

OPSS 905 and OPSS 1440


TCP#000-0224 Construction and Material Specifications for Steel Reinforcement for Concrete

Comments received by TCP			
Comment ID	Organization	Comment	Response
431	Individual	The proposals appear to still forbid rebar welding. The CSA W186 :21 standard has several changes to welder testing and procedure qualification that should increase the confidence of designers for accepting welding. MTO should look into this if they have not already done so.	Text has been updated.
438	Large volume precast component supplier	<p>There are major key points in terms of OPSS 905 that cannot be summarized here.</p> <p>We strongly appreciate and encourage that the entirety of the attached documents which contains sections of the 2024 OPSS 905 and associated comments related to each section to be reviewed.</p> <p>However, below are major concerns that are discussed in detail in attached documents with reasoning and reference to other standards and specifications are:</p> <p>We prioritize them as major due to safety concerns, causing hardship for an industry and lack of clarity and not requesting information from the correct party or not being able to use the mechanical connector in products the way specification is written.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Precast industry strongly stands that welding as per CSA W186 clause 13.6.4.2 to be allowed to prevent potential major safety concerns. & <input type="checkbox"/> Galvanized steel shall be allowed. <input type="checkbox"/> Mechanical Connector <p><u>Supporting Links:</u></p> <p>Link 1: Work Safe BC - Rebar structure collapsed, injuring two workers</p> <p>Link 2: OHS Canada - Injury by Falling Rebar</p> <p>Link 3: Daily Commercial News - Rebar cage collapsed on workers (Fort Erie)</p>	Thank you for your comment and consideration MTO has reviewed and addressed the comments you provided in the attachment. Please see responses below.
438-1	Large volume precast component supplier	<p>Section 905.04.01.04 Welding Details</p> <p>ofSteel reinforcement shall not be welded. Tack welding of steel reinforcement is not permitted.</p> <p>Recommendation: Resistance Welding</p> <ul style="list-style-type: none"> - Resistance welding shall be defined and allowed. <ul style="list-style-type: none"> o Proposed definition – Resistance welding is the machine-operated process by which steel reinforcement is fused together when a high electrical current is passed through two workpieces in contact, instantaneously forming molten steel at the interface. This process is in stark contrast to traditional arc welding processes, as there is no consumable electrode deposited to fuse the workpieces together and machine operators are not engaged in the actual welding process. <p>Welding</p> <ul style="list-style-type: none"> ❖ Precast industry strongly stands that welding as per CSA W186 clause 13.6.4.2 to be allowed to prevent potential major safety concerns. <p><u>Please see below for reasoning behind this strong stand.</u></p> <p>OPSS Prov 912 -2020 allows for welding, entirety of the Welding Section is noted below.</p> <p>912.07.01.03.02 Welding Welding of steel hardware shall be according to CSA W59 and shall be performed by a welder qualified by the Canadian Welding Bureau (CWB) working for a company certified in accordance with CSA W47.1, Division 1 or 2. Welding of reinforcing steel bars shall be according to OPSS 905. The reinforcing steel welding shall be performed by a welder qualified by the CWB working for a company certified in accordance with CSA W186.</p> <p><u>CSA W186 13.6.4.2 statement</u> The entirety of CSA W186 clause that allows welding for lifting and transferring cages is copied and pasted below.</p> <p>13.6.4.2 The welds in non-load-bearing joints shall have sufficient strength for their intended application to resist lifting loads and are not included in the design strength of the structure unless expressly allowed by the design standard used for the structure.</p> <ul style="list-style-type: none"> ❖ Welding shall be conducted as per the Welding Engineer procedure and by a certified welder. 	The draft has been updated to reflect this.

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Comment ID	Organization	Comment	Response
		<p>Reasoning</p> <ul style="list-style-type: none"> ❖ Not allowing welding creates major safety concern. ❖ Welding is needed to allow for transfer of reinforcement cages. ❖ Welding is needed to ensure correct wall spacing. ❖ A typical cage weighs between 3 to 6 Tonnes. Tie wire alone cannot hold the cage in place. ❖ Without welding, cages cannot be manufactured at steel cage manufacturing facility and transferred for precasters. ❖ Even with welding there have been incidents where the cage has fallen apart and resulted in serious injuries to workers. ❖ Welding shall be allowed if a procedure provided by a welding engineer is being followed. ❖ MTO and construction industry switched from 400 bar to 400W & 500W bars to allow for weldability. <p>Consequences & impact on the industry and the Ministry</p> <ul style="list-style-type: none"> ❖ Tied cages cannot be lifted and transferred safely. ❖ This lack of permission would significantly increase the cost of the product. ❖ Manufacturing cannot be done every day, as cages shall be made in the mould. ❖ Significant delays in all construction projects, precast. ❖ Removing work from weld engineers ❖ There have been incidents related to the collapse of cage while fastening it with tie wire. An example is shared in below link ❖ Rebar structure collapsed, injuring two workers WorkSafeBC ❖ Construction company fined \$175,000 after worker injured by falling rebar on high-rise project - OHS Canada MagazineOHS Canada Magazine ❖ Rebar cage collapsed on workers at Fort Erie jobsite, firm fined <p>Link 1: Work Safe BC - Rebar structure collapsed, injuring two workers Link 2: OHS Canada - Injury by Falling Rebar Link 3: Daily Commercial News - Rebar cage collapsed on workers (Fort Erie)</p> <p>Proposals to meet halfway.</p> <ul style="list-style-type: none"> ❖ During annual audit for manufacturers in Steel reinforcement audit, audit the welding procedure. ❖ Currently both CSA and CPCQA audit the welding procedure in detail. ❖ MTO inspectors, during comprehensive inspection, can request welding personnel certificate(s) and welding procedure in the same manor ACI testing certifications are requested. <p>Without defining and allowing resistance welding the following companies will be significantly impacted.</p> <ul style="list-style-type: none"> ❖ DECAST cannot produce some cages. ❖ Stelcrete ❖ Laurel Steel ❖ Numesh <p>Without permission to weld, the following companies cannot transfer their built cages in a safe manner for precasters. This could cause significant hardship for the construction industry.</p> <ul style="list-style-type: none"> ❖ Stelcrete ❖ Laurel steel ❖ Numesh 	
438-2	Large volume precast component supplier	<p>Section 905.04.01.05 Mechanical Connections Details</p> <p>An electronic copy in PDF format of mechanical connection details shall be submitted to the Contract Administrator for information purposes only at least seven7 Days prior to the commencement of steel reinforcement welding. Installation of the connectors, An Engineer's seal and signature shall be affixed on the Working Drawings verifying that they are consistent with the Contract Documents. The welding details shall include materials, procedures, bars to be welded, location, and type of welds, as well as details of tack welds. Details shall be designed to prevent notching effects in the bars.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Highlighted sections above shall be kept. ❖ Reasoning for keeping the second crossed-out section was provided in the comment for 905.04.01.04. ❖ Reasoning "for information purposes" is stated below. <p>Reasoning</p> <ul style="list-style-type: none"> ❖ Mechanical connectors are chosen from DSM suppliers. ❖ Calculations shall be submitted to the Ministry at the time that the mechanical connector supplier is certified to be included in the DSM list. ❖ Precasters & Cast-in-Place contractors cannot provide calculations. ❖ The mechanical connectors are listed in the shop drawings, which shall be approved by the Ministry. ❖ Some of the mechanical connectors need to be welded; otherwise, there is no way to secure the mechanical connectors to a cage. ❖ Also connecting them to a cage with tie wire could result in displacement during pour 	MTO will adhere to this update. The related CAIS will explain the working drawings review requirements.
438-3	Large volume precast component supplier	<p>Section 905.05.03.02 Reinforcing Bars</p>	This clause has been updated to align with upcoming CSA-S6-25

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		<p>Mechanical connections for reinforcing steel reinforcement bars shall develop, in tension, the greater of 120 125% of the specified yield strength for the specified grade of the bars or 110% of but not less than the mean maximum yield strength of the actual bars used to test specified grade of the bars when this property is indicated in the material standard. Where different bar sizes or different material grades are mechanically connected, the mechanical connection device shall develop the smaller force applicable to the bars to be connected. Two issues with this</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Keep 120% value to match with CSA S6-19 ❖ This clause should state the result should match Dayton OR Mechanical connector supplier handbook and the criteria mechanical connector was approved with for DSM. <p>Question</p> <ul style="list-style-type: none"> ❖ Does this coincide with the new version of CSA S6-25? ❖ Define maximum yield strength? <p>Reasoning</p> <ul style="list-style-type: none"> ❖ 125% is based on American standard, which Dayton handbook is based on. ❖ American bar area is slightly smaller than Canadian; therefore, their spec specifies 125%. ❖ CSA S6-19 states :120% →OPSS should match CSA S6 <p>8.4.4.4 Mechanical connections for reinforcing bars Mechanical connections for reinforcing bars shall develop, in tension or compression (as required), the greater of 120% of the specified yield strength of bars or 110% of the mean yield strength of the actual bars used to test the mechanical connection.</p> <p>The total slip of the reinforcing bars within the splice sleeve of the connector after loading in tension to 0.5f, and relaxing to 0.05f, shall not exceed the following measured displacements between gauge points straddling the splice sleeve:</p> <p>a) for bar sizes up to and including 45M: 0.25 mm; and b) for 55M bars: 0.75 mm.</p> <p>November 2019 © 2019 Canadian Standards Association 501</p> <p>specified grade of the bars when this property is indicated in the material standard</p> <p>Clarification What is the material standard?</p>	
438-4	Large volume precast component supplier	<p>Section 905.05.04 Associated Hardware b) Except for tie wire, embedded hardware within 50 mm of exposed surfaces shall be stainless steel, galvanized steel, or of a non-metallic material verified not to react with concrete and approved by the ministry prior to use. Embedded hardware within 50mm of the underside of deck slabs may be galvanized steel.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Keep the galvanized steel which is crossed out in the 2024 revision. <p>Reasoning</p> <ul style="list-style-type: none"> ❖ Galvanized steel shall be kept as the spacers for dry cast are galvanized steel. In addition to this, the MTO Standard Structural Drawings for prestressed girders requires a galvanized finish on embedded hardware that is within 50mm of exposed surfaces. Note No. 3 on SS107-15 Prestressed Girders Box Girders – Details specifies that plates and angles shall be hot-dip galvanized. The vertical leg of the galvanized transverse tie angles will be exposed within the 10mm gap between adjacent girders. Note No. 4 on SS107-15 (in addition to Note No. 7 on SS107-24 Prestressed NU Girders – Details) specifies that anchored embedded steel bearing plates shall be hot dipped galvanized. When embedded plates are specified at semi-integral abutments, the bearings and therefore galvanized embedded plates will be exposed in service. <p>Excerpt from MTO Standard Structural Drawing SS107-15 Prestressed Girders Box Girders – Details:</p> <p>NOTES:</p> <ol style="list-style-type: none"> 1. THIS DRAWING SHOWS TYPICAL DETAILS FOR PRECAST CONCRETE BOX GIRDERS AND IS TO BE READ IN CONJUNCTION WITH DRAWING SS107-15. 2. STEEL PLATES AND ANGLES SHALL BE ACCORDING TO CSA G40.20-13/G40.21-13, GRADE 300W. 3. STEEL PLATES AND ANGLES SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION. 4. IF ANCHORED EMBEDDED STEEL BEARING PLATES ARE REQUIRED AT GIRDER ENDS, THEY SHALL HAVE A THICKNESS OF 20mm. THEY SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION. ALL DAMAGED GALVANIZED SURFACES SHALL BE COATED WITH TWO COATS OF ZINC-RICH PAINT. <p>SSP 999S31 Oct 2024 The Section 5.01 of SSP 999S31 specification that came out October 2024 for "Requirements for Precast Concrete Bridge Elements and Systems" contradicts this clause. Section 5.01 OF SSP 999S31 allows use of galvanized steel.</p> <p>5.0 MATERIALS</p> <p>5.01 Associated Hardware</p> <p>Associated hardware shall be according OPSS 905. All hardware shall be non-corroding or be galvanized according to ASTM A153.</p> <p>Surfaces of hardware located within 40 mm of the concrete surface shall be chromate coated over an electro-deposited coating of zinc according to ASTM B633.</p>	We revised the text to allow the use of Galvanised spacers in Dry Cast concrete. This clause does not apply to angles and inserts used in Psc Girders and non-structural elements.

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		<p>912.05.10 Hardware Hardware shall be made of stainless steel according to OPSS 1440 or be galvanized according to ASTM A153, except that galvanized hardware located within 50 mm of the concrete surface shall be chromate coated over an electro-deposited coating of zinc according to ASTM B633.</p> <p>Clarification</p> <ul style="list-style-type: none"> ❖ lifting pins are galvanized steel!!! Stainless-steel lifting pin is not available ❖ How the products should be lifted without lifting pins? ❖ Precast industry strongly stands that the galvanized hardware shall be allowed in the new specification. 	
438-5	Large volume precast component supplier	<p>Section 905.05.04 Associated Hardware</p> <p>e) Bar chairs <u>and bolsters</u> for supporting steel reinforcement shall be non-metallic- <u>(Class E Maximum Protection per the RSIC Reinforcing Steel Manual of Standard Practice)</u>.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Dry cast industry utilizes galvanized spacers. Due to high vibration in the dry cast process, these spacers clip the inner and outer cage and also provide concrete cover for inner and outer cage. 	Refer to response o comment #438-4
438-6	Large volume precast component supplier	<p>Section 905.05.04 Associated Hardware</p> <p>g) Bar chairs or bolsters against exposed concrete surfaces shall have minimal exposure on the concrete surface such as pinpoint tips. When falsework is removed, the exposure of chairs shall be minimal.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Dry cast shall be exempt. Dry cast currently uses galvanized spacers. ❖ Due to high vibration, other recommended options will not work for dry cast. 	Refer to response o comment #438-4
438-7	Large volume precast component supplier	<p>Section 905.07.02.03 Fastening</p> <p>Reinforcing steel bars shall be tied to achieve sufficient strength and stiffness of the cage and maintain the bars in correct position to maintain concrete cover to reinforcement. Bars shall be tied at least at every fourth intersection except in caissons where every intersection shall be tied. The maximum untied length of any bar shall be 1 m.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Tie wire cannot provide sufficient strength to handle and transfer the cages safely. ❖ Cages are not built on the mould. Cages are built either at steel cage manufacturing facilities or at a separate department within a precast company. ❖ Due to the weight of the cage, during transfer the cage will fall apart and this leads to significant and major safety concerns during transportation on the roads or within a company. ❖ There have been incidents related to the collapse of cage while fastening it with tie wire. An example is shared in below link ❖ Rebar structure collapsed, injuring two workers WorkSafeBC ❖ Construction company fined \$175,000 after worker injured by falling rebar on high-rise project - OHS Canada Magazine ❖ Rebar cage collapsed on workers at Fort Erie jobsite, firm fined ❖ Welding is needed to allow safe transportation and for the cage to maintain its integrity. ❖ Precast industry strongly stands that welding as per CSA W186 clause 13.6.4.2 to be allowed to prevent potential major safety concerns. <p>Link 1: Work Safe BC - Rebar structure collapsed, injuring two workers Link 2: OHS Canada - Injury by Falling Rebar Link 3: Daily Commercial News - Rebar cage collapsed on workers (Fort Erie)</p>	The text has been updated.
438-8	Large volume precast component supplier	<p>Section 905.07.02.03 Fastening</p> <p>Where cages are lifted after preassembly, they shall be tied with tie wire to resist the lifting loads imposed on them.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Tie wire cannot provide sufficient strength to handle and transfer the cages safely. ❖ Cages are not built on the mould. Cages are built either at steel cage manufacturing facilities or at a separate department within a precast company. 	Refer to response o comment #438-1

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438-9	Large volume precast component supplier	<p>Section 905.07.02.04 Surface Condition Steel reinforcement other than stainless steel reinforcing bars with rust, mill scale, or a combination of both shall be acceptable, provided the minimum physical properties including height of deformations and mass of a wire brushed test specimen are not less than the applicable specification requirements. Loose scale shall be removed. Stainless steel reinforcing bars at the time the concrete is placed shall be free of deposits of iron and <u>non-stainless steels</u>, non-stainless-steels.</p> <p>Clarification</p> <ul style="list-style-type: none"> ❖ As per MTO, the stainless-steel finish can exhibit light discoloration with no impact on service life. Please refer to 'Guidelines for Acceptable Finish' excerpt below <p>Excerpt from 'Stainless Steel Rebar Guidelines for Shipping, Handling, Fabrication and Placement' article published by Specialty Steel Industry of North America</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>CLEANING AND PICKLING</p> <p>Stainless Steels, received in the pickled condition, can usually be easily cleaned with a mild soap and water. In some cases a degreaser may be needed. In cases where rusting, iron contamination or weld oxide must be removed, stainless steel brushes can be employed in localized areas. For more general cleaning, stainless steels are often cleaned with a commercial pickling paste.</p> </div> <div style="width: 45%;"> <p>SPECIFICATIONS-STAINLESS STEEL REBAR</p> <p>ASTM A-915M and British Standard 6744</p> <p>RELATED STAINLESS SPECIFICATION FOR BAR AND WIRE PRODUCTS</p> <p>ASTM A-276 Specification for Stainless Steel Bars and Shapes ASTM A-476 Stainless and Heat Resistant Welding Wire ASTM A-403 Stainless and Heat Resistant Wire for Cold Heading and Forging ASTM A-555 Stainless Steel Wire and Rod -- General Requirements ASTM A-342 Test Methods for Permeability of Fireably Magnetic Materials ASTM A-564 Specification for Hot Rolled and Cold Finished Stainless Steel Bars and Shapes ASTM A-484 Specification for General Requirements of Stainless and Heat Resistant Shapes</p> <p>LITERATURE/BIBLIOGRAPHY MATERIAL ON STAINLESS STEEL REBAR</p> <table border="1"> <thead> <tr> <th>Author(s)</th> <th>Title</th> </tr> </thead> <tbody> <tr> <td>F.N. Smith & M. 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Federal Highway Administration Report No. FHWA-RD-98-153</td> </tr> <tr> <td>Ontario Ministry of Transportation</td> <td>Research Agreement No. 9015-A-000045. Some Corrosion Aspects of Stainless Steel Reinforcement in Concrete</td> </tr> </tbody> </table> </div> </div> <div style="width: 45%;"> <p>GUIDELINES FOR ACCEPTABLE FINISH*</p>  <p>* Per Ontario Ministry of Transportation</p> <p>NOTE: "A" can exhibit some light discoloration with no impact on service life. "C" heavy rust "D" pits and scale on scale</p> </div>	Author(s)	Title	F.N. Smith & M. Tullmin	"Using Stainless Steel as Long-lasting Rebar Material" Materials Performance (NACE), Vol. 38, No. 5, May 1999, P. 72-76	A. Knudsen & T. Skovgaard	"Ahead of its Peers" Concrete Engineering International, August/September 1999, P. 58-61 The reference draws with the 90-year old pier in Mexico which was built with 304SS rebar	Zwick, et al.	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		<p>Resistance Welding</p> <ul style="list-style-type: none"> - Resistance welding shall be defined and allowed. <ul style="list-style-type: none"> o Proposed definition – Resistance welding is the machine-operated process by which steel reinforcement is fused together when a high electrical current is passed through two workpieces in contact, instantaneously forming molten steel at the interface. This process is in stark contrast to traditional arc welding processes, as there is no consumable electrode deposited to fuse the workpieces together and machine operators are not engaged in the actual welding process. <p>Welding OPSS Prov 912 -2020 allows for welding, entirety of the Welding Section noted below.</p> <p>912.07.01.03.02 Welding Welding of steel hardware shall be according to CSA W59 and shall be performed by a welder qualified by the Canadian Welding Bureau (CWB) working for a company certified in accordance with CSA W47.1, Division 1 or 2. Welding of reinforcing steel bars shall be according to OPSS 905. The reinforcing steel welding shall be performed by a welder qualified by the CWB working for a company certified in accordance with CSA W186.</p> <p>CSA W186 13.6.4.2 statement</p> <p>The entirety of CSA W 186 clause that allows welding for lifting and transferring cages is copied and pasted below.</p> <p>13.6.4.2 The welds in non-load-bearing joints shall have sufficient strength for their intended application to resist lifting loads and are not included in the design strength of the structure unless expressly allowed by the design standard used for the structure.</p> <ul style="list-style-type: none"> - Welding shall be conducted as per Welding Engineer procedure and shall be conducted by the certified welder. <p>Reasoning</p> <ul style="list-style-type: none"> - Not allowing welding creates major safety concern - Welding is needed to allow for transfer of reinforcement cages - Welding is needed to ensure correct wall spacing - Typical cage weighs between 3 to 6 Tonnes. Tie wire cannot hold the cage in place. - Without welding, cages cannot be manufactured at steel cage manufacturing facility and transferred for precasters. - Even with welding there have been incidents where the cage has fallen apart and resulted in serious injuries of workers. - Welding shall be allowed if a procedure provided by a weld engineer is being followed. - MTO and construction industry switched from 400 bar to 400W & 500W bars to allow for weldability. <p>Consequences & impact on the industry and the Ministry</p> <ul style="list-style-type: none"> - Tied cages cannot be lifted and transferred safely. - This lack of permission would significantly increase the cost of the product. - Manufacturing cannot be done every day, as cages shall be made in the mould. - Significant delays in all construction projects, precast. - Removing work from weld engineers <p>Proposals to meet halfway.</p> <ul style="list-style-type: none"> - During annual audit for manufacturers in Steel reinforcement audit, audit the welding procedure. - Currently both CSA and CPCQA audit the welding procedure in detail. - MTO inspectors, during comprehensive inspection, can request welding personnel certificate(s) and welding procedure in the same manor ACI testing certifications are requested. <p>Without defining and allowing resistance welding the following companies will be significantly impacted.</p> <ul style="list-style-type: none"> - DECAST cannot produce some cages. - Stelcrete - Laurel steel - Numesh <p>Without permission to weld the following companies cannot transfer their built cages in a safe manner for precasters. This could cause significant hardship for the construction industry.</p> <ul style="list-style-type: none"> - Stelcrete - Laurel steel - Numesh 	
438-11	Large volume precast component supplier	Section 905.07.05 Inspection after Installation of Steel Reinforcement and Mechanical Connectors	Text has been revised to exclude precast concrete.

Comments received by TCP					
Comment ID	Organization	Comment	Response		
		<p>A Request to Proceed shall be submitted to the Contract Administrator upon completion of the installation of the steel reinforcement and, if any, mechanical connectors. The next operation shall not proceed until a Notice to Proceed has been received from the Contract Administrator.</p> <p>Recommendation</p> <ul style="list-style-type: none"> ❖ Applicable to cast-in-place not precast industry. ❖ An exemption for precast industry shall be stated. 			
439-1	OCPA – Ontario Concrete Pipe Association	<p>905.04.01.04 Welding Details</p> <p>Three sets of Steel reinforcement shall not be welded. Tack welding of steel reinforcement is not permitted.</p> <table border="1"> <tr> <td style="width: 15%;">Industry Comment</td> <td> <ul style="list-style-type: none"> • Tack welding on sacrificial bars is needed to ensure correct wall spacing. • Tack welding is done on sacrificial bars to allow for transfer of cages within manufacturing plant areas, and/or from off-site certified suppliers of reinforcing manufactured products (i.e. pre-fab cages). • Tack welding is allowed by CSA W186 and weld engineers. • Tack welding should be allowed. </td> </tr> </table>	Industry Comment	<ul style="list-style-type: none"> • Tack welding on sacrificial bars is needed to ensure correct wall spacing. • Tack welding is done on sacrificial bars to allow for transfer of cages within manufacturing plant areas, and/or from off-site certified suppliers of reinforcing manufactured products (i.e. pre-fab cages). • Tack welding is allowed by CSA W186 and weld engineers. • Tack welding should be allowed. 	Welding related text has been modified. However, tack welding is not acceptable and not allowed.
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439-2	OCPA – Ontario Concrete Pipe Association	<p>905.05.0504 Associated Hardware</p> <p>Only hardware Hardware, including spacers and support devices, approved by the Owner shall be used with steel reinforcement and the hardware shall meet the following requirements:</p> <p>e) Bar chairs and bolsters for supporting steel reinforcement shall be non-metallic. (Class E Maximum Protection per the RSIC Reinforcing Steel Manual of Standard Practice).</p> <table border="1"> <tr> <td style="width: 15%;">Industry Comment</td> <td> <ul style="list-style-type: none"> • Dry cast industry utilizes galvanized spacers to clip the inner & outer cage and also provide concrete cover for inner & outer cage. • Dry cast process utilizes intense vibration and pressure for consolidation purposes. • Galvanized spacers will only have a pin-point tips as exposure. • Dry cast production processes using galvanized metal spacers (supports) should be exempt. </td> </tr> </table>	Industry Comment	<ul style="list-style-type: none"> • Dry cast industry utilizes galvanized spacers to clip the inner & outer cage and also provide concrete cover for inner & outer cage. • Dry cast process utilizes intense vibration and pressure for consolidation purposes. • Galvanized spacers will only have a pin-point tips as exposure. • Dry cast production processes using galvanized metal spacers (supports) should be exempt. 	Refer to response to comment 438-4
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439-3	OCPA – Ontario Concrete Pipe Association	<p>905.07.02.02 Placing</p> <p>Steel reinforcement shall be accurately placed in the positions as specified in the Contract Documents and held in the correct location during the operations of placing and consolidating concrete. Steel reinforcement shall be supported by plastic bar chairs, bolsters, or supplementary bars.</p> <table border="1"> <tr> <td style="width: 15%;">Industry Comment</td> <td> <ul style="list-style-type: none"> • See comments above for 905.05.04, Associated Hardware. • Dry cast production processes using galvanized metal spacers (supports) should be exempt. </td> </tr> </table>	Industry Comment	<ul style="list-style-type: none"> • See comments above for 905.05.04, Associated Hardware. • Dry cast production processes using galvanized metal spacers (supports) should be exempt. 	Refer to response to comment 438-4
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439-4	OCPA – Ontario Concrete Pipe Association	<p>905.07.02.03 Fastening</p> <p>Reinforcing steel bars shall be tied to achieve sufficient strength and stiffness of the cage and maintain the bars in correct position to maintain concrete cover to reinforcement. Bars shall be tied at least at every fourth intersection except in caissons where every intersection shall be tied. The maximum untied length of any bar shall be 1 m.</p> <p>Bars shall be fastened with tie wire except that purpose-designed plastic clips may be used in precast components and slabs. Plastic clips shall be spaced sufficiently to allow concrete flow and avoid segregation.</p> <p>Where cages are lifted after preassembly, they shall be tied with tie wire to resist the lifting loads imposed on them.</p> <p>There shall be at least 50 mm clear spacing between any adjacent bar chairs or plastic clips.</p> <p>Bar chairs, bolsters, and plastic clips shall be stored in opaque containers to minimize UV exposure at site.</p> <table border="1"> <tr> <td style="width: 15%;">Industry Comment</td> <td> <ul style="list-style-type: none"> • See comments above for 905.04.01.04, Welding Details. • Tack welding should be allowed. </td> </tr> </table>	Industry Comment	<ul style="list-style-type: none"> • See comments above for 905.04.01.04, Welding Details. • Tack welding should be allowed. 	Refer to response to comment 438-4 & 439-1
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439-5	OCPA – Ontario Concrete Pipe Association	<p>905.07.02.0607 Welding</p> <p>Welding of steel reinforcement, including tack welding, shall not be permitted except as specified in the Contract Documents or as shown on the welding details submitted to the Contract Administrator.</p> <table border="1"> <tr> <td style="width: 15%;">Industry Comment</td> <td> <ul style="list-style-type: none"> • See comments above for 905.04.01.04, Welding Details. • Tack welding should be allowed. </td> </tr> </table>	Industry Comment	<ul style="list-style-type: none"> • See comments above for 905.04.01.04, Welding Details. • Tack welding should be allowed. 	Refer to response to comment 438-4 & 439-1
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439-6	OCPA – Ontario Concrete Pipe Association	<p>905.07.05 Inspection after Installation of Steel Reinforcement and Mechanical Connectors</p> <p>A Request to Proceed shall be submitted to the Contract Administrator upon completion of the installation of the steel reinforcement and, if any, mechanical connectors.</p> <p>The next operation shall not proceed until a Notice to Proceed has been received from the Contract Administrator.</p> <table border="1"> <tr> <td style="width: 15%;">Industry Comment</td> <td> <ul style="list-style-type: none"> • Applicable to cast-in-place not precast industry. • The exemption for precast industry shall be stated </td> </tr> </table>	Industry Comment	<ul style="list-style-type: none"> • Applicable to cast-in-place not precast industry. • The exemption for precast industry shall be stated 	Refer to response to comment 438-11.
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440-1	Large Volume Precast Component Supplier	Section 1440.03 Definitions	Lot definition of reinforcing steel bar is unchanged from the previous version.		

Comments received by TCP			
Comment ID	Organization	Comment	Response
		<p>Section Note</p> <p>Lot means a quantity of steel that can be identified. For each size designation of prestressing steel strand, a lot shall be reels or coils produced from one heat and traced. For each nominal diameter of prestressing steel bar and for each size designation of the reinforcing steel bar, a lot shall be all the supplied bars from one heat. For prestressing strands lot means all the coils of wire of the same nominal wire size contained in an individual shipping release or shipping order.</p> <p>Recommendation</p> <p>Lot designation for prestressing strands is attainable and logically written. Meanwhile, for reinforcement steel for companies on MTO steel reinforcement DSM , this definition of lot would lead into massive amount of bars to be sampled and set aside. For companies on MTO DSM list , the CA randomly chooses one piece and then request rebar samples for heat numbers applicable to that piece to be sampled. e.g. if a project has 20 precast elements of the same type, CA chooses piece ID 4 for rebar sampling. Rebar sample to be taken from all heat numbers used in Piece ID 4.</p>	
440-2	Large Volume Precast Component Supplier	<p>Section 1440.07.01.02 Uncoated Reinforcing Steel</p> <p>The manufacture of and fabricator of uncoated reinforcing steel bars shall be by a manufacturer listed under "Mill" in the Designated Sources for Materials listing for Reinforcing Steel, Uncoated, and a fabricator listed under "Fabricators and Mills," in Ministry's DSM #9.65.80 for the grade specified in the Contract Documents.</p> <p>Minor: Should read 'The manufacturer and fabricator...' (r missing)</p>	Thank you, correction has been, made.
440-3	Large Volume Precast Component Supplier	<p>Section 1440.07.04.01 Prestressing Steel</p> <p>All For each size designation of prestressing steel strand, a lot shall be reels or coils produced from each manufactured reel used and one production lot and shall be tagged with the lot number.</p> <p>For each nominal diameter of prestressing steel bar, a lot shall be all high-strength alloy the supplied bars used shall be assigned an individual lot number from one heat, and shall be tagged with the lot number.</p> <p>The change request indicates manufacturer to create lot numbers. Defining lot by each manufactured reel used would align with other specifications and sampling of prestressed strand.</p>	Thank you for your comment.

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440-4	Large Volume Precast Component Supplier	<p>Section 1440.07.04.02</p> <table border="1"> <thead> <tr> <th>Section Title</th> <th>Section Note</th> </tr> </thead> <tbody> <tr> <td>Reinforcing Steel Bars, Stainless-Steel Reinforcing Bars, Splice Bars, and Stainless-Steel Splice Bars</td> <td> <p>All bars shall be shipped in bundles.</p> <p>For each size designation of the reinforcing steel bar, a lot shall be all the supplied bars from one heat. Each lot of uncoated reinforcing steel bars, stainless steel reinforcing bars, splice bars, and stainless - steel splice bars shall be assigned an individual lot number and shall be tagged with the lot number.</p> <p>In addition, tags for reinforcing steel bars, and stainless-steel reinforcing bars shall identify the manufacturer, the stainless -steel type and grade or reinforcing steel grade, and bar size.</p> </td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Recommendation</th> </tr> </thead> <tbody> <tr> <td> <p>The lot definition would not work . As this would lead into significant amount of samples.</p> <p>Companies that are on MTO Steel reinforcement DSM order bars in bundles.</p> <p>This means that there could potentially be several heat numbers for each piece for each size bar, let alone for the entire job.</p> </td> </tr> </tbody> </table>	Section Title	Section Note	Reinforcing Steel Bars, Stainless-Steel Reinforcing Bars, Splice Bars, and Stainless-Steel Splice Bars	<p>All bars shall be shipped in bundles.</p> <p>For each size designation of the reinforcing steel bar, a lot shall be all the supplied bars from one heat. Each lot of uncoated reinforcing steel bars, stainless steel reinforcing bars, splice bars, and stainless - steel splice bars shall be assigned an individual lot number and shall be tagged with the lot number.</p> <p>In addition, tags for reinforcing steel bars, and stainless-steel reinforcing bars shall identify the manufacturer, the stainless -steel type and grade or reinforcing steel grade, and bar size.</p>	Recommendation	<p>The lot definition would not work . As this would lead into significant amount of samples.</p> <p>Companies that are on MTO Steel reinforcement DSM order bars in bundles.</p> <p>This means that there could potentially be several heat numbers for each piece for each size bar, let alone for the entire job.</p>	The intent of the lot definition remains unchanged.
Section Title	Section Note								
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440-5	Large Volume Precast Component Supplier	<p>Section 1440.08.01 Inspection and Testing</p> <table border="1"> <tbody> <tr> <td> <p>The Owner reserves the right to carry out inspections and tests at such times as the Owner may consider necessary to ensure that the materials supplied are according to this specifications specified in the Contract Documents.</p> <p>Materials failing to comply with the requirements of this specification specified in the Contract Documents shall be rejected.</p> <p>The Owner’s representative shall be permitted free entry to the manufacturing and fabrication plants, as well as the finished product storage and loading areas for inspection purposes.</p> </td> </tr> </tbody> </table> <p>a minimum time frame should be allocated to the notice to manufacturer if the owner’s representative would like to visit</p>	<p>The Owner reserves the right to carry out inspections and tests at such times as the Owner may consider necessary to ensure that the materials supplied are according to this specifications specified in the Contract Documents.</p> <p>Materials failing to comply with the requirements of this specification specified in the Contract Documents shall be rejected.</p> <p>The Owner’s representative shall be permitted free entry to the manufacturing and fabrication plants, as well as the finished product storage and loading areas for inspection purposes.</p>	The Ministry makes arrangements prior to the visit, there is no need of defining minimum time period for the visit.					
<p>The Owner reserves the right to carry out inspections and tests at such times as the Owner may consider necessary to ensure that the materials supplied are according to this specifications specified in the Contract Documents.</p> <p>Materials failing to comply with the requirements of this specification specified in the Contract Documents shall be rejected.</p> <p>The Owner’s representative shall be permitted free entry to the manufacturing and fabrication plants, as well as the finished product storage and loading areas for inspection purposes.</p>									

Comments received by email			
Number	Organization	Comment	Response
1.	Dayton Superior	<p>OPSS.PROV 905 (April 2020) Clause 905.04.01.05 Mechanical connections Details (e)</p> <p><i>e) A certificate of training from the mechanical connector company listed on the DSM for all fabricator personnel operating threading machines for threaded mechanical connectors and/or threaded bars supplied for the work. The certificate shall identify the name of the trainee and the date of the last training.</i></p> <p>Comment: I am in favor of this addition to the document as it improves on quality control and accuracy as well as accountability, however the requirement is bias towards mechanical connections “threaded” type. If the Ministry is making improved changes such as these, then the requirement shall be a uniform one that requires “ALL” mechanical connector companies that supply their own proprietary equipment to a fabricator or installer for the fabrication and or installation of the mechanical connections. The DSM for Mechanical Connectors lists several Product Types (other than threaded type), that require the approved mechanical connector company to ship specialized proprietary</p>	Change has been made.

Comments received by email			
Number	Organization	Comment	Response
		<p>equipment to fabricators and or jobsite installers to complete the connections in the field or fabrication plant. Proper training and certification of the operators and installers using these other types of equipment MUST be held to the same standards as “threaded” types. I am therefore asking you to reword the clause to the following,</p> <p>(e) A certificate of training from the mechanical connector company listed on the DSM for all fabricator or installation personnel operating proprietary equipment, machines for mechanical connectors supplied for the work. The certificate shall identify the name of the trainee and the date of the last training.</p>	
2.	Dayton Superior	<p>OPSS.PROV 905 (April 2020) Clause 905.05.02 Mechanical Connection Details for Reinforcing Steel Bars Sub paragraph.</p> <p><i>Mechanical connections for reinforcing steel bars shall develop, in tension, the greater of 125% of the specified yield strength for the specified grade of the bars but not less and the maximum yield strength of the specified grade of the bars when this property is indicated in the material standard. Where different bar sizes or different material grades are mechanically connected, the mechanical connection device shall develop the smaller force applicable to the bars to be connected.</i></p> <p>Comment: The standard referenced at the front of the OPSS.PROV 905 document related to Mechanical connection is CSA S-6:19 Canadian Highway Bridge Design Code. There is a discrepancy, as the current CSA S-6:19 related clause states.</p> <p>8.4.4.4 Mechanical connections for reinforcing bars Mechanical connections for reinforcing bars shall develop, in tension or compression (as required), the greater of 120% of the specified yield strength of bars or 110% of the mean yield strength of the actual bars used to test the mechanical connection.</p> <p>The Laboratory Testing Manual: LS-434 also reflects the current CSA S-6:19 requirements outlined in Clause 8.4.4.4 and not the proposed change above.</p>	<p>This clause has been updated to correctly align with upcoming CSA-S6-25. The contractual requirements are what is required in the specifications. LS-434 will be updated accordingly.</p>
3.	Dayton Superior	<p>OPSS.PROV 905 (April 2020) Clause 905.07.02.08 Splicing (First Paragraph)</p> <p><i>Splices for stainless steel reinforcing bars and reinforcing steel other than spirals shall be made as specified in the Working Drawings. Splices on adjacent bars shall have a clear offset spacing along the bar of not less than 50mm unless specified in the working drawings. If not specified on the Contract Drawings, all splices shall develop 100% of the tensile strength of the bar.</i></p> <p>Comment: Reading this paragraph, it is unclear if it relates to Mechanical Splices or Lap Splices or both? If it does relate to Mechanical Splices, the requirement for “<i>shall develop 100% of the tensile strength of the bar</i>” is not consistent with the requirements for Mechanical Connections for reinforcing bars, outlined in CSA S-6:19 above. In addition, there are Stainless Steel and Mechanical Connections listed on the DSM’s that will not develop the full tensile strength of the specified bars.</p>	<p>Clauses have been updated to apply lap splicing.</p>
4.	Dayton Superior	<p>OPSS.PROV 905 (April 2020) Clause 905.07.02.03 Fastening (Plastic Clips) (Sub Paragraphs)</p> <p><i>Bars shall be fastened with tie wire except that purpose-designed plastic clips may be used in precast components and slabs. Plastic clips shall be spaced sufficiently to allow concrete flow and avoid segregation.</i></p> <p>and,</p> <p><i>There shall be at least 50mm clear spacing between any adjacent bar chairs or plastic clips.</i></p> <p>and,</p> <p><i>Bar chairs, bolsters, and plastic clips shall be stored in opaque containers to minimize UV exposure at site.</i></p> <p>Comment: The addition of “Purpose-designed Plastic Clips” for rebar fastening above is great to see. To capture this in the rest of the document, I’d like to see the same requirements for Purpose-designed Plastic Clips, listed under the Clause 905.05.04 Associated Hardware.</p>	<p>905.05.04 does not apply to reinforcement ties.</p>
5.	Dayton Superior	<p>OPSS.PROV 1440 (April 2020)</p> <p>Comment: I have read the proposed changes and have no comment at this time.</p>	<p>Thank you.</p>
6.	RSIC	<p>905.05.01.01 Reinforcing Steel Bars, Stainless Steel Reinforcing Bars Mechanical connections for reinforcing steel bars shall develop, in tension, the greater of 125% of the specified yield strength for the specified grade of the bars or 110% of the mean yield strength of the actual bars used to test the specified grade of the bars when this property is indicated in the material standard. Where different bar sizes or different material grades are mechanically connected, the mechanical connection device shall develop the smaller force applicable to the bars to be connected.</p>	<p>Refer to comment #438-3 response.</p>

Comments received by email			
Number	Organization	Comment	Response
		<p>This paragraph does not align with the new CSA A23.3:24 Clause 12.14.3.4 Mechanical connection strength requirements:</p> <p><i>"A Type 1 mechanical connection shall develop, in tension or compression as required, the lesser of 125% of the minimum yield strength for the specified grade of reinforcing steel, fyg, or the minimum tensile strength of the bars connected based on the specified grade of steel where this property is indicated in the material standard."</i></p>	
7.	RSIC	<p>OPSS 905 Definitions</p> <p>We suggest: There should be a definition for "Engineer" or "Engineer of Record". It is not clear if this is any engineer or the engineer of record, but the word is capitalized suggesting it needs a definition in the standard.</p> <p>Reinforcing Steel Bars means uncoated deformed reinforcing steel bars made of carbon and/or stainless steel as defined in GSA-G30.18, used for the reinforcement of concrete reinforcing bars used for the reinforcement of concrete.</p>	In MTO's contracts the term "An Engineer" is defined in General Condition of Contracts & we do not use the terminology of "Engineer of Record"
8.	RSIC	<p>905.04.01.01.01 Steel Reinforcement Working Drawings</p> <p>The fabricator fabrication shall not commence fabrication until he has received one set of steel reinforcement Working Drawings are sealed and signed by the an Engineer of Record. The fabricator shall have a copy of the Working Drawings at the manufacturing plant during fabrication.</p> <p>Following line to remain: A sealed and signed copy of these drawings shall be kept at the site before and during placing of steel reinforcement.</p>	Please see response to RSIC Comment #7. It is up to the contractor to have a printed copy of the drawings.
9	RSIC	<p>905.04.01.01.02 Steel Reinforcement Schedule</p> <p>The fabricator shall not commence fabrication until he has they have received one set of the steel reinforcement schedule sealed and signed by the an Engineer of Record. The fabricator shall have a copy of the steel reinforcement schedule at the manufacturing plant during fabrication.</p>	Please see response to RSIC Comment #7
10	RSIC	<p>905.05.01.01 Reinforcing Steel Bars, Stainless Steel Reinforcing Bars</p> <p>This paragraph is not in accordance with the new changes to A23.3:24 Cl 12.14.3.4:</p> <p>Mechanical connections for reinforcing steel reinforcement bars shall develop, in tension, the greater of +20 125% of the specified yield strength for the specified grade of the bars or 110% of but not less than the mean maximum yield strength of the actual bars used to test specified grade of the bars when this property is indicated in the material standard. Where different bar sizes or different material grades are mechanically connected, the mechanical connection device shall develop the smaller force applicable to the bars to be connected.</p>	This clause has been updated to correctly align with upcoming CSA-S6-25
11	RSIC	<p>905.05.0504 Associated Hardware</p> <p>d) Tie wire shall be 1.2 mm (16 gauge) in diameter except when using automatic rebar tying machines in which tie wire of 0.8 mm diameter or larger is permitted if at least an equivalent area of wire to the required 1.2mm (16 gauge) tie wire connection is provided.</p> <p>Second sentence is unnecessary:</p> <p>f) Bar chairs or bolsters shall not obstruct the flow of concrete. Chairs shall have an open design with discrete legs to permit flow under and across the chair, in any direction.</p> <p>The last sentence is not in accordance with the new changes to A23.3:24</p>	This clause provides the minimum requirement, it is contractor's responsibility to have a stable cage as per 905.07.02.03.
12	RSIC	<p>905.07.02.0708 Splicing</p> <p>Welded splices shall develop 100% of the tensile strength of the bar.</p> <p>Splices for stainless steel reinforcing bars and reinforcing steel other than spirals shall be made as specified in the Working Drawings. Splices on adjacent bars shall have a clear offset spacing along the bar of not less than 50 mm unless specified in the working drawings. If not specified on the Contract Drawings, all splices shall develop 100% of the tensile strength of the bar.</p> <p>OPSS 1440</p> <p>Question: Why have spacers been removed from 1440</p> <p>Question about reinforcing steel bar relaxation we are waiting on MANA to get back to us.</p>	Spacers has been added to the clause.

Comments received by email			
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13	RSIC	<p>905.07.02.07 Welding:</p> <p><i>"Welding of steel reinforcement, including tack welding, shall not be permitted."</i></p> <p>Comment:</p> <p>2020 Existing Clause 905.07.02.06: <i>"Welding, including tack welding, shall not be permitted except as specified in the Contract Documents or as shown on the welding details submitted to the Contract Administrator."</i></p> <p>We request that the current clause allowing for specific welding scenarios be maintained or that alternatives are considered. Here's why:</p> <ul style="list-style-type: none"> • Impact: None MTO project which specify OPSS specification will be effected • Safety: Welding supports safe transport, lifting, hoisting, and stability for caissons and cages. Tied-only supports risk column collapse, while welding provides structural stability. 	Refer to comment # 439-1 response.
14	RSIC	<p>905.04.01.05 Mechanical Connections Details:</p> <p><i>"An electronic copy in PDF format of mechanical connection details shall be submitted to the Contract Administrator for information purposes only at least seven7 Days prior to the commencement of steel reinforcement welding. Installation of the connectors, An Engineer's seal and signature shall be affixed on the Working Drawings verifying that they are consistent with the Contract Documents. The welding details shall include materials, procedures, bars to be welded, location, and type of welds, as well as details of tack welds. Details shall be designed to prevent notching effects in the bars."</i></p> <p>Comments:</p> <ul style="list-style-type: none"> • Both proposed crossed out sections shall be kept. • Reasoning for keeping the second crossed-out section was provided in the comment for 905.04.01.04. • Reasoning "for information purposes" is stated below. • Mechanical connectors are chosen from DSM suppliers. • Calculations shall be submitted to the Ministry at the time that mechanical connector supplier is certified to be included in the DSM list. • Contractors cannot provide calculations. • The mechanical connectors are listed in the shop drawings, which shall be approved by the Ministry. • Some of the mechanical connector's need to be tack welded to a sacrificial bar; otherwise, there is no way to tie it to a cage. • Also connecting them to a cage with tie wire could result in displacement during pour 	Welding requirements do not belong to this clause and have been included in the applicable clauses. We expect that the tack welding of mechanical connectors should be avoided.
15	RSIC	<p>905.07.02.03 Fastening:</p> <p><i>"Reinforcing steel bars shall be tied to achieve sufficient strength and stiffness of the cage and maintain the bars in correct position to maintain concrete cover to reinforcement. Bars shall be tied at least at every fourth intersection except in <u>caissons where every intersection shall be tied</u>. The maximum untied length of any bar shall be 1 m. Bars shall be fastened with tie wire except that purpose-designed plastic clips may be used in precast components and slabs. Plastic clips shall be spaced sufficiently to allow concrete flow and avoid segregation. Where cages are lifted after preassembly, they shall be tied with tie wire to resist the lifting loads imposed on them. There shall be at least 50 mm clear spacing between any adjacent bar chairs or plastic clips. <u>Bar chairs, bolsters, and plastic clips shall be stored in opaque containers to minimize UV exposure at site.</u>"</i></p> <p>Comments:</p> <p>Both underlined notes are new requirements which impact the cost, they should have been listed under cover page proposal to capture proper attention</p>	We acknowledge that these clauses have some cost implications.
16	nVent LENTON	<p>Comment made by an Applications Engineer with nVent LENTON.</p> <p>"You reached out to my Co-worker about a change being made to OPSS 905 that would possibly affect our product line. We are a little late to the party with a response and I was wondering if I could ask you a question about a scenario that my co-worker and I found in the code that would cause a mechanical splice to fail the test criteria even though it would be no fault of the coupler. In CSA G30.18 there is a scenario in which the specified yield is 600 MPa for grade 600W bar and its minimum tensile strength would be 700 MPa. By the requirements of the revised OPSS 905 the system would need to meet a minimum tensile strength of 125% of 600 MPa (750 MPa), this would not be possible as the rebar would fail before the system has the chance to reach this stress. Is this a concern that has been raised?"</p>	We have revised the requirements, please refer to the response to comment #438-3.