COLORADO
Department of Transportation
Region 1

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Situation:

Eisenhower/Johnson Memorial Tunnels (EJMT) have recently had several issues with the plumbing and drainage systems. In May 2020 the heat tape failed in the seep main causing it to clog with ice and caused the road to heave. This heat tape exists in both tunnels' seep mains as well as both tunnels water mains. The north tunnel water main had recently failed in August, which was addressed immediately, however the field repair only lasted a couple months before the north tunnel water main failed again. This failure led to a week-long lane closure within the tunnel resulting in traffic queues extending for 10-miles one Friday evening.

Background:

The I-70 Corridor is the only east-west interstate to cross Colorado and is a major corridor for regional and national commerce, recreational traffic, and access to the mountain communities. The EJMT provides a critically important component of this corridor for the State of Colorado. Any failures of the plumbing and drainage systems can cause significant impacts to commercial traffic, the traveling public and potentially block this important link. CDOT needs to find innovative solutions to fix these problems so the plumbing and drainage system function long into the future without requiring frequent maintenance and lane or tunnel closures.

Use of heat tape as a method to keep the drainage system from freezing was installed by maintenance as a temporary fix and was not intended to be a long-term solution. The installation was not part of a construction project and, therefore, there are no as-builts that show how it is powered or specific locations of where the heat tape was installed or if it is even in working condition. The North water mainline that goes into the treatment plant near the east portal was repaired and sleaved approximately 5 years ago. That project installed a valve to pressure test the sleeve section. That valve connection is what most recently failed and is in need of a long term, more suitable fix.

Furthermore, none of the valves in the north water main completely close as evidenced during a recent repair effort the water continued to flow even though all of the valves were in the "off" position. This resulted in additional efforts by maintenance to keep the area dry while administering the repairs. There is an additional leak at a hydrant and the cord grips where heat tape is used and has failed. This water line is approximately 6' under the road surface and accessing it via manholes requires that the road be jackhammered for access. Additional leaks can be found at the hydrants coming off of this subgrade line that are located underground in the right shoulder. The hydrant leaks are hard to service/access and may have several unknown leaks that are only noticeable when water starts pouring onto the roadway and by that time reactionary efforts are needed to get the road reopened.

Assessment:

There are 3 different issues that need to be addressed. First, the seep mains and unreliable heat tape in both tunnels need to be analyzed and a long-term repair needs to be determined. Second, a design for preventing the mainline in the south

tunnel from freezing needs to be recommended. Third, the water mainline in the North tunnel needs to be addressed. Currently a significant amount of the line (25%) has been not in use and does not serve the existing fire hydrants posing a significant safety issue.

The unique nature of this project requires CDOT to seek outside expertise from the contracting and consulting industry to develop innovative design solution that is durable, historically proven, easily maintained, and compatible with current and future improvements in the EJMT.

Due to the existing safety concerns as well as the high impact future road closures within the tunnel have the project team views design/build as the best method to quickly deliver this project and correct the issues identified above. There is $3.6 million available from tunnel asset management to address these problems and Design-Build offers opportunity to maximize the project scope for our given budget.

The Project Delivery Selection Matrix process was considered to determine which delivery method would best provide innovations and new technology that can be thoroughly vetted ensuring that CDOT achieves a well designed solution that will last.

Below is a list of considerations included in CDOT's Project Delivery Selection Matrix and how each delivery method ranks for this project:

Project Complexity and Innovation

Design/build (Most appropriate)– Offer the greatest opportunity for innovation. The opportunity to evaluate alternate technical concepts and alternate concept configurations from three competing shortlisted teams. CDOT can select the team that demonstrates the best solution that addresses specific project complexities.

CM/GC(Appropriate) – Selection is based off aspirational commitments, and no specific solutions. The lack of competition once selected limits innovation, and creativity. CM/GC does not have capability to compare solutions as you can through the Design-Build competitive proposal process.

Design-Bid Build (Least appropriate) – Limited opportunity for innovation, lack of specific specialty skills to adequately develop scope with in-house design. CDOT needs to have its perspective broadened when it comes to a solution for this project, and Design-Bid-Build cannot provide what a Design-Build competitive proposal process can offer.

Project Delivery Schedule

Design/build (Most Appropriate) – Project schedule can be considered during the evaluation and will generates competition for minimizing the project duration. Design-Build allows for construction to begin while on a parallel path design is completed. Allows for a completion date schedule to reinforce that time and impact to this corridor is of the essence. Contractor owns the critical path, and completion date is a contract requirement.

CM/GC (Least Appropriate) – Similar schedule to other procurement of delivery methods but no competition for fastest schedule. Alternate delivery allows for construction to begin before design is complete. Multiple packages could create a multi season project which is not desirable. Contractors do not have a sense of urgency to complete the project, due to share schedule risk.

Design-Bid Build (**Fatally Flawed**) – Longest schedule due to the time needed to look for innovate solutions and complete final design. No work can begin until all the design is complete. **The critical need and nature of the repair and the impact to a strategic corridor makes this delivery method a fatal flaw.**

Project Cost Consideration

Design/build (Appropriate) – Good cost from short listed teams. Generates good price competition. Maximizes Scope for available budget under competition, ensures efficient investment. Cost and Schedule certainty come the earliest.

CM/GC (Appropriate) – Least Price Competitive. Multiple packages (potentially), Multiple negotiations with single contractor. Cost Certainty does not come until last package is negotiated.

Design-Bid Build (**Fatally Flawed**) – Most price competition but may include less qualified Contractors due to the unique nature of the project resulting in significant change orders. The Owners inability to adequately define the scope, increases the owner's exposure to error and omission risk and weakens the owner's ability to adequately negotiate change orders.

Because Design-Bid Build has received multiple fatal flaws it at this point Is removed from consideration. As we move into the remaining primary factors the information for Design-Bid-Build is for information only.

Level of Design

Design/build (Appropriate)- minimal amount of design gives plenty of opportunity for a Design-Build team to get involved and provide efficiencies within construction. No Need to develop a design beyond what is already achieved at this time.

CM/GC (Appropriate)- minimal amount of design gives plenty of opportunity for a CM to get involved and provide efficiencies within construction.

Design-Bid-Build (For Information Only)- developing a complete design without the specialty expertise can prove to be very difficult, and high risk. The high risk makes the owner vulnerable to error and omission, which can compromise the ultimate value of the investment.

Risk Assessment

Design/build (Most Appropriate) – Offer good evaluation of risk. "Spearin Doctrine" Risk lies with the Design-Build Team significantly reducing Owner's exposure to error and omission liabilities. Contractor will identify risks and price into their project. Through the contract Risk is assigned to the party that is best suited to manage the risk.

CM/GC (Appropriate) – CDOT can work with the Contractor to identify and price risk and share in risk as appropriate.

Design-Bid Build (For Information Only) – Owner bears full liability for errors and ommissions due to "Spearin Doctrine" Limited opportunity to address risk. Negative risk impacts cannot be handled during the design of the project, and therefore have a larger impact to cost and schedule.

Secondary Factors

Because there has been a clear distinction in delivery methods through the discussion of the primary factors it is not necessary to enter in discussion of the Secondary Factors such as staff experience, level of oversight and control, and competition and contractor experience.

Recommendation:

Based on the preceding discussion it is recommendation of the team that the Design/Build delivery method, is the most appropriate delivery method for the Eisenhower/Johnson Memorial Tunnel: Drainage, Pumping, and Heat Trace repair project. Design-Build will generate the largest number of innovations in a cost competitive environment and allow CDOT to maximize the scope for a given budget.

CM/GC would offer some benefit but would not generate the completion dates requirements or offer the number of innovations that would come from the competitive proposal process of three short listed Design-Build teams nor the competition on price. The design design-bid-build delivery method has fatal flaws as demonstrated in the discussion above.

CDOT's area of expertise related to drainage in the EJMT is limited and moving forward with design/build as the delivery method will allow CDOT to explore new technologies and innovations by industry that cannot be achieved through the other delivery methods. CDOT's past success delivering similar projects at the EJMT using the design-build delivery method such as the Fixed Fire Suppression Project (FFSS). of which this project shares many similarities to the FFSS project. With the many considerations discussed in the PDSM, the project team believes that design/build is the most appropriate delivery method to start construction by the Summer of 2022.

Respectfully submitted for your concurrence,

Neal Retzer
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Neal Retzer, Eisenhower-Johnson Memorial Tunnel Resident Engineer.

I concur,

Matthew D. Pacheco
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