Reasoned document for the comments received on draft Indian Railway Standard Specification for Cast Manganese Steel (CMS) Crossings and Weldable Cast Manganese Steel (WCMS) Crossings, Serial No. IRS: T-29 (Revised-2024)

SN	Existing Clause of IRS: T-29 (Revised-2023)	Proposed Clause of IRS: T-29 (Revised-2024)	Comments/Suggestions by Vendors/Stakeholders (after 30 days uploading) on RDSO's website	Changes made in Draft IRS: T-29 (Revised-2024) as uploaded on RDSO's website with reason for Acceptance/Rejection of suggestion received
	PART –A **SPECIFICATION FOR CAST MANGANESE STEEL (CMS) CROSSINGS**			
1.	**Cover Page** Indian Railway Standard Specification for Cast Manganese Steel (CMS) Crossings and Weldable Cast Manganese Steel (WCMS) Crossings, Serial No. IRS: T-29 (Revised-2023)	**Cover Page** Indian Railway Standard Specification for Cast Manganese Steel (CMS) Crossings and Weldable Cast Manganese Steel (WCMS) Crossings, Serial No. IRS: T-29 (Revised-2024)	No comments received.	As the specification is to be finalised in 2023, the title of the specification is modified as under: "Indian Railway Standard Specification for Cast Manganese Steel (CMS) Crossings and Weldable Cast Manganese Steel (WCMS) Crossings, Serial No. IRS: T-29 (Revised-2024)"
2.	**0. FOREWORD** 0.1 This specification is issued under the fixed serial number T - 29 : 2022, the final number indicates the year of original adoption as standard or in case	**0. FOREWORD** 0.1 This specification is issued under the fixed serial number T - 29 : 2022, the final number indicates the year of original adoption as standard or in case	No comments received.	As the specification is to be finalised in 2023, the Clause 0.1 & 0.4 is modified as under: "0.1This specification is issued under the fixed serial number T - 29:

	of revision, the year of last revision. ADOPTED 1974 REVISED 1997 REREVISED 2000 REREVISED 2016 REREVISED 2022 REREVISED 2023 (November) 0.2 This specification was revised in 2016 to incorporate the requirements of corrigenda issued so far, to include the latest practices & software adopted in testing, rationalization of inspection procedure by M&C and Engineering officials, to include the casting of integral test bars, for better traceability and to include latest version of IS codes relevant to manufacturing of CMS crossings.	of revision, the year of last revision. ADOPTED 1974 REVISED 1997 REREVISED 2000 REREVISED 2016 REREVISED 2022 REREVISED 2023 REREVISED 2024 0.2 This specification was revised in 2016 to incorporate the requirements of corrigenda issued so far, to include the latest practices & software adopted in testing, rationalization of inspection procedure by M&C and Engineering officials, to include the casting of integral test bars, for better traceability and to include latest version of IS codes relevant to manufacturing of CMS		2024, the final number indicates the year of original adoption as standard or in case of revision, the year of last revision. ADOPTED 1974 REVISED 1997 REVISED 2000 REVISED 2016 REVISED 2022 REVISED 2023 REVISED 2024 0.4 This specification has been revised again in 2024 to incorporate increased the number of cycles for fatigue testing & change in load for static bending test for Part-B of WCMS Crossing including some minor corrections.

	0.3 This specification has been revised in 2022 to incorporate the latest version of IS/IRS codes and to incorporate a uniform & unique numbering system for marking on CMS Crossings including some minor corrections. 0.4 This specification has been revised again in November, 2022 to incorporate the provisions for Weldable Cast Manganese Steel (WCMS) Crossing and special test therefor and is incorporated as Part – B of this specification. For WCMS Crossing, Part – A of this specification wherever applicable has been referred to therein.	crossings. 0.3 This specification has been revised in 2022 to incorporate the latest version of IS/IRS codes and to incorporate a uniform & unique numbering system for marking on CMS Crossings including some minor corrections. 0.4 This specification has been revised again in May, 2024 to incorporate the provisions for Weldable Cast Manganese Steel (WCMS) Crossing and special test therefor and is incorporated as Part – B of this specification. For WCMS Crossing, Part – A of this specification wherever applicable has been referred to therein. 0.5 This specification has been revised again in May, 2024 to incorporate increased the number of cycles for fatigue testing & change in load for static bending test for Part-B of WCMS Crossing including some minor corrections.		
PART –B				

SPECIFICATION FOR WELDEDALE CAST MANGANESE STEEL (WCMS) CROSSINGS				
3.	**4.0 TESTS ON FINISHED WELDED JOINT** **4.2 DIMENSIONAL** Dimensional check shall be conducted on 100% finished welds by using a 1m and 10cm steel straight edge and feeler gauge. Following tolerances are permitted:	**4.0 TESTS ON FINISHED WELDED JOINT** **4.2 DIMENSIONAL** Dimensional check shall be conducted on 100% finished welds by using a 1m and 10cm steel straight edge and feeler gauge. Following tolerances are permitted:	No comments received.	**To improve the reliability of WCMS Crossing in view of failures reported by zonal Railways, Specification** "Indian Railway Standard Specification for Cast Manganese Steel (CMS) Crossings and Weldable Cast Manganese Steel (WCMS) Crossings", Serial No. IRS: T-29 (Revised-2024) is modified to include to increased value of Static bend test and number of samples. Fatigue test samples also increased for improvement in manufacturing of WCMS Crossing and its better reliability, in terms of relevant EN code (BS EN 14587-3:2012

	• Vertical misalignment • Lateral misalignment at running edge • Head finishing (in width) • Finished of top table surface	+0.30mm - 0mm ± 0.25mm Side of rail should be finished to ± 0.20mm on gauge side at the centre of 10cm straight edge +0.20mm - 0mm	at the centre of 1m straight edge at the centre of 1m straight edge at the centre of 10cm straight edge	• Vertical misalignment • Lateral misalignment at running edge • Head finishing (in width) • Finished of top table surface	+0.30mm - 0mm +0.25mm, -0 mm Side of rail should be finished to ± 0.20mm on gauge side at the centre of 10cm straight edge +0.20mm - 0mm	at the centre of 1m straight edge at the centre of 1m straight edge at the centre of 10cm straight edge		
	(For above (+) indicates hump and (-) indicates cupping) Welds not meeting these standards, if rectifiable by grinding can be re-ground, failing which they shall be rejected. Results shall be			(For above (+) indicates hump and (-) indicates cupping) Welds not meeting these standards, if rectifiable by grinding can be re-ground, failing which they shall be rejected. Results shall be maintained as per proforma given				

<table>
<tr><td></td><td>maintained as per proforma given in Annexure-XI.</td><td>in ~~Annexure-XI~~ Annexure-VI.</td><td></td><td></td></tr>
<tr><td>4.</td><td>5.0 Test for weld process approval

Before starting actual welding, weld process approval is required to ensure a constant quality of welding (calibration and maintenance, function tests etc.). This welding process approval shall be done once in a year or 1 in 1200 WCMSC whichever is earlier. For weld process approval, sample test pieces should be welded as under:
<table><tr><td></td><td></td><td></td></tr><tr><td>Cast Manganese Rail</td><td>Intermediate Material (e.g. Inox, etc.)</td><td>IRS:T-12/2009, 90 UTS Rail/ R 260 grade rail</td></tr></table></td><td>5.0 Test for weld process approval

Before starting actual welding, weld process approval is required to ensure a constant quality of welding (calibration and maintenance, function tests etc.). This welding process approval shall be done once in a year or 1 in 1200 WCMSC whichever is earlier. For weld process approval, sample test pieces should be welded as under:
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</table>

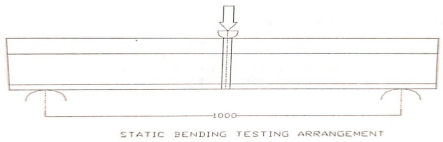
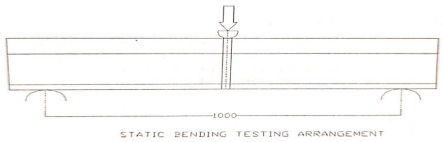
	Its profile shall be the same as the rail on its total length. It shall be made of 3 elements welded in the same conditions as the CMS crossing and intermediate piece. The length of the sample should be minimum 1200mm (600mm normal rail, 600mm cast manganese rail and intermediate piece of suitable length). Initially before starting of actual welding for manufacturing of weldable CMS crossing, 05 weld samples are to be prepared for testing purpose for weld process approval. Flash butt welding for preparation of weld samples shall be done in presence of RDSO representatives / inspecting officials. A computerized graph shall be obtained for different parameters for each weld of entire welding process which is recorded by auto weld recorder for Weld Process Approval. A copy of same shall be provided to RDSO for record. The three important parameters current,	Its profile shall be the same as the rail on its total length. It shall be made of 3 elements welded in the same conditions as the CMS crossing and intermediate piece. The length of the sample should be minimum 1200mm (600mm normal rail, 600mm cast manganese rail and intermediate piece of suitable length). Initially before starting of actual welding for manufacturing of weldable CMS crossing, ~~05 weld samples~~ 11 weld samples are to be prepared for testing purpose for weld process approval. Flash butt welding for preparation of weld samples shall be done in presence of RDSO representatives / inspecting officials. A computerized graph shall be obtained for different parameters for each weld of entire welding process which is recorded by auto weld recorder for Weld Process Approval. A copy of same shall be provided to RDSO for record. The three important parameters		

	force and feed travel shall be plotted with respect to time. For welding process approval, tests mentioned at Clause 5.1 to 5.5 of Part – B of this specification shall be conducted. Out of the 05 samples, 02 samples shall be used for Macro Examination, Micrographic Examination and Hardness Test. 01 sample shall be used for Static Bending Test and 01 for Fatigue Test. Remaining 01 sample shall be kept as spare which may be used in case of damage during testing arrangements etc. Fatigue test shall be required during initial approval. Once the weldable CMS crossing, manufactured after weld process approval, performs satisfactorily in field trial, the same shall not be required again. After that, during	current, force and feed travel shall be plotted with respect to time. For welding process approval, tests mentioned at Clause 5.1 to 5.5 of Part – B of this specification shall be conducted. Out of the ~~05 samples~~ 11 weld samples, 02 samples shall be used for Macro Examination, Micrographic Examination and Hardness Test. ~~01 sample~~ 5 samples shall be used for Static Bending Test and ~~01~~ 03 for Fatigue Test. Remaining 01 sample shall be kept as spare which may be used in case of damage during testing arrangements etc. Fatigue test shall be required during initial approval. Once the weldable CMS crossing, manufactured after weld process approval, performs satisfactorily in field trial, the same shall not be		

	quality audit, no fatigue testing/field trial shall be required, even though 04 samples shall be required for welding process approval. However, in case of change in rail section or grade the Fatigue test shall be invariably conducted. Weld process shall be approved only if weld samples pass all the 05 tests mentioned in Clause 5.1 to 5.5 of Part – B of this specification. In case of failure of weld samples to meet the acceptance criteria in any of these tests, the entire process of preparing weld samples and testing shall be repeated. Total two chances shall be given to any tenderer for weld process approval failing which Performance Guarantee Bond shall be forfeited and the contract shall be rescinded. Additional 'Static Bending Test' is to be carried out under	required again. After that, during quality audit, no fatigue testing/field trial shall be required, even though ~~04 samples~~ 08 weld samples shall be required for welding process approval. However, in case of change in rail section or grade the Fatigue test shall be invariably conducted. Weld process shall be approved only if weld samples pass all the 05 tests mentioned in Clause 5.1 to 5.5 of Part – B of this specification. In case of failure of weld samples to meet the acceptance criteria in any of these tests, the entire process of preparing weld samples and testing shall be repeated. Total two chances shall be given to any tenderer for weld process approval failing which Performance Guarantee Bond shall be forfeited and the contract shall be rescinded. Additional 'Static Bending Test'		

	supervision of Inspecting Authority during bulk production of WCMS crossings: Static Bending test on one test weld, prepared in the same manner as done for developmental stage, at the time of starting the bulk production of WCMSC crossings and then after every 100 nos. of WCMS crossings initially upto 1000 nos. of WCMS crossings. After production of 1000 nos. of WCMS crossings, Static Bending test shall be on one test weld after every 300 nos. of WCMS crossings. **5.4 STATIC BENDING TEST** The sample shall be placed on its foot supported on two rigid supports (with a radius of between 23 and 80mm) at a 1 meter distance, equally apportioned in comparison with the weld axis. The force of pressure must be applied vertically on the running	is to be carried out under supervision of Inspecting Authority during bulk production of WCMS crossings: Static Bending test on one test weld, prepared in the same manner as done for developmental stage, at the time of starting the bulk production of WCMSC crossings and then after every 100 nos. of WCMS crossings initially upto 1000 nos. of WCMS crossings. After production of 1000 nos. of WCMS crossings, Static Bending test shall be on one test weld after every 300 nos. of WCMS crossings. **5.4 STATIC BENDING TEST** The sample shall be placed on its foot supported on two rigid supports (with a radius of between 23 and 80mm) at a 1 meter distance, equally apportioned in comparison with the weld axis. The force of pressure must be		

	surface in the weld axis using a punch placed between the sample running surface and the head of the test machine. The punch must rest on the width of the running table along a length of 40mm ±2mm in order not to create a punching force. Its edges shall be rounded by a minimum radius of 40mm. The load must be applied progressively, without interruption, at a maximum 60kN/second, from the beginning of the test until the sample breaks. The equipment must make it possible to ensure recording of the load and deflection at the centre until the sample breaks.	applied vertically on the running surface in the weld axis using a punch placed between the sample running surface and the head of the test machine. The punch must rest on the width of the running table along a length of 40mm ±2mm in order not to create a punching force. Its edges shall be rounded by a minimum radius of 40mm. The load must be applied progressively, without interruption, at a maximum 60kN/second, from the beginning of the test until the sample breaks. The equipment must make it possible to ensure recording of the load and deflection at the centre until the sample breaks.		

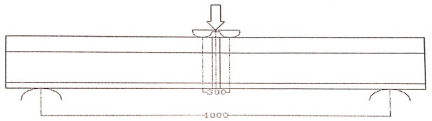
	• General testing arrangement shall be as given below:-  **Acceptance Criteria:** The sample must show minimum deflection of 18mm at the centre before breaking. The minimum bend test force at breakage must not be less than 850 KN. The breakage faces must not show weld defects of the bonding, oxidation and fusion craters of volume when examined with the naked eye. The recording of the load-deflection curve and photographic illustration of the breakage faces must be attached to the test report.	• General testing arrangement shall be as given below:-  **Acceptance Criteria:** The sample must show minimum deflection of 18mm at the centre before breaking. The minimum bend test force at breakage must not be less than ~~850 KN~~ 950KN. The breakage faces must not show weld defects of the bonding, oxidation and fusion craters of volume when examined with the naked eye. The recording of the load-deflection curve and photographic illustration of the breakage faces must be attached to the test report.		

	5.5 FATIGUE TEST This test shall be conducted to check the fatigue strength of the weld joint. Following test scheme shall be followed for fatigue testing of weld joints:- (i) One weld sample out of 05 weld samples already prepared in presence of RDSO representatives/inspecting officials shall be used for fatigue test. (ii) The test sample must correctly bear 2 million cycle of load as shown in the following table. Frequency of load applied	**5.5 FATIGUE TEST** This test shall be conducted to check the fatigue strength of the weld joint. Following test scheme shall be followed for fatigue testing of weld joints:- (i) ~~One weld sample~~ Three weld samples out of ~~05 weld sample~~ 11 weld samples already prepared in presence of RDSO representatives/inspecting officials shall be usedfor fatigue test. (ii) The test sample must correctly bear ~~2 million cycle~~ 5 million cycle of load as shown in the following table. Frequency of load applied shall be 8.33 – 10 hertz.		

shall be 8.33 – 10 hertz.

Profile	Max. Load	Min. Load
UIC 60kg - 880 Grade/60E1 R-260 Grade	300 kN	30 kN

(iii) General testing arrangements shall be as given below:-



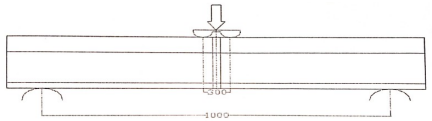
FATIGUE TESTING ARRANGEMENT

Acceptance Criteria:

The test sample shall not develop any cracks on the surface which may be shear, flexural or torsional rupture (due to local buckling) in nature. Hairline localised cracks may be permissible provided there is no reduction in the load carrying capacity of sample.

Profile	Max. Load	Min. Load
UIC 60kg - 880 Grade/60E1 R-260 Grade	300 kN	30 kN

(iii) General testing arrangements shall be as given below:-



FATIGUE TESTING ARRANGEMENT

Acceptance Criteria:

The test sample shall not develop any cracks on the surface which may be shear, flexural or torsional rupture (due to local buckling) in nature. Hairline localised cracks may be permissible provided there is no reduction in the load carrying capacity of sample.

Remaining Para of Part-A & Part-B of draft IRS T-29 (Revised -2024) will remain unchanged.