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Oregon

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File Code:

TO: Matthew Garrett
Director, Department of Transportation

FROM: Jim Cox 
Assistant Branch Manager, ODOT Major Projects Branch

SUBJECT: Findings of Fact Exemption # 2006-53 Final Evaluation Report
Bundle No. 401, OR38: Elk Creek – Hardscrabble Creek
Design-Build Project
Key No. K14221

The post-construction evaluation for the Bundle No. 401, OR38: Elk Creek – Hardscrabble Creek Design-Build project is enclosed for your review as required by ORS 279C.355.

Use of the design-build project delivery method requires an exemption from letting the construction contract through competitive low bid (ORS 279C.335). The exemption process includes the development and adoption of findings prior to awarding the design-build contract, and a post-construction evaluation of the project.

The Bundle No. 401, OR38: Elk Creek – Hardscrabble Creek project was granted an exemption (2006-53) by the Director of the Department of Transportation (ODOT), under ORS 279C.335. The statute requires that the post-construction evaluation be submitted to the Director of ODOT and made available for public review. The evaluation compares the actual project results with the expected benefits of using design-build delivery method described in the adoption findings and with the estimated results had the project been delivered using design-bid-build. The results of those comparisons are summarized in the following table.

PROJECT DELIVERY RESULTS COMPARISON SUMMARY			
Factors	Exemption Findings Estimate	Actual Project Results	Hypothetical Design-Bid-Build Estimate
Cost	\$25 to \$30 Million	\$49,769,774	\$53,1391,771
Duration	37 Months	32 Months	54 Months

No formal action by the Director of ODOT is required. The final evaluation report will be posted on the ODOT Design-Build website within ten (10) business days at:

<http://www.oregon.gov/ODOT/HWY/MPB/ehs.shtml>

Enclosure: OR38: Elk Creek – Hardscrabble Creek Final Evaluation Report

**Final Evaluation
For The
OR38: Elk Creek – Hardscrabble Creek
Design-Build Project**
(as required by ORS 279C.355)

Project Name: Bundle No. 401, OR38: Elk Creek – Hardscrabble Creek

Exemption Number: 2006-53

Contract Number: C13319

Key Number: K14221

FAP: BFR-OTIA-S045 (030) OTIA III

Design-builder: Slayden Construction Group, Inc.

Designer: TY-LIN International

Project Description

The design-build OR38: Elk Creek – Hardscrabble Creek bridge replacement project was located in Douglas County, Oregon, between Elkton and Drain. This project included replacing five bridges along a 14-mile stretch of Oregon 38 (Umpqua Highway) and improved the Oregon 38/Oregon 138 in Elkton intersection. New bridges were built to current design standards to provide increased capacity for heavy loads and wider shoulders.

I. Introduction.

On July 18, 2006 the Oregon Department of Transportation's (ODOT) OR38: Elk Creek – Hardscrabble Creek design-build project received an order from the ODOT Director granting an exemption from competitive bidding to allow the use of the design-build project delivery method. ORS 279C.335(2) permits the Director of Transportation to grant exemptions to the Oregon Department of Transportation (ODOT) from the requirement for competitive bidding on approval of specific findings. Under ORS 279C.335(4) a public hearing must be held before the findings are adopted, allowing an opportunity for interested parties to comment on the draft findings. The public hearing was held on June 28, 2006 and there were no comments received.

ORS 279C.355 requires an evaluation of the public improvement project upon its completion. The evaluation includes, but is not limited to the following matters:

1. The actual project cost as compared with original project estimates.
2. The number of project change orders issued by the public agency.

3. A narrative description of successes and failures during the design, engineering, and construction of the project.
4. An objective assessment of the use of the alternative contracting process as compared to the findings required by ORS 279.015 (now ORS 279C.335).

In the following sections, two types of comparisons are made. The first evaluation, reported in Section II, compares actual results of the project with results that would be expected on a typical design-bid-build project. The second evaluation, reported in Section III, compares actual results of the project with the expected results described in the original exemption findings. Notice-to-Proceed was issued to the design-builder on December 19, 2006 and construction was completed on June 8, 2009. Dollar amounts provided in this report are rounded to the nearest whole dollar.

II. Comparison of the OR38: Elk Creek – Hardscrabble Creek Project Actual Results vs. a Typical Design-Bid-Build Project

A. Schedule and Project Duration

Under the traditional design-bid-build method ODOT obtains all environmental clearances and permits, and completes biddable final plans and specifications prior to advertising and awarding the construction contract to the lowest responsive bidder. Under the design-build contracting method, design, permitting, and construction are performed by the design-builder under one contract. Because the design-builder is responsible for both design and construction, it can begin construction before plans and specifications are finalized, and construction activities can be phased in a manner that is most efficient for the particular project.

A project equivalent to the OR38: Elk Creek – Hardscrabble Creek project completed under the design-bid-build method of delivery would typically take approximately 18 months for design and 36 months for construction, rendering a total project length of 54 months, or 4 years and 6 months. Using design-build the OR38: Elk Creek – Hardscrabble Creek project took only 32 months; from Notice-to-Proceed on December 19, 2006 to construction completion on June 8, 2009, or approximately 22 months earlier than the estimated duration if the design-bid-build method had been utilized.

Additionally; innovative traffic control measures and staging methods were used by the design-builder throughout the project area. The innovative methods significantly minimized impacts to traffic mobility on OR38, which is a key route connecting Interstate 5 (I-5) with the Oregon coast and provides a vital transportation corridor for agriculture, livestock, lumber, freight, basic goods and services and approximately 3,600 daily motorists. Design-builder utilized an innovative rapid bridge replacement technique to replace bridge crossing numbers three and four at OR38 tunnel. The design-builder constructed the replacement bridges next to the existing bridges, without impacting traffic flow. During two separate 48-hour weekend road closures the design-builder demolished existing bridges, slid in the replacement bridges, built approaches and opened OR38 to unrestricted traffic flow. If traditional construction staging methods

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were used to replace both bridges traffic control measure would have included single traffic lane closures with reduced speed limits for 180 consecutive days for each bridge.

B. Costs

The following tables provide actual change order costs and a comparison of actual project costs utilizing the design-build contracting method with what would have been expected under the design-bid-build method, based upon ODOT historical experience.

The actual total construction cost for the project was \$46,390,721, inclusive of change orders, as enumerated in the below table. (Change order amounts in parenthesis are cost savings)

Base contract amount: **\$ 45,900,500**

Change Order Item	Amount
Payment for TPM	\$ 2,767
Eight (8) Percent contractor Admin Cost	\$ 216
Compete Permit, Probe, Artifact Analysis	\$ 297,000
Deduct \$75k from Contractor Contract AM	\$ (75,000)
Reimbursement for Utility Relocation	\$ 8,815
Modify Section 00540, Bridge 20582 Deck	\$ 13,574
Modify Section 00540, Bridge 20583 Deck	\$ 9,217
Modify Section 00540, Bridge 20584 Deck	\$ 7,130
Modify Section 00540, Bridge 20585 Deck	\$ 4,876
50 Percent from OR38/138 Intersection Upgrade	\$ 5,805
First full Closure for Crossing #4	\$ (14,963)
Second full Closure for Crossing #3	\$ (14,963)
Pavement Rehabilitation Support of REG	\$ 14,997
Region 3 Request for Additional Signing Work	\$ 12,785
Bridge #1 Pavement Section Credit (20%)	\$ (2,134)
Bridge #3 Pavement Section Credit (20%)	\$ (6,661)
Bridge #5 Pavement Section Credit (20%)	\$ (11,101)
Reimbursement for User Satisfaction Survey	\$ 18,751
Event Planning Cost Reimbursement	\$ 14,966
Price Adjustment for Crossing #1 Deck	\$ (87,711)
Price Adjustment for Impacts from DTM Error	\$ 87,711
Modify PS 11 Section 3.4 (Load Ratings)	\$ 56,754
Reimburse for Archeological Site Impacts	\$ 57,232
Price Adjustment Crossing #5 Waterproof Membrane	\$ (9,832)
Accept Yellow Stripping at Crossing #1 W/Adj	\$ (10)
Total Change Order Amount	\$ 490,221

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Base contract amount plus change orders: **\$ 46,390,721**

For the cost comparison below we also add the change order cost increase to the design-bid-build estimate and use the following assumptions:

- Fifteen percent (15 %) of the change order cost is related to design/engineering, a common percentage in the industry, and the remainder to construction.
- The change orders would have been issued in a design-bid-build project.

Actual Costs Under Design-Build Method vs. Estimated Cost Under Design-Bid-Build Method

Estimated Cost for Hypothetical Design-Bid-Build Delivery:	Amount
Design (15 % of Construction Value)	\$ 6,104,025
Environmental/Permitting (5 % of Construction Value)	\$ 2,034,675
Construction Value	\$ 40,693,500
ODOT Construction Engineering/Construction Management (10 % of Construction Value)	\$ 4,069,350
Change Order Costs (Source - CCO Table Total)	\$ 490,221
Total Estimated Cost:	\$ 53,391,771
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Actual Cost for OR38: Elk Creek – Hardscrabble Creek Design-Build Delivery:	Amount
ODOT Preliminary Design and partial Permitting	\$ 1,261,827
Final Design and partial Permitting - Design-Builder (Design Services)	\$ 5,207,000
Construction (Construction & Engineering Services)	\$ 40,693,500
ODOT Project Management	\$ 2,117,226
Change Order Costs (Source - CCO Table Total)	\$ 490,221
Total Actual Cost :	\$ 49,769,774
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Difference between Hard Bid (Design-Bid-Build) and Design-Build in Total Cost Savings:	\$ 3,621,997

The construction value assigned to the hypothetical design-bid-build project uses the actual design-build construction cost for the project. It does not include adjustments for inflation. If inflation is factored in, at a nominal 3%, and attributed to the time period difference between actual completion of the design-build project versus the time the hypothetical design-bid-build project would have concluded, the difference in cost grows wider. The hypothetical design-bid-build costs for design, construction engineering/management and environmental/permitting were calculated using

percentages of construction cost. Those percentages were developed by ODOT base on experience and history and are commonly used to develop project estimates.

C. Conclusion

The use of design-build contracting resulted in the OR38 being opened for unrestricted public use about 22 months earlier than it would have been anticipated under the design-bid-build contracting method. Also of note, the design-builder's overall staging and traffic control and use of rapid bridge construction and replacement methods allowed for early completion of the project and full operational use of a critical east-west costal corridor. Due to load restrictions on US101 at Coos Bay and Florence, Oregon OR38 was the only route connecting I-5 to US101 that could accommodate legal commercial truck loads.

During the rapid replacement of crossings three and four, tunnel bridges OR38 highway was totally closed for 48 hours for each bridge. Motorists traveling from I- 5 to Reedsport were advised to take exit 136 (Sutherlin) and follow OR138 highway to Elkton. The OR138 detour route added approximately 30 miles to a one-way trip for southbound motorist.

The actual cost of the project was \$49,769,774 compared to the estimated cost for delivery of the project using design-bid-build of \$53,391,771 which results in an estimated savings for \$3,621,997. The calculated amounts in the above Actual Costs Under Design-Build Method vs. Estimated Cost Under Design-Bid-Build Method table indicate a cost savings of approximately 7% in comparing actual design-build cost with estimated design-bid-build cost.

This does not take into account the efficiencies and savings resulting from construction acceleration using design-build as compared to the traditional design-bid-build delivery method.

It would not have been practical to use the rapid replacement technique if the project had been delivered using design-bid-build. The designer would have had to make many decisions about construction means and methods that would have resulted in increased costs and risks that would not have been unacceptable to the Agency.

III. OR38: Elk Creek – Hardscrabble Creek Actual Project Results vs. Estimated Results Stated in the Original Exemption Findings

The comparisons made in this section are between the original OR38: Elk Creek – Hardscrabble Creek project estimated results in the exemption findings and actual project results.

A. Project Successes.

Successes experienced on the OR38: Elk Creek – Hardscrabble Creek project were:

1. Early Completion – The contract was completed ahead of schedule, with wider bridges with increased load rating and improved OR38 and OR138 intersection the critical I-5 to central coastal corridor opened to unrestricted truck traffic. This project was a hallmark of success, all of the critical path items, such as scope, schedule, budget, traffic control and management services came together in an efficient and effective manner. Mobility in the corridor worked well and was efficient. The design-builder utilized innovative techniques for staging, rapid bridge replacement and lane closure configurations that lessened impacts of closures and construction to the traveling public and local communities. Efficiencies achieved through the use of design-build method allowed the design-builder to complete the design and construction portion of the project about five months, earlier than the exemption findings estimated completion date of November 2009.
2. Direct Cost Savings – The exemption order for this project estimated a maximum direct cost savings of \$990,000. When comparing the cost of the completed project to the estimated cost of delivering the project using design-bid-build there was an actual direct cost savings of about \$2,632,000 or more than three (3) times the savings estimated in the exemption order.
3. Innovations:
 - a. Mobility – Due to the bridges for crossings three and four being located in rural area with steep canyons and their close proximity to the OR38 tunnel there was no space to build detour structures. Typical staged construction would have required approximately 180 days of a single lane detour bridge for each bridge. The design-builder utilized a rapid replacement technique which eliminated the need for detour structures and phased construction. Utilization of the rapid replacement technique allowed for complete replace of the two bridges during two separate 48-hour weekend highway closures. No significant work zone traffic delays or queues were encountered during the project
 - b. Construction Methods – For the bridge replacement at crossing five the design-builder utilized a single lane detour structure and controlled traffic with flaggers. This method eliminated traffic queues that would have been inevitable if temporary traffic signals had been used. Design-build contracting allowed the design-builder to identify and implement efficiencies in construction methods. These efficiencies allowed for the replacement of this bridge to be completed within a 6-week period, minimizing overall cost and impacts to the traveling public.
 - c. Traffic Control – Due to sight distant limitation on OR38, instead of utilizing flaggers the Design-builder placed cones on the roadway centerline and aligned with warning signage. This innovative technique proved to be very effective in increasing safety to the traveling public within the project area and contributed to the fact that there were no reported accidents.

- d. Value Engineering – ODOT approved design-builders cost saving proposal to eliminate the requirement to reconstruct 200 feet of roadway at 3 of the 5 bridge locations. As a result of the design-builder's ability to apply efficiencies in design and construction ODOT received a credit of \$19,896.

The design-builder's use of precast end panels for the rapid replacement bridges demonstrated to ODOT that this method was significantly faster and cheaper than the standard pour in-place method currently in use. ODOT is currently implementing this method for other ODOT projects state-wide, especial when short road closures are mandated.

- e. Environmental Stewardship:

(1) The design-builder worked closely with the Oregon State Historic Preservation Office and neighboring Indian tribes to address previously unknown archaeological resources discovered during the project. The design-builder's ability to adapt design and construction approaches to unforeseen changes to site conditions eliminated impacts to archaeological resources.

(2) The contract included up to \$50,000 available as an Environmental Excellence Award. The design-builder was awarded \$49,000 for the following areas.

- **Habitat Enhancement** – for utilizing intricate design elements to provide microhabitat features that will allow for a quicker establishment of biodiversity of the project area.
- **Protection of Regulated Areas** – for having Environmental Monitors on-site full time during the in water work period and at all deck pours. Near real-time input by monitors enhanced the design-builder's ability to avoid impacts and instilled a higher level of confidence in the regulatory agencies concerning the design-builder's environmental stewardship.
- **Protective Design Features** – for utilizing a retaining wall at bridge crossing three to reduce the amount of temporary fill impacting Elk Creek, which provides habitat for endangered fish species. This reduced the likelihood of scour and permanent impacts to fish habitat.

4. Awards:

The project has received widespread recognition through numerous awards.

- (1) American Public Works Association 2009 Public Works Project of the Year–Transportation \$25 - \$75 million range. This award recognizes project management and administration excellence in public works projects for the alliances between managing agencies, contractors, and consultants and their cooperative achievements.

- (2) ASCE 2009 Outstanding Civil Engineering Achievement Award Finalist - . This award recognizes superior civil engineering skills and significant contribution to society and civil engineering progress. This recognition was for design of the two rapid replacement bridges.
- (3) AASHTO 2009 America's Transportation Award for On Time Medium Project, Western Region. The use of rapid replacement technique by design-builder expedited construction by as much as six months, saving taxpayers time and money. The design-builder was recognized for demonstrating specific measurement, process management, and quality assurance methods used to deliver a quality product while demonstrating effective schedule management from conception to completion. The award also noted the design-builder's involvement and interaction with the surrounding local communities.
- (4) AASHTO 2009 Faces of Transportation Award for the following two photo categories.
 - Celebrating Achievements: Photo of construction worker raising American flag at the completed Elk Creek tunnel bridge, crossing four.
 - Connecting Communities: Photo of design-builder cooperation and community involvement at a public event in Elkton, Oregon.
- (5) Alternative Funding Grant. \$1 million in additional funds from the Highways for LIFE grant by the Federal Highway Administration for the design-builder's use of the innovative rapid replacement technique on this project.

5. Claims Avoidance – There were no claims filed against this project.

B. Project Failures – There were no failures identified specific to the use of the design-build method for this project. The following project issues should be evaluated for possible impacts and ways to avoid them for future ODOT bridge projects.

1. Utilization of two-stage construction for crossing one bridge resulted in the deck grades not matching. To eliminate the adverse effects on traffic ODOT required the design-builder to re-grade and level the deck construction joint.
2. Errors in the ODOT provided Digital Terrain Model (DTM) resulted in changes to the design-builders design and approach for crossing one bridge, costing ODOT \$87,711 in settlement fees.
3. Calculation errors by the design-builder for crossing three bridge resulted in steel girder chamber being slightly incorrect. ODOT accepted the bridge as is.
4. A failure in the deck forms during a deck concrete pour for crossing three (3) bridge was caused by use of a threaded steel support rod that was accidentally nicked during the cutting to size process. Clean-up and rebuilding the forms with redundant form kickers delayed work approximately one month.

C. Comparison to Original ORS 279.103 Exemption Findings. The comparisons made in this section are between the original findings presented in support of an exemption for the OR38: Elk Creek – Hardscrabble Creek project and the actual design-build project performance.

1. **Impact on Competition** – In the original exemption findings ODOT suggested that there would be no impairment of competition under a solicitation process utilizing technical and price-based evaluation and selection factors, as many firms had expressed interest in the OR38: Elk Creek – Hardscrabble Creek project. In fact, three design-build teams submitted statement of qualifications and two proposed on this project, resulting in a competitive procurement.
2. **Net Cost Savings** – In the original exemption findings, ODOT presented data from national studies that indicated cost savings could be expected in several areas through utilization of the design-build project delivery method when compared to the traditional design-bid-build method. ODOT concluded that if Oregon experienced similar results by eliminating the separation between design and construction phases, it could expect to realize a total savings of approximately \$990,000. Actual project savings exceeded the original exemption findings estimated savings by about \$2,632,000.
3. **Commercial Traffic/Industry Savings** – ODOT has developed a standardized evaluation process to estimate the financial impact a project will have on the traveling public. This process uses several key project factors in estimating road user cost; these factors include construction duration, average daily traffic volume, detours, speed reductions and length of the project work areas. Utilizing these factors ODOT estimates that the motor freight industry and traveling public could have incurred about \$82,000, per bridge in additional monthly road user costs if the design-builder had utilized a typical staged approach consisting of six month single lane traffic closures for each bridge. The total estimated user cost for 12 months of single lane closures is about \$984,900.

Utilizing the same above factors, ODOT estimates additional road user costs incurred by motor freight industry and traveling public by design-builder's use of the rapid replacement technique for the two tunnel bridges, with two separate 48-hour total road closures was approximately \$38,000 per bridge.

IV. Summary.

In conclusion, the OR38: Elk Creek – Hardscrabble Creek project exceeded expectations in ODOT's original exemption findings, supporting the granting of an exemption from competitive bidding. The project demonstrated that the design-build method saves ODOT time and money for construction projects as compared to traditional design-bid-build method.

The project was completed in less time that was estimated in the exemption findings with no construction contract claims pending. Whether evaluating the project on the basis of comparisons to a comparable design-bid-build project or expectations

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contained in the original exemption findings, the design-build delivery method implemented on the OR38: Elk Creek – Hardscrabble Creek project saved ODOT significant dollar amounts. Furthermore, with minimization of impacts to speed zone and traffic lane reductions, traffic delays and construction duration for the two tunnel bridges ODOT estimates with the use of the rapid replacement technique motorist incurred approximately \$76,000 in additional road user cost versus an estimated \$984,900 if 12 months of single lane closures had been utilized.

PROJECT DELIVERY RESULTS COMPARISON SUMMARY			
Evaluation Factors	OR38: Elk Creek – Hardscrabble Project (Design-Build) Exemption Findings	OR38: Elk Creek – Hardscrabble Project (Design-Build) Actual	Hypothetical (Design-Bid-Build) Estimated
Project Cost	\$25 to \$30 Million	\$49,769,774	\$53,391,771
Project Duration	37 Months	32 Months	54 Months