

Posting Title: Update to Guidelines for Inspection and Field Acceptance of Glass Fibre Reinforced Polymer (GFRP) Reinforcing Bars

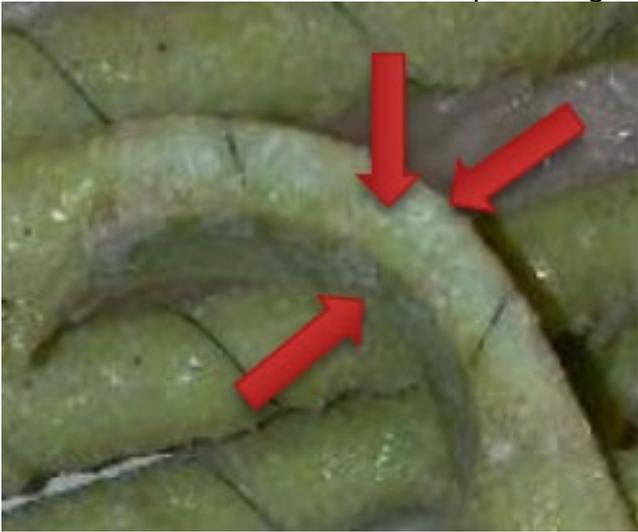
TCP #: 000-0092

Closing Date: September 12, 2022

Comment	Response
<p>There's nothing in the guideline on GFRP acceptance subsequent to sandblasting a construction joint (CJ), between the deck and barrier wall for example.</p> <ul style="list-style-type: none"> • Has the MTO considered what is an acceptable condition after a CJ is abrasive blasted in accordance with OPSS 904? • What the damage would look like, if any, after abrasive blasting around GFRP? 	<p>The MTO is currently unaware of any research conducted into performance of internal FRP reinforcement subject to abrasive blast media. Until such research is conducted, the MTO cannot provide any guidance on what an acceptable condition of abrasive blasted GFRP is.</p> <p>Photographs of abrasive blasted GFRP reinforcing bars were not available in preparation of this guideline. If photographs are obtained, they will be included in future editions published.</p>
<p>OPSS 929 will have us wrapping/protecting all the individual barrier wall dowels likely after removing the horizontal bars prior to blasting to satisfy 904.07.04.02.</p> <ul style="list-style-type: none"> • Is this the MTO's expectation? 	<p>From SSP 999S02, October 2021; Section 7.01 – Delivery, Handling, Storage and Protection of GFRP Bars, e) “Before and after placing, bars shall be protected from any construction operations in their immediate vicinity such as abrasive blasting...by adequate covering or wrapping with protective material.”</p> <p>The requirement of the construction contract is to protect GFRP from abrasive blasting operations by some means.</p>
<p>Table 1 - Glass Fibre Reinforced Polymer – Reinforcing Bar (DSM #9.65.90) The business address listed for Pultron is outdated and requires correction</p>	<p>Specific production facilities are listed on the MTO DSM, not companies in general. The address provided for Pultron Composites is correct for the facility that is qualified to supply GFRP for MTO contracts. Any other facility has not been approved through the DSM process.</p> <p>Table 1 is only as current as the reference date provided in the document. Interested parties are directed in construction contract documents to <u>The Road Authority</u> for current, approved DSM listings.</p>

<p>Clause 3.2. Sample Photos of Products includes Products which are no longer listed on the DSM; We appreciate the note under clause 3.2. and the fact they are shown under separate cause 3.2.2. however, we are concerned inclusion of images from not acceptable products under acceptable photos may cause confusion.</p>	<p>The guidelines will not be updated with every update to DSM list # 9.65.90, so the document may show suppliers which are no longer approved to supply GFRP to MTO contracts at any time.</p> <p>The guidelines are intended for MTO construction staff to visually assess GFRP reinforcing bars. These photos show visually acceptable bars, even if they are no longer DSM approved products. Visually unacceptable bars from the same suppliers are also used throughout the document and their removal from the document will make assessment more difficult.</p> <p>To reduce perceived ambiguity, the visual guidelines reference will be removed from the GFRP construction specification (999S02) when it is updated to an OPSS.PROV so it is not a contract document. The guideline will be included as a reference in the Construction Administration and Inspection Specifications (CAIS) only.</p>
<p>Clause 4.2.3 Further clarifications needed with regards to acceptable vs nonacceptable flattening of the bar.</p> <p>Clause 4.2.3 <i>“It is acceptable for the inside surface of bent bars to be flat through the bend provided the flatness is uniform through the bend and there is no loss in cross sectional area of the bar”</i> Is there a guideline for site to identify acceptable cross-sectional area?</p> <p>Figure 23 is showing flattening at the outside of the bend, is this acceptable?</p>	<p>Some flatness of the inside radius of the bar is expected because of the forming process for bent bars. The degree of flatness is also dependent on the bend radius of bar, which is determined by design detailing and not the FRP manufacturer.</p> <p>Design instruction is provided in the <i>Structural Manual</i> and other standards and will be provided in the CDED to avoid small bend radii which result in excessive flattening or flattening of the outside of bar.</p> <p>There is no visual guideline provided for cross-sectional area of bar. The bar is expected to be round or almost entirely round, with an area that meets the requirements of CSA S807. As there is a strength reduction of bar throughout the bend, section loss is not acceptable.</p> <p>Figure 23 is in Section 4.1 which is for typical surface finish of bars. The surface finish of all the bars in the figure is acceptable. For defects, the bars would need to be evaluated on site from multiple viewing angles. From just this figure:</p>

	<ul style="list-style-type: none"> • The 2nd bar is generally acceptable. There is a flat edge (top right arrow), but it appears to be at the end of bend and is likely just excess resin. • The 3rd bar is questionable. There is some excess resin with tooling marks shown with the double arrows below, and the outside face is slightly concave. Rejection would depend on where the bars are located within a structure, how often this irregular shape occurs in the production lot, and whether the flat edges are entirely excess resin or if the bar shape/fibres are also affected. 
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<p>5.1.4. Excessive Flattening / Non-uniform Finish; <i>The bends of the bent bars shown in Figure 61 exhibit excessive flattening about the curves. This condition cannot be repaired, and the bars must be rejected. Is there a guideline to identify “excessive flattening”</i></p>	<p>As above, this can be avoided with appropriate bend radii and should be addressed in design. No guidance is provided on when flatness becomes excessive, but bars should be round and not have square edges.</p> 
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<p>4.2.5. Concrete Contamination (Splatter) <i>“Concrete contamination may be removed by hand and</i></p>	<p>From SSP 999S02, October 2021; Section 7.03 – Surface Condition, “The bars shall be protected from contamination caused by concrete splatter during adjacent placements. Any concrete contamination</p>
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<p><i>light manipulation, but bars shall not be struck by tools such as hammers to remove concrete”</i></p> <p>This note prompts us to ask If use of vibrators is acceptable? Is there a time limit for concrete splatter removal?</p>	<p>shall be removed immediately while the concrete is still plastic without damaging the bars.</p> <p>It is preferable to prevent splatter contamination than to try and remove the plastic concrete. Covering bars with polyethylene sheeting meets requirements for protection of bars from UV exposure and can also prevent concrete splatter contamination.</p> <p>The use of vibrators to consolidate plastic concrete is acceptable. Brief contact of the vibrator with the reinforcing is assumed; the vibrator should not be used to deliberately ‘rattle’ the reinforcement cage.</p>
<p>4.2.6. Discolouration; Further clarifications needed with regards to images provided for acceptable vs nonacceptable discolorations</p> <p><i>“Unacceptable discolouration from UV exposure or manufacturing processes can typically be identified from <u>nonuniform</u> colouration. “The note is clear however the images from acceptable and nonacceptable bars are confusing. Example: Acceptable Figure 51, 52, vs Nonacceptable Figure 85, 86 they all show similar colors and the discoloration appear uniform</i></p>	<p>Figure 51 and 52 are listed under 4.3 Surface Finish and are not demonstrating discoloured bars.</p> <p>Figure 44 in 4.2.6 shows different coloured bars from the same production lot. This difference is not a result of UV exposure and each bundle of bars is generally uniform in appearance.</p> <p>Figure 85 has discoloured bars within the same bundle from the same lot. You can see the production colour of the bar from the red arrow and the UV discoloured condition in the blue arrow. There are also visible transition points around the black arrow where some portion of bar was protected from UV exposure, and other sections of the same bar were not.</p>

	
<p>Anchor head; Is there a specification or guidelines with regards to size of the heads? I.e.: 5xBar Dia or 10xbar Dia</p>	<p>Anchor-headed bars are proprietary products subject to the requirements of CSA S807 and the MTO DSM Structural Division Criteria for Approval. Specific information may be obtained from the supplier.</p>