as a result of co-location.
 5. Quality was executed at the highest standard.
 - There was a high level of accountability for implementing an integrated Quality Management Plan.
 - The quality on design was robust due to a design quality control manager.
 - The project successfully extended quality beyond materials testing. Quality control extended to the journeyman level of contract execution.
 6. Project increased participation of small, disadvantaged businesses.
 - The DBE goals were exceeded.
 - Design build encouraged the unbundling of work packages and resulted in introduction of new firms into the construction process.
 7. Construction and design was on schedule and on budget.
 - Up front planning during the bid phase had a significant positive impact.



- Every design package was delivered on time and on schedule.
 - Cost was much more integrated and an important factor related to design and construction.
 - Having a design build traffic designer available during QA processes, allowed vast and expedited improvements in approaches towards construction phasing.
 - Approximately fifty (50) Notice of Design Changes (NDCs) were implemented to optimize construction.
 - NDCs were implemented more as a continuous improvement process that enhanced design and construction rather than to “correct mistakes”.
 - There were fewer claims which kept the project on schedule.
8. Project safety was a core priority.
- Team had unique connection between public and construction safety and quality.
 - Safety issues were addressed following the Quality Management Plan, treating them with the same diligence and process evaluation as other critical project components like design.
 - Having contractor accountable for incident management resulted in increased accountability, collaboration and created atmosphere for problem solving.
9. Project had a consistent “face” for the job.
- There was a continuous team from start to finish addressing public and communications issues.
 - Having an integrated public information team enabled a better tie into information and more immediacy in communicating with traveling public.
10. Team built a high level of trust with each other and external agencies during progression of work.
- The right mix of individuals and a good working relationship make for a good working environment and a successful project
 - Plan development and permitting requirements such as Incident Management and Quality allowed agencies to come together in a non-confrontational manner to agree on a solution.



Project Considerations

As with any project, there are certain areas that need to be carefully monitored in order to assure project success. These are the top five elements that required additional care and attention on the project.

1. CDOT needs to watch out for “scope explosion.”
 - An easy challenge with any project; you have to ensure that the base project scope is well established and any changes are clearly documented as outside of the original scope.
2. Understand risk.
 - Both the owner and the design build team need to carefully evaluate and discuss risk throughout the project. As a result, there needs to be clear expectations as to who assume what risk and how it is monitored.
 - o For example, permitting (HB 1041) requirements were more extensive than originally anticipated. Future projects should develop procedures in advance to more effectively manage these tasks.
3. Give yourself the flexibility of benefiting from design build with value-based selection.
 - Consider also continuing to pay unsuccessful proposers stipends which allows successful proposer access to other innovations and ideas, encouraging development and opportunities (i.e. unbundling) for DBEs and small businesses.
 - o For example, CDOT did a good job of clearly providing feedback on the ATCs and the contractor was able to discern which ones they needed to focus on for their proposal.
4. Make sure quality management is a core priority.
 - Everyone needs to have a general idea of a quality system, as well as understand roles and responsibilities with QA, QC, and owner verification. While having the contractor do a comprehensive Quality Management Plan (QMP) was more costly and time consuming than originally anticipated, it provided the training and commitment for those who wrote the document to effectively produce the required products.
 - Improved quality also makes for a cost savings that could be shared as an incentive with the contractor.
5. Make sure every team member owner, designer and contractor, has a complete understanding of contract requirements and expectations.
 - Contractor versus CDOT roles were well defined and worked effectively during the performance of the work; and as a result it becomes obvious if one program element is not operating under the same process. Upfront understandings with all team members help alleviate pressure down the road.
 - Future projects should consider streamlining review processes for certain specialties; such as supplementing staff for quicker turnaround and adhering to scheduling requirements.



Overall the team had significant successes, resulting in a project that could be recognized as a leading example of design build.

US 285 Design Build Project



LESSONS LEARNED

LESSON LEARNED

The US 285 Design Build Project was executed in three phases including:

1. Request for Proposal – Phase where CDOT and bidders worked to develop the Request for Proposal, project specifications and proposals.
2. Procurement – Phase where CDOT selected a procurement approach, identified the successful team and finalized the contract.
3. Implementation – Phase where CDOT and selected design/contractor finalized design and constructed the project.

Lessons learned are identified according to specific work categories and provide where possible the perspective of the owner, CDOT, as well as that of the designer and contractor.

REQUEST FOR PROPOSAL DEVELOPMENT PHASE

Additional Requested Elements (AREs)

CDOT Perspective:

- AREs not defined by the Owner (would be considered Alternative Configuration Concept) could have been allowed where appropriate.

Designer Perspective:

- Give more detail on definition of project goals.
- CDOT should state if there is a priority or independence of AREs.
- Consideration of additional AREs or partial credit of existing AREs would have provided further benefit to CDOT. Ability to do so not clearly defined.

Construction Traffic Control

CDOT Perspective:

- Using the contract Method of Handling Traffic (MHT) process helped the contractor by integrating continuity for developing MHTs consistent with the traffic control plans. The requirement of involving design PE helped implement compliant MHTs and added critical point of accountability with the design engineer providing QA for the project. This process is a much larger effort for designer.
- Traffic management plan was effective.
- Lane closure requirements not well understood. The regional incident management plan was too generalized for the specific requirements of the project. The contractor worked through a lot of differing perspectives on traffic management to get a specific plan for traffic management. There were somewhat ambiguous lane closure requirements relative to executive management, Region 6 lane closure policy, multi-jurisdictional traffic control permits, and incident management plans.
- Traffic variances worked well because various entities were flexible and agreed to a process.
- Interaction with local agencies evolved as project progressed and communication increased, including local agencies delegating more authority back to CDOT.
- Local agency permitting subjugates CDOT's processes.
- Coordinating with local agencies and describing project procedures as part of the RFP would

have better defined risk and responsibilities for CDOT vs. contractors documented as a commitment, within an IGA.

Designer Perspective:

- In general, allowing flexibility with some of the lane restrictions allowed for a faster, safer, better project. Having designer who did traffic control planning and review of the MHTs, provided consistency in thought and execution.
- Speed limits were an issue. Getting speed reductions in areas and forms signed off was cumbersome. Normally CDOT does speed reduction, but designer was responsible on this project.
- Construction – things have functioned smoothly with MHTs and traffic control.

Cost Estimate

CDOT Perspective:

- Low bid inhibits risk management and creates higher price.
- Needs to be tied to risk assessment.
- Estimator involvement early and on-going is vital.
- Better to engage estimator for entire RFP development, not just at end.
- Parametric vs. unit price approach required.
- If CDOT had a summary of risk as part of the escrow documents, future negotiations could be expedited.

Designer Perspective:

- CDOT not providing the detailed cost estimate was not an issue. It is nice to have, but at end of the day, not necessary.
- If CDOT and contractor could agree on the value (\$) of risk assigned, then they are on an equal basis.
- CDOT and contractor should collaborate on identifying the key areas of risk.

Environmental Permitting

CDOT Perspective:

- More performance/end result criteria worked best.
- Less process oriented criteria suggested.
- CDOT should not be the critical path.
- More contractor accountability is best.

Designer Perspective:

- Multi-agency grading permits were required; too much to effectively coordinate.
- Designer thought they would be following CDOT's process for drainage/erosion control. When other agencies became involved, they thought they needed a separate permit for the work resulting in multiple permits for agencies' own requirements. Had to partner with all agencies to develop one common accepted permit.
- From design perspective, there were not significant impacts from coordination. Construction permitting reporting was increased.
- House Bill (HB) 1041 complicated the process. Multi-agency jurisdictional authority. Same as design-bid-build.

- During the procurement process, having an attorney from AG's office expedited the Lakewood IGA.

Geotechnical Materials/Survey Investigations

CDOT Perspective:

- Need survey for entire project.
- Need to define types, limits, specific design requirements.
- Consider providing supplemental geotech in advance of RFP.
- Need more dialogue of who stands behind provided information.
- CDOT needed a commonly held goal with respect to pavement improvements. Goal: quality vs. cost.
- CDOT's process should be less subjective and not influenced by industry involvement.
- Either more prescriptive or performance based (just less process oriented) pavement type requirements would work best.

Designer Perspective:

- For pavement design, the process for selection and subsequent approval of different pavement types needs to be as concise as the standard practice used for the bridge process.

Insurance Requirements

CDOT Perspective:

- Projects of this size make joint venture relationships unfeasible, and not practical. Insurance requirements should reflect this.

Contractors Perspective:

- CDOT would benefit by working with the insurance industry to understand exactly what they can/should require of the prime contractor as well as the subs.

Internal Partnering

Technical Level

CDOT Perspective:

- The organization and hierarchy that was developed reflected the decision making process and the responsibilities of the Executive Oversight Committee(EOC).

Policy Level

CDOT Perspective:

- Allowed direct involvement of upper management in decision process and facilitated effective issue resolution.

Maintenance During Construction

Contractor Perspective:

- This is a huge risk that is shifted to the contractor without the benefit of the state's governmental immunity. Either CDOT should be required to perform maintenance during the project or there

needs to be a statutory change to the law to extend governmental immunity to the contractor when performing work for which CDOT would have immunity.

Options

CDOT Perspective:

- Additional Requested Elements (AREs) distinguish different contractor abilities.
- Could have had more AREs.
- Alternate Technical Concepts (ATCs) allowed innovation.
- Timely CDOT response lacking.

Designer Perspective:

- CDOT needs the ability to have informal interaction with the designer and contractor without ambiguity characteristic of a written response. Provide more time in the proposal preparation process to allow this informal discussion to continue.

Project Management Structure

Designer Perspective:

- Allowed ability for the Design Builder to define Quality Assurance (QA) management roles.
- Contract needs to be flexible in most areas to allow the Design Builder maximum ability to manage the work.

Public Information (PI)

CDOT Perspective:

- Contractor's vs. owner's role difficult to communicate in RFP.

Contractor Perspective:

- RFP requires significant amount of plan development with a clear description of who will be responsible for what. Inference is that often CDOT will be responsible when that appears to run counter to the remainder of the contract where the contractor is responsible for implementation.

Right of Way (ROW) Requirements

CDOT Perspective:

- Not a factor on this job.
- ROW was adequate to do the work.
- Drainage for off-site impacts affected the ROW.

Utility Agreements

CDOT Perspective:

- Use early development of Intergovernmental Agreements (IGA) where appropriate.

- Identify processes early including funding, and document in a UIS, if appropriate, otherwise develop an IGA.

Designer Perspective:

- Procurement document was fine with the exception of the Denver Water line impacts at Wadsworth that were identified following Notice to Proceed.
- Sometimes the contractor or designer does not have the same authority to deal with utility issues. The agreements are between owner and utility agency. Designer acted as facilitator without the authority to back it up.

Warranty

Contractor Perspective:

- CDOT and the industry would benefit by a better understanding of the basics of warranty as applied to designers for Design-Build projects. On US 285, they attempted to hold the designers to the same standard as the contractor. Designers cannot warrant their work because there really is nothing to warrant. They cannot come back and “repair” the design like a contractor can come back and make repairs for faulty workmanship.
- Also, by having the PE stamp on the drawings, the PE has attested to the fact that he/she has performed their duties in accordance with the standards of their industry and their professional obligations. If the design does turn out to be faulty, CDOT and the contractor still have negligence and possibly breach of contract claims against the designer, which would be covered by Errors & Omissions insurance.

PROCUREMENT PHASE

Internal Partnering

Technical Level

CDOT Perspective:

- Effective coordination of issues expedited resolution and allowed for timely issuance of associated responses to proposers.

Policy Level

CDOT Perspective:

- Partnering attitudes are important. There was a “win-win” goal between CDOT and perspective contractors. Some contractors came to the table wanting to control selection process and did not practice an open partnering approach.
- Partnering during procurement maximized best value potential for the proposers and the owner.
- Certain proposers chose to circumvent the contract protocol and directly involve CDOT executive staff. This was a violation of the contract requirements and may be not well understood by CDOT senior staff. Could have resulted in a protest.

Request for Letters of Interest (LOIs)

CDOT Perspective:

- Process too long, specifically the 45 day advertisement period.
- Process too expensive.
- Needed to be better clarified for submittal requirements.
- Good for project introduction/networking.

Request for Qualifications (RFQ)

CDOT Perspective:

- Appropriate for scope of this project.
- Standardized process would facilitate future procurements.
- Consider submittals from previous design-build projects (proposers thought they had already qualified with modified design-build submittal).

Request for Proposals (RFP)

CDOT Perspective:

- Use more internal workshops to review RFP in a collective fashion with key technical staff.

Book 1

CDOT Perspective:

- Should be completed earlier and standardized.
- Legal coordination helped through entire RFP development
- Scoring for asphalt vs. concrete and Kipling to Wadsworth ARE complicated by late changes to the basic configuration.
- Tying AREs to basic configuration provided effective means to manage project scope.
- Late change to basic configuration (Kipling to Wadsworth) changed to Knox/Lowell to Federal (including Federal bridge).

Book 2

Designer Perspective:

- More detailed requirements for quality control/quality assurance personnel relating to design or construction would have helped. CDOT should define process as well as staffing levels for QA/QC.

Project Website

CDOT Perspective:

- Overall process worked well.
- Version control needed improvement.
- SharePoint needed gate keeper for better version control.

Confidentiality

CDOT Perspective:

- Process worked well.
- Process clearly communicated to and understood by CDOT staff.
- Process seemed acceptable to proposers.

Request for Information (RFIs)

CDOT Perspective:

- Responses not issued in a timely fashion.
- Process complicated by technical resource coordination and legal review.

Addendums

CDOT Perspective:

- Responses not issued in a timely fashion.
- Process complicated by technical resource coordination, legal review, EOC approval.

Designer Perspective:

- Addendums issued during quiet period did not allow sufficient time for further clarification.

Selection Process

CDOT Perspective:

- Criteria reflected final goals.
- Improved process to normalize numerical scoring (eliminated outliers).
- Need to establish scoring criteria well in advance of proposal submittal.
- Standardized training and scoring forms should be used for future projects.
- Proposal review broken into logical sections with appropriate technical experts involved worked well.

IMPLEMENTATION PHASE

Award

CDOT Perspective:

- The 20-day period to issue Notice to Proceed (NTP) should be tied to when the contract is actually signed.
 - *Example:* Book one Section 11.1.3 - If CDOT has not issued NTP1 on or before 30 days after the Proposal Due Date, the Contractor may seek to negotiate a Change Order including an extension in the time allowed to CDOT for issuance of NTP1 and an increase in the Contract Price mutually acceptable to the Contractor and CDOT).
- Correlate NTP1 and NTP2 more closely with contractor's actual progression of the work; especially development of the Quality Management Plan.
- NTP1 payment cap needs to be more consistent with work required to receive NTP2.
- Standardize process for all design-build contracts.

Change Management

Issue Resolution Process (IRP) – a copy of the process is included in the appendices

CDOT Perspective

- Process had been effectively used on other projects, but refined to address the specific needs for this project and worked well.

Contractors Perspective:

- The IRP document was initiated to provide a detailed analysis of a conflict/disagreement/dispute. CEI believes it was an excellent tool for this project and it set a tone for honest and direct communication.
- Relative to a design-bid-build traditional project, a design build will have many issues arise over the intent of the contract in terms of scope. This one document provided a means for both sides to put their case in writing and could be escalated up the ladder fairly easy.

Dispute Resolution Process

Contractor Perspective:

- Per Dennis Largent, CDOT intends to use Sections 105.21 through 105.23 (that were developed partly due to this project) on all projects including DB. The major issues were solved by using the IRP process, and the project did not have to test the effectiveness of the DRB. However, we believe the process is an excellent alternative to the previous claims specifications.

Issue Tracking Report

CDOT Perspective:

- Provided effective tool to manage key issues.
- Expedited decision-making process.
- Enhanced tracking of key issues for timely resolution.
- RCO/PCO forms developed for the project worked effectively for project needs.
- Issue identification resolution process provided good documentation of issues.

Submittal Tracking

Contractor Perspective:

- There were several levels of submittal tracking. CDOT kept a very complete log of contract submittals for review, approval etc. The list was instrumental in keeping the project moving. For construction related submittals an appendix to the QMP was produced by TSH and CEI. Both lists are still being used as a quality reference.

Contract Administration/Assessment Process**CDOT Perspective:**

- CDOT needs further development of non-proprietary assessment templates.
- Assessment process improved contractor's understandings of CDOT expectations for project work. Training the contractor on CDOT's assessment process improved this understanding further.
- CDOT needs to standardize design-build requirements database template.
- Improved CDOT staff efficiencies by using specialties for specific assessments vs. general review.
- MS Access database needs to be more user-friendly, and refined for future use.

Contract Implementation*Co-location with Design-Builder***CDOT Perspective:**

- Large design-build projects have 100% co-location, but this project made a compromise. The management and construction personnel were co-located. Design production was located elsewhere. Approach worked well.
- Helps partnering and was economical.
- Co-location is economically implemented in small projects with management and construction personnel and QA personnel in same office.
- Reinforced culture of problem solving and getting the project done as an overarching goal.
- Design-build was less adversarial.
- During design phase, many issues needed to be resolved and having management of both parties in same place helped.
- Frequent design task force meetings substituted co-location quite effectively.
- Design-build co-location is very difficult when using CDOT staff resources because of other work they have. It is not economically feasible to have full-time dedicated designers for both CDOT and designer.
- Co-location helped streamline the decision making process, expedite information exchange as well as issue identification and the resolution process.

Designer Perspective:

- A lot more collaborative to address construction issues as they arise.
- Co-location is essentially the same as the design phase and the construction support phase.
- Bringing in all designers would not be economical or feasible.
- Subconsultants would have benefited with having some office space in designers office from a communication and production standpoint, however not economical or efficient.
- Co-location was not necessary for a project of this size. However, the weekly meetings with the contractor helped facilitate the design process.

Contractor Perspective:

- Co-location has been a vehicle for increased communication.
- Having CDOT, QA and the contractor in the same office provides a means for quick decision making.
- From CEI's perspective, the designers did not have to be co-located because the Designer was the same company as QA which served nearly the same purpose with quick communication and decision making.
- The negative is the lack of privacy and disruptions caused by frequent meetings with subcontractors and field supervision.

*NTP 1***CDOT Perspective:**

- Final QMP, as tied to issuance of NTP 1, needs to address how industry standards, which establish Quality Control, interface with Quality Assurance.
- NTP 1 needs to consider the cost of developing a QMP
- A cost loaded schedule reflecting the QMP should be provided with the proposal and should equal the NTP-1 Payment cap.

Designer Perspective:

- Having NTP1 and requiring the QMP plan be completed prior to moving forward forced the QMP plan to be a priority. However, it slowed the start of design because the upfront activities, such as survey and geotechnical investigation needed to proceed with designs being delayed.
- CDOT did approve the Design QMP, a subsection of the overall QMP, to allow design activities to proceed. However a month of anticipated design time was lost while the Design QMP was developed reviewed, revised and accepted. A suggestion to allow portions of the Design QMP for areas such as survey which already have standards established would have helped.
- The payment associated with NTP 1 needs to be large enough to cover up front costs including the designers costs. The designer typically has a significant up front cost in preparing the proposal. CDOT's ability to have flexibility with this amount is important.

Contractor's Perspective:

- CEI is supportive of added levels of NTPs. The contract was rigid on NTPs and did cause delays in starting the initial design work.
- Significant cost is tied up in producing the QMP with no way to finance those costs.
- There was a steep learning curve in developing a Quality Management Plan. If CEI were to do another design-build type of project, it would be a much easier task but it still should not delay critical design elements such as survey and geotechnical work.

*NTP 2***Contractor Perspective:**

- There was a compromise reached where CEI was allowed to separate the design QMP from the Construction QMP to begin the critical elements of design work through the issuance of NTP1.
- There was significant additional work in getting NTP 2 including: QMP, Maintenance of Traffic Plan, Environmental Compliance Work Plan, Maintenance Level of Service Plan, Safety Plan and many other specified plans in the contract.
- As with the NTP 1 requirements, there was a steep learning curve in developing all the plans. If CEI were to perform another design build type of project it would be a much easier task.
- There should be a greater cash flow associated with the development of plans. CEI had to cash flow significant costs of salaries, supplies and subcontract consultants.

General Coordination

Design Task Forces

Designer Perspective:

- Task force meetings with CDOT specialty staff were generally effective. In a few cases, getting assessment responses and resolutions took longer than desired.
- The issues escalation process worked well once everyone understood it and became comfortable with it. Issues that could not be resolved at the task force level were elevated to the project management level.

Management Meetings

CDOT Perspective:

- The contractor should control the meeting frequency.

Designer Perspective:

- If CDOT desires weekly meetings it should be defined. Weekly were effective for the most part but at times seemed too frequent.

Contractor Perspective:

- The discipline of weekly meetings provided several advantages in the early phases of the project. All parties to this contract were feeling their way through the initial process and the weekly meeting was used as a formal method of working through issues, an informal communication exchange, a means to bring other peoples' experience into the US 285 projects and a way to partner with other agencies.

Quality

Designer Perspective:

- The design work on this project was of the highest quality. This quality was the result of many factors including having qualified staff, a QMP plan that was followed, a coordinated approach to integrating disciplines. The one area where QC issues were found was in the drainage design. The root cause of these issues appears to be inadequate checking and staff not understanding CDOT's drainage design criteria.

Public Involvement

CDOT Perspective:

- Good communication from contractor.
- No major issues (hotline in incident management plan).
- Elected official coordination good.

Contractor Perspective:

- CEI recognized that their strong suit was building bridges and roadways and not Public Relations. CEI hired a PR/communications firm to lead them through the maze of Public Involvement and Public Relations. Belay Communications provided a lot of experience from T-REX and RTD projects and could communicate well with CDOT.
- Early on, several meetings were held that warned the local neighborhood groups what the impacts would be and what the roadway would end up looking like. It is hard to determine the effectiveness of those meetings other than the fact that there were very few calls and complaints when construction started.

Document Control (DCS)

Designer Perspective:

- The DCS system was adequate from a design perspective to coordinate communication of documents.
- Using yellow colored paper for Release for Construction Documents seems to have been effective in having the contractor using the proper plans for construction.

Contractor Perspective:

- CEI started from scratch on document control systems. Originally, we looked at complicated data base systems that cost upwards of \$100,000 plus for each project. The decision was reached to go with simple, cost effective Share Point software. Share Point is a web based data storage site where CDOT, CEI, TSH and others could get access to records and upload test reports and other documentation. It was flexible enough to set up a system of files and folders aligned to the CDOT specification numbering system. CEI put a single person in charge of the system that could train others to use the system and upload files. Training was minimal and most of the project personnel could use it very quickly.

Invoicing

Designer Perspective:

- Requiring the designer subs to sign off on their quality process was effective in instilling a culture of quality on design subconsultants.

Contractor Perspective:

- The invoicing system developed from the contract and by CEI is very thorough and can be evaluated fairly easy based on the original WBS cost breakdown. It includes sign offs from the design QA function and the construction QA function which insures compliance during the period.
- The invoicing process is very detailed, time consuming and expensive for the contractor, designer and construction QA.
- All the additional procedures and cost is necessary and provides checks and balances throughout the process.
- The compliance issues related to the contract and ultimately the invoicing caused CEI to produce very detailed subcontract requirements for subs and suppliers.
- Also, since the contract required a breakdown into WBS items and not traditional CDOT bid items it was a challenge to develop an invoicing system.
- Also, the WBS and related schedule had to be developed before design was completed. There are items within the WBS that don't necessarily reflect the final quantities from the final design.

Quality Control

Contractor Perspective:

- All parties recognized that the level of Quality Control required by the contractor, the designer, subcontractors and material suppliers is what makes this project different from the traditional CDOT project.
- Book 2 requirements spelled out a detailed Quality Management Plan that was difficult to get our arms around. Writing a QMP required us to define roles and responsibilities as well as spell out detailed processes to ensure compliance to the contract.

- CEI recognized that CDOT's specification required a Total Quality Management approach that included: design quality, public communication, local agency relationships, traffic management, maintenance during construction, process management of the work and materials testing and acceptance.
- CDOT's management helped guide CEI through the process and we believe we succeeded in producing a solid Quality Management Plan.
- Two of the most important lessons learned on quality are 1) Instill quality throughout all processes including all the way down to the worker level, and 2) Employ a strong QA Construction group presence.

Partnering

Mission Statement

Contractor Perspective:

- The initial Partnering session produced a Mission Statement for the project. It was framed and continues to be referred to by the Project Management. Tony Gross has done a great job of reminding everyone what the project goals are.

Partnering Agreement

CDOT Perspective:

- Team level partnering has been extraordinary and many issues we resolved.
- Developing an organized process related to the IRP that could identify contractor perspective and CDOT perspective, so that we could systematically go through the issues and resolve them was effective.
- Key to both policy and technical level collaboration was the establishment of the charter and periodic discussion of the charter. Partnering has been on all agendas.
- Issues came up through task force meetings and were either resolved at that level, or escalated in a timely fashion in order to not burden progress of the work.
- Were able to freely and honestly have a real-time discussion about issues.
- Contract did not identify resolution process in regards to partnering, but one was created and utilized as a key part of the overall partnering process.
- Team was able to develop processes beyond partnering to resolve issues day-to-day issues. (Policy and technical).
- Design-build fosters and requires much more attention to partnering than design-bid-build. The contract was the overarching authority. Partnering was used extensively by CDOT and Designer trying to clarify and understand the contract.
- Contract allowed collaboration for joint refinements of contract requirements.
- CDOT and perspective contractors used partnering successfully through the procurement process.

Designer Perspective:

- Including the Designer in the partnering session was positive because it allows design issues to be addressed and understood.

Contractor Perspective:

- CEI believes partnering is an extremely valuable tool.
- The commitment from upper management at CDOT is impressive.
- The partnering on this project provided a forum for open communication for all parties.
- We feel fortunate we did not have more issues come up that required a partnering solution. But the issues we did have were ultimately solved partially due to the spirit and formality of partnering.

- It is worth taking the time, money and effort to make partnering work.
- The project management team used the partnering concept to work with Denver Water, the city of Lakewood, the city of Denver and others.

Risk

CDOT Perspective:

- Risks were identified early in project which provided effective development of the RFP.
- Initiation of a risk workshop effectively engaged technical staff for subsequent development of their individual technical sections.
- Clearly identifying risks provided structured approach to communicating goals, best value, and policy-related decisions.
- Cost estimate was structured around risk assignments.
- Needed to formalize additional milestones where risk assignments could be reassessed during the course of the RFP development.

Contractor Perspective:

- In a highway design-build project, there are certain risks that the contractor cannot reasonably foresee (such as underground conditions) and therefore the contractor can not build this risk into the proposal. There should be a way to pay for these risks as they are encountered. The scope of this project could have eliminated a lot of risk to the contractor with design survey and more drainage information.
- The more risks a contractor perceives the higher the cost to CDOT. Some risks are predictable others are unknown.
- The contract required too many requirements from the Contractor/CDOT to be actually included in the subcontracts which made the subcontracts cumbersome (especially small minority firms.)

Materials

Contractor Perspective:

- Material submittals/certifications many times required multiple agency coordination. Should be able to coordinate with one (CDOT) agency that would represent the interests of all
- It would expedite reviews if specific standards for use on the project could be identified up front, including those required by other entities. Many times these weren't known until an actual design was completed and formally submitted, just to find out it would be rejected due to the wrong use of standards
- Entities sometimes provide certified inspectors that direct the work as part of their permitting requirements. It would be good to receive their documentation associated with this work for the Contractor's files.
- Minimize redundant staffing (re: inspectors checking other inspectors work).

US 285 Design Build Project



APPENDIX

US 285 Design Build Project



FACT SHEET

Project Scope

The US 285 Design Build project is a \$40.1 million safety and mobility improvement project on US 285 between Federal Boulevard and Kipling Boulevard. The project will replace three structurally deficient bridges and reconstruct a portion of US 285 that is in poor condition, as well as other improvements. Specifically the project will:

- Reconstruct US 285/Hampden Avenue from Federal Boulevard to Wadsworth Boulevard where the current pavement has a remaining service life of zero, meaning the only alternative is complete reconstruction.
- Replace three poor bridges at Wadsworth Boulevard, Pierce Street and Federal Boulevard.
- Reconstruct the Wadsworth Boulevard interchange and add a third lane on Wadsworth Boulevard under US 285.
- Rehabilitate the bridge decks at Sheridan Boulevard, Estes Street, Raleigh Street and Bear Creek.
- Improve drainage and water quality elements along US 285/Hampden Avenue.



Current bridge condition over Wadsworth Boulevard.

Value-Added Elements

As a result of the design build process, CDOT will be able to make additional improvements within the original budget amount:

- The roadway reconstruction will now stretch an additional mile to Kipling Street rather than to Wadsworth Boulevard.
- Wider shoulders between Federal Boulevard and Wadsworth Boulevard will enhance safety and mobility, as well as match existing pavement widths of other corridor bridges within project limits.



Hampden Avenue bridge over Wadsworth Boulevard, looking south, with wider medians and no center pier.

- Innovative clear-span bridges, which eliminate support piers in the median, will help minimize construction impacts on commuters.
- Operational improvements such as an additional left turn lane from southbound Knox Court to eastbound US 285/Hampden Avenue will also enhance traffic safety.
- New sidewalks along Federal Boulevard and Pierce Street under the new bridges will improve pedestrian safety.

Preliminary Construction Approach and Schedule

The US 285 Design Build project will start the first half of January 2010. It will take approximately 19 months and should be completed by June 2011. The project will

be constructed in three basic phases. During construction, the same number of lanes will remain open on US 285/Hampden Avenue, six through lanes will be maintained at the Knox Court/Lowell Boulevard intersection during peak hours, courtesy patrol will be provided and road closures will be minimized. Specific dates and more detailed construction information will be provided as the project proceeds.

FOR MORE INFORMATION

WEB SITE

<http://www.coloradodot.info/projects/us285wadsdb>

E-MAIL

info.us285@dot.state.co.us

HOTLINE

(303) 472-6334

ISSUE RESOLUTION **AND CHANGE PROCESS**

Issue Resolution Process (IRP)

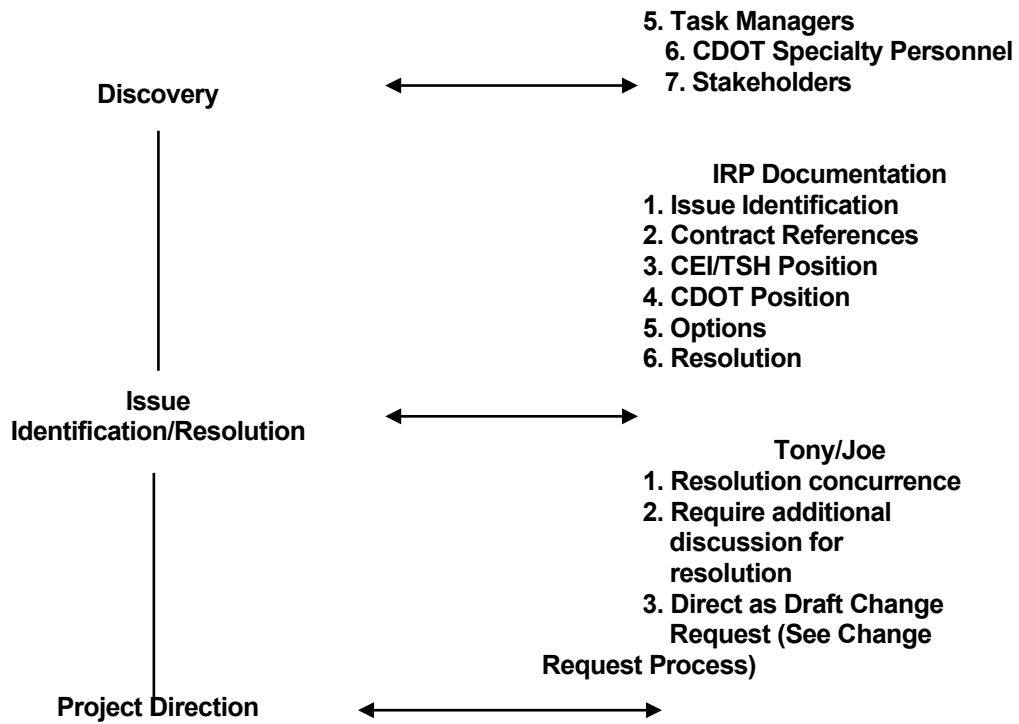
Project Issue Resolution Process

As part of the partnering process, an issue resolution process (Figure 1) was developed by members of CEI, TSH, and CDOT. This resolution process includes the following:

- Issues will be delegated to the lowest appropriate level of authority on the Project team with instruction to resolve the matter within the directed timeframe. If not resolvable, the matter will be elevated to the next level of authority.
- If the matter is not resolved at the various levels of authority or within the timeframe established by the parties, it will be escalated to next levels of authority according to the agreed to escalation ladder (Figure 2) or the required dispute resolution process per Book 1-Section 19 of the Contract.
- A written report (Issue Resolution Process) (Figure 3) prepared by CEI and signed by both CEI and CDOT describing the issue, all subsequent actions, and the final resolution will be included in the project records. For formal change requests (Figure 4), the written documentation required by the Contract will be completed.
- Should a dispute over the same or similar issue arise, the written report (Issue Resolution Process) from the previous issue shall be used as a resource during the issue resolution process.
- Issues or disputes may include, but are not limited to:
 - Design
 - Contract interpretation
 - Differing site conditions
 - Change in scope
 - Third party stakeholder requirements

Figure 1:

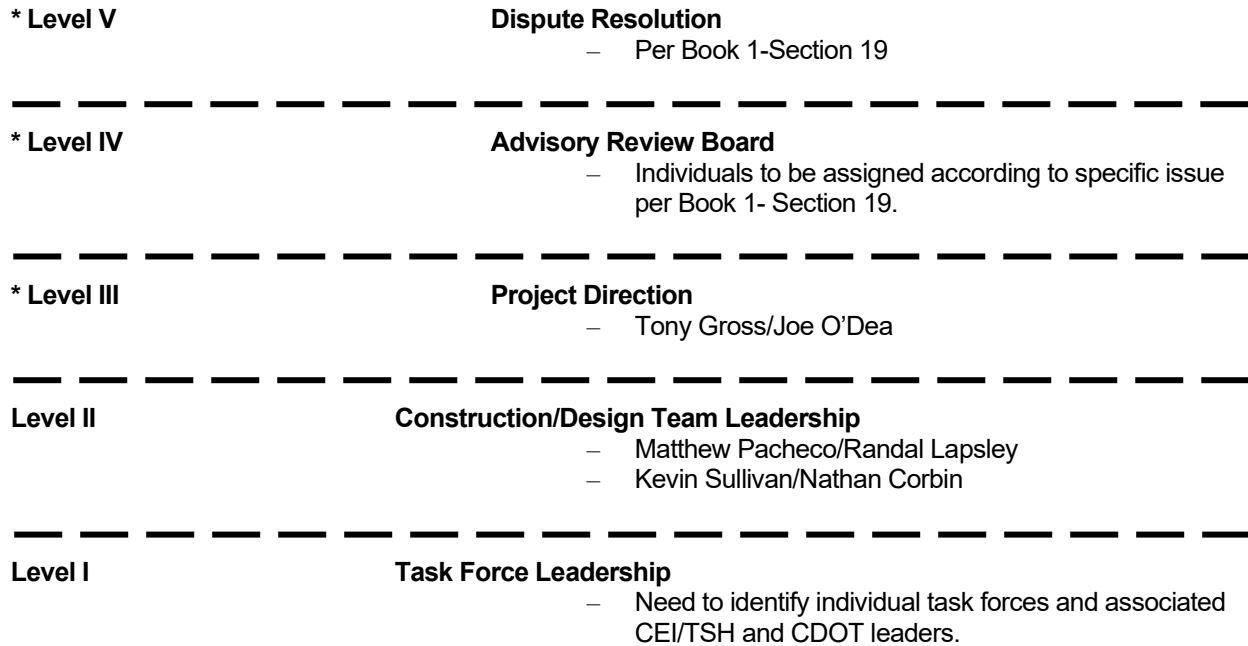
Issue Resolution Process (IRP)



- Coordination Including:**
1. CEI
 2. TSH
 3. Subs
 4. CDOT Project Personnel

Figure 2:

Issue Escalation Ladder



* Use of a third party neutral, per Book 1-Section 19, to mediate the resolution of an issue that may occur at Levels III, IV, or V.

Figure 3:



ISSUE RESOLUTION PROCESS

DATE:

1. **ISSUE IDENTIFICATION**

2. **CONTRACT REFERENCES**

3. **CEI/TSH POSITION**

4. **CDOT POSITION**

5. **OPTIONS**

5. **RESOLUTION**

CEI:

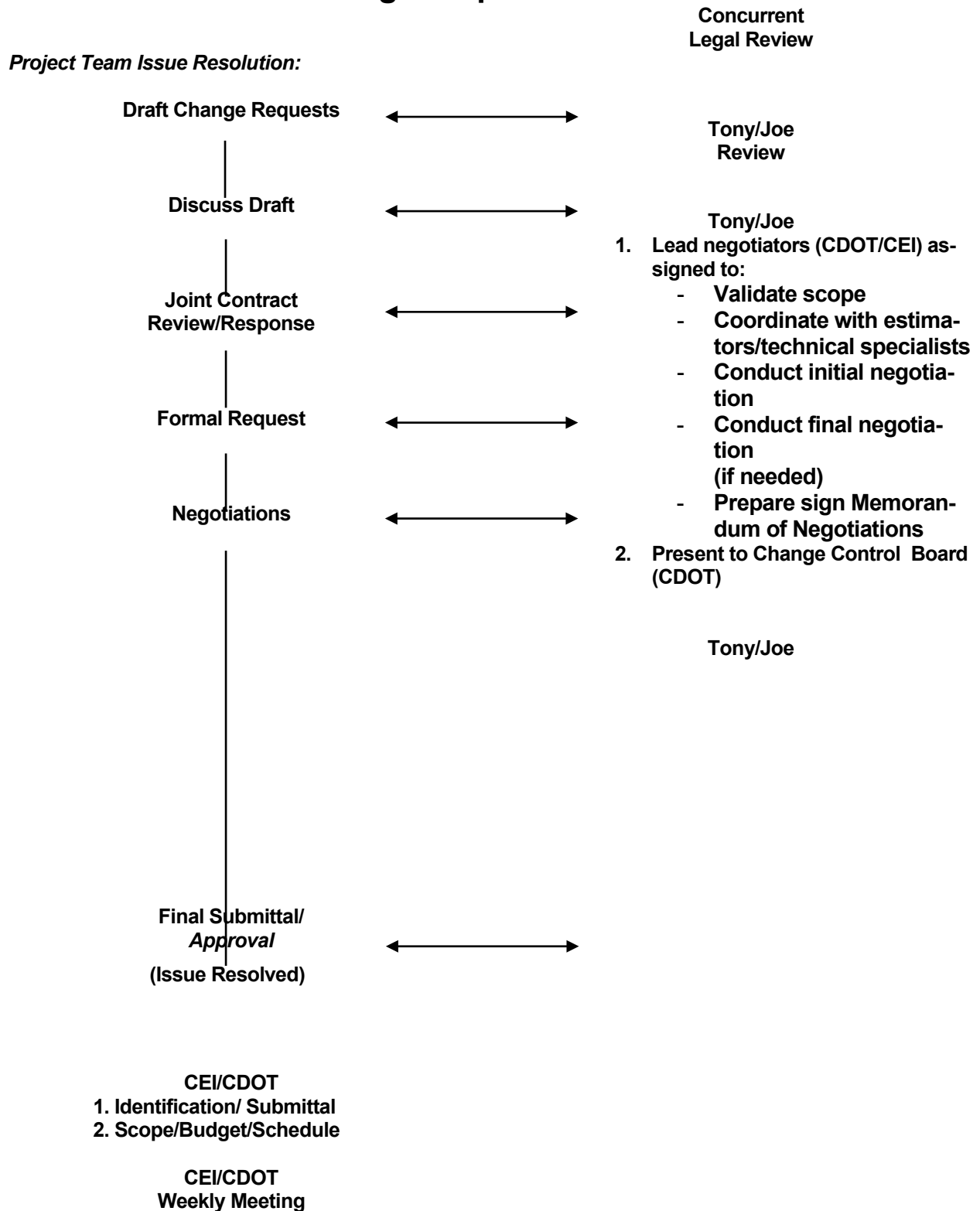
Joe O'Dea Date

CDOT:

Tony Gross Date

Figure 4:

Change Request Process



US 285 Design Build Project



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