

Administration and Inspection Activities for Steel Reinforcement for Concrete

(As Specified in OPSS 905 and SSP 905S05)

905.01 SCOPE

This CAIS covers the construction administration and inspection requirements for the placement of all steel reinforcement and mechanical connections for concrete structures as specified in OPSS 905, April 2020 and SSP 905S05, January 2023.

905.02 REFERENCES

This CAIS refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction:

OPSS 905 Steel Reinforcement for Concrete

MTO Standard Special Provisions:

SSP 905S05 Amendment to OPSS 905, April 2020 - Reinforcing Steel Bars, 400W and 500W

Construction Administration and Inspection Specifications (CAIS):

CAIS 909 Prestressed Concrete -Precast Members

CAIS 910 Stressing Systems for Post-Tensioning

CAIS 1440 Steel Reinforcement for Concrete

Ontario Ministry of Transportation Publications

Construction and Maintenance Change Order Manual

MTO Forms:

PH-CC-812 Field Sample Data Sheet - Mechanical Connectors

PH-CC-885 Referee Request Form

PH-CC-701 Request to Proceed

PH-CC-702 Notice to Proceed

905.03 DEFINITIONS

For the purpose of this CAIS, the definitions shall be as specified in OPSS 905.

905.04 DESIGN AND SUBMISSION REQUIREMENTS

905.04.01 Submission Requirements

Administrative Activities:

1	SSI M	At least 7 Days prior to the commencement of placing the steel reinforcement, receive and Review the steel reinforcement Working Drawings, steel reinforcement schedule, mill test certificates, welding details , and mechanical connection details and Check they meet the requirements of the Contract Documents.	-
2	M	Verify that reinforcing steel and splice bars are supplied by the manufacturer of the associated mill certificates and confirm that the reinforcing steel is supplied from one of the specific mills and fabricators listed on the Designated Sources of the Materials List.	-
3	-	Check the identification number and manufacturer's catalogue for the mechanical connectors and confirm that the mechanical connectors are supplied from one of the sources listed on the Designated Source of materials List.	-
4	-	Submit a copy of the reinforcing steel schedule, Working Drawings, mill test certificates, mechanical connector details and welding details to the design Structural Engineer and MTO Structural.	-
5	-	Check that any lap splices are at approved locations and allow for adequate lap length.	-

905.04.01.02 Prestressed Concrete -Precast Members

Submissions of proposals and shop drawings for prestressed concrete precast members as specified in CAIS 909.

905.04.01.03 Prestressed Concrete -Post-Tensioning

Submissions for post-tensioning as specified in CAIS 910.

905.05 MATERIALS

905.05.01 Steel Reinforcement

As specified in CAIS 1440.

~~905.05.02 Post-Tensioning Materials~~

~~As specified in CAIS 910.~~

905.05.0302 ————— **Mechanical Connection Details for Reinforcing Steel Bars**

905.05.03.01 ————— **Post-Tensioning Tendons**

Administrative Activities:

4	-	Verify that mechanical connections for post-tensioning tendons can withstand the conditions specified in the OPSS 905.05.03.01.	-
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905.05.03.02 ————— **Reinforcing Steel Bars, Stainless Steel Reinforcing Bars**

Inspection Activities:

4	M	Check all the reinforcement tags on bar bundles to verify that the correct grade, type, and size of steel splice bars has been supplied, from one of the fabricators listed on the Designated Source of Materials List (both mills and fabricators are shown on the same list). The Bill of Lading for the steel shall also show the name and location of the fabricator.	100%
2	M	Check that the size, grade and type of steel shown on the mill certificates, is the same as shown on the tags, and both are consistent with the material supplied.	100%

Administrative Activities:

4	-	Verify that mechanical connections for steel reinforcement are as specified in OPSS 905.05.04905.05.03.02 and the MTO Designated Sources for Materials Lists.	-
2	-	Verify that splice bars are supplied by the manufacturer of the associated mechanical connector from a mill/fabricator listed on the MTO Designated Sources for Materials Lists.	-
3	-	Verify that stainless steel splice bars are used with stainless steel mechanical connections and are of a type according to OPSS 1440.	-

905.05.0403 **Mechanical Connectors for Reinforcing Steel Bars, Stainless Steel Reinforcing Bars**

905.05.04.01 ————— **Post-Tensioning Tendons**

Administrative Activities:

4	-	Verify that mechanical connectors are supplied by the manufacturer of the prestressing system.	-
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905.05.04.02**~~Reinforcing Steel Bars, Stainless Steel Reinforcing Bars~~**

Inspection Activities:

1	M	Check all the mechanical connectors to verify that the correct type, and size of mechanical connector has been supplied, from one of the fabricators listed on the Designated Source List (both mills and fabricators are shown on the same list). The Bill of Lading shall also show the name and location of the fabricator.	100%
2	M	Check that the size, grade and type of steel shown on the mill certificates, is the same as shown on the tags, and both are consistent with the material supplied.	100%

Administrative Activities:

1	-	Check that the mechanical connections areas are as specified in OPSS 905.05.04. <u>OPSS 905.05.04.02.</u>	-
2	-	<u>Verify that splice bars are supplied by the manufacturer of the associated mechanical connector from a mill/fabricator listed on the MTO Designated Sources for Materials Lists.</u>	
23	-	Verify that stainless steel mechanical connectors are used with stainless steel reinforcing bars and are of a type specified in CAIS 1440.	-

905.05.0504**Associated Hardware**

Administrative Activities:

1	-	Verify <u>only that</u> hardware, including spacers and support devices, approved of the Owner, are used with steel reinforcement and the hardware is are as specified in OPSS 905.05.05.	-
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905.06 EQUIPMENT -- Not Used**905.07 CONSTRUCTION****905.07.01 General**

Inspection Activities:

1	M	Check that the reinforcement and associated hardware complies with the requirements of the Contract Documents.	50%
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905.07.02 Reinforcing Steel Bars, ~~Stainless Steel Reinforcing Bars~~, Splice Bars, Stainless Steel Splice Bars and Steel Welded Wire Reinforcing

905.07.02.01 Storage and Protection of Stainless-Steel Reinforcing Bars

Inspection Activities:

1	-	Check for proper site storage, protection, and handling. Also, confirm that bar tags are maintained until the bars are ready for placement.	50%
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905.07.02.02 Placing

Inspection Activities:

1	SSI M	Witness and Check the placement of steel reinforcement throughout the installation process.	100%
2	SSI M	Verify the bar spacing and ties are maintained according to the Contract Documents.	50%
<u>3</u>	<u>SSI</u> <u>M</u>	<u>Check that circular spacing chairs are not used for spiral reinforcement when the pitch is less than the concrete cover.</u>	<u>100%</u>

905.07.02.032 Fastening

Inspection Activities

<u>4</u>	<u>-</u>	<u>Verify that Reinforcing steel bars shall be tied to achieve sufficient strength and stiffness of the cage according to the Contract Documents, and maintain the bars in correct position to maintain concrete cover to reinforcement. Bars shall be tied at least at every fourth intersection. The maximum untied length of any bar shall be 1 m.</u>	<u>50%</u>
<u>2</u>	<u>-</u>	<u>Verify that Bars are tied at least at every fourth intersection. The maximum untied length of any bar shall be 1 m.</u>	<u>50%</u>
<u>31</u>	<u>-</u>	<u>Check that there are at least 50 mm clear spacing between any adjacent bar chairs or plastic clips.</u>	<u>50%</u>
<u>42</u>	<u>-</u>	<u>Verify that Bar chairs, bolsters, and plastic clips shall be stored in opaque containers to minimize UV exposure at site</u>	<u>100%</u>
<u>3</u>	<u>-</u>	<u>For caisson reinforcement check that the bars are ties at every intersection.</u>	<u>100%</u>
<u>4</u>	<u>-</u>	<u>Check that reinforcing steel bars except for caisson reinforcement are tied at least at every fourth intersection with a maximum untied length of 1m.</u>	<u>50%</u>
<u>5</u>	<u>-</u>	<u>Check that reinforcing steel bars are tied to achieve sufficient strength and stiffness to maintain the bars in the correct position and maintain specified concrete cover to reinforcement.</u>	<u>50%</u>

905.07.02.043 Surface Condition

Inspection Activities:

1	-	Check that the surface condition of steel reinforcement is not less than the applicable OPSS 905 requirements.	100%
2	-	Prior and up to the placement of the concrete, verify that the stainless-steel reinforcing bars are free of deposits of iron and non-stainless steels.	100%

905.07.02.054 Cutting

Administrative Activities:

1	-	Check that the cutting of stainless-steel reinforcing bars, reinforcing bars, welded wire reinforcement, and splice bars by oxyacetylene torch is not carried out before a written permission is issued by the Contract Administrator.	-
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905.07.02.065 Bending

Administrative Activities:

1	-	When applicable, Check that the onsite bending of stainless-steel reinforcing bars and reinforcing steel bars are according to the Contract Documents.	-
2	-	When applicable, issue permission for field bending of reinforcing steel bars if onsite bending becomes necessary for constructability.	-

905.07.02.076 Welding

Administrative Activities:

1	-	Check that welding details submitted by the contractor are as specified in OPSS 905, and that the welding is completed according to the Contract Documents. Check that there is no welding of Reinforcing Steel Bars. Welding of steel reinforcement, including tack welding, shall not be permitted	-
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905.07.02.087 Splicing

Inspection Activities:

1	-	Check that the installation of the steel reinforcement and, if any, mechanical connectors, lap splices and end anchorages are according to the Contract Documents. Photo documentation is required. Any lap splices shall be measured to Check that appropriate lap lengths and distance to adjacent bar is provided.	50%
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905.07.02.098 Mechanical Connections

Inspection Activities:

1	SSI	When mechanical connectors are used, witness the assembly of sample connections at the work site.	100%
2	-	Check that the mechanical connectors are according to the Contract Drawings and their locations are according to the Working Drawings.	50%
3	-	Prior to concrete placement, where staged construction embeds reinforcing steel to be joined with threaded mechanical connectors, check that exposed ends of reinforcing steel bars are threaded and cut square.	50%

Administrative Activities:

1	-	Do not allow mechanical connections in strand or high strength bars if they are not specified in the Contract Documents.	-
2	-	Verify all procedures and equipment for mechanical connections are according to the manufacturer's recommendations.	-

905.07.02.098.01 General

Inspection Activities:

<u>1</u>	-	<u>Check that the mechanical connectors are according to the Contract Drawings and their locations are according to the Working Drawings.</u>	<u>50%</u>
<u>2</u>	-	<u>Prior to concrete placement, where staged construction embeds reinforcing steel to be joined with threaded mechanical connectors, check that exposed ends of reinforcing steel bars are threaded and cut square.</u>	<u>50%</u>

Administrative Activities:

1	-	Check ends of reinforcing bars, connector sleeves, other reinforcements are as specified in OPSS 905.07.02.08.01.	-
<u>2</u>	-	<u>Verify all procedures and equipment for mechanical connections are according to the manufacturer's recommendations.</u>	-

905.07.02.098.02 Job Control Tests

Inspection Activities:

1	-	Witness the assembly of sample connections on site and verify the method is the same as the connectors used in the Work.	100%
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Administrative Activities:

1	-	Check that the testing of sample connections is as specified in OPSS 905.08.	-
2	-	At least 10 Days prior to the intended start of concrete placement, verify that samples for testing are submitted.	-

905.07.03 Prestressing Steel for Prestressed Concrete

Administrative Activities:

1	-	Check and Review the working drawings for the prestressed concrete members before going for inspection in the precast plant.	-
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905.07.03.01 Surface Condition

Inspection Activities:

1	-	Verify that <u>the surface condition of</u> all prestressing steel be clean and free of all rust, oil, dust, scale, and pitting, <u>according to OPSS 910.</u>	100%
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905.07.03.02 Placing

Inspection Activities:

1	-	Check that the placement of prestressing steel and any mechanical connection in strand or high strength bars are according to the Contract Documents <u>prior to placement of concrete.</u>	50%
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905.07.03.03 Welding

Inspection Activities:

1	-	Check that there is no welding of prestressing strand.	100%
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905.07.05 Inspection after Installation of Steel Reinforcement and Mechanical Connectors

Inspection Activities:

1	-	Verify that mechanical connections are installed according to the recommendations of the manufacturer of the prestressing system used.	100%
2	-	Check that the correct grade/type and size of steel has been placed according to the Contract Documents.	50%
3	M	Check that the installation of the mechanical connectors and lap splices, if any, are according to the Contract Documents.	100%

Administrative Activities:

1	-	Receive and Check a Request to Proceed from the Contractor upon completion of the installation of the steel reinforcement and, if any, mechanical connectors.	-
2	-	Issue a Notice to Proceed in a timely manner to proceed with the next operation.	-

905.07.06 Management of Excess Material

Administrative Activities:

1	-	Check that the management of excess material is completed according to the Contract Documents.	25%
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905.08 QUALITY ASSURANCE

905.08.01 Sampling

Administrative Activities:

1	M	Obtain assembled samples of all steel reinforcement and mechanical connectors, as well as the supporting documentation as specified in OPSS 905.	-
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905.08.01.01 Prestressing Steel

~~Inspection Activities:~~

4	-	Select samples for submission to the lab and Check that samples are properly labelled as specified in the Contract.	100%
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Administrative Activities:

1	-	<u>Samples of prestressing steel shall be provided to the Contract Administrator according to OPSS 910 when requested.</u> Receive a notification from the Contractor when prestressing steel is available for sampling.	-
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905.08.01.02 Reinforcing Steel Bars and Stainless-Steel Reinforcing Bars

Inspection Activities:

1	-	Select three, 1.5 m long samples per lot on a random basis at the site as specified in OPSS 905.	100%
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905.08.01.03 Mechanical Connectors -Sampling for Job Control Test

Inspection Activities:

1	M	Check that the Contractor assembled 6 sample connections as specified in OPSS 905 and that the Contractor has completed MTO Form PH-CC-812 for each assembled sample.	100%
2	M	Select and witness assembly of samples. Receive and Check completed forms along with mill test certificates from the Contractor for samples for delivery to the laboratory designated by the ministry.	100%

Administrative Activities:

1	-	Determine lot and subplot sizes as specified in OPSS 905.	-
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905.08.01.04 Steel Welded Wire Reinforcement -Sampling for Tensile Strength

Inspection Activities:

1	-	Check that a minimum five samples are collected per lot for testing as specified in OPSS 905.	100%
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Administrative Activities:

1	-	Determine lot and subplot sizes and determine the sampling time and location as specified in OPSS 905.	-
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905.08.02 Testing

905.08.02.01 Prestressing Steel

Administrative Activities:

1	-	Verify that the testing of prestressing steel is according to ASTM A421.	-
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905.08.02.02 Reinforcing Steel Bar and Stainless-Steel Reinforcing Bar

Administrative Activities:

1	-	Verify the testing of reinforcing steel bar is according to CSA G30.18 and the testing of stainless-steel reinforcing bar is according to ASTM A276 and ASTM A955.	-
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905.08.02.03 Mechanical Connections

905.08.02.03.01 Testing for Torque

Administrative Activities:

1	-	Verify that torque is checked when required by the manufacturer's installation process.	-
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905.08.02.03.02 Job Control Test

Administrative Activities:

1	-	Check that three of the six sample connections for each lot or subplot are tested for acceptance and the remaining 3 samples are retained by the testing laboratory for referee testing, if invoked.	-
2	-	Forward individual test results to the Contractor as they become available.	-

905.08.02.03.03 Job Control Test -- Referee Testing

Administrative Activities:

1	-	Receive and Check the Contractor's request to invoke Referee Testing within 5 Business Days of receiving the test result.	-
2	-	Check that when referee testing is invoked, the three retained referee samples are tested by the referee laboratory as specified in Clause OPSS 905.08.02.03.03.	-
3	-	Receive and Review the referee test results as specified in Clause OPSS 905.08.02.03.03.	-

4	-	Forward the referee test results to the Contractor.	-
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905.08.02.03.04 Referee Testing Cost

Administrative Activities:

1	-	Charge the Contractor the cost of referee testing in accordance with the Construction and Maintenance Change Order Manual <u>Special Provision No. 199S64</u> when referee results indicate that the acceptance test results for refereed lot or subplot are confirmed.	-
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905.08.02.04 Steel Welded Wire Reinforcement for Tensile Strength

Administrative Activities:

1	-	Verify that the average of test results for the material is as specified in Clause OPSS 905.08.02.04.	-
2	-	Verify there are a minimum of 3 valid test results. If less than the 3 valid test results, Notify the Contractor that the lot of material shall be resampled and tested until a total of five valid test results are obtained.	-
3	-	Review the test results as specified in Clause OPSS 905.08.02.04.	-

905.09 MEASUREMENT FOR PAYMENT

Administrative Activities:

1	-	Measurement for payment shall be as specified.	-
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905.10 BASIS OF PAYMENT

Administrative Activities:

1	-	Basis of payment shall be as specified.	-
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WARRANT: Always with OPSS 905, Construction Specification for Steel Reinforcement for Concrete.