

Specification No. 13
Wheel and Axle Assembly for Carriages and Wagons



IRS R-19/93(Part-I)

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

INDIAN RAILWAY
STANDARD SPECIFICATION
FOR
WHEEL AND AXLE ASSEMBLY FOR
CARRIAGES AND WAGONS

(APPLICABLE TO ALL GAUGES)

13

SERIAL NO.R-19/93 (PART-I)

ISSUED BY

RESEARCH DESIGN & STANDARDS ORGANISATION

LUDHIANA - 226011.



IRS R-19/93(Part-I)

SPECIFICATIONS REFERRED

This specification refers to the latest amendments of following specifications:-

1. IRS R-16/93 - Steel axles for carriages and wagons.
2. IRS R-43/92 - Steel axles for Diesel and Electric Locomotives, EMU Motor coaches and powered axles of Rail Cars.
3. IRS R-19/93 (Part-II) - Forged/rolled solid wheels for Carriages and Wagons except EMU stock.
4. IRS R-19/93 (Part-III) - Cast steel solid wheels for carriages and wagons.
5. IRS R-19/93 (Part-IV) - Forged/rolled solid wheels for EMU stock.
6. IRS R-19/93 (Part-V) - Wheel centres for carriages and wagons.
7. IRS R-15/64 - Steel tyres for locomotives, tender, carriages and wagons.
8. IS:341 - Black Japan.
9. IS:2062 (Grade 'A') - Tyre fastening rings and locking keys.
10. IS:2074 - Ready mixed paint, red oxide zinc chrome, priming.
11. IS:9862 - Ready mixed paint, brushing, bituminous, lead free, acid, alkali, water and heat resisting.



IRS R-19/93(Part-I)

INDIAN RAILWAY STANDARD SPECIFICATION FOR
THE ASSEMBLY OF WHEELSETS FOR CARRIAGE & WAGON STOCK

(Applicable to all Gauges)

SERIAL NO. IRS R-19/1993 (PART-I)

1. SCOPE

- 1.1 This specification covers the requirements for the assembly of wheels/wheel centres with the axle and wheel centres with the tyres for use on carriages and wagons.

2. ASSEMBLY OF WHEEL & AXLE

- 2.1 At the time of pressing on the solid wheel/tyred wheel/wheel centre shall be on the same ambient temperature as the axle.
- 2.2 The axles shall be fully machined and finished as per drawing. However, burnishing of journals wherever prescribed might either be done before the wheel centre/wheels are pressed on the axle or after that.
- 2.3 The wheel/wheel centre bore shall be fully machined and finished as per drawing to ensure its selective assembly with the axle.
- 2.4 The wheel/wheel centre bore and the wheel seat area of the axle must be cleaned carefully to remove rust, grit, chips and grease, before assembly.
- 2.5 Surface finish of the wheel/wheel centre bore and wheel seat area of the axle shall be as indicated in the drawings. A record of actual measurements of the same shall be maintained which can be checked up and verified by the Purchaser/Inspecting Officer if required by getting the measurements done in his presence.

A record of actual measurement of wheel/wheel centre bore and wheel seat dia. of the axle shall also be maintained and their assembly shall be identified with the wheel and axle numbers. Such records can be checked by Inspecting Authority if required.

- 2.6 Both, wheel seat and bore must be coated with mixture of basic carbonate white lead and boiled linseed oil. The proportion should be 1.2 Kg of white lead paste to one litre of boiled linseed oil, thoroughly mixed. Only sufficient quantity for a few day's operation should be prepared.

Any other lubricant can also be permitted only after RDSO's approval. However, for consideration of lubricant other than the one stated above, sufficient data should be produced regarding its usage on railways in the world.



IRS R-19/93(Part-I)

- 2.7 The assembly of the wheel/wheel centre with the axle must be carried out generally with a hydraulic press, taking all suitable precautions to prevent deformation of the components and damage to the machined parts, especially the journals.
- 2.8 The wheel press used for the wheel/wheel centre and axle assembly shall be equipped with a pressure indicating gauge and a graph recording facility to show the progressive development of pressure during pressing on operation including the final pressures at which the wheel centres or wheels are pressed on to the axles. The fitting speed should be slow enough to satisfy the conditions of clause 2.9 (typical value 0.5 to 5mm/sec.). The pressing on pressure diagram shall be identified with the wheel and the axle numbers. The records from this gauge shall be submitted to the Purchaser or the Inspecting Officer, who at his discretion may verify the records by having wheels pressed on in his presence from time to time during the progress of the contract.
- 2.9 The pressing on pressure diagram shall satisfy the following conditions:
- .1 The pressure shall begin to rise before the movement of the wheel or wheel centre on the seat has reached 20 mm.
 - .2 The pressing on pressure shall increase steadily and continuously in relation to the movement.
 - .3 The final pressing on pressure shall not be less than the value of the minimum pressing on pressure nor exceed the maximum pressing on pressure as specified in clause 2.10. However, the maximum pressing on pressure may be exceeded upto 10% if a satisfactory back pressure test is carried out as specified in clause 3.
 - .4 A reduction of the pressing on pressure by upto 5 tonnes is permitted in the last 25 mm movement.
- Some of the not acceptable type of pressing on pressure diagram are shown in fig.1(a), 1(b) and 1(c)
- 2.10 The pressing on pressure for the wheel/wheel centre and axle assembly shall be as follows:



IRS R-19/93(Part-I)

Gauge	Pressing on pressure in Kg. per. mm diameter of axle at wheel seat.
B.G.	400 to 600
M.G.	400 to 520
N.G.	400 to 480

2.11 Location of Out-of-balance:-

In case of wheels having been tested for out-of-balance and the extent and position of their residual out-of-balance being known, fitting of the wheels on the axle shall be so arranged that the residual out-of-balance of each of the two wheels of the same wheel set lies in the same diametrical plane and on the same side of the centre line of the axle.

The residual out-of-balance of the brake discs must lie in the same diametrical plane as the out-of-balance of the wheels and be opposite in relation to the centre line of the axle.

3. BACK (COUNTER) PRESSURE TEST:-

3.1 A back pressure test shall be carried out in the presence of the Purchaser or the Inspecting Officer in the following cases:-

- .1 Examination of the pressing on pressure diagram gives rise to doubt.
- .2 The final pressing on pressure achieved exceeds the maximum limit but not by more than 10%.

3.2 When the back pressure test is required, it may be carried out before finishing operations, such as machining of the wheel tread. The wheel sets should not undergo this test earlier than 48 hours after pressing on. However, manufacturer is free to reduce this time limit.

3.3 The back pressure test must be carried out on a press similar to the one used for pressing on operation and equipped with a pressing on pressure indication gauge. The back pressure must be applied continuously and uniformly to the wheel set.

3.4 During back pressure test, the pressure shall reach 1.2 times the minimum pressing on pressure prescribed in clause 2.10 and the wheel must not be displaced.

4. ASSEMBLY OF WHEEL CENTRE AND TYRE:-

4.1 Disc wheel centres may have tyres shrunk on either before or after wheel centres have been pressed on to the axles, but if the former order is adopted care



IRS R-19/93(Part-I)

shall be taken that the rim of wheel centres are turned absolutely concentric to the bores of their bosses. Tyres shall be carefully bored out to correct diameter for the wheel centres, to achieve the following shrinkage allowance.

Gauge	Stock	Shrinkage allowance
S.G.	Carriage & Wagon	1.00 mm to 1.20 mm
	EMU (Motor & Trailer)	1.20 mm to 1.50 mm
M.G.	All stock except EML Motor coach	0.65 mm to 0.75 mm
	EMU (Motor Coach)	0.9 mm to 1.0 mm
N.G.	All stock	0.5 mm to 0.6 mm

- 4.2 The tyres shall be heated to the temperature just sufficient to obtain the expansion enabling the tyre to be placed in position and not exceeding 800 degree centigrade. Before placing in position, the bore of the tyre and the surface of the rim shall be cleaned of all foreign matter which would hinder contact between the two components.
- 4.3 The retaining ring shall be inserted as rapidly as possible so that it is set well into the bottom of the groove, the ends shall be fixed into position immediately by several blows with a sledge hammer applied to the retaining ring.
- 4.4 After tyreing, wheels or wheel sets shall be left to cool and sheltered from draughts and water splashes.
- 4.5 Tyres shall be turned on the tread and flange, but need not be turned on the sides if they are sufficiently accurate when finished to satisfy the Purchaser or the Inspecting Officer. Care must be taken when knocking down the edge of the tyre on to the retaining ring that the tyre is not cracked circumferentially or otherwise. The knocking down of the edge shall be done on a suitable machine to the satisfaction of the Purchaser or the Inspecting Officer.

MARKING:-

After assembly of the wheel or wheel centre with the axle the following details shall be stamped legibly as per RDSO Sk-92114 on inner face of the wheel hub.



IRS R-19/93(Part-I)

- i) Manufacturer's / Workshop's code
- ii) Month & year of assembly
- iii) Pressing on pressure in tonnes

6. GAUGES AND TEMPLATES:-

The whole of the work shall be finished off in the best style of wheel work in strict accordance with the dimensions, steel gauges and templates as mentioned on drawings. The gauges and templates shall be submitted to the Purchaser or the Inspecting Officer or approval before the work is commenced and calibrated thereafter periodically.

7. AXIAL AND RADIAL RUN OUT:-

- 7.1 Each pair of wheels and axle shall be mounted on rigid centres to check the axial and radial run out of each wheel with the help of the dial gauge. Any wheel, not found meeting the following requirements shall be rejected.

<u>Designation</u>	<u>Type of Rolling stock</u>	<u>Tolerance in mm.</u>
1) Axial off centre (run out) of the inner face of rim of each wheel	Wagon stock Coaching stock	1.0 0.8
2) Radial off centre (run out) of the wheel tread at the taping line.	Wagon stock Coaching stock	0.5 0.25

- 7.2 The checks as per clause 7.1 can be carried out at the time of reprofiling of the wheel if the same is done after assembly of the wheel set.

- 7.3 Manufacturer shall maintain the records of the checks as per clause 7.1 for all the wheels and produce the same on being asked by the Inspector or the Purchaser.

- 7.4 The Inspector or the Purchaser may order retest for the checks as per clause 7.1 on one out of every 250 wheelsets or part thereof. If a wheelset fails during this retest, the whole lot shall be rejected.

- 7.5 The rejected lot can, however be reoffered for inspection after necessary rectification. No subsequent rectification shall be permissible. On the reoffered lot the Inspecting authority shall carry out the above tests on atleast 4 wheelset out of every 250 wheelsets or part thereof.

8. REPAIRS:-

Any repair for the purpose of hiding a fault is



prohibited and entails rejections of the supply.

9. SAMPLE PAIR OF WHEEL AND AXLE ASSEMBLY:-

A sample pair of wheel and axle assembly, fitted complete, shall be approved by the Purchaser or the Inspecting Officer before the general execution of the order is proceeded with, and all the wheel sets to be supplied on order must be similar to the approved sample.

10. INSPECTION:-

The Inspecting Officer or the Purchaser shall have free access at all reasonable times to the Works in which wheel centres, wheels and wheel and axle assemblies are being manufactured. He shall be at liberty to inspect the manufacture at any stage and to reject any material or supplies that do not conform to this specification. The Inspecting Officer or the Purchaser shall have power to mark or deface in easily distinguishable manner all rejected wheel centres or wheels, but they shall not be marked or defaced in such a manner as to render them unsaleable to other parties.

11. TESTING FACILITIES:-

The manufacturer shall supply the material required for testing free of charge, and shall, at his own cost, furnish and prepare the necessary test pieces, and supply labour and appliances for such testing as may be carried out in his own premises in accordance with this specification. Failing facilities at his own Works for making the prescribed tests, the manufacturer shall bear the cost of carrying out the tests elsewhere.

12. PROTECTION:-

12.1 Painting:-

12.1.1 Journal:-

After inspection and approval, the journals shall be carefully protected with three coats of ready mixed paint, brushing bituminous black to IS:9862 or with any other approved anti-rust compound capable of being removed easily by white spirit or kerosene oil. Sufficient drying time should be allowed between successive coats.

12.1.2 Axle Body:-

The rest of the axle shall be painted with a coat of Zinc Chromate Primer to IS:2074 followed by a second coat of Black Japan to IS:341, allowing sufficient drying time between the coats. Before painting, all parts must be cleaned free from rust and moisture.



IRS R-19/93(Part-I)

13 PACKING:-

Packing of the wheel sets shall be done as follows:-

13.1 Roller Bearing Axles:-

13.1.1 Axle ends and the journal:-

After painting as per clause 12.1.1, the axle ends and journals shall be covered with at least 5 mm thick well fitted one piece high density polyethylene to IS-7238-74 designated as HDPE-44-MB cover which as shown in Fig.2, shall be secured by means of three PVC screws which suit the axle end holes shown in relevant axle drawing.

13.1.2 Axle Body:-

Rest of the axle body after painting as per clause 12.1.2 shall be covered with 5mm thick high density polyethylene to IS-7238-74 designated as HDPE-44-MB covering in two halves and clamped with 20mm wide steel strap at three places as shown in figure 4.

13.2 Plain Bearing Axles:-

13.2.1 Axle Ends and Journal:-

After painting as per clause 12.1.1 axle ends and the journals shall be covered with at least 5 mm thick high density polyethylene to IS-7238-74 designated as HDPE-44-MB covering in two halves, clamped with 20 mm wide steel strap as shown in figure 3.

13.2.2 Axle Body:-

Rest of the axle body after painting as per clause 12.1.2 shall be covered with 5mm thick high density polyethylene to IS-7238-74 designated as HDPE-44-MB covering in two halves, clamped with 20mm wide steel strap at three places as shown in figure 4.

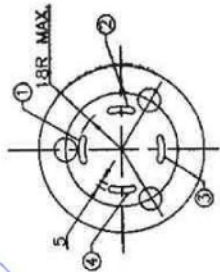
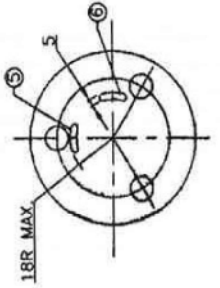
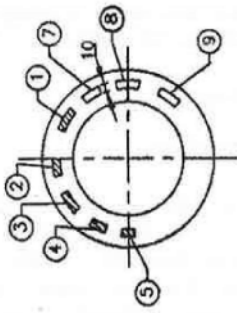
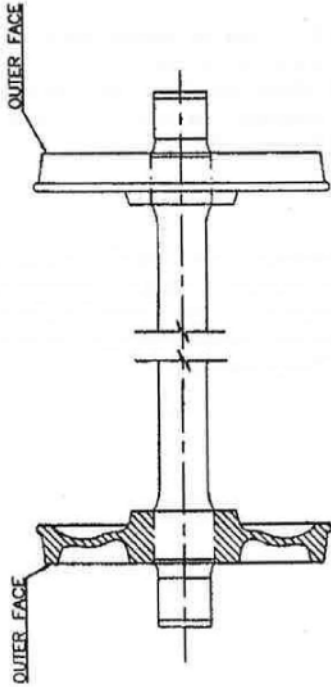
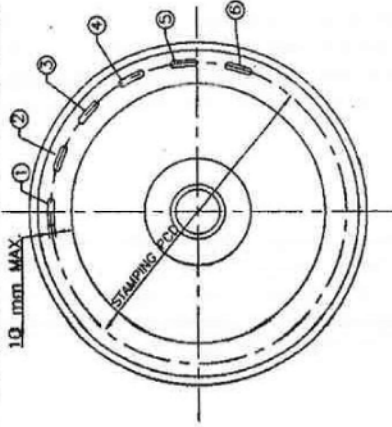
14. MARKING:-

Shipping marks and number shall be stencilled on the high density polyethylene covering of the axle body. In addition, a legend 'DO NOT SLING HERE' shall be stencilled on both the journal covers and the legend 'SLING HERE' shall be stencilled on the axle body cover as indicated in figure 4.



STAMPING PARTICULARS

1	MANUFACTURER'S CODE
2	YEAR OF MANUFACTURE
3	CONSECUTIVE No.
4	BATCH No.
5	INSPECTOR'S APPROVAL STAMP
6	'UT' FOR ULTRASONIC TESTING
7	MANUFACTURER'S/WORKSHOP'S CODE
8	MONTH AND YEAR OF ASSEMBLY
9	PRESSING ON PRESSURE IN TONNES



PCD OF STAMPING OF DIFFERENT WHEELS

TYPE OF WHEEL	PCD OF STAMPING ON RIM
COACHING W/PAC-0-2-301 T-0-2-622 W/WL-1660	788 mm 788 mm 788 mm 810 mm
WAGON W/WL-4784 W/WL-4771 W/D-89025/S-5 W/D-89025/S-9	870 mm 780 mm 830 mm 960 mm
CONTAINER FLAT CONTR-9404-5/13	755 mm
SOLID WHEEL FOR EMU SK-K4004	842 mm (FOR MC) 832 mm (FOR TC)

NOTE:

1. WHEEL DETAILS
 .1 TO BE HOT/COLD STAMPED OR MARKED BY ELECTRIC ETCHING IN 10 mm LETTERS ON OUTER FACE OF THE RIM OF ROUGH TURNED OR FINISH TURNED WHEELS.
 .2 FOR LHB STAMPING SHOULD BE DONE ON OUTER FACE OF THE HUB.
2. WHEEL CENTRE DETAILS
 TO BE COLD STAMPED OR MARKED BY ELECTRIC ETCHING IN 10 mm LETTERS AT THE HATCHED LOCATIONS ON OUTER FACE OF THE HUB.
3. AXLE DETAILS
 .1 TO BE STAMPED COLD OR MARKED BY ELECTRIC ETCHING ON BOTH ENDS IN 5 mm LETTERS IN CASE OF ROUGH TURNED OR FINISHED AXLES.
 .2 TO BE STAMPED IN 10 mm LETTERS IN CASE AXLES ARE SUPPLIED IN AS FORGED CONDITION.
4. ASSEMBLY DETAILS
 TO BE STAMPED COLD OR MARKED BY ELECTRIC ETCHING IN 10 mm LETTERS ON THE OUTER FACE OF THE WHEEL/WHEEL CENTRE HUB.
5. IT IS MANDATORY TO STAMP THE RESPECTIVE MARKINGS AT THE LOCATIONS INDICATED ABOVE.

SUPERSEDED BY:		SCALE		DRAWING REVISED	
SUPERSEDES:		C	P	1/06	
		C (G.V. RAMAN)		3/03	
		D (PARTI S. SANKAR)		2/02	
		T		8/98	
		U.S.		9/97	
		R.D.S.O. [C]			
		B.G.			
		DATE			
		DESCRIPTION			
ALT. ITEM	AUTHY.	DATE	DESCRIPTION		

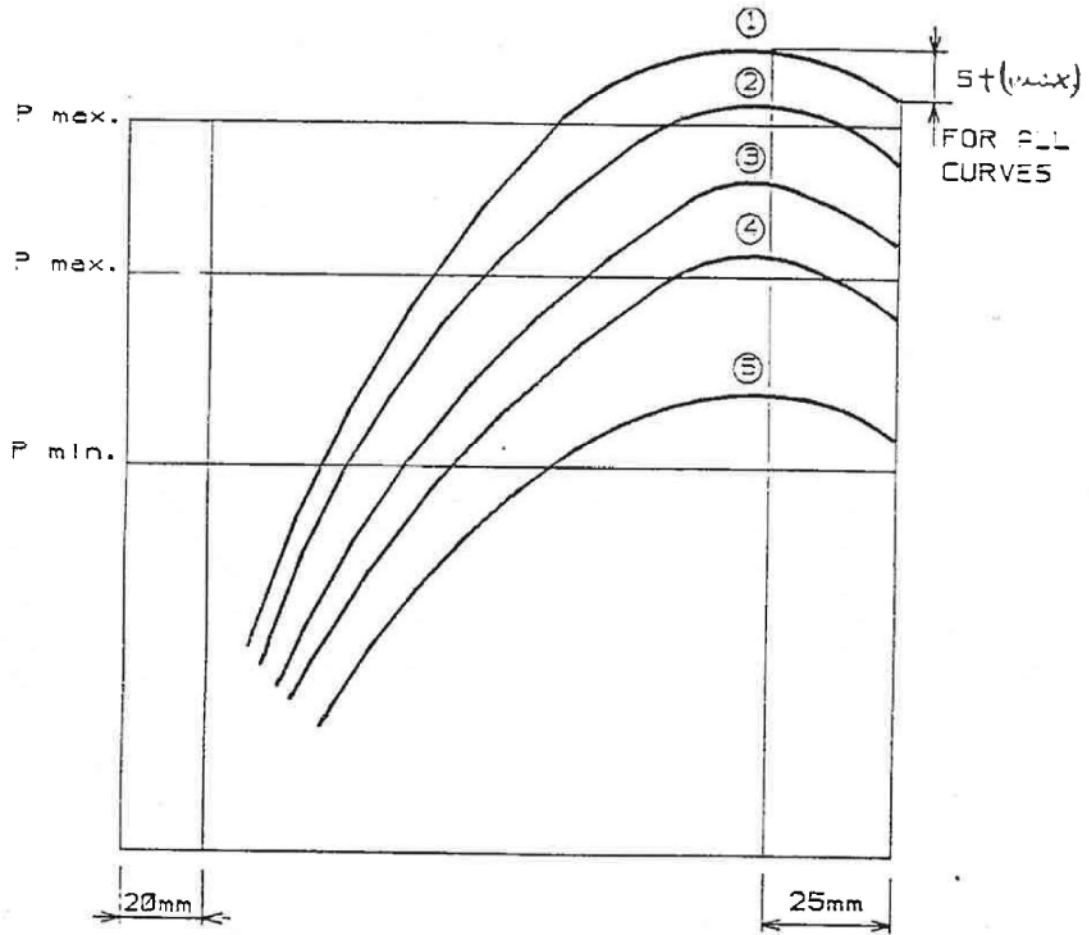
BRANDING DETAILS ON WHEEL & AXLE

SKETCH-92114



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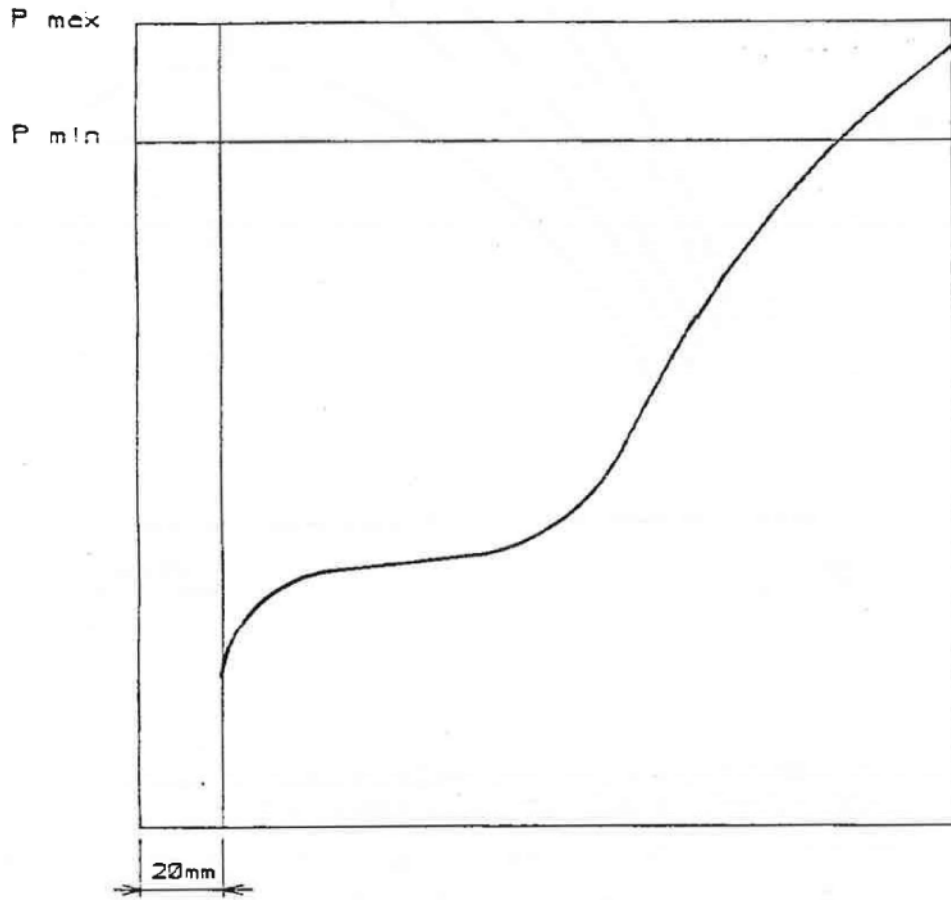
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- 102 - NOT COMPLYING WITH THE PROVISIONS OF THIS SPECIFICATION DUE TO HIGH PRESSURE.
- 3 - COMPLYING WITH THE PROVISIONS OF THIS SPECIFICATION AFTER SATISFACTORY BACK PRESSURE TEST.
- 405 - COMPLYING WITH THE PROVISIONS OF THIS SPECIFICATION

FIG-(1a)
(REFER CLAUSE 2.9.5)

विशेषज्ञ अनुभाग
Specification Section
ज.स.सा सं. क्र. 11
R.D.S.O., Mandla, M.P., India
11/11/11



NOT COMPLYING WITH THE PROVISIONS OF THIS SPECIFICATION
DUE TO IRREGULAR PRESSURE INCREASE

FIG-1(b)

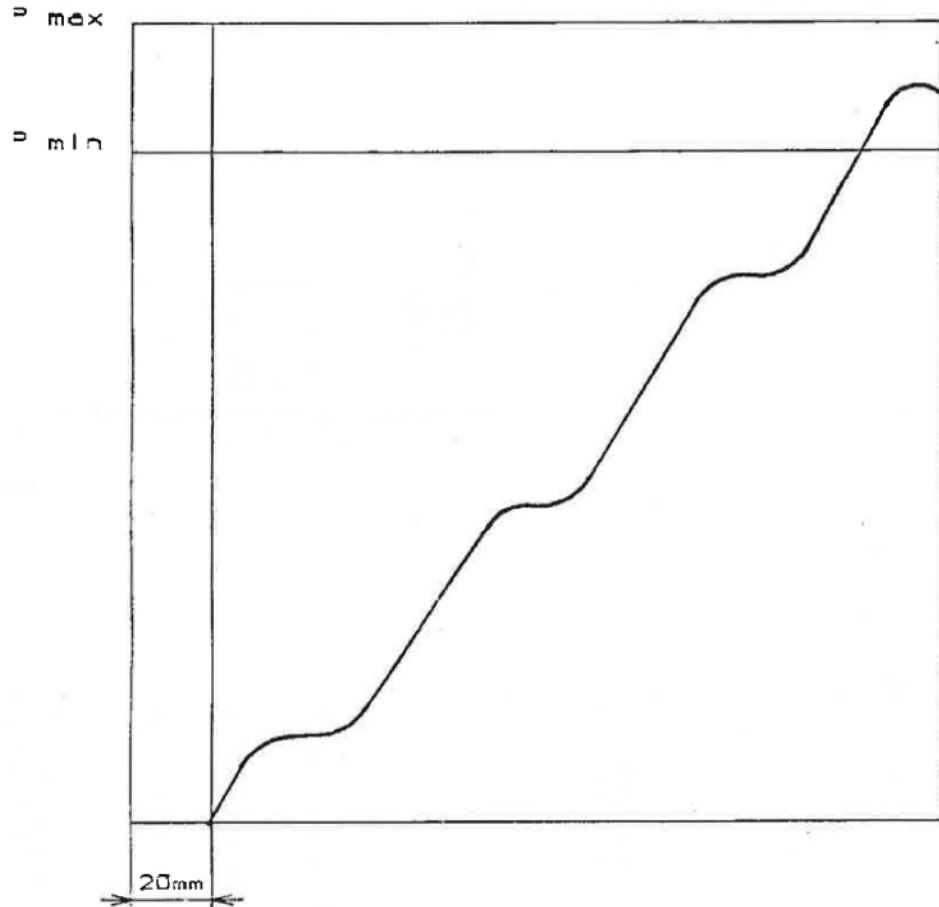
(REFER CLAUSE 2.9.5)

विश्वविद्यालय

Specification Section

कृष्णा नगर, बल्लभपुरा
K.D.S.C., Manak Nagar, Lkoeli





NOT COMPLYING WITH THE PROVISIONS OF THIS SPECIFICATION DUE TO IRREGULAR PRESSURE INCREASE

FIG-1(c)

(REFER CLAUSE 2.9.5)

विशिष्ट अनुसूची
Specification Section
ब.स.स.स. सं. 11
B.D.S.C., Manek Nagar, Lko-11



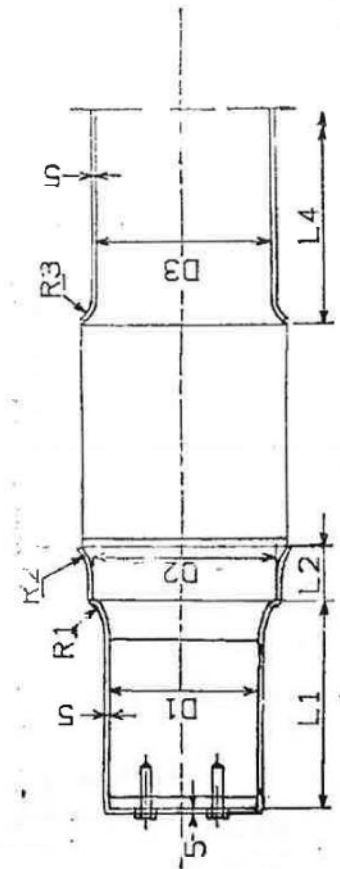


FIGURE - 2

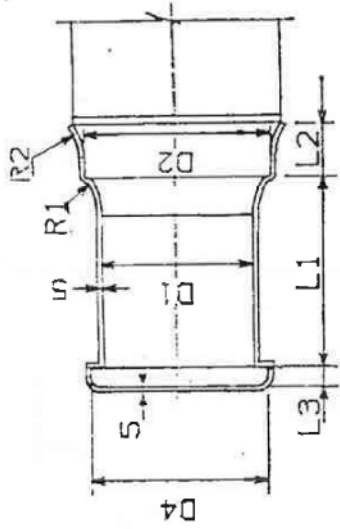


FIGURE - 3

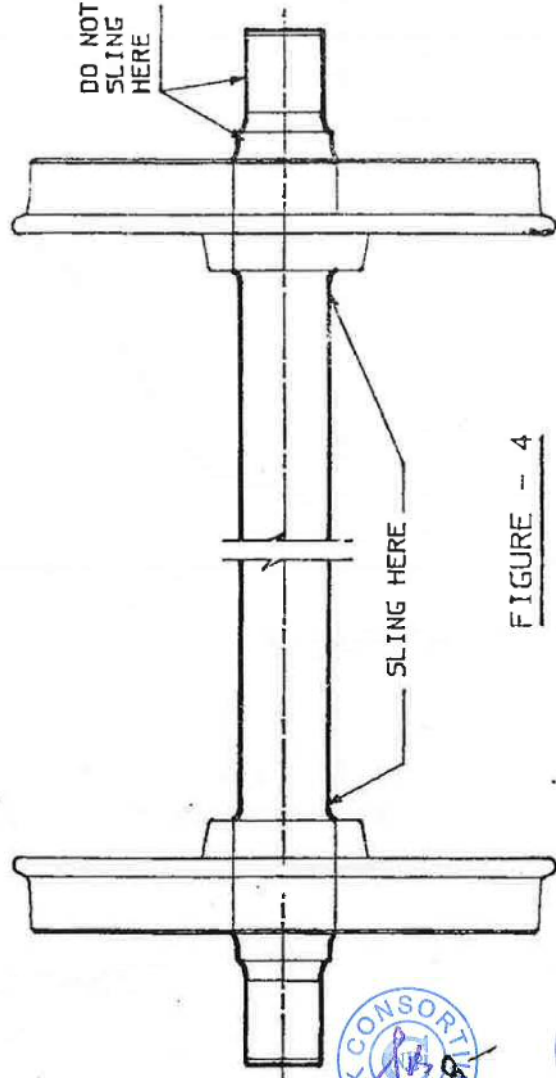


FIGURE - 4

NOTE 1 -

1. TOLERANCE ON COVER :-

DIMENSIONS - TOLERANCE

D1, D2, D3 & D4 - ± 0.2

L1 & L2 - ± 0.3

L3 - ± 0.2

L4 - ± 0.3

R1, R2, & R3 - ± 0.2

FOR DIAMETER, LENGTH AND RADIUS, REFER TO CORRESPONDING DIMENSIONS OF THE FINISHED AXLE.

2. MATERIAL FOR THE COVER SHALL BE HIGH DENSITY POLYETHYLENE TO IS 17238-74 DESIGNATED AS HDPE-44-MB.

3. PROTECTIVE COVERS SHALL BE CLAMPED WITH MIN. 20mm WIDE STEEL STRAPS AT SUITABLE LOCATIONS WITH MINIMUM TWO STEEL STRAPS ON EACH JOURNAL & THREE ON AXLE BODY.

PROTECTION AND PACKING



Government of India
Ministry of Railways
(Railway Board)

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E
A
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Corrigendum No. 1 of October 1997

to

Indian Railway

Standard Specification

For

Wheel & Axle Assembly for Carriages & Wagons

Serial No. R-19/93 (Part-I)

In lieu of Sketch-92114 Alt. Nil substitute Sketch-
92114 Alt.1.

Government of India
Ministry of Railways
(Railway Board)

S
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Corrigendum No.2 of September 1999

To

Indian Railway

Standard Specification

For

Wheel and Axle Assembly For

Carriages and Wagons

(Applicable to All Gauges)

Serial No. R-19/93 (Part-I)



In Lieu of Sketch 92114 Alt.1 Substitute to Sketch-
92114 Alt.2.

15

Government of India

Ministry of Railways

Railway Board

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Corrigendum No. 3 of June 2003

To

Indian Railway

Standards specification

for

Wheel and Axle assembly for

Carriages and Wagons

Serial No. IRS R-19/93 (Part I)

(Applicable to all gauges)

Replace Clause No. 5.1 by the following.

"Marking should be done as per RDSO drawing No. Sk-92114 with latest alteration."



Specification No. 14
Axles for Diesel and Electric Locomotives, EMU Motor
Coaches and Powered Axles of Rail Cars



Government of India
Ministry of Railways
(Railway Board)

SEAL

INDIAN RAILWAY

STANDARD SPECIFICATION

FOR

AXLES FOR DIESEL AND ELECTRIC LOCOMOTIVES, EMU
MOTOR COACHES AND POWERED AXLES
OF RAIL CARS

(Applicable to all Gauges)

Serial No. R-43-92 (with Gov. No.1)

0. FOREWORD:

0.1 This Specification is issued under the fixed Serial No. R-43; the final number indicates the year of original adaptation as standard or, in the case of revision, the year of last revision.

ADOPTED, 1969; REVISED, 1992

0.2 This specification was originally issued to cover the requirements of motor driven axles of Diesel and Electric Locomotives, EMU motor coaches and powered Axles of Rail Cars. It has been revised to cover the requirement of Cardan shaft driven axles of Diesel Hydraulic Locomotives and Rail Cars also.

0.3 The requirements of axles for Steam Locomotives and tenders are covered by IRB Specification No. R-18.

1. SCOPE:

1.1 This standard covers the requirement of the following two categories of straight steel axles.

Category - A : Motor driven axles of Diesel and Electric Locomotives, EMU Motor Coaches and Rail Cars.

Category - B : Cardan Shaft driven axles of Diesel Hydraulic Locomotives and Rail Cars.

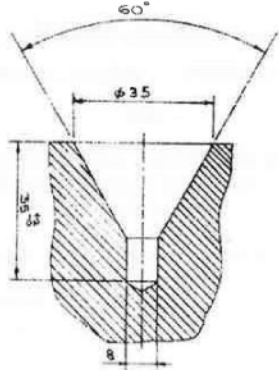
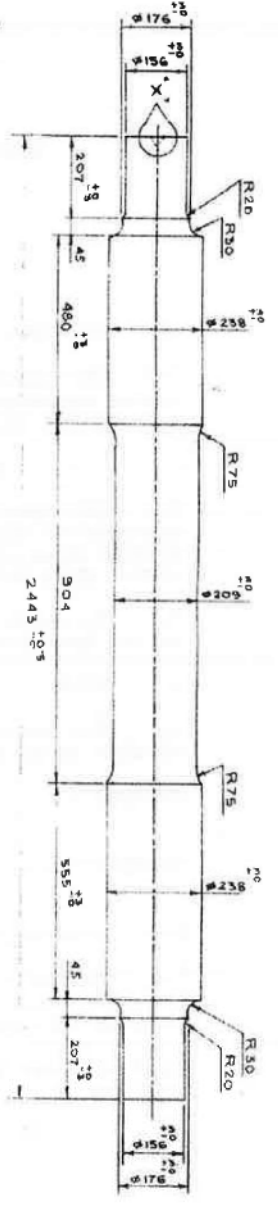
2. STEEL MAKING PROCESS:

2.1 Axles of Category-A shall be manufactured from steel made by Open Hearth, electric, Basic Oxygen or a combination of these processes. The steel shall be of killed quality. In case basic Oxygen process is used:-

2.1.1 Nitrogen content of steel determined by analysis of finished product shall not exceed 0.007%.

...2/-





DETAIL AT 'X'

NOTE:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ~~XX~~ ALL OVER UNLESS OTHERWISE SPECIFIED.
3. ALL AXLES SHALL BE ULTRASONICALLY TESTED & STAMPED.
4. FOR FINISHED AXLE REFER CLW DRG. NO. 1209-01-01-002.
5. ANY GRIPPING/BENT MARK AND STEP TURNING ON JOURNAL DIA. 120.156 mm IS NOT PERMITTED.



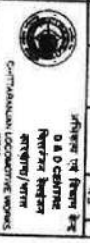
Material	Grade	Part No.
STEEL	R413	1209-01-01-002

Part No.	1209-01-01-002
Revision	01
Scale	1:1
WAP - A-016	

Part No.	1209-01-01-002
Revision	01
Scale	1:1
WAP - A-016	

Part No.	1209-01-01-002
Revision	01
Scale	1:1
WAP - A-016	

Sl. No.	Part No.	Description	Quantity	Material	Grade	Part No.	Revision	Scale	WAP - A-016
1	1209-01-01-002	ROUGH TURNED AXLE	1	STEEL	R413	1209-01-01-002	01	1:1	



1209-01-01-002
1209-01-311-054

2.1.2 Hydrogen content of the steel determined by analysis of finished product shall not exceed 2 PPM.

2.1.3 The manufacturer shall furnish full details of the steel making process, including subsequent refining and prior approval taken from the purchaser for use of Basic oxygen or LD steel for manufacturing of the axles.

2.2 Axles of Category-B shall be manufactured from steel conforming to Grade 25 Cr Mo4 to DIN 17200* - Nov., 1984.

2.3 Chemical Composition:

2.3.1 Ladle Analysis :-

The chemical composition of steel shall be as under when analysed in accordance with IS:228** or any other established instrumental/chemical method. In case of dispute, the procedure given in the relevant part of IS:228 shall be the reference method. However, where the method is not given in IS:228 and its relevant parts, the reference method shall be as agreed to between the purchaser and the manufacturer.

<u>Contents</u>	<u>Category-A</u>	<u>Category-B</u>
Carbon	0.40 - 0.55%	0.22 - 0.29%
Manganese	0.60 - 0.90%	0.60 - 0.90%
Sulphur	0.05% max.	0.030% max.
Phosphorus	0.045% max.	0.035% max.
Silicon	0.15% Min.	0.15 - 0.40% max.
Chromium	-	0.90 - 1.20%
Molybdenum	-	0.15 - 0.30%

2.3.2 Check Analysis:-

Permissible variation in case of check analysis over the limits specified in Clause 2.3.1 shall be as under:-

<u>Contents</u>	<u>Category-A</u>	<u>Category-B</u>
Carbon	± 0.03%	± 0.02%
Manganese	± 0.03%	± 0.04%
Sulphur	+ 0.005%	+ 0.005%
Phosphorus	+ 0.005%	+ 0.005%
Silicon	- 0.02%	+ 0.03%
Chromium		± 0.05%
Molybdenum		± 0.03%

* Quenched and Tempered steels - (Technical delivery condition).
 ** Method of analysis of steel.

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NOTE: The variations may occur either below or above the individual element ranges but shall not be applied both above and below the specified range for any one element in any one cast of steel.

2.4 Discard:

Sufficient discard shall be made from either end of each ingot to ensure freedom from piping and harmful segregation.

3. MANUFACTURING PRACTICES :

3.1 The forged axles shall be manufactured from ingots rolled down to bloom size but shall be finally shaped to profile by forging only under a hammer or press. The forging profile shall generally follow the contour of the rough machined axles (as given in relevant drawings) with adequate machining allowances. The minimum cross section of ingot shall not be less than twice the maximum cross section of bloom and minimum cross section of bloom shall not be less than twice the maximum cross section of axle.

3.2 In case the axles are manufactured direct from ingots by forging under a hammer or press only, the minimum cross section of the ingot shall be not less than three times the maximum cross section of the axles. The forging profile shall be as described in Clause 3.1 above.

3.2.1 Axle can also be manufactured with a lower reduction ratio of forging provided the minimum section of the bloom is at least 1.5 times the maximum section of the axles and the minimum section of the ingot is at least five times the maximum section of the rolled/forged axles.

3.3 Cooling:

3.3.1 When hot blooms are cooled, they shall be allowed to cool uniformly and shall not be permitted to come in contact with water or draft of air.

3.3.2 The cooling of axles after forging operation shall be controlled by a suitable method as mutually agreed to between the Purchaser and Supplier.

3.4 Heat Treatment :

While Category - A axles shall be either normalised or oil hardened and tempered, Category-B axles shall be oil hardened and tempered to achieve the desired mechanical properties.

4. QUALITY OF MATERIAL:

4.1 The axles shall be sound throughout and without cracks, inclusions, flaws, burrs, lack of metal, laps or any harmful defect detrimental to their functions and shall be supplied to the prescribed dimensions and tolerances.

5. BRANDING:

5.1 Each axle shall be legibly stamped after forging at a suitable location for identification. The axles after machining, shall be stamped with an

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identifying cast number, manufacture's code, month, year of manufacture and such other marks as may be shown on the drawings or otherwise specified by the Purchaser. The branding shall be with the letters of at-least 6 mm in height.

6. SELECTION FOR TESTS :

6.1 The axles shall be submitted in identifiable batches of a maximum of 60, each batch containing axles from only one cast and heat treated in a similar manner. The selection for testing as specified in clause 7 shall be at the rate of one axle per batch or part thereof.

6.2 If less than 15 axles are made from one cast of the same heat treatment batch, the test requirements shall be either:-

6.2.1 One axle tested in accordance with clause 7.

or

6.2.2 The manufacturer shall leave an extra length of the same diameter as that of forged end of the axle on 50% of the axles (subject to a minimum of 5 nos.) so as to enable the Purchaser or his Inspecting Officer to select and cut one such coupon for tensile test, cold bend test, Charpy Impact test and macro-examination as specified in clauses 7.2, 7.3, 7.4 and 9.4 respectively.

6.3 The Purchaser or the Inspecting Officer shall select and test such of the axles as he may think proper to the extent of the number specified above. Proper cast identification shall be maintained at the ingot and bloom stages. The axles tested shall be correlated and considered to represent the average quality of the axles of the lot produced from the same cast from which they were selected. After selection of the axles for testing, each test axle shall comply with the following tests without further re-heating or any other manipulation whatsoever, either of the axle selected for testing or any portion selected therefrom to prepare the test pieces.

7. MECHANICAL TESTING :

7.1 From the test piece selected in accordance with clause 6, following test pieces shall be cold machined in the longitudinal direction. The test pieces shall be taken from the wheel seat location of the axle or the test prolongation as the case may be as shown in Fig. 1.

7.1.1 Tensile test piece shall be round and of standard proportion in accordance with IS:1608*, having a gauge length equal to $5.65\sqrt{A}$, where A is cross sectional area of the test piece.

7.1.2 The cold bend test piece 250 mm x 32 mm sq. with corners rounded off with 1.6 mm radius, shall be machined from positions adjacent to tensile test piece.

7.1.3 Charpy Impact test piece shall be of square section, 10 mm x 10 mm,



in accordance with IS:1499**. The depth of 'U' notch shall be 5 mm.
(SEE FIG.1)

7.2 Tensile Test:

Tensile test shall be carried out in accordance with IS:1608.
Tensile strength, yield stress and percentage of elongation obtained
from the test piece shall be as follows:-

	<u>Category-A</u>	<u>Category-B</u>
7.2.1 Tensile Strength	570 N/sq.mm (Minimum)	650 N/sq.mm (Minimum)
	685 N/sq.mm (Maximum)	800 N/sq.mm (Maximum)
Yield Stress	Not less than 50% of Tensile Strength.	400 N/sq.mm (Minimum)
Elongation	Minimum of 21% and 17% corres- ponding to 570 and 685 N/sq.mm tensile strength respectively.	18% Minimum
Reduction in Area after fracture % min.	-	60%

7.2.2 Intermediate elongation shall correspond to tensile strength occurring
within the permissible range.

7.3 Cold Bend Test:

Cold bend test piece (7.1.2) shall be bend cold by direct pressure
from a tool 50 mm wide and having 50 mm diameter at the thrust end, until
the sides of the test piece are parallel. The test piece shall not show any
sign of fracture.

7.4 Charpy Impact Test:

Charpy Impact (U-Notch) test can be carried out in lieu of cold bend
test in accordance with IS:1499. The minimum impact strength obtained shall
be:-

<u>Condition</u>	<u>Category-A</u>	<u>Category-B</u>
Normalised	KU 20J	-
Hardened and tempered.	KU 35J	KU 40J

* Method of Tensile Testing of Steel product.

** Method for Charpy Impact Test (U-Notch) for metals.



8. TEST BY CHEMICAL ANALYSIS:

8.1 The sample shall be taken for analysis by the Purchaser or the Inspecting Officer from one axle from every cast, or from one axle in every 60 in case there are more than that number in the cast or as specified in clause 6.2.2 if less than 15 axles are made from one cast. The chemical analysis shall be carried out in accordance with IS:228.

9. OTHER TESTS:

9.1 Magnetic Particle Test:

All axles (in proof machined or fully machined and heat treated condition) shall be tested by the Magnetic Particle Method both in longitudinal and circular magnetisation shall not reveal any harmful surface defects. The axles revealing harmful surface defects shall be rejected.

9.2 Ultrasonic Test:

All axles conforming to the stipulation of clauses mentioned above shall be subjected to Ultrasonic test and those passing the test shall be accepted. The method of testing and acceptance standards shall be as given in Appendix-A.

9.3 Microscopic Examination:

9.3.1 The transverse section of the gripping portion of tensile test piece shall be examined under microscope. The test piece of Category-A axle in normalised condition shall generally show well defined uniform fine grained structure comparable with ASTM grain size No.8 and shall not be coarser than grain size No. 6.

The test piece of Category-A axles in hardened and tempered condition and Category-B axle shall show well defined fine tempered martensite structure and shall not show undesirable ferrite patches.

9.3.2 Longitudinal section of the gripping portion of tensile test piece on microscopic examination shall not show any banding.

9.3.3 A specimen, representing each size classification per cast and per heat treatment batch shall be selected for microscopic examination from the tensile test specimen. The specimen for microscopic test shall be cut from the large undistorted portion of the tensile test specimen in such a way as will give a face transverse to the axis of the axle.

9.4 Macro Examination:

9.4.1 Macro-examination shall be conducted on the transverse cross section of the representative sample cut from the test piece prolongation (extra length) of the axle selected as per clause 6, by deep etching in 50% hydrochloric acid. The section of the sample if taken from the axle shall be from the thickest portion.

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9.4.2 Sample shall not show presence of harmful defects such as remnant of piping, harmful segregation and non-metallic inclusions etc.

9.4.3 The sampling plan for macro examination shall be one test per cast per heat treatment batch.

10. ADDITIONAL TESTS:

10.1 If so desired by the Purchaser/Inspecting Officer, sulphur prints of the transverse sections cut from the test prolongation (extra length) or the axle selected as per clause 6 shall be carried out to ensure freedom from sulphur segregation and other defects. The sample shall be free from harmful segregation, inclusions etc.

11. RE-TESTS:

11.1 Should a tensile, cold bend test or impact test piece fail to meet the requirements of cl. 7 or micro-structure be found unsatisfactory and the purchaser or the Inspecting Officer considers that the fractured test piece or its micro-structure does not fairly represent the quality of the batch, two further test pieces shall be taken for repeating the test in respect of the same batch in which failure occurred. As an alternative to double re testing or should either retest fail to meet the requirements, the batch of axles together with the test samples, may, with the agreement of the Purchaser or Inspecting Officer, be re-heat-treated and re-submitted for testing in accordance with clause 6.

11.2 In case of axles re-heat-treated to meet the requirement of Ultrasonic test (longitudinal Penetration), as stipulated in Appendix A, clause A-6.1.5, they shall be resubmitted for testing in accordance with clause 6.

11.3 The axle shall not be re-heat-treated more than twice over and above the original heat-treatment.

12. MACHINING OF AXLES:

12.1 Axles shall be delivered rough turned or machined to drawings as required by the Purchaser. The rough turned/machined portion shall be concentric with the unmachined portion of the axle. The axles shall be free from injurious tool marks.

12.2 Axles shall be roller burnished at portions, if so specified on the relevant drawings, by the following process:-

12.2.1 Turned with fine feed and subsequently burnished by revolving hardened rollers.

12.2.2 Turned, ground and then burnished by revolving hardened rollers.

12.2.3 Turned with a skin cut using a broad-faced spring tool with a suitable lubricant and then burnished by revolving hardened rollers.

12.3 Lathe Centres:

Permanent lathe cent smooth and accurately machined and truly in



line with the centre of the axle, shall be provided in the ends of the axle. The centres shall be of the form shown in figure below. The included angle shall be 60 deg. unless otherwise specified.

----- 377 FIG. 2.) -----

13. SAMPLE AXLE:

13.1 A sample axle of each kind, finished complete, shall be approved by the Purchaser or the Inspecting Officer before the general execution of the order is proceeded with and the whole supply must be in accordance with the approved sample (s).

14. INSPECTION:

14.1 The Purchaser or the Inspecting Officer shall have free access to the works of the manufacturer at all reasonable times; he shall be at liberty to inspect the manufacture at any stage and to reject any material that does not conform to the terms of this Specification. The Purchaser or the Inspecting Officer shall have the power to mark or deface in some easily distinguishable manner all rejected axles, but they shall not be marked or defaced in such a manner as to render them unsaleable to other parties.

14.2 Power shall be reserved to the Purchaser or the Inspecting Officer to be present at, and take such part as he thinks fit, in all tests such as macroscopic examination, sulphur print test and microscopic examination etc. which the manufacturer may carry out for his own purpose or under the terms of this specification, both of the axles and of their materials, in all stages of manufacture.

15. TESTING FACILITIES:

15.1 The manufacturer shall supply the material required for testing free of charge, and shall, at his own cost, furnish and prepare the necessary test pieces, and supply labour and appliances for such testing as may be carried out in his own premises in accordance with this specification. Failing facilities at his own works for making the prescribed tests, the manufacturer shall bear the cost of carrying out the tests elsewhere.

16. GUARANTEE:

16.1 The axle shall be guaranteed by the supplier for four years against any defect imputable to the manufacture and not revealed during acceptance at the works.

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16.2 This period shall be calculated from the end of the month stamped on the axle.

16.3 In case of axles for new vehicles, the delivery date of the vehicles to which they are fitted shall be regarded as the date of delivery of axles.

16.4 Axles, which, during the guarantee period show defects making them either unfit for service or reducing their period of service, will be rejected.

16.5 When two axles from the same cast have failed in service, or when more than 5% of the axles from the same cast revealed defects within the above conditions the Purchaser shall have the right to reject the whole of the cast.

16.6 Rejected axles shall be made available to the supplier with a view to their replacement or reimbursement.

17. PROTECTION AND PACKING:

17.1 After inspection and approval, the axles shall be carefully protected with three coats of bituminous paint to IS:152* or with any other approved anti-rust compound, easily removable with kerosine or white spirit, allowing sufficient drying time between each coat. After the coat has dried, the journals, wheel and gear seats, wherever relevant, shall be covered with water proof paper and gunny cover tied with jute string. The journals, wheel and gear seats shall, then be further protected with well fitted and tightly bound wood lagging or by any other approved material. The wood used shall be dry and shall be held in place either by hoop iron bands or by steel wire not less than 1.6 mm in grooves cut in the periphery of the protecting wood pieces.

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17.1.1 For roller bearing axles; the ends shall be protected by mild steel plate about 5 mm thick and 25 mm larger than journal diameter screwed or secured in position by a method approved by the Purchaser or the Inspecting Officer.

17.2 Axle middle except for gear seat locations of finished axles shall be painted with one coat of zinc chromate primer to IS:2074* followed by a second coat of black Japan to IS:311**, proper time for drying shall be allowed between the coats. All parts must be cleaned and free from rust and moisture at the time the coating is applied.

* Ready mixed paint, brushing, staining, lead free, for general purpose, coloury as required.

* Ready mixed paint, red oxide-zinc chrome, Priming.

** Black Japan:- Type A, B & C.

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APPENDIX-1
(Ref : Clause 9.2)

Ultrasonic Inspection of New rough turned Axles for Railway Rolling Stock (Traction & Trailing) - Method of Testing and Acceptance Standard.

A-1 SCOPE

The method of testing and the acceptance standard set out hereunder shall be used to evaluate all types of new axles of railway rolling stock (locomotive, EMU, Carriage & Wagon) as stipulated in the relevant IIS Specification for axles.

A-2 PURPOSE

The axles shall be evaluated for

A-2.1 End-face to end-face penetrability

A-2.2 Detecting discontinuities which may be harmful to the axle service.

A-2.3 Longitudinal discontinuity detection

A-3 EQUIPMENT

A-3.1 The instrument used must be of the pulse echo type.

A-3.2 The instrument shall be operated at 2 to 2.5MHz for penetrability test, transverse discontinuity detection and longitudinal discontinuities.

A-3.3 The instrument may be used with various types of transducers namely, Bariumtitanate, PZT, Lead metaniobate etc. of 20 to 26 mm dia or equivalent area probe, at the option of the axle manufacturer. Other types and sizes of transducers of similar response capability as those described may be used with the approval of the inspecting authority.

A-4 STAGE OF INSPECTION

A-4.1 The axles shall be ultrasonically inspected after the stipulated heat treatment and machining of the end faces to a finish better than 6.35/ m.

A-5 INSTRUMENT SENSITIVITY

A-5.1 The instrument sensitivity shall be adjusted with the help of a reference block manufactured from an axle forging in the normalised condition, and conforming to the relevant IIS specification for axle. The block shall be approximately 406 mm long. The two end faces shall be machined parallel to a finish better than 6.35/ m. The reference standard shall be a flat-bottom 3.2 mm dia. hole drilled perpendicular to one of the end faces at mid-radius to a depth of about 25 mm such that the flat bottom of the hole shall be located at a distance of 381 mm from the other end face.

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:2:

A-5.2 Using the reference block the sensitivity of the equipment shall be adjusted to give an echo amplitude of about 12.5 mm from the reference hole when probed from the opposite end face.

A-6 SCANNING

A-6.1. Longitudinal penetration (end-face to end-face)

A-6.1.1 With the sensitivity setting, as described in clause A-5 above, axles when scanned manually or by automated inspection techniques from one end face, shall produce a minimum of 25 mm back reflection from the opposite end face.

A-6.1.2 The scanning shall be done from both the end faces of axles.

A-6.1.3 Axles which do not meet the above requirements shall be rejected. However, the manufacturer may, by mutual agreement with the Purchaser/Inspecting Officer, re-heat-treat the axles and re-submit for this test. Re-heat-treated axles shall conform to the stipulations of "re-test" clause in the relevant IRS Specification for axles.

A-6.2 Discontinuity Detection

A-6.2.1 With the sensitivity setting as described in Clause A-5 the instrument shall be capable of detecting in reference axle pieces, flat bottom holes of sizes and at distances indicated in the following table:-

Distance in mm	380	750	Over 750
Dia. of flat bottom hole(mm)	3.2	6.4	9.5

A-6.2.2 The depth range of the instrument shall be set to cover half the length of axle under test. The axles shall be scanned alternatively from both the end faces covering the maximum end face area possible either by manual or automated inspection techniques.

A-6.2.3 The axles shall not show any discontinuity indication exceeding the levels obtained from reference flat bottom holes of sizes for the various zones, as indicated below:

Permissible Size of Discontinuity (Max.)

Zone	I	II	III
F.B. Hole (dia)	3.2 mm	6.4 mm	9.5 mm

Note:- Please see fig. 1a, 1b & 1c for identification of the zones.

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A-6.2.4 The amplitude of all discontinuity indications shall be evaluated with respect to distance from the test surface by utilising either an in-built Distance Amplitude Correction electronic device if provided in the instrument or by establishing Distance Amplitude Curves (DAC) for the specific instrument and transducer as described in Clause A-7 below.

The gain/attenuator control setting shall be the same as used for the respective zone for establishing DAC.

A-6.2.5 Axles under test shall be rejected if the amplitude of any discontinuity indication exceeds the levels indicated in Clause A-6.2.3, read with the Corresponding DAC for the respective zone.

A-6.3 Longitudinal discontinuity detection.

A-6.3.1 With sensitivity setting as described in Clause A-5 above, axles when scanned manually or by automated inspection technique by placing the normal probe, fitted with perspex piece having diameter of curvature to match the diameter of the axle, on the body of the axles, shall not produce any intermediate signal in between initial and back signal obtained from the other end of the diameter of the axle, suggestive of longitudinal discontinuity. (The perspex thickness should be such that the back wall echo should not be less than full screen height).

The axle shall be tested throughout the length and no intermediate echo should appear between initial and back wall echo.

A-6.3.2 Axles which do not meet the above requirement shall be rejected.

A-7 Distance Amplitude Correction (DAC)

A-7.1 The amplitude of ultrasonic indication for a given discontinuity size varies with the distance from the test surface. It is, therefore, necessary to have either an in-built electronic distance amplitude correction device or establish DAC for the particular type of axle. Because the distance amplitude relationship is influenced primarily by the ultrasonic equipment and transducer, it is necessary to establish the DAC for the specific equipment and transducer combination used.

A-7.1.1 For establishing DAC for the three zones, indicated in fig.1, four or more reference axle cut pieces for each zone with progressively varying lengths and with the relevant size of flat bottom hole drilled perpendicular to one of the end-faces on each piece may be used and the distance amplitude curve drawn for each zone for the particular type of axle to be tested. However, where more than one type of axle is to be tested, a common DAC could be established for axles having close geometry.

A-7.1.2 An alternate method would be to start with an axle piece equal to half the length of the axle under test with the three sizes of flat-bottom holes, viz. 3.2, 6.4 and 9.5 mm dia. respectively, drilled perpendicular to one of the end-faces and at mid-radius suitably dispersed around the centre. Scanning should be done from the other end face and the amplitude

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of the indications noted down. Scanning shall be continued after progressively slicing the axle from the testing end. From the amplitude indications and the distance, the DAC could be drawn for each zone, and for the relevant reference holes.

A-7.1.3 An example of establishing a typical DAC as per above two methods is given in fig. 2a & 2b.

A-8 REJECTION

A-8.1 For end-face to end-face penetrability test, see clause A-6.1.1 and clause A-6.1.3.

A-8.2 For discontinuity test, see clause A-6.2.5.

A-8.3 For longitudinal discontinuity see Cl. A-6.3.2

A-8.4 Spurious echoes attributable to the geometry of the axle or ground noise of the instrument shall not be a cause for rejection.

A-9 MARKING:

Axles that conform to the above ultrasonic stipulation shall be stamped 'UT' on the end face which contains the axle identification marks, adjacent to heat number or Sl.No.



Specification No. 15
Tungsten Carbide Tamping Tool (TCTT) for on Track
Tamping Machines



SPECIFICATION No.TM/HM/6/320 (Rev-2-2016)

**SPECIFICATION OF TUNGSTEN CARBIDE TAMPING TOOL
(TCTT) FOR ON TRACK TAMPING MACHINES**

1.0 Scope and Technical eligibility:

This specification covers technical requirements of manufacture and supply of tungsten carbide tamping tool(s), hereinafter referred as "TCTT", for high output on track tamping machines deployed over Indian Railways.

- 1.1 The specification has been drawn to stipulate the performance and quality requirements of the TCTT, in an objective manner without reference to any specific manufacturer. If a manufacturer feels that his TCTT can generally meet the performance and quality requirements of the TCTT but does not fully satisfy a particular clause of the specification, then he shall furnish clause-wise details of deviations along with remarks in his offer.
- 1.2 The manufacturer should be aware of various types of tamping tool(s) used on tie tamping machines in operation on Indian Railways to avoid fitment and functional problem at later stage.
- 1.3 Following manufacturer or his authorized agent will be technically eligible for participating in the said tender.
 - Original Equipment manufacturer (OEM) of Tamping Machine on which TCTT is to be provided.
 - Manufacturer, who has successfully supplied tools equal to minimum 35% of tendered quantity in last ten calendar years and current calendar year to Indian Railways or operators on other world Railways with satisfactory performance. Proof of satisfactory performance should be submitted from at least two such clients in case of supply to operators on Railways other than Indian Railways.
- 1.4 New manufacturer who does not meet the above two criteria but who agrees to abide by the specification and has the Testing facilities as specified in the clause 13.0 and Quality Control System as specified in clause 14.0 respectively of the document. Offer of such new manufacturer shall be considered for developmental order only.

2.0 Technical capability of TCTT:

During tamping the tool should be able to withstand:

- a) Vibration frequency (minimum): 35 HZ.
- b) Squeezing pressure of (minimum): 135 Kg/sq cm.



3.0 Dimensional requirement of TCTT:

The position, type and number of tamping tools for CSM, Tamping express and UNIMAT Tamping Machines on Indian Railways are shown in Annexure-I/1 & I/2. The tools are provided as per following drawings

Type of Machine	Used for	Drawing of Tamping tool
Tamping Express (09-3X)	Plain track	RDSO/TM/15A/16 (32 no. in a set) RDSO/TM/15E/16 (16 no. in a set)
CSM & Duomatic (Old models)	Plain track	RDSO/TM/14A/16 (16 no. in a set) RDSO/TM/14B/16 (04 no. in a set) RDSO/TM/14C/16 (04 no. in a set) RDSO/TM/14D/16 (08 no. in a set)
CSM (New model CSM-955 on ward machines) & Duomatic	Plain track	RDSO/TM/15A/16 (08 no. in a set) RDSO/TM/15B/16 (08 no. in a set) RDSO/TM/15C/16 (08 no. in a set) RDSO/TM/15D/16 (08 no. in a set)
UNIMAT-2S & UNIMAT -3S	Tamping point & x-ing	RDSO/TM/01A/16 (08 no. in a set) & RDSO/TM/01C/16 (08 no. in a set)
UNIMAT-4S	-do-	RDSO/TM/ 01A/16 (08 no. in a set) & RDSO/TM/ 01B/16 (08 no. in a set)

The drawings are attached as Annexure II/1 to II/12. The manufacturer should note that the drawing is for general guidance purpose. Other minor deviations are also acceptable, but following should be ensured.

- The fixing arrangement of tools with the tamping bank should be same or similar so that no modification in the tamping bank is required.
- Length of TCTT and the size of spade should be within the range given in the drawings so that it can be fit in the tamping bank without any infringement.
- Thickness of carbide chips should not be less than 3 mm.

The TCTT shall have suitable shape for easy penetration into the ballast and it should be strong enough to meet the functional requirement for its entire life.

4.0 Steel for TCTT:

4.1 TCTT shall be manufactured from chromium molybdenum /nickel chromium molybdenum alloy steel or any other special quality steel serving the functional requirement and having technical capability as mentioned in different clause of this specification. The mechanical properties of such steel should however meet the following minimum requirement:

- Tensile strength (min) - 800 N/mm²
- 0.2% proof stress (min) - 550 N/mm²
- Elongation %min - 10 %



The manufacturer should give the Grade (Indian standard or equivalent International standard as applicable) and corresponding parameters of steel used if required by

the purchaser or the inspecting official. Proper treatment to steel in shank portion which is fitted to tamping arm of tamping bank should be given to prevent its wear and tear during service life of TCTT.

4.2 **Chemical composition:**

The steel should be of quality and composition such that proper brazing/joining with tungsten carbide inserts is possible. The manufacturer shall however give the Grade (Indian standard or equivalent International standard as applicable) of steel and chemical composition of each cast of the steel and batch of forged and heat-treated TCTT, whenever required to do so by the purchaser or the inspecting official.

5.0 **Manufacturing process for TCTT with respect to tungsten carbide inserts:**

5.1 The mechanical properties of tungsten carbide inserts should meet the following minimum requirement:

- Hardness (min): HRA 84/HRC 65 or its equivalent in any other recognized scale of measurement.
- Density (min): 13.2 g/cm³.
- Transverse rupture strength (min): 2600 N/mm²
- Ultimate compressive strength (min): 2600 N/mm²

The manufacturer should give the above details of tungsten carbide inserts used if so required by the purchaser or the inspecting official. Manufacturer shall also provide the test certificates including testing procedures/methodology and reference technical documents to the purchaser/inspecting authority in this regard. Suitable size of the tungsten carbide inserts shall be used for higher impact, wear resistance and better brazing.

5.2 Tungsten carbide inserts shall be joined with the steel spade of TCTT by brazing or other tried and proven method. The Brazing/Joining should be strong enough to meet the service life of the tamping tool as in clause 11.2. Failure of brazing or joint shall be treated as failure of tamping tool for all purpose as per clause 11.3.

5.3 TCTT should be of such design that it can be removed easily from tamping arm without hammering. If design is such that it requires external device for removing it from tamping arm, one such device should be supplied with each set of TCTT and rate should be quoted accordingly.

5.4 The forged TCTT should have the desired mechanical properties throughout the cross section of the component.

6.0 **Quality of product:** The TCTT shall be free from surface and internal forging defect i.e. laps, seams, bursts, cracks, pits, porosity, improper edges etc. which may impair the end use. The TCTT shall be supplied to the prescribed dimensions and tolerances as mentioned at clause 3.0.



7.0 Branding: All TCTT shall be branded with TCTT manufacturer's code, batch no., month and year of manufacture. From the batch no. of the finished TCTT, the process flow and composition of raw materials should be identifiable.

8.0 Testing of TCTT:

The consignment should be supplied in identifiable batches where testing for mechanical properties of sample will represent the quality of complete batch. The manufacturer should give the certificate that the batch has same mechanical properties and such certificate should be supported by relevant documents.

Each TCTT of the consignment shall be checked for their dimensional correctness as per clause 3.0.

Out of each such batch of consignment, one No. of TCTT for each 500 tools or part thereof will be subjected to various mechanical tests for ascertaining minimum standard mentioned in clause 4.0 and clause 5.0. The test shall be conducted as per relevant IS code or equivalent international code. The test shall be conducted in the manufacturer laboratory or in any other reputed laboratory as per the decision of the purchaser or inspecting official at the cost of the supplier/manufacturer. The supplier /manufacturer shall accordingly supply required additional tools for testing with each batch of consignment. Tools from the batch will be randomly picked up by the inspecting official for testing. Care should therefore be taken that while making the batch, the set of supplied tools in the consignment are not disturbed by such random selection of tools for testing .The cost of these additional sample tools used for testing shall also be borne by the supplier/manufacturer and should be accounted for while quoting the rates.

The inspecting official may conduct non-destructive test for ascertaining mechanical properties on other tools of the consignment.

9.0 Inspection:

The TCTT shall be inspected by Indian Railways' official(s) to ensure supply as per stipulation in this specification. Certificate of inspection and approval for dispatch of TCTT shall be issued by the nominated officer(s) as per Annexure-III For this purposes the supplier/manufacturer shall provide all necessary facilities including equipment and material required for testing free of cost. He shall also produce all relevant documents/certificates in respect to properties, source and quality etc. of the material. Copies of the Maker's certificate guaranteeing the performance of the TCTT should be shown to the inspecting official and shall be supplied in duplicate along with the delivery of each consignment.

10.0 Acceptance criteria:

10.1 If any sample selected from the batch, as mentioned at clause 8.0, fail to meet the requirement given in different clause of this specification, two further samples for each 500 tools or part there of shall be selected from same batch of consignment. The batch shall be considered to conform to the requirements if test results of



additional tools are satisfactory. This test shall be conducted at the cost of supplier/manufacturer. Even in case the tools confirm to the specification in this test but become unserviceable in the process, the cost of tool/tools shall be borne by the supplier/manufacturer and additional tool/tools will be supplied by them free of cost to complete the set. The manufacturer shall give a certificate that the extra tools so supplied in lieu of tested tools confirms to the specification. If any of the additional tools tested, fails to confirm to the specification, the batch shall be treated as rejected.

- 10.2 The components shall be carefully protected against corrosion. Packing of the TCTT must withstand the weight of the tool and tungsten carbide chips must be protected to prevent damage while handling. Holding area must be oiled with rust preventing oil.

11.0 Performance monitoring of TCTT:

- 11.1 Service Life of each TCTT shall be taken as the Number of insertions before it becomes unserviceable. Set of tools for monitoring the performance shall be taken as a lot of 16 no. tool for one UNIMAT, 32 no. tool for one CSM/DUO and 48 no tools for one Tamping Express machine.. Average life of TCTT in a set shall be calculated as per formula given below:

$$\text{Average service life of TCTT in a set} = \frac{\text{Sum of service life of each TCTT in the set}}{\text{No of TCTT in the set}}$$

- 11.2 The average service life of TCTT in a set shall be guaranteed for tamping of minimum 2,50,000 insertions .However minimum service life of any one TCTT shall not be less than 50,000 insertions.

- 11.3 A TCTT shall become unserviceable when one or more than one of the following condition occurs:

- i) The effective reduced area of TCTT blade due to wear becomes less than 80% of the original surface area of the TCTT supplied .It will be termed as failure of TCTT.
- ii) Chipping off of more than 50% of carbide inserts, breakage of blade or arm of TCTT.

Such failures may occur under following conditions:

- a) Tungsten carbide inserts should not chip out and Blade or Arm of TCTT should not break during normal tamping work or by their occasional hitting with concrete sleepers, TCTT becoming unserviceable due to such reasons will be covered under warranty and will be termed as failure of TCTT.
- b) However the breakage of the Blade, Arm of TCTT or carbide inserts on the Blade due to direct hitting on hard objects hidden in ballast or otherwise like



rail foots, rail clamps, fishplates, concrete foundation etc. making the tool unserviceable shall not be covered under warranty and shall be termed as failure not attributed to failure of TCTT.

The performance of TCTT and reason for TCTT becoming unserviceable should be recorded by in-charge of the machine in Performa given at clause 11.7. The same shall be reviewed with the supplier or his nominee once in three months approximately or at interval as agreed with the supplier and reason ascertained and jointly recorded. In case of any dispute/disagreement, between supplier or his representative and machine operator /in-charge, decision of Dy Chief Engineer /Track Machine of Railway shall be final.

11.4 The TCTT may be required to be removed / replaced due to following reasons:

- TCTT becomes unserviceable for reasons given in clause 11.3 above. In such case, the action as detailed in clause 11.5 may be taken and average service life of set of TCTT may be calculated accordingly.
- If TCTT is replaced before it achieves its warranted average service life, due to failure of tamping arm/arms or tamping bank itself or due to POH/IOH or other maintenance of Machine which is termed as premature replacement, The action as detailed in clause 11.6 may be taken and average service life of set of TCTT may be calculated accordingly.

11.5 For calculating the average service life of TCTT in a set due to TCTT being unserviceable, following guideline shall be followed:

i.) If any TCTT becomes unserviceable before achieving minimum service life of 50,000 insertions due to:

- Failure of TCTT as defined at clause 11.3(i) and (ii) above: It shall be replaced free of cost by the supplier. The average service life of TCTT in a set for calculating performance shall however be taken on the basis of first tool and not the replaced tool.
- Failure not attributed to failure of TCTT as defined at clause 11.3 (i) and (ii) above: Railway shall replace the tool at its own cost and the performance of that tool shall not be taken for calculating Average service life of TCTT.

ii) If any TCTT becomes unserviceable between service life of 50000 insertions and 2,50,000 insertions due to:

- Failure of TCTT as defined at clause 11.3(i) and (ii) above: Railway shall replace the tool at its own cost and the performance of that tool shall be taken for calculating Average service life of TCTT.
- Failure not attributed to failure of TCTT as defined at clause 11.3(i) and (ii) above: Railway shall replace the tool at its own cost and the performance of that tool shall not be taken for calculating Average service life of TCTT.

iii). If any TCTT becomes unserviceable after service life of 2,50,000 insertions:



- Failure of TCTT as defined at clause 11.3(i) and (ii) above: Railway shall replace the tool at its own cost and the performance of that tool shall be taken for calculating Average service life of TCTT.
- Failure not attributed to failure of TCTT as defined at clause 11.3(i) and (ii) above: Railway shall replace the tool at its own cost and the performance of that tool shall be taken for calculating Average service life of TCTT.

11.6 For calculating the average service life of TCTT due to premature replacement of TCTT as defined at clause 11.4 above following guideline should be followed:

- In case of tamping arm/arms failure, the TCTT should be put back after that arm is repaired.
- In case of tamping bank failure, the complete set which is in use should be put back after repair or replacement of tamping bank.
- In case of POH / IOH or other maintenance work of machine which is likely to keep the machine idle for long duration, railway may decide to shift the complete set to other similar machine

In all such case, the insertions for calculating service life of each TCTT will be counted in continuation of previous insertions recorded at the time of premature replacement.

11.7 Measurement/observation on performance of TCTT shall be recorded in the three Performa given below:

I. PERFORMA A. :INITIAL OBSERVATION

- Machine NO: _____
- Railway/Division/Section : _____
- Date of providing the tool: _____
- Sketch showing position of different tools marking each tool with different identification No (Similar to Annexure-I) : _____

Tool No.	Size of Blade			Area of carbide insert (sq mm)	Remarks	Signature	
	Width (mm)	Height (mm)	Area (sq mm)			Machine in-charge	Supplier's representative

In case the complete set of TCTT is shifted to other machine due to premature replacement as defined at clause 11.4, the TCTT details at the time of replacement shall be recorded again in the similar Performa. It shall be ensured that the Tools are provided at the same position as in previous machine.



II. PERFORMA-B OBSERVATIONS DURING SERVICE:

Machine in-charge should record observation in this Performa at every 30 days interval (approximately)

Date of inspection: _____

Machine NO: _____

Railway/Division/Section: _____

Tool No.	Total No of insertions	Size of Blade				carbide inserts performance		Remarks if any	Machine in-charge	Signature of supplier's representative with date.
		Width (mm)	Height (mm)	Area (sq mm)	% worn out w.r.t original area	Area of carbide inserts	% of original area			

The observation recorded shall be jointly reviewed with the supplier or his authorized representative at 3 months interval approximately or at interval as jointly agreed between railways and the supplier. However, if the supplier or his representative fails to attend the joint inspection at this frequency or on pre-decided date, the measurement taken by the machine supervisor shall be final. In case of any dispute/disagreement, between supplier or his representative and machine operator /in-charge, decision of Dy Chief Engineer /Track Machine of Railway shall be final.

- In case tool is prematurely replaced for reasons specified in clause 11.4 and action as specified in clause 11.6 is taken, the same should be recorded and insertions should accordingly be accounted.
- If at the time of measurement or at any time between two measurements, the tools are found to have reached the failure limit or become unserviceable, the same should be mentioned here and detail of all such failed tools should be recorded in Performa-C given below.

III. PERFORMA-C OBSERVATION AT THE TIME OF FAILURE OF TCTT :

Dimension of all tools when it fails for reasons specified in clause 11.3, shall also be recorded in this Performa. This shall also be reviewed with supplier or his representative and jointly signed by Machine operator/in-charge and supplier's representative while reviewing entry in Performa-B

Tool No.	Date of failure of tool.	Total No of insertions at the time of failure	Size of blade				carbide inserts position		Remarks	Signature	
			Width (mm)	Height (mm)	Area (sq mm)	% worn out w.r.t original area	Area of carbide inserts	% of original area		Machine in-charge	Supplier's representative with date.



- This table will thus contain details of failure of each tool in the set. Reasons for replacement, clearly specifying whether it is attributed to manufacturer failure or Railways failure, shall be entered in remark column.
- Average service life of TCTT in a set will accordingly be calculated on the basis of entry in this Performa.

11.8. Whenever the failure of any TCTT occurs, the supplier/manufacturer or his authorized representative shall be informed in writing as early as possible and preferably within seven days of such failure for joint inspection. The supplier/manufacturer or his authorized representative should come for such inspection within 3 months of intimation being sent to them. Railway reserves the right to replace this tool with another tool immediately after failure so that the progress and quality of work is not hampered. Railway shall be liable to preserve such failed tools for three months from the date of sending intimation for joint inspection after which Railway reserves to dispose the tools at its discretion. In case of failure to report within this period, the measurement taken by Railway representative and cause of failure so ascertained shall be binding on the supplier/manufacturer. The cause of failure shall be recorded in Performa B and C as given under clause 11.7. In case there is dispute on cause of failure during joint inspection, the decision of Dy CE/Track machine of the railway shall be final and binding.

11.9 Required manual/instructions for installation, removal and upkeep of the TCTT shall be supplied by the manufacturer.

12.0 **Warranty:**

The TCTT shall be warranted for the average service life specified in clause 11.2. This warranty shall expire 24 (twenty four) months after delivery at ultimate destination in India or eighteen months from the date of fitment on machine, whichever is earlier

13.0 **Testing Facilities:**

The manufacturer, preferably, should have their own equipment/arrangement for conducting following tests. If the firm does not have the arrangement of their own, they must confirm a tie up with some reputed (NABL accredited or accredited by other international body like APLAC, MRA, ILAC etc) laboratories for conducting these tests.

- a) Chemical analysis of steel and facilities for the estimation of Silver brazing alloys..
- b) Universal Testing Machine of adequate capacity for tensile yield, elongation and bend tests.
- c) Metallurgical Microscope with magnification up to 500x. for Preparation of metallographic test specimen.



- d) Minimum one No. Magna flux crack detector of adequate amperage for longitudinal and circular magnetization of the TCTT.
- e) Brinell hardness Tester with standard calibration test pieces. for the inspection of hardness on Rockwell (A scale or equivalent scale) of Tungsten carbide inserts, welding and TCTT.
- f) Dedicated proof load test set-up with capacity up-to 25t and with facility of recording load-deflection characteristics of the product.
- g) All required measuring instruments / gauges in adequate number should be available i.e. micrometers, dial gauges, vernier calipers, GO, NO-GO gauges for all-important dimensions of the product.

14.0 Quality control requirements:

The manufacturer of TCTT must be either ISO certified or they must have a system to ensure a uniform and good quality product. For this, below given system or some alternative system as suitable to ensure quality may be followed by the manufacturer:

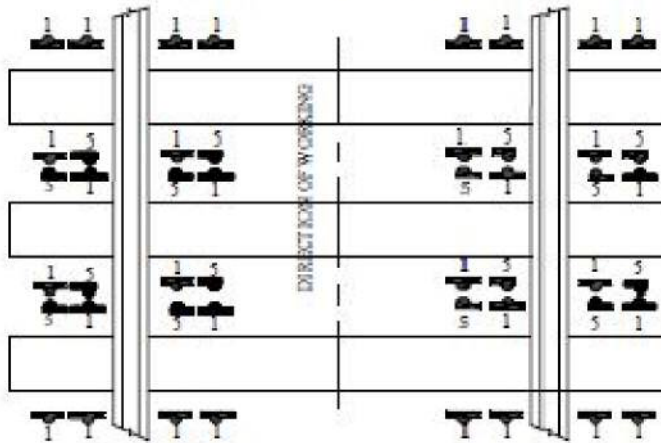
- a) There should be a system to ensure the traceability of the product from raw material stage to finished product stage. This system should also facilitate to identify the raw material composition from the finish product stage.
- b) There is a Quality Assurance Plan for the product detailing various aspects:
 - Organizational Chart
 - Flow Process Chart
 - Stage inspection details
 - Various parameters and to ensure control over them.
- c) The QAP must be provided by prospective vendors as prerequisite for participation in the said tenders .
- d) They should ensure that proper analysis is being done on regular basis to study the rejection at various internal stages and it is documented properly.
- e) They should ensure that prior to release of dies for production it should be dimensionally checked in all respects including its mounting on the forging equipment.
- f) They should ensure that critical inspection of the first forging and last forging of a production run is essentially carried out to ascertain behavior of the dies in operation and product quality.



- g) They should ensure that all the relevant specifications, code; standards are available with the firm.
 - h) Infrastructure and quality control work related with manufacture of Tungsten Carbide Tamping Tool shall be documented and furnished along with tender
 - i) Individual component suppliers should be preferably certified ISO-9001 which include supplier of steel, forging tungsten carbide silver solder brazing and welding operations.
- 15.0 The manufacturer may be following exceeding technical specification, which may be different in order to achieve higher service life of "TCTT". In case of any such deviations, manufacturer shall furnish the reasons of such deviations and also its implication on functional requirement and quality of product.

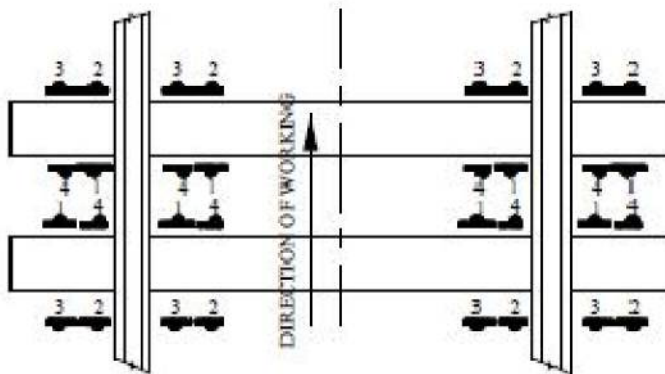


POSITION OF TAMPING TOOLS OF 3-X TAMPING MACHINE



TOOL DESCRIPTION FOR TAMPING EXPRESS (09-3X)		
TOOL	RDSO DRG. NO.	TOTAL NO REQUIRED IN A SET OF 48
1	RDSO/TM/15A/18	32
5	RDSO/TM/15B/18	16

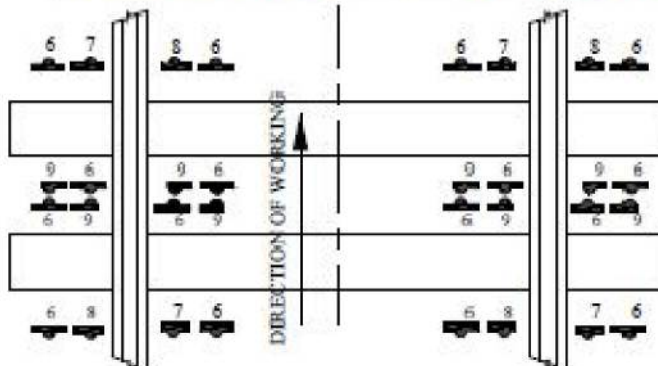
POSITION OF TAMPING TOOLS OF NEW CSM (MODEL CSM-955 ON WARD) & DUO



TOOL DESCRIPTION FOR NEW CSM (MODEL 955 ON WARD) & DUO		
TOOL	RDSO DRG. NO.	TOTAL NO REQUIRED IN A SET OF 32
1	RDSO/TM/15A/18	8
2	RDSO/TM/15B/18	8
3	RDSO/TM/15C/18	8
4	RDSO/TM/15D/18	8

NOTE:
NO. 2 & 4 CAN BE REPLACED BY EACH OTHER

POSITION OF TAMPING TOOLS OF CSM & DUO (OLD MODEL)

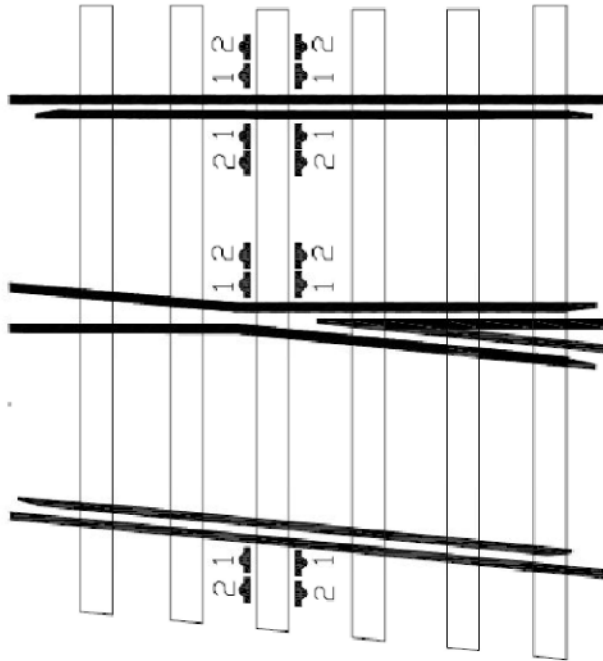


TOOL DESCRIPTION FOR CSM & DUO (OLD MODEL)		
TOOL	RDSO DRG. NO.	TOTAL NO REQUIRED IN A SET OF 32
6	RDSO/TM/14A/18	16
7	RDSO/TM/14B/18	4
8	RDSO/TM/14C/18	4
9	RDSO/TM/14D/18	8

NOTE-
NO. 2 & 4 CAN BE REPLACED BY EACH OTHER

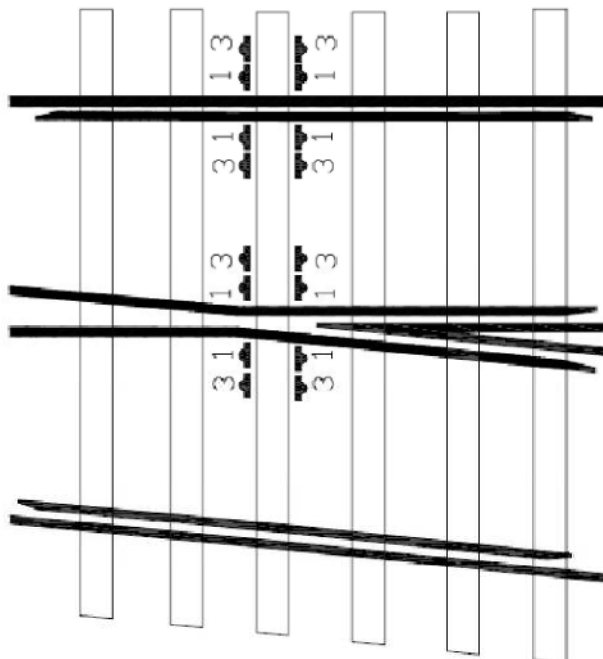


POSITION OF TAMPING TOOLS OF UNIMAT-4S
TAMPING MACHINE



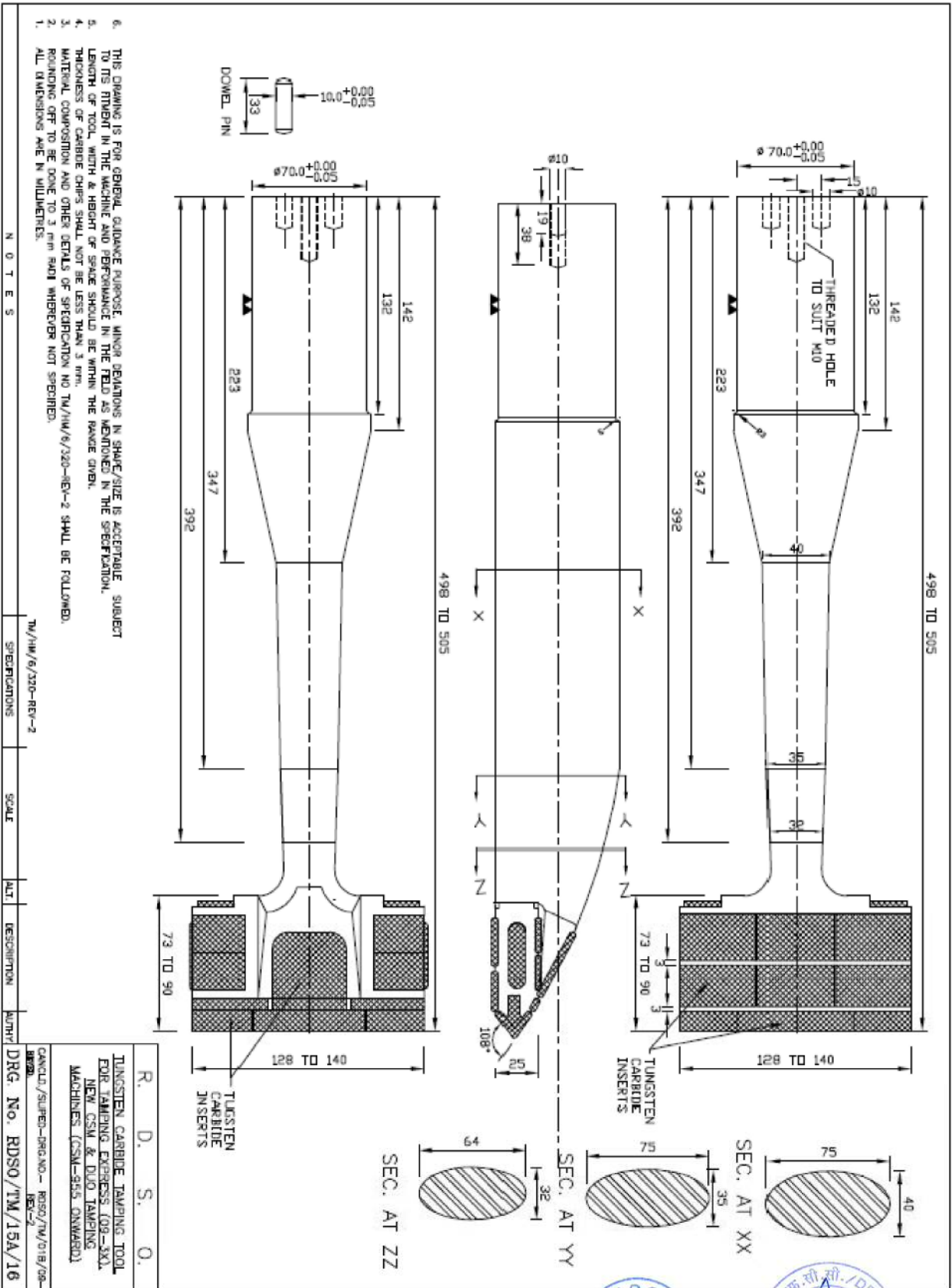
TOOL DESCRIPTION FOR UNIMAT-4S		
TOOL	RDSO DRG. NO.	TOTAL NO REQUIRED IN A SET OF 16
1	RDSO/TM/01A/16	8
2	RDSO/TM/01B/16	8

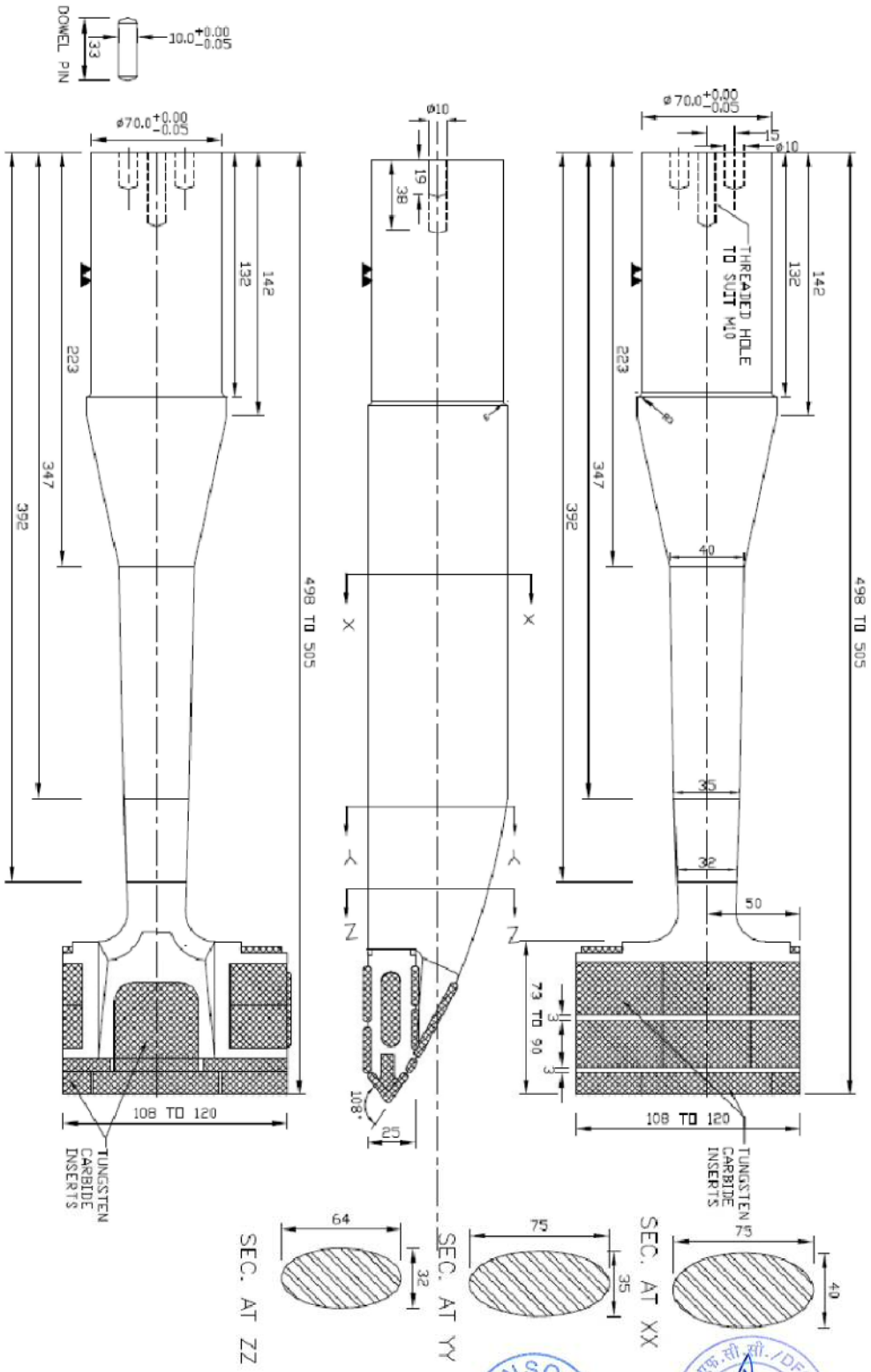
POSITION OF TAMPING TOOLS OF UNIMAT-2S&3S
TAMPING MACHINE



TOOL DESCRIPTION FOR UNIMAT-2S&3S		
TOOL	RDSO DRG. NO.	TOTAL NO REQUIRED IN A SET OF 16
1	RDSO/TM/01A/16	8
3	RDSO/TM/01C/16	8







1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ROUNDING OFF TO BE DONE TO 3 mm RADI whenever not specified.
3. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/HW/6/320-REV-2 SHALL BE FOLLOWED.
4. THICKNESS OF CARBIDE CHIPS SHALL NOT BE LESS THAN 3 mm.
5. LENGTH OF TOOL, WIDTH & HEIGHT OF SPACE SHOULD BE WITHIN THE RANGE GIVEN.
6. THIS DRAWING IS FOR GENERAL GUIDANCE PURPOSE. MINOR DEVIATIONS IN SHAPE/SIZE IS ACCEPTABLE SUBJECT TO ITS FITNESS IN THE MACHINE AND PERFORMANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.

NOTES

TM/HW/6/320-REV-2

SPECIFICATIONS

SCALE

ALT.

DESCRIPTION

AUTHOR

DRG. No. RDSO/TM/15B/16

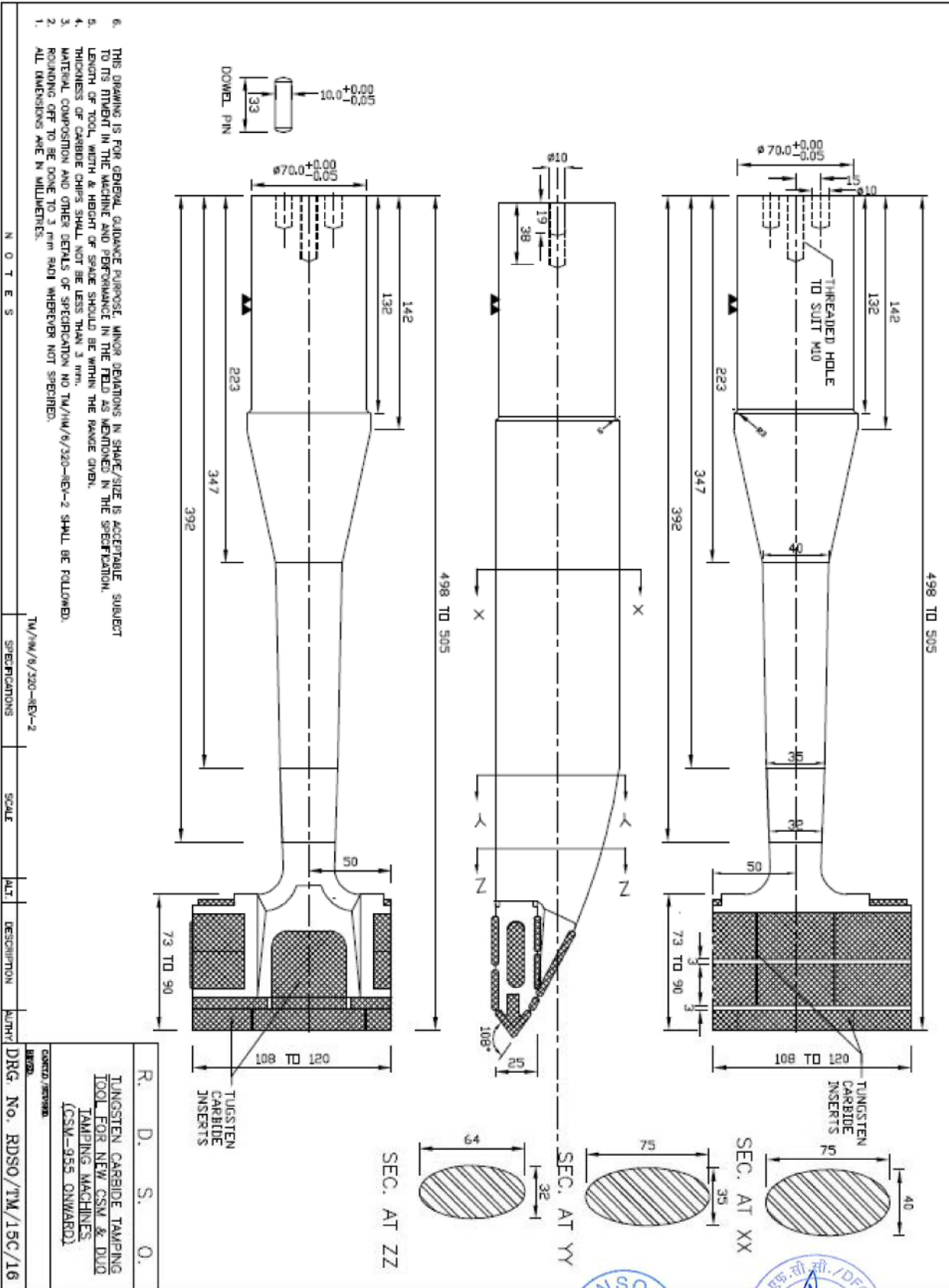
REVISION

R. D. S. O.

TUNGSTEN CARBIDE TAPPING TOOL FOR NEW CSM & DUO TAPPING MACHINES (CSM-955 ONWARD)

CHECKED / APPROVED





1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FINISHING OFF TO BE DONE TO 3 mm RAU1 WHEREVER NOT SPECIFIED.
3. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/IM/6/320-REV-2 SHALL BE FOLLOWED.
4. THICKNESS OF CARBIDE CHIPS SHALL NOT BE LESS THAN 3 mm.
5. LENGTH OF TOOL, WIDTH & HEIGHT OF SPACE SHOULD BE WITHIN THE RANGE GIVEN.
6. THIS DRAWING IS FOR GENERAL GUIDANCE PURPOSE. MINOR DEVIATIONS IN SHAPE/SIZE IS ACCEPTABLE SUBJECT TO ITS FITMENT IN THE MACHINE AND PERFORMANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.

N O T E S

TM/IM/6/320-REV-2

SPECIFICATIONS

SCALE

ALT

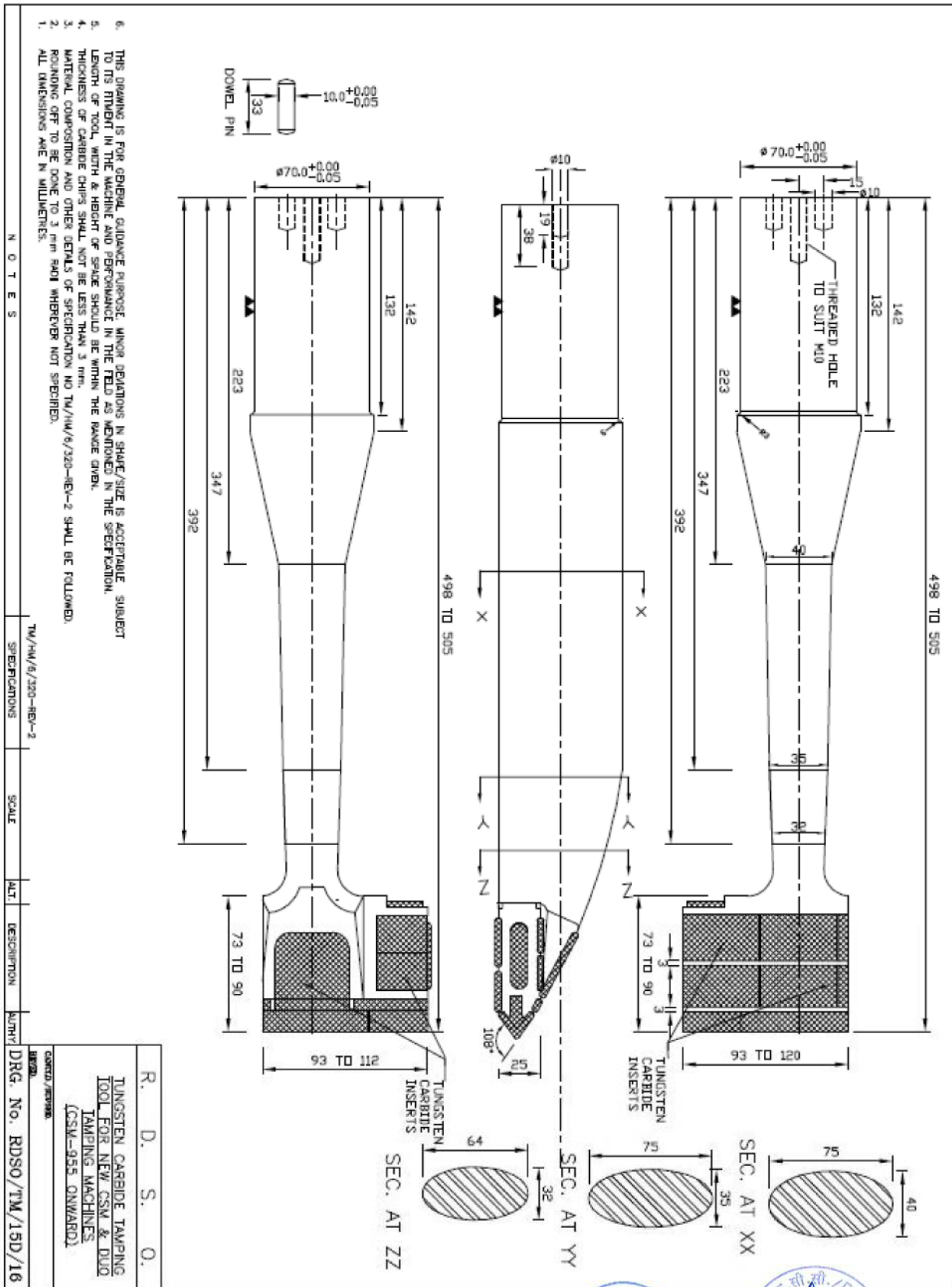
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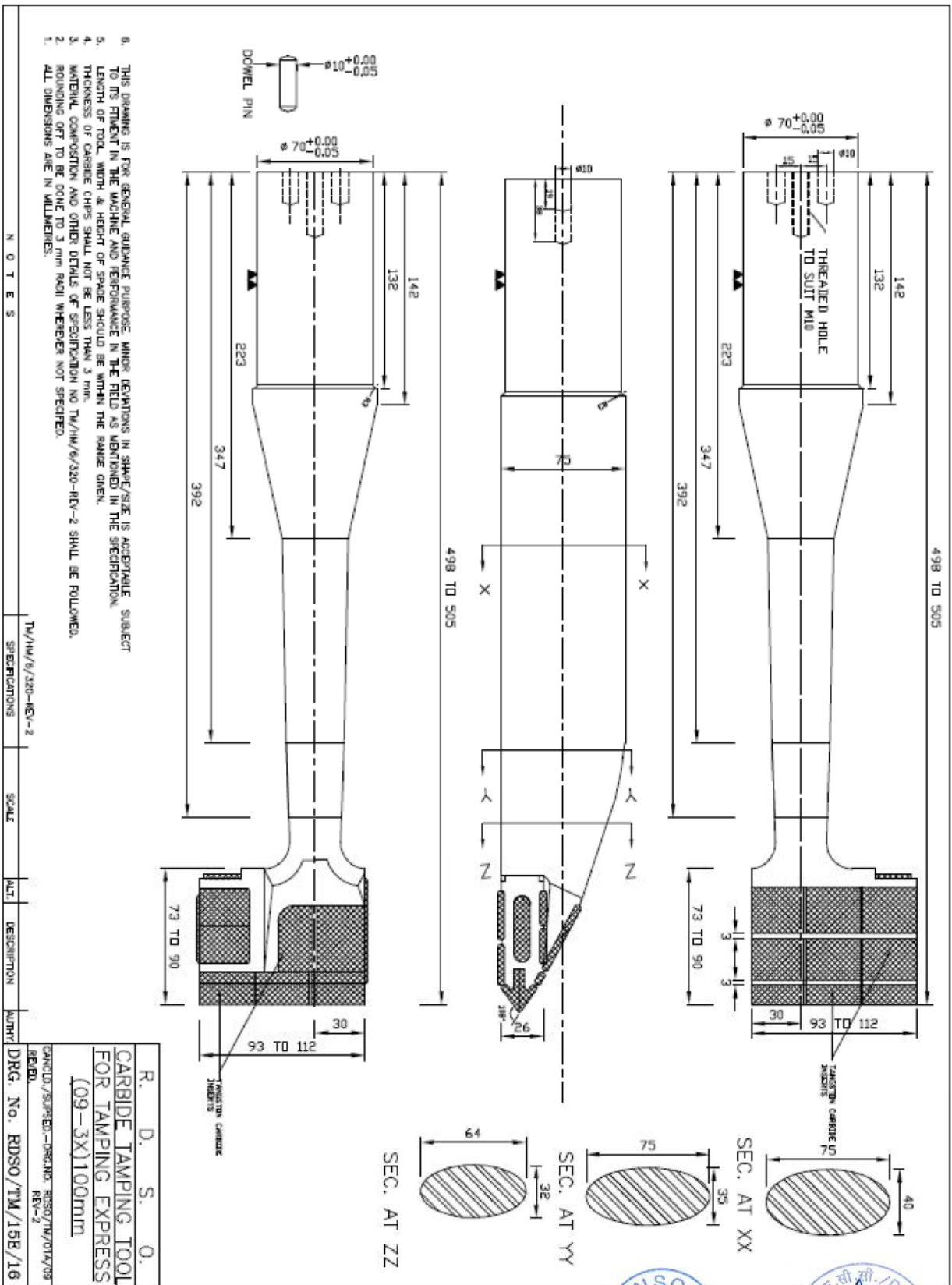
AUTHY

DRG. No. RDSO/TM/15C/16

REVISED
 R. D. S. O.
 TUNGSTEN CARBIDE TAMPING
 TOOL FOR NEW CSM & DUO
 TAMPING MACHINES
 (CSM-955 ONWARD)







1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. ROUNDING OFF TO BE DONE TO 3 mm ROUNDER WHEREVER NOT SPECIFIED.
3. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/HW/6/320-REV-2 SHALL BE FOLLOWED.
4. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/HW/6/320-REV-2 SHALL BE FOLLOWED.
5. THICKNESS OF CARBIDE CHIPS SHALL NOT BE LESS THAN 3 mm.
6. LENGTH OF TOOL WITH A HEIGHT AND TOLERANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.
7. TO ITS FINISH IN THE MACHINE AND TOLERANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.

N O T E S

TM/HW/6/320-REV-2
SPECIFICATIONS

SCALE

ALT

DESCRIPTION

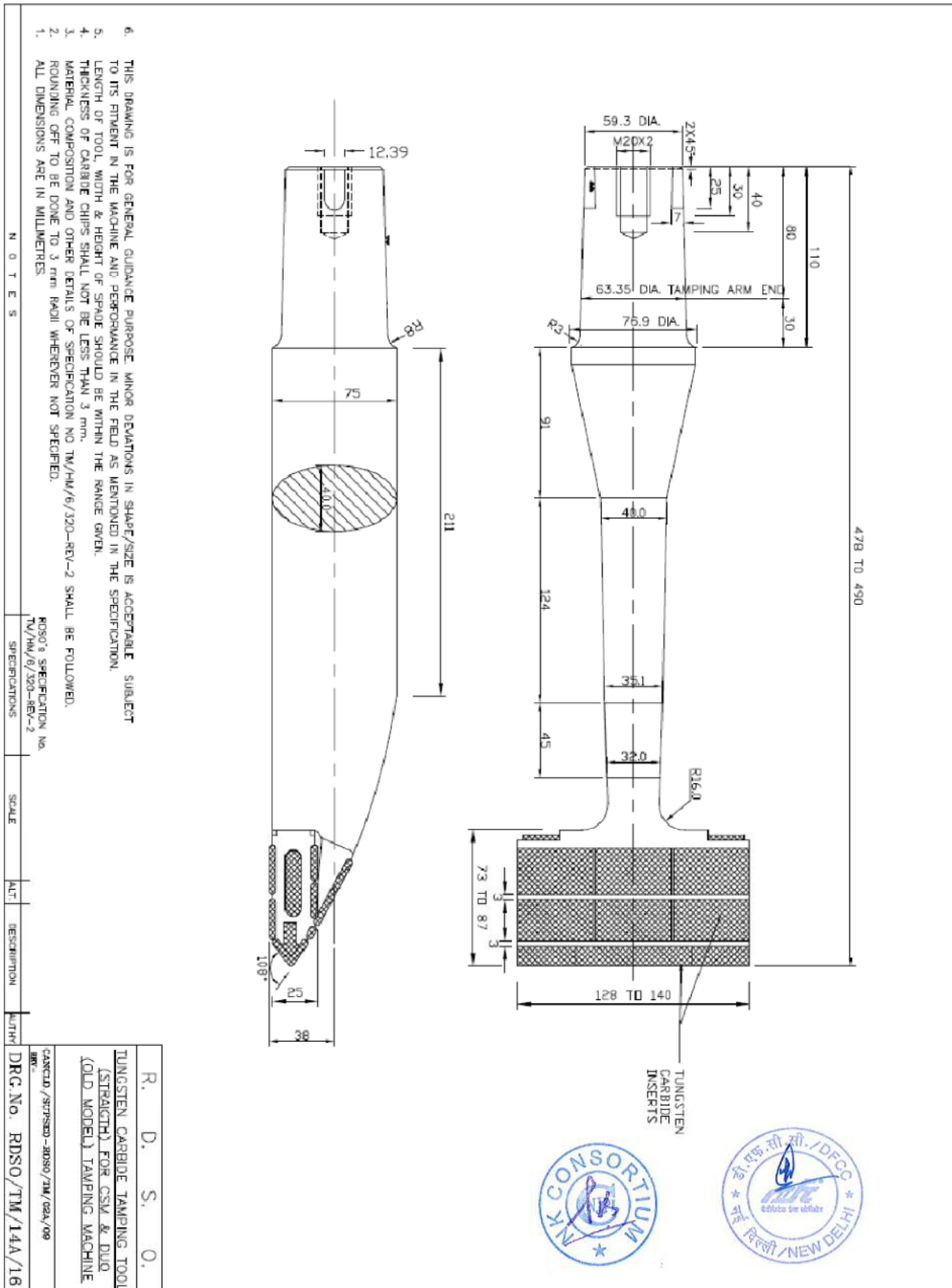
AUTH

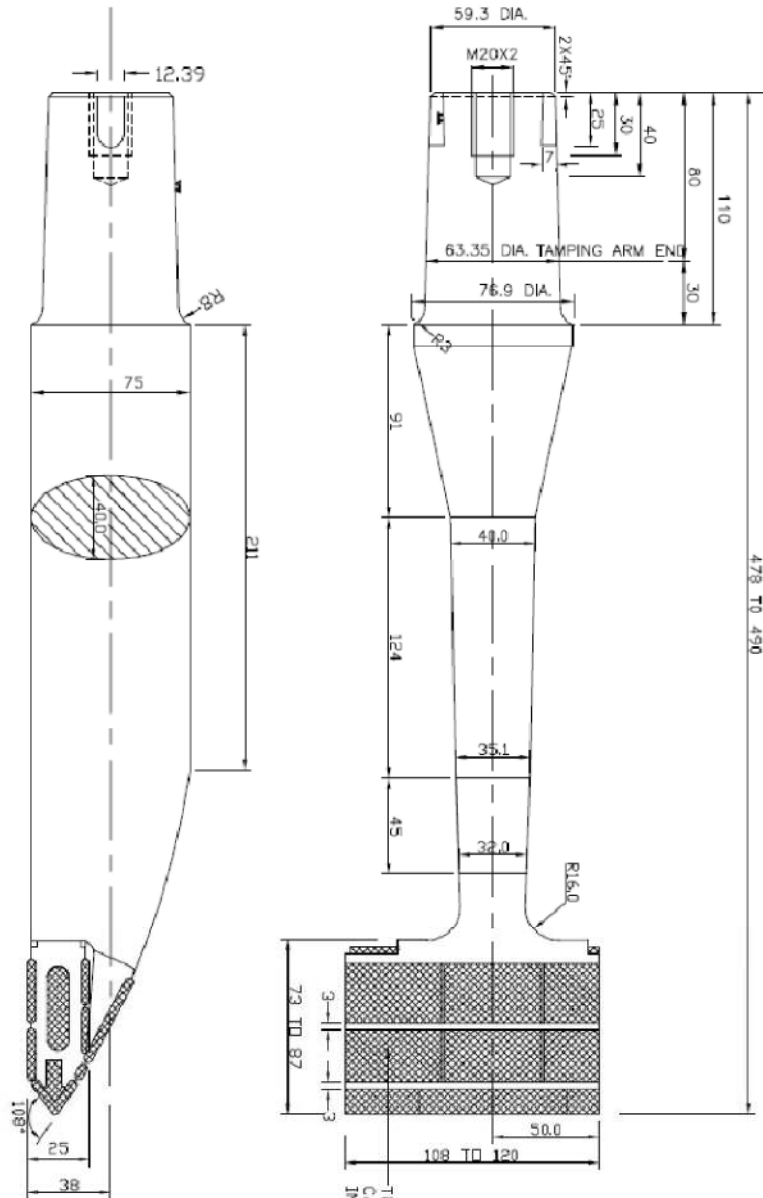
DRG. No. RDSO/TM/15B/16

R. D. S. O.
CARBIDE TAMPING TOOL
FOR TAMPING EXPRESS
(09-3X) 100mm

CANCELLED/SUPPRESSED-DRG. NO. RDSO/TM/01A/09
REV-2







6. THIS DRAWING IS FOR GENERAL GUIDANCE PURPOSE. MINOR DEVIATIONS IN SHAPE/SIZE IS ACCEPTABLE SUBJECT TO ITS FITMENT IN THE MACHINE AND PERFORMANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.
5. LENGTH OF TOOL, WIDTH & HEIGHT OF SPADE SHOULD BE WITHIN THE RANGE GIVEN.
4. THICKNESS OF CARBIDE CHIPS SHALL NOT BE LESS THAN 3 mm.
3. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/HW/6/320-REV-2 SHALL BE FOLLOWED.
2. ROUNDING OFF TO BE DONE TO 3 mm RAULI WHEREVER NOT SPECIFIED.
1. ALL DIMENSIONS ARE IN MILLIMETRES.

N O T E S

RDSO SPECIFICATION No.
TM/HW/6/320-REV-2
SPECIFICATIONS

SCALE

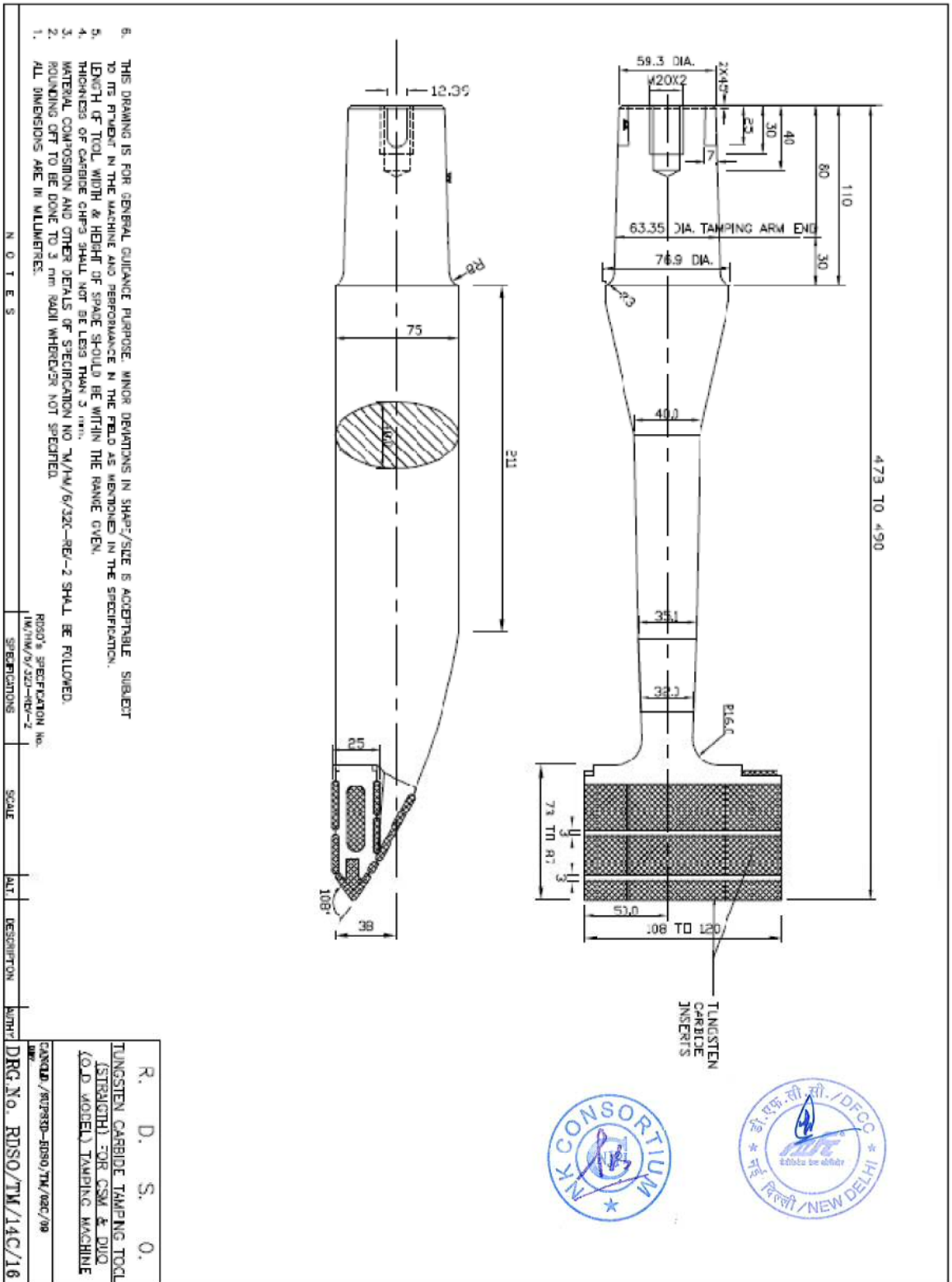
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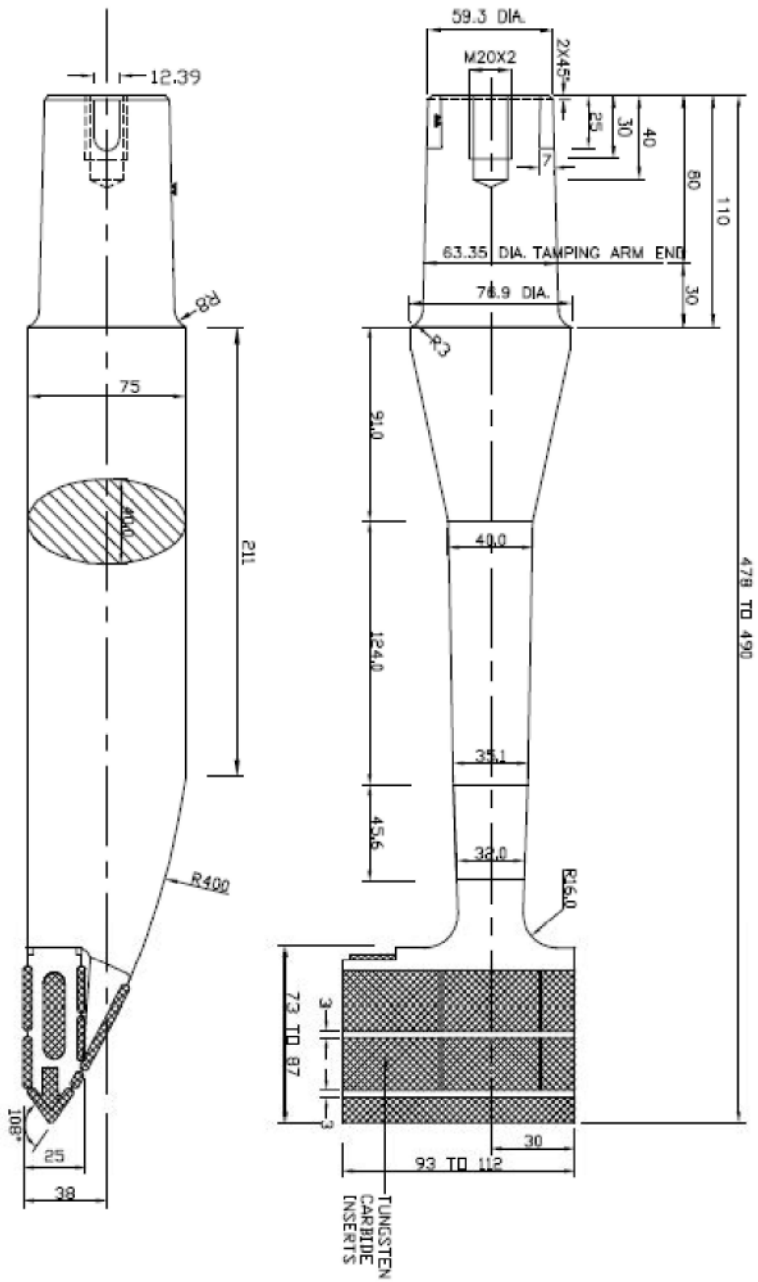
DESCRIPTION

AUTH

R. D. S. O.
TUNGSTEN CARBIDE TAMPING TOOL
(STRAIGHT) FOR CSM & DUD
(OLD MODEL) TAMPING MACHINE
CANCAD./SURSID-8030/TM/02B/09
DW-
DRG.No. RDSO/TM/14B/16







1. THIS DRAWING IS FOR GENERAL GUIDANCE PURPOSE. MINOR DEVIATIONS IN SHAPE/SIZE IS ACCEPTABLE SUBJECT TO ITS FITMENT IN THE MACHINE AND PERFORMANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.
2. LENGTH OF TOOL, WIDTH & HEIGHT OF SPACE SHOULD BE WITHIN THE RANGE GIVEN.
3. THICKNESS OF CARBIDE CHIPS SHALL NOT BE LESS THAN 3 mm.
4. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/M/6/320-REV-2 SHALL BE FOLLOWED.
5. ROUNDING OFF TO BE DONE TO 3 mm RADI WHEREVER NOT SPECIFIED.
6. ALL DIMENSIONS ARE IN MILLIMETRES.

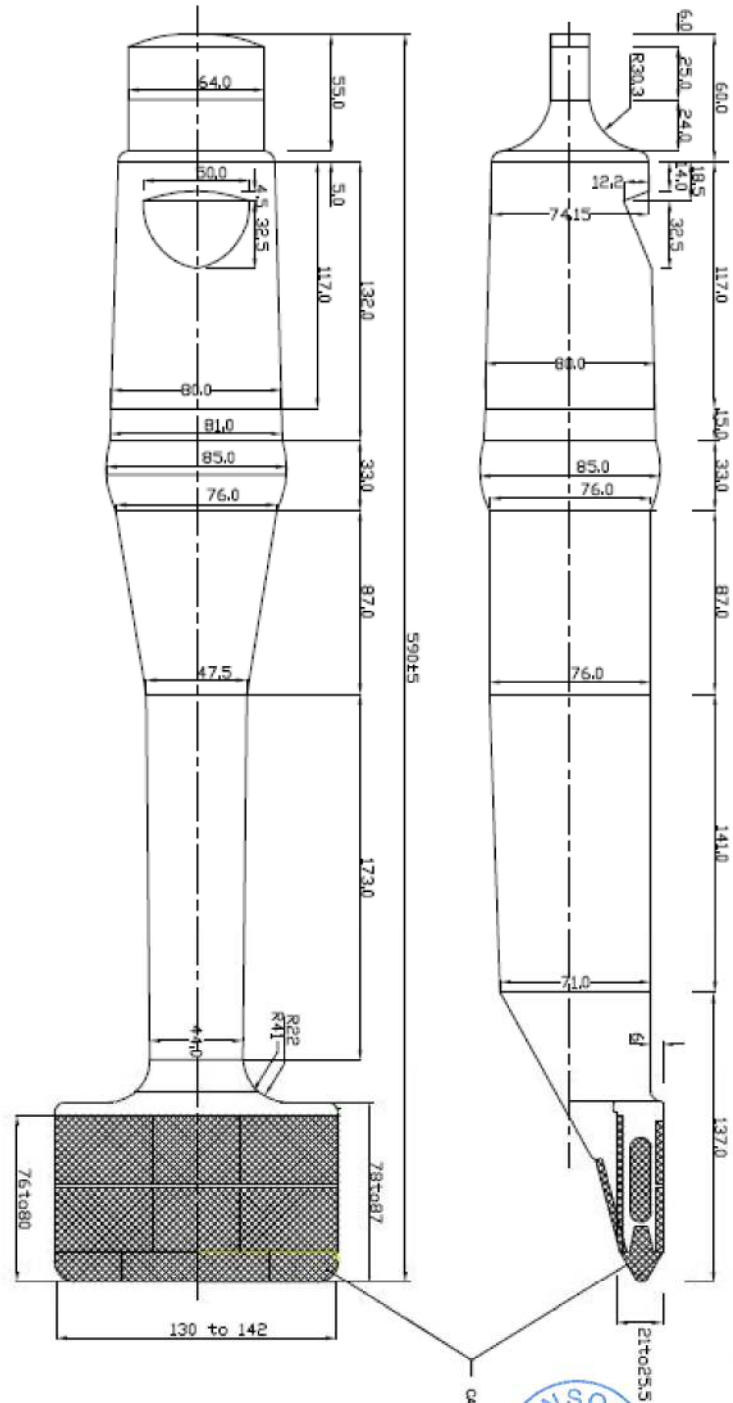
RDSO'S SPECIFICATION No. TM/M/6/320-REV-2		SCALE	ALT	DESCRIPTION	DATE
SPECIFICATIONS					
DRG. No. RDSO/TM/14D/16					

R. D. S. O.

TUNGSTEN CARBIDE TAMPING TOOL
(STRASHTH) FOR CSM & DDU
(OLD MODEL) TAMPING MACHINE

CANCELLED/987980-8090/TM/090/09





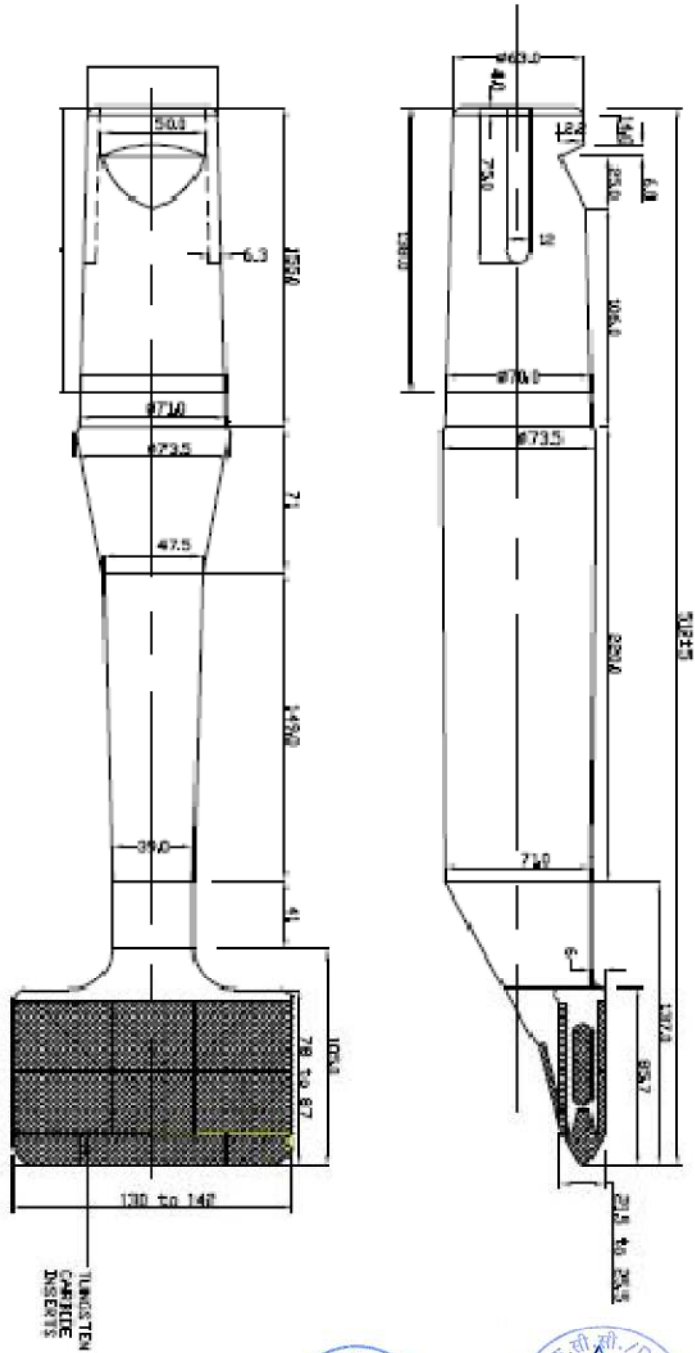
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. ROUNDING OFF TO BE DONE TO 3 mm RADI WHEREVER NOT SPECIFIED.
3. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO TM/HW/6/200-REV-2 SHALL BE FOLLOWED.
4. THICKNESS OF CARBIDE CHIPS SHALL NOT BE LESS THAN 3 mm.
5. LENGTH OF TOOL, WIDTH & HEIGHT OF SPACE SHOULD BE WITHIN THE RANGE GIVEN.
6. THIS DRAWING IS FOR GUIDING, GUIDANCE PURPOSE. MINOR DEVIATIONS IN SHAPE/SIZE IS ACCEPTABLE SUBJECT TO ITS FITNESS IN THE MACHINE AND PERFORMANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.

TM/HW/6/200-REV-2	SCALE	ALT	DESCRIPTION	PURTY
SPECIFICATIONS				

R. D. S. O.
 TUNGSTON CARBIDE TAMPING
 TOOL FOR UNMAT-25,35&45
 (PART NO.- 2W,31,41B & C,300-880,882)

DRG. No. RDSO/TM/01A/16





4. THE DRAWING IS FOR A TUNGSTEN CARBIDE INSERTS. THESE INSERTS ARE TO BE USED IN THE PROCESS OF TUNGSTEN CARBIDE TOOL FOR UNIMITE-4S. THE TOLERANCE IN THE LENGTH AND PERFORMANCE IN THE FIELD AS MENTIONED IN THE SPECIFICATION.
5. LENGTH OF TOOL, WITH A LEAD OF 50MM SHALL BE MORE THAN THE SPECIFIED.
6. TOLERANCE OF DIMENSIONS SHALL NOT BE LESS THAN 3 PER.
7. MATERIAL COMPOSITION AND OTHER DETAILS OF SPECIFICATION NO. TM/14/0/300-4S-2 SHALL BE FOLLOWED.
8. MATERIALS TO BE USED TO BE MORE TO 3 PER SHALL BE ACCEPTED NOT SPECIFIED.
9. ALL DIMENSIONS ARE IN MILLIMETERS.

N O T E S

TM/14/0/300-4S-2

SPECIFICATION

SCALE

A1T

DESCRIPTION

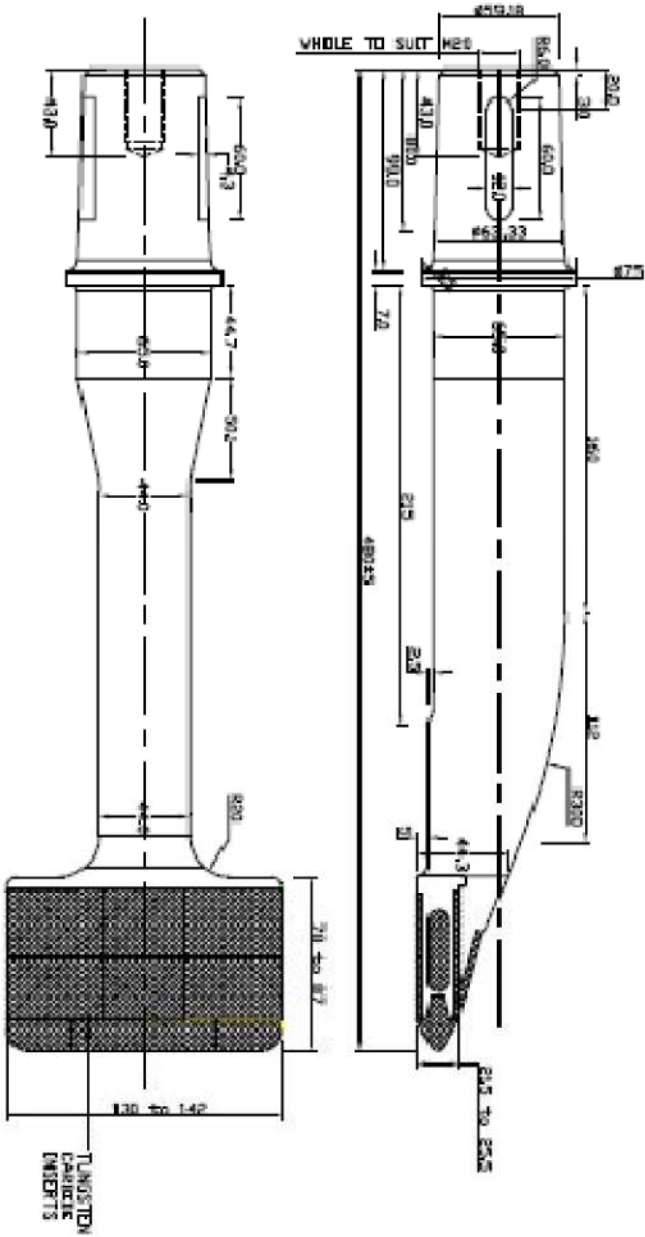
DATE

DRG. No. R300/TM/01B/10

R. D. S. O.

TUNGSTEN CARBIDE TAMPING TOOL FOR UNIMITE-4S

DATE: 10/10/2010



1. THE DIMENSIONS IN THIS SPECIFICATION SHALL BE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. THE DIMENSIONS IN THE SQUARE AND ROUND DIMENSIONS IN THE TOOL AS SHOWN IN THE SPECIFICATION.
3. LENGTH OF TOOL, WITH A HEIGHT OF 50MM SHALL BE WITHIN THE SPECIFIED RANGE.
4. THE DIMENSIONS OF CARBIDE TIP SHALL NOT BE LESS THAN 3 mm.
5. MATERIAL, COMPOSITION AND OTHER DETAILS OR SPECIFICATIONS NO. TM/HA/6/200-10-2 SHALL BE FOLLOWED.
6. DIMENSIONS GIVEN TO BE DONE TO A NEW READ MEASUREMENT SYSTEM.
7. ALL DIMENSIONS ARE IN MILLIMETERS.

R. D. S. O.		TUNGSTEN CARBIDE TAMPING TOOL FOR UNIMATE-250/25	
TM/HA/6/200-10-2		SPECIFICATIONS	
SCALE		A1E	
DESCRIPTION		MNH	
DIRC. No. MDSO/TM/QIC/16		DATE	



CERTIFICATE OF INSPECTION OF TCTT

BY INSPECTING OFFICIAL AND APPROVAL FOR DISPATCH

(STRIKE OUT WHICHEVER IS NOT APPLICABLE)

This is to certify that I have inspected the TCTT (type) _____ bearing Sl. No. _____ from (date) _____ to _____ at place _____ for its conformity /non conformity with respect to laid down Technical Specifications in contract Agreement No _____ dated _____ between President Of India through nominated inspecting official and M/s (Name of Supplier) _____.

The detail inspection note regarding its conformity /non conformity to the laid down specifications is enclosed along with as Annexure-A. It is observed that (Strike out whichever is not applicable) :-

- The TCTT confirms to all laid down specifications.
- The TCTT confirms to all laid down specifications except those at Sl. No. _____
- The above deviations are major /minor affecting/not affecting the performance of the TCTT in substantial way.

The following T and P/manuals/drawings are to be supplied with the TCTT:

1. _____
2. _____
3. _____

Based on the above, TCTT are certified /not certified to be confirming to the specifications.

The TCTT are approved/not approved for dispatch to _____ (consignee) Zonal Railway

SIGNATURE AND DATE

For M/s _____

INSPECTING OFFICIAL
(NAME AND DESIGNATION)
For and on behalf of President of India

