Washington State Department of Transportation

Paula J. Hammond, P.E.
Secretary of Transportation

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David H. Moseley
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October 26, 2011

The Honorable Mary Margaret Haugen
Chair, Senate Transportation Committee
P.O. Box 40410
Olympia, WA 98504-0410

The Honorable Judy Clibborn
Chair, House Transportation Committee
P.O. Box 40600
Olympia, WA 98504-0600

SUBJECT: Section 308(13) Proviso Report

Dear Transportation Chairs Haugen and Clibborn:

Section 308 (13) of ESHB 1175 required the department to review all terminal project cost estimates to identify projects where similar design requirements could result in reduced preliminary engineering or miscellaneous items costs.

The attached document reflects the changes and the actions that have been taken and are being considered by WSF which may result in future cost savings in design of the current and future projects. However, I would like to point out that while Preliminary Engineering (PE) and design has become more efficient in Terminal Engineering (TE); other PE requirements have become more difficult in recent years. For example, considerable effort is required to obtain compliance with the Marine Mammal Protection Act. However, this is only one of the issues that need to be resolved to accurately design a capital project that meets the site specific requirements of each facility.

Terminal Engineering does currently utilize similar design concepts when the conditions of the site and all related factors permit the use of the same structure. However, there are many factors that make standard applications more rigorous and time consuming. This report touches and provides explanation of those site-specific requirements.

Lastly, I would also like to point out that TE is currently in process of developing a manual for their Design Standards which is expected to be completed by this spring. Our intent is to utilize much of the same information being drafted for the development of this manual to include to the extent possible some of the practices that currently exist. These will be formally documented and adopted in this manual, which will also demonstrate some of the real-life examples of the work being utilized by Terminal Engineering to control design costs.

Please let us know if we can provide more information or answer any questions on this report. Thank you.

Washington State Ferries

Sincerely,

David H. Moseley
Assistant Secretary for
Washington State Ferries
DM:MM

CC: Paula Hammond, Transportation Secretary
Steve Reinmuth, WSDOT Chief of Staff
George Capacci, WSF Deputy Asst. Secretary for Construction & Operations
Jean Baker, WSF Deputy Asst. Secretary for Finance & Admin.
Tim Smith, Director of Terminal Engineering
Mehrdad Moini, Terminal Engineering Program Manager
Nicole McIntosh, Terminal Engineering Design
Gary Lebow, WSDOT CPDM Office
Robin Rettew, OFM
Erik Hansen, OFM
Beth Redfield, House Transportation Committee
Kelly Simpson, Senate Transportation Committee

WSDOT FERRIES DIVISION

TERMINAL ENGINEERING

PROVISO REPORT

As required by Section 308 (13) of ESHB 1175:

> *The department shall review all terminal project cost estimates to identify projects where similar design requirements could result in reduced preliminary engineering or miscellaneous costs. The department shall report by September 1, 2011. The report must use programmatic design and include estimated cost savings by reducing repetitive design costs or miscellaneous costs, or both, applied to projects.*

Terminal Engineering has reviewed all terminal projects where we currently have scoping level cost estimates to identify projects where similar design requirements could result in reduced preliminary engineering or miscellaneous items costs.

We would like to point out that these practices do currently exist in Terminal Engineering and by taking advantage of some of the already established standards, design processes and templates we have reduced preliminary engineering costs. We have and will continue to monitor our costs and through aggressive project management and seek to keep them at the minimum level required to perform the work. For example, in the 09-11 biennium this approach led to a reduction in Preliminary Engineering expenditures of $1.3M for all projects with completed designs that went to construction. The majority of this reduction, nearly $800K, occurred in one single project where a design that was previously developed for a floating dolphin at Orcas Island was modified and used for the floating dolphin at the Mukilteo Terminal. The other 13 projects had both plusses and minuses, the sum of which resulted in the balance of the savings.

The proviso also requires the use of programmatic designs to reduce repetitive design costs and miscellaneous costs. This is a practice that Terminal Engineering has been implementing over the past 10 years. In the arena of dolphin design, Terminal Engineering has developed 4 special spreadsheets to increase efficiency and accuracy of the designs with the ultimate goal of achieving reductions in Project Engineering costs as well as a reduction in construction costs. Approximately 75% of the plan sheets developed for steel pile dolphins are standard, in other words, are re-used for every steel pile dolphin design. In addition the Terminal Engineering Design standards committee, with direct involvement of WSDOT Headquarters Design staff and consultants, is developing a design manual for Terminal Engineering comparable to the WSDOT Highway Design Manual. The publication of this manual will be a significant milestone for terminal projects and will provide design staff with design guidance intended to streamline the design process and require justifications for any deviations from the manual. This manual is slated for completion and publication in the early half

of 2012 and will be approved by Terminal Engineering management as well WSDOT Headquarters Design. Production of this manual will contribute to future design savings and will minimize discussion and debate concerning the final work product as it will be largely determined in advance.

While engineering design has become more efficient, other PE requirements have become more difficult. Currently, the most challenging is the effort required to obtain compliance within the Marine Mammal Protection Act. However, this is only one of the issues that need to be resolved to accurately design a capital project that meets the site specific requirements of each facility. During the recent legislative and OFM tours our staff provided detailed explanation of some of the challenges that we face in delivering our projects and why specific site, environmental and operation conditions need to be considered when designing and constructing each project, based on its specific circumstances. These site-specific requirements, discussed below, were noted by the legislative and OFM staff and have brought a better sense of appreciation and understanding in what all needs to be considered when designing a project to minimize impacts. With these factors in mind at this time we cannot identify projects where we can achieve a significant cost reduction; however, our goal is by aggressive project management and by continuing using of the wealth of experience and standards we have developed, we can show some long-term savings in future projects to be delivered by Terminal Engineering.

Design Process

There are many factors to be considered in the design of a capital project. Using a dolphin as an example, some of the major points that the engineering staff must consider are:

- Geometric Layout - The number of dolphins per slip can vary from 6 at Edmonds to 2 at Shaw. Improper placement of dolphins could result in the vessel rotating out of the slip while loading or unloading the boat, to the more catastrophic vessel striking an adjacent property structure in an errant landing. Terminal Engineering is responsible for developing the dolphin layout, but ultimately, the Captains and Port Captain need to approve the layout at each slip.
- Vessel Berthing Energy - Early in the dolphin design work, extensive velocity / approach studies are performed to determine how fast the vessels were traveling at the location of the new dolphins. This data is used to calculate the direct and drift energy the dolphin needs to withstand. This energy is absorbed in part by the dolphin fenders. As Terminal Engineering has refined dolphin design, the size range of fenders has standardized. The fender pile size (diameter and thickness) is typically the same. This results in fewer changes to plan sheets and consistency for Contractors.
- Soil Conditions - Geotechnical information is needed to determine how much the soil can contribute to the strength of the dolphin, and how deep the reaction piles need to be driven. This is also important to determine whether the piles can be installed with vibratory or impact hammers. Assuming a longer than necessary length would mean extra steel and cost, but also a risk that the contractor could not achieve the penetration specified. Assuming shorter length would mean the

dolphin would not be stable enough to withstand the vessel energy. Special soil conditions exist that also require a different approach. At Shaw, the lack of soil required a special design for rock sockets.

- Dolphin Diaphragm Design and Shape - For a majority of dolphins, the dolphin diaphragm only changes in terms of the number of reaction piles. However, due to proximity of adjacent facilities, other slips, approach angle, and soil conditions, these too may differ. For example, the Port Townsend Dolphin project installed a double sided intermediate dolphin between slips 1 and 2. Since these slips are relatively close, the dolphin shape had to be modified to fit a slimmer space. At Lopez, the soil conditions made it impractical to achieve "fixity" at the pile base, so the diaphragm had to achieve this.

Other important factors that are considered for the design of all projects are:

- Construction phasing
- Cultural resources
- Load volume
- Number of riders
- Sea current
- Vessel type
- Environmental regulation and type of permits
- Noise monitoring and Marine Mammals
- Fish Windows

Project Specific Cost Reductions

Terminal Engineering utilizes similar design concepts when the conditions of the site and all related factors permit the use of the same structure. This was the case when the timber dolphin at the Mukilteo terminal was replaced with a reinforced concrete floating dolphin using existing design concepts from a similar project for the Orcas Island Ferry Terminal. The only substantial difference was the anchoring system required for the specific site. Another example is the construction of the wingwall at the Coupeville Terminal whose original design was used at the Port Townsend terminal. The only substantial difference was the pile depths.

Looking at the project list for the next few biennia, the greatest opportunity to save on design costs are the structures above the water – the superstructures. After the Port Townsend H-span design is completed this biennium, we anticipate significant relative savings on the next two Hspan superstructures at Seattle and Mukilteo. The H-span substructures will vary greatly based on soil conditions, depth, etc. Similarly, trestle decks are primarily a function of vehicle loading (which is consistent terminal to terminal). We can anticipate cost savings on the trestle superstructure designs as we move forward with our trestle program. Like the H-Spans and dolphins, the substructures will need to be designed for the site specific conditions at each terminal.

Conclusion

Terminal Engineering has proven it can deliver projects within its means and budgets and has demonstrated savings in recently completed projects. It is committed to aggressively monitor its costs and achieve the maximum savings where possible. Again as noted earlier, each terminal has its own unique environment and circumstances and environmental regulations and the recent requirements due Marine Mammal Protection Act (MMPA) pose significant challenge in the delivery of our projects. In closure we would like to note that the various ferry terminals were constructed at different times with different design standards, and many were constructed before the Ferry System was acquired by the State of Washington. It is our best intention to continue to review project cost estimates and look for ways to reduce the cost and increase efficiency with above challenges and site specific conditions in mind. We will also soon be able to take advantage of the Design Manual that is currently under production. During early design stages each project is evaluated and all options are considered when conducting cost benefit analyses including using similar design concepts for new projects. It is our goal to achieve the most effective project at the lowest total project cost to the citizens of Washington State and the scarce tax revenues.