| Comments received by TCP#000-0171 | | | |
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| **378** | **Individual** | Under 3.3 Hollow and Solid Precast Slabs: The 1220 mm wide hollow slab typically contained three circular voids. However, they are not recommended for several reasons. maybe use included in the standard OPSD? that will be more specific. | Precast slabs with circular voids are not recommended by MTO. Please refer to the 2nd Paraghraph of Section 3.3 of the guidelines. |
| **379** | **Individual** | **Page 12 "**Tightly spaced girders make it physically harder to properly view between the girders. The minimum spacing between NU girders should be 1.8 m."<br>The sentence in between the above seems not necessary. | Text has been modified for clarity. The middle sentence explains that the ministry has already considered using side-by-side NU girders and did not adopt this approach considering difficulty in future inspection. |
| **380** | **EXP Services Inc.** | I reviewed proposed prestressed concrete girder guidelines and drawings, the guidelines are concise and perfect, and covered all girder design issues, which is easy for design engineer to follow, and also the standard drawing are so much in details. it is great to have all those standards for engineer to follow, thanks for your contribution. | Thank you for your comment. We are glad that you found it hepful. |
| **381-1** | **Ontario Road Builders' Association (ORBA)** | **Comments on Precast Girder Guidelines:**Thank you for the opportunity to provide comments. Please see attached MTO standard drawings and Girder Guidelines marked-up with our member's comments. Note that we only commented on the NU2400 unit drawing as the comments are applicable to all the other | Thank you for your comment. Your comments on the guideline are copied & and responded to below. The comments on the Structural Standard Drawings will be considered in the drawing updates & and possibly be incorporated where found necessary. |

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| **381-2** | **Ontario Road Builders' Association (ORBA)** | 915mm wide sections should be added<br>**3.3. Hollow and Solid Precast Slabs**<br>Hollow and solid precast slabs placed side by side and connected across the top using a cast-in-place concrete topping slab for deck construction provides an economical option for shorter span bridges. The 1220mm wide precast hollow and solid slab girders are produced according to the "S" series of girders. MTO is using solid slab girders with depths of 300 mm, 400 mm, or 500mm and hollow slab girders with depths of 400 mm, 500mm, or 600mm. Due to their shallow depth, these girders are fabricated with straight strands only.<br>Hollow slab girders have been used on occasion for bridges. The 1220 mm wide hollow slab typically contained three circular voids. However, they are not recommended for several reasons. The weight savings from the voids is not significant, and for the short spans that these | We don't see the need to introduce a narrower precast element because it results in more construction joints on site, but we will add an explanation that one or two narrower elements may be required in order to achieve the final width of the deck. |
| **381-3** | **Ontario Road Builders' Association (ORBA)** | This was for additional conservatism due to the variability of the cracking strength, and the uncertainty of the various calculations including for differential shrinkage. As design methods have improved, the limit on tension has been increased to 75% of the cracking strength ($0.75\ f_{cr}$). Does this currently apply? CL 8.8.4.6 in CSA S6-19 currently specifies tighter tensile limits. | The tension limit of $0.75\ f_{cr}$ has been specified in MTO's Structural Manual Divinsion1 " EXCEPTIONS TO THE CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC), CSA S6-19". This requirement is current. |
| **381-4** | **Ontario Road Builders' Association (ORBA)** | - Is this clearer now? Are precasters and designers on the same page, especially when it comes to accounting for losses?<br>- The new draft MTO girder drawings show 192.7 kN/str (74%), should this document be updated to say 74%?<br>- 15 -<br>**4.2. Prestressing Steel Stress Limits**<br>In some earlier codes, the stressing limit was set at 78% of the strand ultimate strength at jacking. There was some uncertainty in the way the clause was written as to whether this full force was transferred to the girder, or whether some nominal early strand relaxation or losses in the plant would be subtracted from it. CSA S6:19 was changed to clarify that a full 75% of the strand ultimate strength was to be transferred the girder at the time of release, and the fabricator would have to add a small amount depending on the magnitude of the losses prior to release at the specific plant. This change to 75% also resulted in a slightly lower prestress force being created, which added to the safety against strand rupture. | This section will be modified to reflect that the designer shall limit the specified prestressing stress prior to transfer to 0.74 fpu. |

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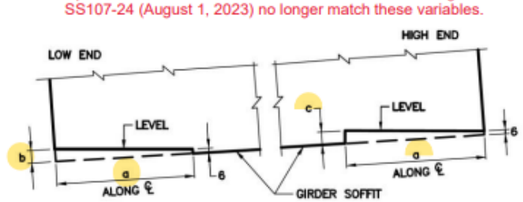
| **381-5** | **Ontario Road Builders' Association (ORBA)** | **5. Prestress Strands**<br><br>Both NU and Box girders use 15 mm strands with an area of 140 mm². Fabricators have standardized their operations to have a regular 50 mm grid on which the prestressing strands can be placed. In the past, some fabricators had accommodated draped strands at the hold-down points to have a 25 mm or 38 mm spacing, however that didn't allow proper consolidation of the concrete and didn't work with most hold down devices. Thus, minimum 50 mm strand spacing shall be used throughout the girder.<br><br>38mm strand spacing shall be allowed to precaster to do permissible change on the strand patterns to avoid conflict such as dowel holes in a full strands pattern design.<br><br>**6. Initial Estimate of Prestress Losses**<br><br>As soon as the jacking force is applied into the prestessing strands various prestressing losses start occurring. CHBDC classifies the pestressing losses into two groups at transfer and after transfer based on their time of occurrence.<br><br>Prestressing losses at transfer:<br>1. Relaxation of strand<br>2. Elastic shortening of girder<br><br>Prestressing losses after transfer:<br>1. Creep<br>2. Shrinkage<br>3. Relaxation of strand<br><br>- These are all prestress losses that should be accounted for by the consultant during the design process.<br><br>- Although the Commentary of CHBDC S6-19 may say that relaxation of strand is determined by the fabricator, this is not done in practice. See supplementary materials on relaxation.<br><br>Guidelines to estimate these losses are provided in the CHBDC Section 8.7. | The 50mm strand spacing is required for the reason of achieving proper consolidation of concrete as mentioned in the guidelines. In case of conflict, the fabricator shall contact the designer to adjust the spacing only when needed.<br>MTO will be following CHBDC requirements by asking the fabricator to compensate for plant losses such as chuck sitting, form shortening, bulkhead rotations, friction at hold downs, ambient temperatures, thermal effects, or relaxation which occurs between the time of stressing and when the strands are cut to release the force into the girder. |
| **381-6** | **Ontario Road Builders' Association (ORBA)** | Updated variables used in 'Girder Soffit Detail at Bearings' on SS107-24 (August 1, 2023) no longer match these variables.<br><br>  <br><br>**Figure 22 – Girder Undercut** | This figure will be updated to comply with SS107-24. |

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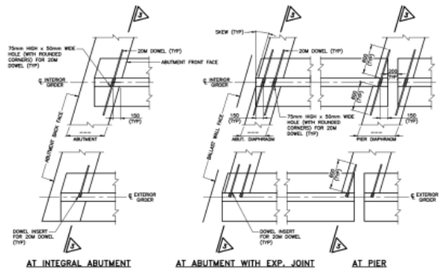
| **381-7** | **Ontario Road Builders' Association (ORBA)** | - 29 -<br>  <br><br>**Figure 23 – Cropping Corners of Flanges on Skewed Bridges**<br>Should Figure 23 depict the updated Plan View on 'Dowel Details at End of Girder' on SS107-24 (August 1, 2023)? | This figure will be updated to comply with SS107-24. |
| **381-8** | **Ontario Road Builders' Association (ORBA)** | Comments on box Girder SSDs, SS107-13,14 &15 | Drawings comments will reviewed and incorporated where appropriate on the final version of the drawings. |
| **381-9** | **Ontario Road Builders' Association (ORBA)** | Comment on NU girder SSD: | Drawings comments provided on NU 2400 SSD i.e. on SS107-23&24 will reviewed and incorporated where appropriate on the final version of all NU girders SSDs. |
| **381-10** | **Ontario Road Builders' Association (ORBA)** | Comment on Solid Slab SSD: | Drawings comments will reviewed and incorporated where appropriate on the final version of the drawings. |

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| **386** | **Individual** | This is a comment on the Prestressed Concrete Girder Guidelines (August11 2023).pdf document but more specifically on OPSS.PROV 909 clause 909.07.12.01.<br>Specifically, the clause in question is: "Moist curing of exposed surfaces shall be applied within 2 to 4 m of concrete placement, except for girders produced in an indoor precast concrete plant and not containing silica fume; for such girders, exposed surfaces may be covered with moisture vapour barrier between concrete placement and concrete finishing, for the shortest practical time period and in no cases exceeding 40 minutes." First, it is unclear if 2 to 4 m means 2 to 4 minutes or 2 to 4 metres. The unit symbol needs to be removed and the full word used to make this sentence clear.<br>Second, this is too restrictive to be practical. OPSS.MUNI 909 allows a cumulative total exposure of 3 hours during the moist curing period. The provincial requirement to apply moist curing within 2 to 4 minutes is not reasonable. If this could be relaxed to applying moist curing within 15 to 20 minutes of concrete placement then it would become possible for more precast fabricators to bid provincial projects and allow for competition in the precast concrete girder market. Right now there is only one fabricator in Ontario who can meet this requirement. Most other fabricators will bid municipal projects but refuse to bid provincial ones solely because of this clause. This is driving the cost of precast girders up and pushing the industry to steel girders. Which is the reason for this comment, since if you don't relax the requirement of OPSS.PROV 909.07.12.01 then there is no need for the Prestressed Concrete Girder Guidelines document. | MTO is currently working to publish a consolidated specification covering material and fabrication requirements of all precast pre-stressed bridge elements. As a result of this initiative, the updated version of OPSS 909 will only contain provisions related to the construction of Precast Prestressed girders. Your questions and concerns have been noted and will be conveyed to MTO's Engineering and Material office. |
| **387-1** | **Individual** | NU girder depths documented in the guideline vary by different increments with a 300 mm difference between the 900 and 1200 girders and 400 mm difference between the 2000 and 2400 ones.  Girder depths have been produced in the past that are different than the 7 sizes in the guidelines. Has the Ministry considered the addition of more standard sizes (using say 100 mm or 200 mm increments) or even the addition of 1000 and/or 2200 girders to eliminate the large difference at the lower and upper depths? | MTO has only produced standards for the NU girder sizes frequently used in MTO's contracts. In the future, MTO may consider creating standards for other sizes if the need arises. |

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| **387-2** | **Individual** | Figures 9 and 10 appear to be very similar. Will these be combined into one figure? | The graphs for single span and two-span NU girdersare slightly different. |
| **387-3** | **Individual** | The proposed details for the side-by-side girders/slabs (SS107-15, July 2023 and SS107-26, Aug 2023) are showing just one single detail of steel ties between box girders / solid slabs. This single detail is showing a tie plate between two girders/slabs that are shown to be level/horizontal (not slanted following deck cross fall is in current details). Does this single detail with the girders/slabs being shown as level, means that the Ministry will require new designs using side-by-side girders/slabs to show them level/horizontal on the bearings at supports? | In practice, there is always some variation between the height of adjacent girders due to tolerances and differences in early age creep. That said, box girders can be detailed to be either inclined (rotated) or stepped. For typical cross-falls, it is easier to incline them whereas for superelevated bridges, it is preferred to step the boxes. |
| **388-1** | **Entuitive Bridge Group - Toronto, Ontario** | **Prestressed Box Girders:** On the standard grid arrangement on SS107-13, strands have been removed from the bottom corners of the cross-section and placed at the top of the cross-section, why have these been omitted from the corners? | The corner strands are removed as per request from the girder fabricators. The reason behind this is that the corner strands conflict with stirrups requiring design modification during the fabrication of the girders. |
| **388-2** | **Entuitive Bridge Group - Toronto, Ontario** | Note to designer #4 specifies that the concrete strength at transfer shall not be higher than 38 MPA for prestressed box girders, while the NU girder specifies a concrete strength at transfer of 40 MPa, why are they different (noting that the previous drawings for the prestressed box girders did not specify a minimum concrete transfer strength)? | These limits are established through discussions with precasters around achieving a 24 hour production cycle. Precast box girders are typically fabricated with a different mix design and their assembly is more laborious than an NU girders, and therefore there is less time for the concrete to achieve transfer strength. |

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| **388-3** | **Entuitive Bridge Group - Toronto, Ontario** | For all NU girder sizes, detail B shows the “Top Flange Transverse Rebar Detail with Partial Depth Deck Panels” and indicated hooked rebar at both ends. At the of the girders where the stirrup spacing is close this could lead to rebar congestion. Would it be possible to space hooked bars at every 2nd or 3rd transverse bar rather than at every bar at these locations? | The MTO has investigated this further and the requirement for hooked bars will be removed from the standard. |
| **388-4** | **Entuitive Bridge Group - Toronto, Ontario** | On SS107-24, the exterior girder cross-section on Section 2 shows the coupler and dowel insert referred to in Note 3 (which indicates that the dowel inserts should be capable of developing a force in tension of 20 kN at SLS). If a higher capacity coupler is available to develop this bar, it would be preferred. This tends to be most important during future jacking for bearing replacement. | It is a challenge to anchor a greater resistance in a thin concrete web. Jacking can be designed to rely on alternative load paths, such as bearing on the top flange and vertical stirrups. |
| **388-5** | **Entuitive Bridge Group - Toronto, Ontario** | On Section 2 of SS107-24, should the cross-section labelled “INTEGRAL GIRDER” be “INTERIOR GIRDER”? | Agreed, drawing will be corrected. |
| **388-6** | **Entuitive Bridge Group - Toronto, Ontario** | On Drawing SS107-22 Girder A, Section 1 the 2-25M [ bars have not been drawn. | Based on input received from ORBA, 2-20M C-shape bars in all sizes of the NU girders are to be used to ease constructability. The standard drawings of all NU girder types will be updated to show this detail. |

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| 1 | **Gannett Fleming Canada ULC** | Misc. Markups on Drawings | Drawings comments will reviewed and incorporated where necessary on the final version of the drawings. |
| 2 | **Gannett Fleming Canada ULC** | Thank you for providing these guidelines, and the opportunity to provide comments. I have one comment:1.Section 4.4.1 provides the design methodology, including consideration of differential shrinkage. Section 4.3.1 also includes some discussion of restraint effects in integral abutment bridges. However, there does not seem to be any discussion of positive restraint moments due to prestress creep and differential shrinkage in multi-span semi-continuous structures, as was described in the August 1969 PCA bulletin Design of Continuous Highway Bridges with Precast, Prestressed Concrete Girders. CSA S6:19 Cl. 8.19.4 requires consideration of these effects. Can the Ministry include consideration of these restraint effects in the guidelines, along with guidance on methodology/assumptions, to ensure consistent application (e.g. assumed duration at which continuity is established)? | We will add some general guidance and references to typical approaches to calculating restraint forces. |
| 3-1 | **K.Smart Associates Ltd.** | 1. The smaller size prestressed girders do seem to be quite advantageous on smaller structures over watercourses. If the configuration works such that the structure can be "integral abutment style", the result is a very cost effective structure that is simple and fast to construct. We typically have very good interest from Contractors for these types of bridges and experience fewer issues during construction compared to girder style bridges. | Thank you for the feedback. |
| 3-2 | | 2. In working with Parlan Precast on quite a number of municipal structures using prestressed concrete box girders, we have found that the 400, 500 and 600 deep girders can be produced with a single void similar to the 700 through 1000 girder. The chamfers on the voids in the 400 series girder need to be smaller though. The 3 round voids were too difficult to construct. The benefits of a single void is reduced dead load and a stronger girder. I can provide drawings of these girders if you wish. | As spans become shorted, there is less incentive to reduce weight by adding voids. The girders do not need to be lighter to ease transportation or erection costs, and the additional effort associated with forming a void is not recovered by the benefit of weight savings. In short span bridges, the dead load moments are a smaller proportion of the total moment, and the reduction in total moment at SLS1 due to the void may only be 5 to 10%. It is more economical overall to add a bit more prestress with a solid slab. This mirrors the approach and findings for cast-in-place bridges. Voided sections should only be considered for spans greater than appoximately 20 m. |

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| 3-3 | | 3.I strongly oppose the Ministry's position that only size 16 strand can be used in box girders and that deflected strands are not permissible in all cases. In some cases and in order to satisfy other design requirements such as geometry, hydraulics, etc. only a certain depth of girder can be used. It may not be possible to comply with CHBDC requirements limiting the number of debonded strands whereas the design would easily satisfy CHBDC if deflected strands are used. | In theory, and size strand and draping/debonding arrangement is feasible. However, in consultation with the precast industry, 15.2 mm strand (140 mm²) is the most widely used for bridge products. Deflected strands in the shallower girders are not beneficial considering additional labour and risk to install hold down arrangement during precastng girders. Considering our experience and the input form the precasters, the ministry has decided to use only straight strands in the shallower depth girders, for constructability and economy. |
| 3-4 | | 4.With respect to the design guidelines, I'd like to see a disclaimer that the guidelines are really intended for MTO projects and that use by other parties/agencies/municipalities is at their own discretion. My fear is that this publication, if finalized and released, will become a new industry standard that all bridge engineers must follow similar to that PEO disciplinary committee case about an engineer not following Annex D a few years back. | We will consider this. It is being released as a guideline. For MTO projects, the policy requirements for precast girders are containted in the MTO Structural Manual. |
| 3-5 | | 5.It would be nice if the design guidelines contained more specific guidance on how to calculate live load moments and shears for box girder type bridges incorporating side-by-side prestressed girders. If the simplified method of analysis is used, , should the designer assume the bridge is a slab-on-girder or is it closer to a multi-spine. Further to this point, MTO has been using side-by-side girders without a distribution slab for the last number of years and this design is starting to find its way into municipal structures. It would be nice if this could also be included if my previous comment is incorporated. | These are now covered in CSA S6-19. Refer to CSA S6.1-19 Commentary to CHBDC Figure C5.1 |
| 3-6 | | 6.While I have very little experience with NU girders, I have heard from colleagues that the design of the falsework for the cantilever can be challenging. I guess there have been some reports of cracking of the top flange of the girder due to the loading of the overhang brackets. If such an issue exists, MTO should provide a standard detail for how to form the outside deck edge | MTO has not observed a specific issues with local spalling of NU girders at cantilever overhangs. Initially, we observed damage to the relatively thin top flanges during transportation, but precasters have adjusted their details and damage during transportation and erection is rare. |

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| 4-1 | CPCI | The ministry continues to show 48mm +15/-5mm cover at the soffit. Because of strands the + tolerance doesn't exist, nor 48mm chairs, leaving us no wiggle room.<br><br>I found that this item has already been discussed previously in MTO/CPCI meetings (March 2019), see snip below providing some more contest and action item:<br><br>11. Box girder soffit cover: Cover per MTO drawing is 48 +15/-5. If the strands are pushed up to the highest tolerance of 70 +5 = 75 mm then the cover is 75 - 14/2 – 18 = 50, so the cover tolerance is really 48 +2/-5. This is very low tolerance range. It also means that a 2" (51 mm) chair should not be used. The other option is using a 1.75" (44 mm) chair, which allows 1 mm wiggle room before reaching the cover tolerance of 48 -5 = 43 mm.<br>a. *It was acknowledged that the tolerances shown on the standard drawings will have to be revised.*<br>***ACTION: The Ministry will revise the standard drawings to show only 15 mm (0.6") strands and will adjust accordingly the concrete cover and the tolerances. OK*** | Tolerance is meant to accound for local deviations such as the out of straightness of reinforcing steel and formwork. As noted, it is unlikley that the +15 could ever be achieved in practice unless the strands are raised, however we are reluctant to decrease the tolerance to 48 ±5. |