



Oregon

Theodore R. Kulongoski, Governor

Department of Transportation
Major Projects Branch
680 Cottage St., NE
Salem, OR 97301-2412
Telephone (503) 986-4445
FAX (503) 986-4469

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TO: Matthew Garrett
Director, Department of Transportation

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

SUBJECT: Findings of Fact Exemption # 2006-51 Final Evaluation Report
Bundle No. 211, Interstate 5 Wilsonville – Hayesville Interchange
Design-Build Project
Key No. K14033

The post-construction evaluation for the Bundle 211 Interstate 5 (I-5) Wilsonville to Hayesville Interchange 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 I-5 Wilsonville to Hayesville Interchange project was granted an exemption (# 2006-51) by the Director of the Department of Transportation (ODOT), under the statute in force at that time (ORS 279.015). The statute was revised by 2005 (ORS 279C.335). Both current and previous statutes require that the post-construction evaluation be submitted to the Director of ODOT and made available for public review. The attached evaluation compares the actual project results with the expected benefits of using the 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.

**Final Evaluation
For The
Interstate 5 Wilsonville – Hayesville Interchange
Design-Build Project**
(as required by ORS 279C.355)

Project Name: Bundle No. 211, Interstate 5 Wilsonville – Hayesville Interchange

Exemption Number: 2006-51

Contract Number: C13243

Key Number: K14033

FAP: IM-OTIA-S001 (212) OTIA III

Design-Builder: Hamilton Construction Co.

Designer: OBEC Consulting Engineers

Project Description

The Interstate 5 (I-5) Wilsonville - Hayesville Interchange design-build project was located in Marion and Clackamas Counties, Oregon, between Wilsonville and Salem. This project included replacing the northbound and southbound bridges on I-5 over Hwy 551 (Wilsonville-Hubbard Highway) at MP 282.25. Both of the bridges were replaced as part of the statewide OTIA III Bridge Program. This project also included 22 miles of interstate maintenance work on both the northbound and southbound lanes of I-5 between MP 259.10 and MP 281.33 and re-tensioning and repairs of the existing cable guardrail between MP 259.10 and MP 281.33. This was the third corridor-level design-build project on the I-5 system.

I. Introduction.

On March 27, 2006 the Oregon Department of Transportation's (ODOT) I-5 Wilsonville - Hayesville Interchange 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 March 2, 2006 and there were no comments received.

ORS 279.103 (now 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. The construction phase of the project commenced with Notice-to-Proceed on April 21, 2006 and was completed on June 19, 2008. Dollar amounts provided in this report are rounded to the nearest whole dollar.

II. Comparison of the I-5 Wilsonville - Hayesville Interchange Project Actual Results vs. a Typical Design-Bid-Build Project

A. Schedule and Project Duration

Under the traditional design-bid-build model 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 model, 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 I-5 Wilsonville - Hayesville Interchange project completed under the design-bid-build method of delivery would typically take approximately 18 months for design and 24 months for construction, rendering a total project length of 42 months, or three and one half (3 ½) years. The I-5 Wilsonville - Hayesville Interchange project, utilizing the design-build method of project delivery, took only 28 months; construction commenced with Notice-to-Proceed on April 21, 2006 and was completed on June 19, 2008, approximately 14 months earlier than the estimated duration if the design-bid-build method had been utilized. Due to labor compliance disputes the project close out (third notification) did not take place until March 04, 2010. Actual construction completion date of June 19, 2008 will be used as the official project completion date throughout this report.

Additionally innovative traffic control measures and staging methods were used by the design-builder, allowing Interstate Maintenance (IM) paving work to move forward with less of an impact to the traveling public and improved the quality of the design-builder's work. Design-builder utilized inlaid skip striping tape which eliminated the need for future re-striping of the mainline section of I-5. These innovative measures decreased

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the amount of time workers would be exposed to live traffic, minimized the amount of drip tracking and slobbers and other potential wearing course imperfections, and minimized additional cleanup work.

B. Costs

The following tables provide actual change order costs and a comparison of actual project costs utilizing the design-build contracting model 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 \$24,497,591, inclusive of change orders, as enumerated in the below table. (Change order amounts in parenthesis are cost savings)

Base contract amount: **\$ 23,461,100**

Change Order Item	Amount
Payment for TPN	\$ 1,677
8% Contractor Admin Cost	\$ 268
Revise Special Provisions PS 11, STR Performance Spec	\$ 37,686
Revise Special Provisions PS 11, STR Performance Spec	\$ 37,686
Salvage a portion of existing drainage	\$ (11,207)
Salvage a portion of existing drainage	\$ (11,207)
Ensure existing illumination remains connected	\$ 9,876
Ensure existing illumination remains connected	\$ 9,876
Construction diversion alignment 7794A/B	\$ 72,500
Construction diversion alignment 7794A/B	\$ 72,500
Design/Construction new emergency turnaround	\$ 22,945
Design/Construction new emergency turnaround	\$ 12,199
Revise Exhibit 10, section 7 table 2.4.2.1A	\$ (16,800)
Revise Exhibit 8, Engineering Data	\$ 42,796
Revise Exhibit 8, Bridge Rehab	\$ 44,839
Revise Exhibit 4 - PS 24 - Weather 3M Tape	\$ 345,930
Revise Exhibit 4 - Mono Direction Pavement Mark	\$ 44,491
Additional Traffic Control	\$ 101,310
Revise Exhibit 4 - Credit to the Agency	\$ (86,784)
Shared savings - CRP - Modify PCC Pavement	\$ (47,066)
Add superset extender for curing SB I-5	\$ 10,370
Additional Traffic Loops @ Woodburn Ramp	\$ 6,462
PCC pavement repairs (Option A)	\$ 308,650
Durable Stripe removal & replacement	\$ 29,989
Temp stripping & markers @WIM facilities	\$ 9,070
Reimburse ODOT, damage sanitary sewer	\$ (11,563)

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Total Change Order Amount	\$ 1,036,491
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Base contract amount plus change orders: **\$ 24,497,591**

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 Model vs. Estimated Cost Under Design-Bid-Build Model

Estimated Cost for Hypothetical Design-Bid-Build Delivery:	Amount
Design (15 % of Construction Value)	\$ 3,449,280
Environmental/Permitting (5 % of Construction Value)	\$ 1,149,760
Construction Value	\$ 22,995,200
ODOT Construction Engineering/Construction Management (10 % of Construction Value)	\$ 2,299,520
Change Order Costs	\$ 1,036,491
Total Estimated Cost:	\$ 30,930,251
Actual Cost for Wilsonville - Hayesville Interchange Design-Build Delivery:	Amount
ODOT Preliminary Design and partial Permitting	\$ 497,760
Final Design and partial Permitting - Design-Builder (Design Services)	\$ 1,700,000
Construction (Construction & Engineering Services)	\$ 21,761,100
ODOT Project Management	\$ 1,076,800
Change Order Costs	\$ 1,036,491
Total Actual Cost :	\$ 26,072,151
Difference Between Hard Bid (Design-Bid-Build) and Design-Build in Total Cost Savings:	\$ 4,858,100

The construction value assigned to the hypothetical design-bid-build project utilized the original authorized design-build construction value for the I-5 Wilsonville - Hayesville Interchange project. It does not include adjustments for inflation. If inflation is factored in, at a nominal three (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 numbers used in arriving at the hypothetical design-bid-build design and construction and environmental

values were developed, consistent with ODOT experience and history of bid item averages, as percentages that are based off the estimated construction value for design-bid-build delivery method.

C. Conclusion

The use of design-build contracting resulted in the I-5 Wilsonville - Hayesville Interchange project being opened for public use about 14 months earlier than it would have been anticipated under the design-bid-build contracting model. Also of note, innovative traffic control measures were used, allowing paving work to move forward with less of an impact to the traveling public and resulting in improved quality of work, which led to the design-builder receiving a first place paving award from American Pavement Association of Oregon. The use of inlaid skip striping reduced the amount of time construction workers spent on re-striping the I-5 mainline, significantly decreasing their exposure to live traffic and risk of injury. The creativeness and acceleration of work by the design-builder significantly lessened the impact on traffic flow and improved safety on I-5, the West Coast's major trade corridor and one of the top freight routes in the nation.

The actual cost of the project was \$26,072,151 compared to the estimated cost for delivery of the project using design-bid-build of \$30,930,251 which results in an estimated cost saving of \$4,858,100. The calculated amounts in the above Actual Costs Under Design-Build Model vs. Estimated Cost Under Design-Bid-Build Model table indicate a cost savings of approximately 16% 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.

III. I-5 Wilsonville - Hayesville Interchange Project Actual Results vs. Estimated Results Stated in the Original Exemption Findings

The comparisons made in this section are between the original I-5 Wilsonville - Hayesville Interchange project estimated results in the exemption and the actual project results.

A. Project Successes.

Successes experienced on the I-5 Wilsonville - Hayesville Interchange project were:

1. Early Completion. 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, design-builder utilized innovative techniques for lane closure configurations that lessened impacts during closures and minimizing complaints from the traveling public. All these elements contributed to the West Coast's

major trade corridor opening up to full operational status approximately two (2) months ahead of the estimated completion timeline stated in the exemption findings. Efficiencies achieved through the use of design-build method allowed the design-builder to complete the project about two (2) months earlier estimated completion timeline stated in the exemption findings.

2. **Direct Cost Savings.** The exemption order for this project estimated a direct cost savings of \$594,000 when comparing incurred costs when utilizing design-build versus design-bid-build method. When comparing the actual cost of the completed project to the estimated cost of delivering the project using design-bid-build there was a direct cost savings of about \$4,264,000, more than seven (7) times the savings estimated in the exemption order.
3. **Innovative traffic control measures** were used, allowing paving work to move forward with less of an impact to the traveling public and resulting in improved quality of work. Design-builder scheduled interchange paving work to take place after mainline paving, significantly decreased drip tracking and slobbers, and other wear course imperfections, minimizing cleanup work. Design-builder used open graded mix for the asphalt for the I-5 mainline paving; this technique provided enhanced surface condition during inclement weather, improving public safety. Collaboration and innovative thinking by ODOT and design-builder's team members significantly improved traffic mobility and public safety on 26 miles of I-5, a major trade and freight route corridor. No significant work zone delays or queues were encountered during the project.
4. **Innovations:**
 - a. **Mobility** –The traffic control plan included traffic shifting which used I-5 shoulders as travel lanes, thereby allowing design-builder to meet contract mobility requirements by maintain two (2) open lanes for traffic while closing more of the I-5 mainline for paving.
 - b. **Lane Striping** – Use of inlayed skip striping reduce the need for future re-striping of the mainline section of I-5, thereby decreasing the need for lane closures and additional impacts to mobility. Worker risk of injury was greatly reduced by minimizing their exposure to live traffic.
 - c. **Value Engineering** – The design-builder's proposal to leave the majority of the existing storm drains for Highway 551 in place and modify existing structures to accommodate grade lowering provided ODOT approximately \$22,400 in cost savings.
 - d. **Environmental Stewardship** – ODOT and the design-builder saved asphalt removed during the project for use on future projects. That kept 130,000 tons of used asphalt out of landfills, saving more than \$133,000 in landfill fees.
5. **Awards.**

- a. The project was awarded the first place 2008 American Pavement Association of Oregon Paving Award in the High-Volume State Highway category. Design-builder coordinated their work with ODOT representatives to alleviate potential problems with asphalt mix designs, compaction and smoothness. The innovative traffic controls measures allowed the design-build team to work with less impact on traffic resulting in improved quality in the pavement work, which was a main factor in the design-builder being nominated and winning this award.
- b. The design-build team was awarded the following bonuses for the level of quality put forth in its paving work:
 - Level 3 Compaction Bonus - \$14,607
 - Level 4 Mix Bonus - \$155,392
 - HMAC Smoothness Bonus - \$226,312
6. Safety. There were no project specific safety incidents reported.
7. Claims Avoidance. There were no construction contract claims filed.

B. Project Failures.

1. Safety. No project specific safety incidents reported. However, during the course of work there were five (5) traffic accidents that occurred during lane closure configurations. No claims were filed against ODOT.
 - a. At fault rear end accident, driver cited for careless driving. Minor injuries with ambulance transport.
 - b. No at fault sideswipe accident, driver maneuvered to avoid another vehicle that cut them off. No injuries reported.
 - c. No at fault rear end accident, vehicle did not stop in time due to braking issues. One minor injury and two possible injuries, no ambulance transport.
 - d. No fault going off highway accident, vehicle head lights stopped working and driver pulled off into median. Driver received injuries after being hit by freight truck and was transported by ambulance.
 - e. No fault lane change accident, vehicle changed lanes to avoid another vehicle and lost control and struck cement barriers. Possible injuries with ambulance transport.
2. Sequencing of paving work was problematic, initial sequencing of work had the mainline paved before interchanges, which resulted in wearing surface imperfections such as drip track and slobber. The design-builder gained ODOT approval to perform mainline paving before interchange paving, minimizing wearing surface imperfections for the remaining project paving work.

3. Project timelines for paving and striping work were impacted and delayed by unsuitable weather conditions. Several contract change orders were issued extending timelines in order to allow the design-builder to complete the work in a manner consistent with ODOT quality expectations.

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 I-5 Wilsonville - Hayesville Interchange 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 I-5 Wilsonville - Hayesville Interchange project. In fact, two (2) design-build teams submitted statement of qualifications and 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 model when compared to the traditional design-bid-build model. 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 \$594,000. Actual project savings exceeded the estimated savings stated in the exemption findings.
 - a. **Bid Documents.** In the original exemption findings ODOT projected that by eliminating the separation between the design and construction phases in the solicitation process using the design-build method, ODOT could reduce Preliminary Engineering (PE) costs by approximately \$100,000 for the I-5 Wilsonville - Hayesville Interchange project when compared to the design-bid-build model. Project data indicated an actual savings of about \$662,000 between the estimated PE cost and the actual PE cost for the project.
3. **Commercial Traffic/Industry Savings.** The design-builder's innovative traffic control plan minimized impacts to traffic mobility during the project. Mainline paving work took place mostly at night; the traffic control plan included short duration ramp closures, single lane closures and double lane closures during non-peak hours. The design-builder also utilized detour structures and highway shoulders to route traffic efficiently around construction work. Through the use of the design-build delivery method and exceptional traffic control measures ODOT and the design-builder jointly saved the traveling public significant inconvenience by eliminating traffic delays, detours and slower posted speeds sooner than what would have been needed if design-bid-build had been utilized.

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 area. Utilizing these factors, ODOT estimates that the traffic control efficiencies achieved through the use of the design-build method for this project saved the motor freight industry and traveling public about \$2,708,000 per month in-additional road user costs.

D. Lessons Learned:

1. Maintaining and powering of highway lighting systems during construction was not addressed in project special provisions. A change order had to be issued in order to have the lighting system for the Highway 551 interchange reenergized.

IV. Summary.

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

The project was completed ahead of the exemption findings estimated completion timeline with no construction contract claims. Whether evaluating the project on the basis of comparisons to a comparable design-bid-build project or expectations contained in the original exemption findings, the design-build delivery model implemented on the I-5 Wilsonville - Hayesville Interchange project saved ODOT significant dollar amounts. Furthermore, with the minimization of impacts that lead to speed zone and traffic lane reductions, and traffic delays, ODOT estimates the use of design-build saved the motor freight industry and traveling public about \$5,416,000 in additional road user costs by completing the project two (2) months earlier than the estimated completion timeline stated in the exemption findings.

PROJECT DELIVERY COMPARISON SUMMARY			
Evaluation Factors	I-5 Wilsonville - Hayesville Interchange Project (Design-Build) Exemption Findings Estimated	I-5 Wilsonville - Hayesville Interchange Project (Design-Build) Actual	Hypothetical (Design-Bid-Build) Estimated
Project Cost	\$20 to \$25 Million.	\$26,072,151	\$30,930,251
Project Duration	30 Months	28 Months	42 Months