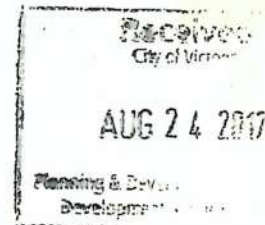




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May 4, 2017
File: 144316040

Attention: Simon Renvoize

Project Manager
Greater Victoria Harbour Authority
100-1019 Wharf Street, Victoria BC, V8W 2Y9

Dear Mr. Renvoize,

Reference: Inner Harbour Paving Replacement

Background

The Greater Victoria Harbour Authority (GVHA) has engaged Stantec to provide consulting services relating to an improvement/ repair project at the Victoria Inner Harbour lower causeway. While removing the existing concrete unit pavers on the south section of the lower causeway the contractor discovered that the existing slab top reinforcing was installed directly below the existing paving stones.



Image 1: Top Reinforcing at Existing Slab. May 4, 2017



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Stantec Structural requested that the pavers directly north of the exposed area be removed down to the level of the existing concrete. After reviewing the entire exposed area, shown in image 1 above, and the existing 1973 drawings for the Inner Harbour lower causeway, Stantec determined that the top reinforcing in the existing slab has been installed without adequate concrete cover. This issue likely applies for the entire tile apron of the lower causeway. The structural detail for the existing causeway slab can be seen in the image below.

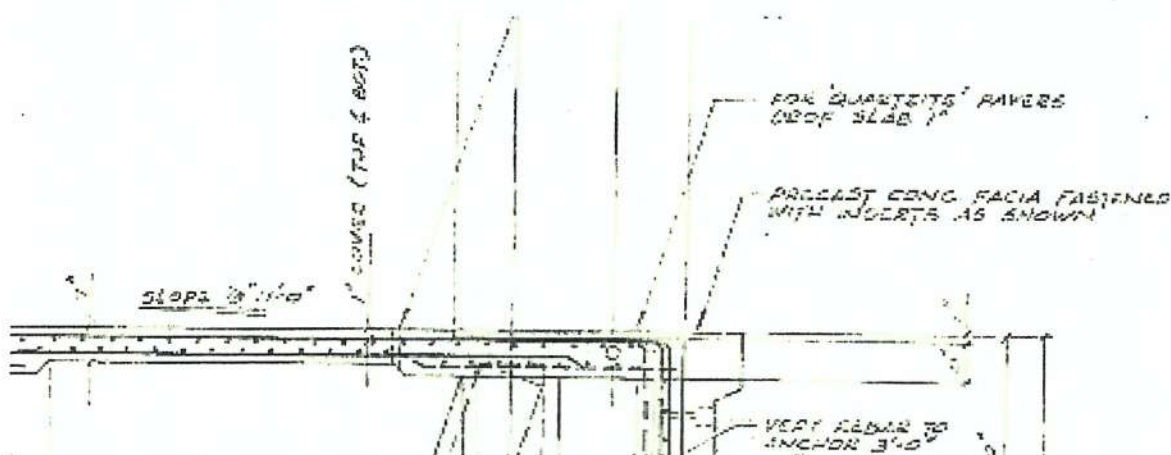


Image 2: Slab Detail 1973 Drawings (Courtesy of Public Works)

As can be seen in the detail above, the top reinforcing for the structural slab typically has 1" top cover and the pavers require a 1" slab depression, which reduces the concrete cover to zero. This matches what can be seen in the exposed location on site.

Concrete cover serves two purposes in a concrete slab, it allows the rebar to properly bond to the surrounding concrete and it protects the reinforcing from exposure to chlorides. Reducing the concrete cover to zero is not permitted in the current concrete code and would not have been permitted in the relevant codes and standards at the time of construction.

The GVHA have reported that the paving stones at the lower causeway have been a consistent maintenance issue. There is evidence of patching repairs in multiple locations on the causeway. In 2014, the GVHA undertook a paver replacement program. The GVHA used 1/2" pavers for the 2014 installation with a 1/2" layer of thin set mortar over the existing concrete. This installation relies on the thin set mortar to provide exposure protection to the existing reinforcing. Many of the 2014 pavers have now become un-bonded.



Reference: Inner Harbour Paving Replacement



Image 3: Un-bonded 2014 Pavers and Existing "Mushroom" Light

Recommendation

The issues with the pavers at the lower causeway are most likely attributed to the original construction detail that was used in 1973. The 1" slab depression does not allow for installation of a 3/4" paver, which would fare better in this high traffic area than the 1/2" pavers that have been used. The top reinforcing in the concrete slab does not have adequate protection from chlorides and freeze thaw, and may be contributing to these tiles becoming un-bonded.

It is recommended that these pavers are removed and replaced with a concrete topping. A bonding agent such as Sikadur 32 Hi-Mod can be used to protect the existing reinforcing and to ensure a proper bond between the existing concrete and the new topping. As part of this replacement the "mushroom" light bases can be replaced with aluminum bases, as per details previously used by GVHA. Crack control details can be utilized at each side of the existing "mushroom" lights, to reduce concrete cracking.

It is recommended that GVHA discuss the concrete topping option with Stantec Landscape Architecture, Stantec Structural and the City of Victoria Heritage Department.

If you have any questions or concerns regarding this project, please contact Bryan Gallagher at 250-389-2383.



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Simon Renvoize
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Reference: Inner Harbour Paving Replacement

Sincerely,
STANTEC CONSULTING LTD.

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