Warren Avenue Bridge Pedestrian Improvements Feasibility and Alternatives Analysis

March 2024 Update Memo

To Shane Weber, PE, City of Bremerton

From: Aaron Knight, PE, SCJ Alliance
Jessica Soward, PE, SE, Sargent Engineers

Date: March 5, 2024

Introduction

This memo documents updates to the Warren Avenue Bridge Feasibility and Alternatives Analysis, dated September 2023, resulting from action of the Bremerton City Council and new information provided by the Washington State Department of Transportation (WSDOT). The following addresses the addition of "Alternative X", introduced by the City Council, tracks revised direction provided by WSDOT regarding maintenance access, clarifies assumptions in bridge design criteria, and discusses the safety and operational performance of the walkway alternatives.

The Executive Summary of the Warren Avenue Bridge Feasibility and Alternatives Analysis is included as **Appendix A**.

Bremerton City Council Resolution

At the Bremerton City Council meeting on August 2, 2023, the recommendation of a preferred alternative, "Alternative 2", was presented to the City Council. However, the City Council introduced and approved a new alternative, "Alternative X", via Resolution 3363 (**Appendix B**). "Alternative X" proposes asymmetrical widening on both sides of the bridge, with a 12-foot clear-width walkway on the east side and an 8-foot clear-width walkway on the west side with two overlooks (widened sections of the walkway to allow for stopping and viewing), if within the project budget.

Summary of WSDOT Field Test

On October 23, 2023, WSDOT held a field test to determine the capabilities of WSDOT's current under-bridge inspection trucks (UBITs). WSDOT's team found that the current A62 model UBIT was more limited than previously stated due to the depths of the bridge's existing steel girders . As documented in the feasibility analysis, instead of accommodating walkway clear widths of 10 feet, the A62 UBIT could only accommodate walkway clear widths of 8 feet.

Additionally, it was determined that alternatives with clear-width walkways of 8 feet or greater would require modifications to existing catwalks and the addition of new catwalks to meet WSDOT inspection requirements.

1 Alternative X

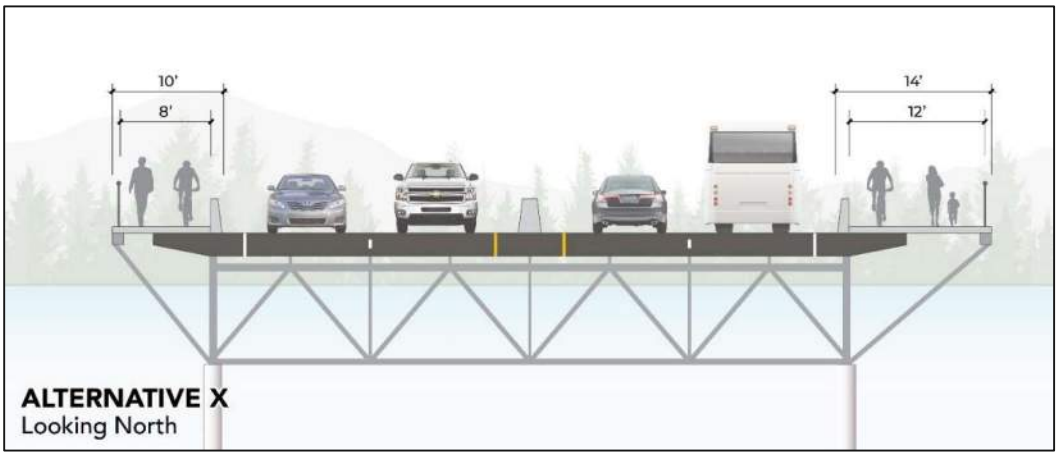
1.1. Alternative Description

Alternative X was not evaluated during the feasibility and alternatives analysis process and was first considered when the Bremerton City Council approved it in August 2023. Alternative X proposes multimodal improvements on both sides of the bridge, including a 12-foot clear-width walkway on the east side and an 8-foot clear-width walkway on the west side. This alternative combines the east side improvements from "Alternative 3" with the west side improvements from "Alternative 1" (including two overlooks) to meet the project intent.

If the City acquires additional funding for "Alternative X," the City Council Resolution directs considering an option with an expanded walkway width on the west side of the bridge.

Alternative X has been added to the alternatives screening matrix and includes the following key elements:

- Structurally feasible
- Fully ADA-compliant
- Purchase of a larger UBIT truck (required)
- Replacement of the existing catwalks and addition of a new centerline catwalk (required)
- An anticipated project cost estimate of $30.3 M



1.2. Structural Evaluation

Alternative X places an 8-foot clear-width path on the west side of the bridge and a 12-foot clear-width path on the east side of the bridge. Up to two 16-foot-wide overlooks are installed to allow for gathering areas along the railing on the west side of the bridge. The lookouts are approximately 24 feet long. In order to meet the added weight limitations, the alternative is constructed as follows:

- The existing sidewalk panels, center curb, and barriers are removed.
- A lightweight concrete center barrier is attached to the deck.
- A lightweight concrete barrier is constructed at each edge of the traveled way.
- Beams are mounted under the tee girder and box girder spans to support the wider deck.
- Columns are set on the beams to support a new longitudinal beam.
- Diagonal braces are installed on the steel girder span.
- A longitudinal beam is installed to support the edge of the deck.
- Sidewalk decking is installed over the new steel framing and supported from the existing bridge deck. The sidewalk decking is composed of steel or FRP decking.
- New baluster-type pedestrian barriers are installed along the edges of the new sidewalks.

The figure in **Appendix C** shows the details of the construction. This alternative does not allow WSDOT to access all necessary areas of the bridge with their current under-bridge inspection trucks. A larger UBIT would be needed, along with three new access catwalks and removal of the existing catwalks. This alternative does not trigger seismic retrofit or truck weight restrictions.

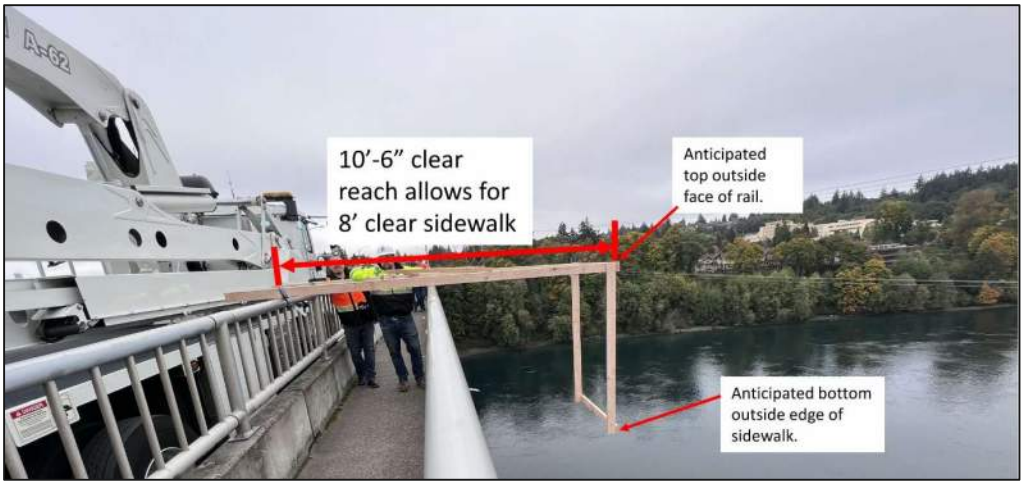
2 WSDOT Field Test for Maintenance Access

A field test was held by WSDOT in October 2023 to evaluate the maximum reach of the existing WSDOT UBIT. Currently, WSDOT services the Warren Avenue Bridge with an A62 model UBIT. During the field test, a WSDOT crew constructed a 2x4 frame, attached the frame to the existing pedestrian railing to simulate an 8-foot clear-width walkway, and tested the reach of the A62 UBIT. The field test found that an A62 UBIT only provides a 10.5-foot reach and can, therefore, only accommodate walkway improvements up to a maximum clear width of 8 feet.

Information provided by WSDOT following this field test is attached as **Appendix D**.

2.1. UBIT Assumptions

The field test represented a change to assumptions previously provided by WSDOT that the A62 UBIT could accommodate walkway clear widths of up to 10 feet. While the UBIT does have a boom length of 12-feet, 2-feet are needed to account for clearance from fixed objects due to bounce and movement resulting from bridge traffic, reflex in the boom operation, and moving the truck while deployed. This results in an effective reach of 10-feet, which after subtracting the width of traffic barriers and the outer pedestrian rail, the resulting maximum walkway clear width is 8-feet.



WSDOT UBIT Field Test

The feasibility and alternatives analysis relied on the original 10-foot clear-width walkway assumption, as well as the assumption that a larger UBIT could accommodate up to a 14-foot clear-width walkway. However, due to the field test results, any alternative that includes a walkway clear-width of 8 feet or greater will require the purchase of a larger UBIT. By correlation, it is also assumed that alternatives greater than 12 feet of clear-width would not be accessible with a larger UBIT, thus requiring rope access teams.

2.2. Proposed Catwalk Modifications

As a result of the WSDOT field test, clarity was provided regarding the need for catwalk modifications along the underside of the steel span sections of the bridge for several of the alternatives. The existing bridge has full-length catwalks running along the steel spans on both sides. The existing catwalks are located 5 feet from the inside face of the girders and approximately 8.5-feet from the underside of the bridge deck.

The following outlines catwalk modification requirements and UBIT model requirement for various walkway widths:

- Walkways up to 5-feet clear-width on both sides would not require any catwalk modifications.
- Walkways up to 5-feet clear width on one side, and greater than 5-feet clear width on the opposite side, would require nearside catwalks on the larger side.

- Walkways greater than 5-feet clear-width on both sides would require nearside and centerline catwalks.
- Walkways up to 8-feet clear-width are accessible with WSDOT's existing A62 UBIT
- Walkways greater than 8-feet clear width require purchase of new A62T UBIT

3 Catwalk Design

3.1. Design Parameters

The bridge has non-redundant steel tension members (NSTM), which requires up-close inspection of the main steel bridge components every two years to satisfy Federal Highway Administration requirements for the National Bridge Inventory. The proposed sidewalk modifications prevent access to key areas of the bridge with an Under Bridge Inspection Truck (UBIT), as demonstrated by the WSDOT Field Test. To supplement access to these areas of the bridge, catwalk access will be provided below the bridge deck.

Based on correspondence with WSDOT, where sidewalks are widened 5-feet or more, the near-side catwalk needs to provide a walking surface within 18 inches (horizontally) of the main steel girders. For sidewalk widenings on both sides of the bridge, a catwalk would also be needed near the centerline of the bridge. The catwalks need to provide a walking surface that is no more than 7 feet (vertically) from the underside of the bridge deck. The catwalks need to have a live load capacity of 90-psf, which does not need to be considered in the truck load rating analysis of the main bridge members. Additionally, the catwalks need to comply with current OSHA/WISHA standards, including guardrails.

3.2. Existing Catwalks

The bridge is equipped with its original catwalks, one running along the inside face of both main steel girders, and one at each end of the steel spans running transversely across the bridge. Unfortunately, the existing longitudinal catwalks are not close enough to the main steel girders or the underside of the deck to facilitate the NSTM inspection. Also, none of the existing catwalk guardrails meet current safety standards. Because of the weight limitations for the project, and the effort required, removing and replacing the existing longitudinal catwalks was deemed more efficient than modifying them. The existing transverse catwalks can remain, but will require upgraded safety railings and modification at tie-ins with the new catwalks.

3.3. Catwalk Framing

New catwalks will provide a walkway width of approximately 42-inches and be constructed of similar materials as the existing. The catwalks are expected to be constructed of steel bar-grating, supported on steel channel framing, which is supported from the existing transverse floor beams. The edges of the catwalks will be protected with 42-inch-tall industrial-style safety railings, constructed of either steel pipes or steel angles.

A graphic of the proposed catwalk framing and a detailed structural cost estimate is included in **Appendix E**.

3.4. Catwalk Weight

Removing the existing catwalk(s) reduces the net weight of the proposed improvements. The two-sided sidewalk widening alternatives require removal of both existing longitudinal catwalks, construction of a new catwalk along the inside face of both main girders, and the addition of a centerline catwalk. Considering the additional weight of the sidewalk alternatives and required catwalks, all of the alternatives are within the weight limitations set for the project with the exception of Alternative 3 (12-foot clear width walkway on both sides). The weight of Alternative 3, combined with the necessary catwalks, will exceed the weight threshold for seismic retrofit of the bridge structure.

4 Load Rating and Design Loads

4.1. Load Rating

The alternatives study has developed an allowable weight increase for the planned improvements based on the threshold prescribed for seismic retrofit requirements, and the capacity of the bridge to safely carry legal truck loads without weight restrictions. The more restrictive of these two parameters is used as the maximum weight that the planned improvements can add to the bridge, to prevent the need for costly structural retrofits.

A bridge load rating analysis calculates the capacity of the main bridge components based on the current conditions, and subtracts the permanent weight being carried by the component to determine how much of the capacity is available for carrying truck live loads. For a given member, the higher the permanent weight gets, the smaller the available capacity to carry truck loads. The result of the load rating analysis is a series of rating factors for different types of standardized truck configurations, with rating factors greater than 1.0 indicating the bridge is safe for that truck. If a rating factor for a legal truck configuration drops below 1.0, the bridge must be posted for weight restrictions to limit the trucks using the bridge. These requirements are set by the Federal Highways Administration, which also mandates the load rating analysis be updated any time there are significant changes to a bridge's condition or permanent weight.

The capacity of the Warren Avenue Bridge to carry truck loads, including the weight of the planned improvements, was evaluated using the current record load rating for the bridge, based on the amount of loading that could be added to each component while still maintaining a rating factor of at least 1.1 for all legal truck configurations. This load rating analysis should be updated as part of the final design process when the weight of the new modifications is more accurately known. WSDOT, as the bridge owner, will also be required to have an updated load rating analysis on file upon construction of the improvements.

4.2. Load Rating Parameters

Many of the bridge components that are active in carrying truck loads are also active in carrying the weight of the proposed improvements, as well as the pedestrian loading on the sidewalks. The methodology for combining the truck and pedestrian loads in a bridge load rating analysis are addressed in the governing code, the AASHTO Manual for Bridge Evaluation (AASHTO MBE). The AASHTO MBE prescribes the standard configurations of rating vehicles, as well as the safety factors and load combinations to be applied in the rating analysis. State agencies are allowed to make more restrictive requirements for the load rating of bridges in their inventories. WSDOT lists their load rating requirements in Chapter 13 of the WSDOT Bridge Design Manual (WSDOT BDM).

The method involved with rating vehicles for truck loading assumes that there is a large truck in each lane of the bridge, and the trucks are placed in various locations on the bridge to produce the maximum effect in each component. For long bridges, additional loading is included with the large trucks to simulate additional large trucks spaced along the length of the bridge, as well as a uniform loading to represent the lighter vehicles filling the available lane space.

Because of the conservatism built into the truck loading analysis, along with the factors of safety applied to the loads, AASHTO MBE Section 6A.2.3.4 specifies that pedestrian live loading on bridge sidewalks need not be considered simultaneously with truck loading. The WSDOT BDM does not apply any additional requirements for bridge load ratings to consider pedestrian live loads in combination with truck loading.

The load rating analysis performed for the proposed sidewalk improvements considers the sidewalk pedestrian design loads separately from the truck loads, consistent with the AASHTO MBE. This assumption was discussed with WSDOT Bridge & Structures, who confirmed through verbal communication that this was consistent with previous WSDOT practice and is acceptable.

5 Cost Estimations

Cost estimating for the feasible and fully ADA-compliant alternatives was updated to include additional project components discussed herein, a revised construction schedule to account for the added project elements, the cost of the feasibility and alternatives analysis, and UBIT operational costs that would be paid by the City. Costs include:

- Catwalks as line items for scenarios where the alternative includes removing and replacing an existing catwalk near the outer girder, and where a new centerline catwalk would be required
- Extra working days added to the traffic control and temporary erosion control line items to account for the time associated with catwalk installation
- A Feasibility and Alternatives analysis
- City administrative costs
- UBIT Operational costs for applicable alternatives, provided by WSDOT

The added costs described above resulted in increases for percentage-based items such as mobilization, inflation, and construction management. Newly added catwalks represent a significant project element, and it is recommended to keep the project's contingency at 25% of the construction cost subtotal to account for added complexity in the design and construction associated with adding new project elements.

The inflation assumption in the feasibility and alternatives analysis assumed 6% per year cost escalation between 2022 and 2025. At the direction of the City, the inflation rate was revised to 3.25% per year cost escalation between 2022 and 2026, based on current construction cost index (CCI) information from Engineering News Record.

Detailed cost estimates are attached as **Appendix F**.

A summary of the costs associated with the remaining structurally feasible, maintainable, and fully ADA-compliant alternatives is below:

Alternative	Description	Cost
Alternative 1	8-foot clear-width walkway, both sides	$26.0 M
Alternative 2	10-foot clear-width walkway, both sides	$29.8 M
Alternative 7	12-foot clear-width on east side; 5-ft clear width on west side	$24.8 M
Alternative X	12-foot clear-width on east side; 8-foot clear-width on west side	$30.3 M

6 Alternatives Matrix

Each alternative was re-evaluated to determine the structural feasibility, maintenance and inspection access, and planning level project cost for design and construction. The updated alternatives matrix is attached as **Appendix G** and includes the following modifications:

- Addition of "Alternative X"
- Addition of required catwalk modifications for feasible and fully ADA compliant alternatives
- Structural feasibility has been updated for all alternatives to account for catwalk modifications
- Updated UBIT access requirements
- Updated planning level project costs

7 Safety and Operational Review

Following the conclusion of the Feasibility and Alternatives Analysis, which focused on structural feasibility and public input to guide decision-making, requests were received by the City to provide further discussion on the safety and operation of the different walkway clear-width alternatives.

7.1. Evaluation Method

The evaluation of safety and operations of walkway alternatives was conducted by reviewing the lateral space requirements for each travel mode, and assessing how well a mix of different modes would operate when passing or traveling next to each other.

7.2. Assumptions

Research was conducted on various pedestrian and bicycle facility planning/design resources to indicate the amount of lateral clearance needed for bicyclists and pedestrians to pass each other without needing to significantly slow, maneuver or avoid each other. The need to slow, maneuver, or avoid all affects the level of safety in the walkway and its overall operational performance and comfort. The three sources listed below provide a comprehensive review of the state of the practice:

- WSDOT Pedestrian Facilities Guidebook
  https://www.wsdot.wa.gov/publications/manuals/fulltext/m0000/pedfacgb.pdf
- NACTO Designing for Things with Small Wheels
  https://nacto.org/wp-content/uploads/2023/03/WP_designing_for_small_things_with_wheels_FINAL_March1-2023.pdf
- FHWA Course on Bicycle and Pedestrian Transportation
  - Walkways, Sidewalks, and Public Spaces
    https://safety.fhwa.dot.gov/ped_bike/univcourse/pdf/swless13.pdf
  - Bicycle Lanes (from FHWA Course on Bicycle and Pedestrian Transportation)
    https://safety.fhwa.dot.gov/PED_BIKE/univcourse/pdf/swless19.pdf

Based on this research, the following assumptions were made regarding lateral clearance requirements for pedestrians and bicyclists:

Pedestrians

- Three feet of lateral space is needed to accommodate a moving pedestrian who could be squeezed to 2.5 feet of space, if necessary, when passing another pedestrian, for a total width requirement of five feet (the width of a typical city sidewalk). Dogs accompanying the pedestrian would increase the space requirement, as would a small child.
- People standing typically need about 18-24 inches of space while occupying a "viewing zone" along a sidewalk or walkway. While two "overlooks" would be included with the 8-foot clear-width alternative, there is no guarantee that pedestrians would stop only in these locations.

Bicyclists

- Five feet of lateral space is needed for a moving bicyclist (2.5 feet width of the user) plus a dynamic envelope of 1.5 – 2.5 feet depending on the user's speed, comfort, and experience. A dynamic envelope is the area required by a bicyclist to sway back and forth while pedaling, particularly while accelerating)
- Bicyclists typically need 20 inches of shy distance from vertical features (walls, barrier etc.) to avoid conflict with handlebars and 8-10 inches of shy distance from curbs to avoid conflicts with pedals

7.3. Walkway Alternatives

Graphic images were prepared to illustrate how bicycle and pedestrian traffic would be affected by three different walkway widths on the modified Warren Avenue Bridge. The lateral space required by bicyclists and pedestrians for multi-directional movement has been identified and applied to the 8-foot, 10-foot, and 12-foot clear-width scenarios to illustrate how each could accommodate a variety of scenarios of two-way bicycle / pedestrian traffic.

The table below compares conclusions related to safety and operational performance for the various walkway width alternatives. Ranking values range from Very Good to Poor, depending on walkway width and the mix of modes assumed to pass each other at a specific location. Highlighted rows have a visual image with further discussion that can be found in **Appendix H**.

Warren Avenue Bridge Walkway Scenarios – Safety and Operations Evaluation Matrix

Scenario – Mix of modes passing one location	Walkway Clear Width		
	8-foot	10-foot	12-foot
One pedestrian			
Two pedestrians (next to each other or passing)			
Two pedestrians and one person viewing			
One bicyclist			
One pedestrian and one bicyclist			
Two bicyclists			
One pedestrian, one bicyclist, and one person viewing			
Two pedestrians and one bicyclist			
Two bicyclists and one person viewing			
Two pedestrians, one bicyclist, and one person viewing			
Two bicyclists and one pedestrian			
One pedestrian, two bicyclists, and one person viewing			
Two pedestrians and two bicyclists			
Two pedestrians, two bicyclists, and one person viewing			

User Comfort Rating [1]	Poor	Fair	Good	Very Good

[1] *Rating values are based on 2.5 to 3 feet of space for a pedestrian, 5 feet for a bicyclist, and 2 feet for a person standing.*

- *Very Good values assume minimal slowing, maneuvering, or avoiding is necessary.*
- *Good values assume that space is fully utilized, likely requiring some slowing but still comfortable.*
- *Fair values require slightly more space than provided.*
- *Poor ratings assume much more space is needed and that the scenario would be uncomfortable even with slowing and maneuvering.*

7.4. Safety and Operations Conclusion and Recommendations

The conclusions in the table reflect expected user comfort as a metric of safety and operational performance at a specific location on the bridge, given the mix of users identified. As shown in the table, all walkway widths work well with lower volumes of conflicting pedestrians and bicyclists, but become increasingly congested and less comfortable as more activity occurs on the bridge. The 8-foot clear-width walkway would experience the lowest levels of comfort in scenarios where there is a mix of modes, with comfort increasing in the wider walkways. However, even the 12-foot clear-width walkway could be challenged by a high level of activity and a mixture of travel modes. Given these findings, it may be appropriate for the City to take actions to encourage the safest possible use of the walkways, regardless of width.

As part of implementing bridge improvements, consideration should be given to maximizing safety through considerate behavior that encourages all modes to exercise caution and make predictable moves when in proximity to each other. General public education about safe use of the walkways should occur at the time of the bridge opening.

Signage should be installed at the beginning of the bridge walkway that recommends keeping to the right, passing on the left, and being aware of the hazard created by any substantive difference in travel speeds, particularly on the narrower alternatives. This signage could also be supplemented by signage that warns users to “Look out for Slow Moving Pedestrians”.

It is further recommended that bicyclists walk their bicycles when using the 8-foot clear-width walkway and when in the presence of more than one pedestrian. This may be further reinforced by the establishment of a City ordinance requiring walking of bicycles on the 8-foot clear-width walkway. This ordinance could provide clear guidance to users while also protecting the City’s liability should a crash occur involving a bicyclist.

8 Conclusion

This update memorandum to the Feasibility and Alternatives Analysis completed in September 2023 includes the addition of Alternative X, addresses new information provided by WSDOT regarding maintenance access, clarifies assumptions in bridge design criteria, and provides a discussion about the safety and operational performance of the walkway alternatives.

The impacts of requiring catwalk modifications to the project resulted in one alternative (”Alternative 3”) being considered structurally infeasible, and increased costs for Alternatives 2 and X above the $26.5M project budget. Alternatives 1 and 7 remain within the project’s $26.5M budget.

Appendix A

Warren Avenue Bridge Pedestrian Improvements Feasibility and Alternatives Analysis – Executive Summary

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Executive Summary

The Warren Avenue Bridge Pedestrian Improvements project is a City of Bremerton-led effort to implement safe, multimodal, ADA-compliant walkways on the Warren Avenue Bridge. This Feasibility and Alternatives Analysis Report outlines the purpose and need for the project, the design alternatives considered by WSDOT and project stakeholders, community involvement in decision-making, and the screening criteria used to determine the preferred alternative.

Current conditions provide substandard facilities for multimodal users and fail to meet the requirements of the Americans with Disabilities Act (ADA). The SR 303 Corridor Study, completed in May 2021, outlines criteria for improvements on the Warren Avenue Bridge, suggesting 10-foot walkway widths. However, during discussions between the City and WSDOT, WSDOT stated that walkway widths on the bridge must be 8 feet or less due to the limitations of WSDOT inspection trucks. The Bremerton City Council rejected this limitation of walkway width and directed the completion of a feasibility and alternatives analysis.

Eleven design alternatives were developed after a review of transportation planning documents, communication with WSDOT, and input from project stakeholders. Alternatives varied from 8 to 16 feet wide, on one or both sides of the bridge.

Throughout the feasibility and alternatives analysis process, the project team focused on community involvement. A stakeholder advisory group was assembled with representatives of the Chamber of Commerce, Olympic College, Bremerton Parks Department, Bremerton Police Department, Bremerton Fire Department, the West Sound Cycle Club, Naval Base Kitsap, the Complete Streets Committee, Kitsap Transit, Kitsap Public Health, WSDOT, the Mayor, City Council President, and several others. Other public outreach methods included the creation and development of a project website, two open houses, and a public survey to gain feedback on existing usage, potential usage, and public preferences for the design alternatives. Public and stakeholder engagement created an ongoing conversation between the project team and the project users, ensuring that a broad range of perspectives were considered.

In order to analyze the alternatives and ultimately arrive at a single preferred alternative, the project team relied on three levels of screening: initial screening (Level 1), alternative evaluation (Level 2), and recommended alternative (Level 3).

- Level 1 screening focused on a fatal flaw analysis, where any alternatives that were structurally infeasible or inaccessible for maintenance were removed from consideration.
- Level 2 screening involved an evaluation of each alternative in terms of ADA-compliance based on three key preferences developed in partnership with the WSDOT Office of Equity and Civil Rights, the City of Bremerton ADA Committee, and a community survey. Key preferences included widening for pedestrians on both sides of the bridge, implementing equal-width walkways on both sides of the bridge, and adopting a walkway width of 10 feet or greater.
- Level 3 screening evaluated the budget for each alternative.

Alternative 2, which consists of 10-foot active transportation paths on both sides of the bridge and a total of four 6’ x 24’ overlooks, was the recommended preferred alternative to best meet the needs of the community.

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Appendix B
City of Bremerton Approved Resolution 3363

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RESOLUTION NO. 3363

A RESOLUTION of the City Council of the City of Bremerton, Washington, Preferred Alternative for Design of Warren Avenue Bridge Multimodal Project

WHEREAS, the Warren Avenue Bridge Multimodal Project goal is to provide safe, ADA accessible options for all non-motorized users to cross the bridge and connect the Bremerton Bridge-to-Bridge trail, and;

WHEREAS, the current available funding for the project is $26.5 million which includes a $1.5 million Washington State grant to design the project and a $25 million State grant to construct the project that was appropriated through the Moving Ahead Washington funding package approved in the 2022 legislative session, and;

WHEREAS, in September 2019, the City Council accepted the $1.5 million in funding for design work that included preliminary engineering and permitting for pedestrian and bike improvements, deck resurfacing, and additional design on Warren Avenue to the South and North of the bridge, and;

WHEREAS, in April 2021 the City Council approved a contract with the Washington State Department of Transportation (WSDOT) for design of the Warren Avenue Bridge with a Description of Work to widen one or both sides of the bridge to obtain a desirable shared-use path width of 12 feet, excluding shoulders, in accordance with WSDOT Design Manual Chapter 1515, and;

WHEREAS, in August 2021 the City Council approved a contract with SJC Alliance that included four preliminary alternative clear width configurations — 8 feet on both sides, 10 feet on both sides, 12 feet on the West side with a South end tunnel, and 12 feet on the East side — including connectivity to tie into existing bicycle networks and the Bridge-to-Bridge trail, and;

WHEREAS, in October 2022 the City Council approved a contract modification with SJC Alliance that included a 12-foot path on the West side with a South end tunnel and a 14-foot West side path with South end tunnel, and;

WHEREAS, the 2020 Kitsap County Road Standards states that the minimum recommended width for a 2-way combined bicycle and pedestrian (multimodal) shared-use path is 12 feet for areas of high volume usage, and;

WHEREAS, the WSDOT Shared-Use Path Design Manual states that the desirable paved width of a shared-use path, excluding the shoulders on either side, is 12 feet, and;

WHEREAS, bicycling and non-motorized transportation groups and individuals have stated that 12 feet is a minimum safe width for a multimodal path, and;

WHEREAS, the City of Bremerton is expected to grow by approximately 20,000 people over the next 20 years, with much of that expected growth surrounding the Bridge-to-Bridge trail, and;

WHEREAS, the SR 303 Corridor Study was conducted to identify projects that would help meet the corridor needs as identified by the study team, a stakeholder advisory group, and the public, and;

WHEREAS, the SR 303 Corridor Study states a clear preference to have bicycle facilities on the Warren bridge connecting to the Bremerton Bridge-to-Bridge trail, i.e., a shared-use multimodal path, and;

WHEREAS, a 12-foot shared-use path would ensure a safe route for multimodal traffic, as well as a desirable path for recreational traveling and sightseeing as part of the Bremerton Bridge-to-Bridge trail, and;

WHEREAS, the $1.5 million design grant is secured, and the $25 million Move Ahead Washington Grant is unsecured and currently programmed in the 2029+ outer years, and;

WHEREAS, City Staff commenced a public outreach effort that consisted of a Stakeholder Advisory Group with invitations extended to representatives of the Chamber of Commerce, Olympic College, Bremerton Parks Department, Bremerton Police Department, Bremerton Fire Department, Naval Base Kitsap, Kitsap Transit, Kitsap Public Health, WSDOT, the Mayor, the City Council, bicycle advocates, and several others, and;

WHEREAS, City Staff hosted two public open houses and conducted two public surveys, and;

WHEREAS, half of online public comments and three-quarters of in-person public comments expressed that at least a minimum width of 12 feet was desired for a shared-use multimodal path, and;

WHEREAS, Alternative X is a combination of the East side from Alternative 3 and the West side from Alternative 1, resulting in a 12-foot clear width path on the East side and 8-foot clear width path on the West side, and;

WHEREAS, Alternative X meets the intent of the project, the desire of the public, and is within budget for design and construction costs, and;

WHEREAS, the City Council recommends expanding the width of the West side, and/or adding in more overlooks, if there is available budget or if any additional funds are able to be secured in the future, and;

WHEREAS, the selection of Alternative X may require construction of an inspection platform that provides additional inspection access or an operational review of the WSDOT bridge inspection program, which could include the additional capital and ownership/operational costs of an additional, unique UBIT;

NOW THEREFORE,

THE CITY COUNCIL OF THE CITY OF BREMERTON, WASHINGTON, DOES HEREBY RESOLVE AS FOLLOWS:

SECTION 1. The City Council endorses Alternative X as the Preferred Alternative. Alternative X includes a 12-foot clear width pathway on the East side and an 8-foot clear width pathway on the West side.

SECTION 2. The City Council endorses widening the West side to greater than 8 feet, and/or adding in additional overlooks, if budget is available or additional funding is able to be secured.

SECTION 3. The City Council endorses pursuing funding for the connectors as separate projects, ideally to be completed prior to the construction of the bridge improvements.

SECTION 4. The City Council endorses the purchase of a new UBIT or other associated mitigation costs in the event that WSDOT is unwilling or unable to fund such costs themselves.

SECTION 5. *Severability.* If any one or more sections, subsections, or sentences of this Resolution are held to be unconstitutional or invalid, such decision shall not affect the validity of the remaining portion of this Resolution and the same shall remain in full force and effect.

SECTION 6. *Effective Date.* This Resolution shall take effect and be in force immediately upon its passage.

PASSED by the City Council of the City of Bremerton, Washington this 2nd day of August, 2023.

DocuSigned by:
Jeffrey S Coughlin
23DA7420E5A0405...
JEFF COUGHLIN, Council President

APPROVED AS TO FORM:

DocuSigned by:
Kylie Finnell
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KYLIE J. FINNELL, City Attorney

ATTEST:

DocuSigned by:
Angela Hoover
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ANGELA HOOVER, City Clerk

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Appendix C
Alternative X – Structural Framing Section View and Cost Breakdown

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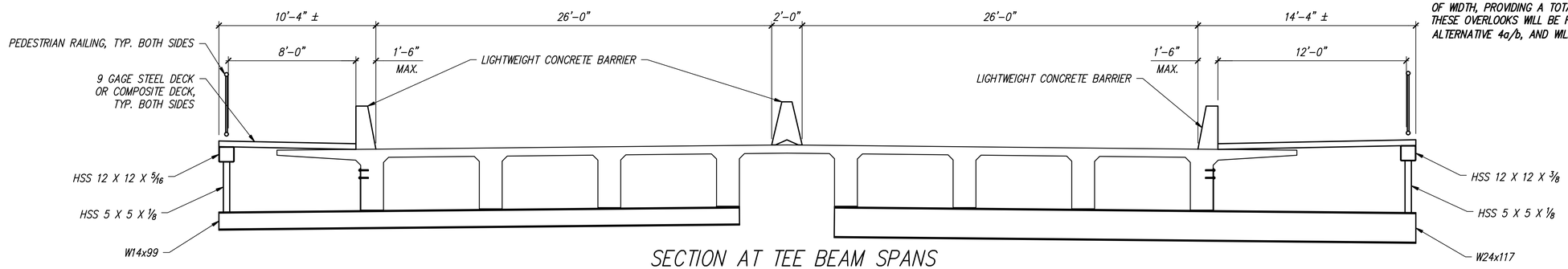
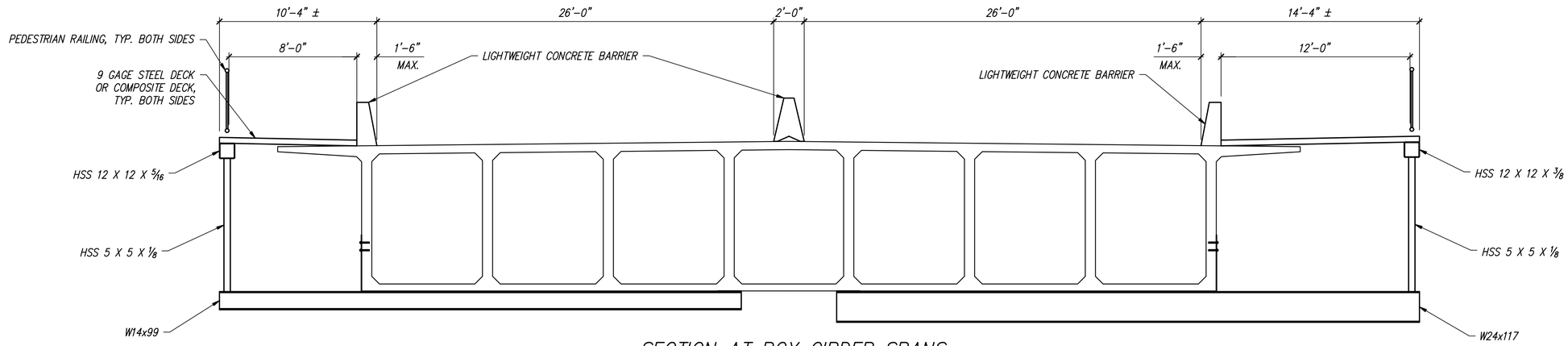
NOTE: THERE WILL ALSO BE TWO OVERLOOKS ON THE WEST SIDE OF THE BRIDGE THAT WILL PROVIDE AN ADDITIONAL EIGHT FEET OF WIDTH, PROVIDING A TOTAL CLEAR WIDTH OF 16-FEET. THESE OVERLOOKS WILL BE FRAMED AS SHOWN FOR ALTERNATIVE 4a/b, AND WILL BE APPROXIMATELY 24-FEET LONG.



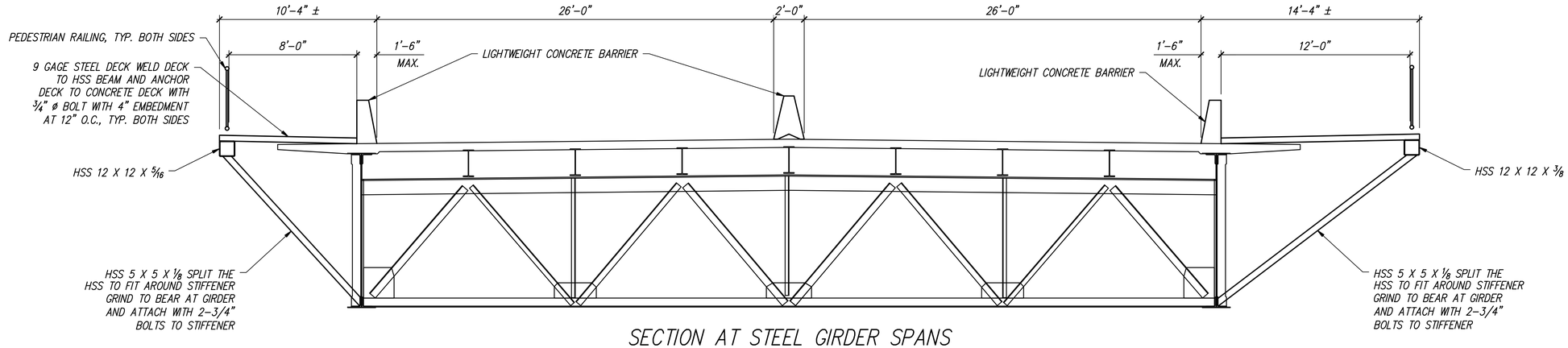
SECTION AT TEE BEAM SPANS

BEAMS LOCATED AT DIAPHRAGMS WHICH ARE SPACED ~ 24 FEET O.C.



SECTION AT BOX GIRDER SPANS

BEAMS LOCATED AT DIAPHRAGMS WHICH ARE SPACED AT 21'-4" O.C.



SECTION AT STEEL GIRDER SPANS

SUPPORTS LOCATED AT FLOOR BEAMS WHICH ARE SPACED AT 22'-3" O.C.

PLAN CHECK	DATE				
DESIGNED BY: R.W. Larsen					
CHECKED BY: J.S. Soward					
PRJ DRAFTER: R.W. Larsen					
DETAILED BY: .					
DETAILED BY: .					
		.	.	.	.
ISSUED:	2/2/2024	DATE	NO.	REVISION	BY

FEDERAL AID PROJECT NO. .

C.R.P. NO. .

JESSICA S SOWARD — STATE OF WASHINGTON — 45272 — PROFESSIONAL ENGINEER — PRELIMINARY

SARGENT ENGINEERS, INC.
320 Ronlee Lane NW • Olympia, WA 98502
Tel. 360 867-9284 • sargentengineers.com

CITY OF BREMERTON
PUBLIC WORKS & UTILITIES

WARREN AVENUE BRIDGE
MULTIMODAL PROJECT
BREMERTON, WASHINGTON
ALTERNATIVE X

SHEET 1 OF 1 SHEETS
SEI REF NO. A21137.00

Plotted: Feb 2, 2024 - 12:02 JessicaS B:\21Files\A21137.00 SCJ - Warren Ave Improvements\Alternatives Study\Drawings\Warren Ave. Alt X.Dwg Layout Name: Alternative X xrefs: titlesht

SARGENT
Sargent Engineers, Inc.
320 Ronlee Lane NW
Olympia, WA 98502
Tel 360-867-9284

CONSTRUCTION COST ESTIMATE

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT COST	COST
	PREPARATION				
0061	REMOVING PORTION OF EXISTING BRIDGE	L.S.	1	$ 1,202,000.00	$ 1,202,000
	STRUCTURE				
4235	STRUCTURAL LOW ALLOY STEEL	L.S.	1	$ 5,760,000.00	$ 5,760,000
4360	BRIDGE RAILING TYPE BP - SUPERSTR.	L.F.	6868	$ 150.00	$ 1,030,000
4365	TRAFFIC BARRIER - SUPERSTR.	L.F.	5151	$ 200.00	$ 1,030,000
4468	CLEANING AND PAINTING	L.S.	1	$ 1,925,000.00	$ 1,925,000
	OTHER				
7725	REIMBURSEMENT FOR THIRD PARTY DAMAGE	EST.	1	$ 50,000.00	$ 50,000
---	ASBESTOS REMOVAL AND DISPOSAL	L.S.	1	$ 162,000.00	$ 162,000
				SUBTOTAL	$ 10,997,000

BREAKDOWN OF LUMP SUM ITEMS

0061	REMOVING PORTION OF EXISTING BRIDGE				
	CENTER CURB	L.F.	1717	$ 140.00	$ 240,000
	EDGE BARRIER	L.F.	3434	$ 140.00	$ 481,000
	SIDEWALK	L.F.	3434	$ 140.00	$ 481,000
					$ 1,202,000
4235	STRUCTURAL LOW ALLOY STEEL	LB	1440000	$ 4.00	$ 5,760,000
4468	CLEANING AND PAINTING	SF	38500	$ 50.00	$ 1,925,000
---	ASBESTOS REMOVAL AND DISPOSAL				
	CONDUIT PIPE	L.F.	10800	$ 15.00	$ 162,000

Appendix D
UBIT Field Test Results by WSDOT

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Washington State Department of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300
360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

December 4, 2023

Mr. Tom Knuckey, PE
Director of Public Works and Utilities
City of Bremerton
100 Oyster Bay Ave. N
Bremerton, WA 98312

Dear Mr. Knuckey,

I am writing today to share the results from the recent UBIT evaluation for the Warren Avenue Bridge. Inspection and maintenance access to structural elements is critical and the configuration of the bridge creates some inherent limitations. Annotated illustrations of the evaluation conducted on October 23 are enclosed for reference and I would like to summarize those here for your consideration in making design decisions.

WSDOT's current A62 UBIT is capable of a ten-foot clear reach to the outside of rail. This equates to an approximate pathway width of eight feet. However, this maximum clear reach affects the articulation of the UBIT's booms and introduces additional limitations as follows:

1. The centerline portion of the structure can no longer be reached unless the widening on the opposite side of the bridge is limited to an eight-foot clear reach to the outside of rail. A centerline catwalk may be feasible to address this shortcoming and would need to be evaluated further during design.

2. Both clear reach scenarios (ten and eight) require modification to both existing catwalks since access to the inner face of the girder is no longer feasible.

Turning to the preferred alternative which would provide asymmetrical widening for pathways of twelve and eight feet. Our current UBIT fleet is not capable of servicing this configuration. An A62T UBIT is capable of clearing an estimated fourteen feet of clear reach to the outside of the rail. However, the UBIT's boom limitations appear to also affect access to the centerline of the bridge unless the widening on the opposite side is limited to an eight-foot clear reach to the outside of rail. Again, modifications to both existing catwalks would be necessary, and a centerline catwalk

may be feasible to address the centerline access and allow for a wider clear reach on the opposite side of the bridge.

During our conversation last week, you asked about the feasibility of ten-foot pathways on both sides of the bridge. While it is feasible for an A62T to reach over the estimated twelve-foot clear reach, we have not done a physical evaluation of centerline access. Based on the estimated boom configuration it appears a centerline catwalk would be needed for inspection and maintenance access.

WSDOT looks forward to supporting the best option that achieves the goals of the project. To that end, it's important to note that the preferred option will require inspection mitigation as part of the overall project cost, including the additional capital cost of an A62T UBIT, reasonable short-term operational cost associated with acquiring a new UBIT, and the aforementioned catwalk modifications and additions.

The City and WSDOT have an executed agreement (GCB 3453) to conduct the structural design for the project. The preferred alternative is not included in the current agreement's scope of work. We will need to amend the agreement prior to initiating the design.

Please feel free to contact me directly if you have any questions.

Sincerely,

Steve Roark, PE
Olympic Region Administrator

SR/cb

Enclosure

cc: E. Grimm
R. Zeldenrust
G. Seipel
J. Schueler
J. Ho

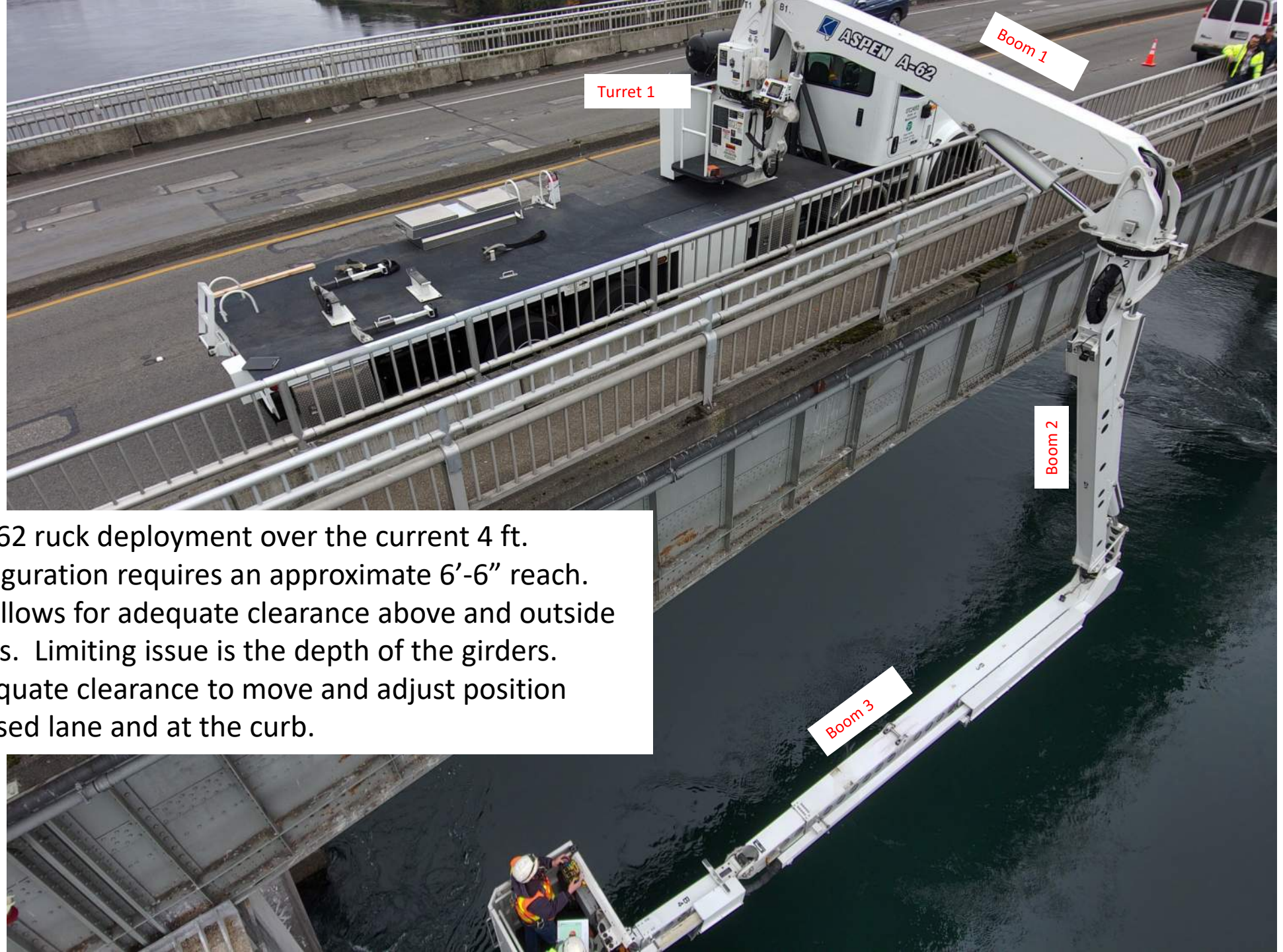
SR 303 Warren
Avenue
Port Washington
Bridge 303/12

Current configuration has a 4 ft. sidewalk requiring a 6’-6” reach to get over. Steel girders on each side of the bridge are 10’ deep across the spans and 12’ deep in the haunches over the piers.

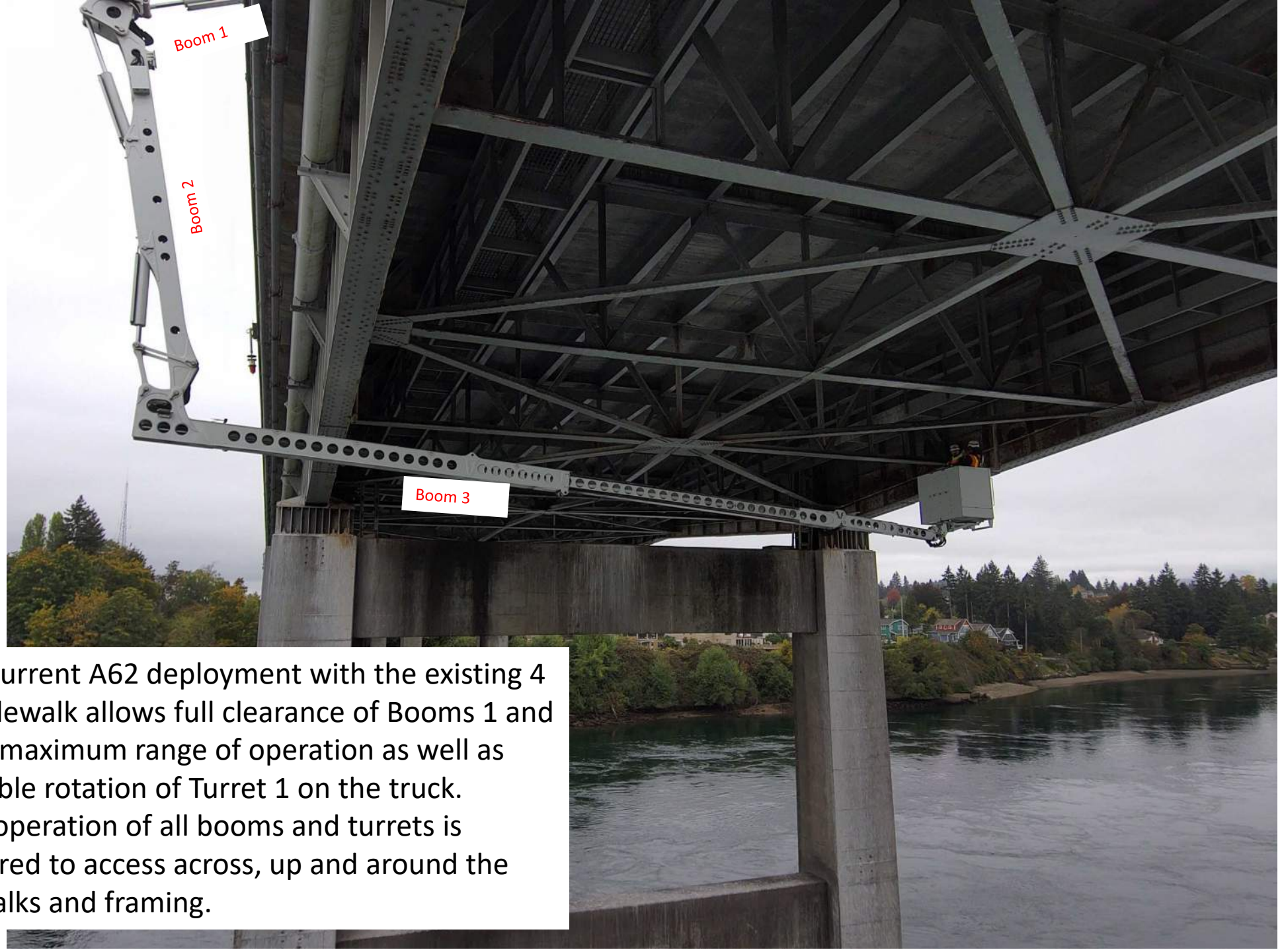
With only 2-Lines of Girders the Bridge is not considered to be Load Path Redundant and must be inspected by NSTM (Non-Redundant Steel Tension Member) procedures.

Existing catwalks run full length of the steel spans on both sides of bridge and are approximately 5 ft. away from the inside face of the girders. Open web truss floor beams, and lateral bracing in all spans make access up to the steel stringers and bottom of the deck difficult and require adequate clearance to avoid damage or injury.

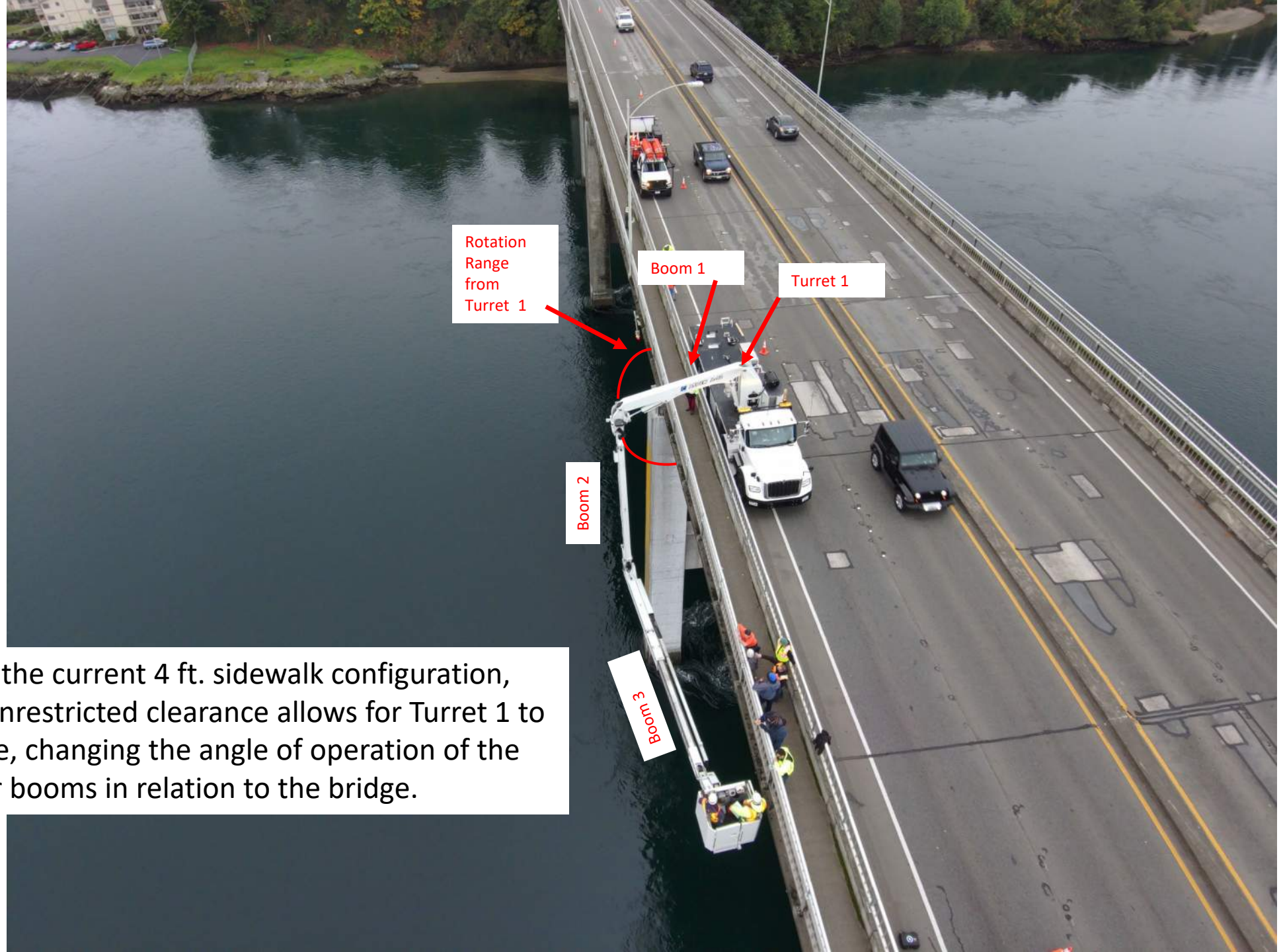
Inspection access is tight with the bucket of the UBIT but it can be done in the bridge's current configuration.



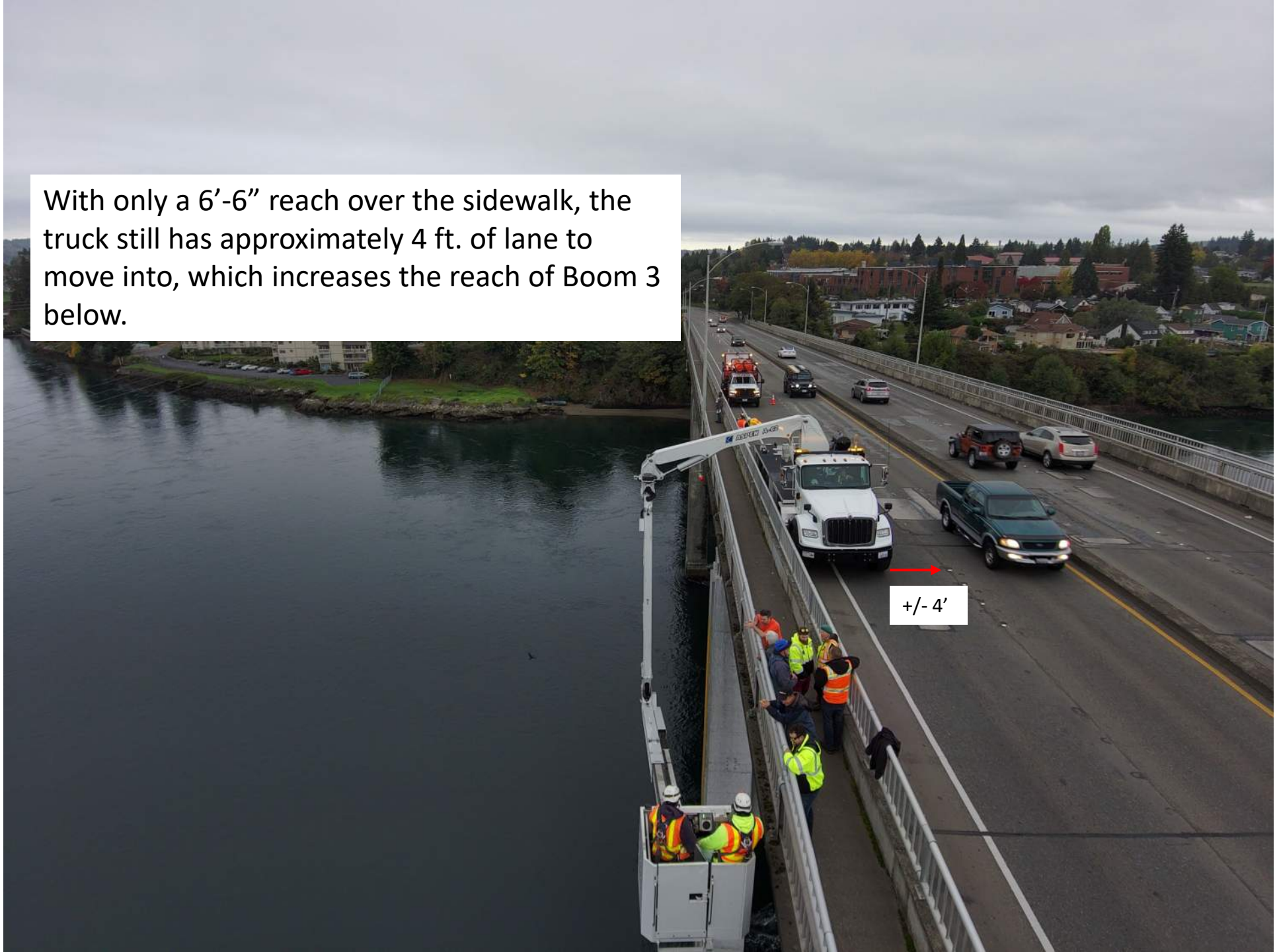
The current A62 ruck deployment over the current 4 ft. sidewalk configuration requires an approximate 6’-6” reach. Deployment allows for adequate clearance above and outside the bridge rails. Limiting issue is the depth of the girders. Truck has adequate clearance to move and adjust position within the closed lane and at the curb.

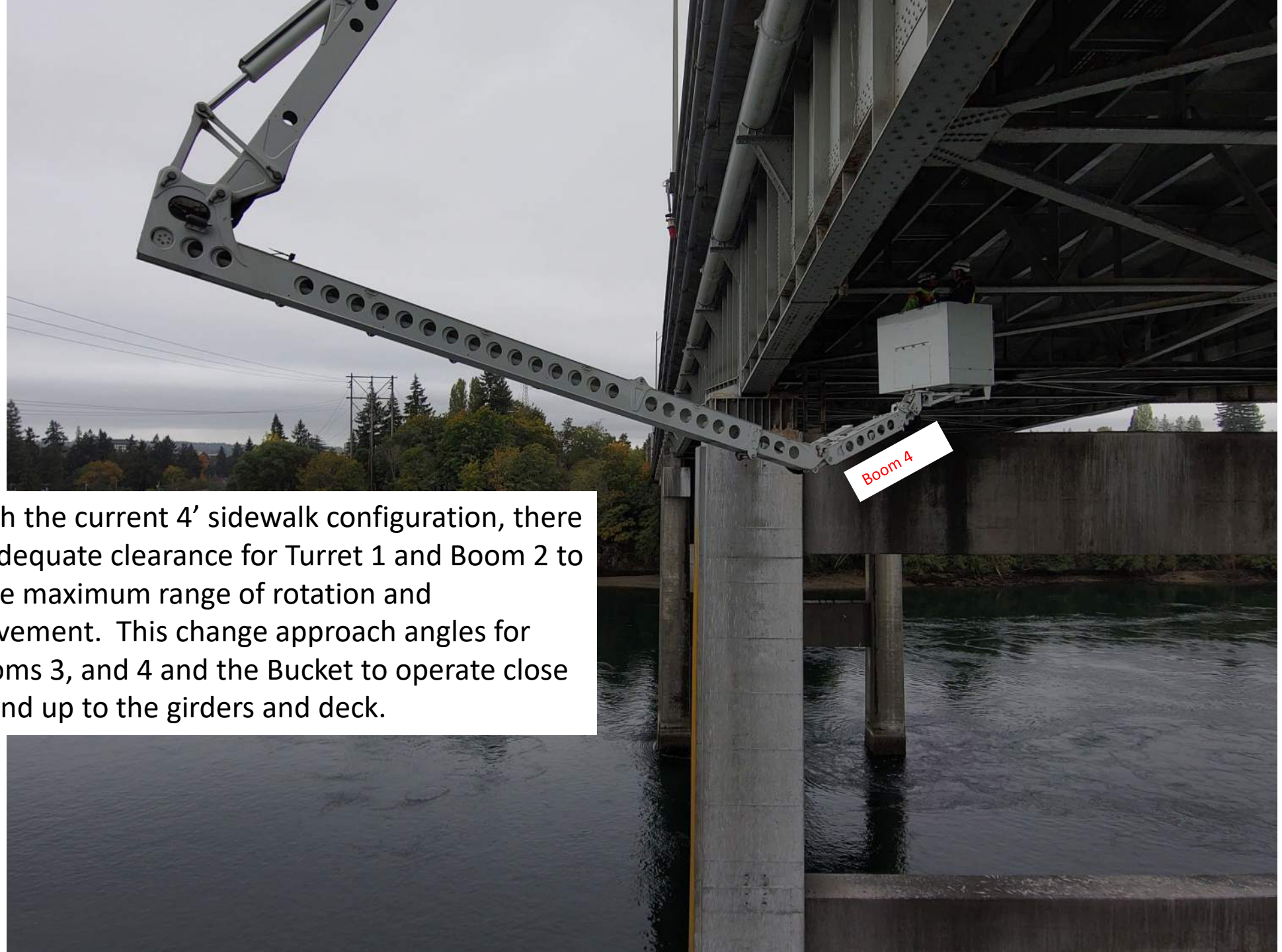


The current A62 deployment with the existing 4 ft. sidewalk allows full clearance of Booms 1 and 2 for maximum range of operation as well as possible rotation of Turret 1 on the truck. Interoperation of all booms and turrets is required to access across, up and around the catwalks and framing.

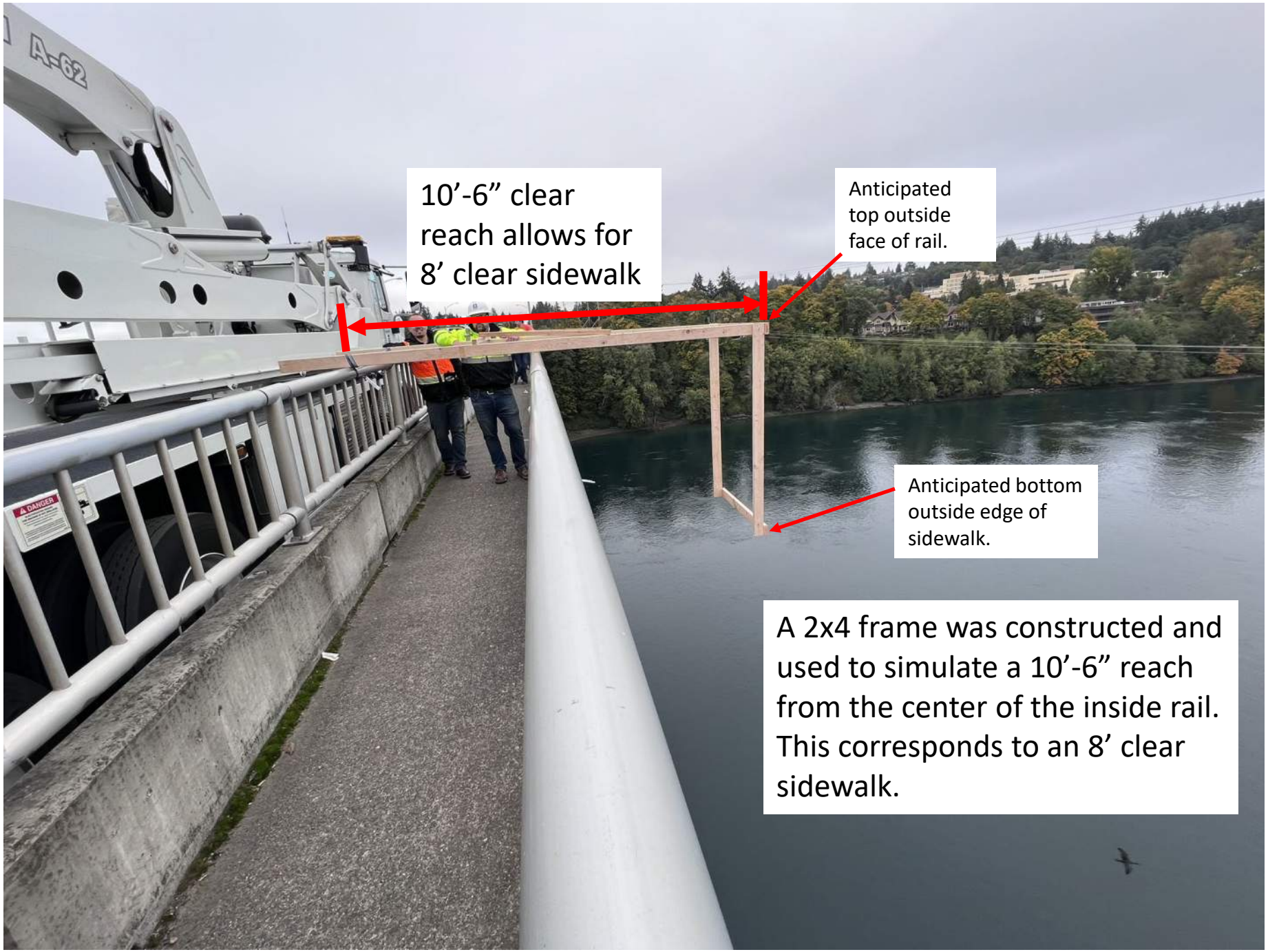


With the current 4 ft. sidewalk configuration, the unrestricted clearance allows for Turret 1 to rotate, changing the angle of operation of the other booms in relation to the bridge.

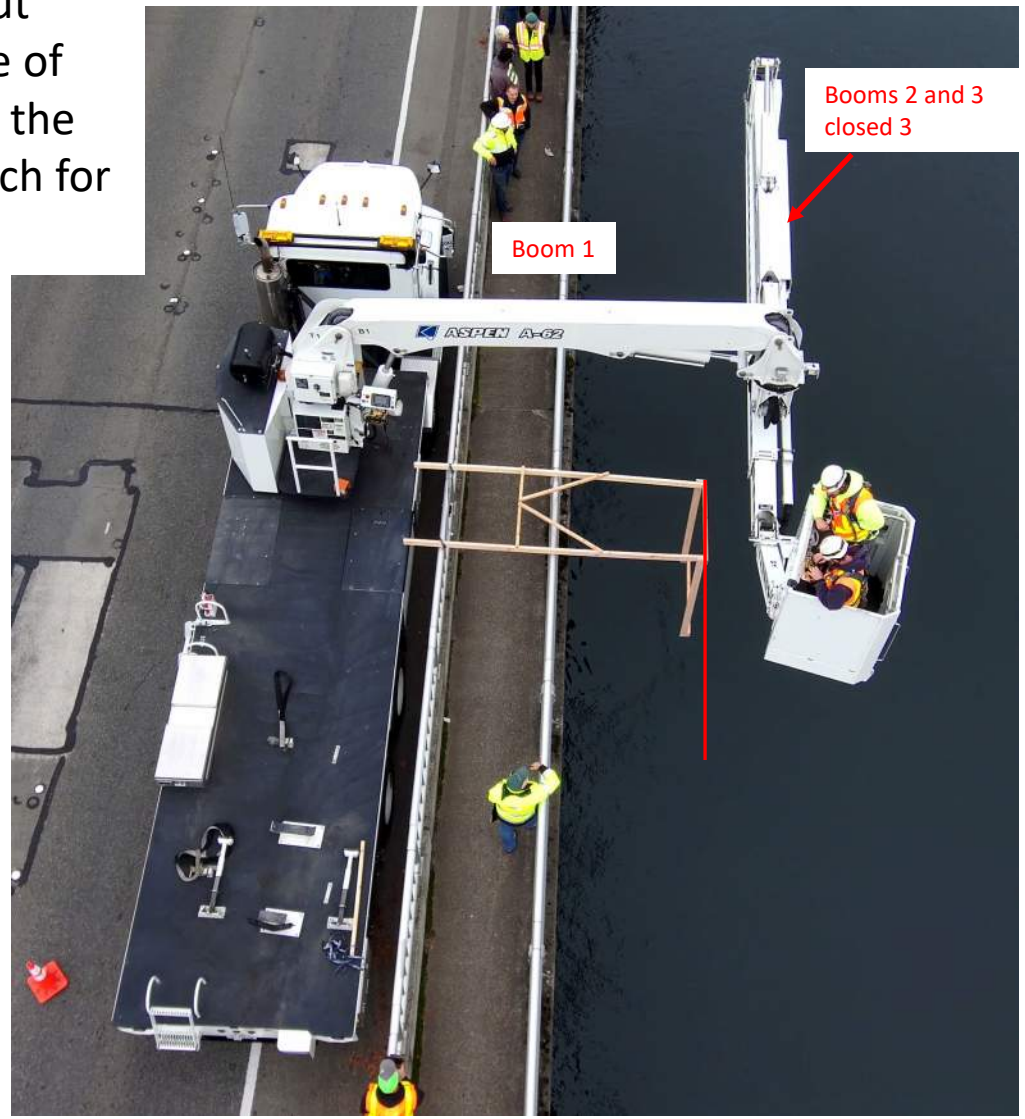

With only a 6’-6” reach over the sidewalk, the truck still has approximately 4 ft. of lane to move into, which increases the reach of Boom 3 below.
+/- 4’



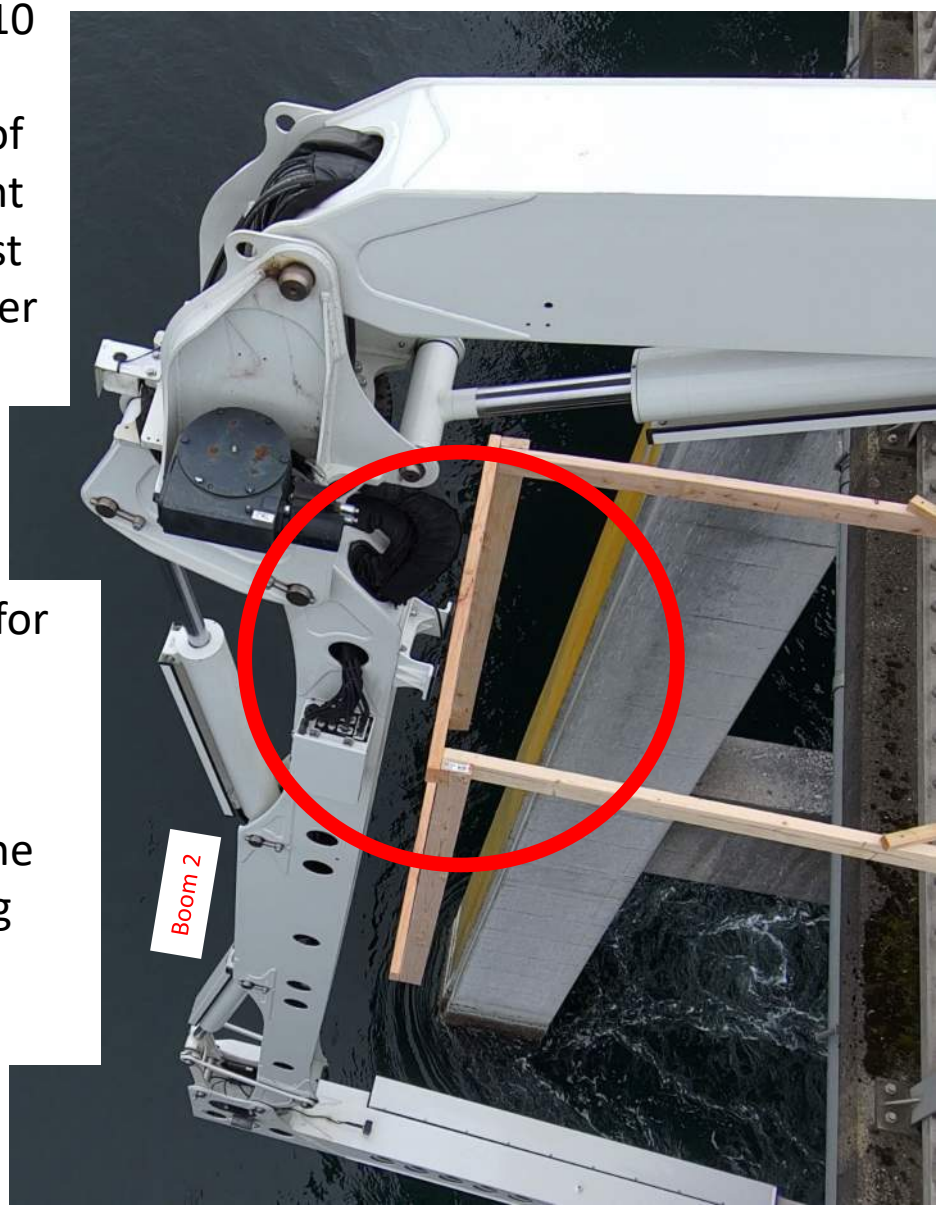
With the current 4’ sidewalk configuration, there is adequate clearance for Turret 1 and Boom 2 to have maximum range of rotation and movement. This change approach angles for Booms 3, and 4 and the Bucket to operate close in and up to the girders and deck.

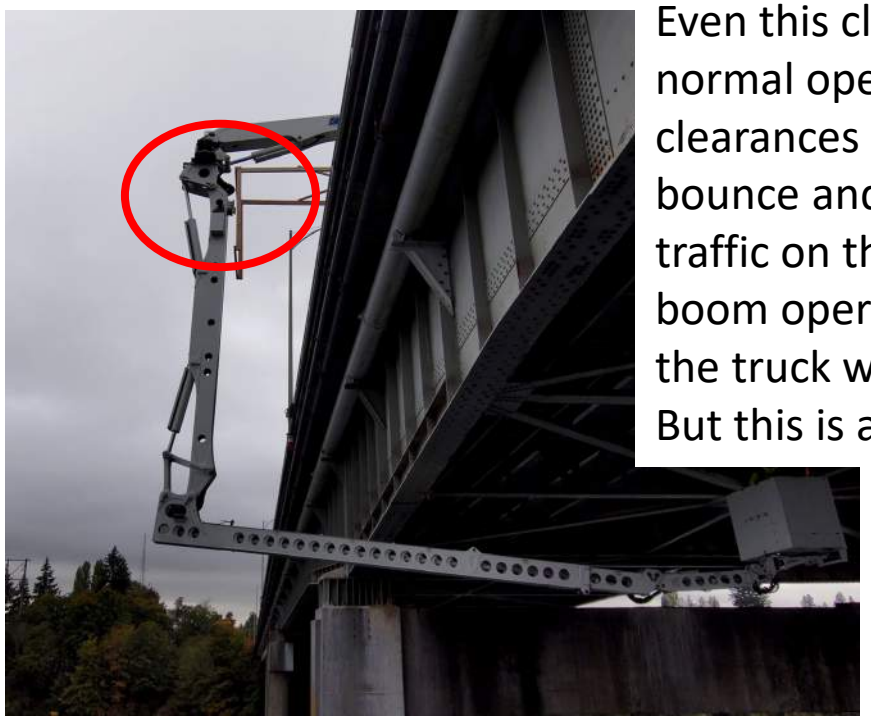

A-62
10’-6” clear reach allows for 8’ clear sidewalk
Anticipated top outside face of rail.
Anticipated bottom outside edge of sidewalk.
A 2x4 frame was constructed and used to simulate a 10’-6” reach from the center of the inside rail. This corresponds to an 8’ clear sidewalk.

When deploying over the 10’-6” reach, Boom 2 will clear but requires the buck to be rotated to get down past the profile of the sidewalk. The red line demonstrates the delineation of the rail line for the wider sidewalk. This is max envelope of reach for the current A62.



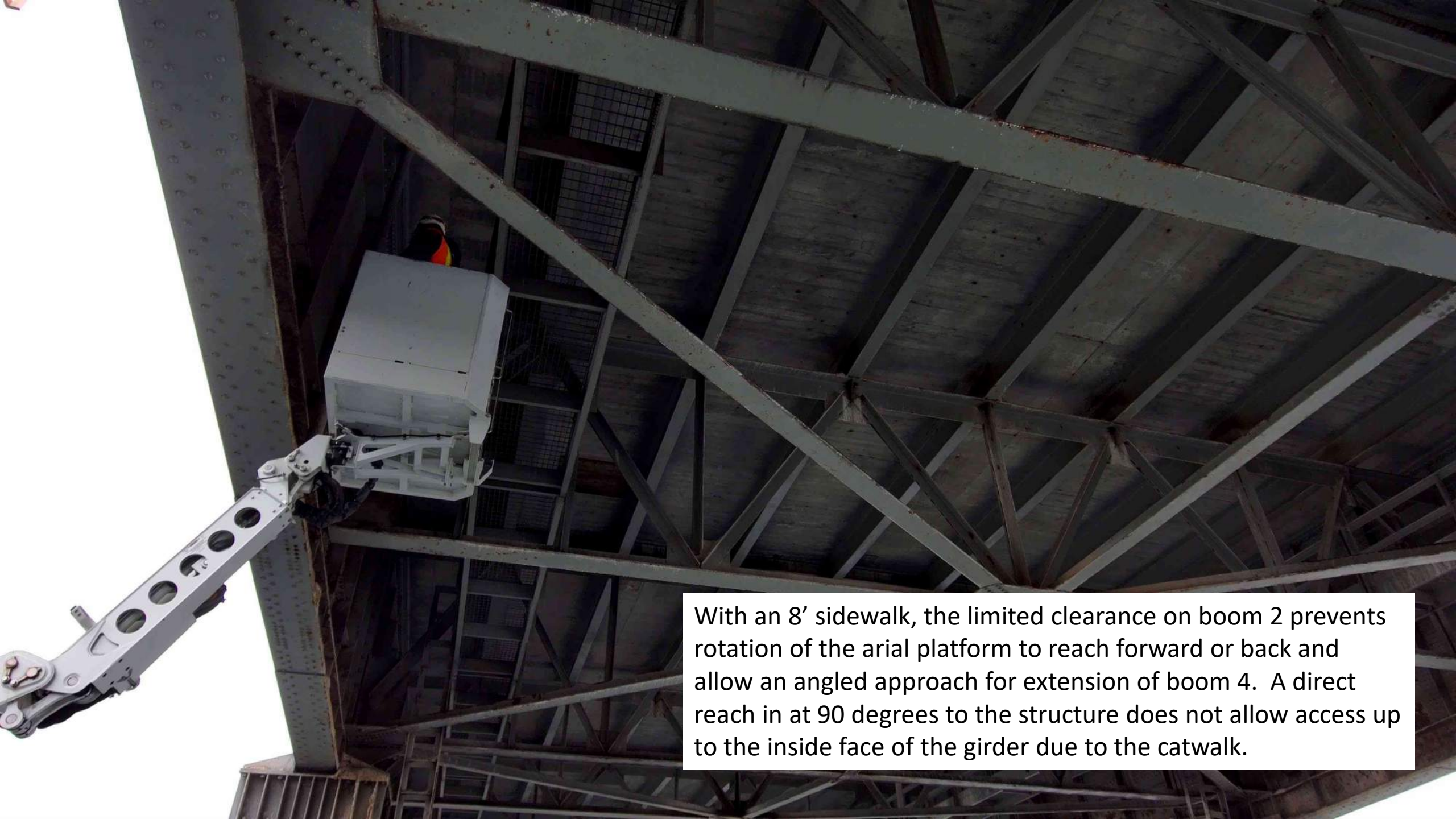
Limiting point of contact for a 10 ft. reach using the A62 is the boom rest at the outside face of the bridge rail. This will prevent boom 2 from moving much past vertical and reduces reach under the bridge by at least 6 ft.





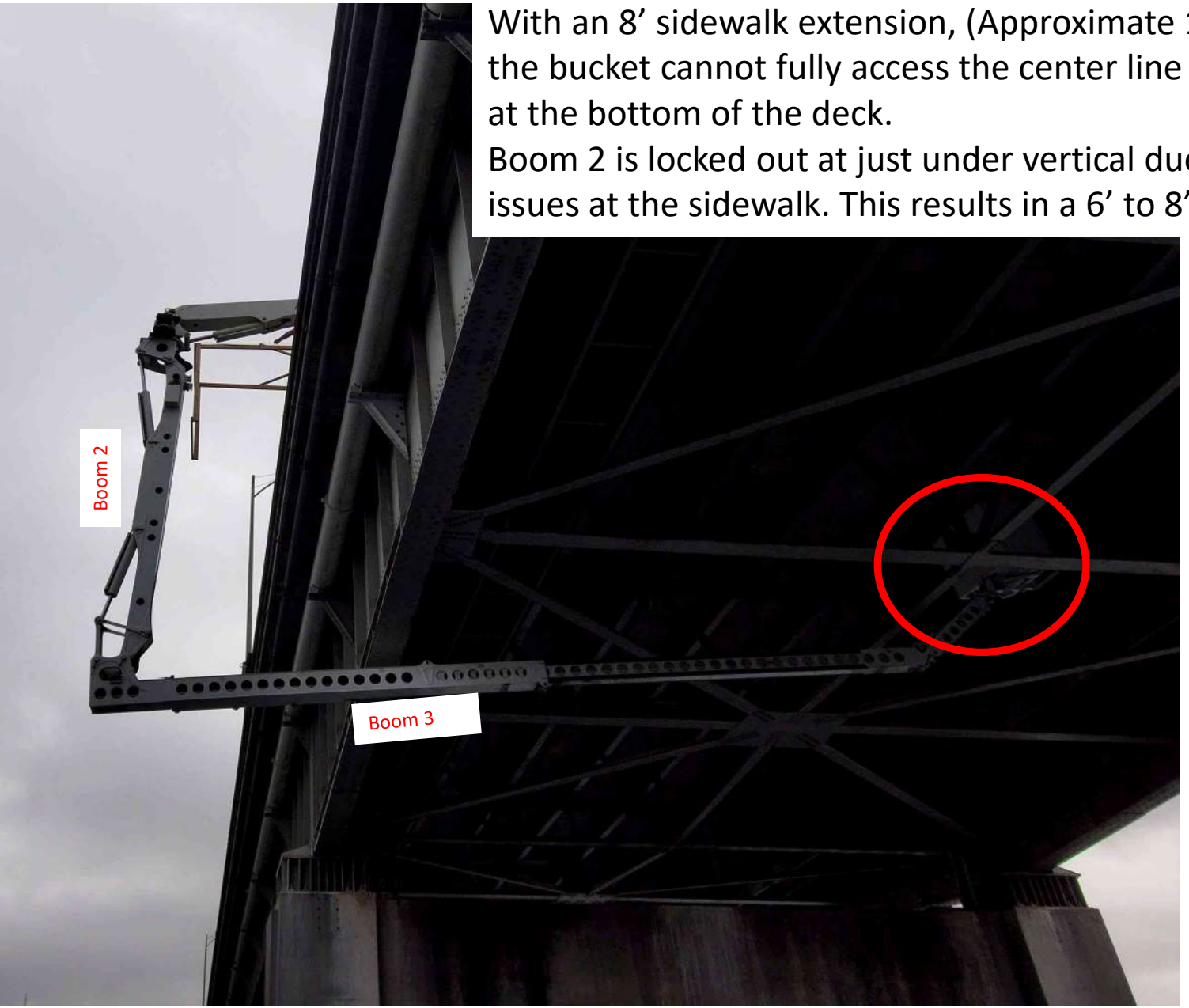
Even this clearance is too tight for normal operations. Operating clearances need to allow for bounce and movement due to traffic on the bridge, reflex in the boom operation and for moving the truck while deployed.
But this is absolute max reach!

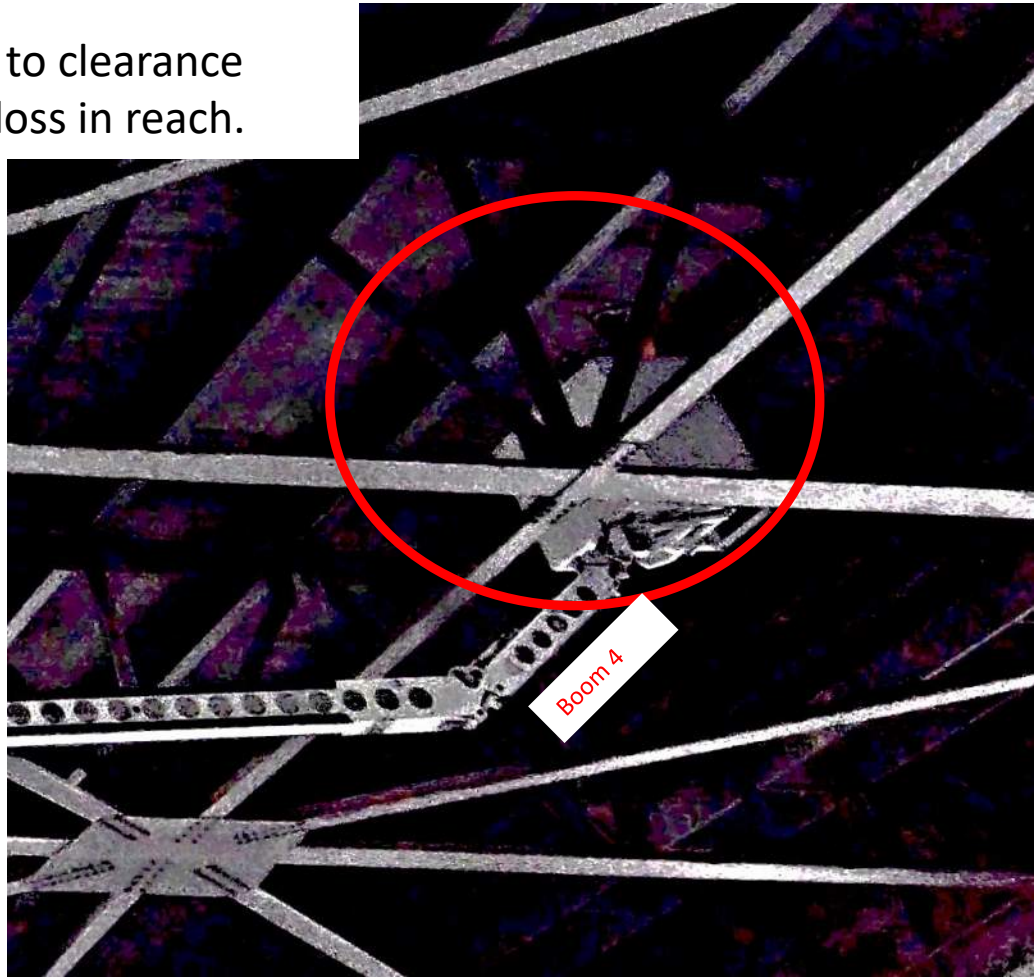
Maximum reach of the current A62 with an 8’ sidewalk extension is right at the bridge centerline. Access up to the bottom of the deck along the centerline is limited due to the multiple lateral bracing lines.

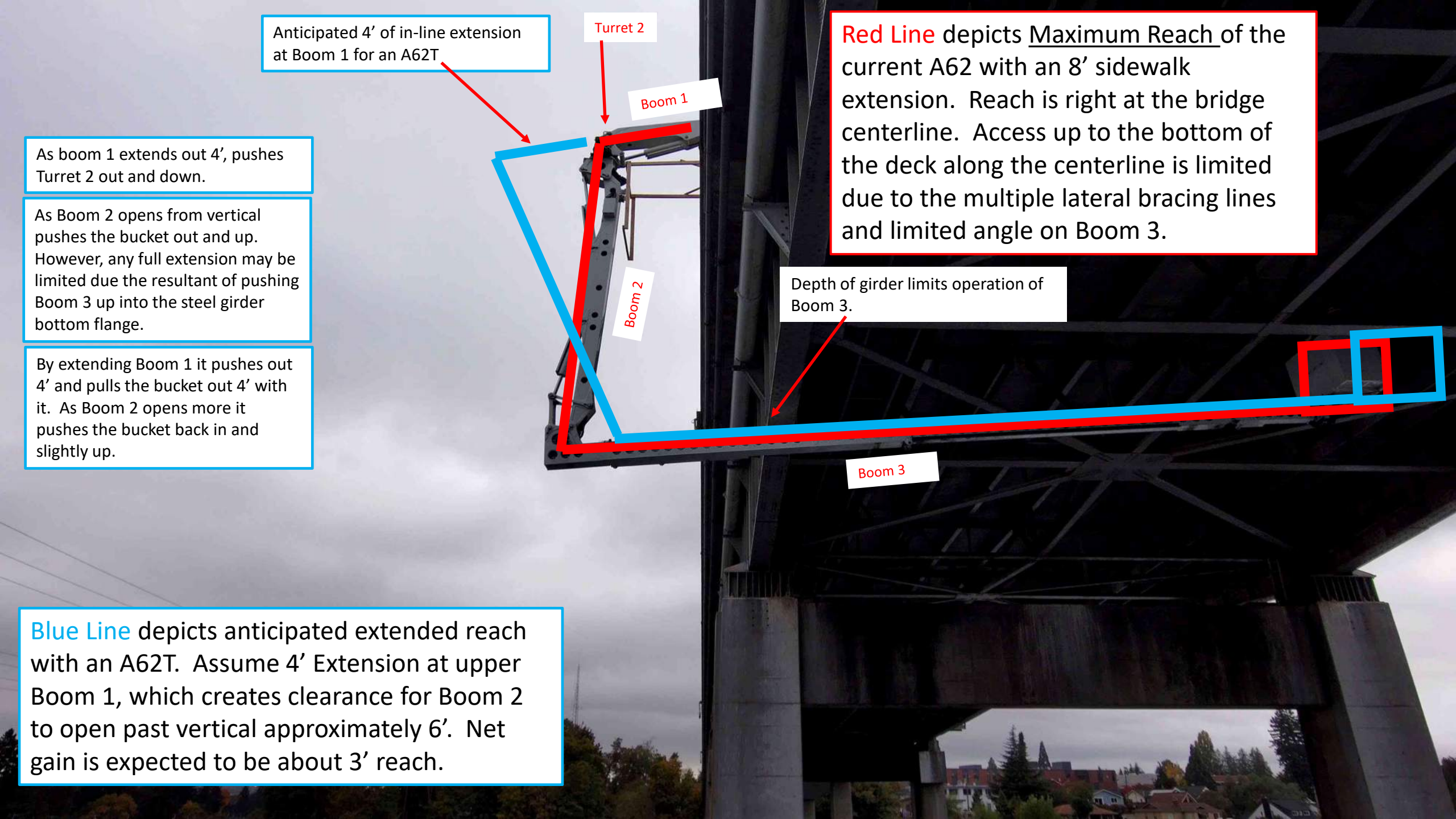


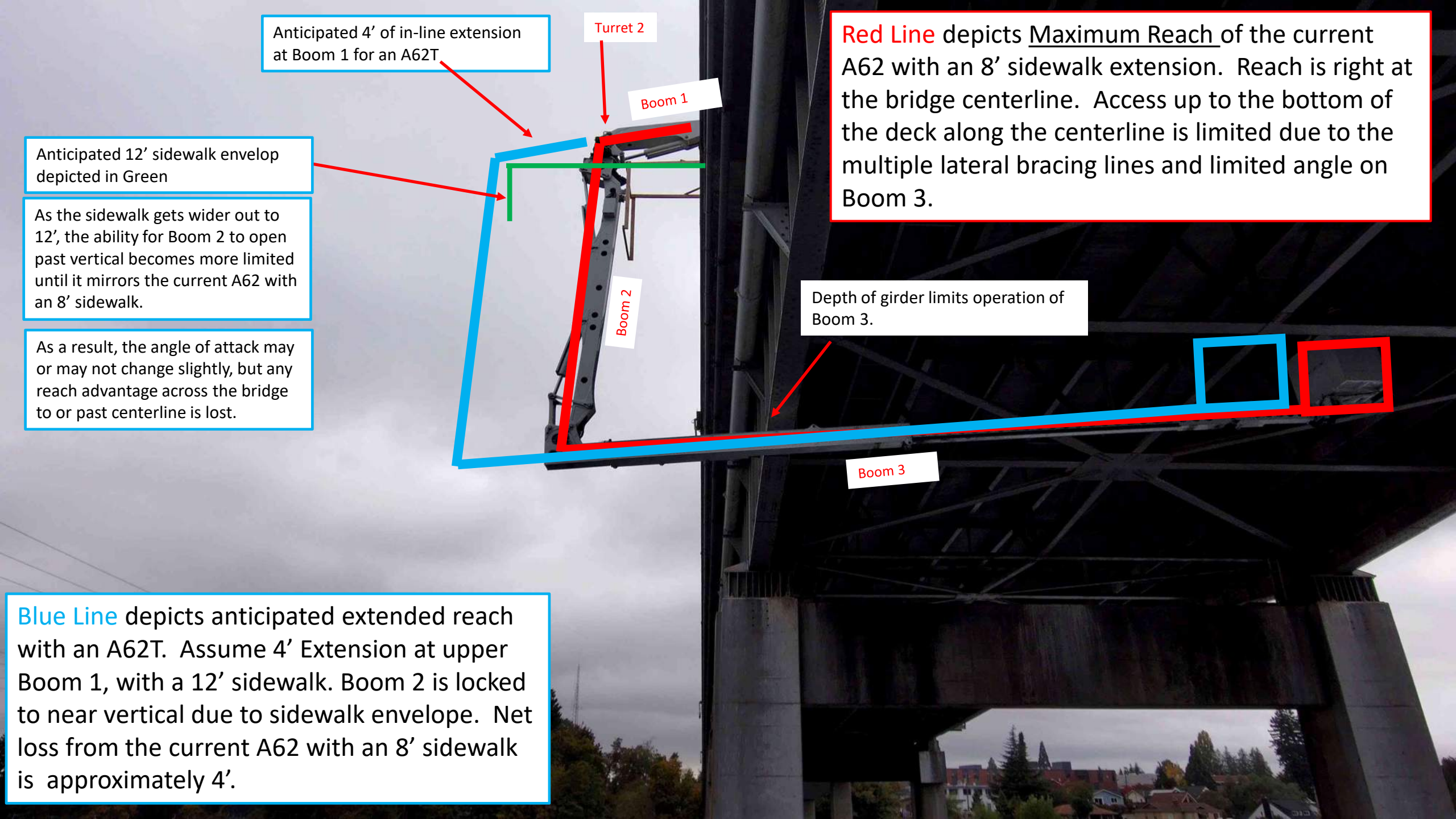
With an 8’ sidewalk, the limited clearance on boom 2 prevents rotation of the arial platform to reach forward or back and allow an angled approach for extension of boom 4. A direct reach in at 90 degrees to the structure does not allow access up to the inside face of the girder due to the catwalk.

With an 8’ sidewalk extension, (Approximate 10’-6” clear reach) the bucket cannot fully access the center line of steel stringers at the bottom of the deck.
Boom 2 is locked out at just under vertical due to clearance issues at the sidewalk. This results in a 6’ to 8’ loss in reach.






Anticipated 4’ of in-line extension at Boom 1 for an A62T
Turret 2
Boom 1
Boom 2
Boom 3
Red Line depicts Maximum Reach of the current A62 with an 8’ sidewalk extension. Reach is right at the bridge centerline. Access up to the bottom of the deck along the centerline is limited due to the multiple lateral bracing lines and limited angle on Boom 3.
As boom 1 extends out 4’, pushes Turret 2 out and down.
As Boom 2 opens from vertical pushes the bucket out and up. However, any full extension may be limited due the resultant of pushing Boom 3 up into the steel girder bottom flange.
By extending Boom 1 it pushes out 4’ and pulls the bucket out 4’ with it. As Boom 2 opens more it pushes the bucket back in and slightly up.
Depth of girder limits operation of Boom 3.
Blue Line depicts anticipated extended reach with an A62T. Assume 4’ Extension at upper Boom 1, which creates clearance for Boom 2 to open past vertical approximately 6’. Net gain is expected to be about 3’ reach.

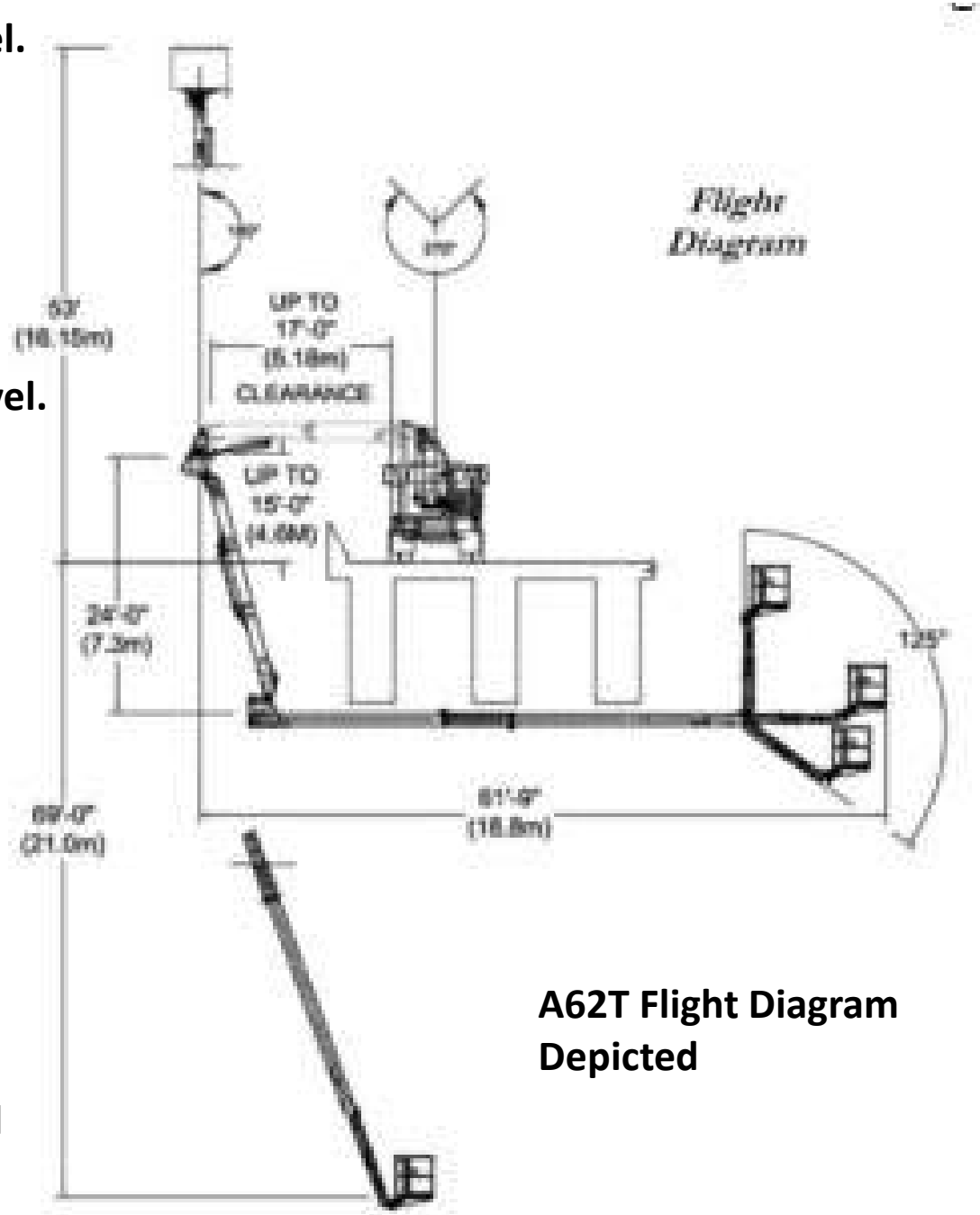

Anticipated 4’ of in-line extension at Boom 1 for an A62T
Turret 2
Boom 1
Anticipated 12’ sidewalk envelop depicted in Green
As the sidewalk gets wider out to 12’, the ability for Boom 2 to open past vertical becomes more limited until it mirrors the current A62 with an 8’ sidewalk.
As a result, the angle of attack may or may not change slightly, but any reach advantage across the bridge to or past centerline is lost.
Boom 2
Depth of girder limits operation of Boom 3.
Boom 3
Red Line depicts Maximum Reach of the current A62 with an 8’ sidewalk extension. Reach is right at the bridge centerline. Access up to the bottom of the deck along the centerline is limited due to the multiple lateral bracing lines and limited angle on Boom 3.
Blue Line depicts anticipated extended reach with an A62T. Assume 4’ Extension at upper Boom 1, with a 12’ sidewalk. Boom 2 is locked to near vertical due to sidewalk envelope. Net loss from the current A62 with an 8’ sidewalk is approximately 4’.

A62 Sidewalk Clearance is shown by ASPEN as 13’ with Boom 1 Level.
Demonstration measurements were 10’ 6” centerline of inside rail to outside face of anticipated rail. With approximately 12” to 18” from centerline of rail out to face of UBIT deck and tires, total clearance achieved with Boom 1 lowered to accommodate deep girders was approximately 12’.

A62T Sidewalk Clearance is shown by ASPEN as 17’ with Boom 1 Level.
This is 4 ft. more than our current A62 trucks. By our demonstration, adding that 4’ would indicate an actual achieved clearance of approximately 16’.

Having to lower Boom 1 for either truck to accommodate the girder depth will reduce the allowable sidewalk clearance.
Clearance diagrams by the manufacture depict total operating clearance. Clear reach must accommodate clear sidewalk width, inside and outside guardrails and operating clearances at both Boom1 and between the truck and rail.

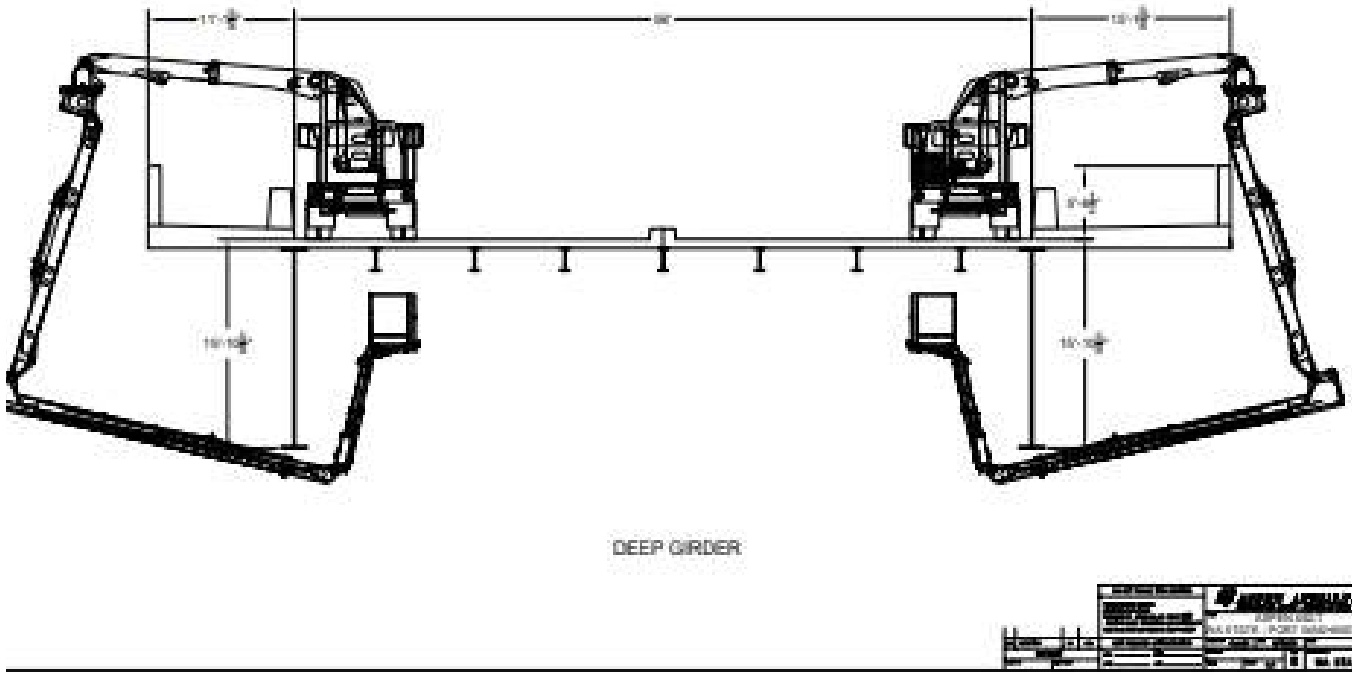
Small margins of clearance in inches or even a foot can be argued but the operation should depict that for every gain there can be a loss. Adding a foot or so of reach does not always help or accommodate maneuvering a 4’ x 5’ bucket between or around steel framing.



A62T Flight Diagram Depicted

This side deployment depicts 11’ of reach comparable to the 10’-6” or more of reach we demonstrated. Allowing for 2-1/2’ of rail and curb as shown, this would allow for an approximate 8’ sidewalk.

Note: Additional clearance for Boom 2 and restricting clearance to Boom 3 at girder is the same as anticipated by field demonstration.



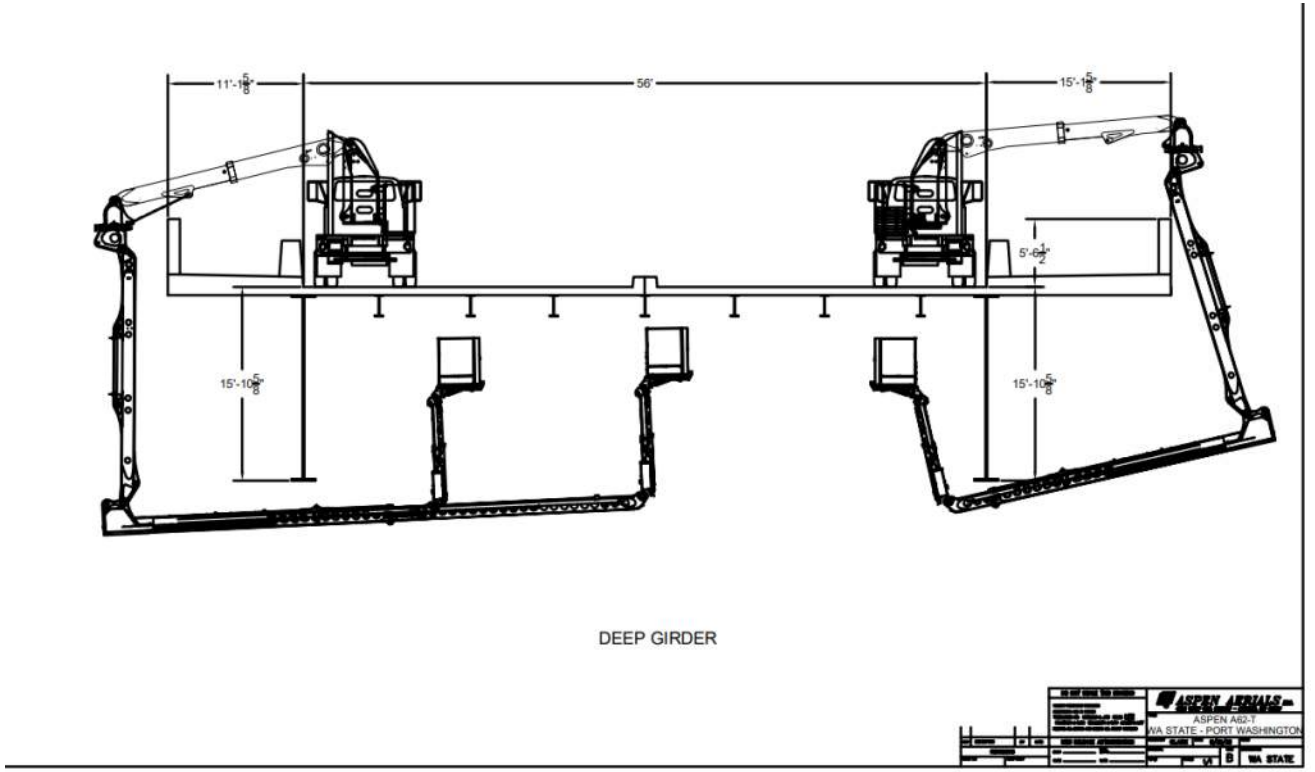
A62T deployment as depicted by ASPEN AERIALS for 8’ and 12’ side walks.
Depictions do not account for interference or limitation imposed by catwalks or framing between the girders.

This side deployment depicts 15’ of reach. Allowing for 2-1/2’ of rail and curb as shown, this would allow for an approximate 12’ sidewalk.

Note: Restriction of Boom 2 at top of rail prevents opening to vertical as anticipated by field demonstration. Boom 1 is not depicted as lowered to accommodate access to deep girders. This is more restrictive by the manufacture.

This side deployment depicts 11’ of reach comparable to the 10’-6” or more of reach as demonstrated. Allowing for 2-1/2’ of rail and curb as shown, this would allow for an approximate 8’ sidewalk.

Note: Additional clearance for Boom 2 allows it to open to vertical and extend reach across the bridge as anticipated by field demonstration.



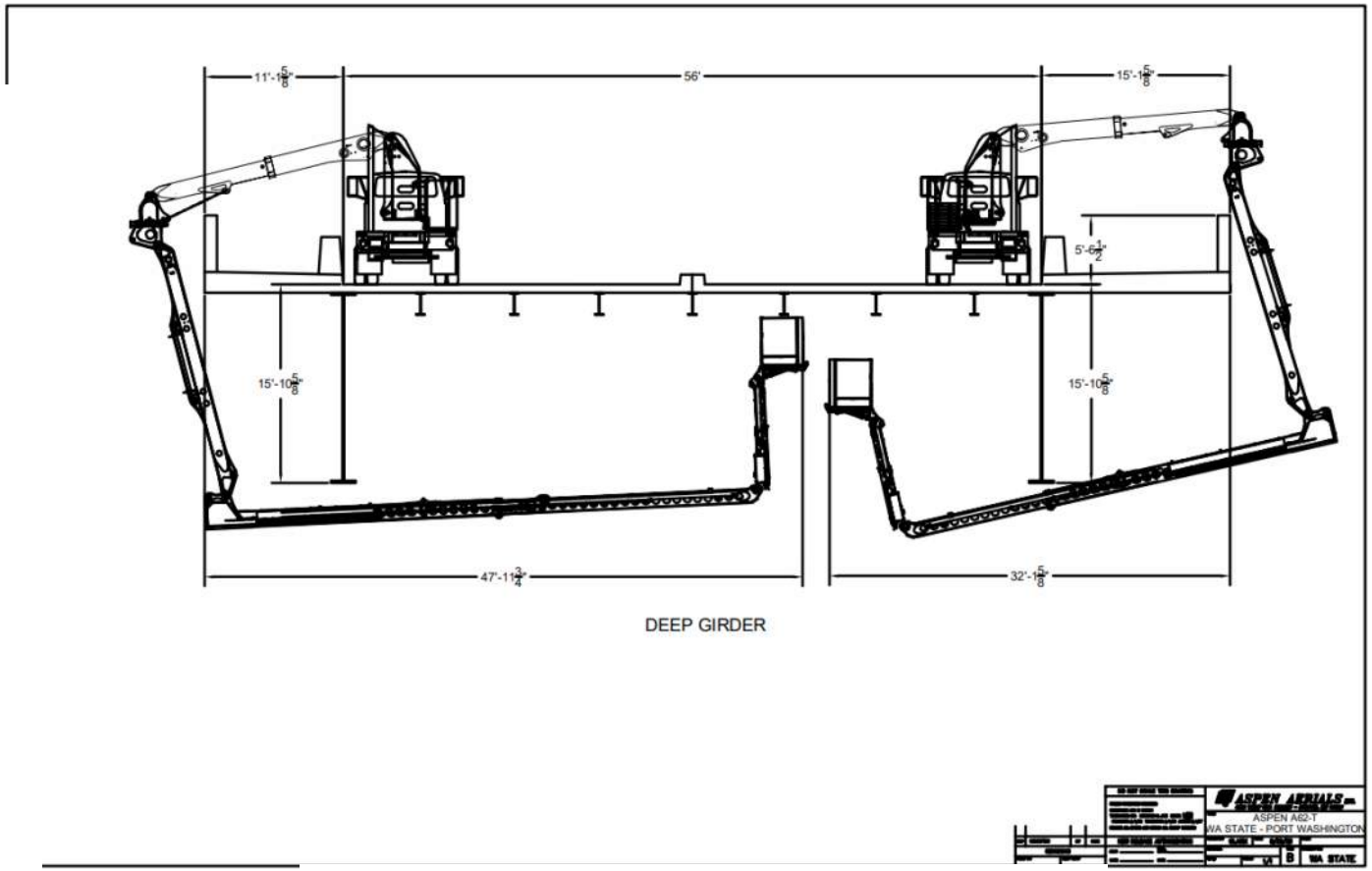
A62T deployment as depicted by ASPEN AERIALS for 8’ and 12’ side walks.
Depictions do not account for interference or limitation imposed by catwalks or framing between the girders.

No Change
This side deployment depicts 15’ of reach. Allowing for 2-1/2’ of rail and curb as shown, this would allow for an approximate 12’ sidewalk.

Note: Restriction of Boom 2 at top of rail and Boom 3 restriction at the girder as anticipated by field demonstration. Boom 1 is not depicted as lowered to accommodate access to deep girders. This is more restrictive by the manufacture.

This side deployment depicts 11’ of reach comparable to the 10’-6” or more of reach we demonstrated. Allowing for 2-1/2’ of rail and curb as shown, this would allow for an approximate 8’ sidewalk.

Note: Additional clearance for Boom 2 allows it to open beyond vertical and extend reach across the bridge as anticipated by the field demonstration.



A62T deployment as depicted by ASPEN AERIALS for 8’ and 12’ side walks.
Depictions do not account for interference or limitation imposed by catwalks or framing between the girders.

This side deployment depicts 15’ of reach. Allowing for 2-1/2’ of rail and curb as shown, this would allow for an approximate 12’ sidewalk.

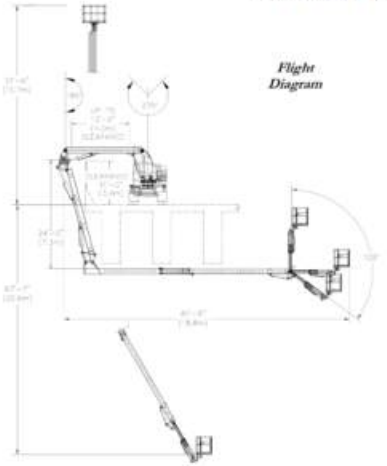
Note: Restriction of Boom 2 at top of rail prevents opening to vertical as anticipated by field demonstration.

Boom 1 is not depicted as lowered to accommodate access to deep girders. This is more restrictive by the manufacture.

A62

Horizontal Underbridge Reach	61.75 ft
Vertical Reach Down	67.58 ft
Vertical Reach Up	51.5 ft
Sidewalk Clearance	13 ft
Fence Clearance	11 ft
Overall Length	40 ft

Click on images to see detail



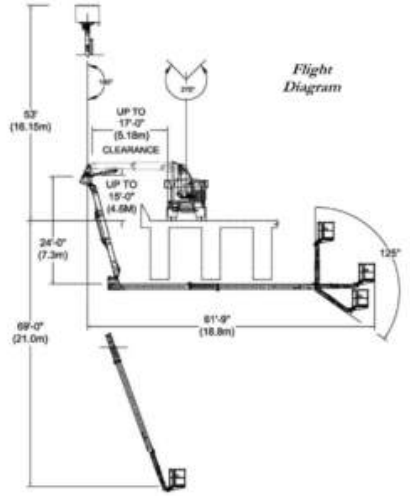
SPECIFICATIONS

Overall Height	13.25 ft
Overall Weight	64,500 lbs
Platform Capacity	700 lbs
Platform Rotation	180 degrees
Platform Size	40" x 60" x 44"
Boom No.1 Movement	+30 to -35 degrees
Boom No.2 Movement	+0 to -105 degrees
Boom No.3 Movement	+90 to -60 degrees
Boom No.4 Movement	+90 to -36 degrees
Platform Vertical Reach	13.17 ft
Space Required on Bridge	102 in
Walkway Reach	51 ft

A62T

Horizontal Underbridge Reach	61.75 ft
Vertical Reach Down	69 ft
Vertical Reach Up	53 ft
Sidewalk Clearance	17 ft
Fence Clearance	15 ft
Overall Length	41 ft

Click on images to see detail

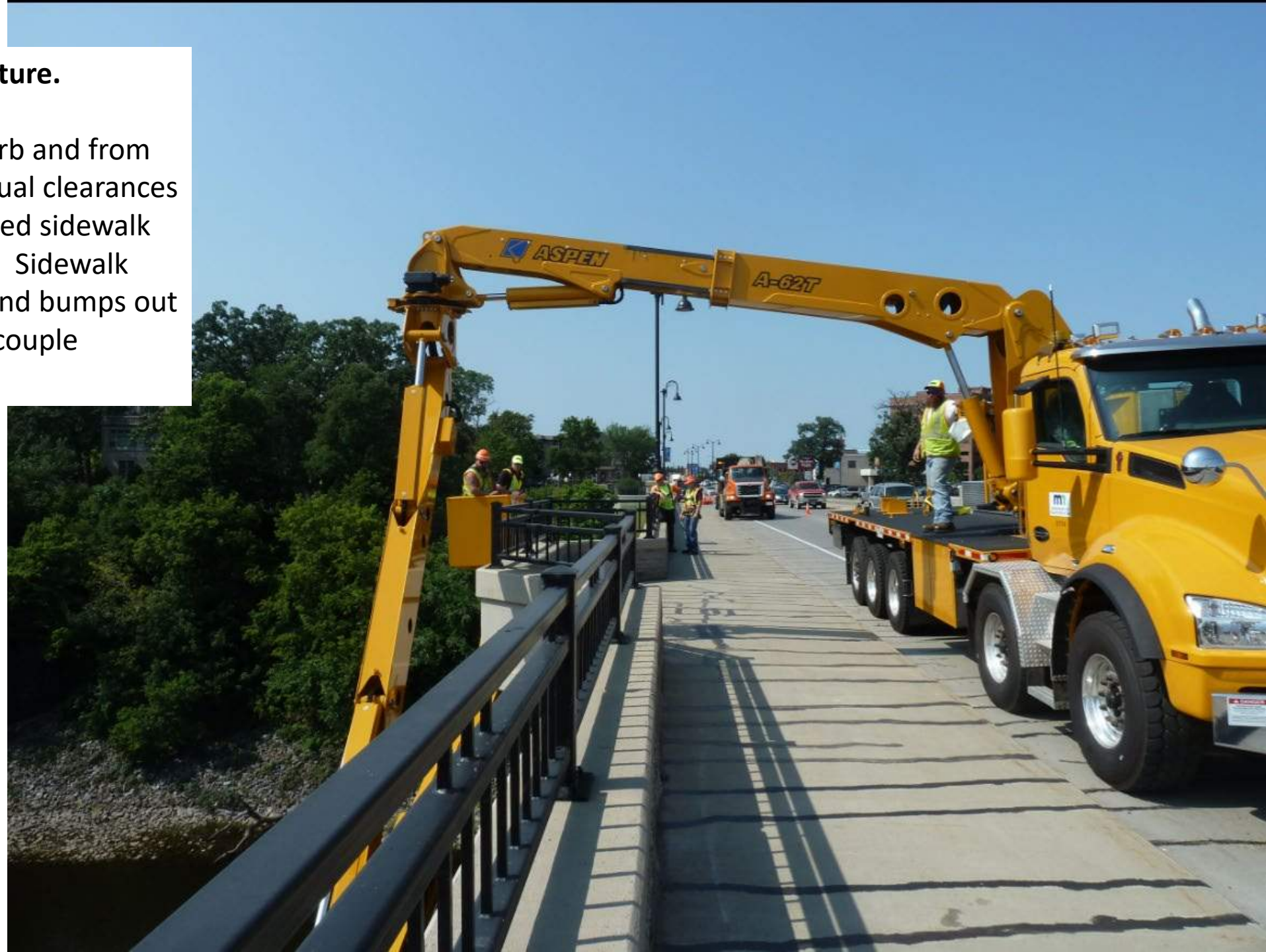


SPECIFICATIONS

Overall Height	13 ft
Overall Weight	76500 lbs
Platform Capacity	700 lbs
Platform Rotation	180 degrees
Platform Size	40 x 60 x 44
Boom No.1 Movement	+30 to -35 degrees
Boom No.2 Movement	+0 to -105 degrees
Boom No.3 Movement	+90 to -60 degrees
Boom No.4 Movement	+90 to -36 degrees
Platform Vertical Reach	13.5 ft
Space Required on Bridge	102 in

A62T as depicted by manufacture.

Note clearances at truck to curb and from Boom 2 to outside of rail. Actual clearances here do not depict the proposed sidewalk expansion on Warren Avenue. Sidewalk and rail here is around 9-10’ and bumps out about another foot or so in a couple locations.



Appendix E
Catwalk Structural Framing Section View and Cost Breakdown

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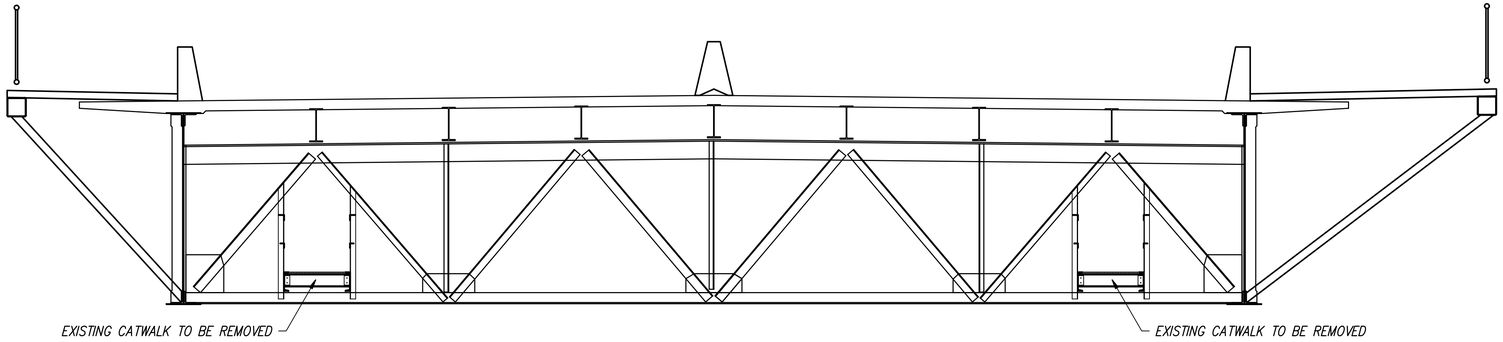
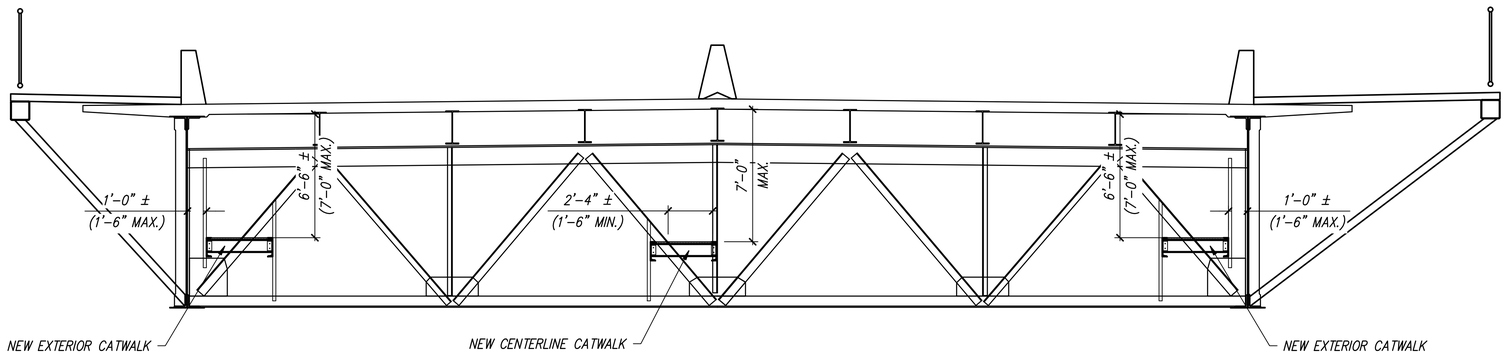


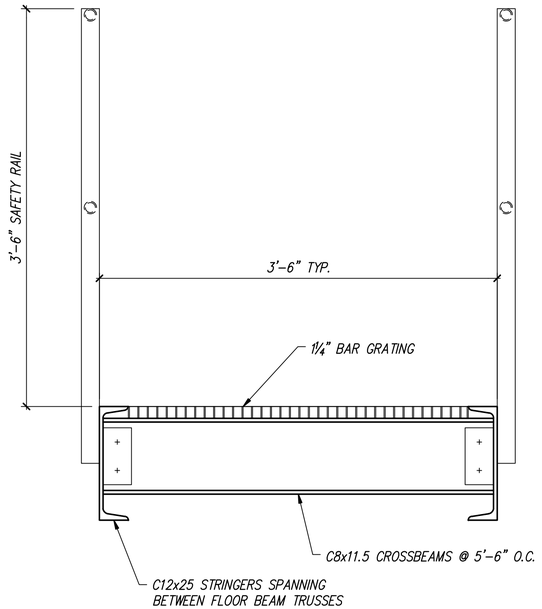
CATWALKS TO BE REMOVED

SIDEWALK ALTERNATIVE X SHOWN



NEW CATWALKS TO BE INSTALLED

SIDEWALK ALTERNATIVE X SHOWN
CATWALK SAFETY RAILING NOT SHOWN FOR CLARITY



TYPICAL CATWALK SECTION

PLAN CHECK	DATE				
DESIGNED BY: R.W. Larsen					
CHECKED BY: J.S. Soward					
PRJ DRAFTER: R.W. Larsen					
DETAILED BY: .					
DETAILED BY: .					
		.	.	.	.
ISSUED:	2/2/2024	DATE	NO.	REVISION	BY

FEDERAL AID PROJECT NO. .

C.R.P. NO. .

JESSICA S SOWARD — STATE OF WASHINGTON — 25272 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

PRELIMINARY

SARGENT ENGINEERS, INC.
320 Ronlee Lane NW • Olympia, WA 98502
Tel. 360 867-9284 • sargentengineers.com

CITY OF BREMERTON
PUBLIC WORKS & UTILITIES

WARREN AVENUE BRIDGE
MULTIMODAL PROJECT

BREMERTON, WASHINGTON

CATWALKS

SHEET 1 OF 1 SHEETS

SEI REF NO. A21137.00

Plotted: Feb 2, 2024 - 12:02 JessicaS B:\21Files\A21137.00 SCJ - Warren Ave Improvements\Alternatives Study\Drawings\Warren Ave. Alt X.Dwg Layout Name: Catwalks xrefs: titlesht

SARGENT
Sargent Engineers, Inc.
320 Ronlee Lane NW
Olympia, WA 98502
Tel 360-867-9284

CONSTRUCTION COST ESTIMATE

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY*	UNIT COST	COST
	STRUCTURE UNIT COST BREAKDOWN				
---	STRUCTURAL STEEL	LB	60000	$ 4.00	$ 240,000
---	CLEANING & PAINTING	S.F.	4500	$ 50.00	$ 225,000
					$ 465,000
				STRUCTURE UNIT COST ($/SF) =	**$ 219.24**
					*** Say $220/SF**

* Quantities listed are for one 3.5' wide catwalk that is 606' long (2121 SF)

SARGENT
Sargent Engineers, Inc.
320 Ronlee Lane NW
Olympia, WA 98502
Tel 360-867-9284

CONSTRUCTION COST ESTIMATE

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT COST
	PREPARATION			
---	CATWALK REMOVAL	S.F.	2121	**$40**
	STRUCTURE			
---	NEW CATWALKS	S.F.	2121	**$220**

*Remove/Replace 1 catwalk

Area	3.5' x 606'	2121	
Removal	3.5' x 606' x $40/SF	$	84,840
New	3.5' x 606' x $220/SF	$	466,620
		$	551,460

*Remove/Replace 2 catwalks + New CL catwalk

Area	3.5' x 606'	2121	
Removal	2 x 3.5' x 606' x $40/SF	$	169,680
New	3 x 3.5' x 606' x $220/SF	$	1,399,860
		$	1,569,540

Aaron Knight

From: Zeldenrust, Richard <ZeldenR@wsdot.wa.gov> on behalf of Zeldenrust, Richard
Sent: Wednesday, January 3, 2024 4:33 PM
To: Shane Weber
Cc: Aaron Knight; Jessica Soward; Ho, John; Seipel, Greg
Subject: RE: [EXTERNAL] Warren Ave Bridge - Catwalk Estimates - Information Request
Attachments: RE: [EXTERNAL] Aspen A62-T (1.06 MB)

Shane,

See answers below, in green.

Richard Zeldenrust P.E. S.E.
Structural Design Unit Supervisor

WSDOT Bridge and Structures Office
7345 Linderson Way SW
Tumwater, WA 98501
Desk: 360.705.7196

From: Shane Weber <Shane.Weber@ci.bremerton.wa.us>
Sent: Friday, December 29, 2023 9:54 AM
To: Zeldenrust, Richard <ZeldenR@wsdot.wa.gov>
Cc: Aaron Knight <aaron.knight@scjalliance.com>; Jessica Soward <jessicas@sargentengineers.com>; Ho, John <HoJohn@wsdot.wa.gov>
Subject: [EXTERNAL] Warren Ave Bridge - Catwalk Estimates - Information Request
Importance: High

Hi Rich,

As mentioned in our check in meeting last week, we have asked Sargent to put together planning level costs for catwalk modifications needed for bridge widening (based on Steve/Greg's presentation) and below are follow-up questions generated by the design team that need input from your folks to help them to develop these estimates.

- What is the required distance from the catwalk deck to the girder for modifying the outside catwalks. Horizontal clearance from the catwalk rail to the girder web should be 1'-6", same as the UBIT inspection criteria. Likewise, vertical clearance from the catwalk surface to the underside of the concrete bridge deck should be 7'-0".
- What is the length of the catwalk modifications? Previously this was identified by Aspen as only being needed for 50' each side of each pier on the steel spans. Wider sidewalks installed on both sides of the bridge will require a deck centerline catwalk, full length of the steel spans. For estimating purposes, I think that widened

catwalks should also be assumed along the inside faces of both steel girders, for the full length of the steel spans.

- Does WSDOT have a design of a catwalk that they would like us to implement, or other material requirements that should be incorporated? WSDOT does not have a standard design or typical details for catwalk design. All catwalk installations on WSDOT structures are essentially project-specific designs, with detailing, geometries, and material choices tailored to the specific installation. Rich mentioned here that FRP decking could be an option. FRP decking material may be a good choice for this project. Corrosion resistance and low weight would be beneficial. UV exposure would not be a concern, with the catwalks being shaded from above and from the sides. Live loads should be well within the capacity of FRP decking.
- What should the design catwalk live load be? I looked at several Codes and Guide Spec's, and a couple of previous WSDOT projects, all in an attempt to identify some consistency in live loading values (IBC, AASHTO LRFD Ped Bridge Guide Spec, SR 520 Floating Bridge RFP, Hood Canal Pontoon Replacement, ASCE Standards, ANSI). Live load values, however, are actually quite variable. To remain consistent with previous practice, to retain consistency between, loads, load factors, and resistance factors, and to retain some overall conservatism, any new or widened catwalks should be designed with a 90 psf live load value. This is consistent with the live load value quoted in the AASHTO LRFD Ped Bridge Guide Spec, and will also maintain consistency with the load factors and resistance factors given in AASHTO LRFD. Live loading shall be 90 psf, with a 750 pound concentrated load (these two loading conditions do not need to be applied concurrently). If it would help with estimating, the Bridge Office could provide some catwalk plans from the Hood Canal project.
- Should catwalk live load be considered concurrent with vehicle live load for analysis of existing framing; if so, what load factors? No, no need to consider both maximum catwalk loads and maximum vehicular live loads concurrently.

If you need any clarification or additional information to help you out, please feel free to reach out to Jessica Soward directly.

Hope you are having a good holiday and we'll touch base sometime after the new year.

Shane

Shane Weber, P.E., PTOE | Engineering Manager – Transportation Capital Program
City of Bremerton
Phone: 360-473-2354
Shane.Weber@ci.bremerton.wa.us

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Appendix F
Updated Project Cost Estimates

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Project Name: Warren Avenue Bridge Pedestrian Improvements
Client Name: City of Bremerton
SCJ Project No.: 20-000248
Estimate Level: Conceptual
Alternative Desc.: 8 foot clear width, both sides of the bridge
Date: 3/5/2024

Alternative 1

SCJ ALLIANCE
CONSULTING SERVICES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION (8%)	LS	1	$ 1,109,907.20	$ 1,109,907.20
2	BRIDGE PREPARATION INCL CORMORANT REMEDIATION	LS	1	$ 500,000.00	$ 500,000.00
3	PROJECT TEMPORARY TRAFFIC CONTROL	DAY	360	$ 1,500.00	$ 540,000.00
4	REMOVING EXISTING CENTER CURB	LF	1,717	$ 140.00	$ 240,380.00
5	REMOVING EXISTING EDGE BARRIER	LF	3,434	$ 140.00	$ 480,760.00
6	REMOVING EXISTING SIDEWALK	LF	3,434	$ 140.00	$ 480,760.00
7	STRUCTURAL LOW ALLOW STEEL (STRUCTURAL STEEL AND DECKING)	LB	1,200,000	$ 4.00	$ 4,800,000.00
8	BRIDGE RAILING TYPE BP - SUPERSTR.	LF	6,868	$ 150.00	$ 1,030,200.00
9	TRAFFIC BARRIER - SUPERSTR.	LF	5,151	$ 200.00	$ 1,030,200.00
10	CLEANING AND PAINTING	SF	32,000	$ 50.00	$ 1,600,000.00
11	REMOVE AND REPLACE EXISTING CATWALK	SF	4,242	$ 260.00	$ 1,102,920.00
12	NEW CENTERLINE CATWALK	SF	2,121	$ 220.00	$ 466,620.00
13	REIMBURSEMENT FOR THIRD PARTY DAMAGE	EST	1	$ 50,000.00	$ 50,000.00
14	ASBESTOS REMOVAL AND DISPOSAL	LF	10,800	$ 15.00	$ 162,000.00
15	ILLUMINATION SYSTEM	EA	12	$ 25,000.00	$ 300,000.00
16	ART & PLACEMAKING ELEMENTS	LS	1	$ 250,000.00	$ 250,000.00
17	TEMPORARY EROSION AND SEDIMENT CONTROL	MONTH	18.00	$ 30,000.00	$ 540,000.00
18	STAIRCASE MODIFICATION	EA	2	$ 50,000.00	$ 100,000.00
19	LANDWARD SIDEWALK TIE IN	LF	200	$ 1,000.00	$ 200,000.00

Subtotal	$	14,983,747.20
Contingency (25%)	$	3,745,936.80
Inflationary Costs (4 year (2026) at 3.25%/yr)	$	2,434,858.92
TOTAL CONSTRUCTION	$	21,164,542.92
Preliminary Engineering	$	2,000,000.00
Construction Management	$	2,805,000.00
TOTAL PROJECT COST (ROUNDED)	**$**	**26,000,000.00**

NOTE:
Cost estimations in the feasibility and alternatives analysis were originated in 2022, using current pricing from that year. The inflationary factor is applied to the planning level construction cost to account for the future costs at the time when the project would receive Contractor bids, which is planned for 2026.

Project Name: Warren Avenue Bridge Pedestrian Improvements
Client Name: City of Bremerton
SCJ Project No.: 20-000248
Estimate Level: Conceptual
Alternative Desc.: 10 foot clear width, both sides of the bridge
Date: 3/5/2024

Alternative 2

SCJ ALLIANCE
CONSULTING SERVICES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION (8%)	LS	1	$ 1,201,907.20	$ 1,201,907.20
2	BRIDGE PREPARATION INCL CORMORANT REMEDIATION	LS	1	$ 500,000.00	$ 500,000.00
3	PROJECT TEMPORARY TRAFFIC CONTROL	DAY	360	$ 1,500.00	$ 540,000.00
4	REMOVING EXISTING CENTER CURB	LF	1,717	$ 140.00	$ 240,380.00
5	REMOVING EXISTING EDGE BARRIER	LF	3,434	$ 140.00	$ 480,760.00
6	REMOVING EXISTING SIDEWALK	LF	3,434	$ 140.00	$ 480,760.00
7	STRUCTURAL LOW ALLOW STEEL (STRUCTURAL STEEL AND DECKING)	LB	1,400,000	$ 4.00	$ 5,600,000.00
8	BRIDGE RAILING TYPE BP - SUPERSTR.	LF	6,868	$ 150.00	$ 1,030,200.00
9	TRAFFIC BARRIER - SUPERSTR.	LF	5,151	$ 200.00	$ 1,030,200.00
10	CLEANING AND PAINTING	SF	39,000	$ 50.00	$ 1,950,000.00
11	REMOVE AND REPLACE EXISTING CATWALK	SF	4,242	$ 260.00	$ 1,102,920.00
12	NEW CENTERLINE CATWALK	SF	2,121	$ 220.00	$ 466,620.00
13	REIMBURSEMENT FOR THIRD PARTY DAMAGE	EST	1	$ 50,000.00	$ 50,000.00
14	ASBESTOS REMOVAL AND DISPOSAL	LF	10,800	$ 15.00	$ 162,000.00
15	ILLUMINATION SYSTEM	EA	12	$ 25,000.00	$ 300,000.00
16	ART & PLACEMAKING ELEMENTS	LS	1	$ 250,000.00	$ 250,000.00
17	TEMPORARY EROSION AND SEDIMENT CONTROL	MONTH	18.00	$ 30,000.00	$ 540,000.00
18	STAIRCASE MODIFICATION	EA	2	$ 50,000.00	$ 100,000.00
19	LANDWARD SIDEWALK TIE IN	LF	200	$ 1,000.00	$ 200,000.00

Subtotal	$	16,225,747.20
Contingency (25%)	$	4,056,436.80
Inflationary Costs (4 year (2026) at 3.25%/yr)	$	2,636,683.92
TOTAL CONSTRUCTION	$	22,918,867.92
UBIT Purchase (2024 $)	$	1,123,000.00
Inflationary Costs (2 year (2026) at 3.25%/yr)	$	145,990.00
UBIT Operational Costs	$	736,528.00
TOTAL UBIT Costs	$	2,005,518.00
Preliminary Engineering	$	2,000,000.00
Construction Management & Inspection	$	2,805,000.00
TOTAL PROJECT COST (ROUNDED)	**$**	**29,800,000.00**

NOTE:
Cost estimations in the feasibility and alternatives analysis were originated in 2022, using current pricing from that year. The inflationary factor is applied to the planning level construction cost to account for the future costs at the time when the project would receive Contractor bids, which is planned for 2026.

Project Name: Warren Avenue Bridge Pedestrian Improvements
Client Name: City of Bremerton
SCJ Project No.: 20-000248
Estimate Level: Conceptual
Alternative Desc.: 12 foot clear width, east side of the bridge and modify west side to achieve 5 foot wide sidewalk
Date: 3/5/2024

Alternative 7

SCJ ALLIANCE
CONSULTING SERVICES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION (8%)	LS	1	$ 951,390.40	$ 951,390.40
2	BRIDGE PREPARATION INCL CORMORANT REMEDIATION	LS	1	$ 500,000.00	$ 500,000.00
3	PROJECT TEMPORARY TRAFFIC CONTROL	DAY	275	$ 1,500.00	$ 412,500.00
4	REMOVING EXISTING CENTER CURB	LF	1,717	$ 140.00	$ 240,380.00
5	REMOVING EXISTING EDGE BARRIER (EAST)	LF	1,717	$ 140.00	$ 240,380.00
6	REMOVING EXISTING EDGE BARRIER (WEST)	LF	1,717	$ 140.00	$ 240,380.00
7	REMOVING EXISTING SIDEWALK (EAST)	LF	1,717	$ 140.00	$ 240,380.00
8	STRUCTURAL LOW ALLOW STEEL (STRUCTURAL STEEL AND DECKING) (EAST)	LB	810,000	$ 4.00	$ 3,240,000.00
9	BRIDGE RAILING TYPE BP - SUPERSTR. (EAST)	LF	3,434	$ 150.00	$ 515,100.00
10	BRIDGE RAILING TYPE BP - SUPERSTR. (WEST)	LF	3,434	$ 150.00	$ 515,100.00
11	TRAFFIC BARRIER - SUPERSTR. (EAST)	LF	1,717	$ 200.00	$ 343,400.00
12	TRAFFIC BARRIER - SUPERSTR. (CENTER)	LF	1,717	$ 200.00	$ 343,400.00
13	TRAFFIC BARRIER - SUPERSTR. (WEST)	LF	1,717	$ 200.00	$ 343,400.00
14	SIDEWALK REPAIR AND OVERLAY (WEST)	SF	8,585	$ 200.00	$ 1,717,000.00
15	CLEANING AND PAINTING (EAST)	SF	22,500	$ 50.00	$ 1,125,000.00
16	REMOVE AND REPLACE EXISTING CATWALK	SF	2,121	$ 260.00	$ 551,460.00
17	REIMBURSEMENT FOR THIRD PARTY DAMAGE	EST	1	$ 50,000.00	$ 50,000.00
18	ASBESTOS REMOVAL AND DISPOSAL	LF	10,800	$ 15.00	$ 162,000.00
19	ILLUMINATION SYSTEM	EA	12	$ 25,000.00	$ 300,000.00
20	ART & PLACEMAKING ELEMENTS	LS	1	$ 250,000.00	$ 250,000.00
21	TEMPORARY EROSION AND SEDIMENT CONTROL	MONTH	13.75	$ 30,000.00	$ 412,500.00
22	STAIRCASE MODIFICATION	EA	1	$ 50,000.00	$ 50,000.00
23	LANDWARD SIDEWALK TIE IN	LF	100	$ 1,000.00	$ 100,000.00

Subtotal	$	12,843,770.40
Contingency (25%)	$	3,210,942.60
Inflationary Costs (4 year (2026) at 3.25%/yr)	$	2,087,112.69
TOTAL CONSTRUCTION	$	18,141,825.69
UBIT Purchase (2024 $)	$	1,123,000.00
Inflationary Costs (2 year (2026) at 3.25%/yr)	$	145,990.00
UBIT Operational Costs	$	736,528.00
TOTAL UBIT Costs	$	2,005,518.00
Preliminary Engineering	$	2,265,000.00
Construction Management	$	2,300,000.00
TOTAL PROJECT COST (ROUNDED)	**$**	**24,800,000.00**

NOTE:
Cost estimations in the feasibility and alternatives analysis were originated in 2022, using current pricing from that year. The inflationary factor is applied to the planning level construction cost to account for the future costs at the time when the project would receive Contractor bids, which is planned for 2026.

Project Name: Warren Avenue Bridge Pedestrian Improvements
Client Name: City of Bremerton
SCJ Project No.: 20-000248
Estimate Level: Conceptual
Alternative Desc.: 12 foot clear width east side; 8' clear width west side with two overlooks
Date: 3/5/2024

Alternative "X"

SCJ ALLIANCE
CONSULTING SERVICES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION (8%)	LS	1	$ 1,212,707.20	$ 1,212,707.20
2	BRIDGE PREPARATION INCL CORMORANT REMEDIATION	LS	1	$ 500,000.00	$ 500,000.00
3	PROJECT TEMPORARY TRAFFIC CONTROL	DAY	360	$ 1,500.00	$ 540,000.00
4	REMOVING EXISTING CENTER CURB	LF	1,717	$ 140.00	$ 240,380.00
5	REMOVING EXISTING EDGE BARRIER	LF	3,434	$ 140.00	$ 480,760.00
6	REMOVING EXISTING SIDEWALK	LF	3,434	$ 140.00	$ 480,760.00
7	STRUCTURAL LOW ALLOW STEEL (STRUCTURAL STEEL AND DECKING)	LB	1,440,000	$ 4.00	$ 5,760,000.00
8	BRIDGE RAILING TYPE BP - SUPERSTR.	LF	6,868	$ 150.00	$ 1,030,200.00
9	TRAFFIC BARRIER - SUPERSTR.	LF	5,151	$ 200.00	$ 1,030,200.00
10	CLEANING AND PAINTING	SF	38,500	$ 50.00	$ 1,925,000.00
11	REMOVE AND REPLACE EXISTING CATWALK	SF	4,242	$ 260.00	$ 1,102,920.00
12	NEW CENTERLINE CATWALK	SF	2,121	$ 220.00	$ 466,620.00
13	REIMBURSEMENT FOR THIRD PARTY DAMAGE	EST	1	$ 50,000.00	$ 50,000.00
14	ASBESTOS REMOVAL AND DISPOSAL	LF	10,800	$ 15.00	$ 162,000.00
15	ILLUMINATION SYSTEM	EA	12	$ 25,000.00	$ 300,000.00
16	ART & PLACEMAKING ELEMENTS	LS	1	$ 250,000.00	$ 250,000.00
17	TEMPORARY EROSION AND SEDIMENT CONTROL	MONTH	18	$ 30,000.00	$ 540,000.00
18	STAIRCASE MODIFICATION	EA	2	$ 50,000.00	$ 100,000.00
19	LANDWARD SIDEWALK TIE IN	LF	200	$ 1,000.00	$ 200,000.00

Subtotal	$	16,371,547.20
Contingency (25%)	$	4,092,886.80
Inflationary Costs (4 year (2026) at 3.25%/yr)	$	2,660,376.42
TOTAL CONSTRUCTION	$	23,124,810.42
UBIT Purchase (2024 $)	$	1,123,000.00
Inflationary Costs (2 year (2026) at 3.25%/yr)	$	145,990.00
UBIT Operational Costs	$	736,528.00
TOTAL UBIT Costs	$	2,005,518.00
Preliminary Engineering	$	2,265,000.00
Construction Management & Inspection	$	2,805,000.00
TOTAL PROJECT COST (ROUNDED)	**$**	**30,300,000.00**

NOTE:
Cost estimations in the feasibility and alternatives analysis were originated in 2022, using current pricing from that year. The inflationary factor is applied to the planning level construction cost to account for the future costs at the time when the project would receive Contractor bids, which is planned for 2026.

Appendix G
Updated Alternatives Matrix

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Updated Alternatives Matrix

		Alternative 1	Alternative 2	Alternative 3	Alternative 4a	Alternative 4b	Alternative 5	Alternative 6	Alternative 7	Alternative 7a	Alternative 8	Alternative 8a	Alternative X
Alternatives		8-foot clear width Both sides	10-foot clear width Both sides	12-foot clear width Both sides	16-foot clear width West side	16-foot clear width East side	14-foot clear width Both sides	At-grade 6-foot bike lane, 6-foot sidewalk Both sides	12-foot clear width on east side; 5-ft clear width on west side Both sides	12-foot clear width East side *	14-foot clear width on east side; 5-ft clear width on west side Both sides	14-foot clear width East side *	12-foot clear width on east side; 8-foot clear width on west side Both sides
Origin		WSDOT recommendation	SR 303 Corridor Study preferred alternative	Larger 2-sided alternative assuming purchase of new UBIT	Combined WSCC one-sided alternative with WSDOT standard for shared use path	Alternate to 4a, not requiring an undercrossing of SR 303	WSDOT Traffic Office requested	Input from the stakeholder survey	WSCC option plus 5' for ADA access on opposite side	WSCC option as presented to Council (2021)	WSCC option plus 5' for ADA access on opposite side	WSCC option as presented to Council (2021)	City Council approved alternative in August 2023
Overlooks		8'x24', 4 total	6'x24', 4 total	No	No	No	N/A	N/A	No	No	No	No	8'x24', 2 total West side only
Structural Feasibility		Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Bridge Fully ADA Compliant		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Maintenance & Inspection Access	**UBIT**	Existing UBIT*	Larger UBIT*	Larger UBIT*	Rope access required	Rope access required	Rope access required	Existing UBIT*	Larger UBIT*	Larger UBIT*	Rope access required	Rope access required	Larger UBIT*
	Catwalk Modifications	Replacement of outside catwalks + New centerline catwalk	Replacement of outside catwalks + New centerline catwalk	N/A Added catwalk weight exceeds limits for seismic retrofit	N/A	N/A	N/A	N/A	Replacement of east catwalk	N/A	N/A	N/A	Replacement of outside catwalks + New centerline catwalk
Planning Level Project Cost	**Design**	$2.0M	$2.0M	N/A	N/A	N/A	N/A	N/A	$2.3M	N/A	N/A	N/A	$2.3M
	Construction	$24.0M	$25.8M						$20.5M				$26.0M
	UBIT Procurement	N/A	$2.0M						$2.0M				$2.0M

	Modified Information
	Eliminated Alternative (structurally infeasible, rope access required or not ADA compliant)

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Appendix H
Safety and Operational Analysis – Modal Conflict Graphics

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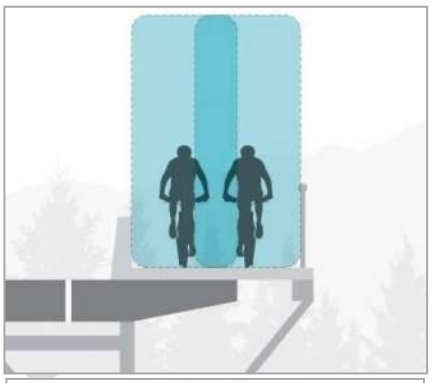
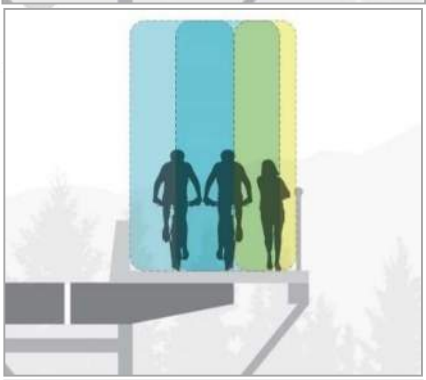
SCENARIO A – 8-FOOT WIDE PATHWAY WITH TWO-WAY TRAFFIC

Scenario A-1: Two bicycles passing each other
This width would allow only 4 feet of lateral space for bicyclists to pass each other which would likely require slowing to avoid entangling handlebars or otherwise hitting each other. Some users would be comfortable operating in this environment but many less experienced users may not, particularly at higher speeds. 8-foot width in this scenario is considered less than desired.



Scenario A-2: Two bicyclists passing with a pedestrian
Significant overlap in the lateral space needed for each individual would be experienced, likely requiring that the bicyclists slow or even walk when passing each other and avoiding the pedestrian. This scenario may be extremely uncomfortable for the pedestrian, particularly an older person who would have no refuge from the higher speed bicyclists. Generally, this scenario would be unacceptable within an 8-foot pathway width.

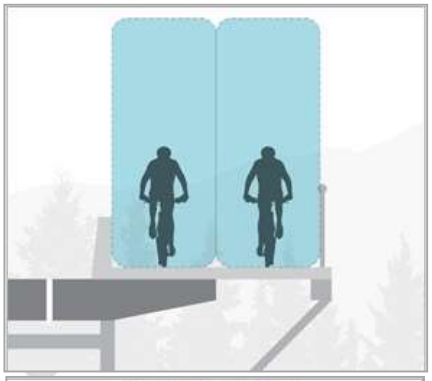


Scenario A-3: Two pedestrians passing with a bicyclist
Likely several feet of overlap in lateral space with this scenario which would require the pedestrians to walk more closely together and minimize the required space to about 5 feet or less. This scenario would likely require the bicyclist to go very slowly or to walk in passing the pedestrians particularly if there is a dog present. Generally, this scenario would be unacceptable within an 8-foot pathway width.

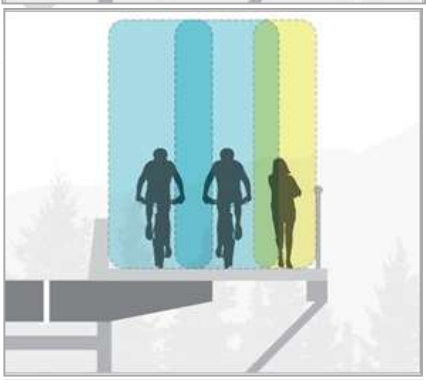
Scenario A-4: Two bicyclists passing a person stopped to view scenery
Would require the bicyclists to slow significantly or to walk when passing each other and would also likely be very uncomfortable for the person taking in the view from the bridge due to the close proximity of the bicyclists. Generally, this scenario would be unacceptable within an 8-foot pathway width.

SCENARIO B – 10-FOOT WIDE PATHWAY WITH TWO-WAY TRAFFIC

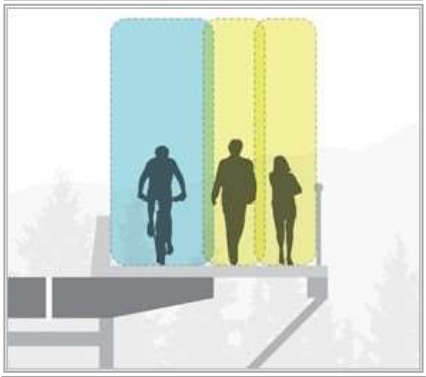
Scenario B-1: Two bicycles passing each other
This could include opposing or passing maneuvers. 10-foot width is typically the narrowest recommended pathway width per much of the guidance identified above. In this scenario two bicyclists could easily pass each other without having to significantly slow or having a higher degree of discomfort.



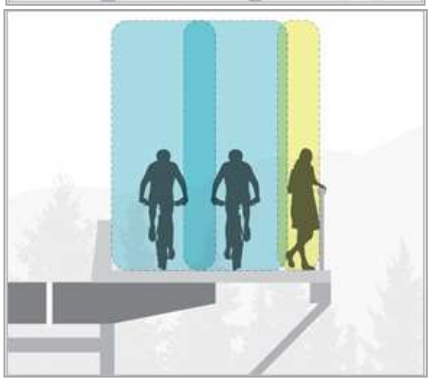
Scenario B-2: Two bicyclists passing with a pedestrian
Some overlap in the lateral space needed for each individual would be experienced, likely requiring that the bicyclists slow to pass each other and avoid the pedestrian. This scenario may be very uncomfortable for the pedestrian who has no refuge from the higher speed bicyclists.



Scenario B-3: Two pedestrians passing with a bicyclist
A small amount of overlap in lateral space with this scenario which would likely require the pedestrians to walk more closely together and minimize the required space to about 5 feet. Generally, this scenario would be acceptable within a 10-foot pathway width.

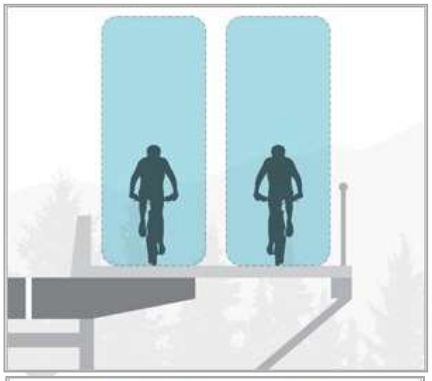


Scenario B-4: Two bicyclists passing a person stopped to view scenery
This scenario would likely require the bicyclists to slow significantly when passing each other and would also likely be uncomfortable for the person taking in the view from the bridge due to the close proximity of the bicycles.

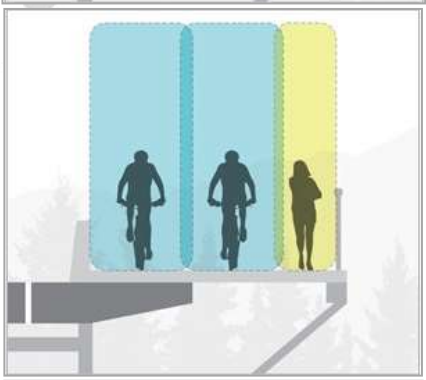


SCENARIO C – 12-FOOT WIDE PATHWAY WITH TWO-WAY TRAFFIC

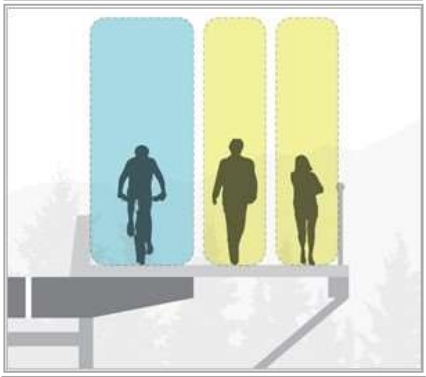
Scenario C-1: Two bicycles passing each other
12-foot width is considered an optimal width for most multi-use pathways. This width would allow more than the minimum 5 feet of lateral space for bicyclists to pass each other, which would likely allow for higher speeds and more freedom of movement.



Scenario C-2: Two bicyclists passing with a pedestrian
Small amount of overlap in the lateral space needed for each individual would be experienced, but could likely be accommodated without substantive discomfort for the bicyclists or the pedestrian.



Scenario C-3: Two pedestrians passing with a bicyclist
No substantive overlap in lateral space is expected with this scenario which may allow for additional pedestrians to walk next to each other (such as parents with children). This scenario could also accommodate special needs users such as those in a wheelchair or using crutches or other walking assistance.



Scenario C-4: Two bicyclists passing a person stopped to view scenery
This scenarios could readily accommodate two passing bicyclists and a person or persons next to the bridge railing who is stopped to view the scenery.