GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESERCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW – 226011

No.SV. IB Dated: 31.12.2009

INSTRUCTION BULLETIN No. MP.IB.BD.02.16.01 (Rev.01)

1. TITLE

Instruction Bulletin on "Wheel Wear and Application Management".

2. BACKGROUND

Wheels are one of the most safety critical components of a locomotive which have a bearing not only on the safe running but also on the riding quality and running cost of the locomotive.

Though locomotive wheels are designed to have a failure-free life up to the condemning limit, they however, occasionally require to be replaced out-of-course during mid-life either due to excessive wear rate or due to reliability related issues like gauge widening, breakage from rim, plate or hub etc. RDSO had studied wheel wear problem in the past and a number of instructions for improving the life of wheel discs have been issued from time to time. Revision 0 of this Instruction Bulletin was released in August 2001 to issue the recommended practices to control the wheel wear rate.

Keeping in view, the fact that the locomotive operating conditions have become more stringent over last few years due to higher trailing loads, wheels are being exposed to higher tractive and braking efforts. This situation aggravates further when locomotive continuously operates in ghat sections.

Hence, an increase in instances of wheel failures has been recently observed, especially during last 2-3 years due to wheel failure causes like wheel gauge widening, breakage from rim, plate or hub etc, necessitating out-of-course replacement during mid-life.

Operating requirements of locomotives from time to time have warranted a critical review of maintenance practices of brake rigging mechanisms, various bogie clearance limits etc which have a direct implication on wheel life and reliability. Thus, this release of Instruction Bulletin no. MP.IB.BD.02.16.01 as "Revision 01" has been necessitated by requirement to incorporate instructions to improve wheel reliability and review of wheel maintenance parameters in addition to revising the wheel wear management instructions.

3. OBJECT

This Instruction Bulletin is intended to:

a. Revise the wheel wear management instructions.

b. Incorporate better maintenance practices/ instructions to improve wheel reliability.

c. Review wheel maintenance parameters.

4. DETAILS OF STUDY/ EXPERIMENTATION DONE

Various issues related to wheel life, reliability and failures are periodically being reported by Zonal Railways to RDSO for analysis and recommendation of remedial actions. A comprehensive analysis of such reports, including extensive exercise of visits to site and metallurgical investigations has been done by RDSO.

Besides, RDSO has also examined various wheel related stipulations like condemning wheel diameter, permissible wheel diameter difference on the same axle, limits and procedure for measurement of bogie clearances, limits for wheel gauge & wheel flats permissible. Appropriate instructions have been issued from time to time while keeping in view, the aspects like minimum rail clearance, various operating restrictions imposed while running such wheels in service, available directives given by Railway Board etc.

In addition, the service limits for wheel gauge have been studied in reference to the recommendations of various international railroad governing bodies like AAR, UIC etc vis-á-vis the service limits being observed by Indian Railways in case of broad gauge locomotives. It is seen that these service limits on wheel gauge being observed in IR broad gauge locomotives are comparatively tight and require to be optimized.

Specific technical and logistics-related recommendations have been issued by RDSO through various letters, Instruction Bulletins etc with a view to achieve failure-free performance of locomotive wheels. These documents have been referred at appropriate places in this document for easy reference and decision making by Zonal Railways.

Above all, the consolidated instructions to handle the eventuality of axle getting locked on line have been issued by RDSO for locomotives. It has also been referred in this document to appraise the maintenance sheds and Zonal Railways about the latest recommendations on the issue and be abreast with various ways to handle such extra-ordinary situations.

5. INSTRUCTION CONTENTS

The technical and maintenance aspects which are instrumental in improving locomotive wheel life and reliability are shown in the following table along with the actions/ measures desired. The user Railways shall implement the instructions under the column 'Actions Desired'.

	Item / Area	**Actions Desired**
1.	**Brake Blocks**	
A.	Composite Brake Blocks	1. Checks must be made on the quality of brake blocks in respect to hardness, coefficient of friction & dimension. • The coefficient of friction of composite brake blocks should strictly be within the prescribed limits. • Width of brake block should be strictly as per drawing. Wider brake blocks eat away material from root of wheel flange and hence should not be used. • *Hardness of 'L' type brake block, should be in the range of 85-115 in R Scale, to be ensured from Inspection documents. This should be as per RDSO specifications mentioned below for composite brake blocks.* ***High hardness brake blocks should never be allowed on locomotives since they over-stress the wheels.***

	Item / Area	Actions Desired
		2. Brake blocks are given taper similar as that of wheel tread i.e. 1 in 20 to ensure proper contact between them. Besides, the block should be fitted such that its taper matches with that of the wheel tread. 3. Alignment of brake blocks should be parallel to wheel tread with uniform clearance and without any skewness. 4. The clearance between brake block and wheel should be maintained as stipulated in Instruction Bulletin (IB)/ Maintenance Instructions (MI) for respective locomotives corresponding to Instruction Bulletins as follows:

Loco	IB / MI No.
WDG3A, WDM3D, WDP3A, WAP4, WAP3, WAM4B, WAG7, WAM4, WCAM1	MP.IB.VL-03.11.01 (Rev00) dated 16.07.01
Co-Co trimount Bogies	MP.IB.VL-01.04.01 (Rev 00) dated 23.03.2001

5. This clearance should be checked as recommended in Maintenance Instructions/ Maintenance Schedule to take care of wheel and brake block wear in service and should be suitably adjusted through slack adjusters.
6. Procurements of brake blocks should be done from approved sources only as appearing in the current RDSO Vendor List depending on the Category of this item as approved by the Railway Board.

   The particulars about sources for procurement, specifications and drawings of composite brake blocks are as follows:

'K' Type	The procurement of composite brake blocks should be done as per RDSO specification no. MP.0.0100-10 Rev. (Latest) and drawing no. SK.DP- 3630 (Alt.2).
'L' Type	The procurement of composite brake blocks should be done as per RDSO specification no. MP.0.01.00.04 Rev. (Latest) & drawing no. SK.DP- 3650 (Alt.1).

<table>
<tr><th></th><th>Item / Area</th><th>Actions Desired</th></tr>
<tr><td>B.</td><td>Cast Iron Brake Blocks</td><td>
1. Procurement/ manufacture of brake block should be strictly as per RDSO drawing no. D/BG-1753 with full shrouding to get a perfect snug fit in assembly.
2. Frequent checks must be made on the quality of brake blocks in respect to hardness & dimension.
• Width of brake block should be strictly as per drawing. Wider brake blocks eat away material from root of wheel flange and hence should not be used.
• Hardness of brake block should be in the range of 210-250 BHN. This is as per RDSO specification no. M&C/MTD/101/94 for phosphoric iron brake block.
High hardness brake blocks should never be allowed on locomotives since they over-stress the wheels.
It is recommended that the user should cross check hardness of 2-3 brake blocks from each lot with portable hardness testing machine.
3. Brake blocks are given taper similar as that of wheel tread i.e. 1 in 20 to ensure proper contact between them. Besides, the block should be fitted such that its taper matches with that of the wheel tread.
4. Alignment of brake blocks should be parallel to wheel tread with uniform clearance and without any skewness.
5. The clearance between brake block and wheel should be maintained as stipulated in Instruction Bulletin (IB)/ Maintenance Instructions (MI) for respective locomotives corresponding to Instruction Bulletins as follows:
<table>
<tr><th>Loco</th><th>IB / MI No.</th></tr>
<tr><td>WDG3A, WDM3D, WDP3A, WAP1/WAP4, WAP3, WAM4B, WAG7, WAM4, WCAM1</td><td>MP.IB.VL-03.11.01 (Rev 00) dated 16.07.2001</td></tr>
<tr><td>Co-Co trimount Bogies</td><td>MP.IB.VL-01.04.01 (Rev 00) dated 23.03.2001</td></tr>
</table>
6. This clearance should be checked as recommended in Maintenance Instructions/ Maintenance Schedule to take care of wheel & brake block wear in service and should be suitably adjusted through slack adjusters.
7. Procurements of brake blocks should be done from approved sources only as appearing in the current RDSO Vendor List depending on the Category of this item as approved by the Railway Board.
</td></tr>
</table>

<table>
<tr><th></th><th>Item / Area</th><th>Actions Desired</th></tr>
<tr><td>2.</td><td>Brake Head/ Brake Hanger</td><td>
1. Alignment of brake hanger bracket on bogie frame both at the time of new manufacture and POH of locomotive should be ensured.
2. It should be strictly ensured that brake blocks never touch the root / flange of wheel.
3. MS washer of 4 mm thickness may be inserted in the hanger assembly to enable brake head assembly to move away from the flange.
4. Reconditioning of brake heads should be done by welding and grinding to give a smooth surface for proper seating of brake block.
4. The brake head should not be reversed since it increases the offset in the centre line of brake head.
5. Brake rigging safety strap/ bracket for slack adjuster assembly should be secured as contained in the following documents:
<table>
<tr><th colspan="2">Bogie / Loco</th><th>Drawing no. / Modification Sheet no. / IB no. / Letter no.</th></tr>
<tr><td colspan="2">Co-Co Trimount Bogie</td><td>SK.DL-1476/ M Alt. 1</td></tr>
<tr><td colspan="2">ATHS</td><td>SK.VL- 478 Alt. Nil</td></tr>
<tr><td rowspan="3">High Adhesion Bogie</td><td>WDG3A</td><td>SK.VL- 326 Alt. Nil</td></tr>
<tr><td>WDM3D/ WDM3B (With Equalising & Compensating Mech.)</td><td>53.08.01 Alt. 2</td></tr>
<tr><td>WAG7</td><td>SK.DL- 4199 Alt. 4</td></tr>
<tr><td>EMD</td><td>WDP4, WDG4</td><td>MP.IB.VL-14.50.09 (Rev 01) dated 30.11.09</td></tr>
<tr><td colspan="2">WDM3D (Without Equalising & Compensating Mech.)</td><td>SK.VL- 232 Alt. 1</td></tr>
<tr><td colspan="2">WDP3A</td><td>VL.FM5.h.01 Alt. 1</td></tr>
<tr><td colspan="2">WAP7 (With lever type brake rigging)</td><td>MP.MOD.VL- 01.03.09 (Rev 00) dated 29.01.2009</td></tr>
<tr><td colspan="2">WAP1/ WAP4</td><td>29.08.01 Alt. 5</td></tr>
</table>
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<table>
<tr><th></th><th>Item / Area</th><th>Actions Desired</th></tr>
<tr><td>3.</td><td>Tie Bar Assembly</td><td>1. Bent or misaligned tie bar results in brake blocks being pulled towards the flange of the wheel and thus riding/ binding of brake block against wheel root/ flange takes place causing excessive root wear.

The bent or misaligned tie bar should not be allowed.

2. Tie Bar Assembly as per following details to be ensured:

<table>
<tr><th colspan="2">Bogie / Loco</th><th>Drawing no. / Modification Sheet no. / IB no. / Letter no.</th></tr>
<tr><td colspan="2">Co-Co Trimount Bogie</td><td>MP.MOD.VL- 03.09.01 (Rev 00) dated 29.03.2001</td></tr>
<tr><td colspan="2">ATHS</td><td>SK.VL-478 Alt. Nil</td></tr>
<tr><td rowspan="3">High Adhesion Bogie</td><td>WDG3A</td><td>SK.VL- 326 Alt. Nil</td></tr>
<tr><td>WDM3D/ WDM3B (With Equalising & Compensating Mech.)</td><td>53.08.01 Alt. 2</td></tr>
<tr><td>WAG7</td><td>SK.DL- 4199 Alt. 4</td></tr>
<tr><td colspan="2">WDM3D (Without Equalising & Compensating Mech.)</td><td>SK.VL- 232 Alt. 1</td></tr>
<tr><td colspan="2">WDP1</td><td>SK.VL- 023 Alt. 6</td></tr>
<tr><td colspan="2">WDP3A</td><td>VL.FM5.h.01 Alt. 1</td></tr>
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<table>
<tr><th></th><th>Item / Area</th><th>Actions Desired</th></tr>
<tr><td>4.</td><td>Slack Adjuster assembly/ Pull Rod/ Brake Rod/ Connection Strip.</td><td>Documents showing relevant designs of slack adjusters for various locomotives are as follows:
<table>
<tr><th colspan="2">Bogie / Loco</th><th>Drawing no. / Modification Sheet no. / IB no. / Letter no.</th></tr>
<tr><td colspan="2">Co-Co Trimount Bogie</td><td>Modification Sheet no. MP.MOD.VL-07.13.01dated 08.08.2001</td></tr>
<tr><td rowspan="2">High Adhesion Bogie</td><td>WDG3A,WDM3D/ WDM3B (With Equalising & Compensating Mech.)</td><td>SK.VL-326 Alt. Nil, 53.08.01 Alt.1</td></tr>
<tr><td>WAG7</td><td>SK.DL-4199 Alt.4</td></tr>
<tr><td>EMD</td><td>WDP4, WDG4</td><td>EMD Part No. 4009286 & 40079274</td></tr>
<tr><td colspan="2">WDM3D (Without Equalising & Compensating Mech.)</td><td>SK.VL-232 Alt.1</td></tr>
<tr><td colspan="2">WDP1</td><td>SK.VL-023 Alt.6</td></tr>
<tr><td colspan="2">WDP3A</td><td>VL.FM5.h.01 Alt. 1</td></tr>
<tr><td colspan="2">WAP7(with lever type brake rigging)</td><td>MP.MOD.VL-01.03.09 (Rev.00) dated 29.01.09</td></tr>
<tr><td colspan="2">WAP4</td><td>29.08.01 Alt.5</td></tr>
</table>
1. The recommended design of slack adjusters for various locomotives as tabulated above should only be used. This is essential to:

Maintain proper alignment of brake blocks and prevent biased wear of wheels and brake blocks.
Ensure the designed brake power and to maintain desired clearances between brake block and wheel.
Avoid skewed movement of piston rod.
Prevent biased wear of brake rigging bushes.
</td></tr>
</table>

	Item / Area	Actions Desired
5.	Brake Cylinder Pressure	Brake cylinder pressure should be maintained as stipulated to avoid excessive thermal loading of wheels due to repeated applications. As per the RDSO's Modification Sheet No. MP.MOD.BK.05.34.09 (Rev00) dated 04.11.09 (for EMD locomotives) & IB no. MP.IB.BK.02.16.08 dated 03.06.2008 (For ALCo locomotives & Conventional Electric locomotives other than ABB locomotives), reduction in brake cylinder pressure during automatic brake application should be implemented as under: • EMD locomotives : 1.8 Kg/ cm^2 • ALCo locomotives : 1.8 Kg/ cm^2 • Conventional Electric locomotives (Other than ABB locomotives) : 1.8 Kg/ cm^2
6.	Dynamic/ Rheostatic Brakes	1. Dynamic/ Rheostatic brake minimizes the use of tread brakes & is beneficial in many ways e.g. absence of frictional losses and lower heat generation, higher life of wheels, brake blocks and even brake rigging. The frequent or sustained braking with insufficient heat dissipation rate may lead to abnormal temperature rise in locomotive wheels. All the locomotives on IR except WAP4s, are provided with Dynamic brakes. With introduction of composite brake blocks and the associated higher heat input into wheels, it must be ensured that dynamic brakes are available and kept effective in all locomotives. Use of dynamic brakes is recommended especially when the locomotive is supposed to operate in ghat sections and composite brake blocks are fitted on the locomotive in question. 2. EMD locomotives are provided with CCB along with blended brakes. Blending feature must be kept operative for optimum wheel life and reliability. 3. The driver should be counseled / monitored to ensure use of dynamic brakes to control trains. Use of loco brake should be limited to minimum.
7.	Colour coding of Helical Coil Springs	1. The sprung mass of locomotives is transferred to wheels through the suspension system only. Hence, these suspension components i.e. helical coil springs (single/ nested/ fitted with snubbers) require to be appropriately matched before fitment. 2. All helical springs should be matched after testing them under working loads by means of hydraulic/ pneumatic press in respect of load deflection parameters. Matching of spring based on free height parameters is not adequate. Working heights of single/ nested springs, outer and inner coil springs along with snubbers (depending on the application in the respective locomotives) must be maintained within specified recommended limits. 3. Instructions about colour coding of helical coil springs of locomotives are contained in the following IBs:

		Instruction Bulletin no. / **Applicable Locomotives** MP.IB.VL- 04.19.01 (Rev 01) dated 29.11.05 — Co-Co Trimount MP.IB.VL- 05.20.01 (Rev 00) dated 05.10.01 — WDP3A MP.IB.VL- 01.06. 02 (Rev 00) dated 18.04.02 — WDG3A/ WAG7
8.	Equalizer Beams of Trimount Bogies	It is necessary that the sprung mass should be transferred through equalizers to wheels by application at correct location on the manganese steel liner welded on the top of axle boxes. Hence, it must be ensured that: 1. The hardened face of equalizers should rest on top of the axle boxes. It can be verified by rotating the roller pins by hand, which should get rotated freely in position. 2. Equalizing beam bottom ends are to be hard faced as per procedure No. RDSO/ 2006/ MC/ 43. 3. All the sprung loads are transferred through pins and bushes provided in this linkage mechanism. If these bushes are allowed in service with excessive wear, they can: • Lead to wearing of parent material of beams and over stressing them due to reduction in their cross section area. • Disturb the alignment of Equalizer beams. Hence, following measures are recommended: 1. Pins & bushes to recommended design for various locomotives should be used. 2. 100% pins and bushes should be renewed during M 48 schedule (or as recommended in the relevant MI/ Maintenance Schedule and POH.)
9.	Equalizer Beams of High Adhesion Bogies	Equalizer & Compensating beams of high adhesion bogies are critically loaded components. The sprung mass of locomotive is carried on helical coil springs in the primary stage of suspension which in turn is supported on this mechanism. All the sprung loads are transferred through pins and bushes provided in this linkage mechanism. If these bushes are allowed in service with excessive wear, they can: • Adversely affect the free movement of linkage mechanism restricting the inter-axle load transfer during movement, to some extent. This can result in to a probable adhesion loss. • Lead to wearing of parent material of beams and over stressing them due to reduction in their cross section area. • Disturb the alignment of Equalizer & Compensating beams. Hence, following measures are recommended: 1. Pins & bushes to recommended design for various locomotives should be used. 2. 100% pins and bushes should be renewed during M 48 schedule (or as recommended in the relevant MI/ Maintenance Schedule) and POH.

<table>
<tr><td></td><td></td><td>3. For locomotives fitted with modified lubricated pin arrangement as tabulated below, lubrication should be done as recommended in the relevant MI/ Maintenance Schedules.
<table><tr><th>Loco</th><th>Drawing no.</th></tr><tr><td>WDG3A , WDM3B, WDM3D(With Equalizer & Compensating Mech.), & WAG7, WCAG1,WCAM3</td><td>SK.VL-139 (Alt. 08)</td></tr></table>For locomotives fitted with non-metallic bushes in Equalizer & Compensating beams, they need not be lubricated externally since they are self-lubricated with solid lubricants like graphite, MoS_2 etc. In this regard Instruction Bulletin no. MP.IB.VL-01.21.08 (Rev 00) dated 28.07.2008 may be referred.</td></tr>
<tr><td>10.</td><td>Pins & Bushes for Brake Rigging</td><td>If brake rigging bushes with excessive wear are allowed in service, they can:
• Disturb the alignment of brake heads and hence can cause biased wheel wear/ brake binding.
• Adversely affect the rigging efficiency.
• Create impact loading on pins and bushes during brake application.

Hence, following measures are recommended:
1. Pins & bushes to recommended design for various locomotives should be used.
2. 100% pins and bushes of brake rigging should be renewed during M 48 schedule (or as recommended in the relevant MI/ Maintenance Schedule) and POH.
3. Metallic bushes should be periodically lubricated as recommended in respective Maintenance Instructions / Maintenance Schedule.
4. Non-metallic bushes are self-lubricated with solid lubricants like graphite, MoS_2 etc. Hence, they need not be lubricated externally.</td></tr>
<tr><td>11.</td><td>Lateral & Longitudinal Clearances of Axle Box</td><td>Locomotives having wheel guidance through pedestals are fitted with liners on these pedestals as well as on axle boxes.

Lateral and longitudinal clearances of axle boxes should be maintained within prescribed limits as specified in different Maintenance Instructions/ documents issued by RDSO.

The details of recommended lateral and longitudinal clearances and corresponding documents are contained in Annexure I.
1. Locomotives provided with manganese steel liners at pedestals should be checked in prescribed maintenance schedules to ascertain that they are intact and have not worn beyond recommended limits.
2. If locomotives are provided with non-metallic liners at pedestals, they should be checked as recommended in the maintenance schedule or Instruction bulletin issued in this regard, for soundness and to ascertain that they are intact.

Note: Proper record of lateral & longitudinal clearances should be kept for all specified schedules.</td></tr>
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<td>12.</td>
<td>Movement of locomotives having one axle defective</td>
<td>There are instances when axle of locomotives gets locked/ defective on the mid section thus blocking the Railway traffic movement on the effected section. To move such locomotives to the nearest station/ loco shed/ loco work shop to clear the block section, RDSO has issued instruction bulletin as follows. Instructions contained in these IBs should be followed to move such crippled locomotives:
<table>
<tr><th>Loco</th><th>IB no. / Letter no.</th></tr>
<tr><td>Locomotives fitted with Co-Co Trimount Bogie</td><td>MP.IB.VL-01.02.07 (Rev 00) dated 24.03.2009</td></tr>
<tr><td>WDG3A, WDM3B, WDM3D</td><td>MP.IB.VL-01.05.07 (Rev 00) dated 24.03.2009</td></tr>
<tr><td>WAG9/ WAP7</td><td>SV.Tow. Equipt dated 15.12.2005</td></tr>
<tr><td>WAP5</td><td>SV.Tow. Equipt dated 24.01.2006</td></tr>
</table>
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<td>13.</td>
<td>Attention to wheels with Punch Marks on Rim</td>
<td>Fatigue failures generally initiate from stress concentration points like notches, punch mark, micro cracks etc. The crack propagates over a period of time and annular rings are visible on failed surfaces.

Some locomotive wheel failures have been observed to have initiated from punch marks provided for identification on the wheel rims. These marks have acted as stress raisers. At reduced wheel diameter in service, these stress concentration points can lead to initiation of a crack, which can propagate through the wheel rim/ plate causing failure.

Initially, the identification marking on locomotive wheels was punched on wheel rim. In late nineties, many wheel failures were reported due to rim cracks originating from these punch marks. The cracks were predominant in cases where wheel diameter was approaching condemning limit. In new wheel, though these punch marks have now been shifted to hub, the wheels if at all in service with punch marks on rim require to be monitored.

In this connection, an IB no. MP.IB.VL.05.07.07 (Rev.00) dated 27.08.2007 has been issued indicating the line of action for wheel monitoring with punch marks on the rim. The instructions contained therein should be implemented.</td>
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14.	Lowering of Condemning Wheel Diameter & Adoption of Intermediate Profile	The study undertaken by RDSO to improve the wheel life achieved with revision of locomotive condemning wheel diameter has been compiled as a flow chart (**Annexure II**) contained in IB no. MP.IB.VL-06.42.08 (Rev00) dated 28.11.08 indicating methodology, suitable timing of tyre turnings during service and adopting appropriate wheel profile such that an optimum wheel cut is required to restore the profile. This includes adoption of intermediate profile to drawing no. SKDL-4461 at the time of last wheel profiling to achieve an optimum life of locomotive wheels. Also, based on service experience with reduced wheel diameter (below condemning limits), RDSO has reduced condemning diameter of locomotive wheels as follows: 1012 mm in case of Passenger locomotives 1008 mm in case of Goods locomotives The above limits are applicable to diesel locomotives contained in IB no. MP.IB.VL-06.42.08 (Rev00) dated 28.11.08 These limits shall be extended to other locomotives including electric locomotives, as soon as condonation for minimum rail clearance is approved by Railway Board.
15.	Wheel Profile	Wear adopted profile as per RDSO Drg. no. SK.DL-2561 (Alt.8) shall be applicable to all BG Diesel & Electric locomotives irrespective of speed of operation vide IB No.MP.IB.BD.02.07.06 dated 12.09.2006 & letter No. SD.WATP dated 14.11.2006 or IRS thick flange profile as per CSL-3040 beyond 110Kmph (Annexure III). However, special instructions about wheel profile to be followed on specific locomotive(s) should be observed.
16.	Wheel Re-profiling	1. Following criteria have been laid down for the purpose of re-profiling: Permissible wear limits of wheels are Root wear 6mm, flange wear 3mm & total tread wear (even wear + flat wear) 6.5mm (maximum). These limits of root wear, flange wear and tread wear are shown in Drg. no. CSL- 2127/ M. (**Annexure – IV**). Rly. Board's letter no. 83/M(N) 960/1 Vol. I Pt dated 24.08.2005 may be referred for permissible extent of wheel flat vis-á-vis the corresponding permissible speed. Length of flatness should not more than 50 mm. 2. It is seen from wheel wear pattern that the wear is faster immediately after re-profiling. At about 2 mm root wear, the profile gets stabilized and the wear rate is slow upto 5.25-5.5 mm root wear. As elaborated above, a flow chart (**Annexure II**) is contained in IB no. MP.IB.VL-06.42.08 (Rev00) dated 28.11.08 indicating methodology, suitable timing of tyre turnings during service and adopting appropriate wheel profile such that an optimum wheel cut is required to restore the profile and hence to achieve an optimum wheel life. 3. Minimum cut should be ensured during reprofiling. RDSO has formulated an empirical relationship through computer simulation between reduction in wheel diameter and root wear, flange wear &

		tread wear during wheel turning as follows: D = 2.22R + 1.3F + 0.31T + Tolerance (+ 2.5 to – 0.6mm) Where D is reduction in wheel diameter with respect to diameter of previous profile, R = Root wear, F = Flange wear and T = Tread wear. This formula can be used as a guidance to decide the depth of cut instead of leaving everything on the judgment of the machinist. 4. The trueness of template used during wheel turning in the sheds & shops should be checked periodically, at least once in 06 months. 5. Many designs of surface and pit wheel lathes are fitted with optical equipment. New wheel profile (say SK.DL-2561) can be superimposed on the existing tread profile of the wheel to be machined, with this equipment to decide the minimum cut. This equipment should be operational, if available.
17.	Hydraulics & Tracer Units of Wheel Lathes	Maintenance of hydraulics and tracer units of wheel lathes should be given due priority since precision level of wheel profile being done by wheel lathes depends on its maintenance standards also. Besides, timely calibration of wheel turning lathes is essential.
18.	Re-Discing of Wheels in Workshops	RDSO IB. No. MP.IB.VL.01.02.09 (Rev.00) dated 27.02.2009 stipulates the guidelines for assembly of wheels and axles. Workshop should not re-disc each and every wheel set received under POH loco indiscriminately. Some limit for re-discing should be fixed. Railways may use their discretion in this regard, but a residual life of 18 months on Mail/ Express services is considered adequate for this purpose. For other cases, released wheel set with wheel discs of lesser diameter can be used on freight loco or can be sent to running sheds to be used as spare.
19.	Wheel Changing	It has been seen that many times, unnecessary metal removal is necessitated only to match diameter of wheels. This can be avoided by replacing the wheel set or truck with that having matching diameter wheels. Adequate wheel spare should be kept in sheds for this purpose.
20.	Biased Wear of a Wheel	The correct cause of biased wear should be identified with special emphasis to the following aspects: 1. Brake block rubbing on wheel flange due to shifting. 2. Excessive lateral clearances between axle box and bogie pedestal. 3. Misalignment of bogie frame: Parallelism of bogie should be maintained. The variation in diagonal dimensions of bogie should not more than 3 mm. 4. Axle box lateral wear liners set wrongly. 5. Bogie frame pedestal lateral wear liners set wrongly. 6. Lesser longitudinal clearance between axle box & bogie pedestal. 7. Wheel diameter variation may not be within permissible limits. Limits of wheel diameter variation are given as under unless specified otherwise in the Maintenance Instructions or Instruction

<table>
<tr><td></td><td></td><td>bulletin issued in this regard:
<table>
<tr><th>Location</th><th>At the time of Wheel Turning/Wheel change (mm)</th><th>Service Limit (mm)</th></tr>
<tr><td>On same axle</td><td>0.5</td><td>2.5</td></tr>
<tr><td>On same bogie</td><td>2.0</td><td>8.0</td></tr>
<tr><td>On same loco</td><td>15.0</td><td>25.0</td></tr>
</table>
As per instruction bulletin No.MP.IB.BD.01.01. 05 dated 01.02.2005. The revised service limit of wheel diameter variation in ALCo diesel locomotives fitted with Co-Co tri-mount bogies are given below:
<table>
<tr><td>Location</td><td>At the time of Tyre Turning/Wheel changes (mm)</td><td>Revised service limit (mm)</td></tr>
<tr><td>On same axle</td><td>0.5</td><td>-</td></tr>
<tr><td>On same bogie</td><td>2.0</td><td>8.0</td></tr>
<tr><td>On same loco</td><td>15.0</td><td>25.0</td></tr>
</table>
***Note**: Any other specific instruction, if issued, may be followed.*
8. Gauge Width: Distance between the inside gauge face of the rim of the wheels on the same axle may not be maintained as specified. Permissible variations are as follows:
New Assembly : 1596 (± 0.5) mm
Service Limit : 1596(-0.5/+3) mm</td></tr>
<tr><td>21.</td><td>Biased Wear on all Wheels</td><td>Investigation to ascertain the correct cause of biased wear should be carried out. If the root wear on one side of all 6 wheels is high compared to other wheels in the same axle, the direction of the locomotive is apparently not getting changed and loco is running on curved section.</td></tr>
<tr><td>22.</td><td>Wheel Flat/ Wheel Skidding</td><td>1. Wheel skidding and wheel slip are to be minimized by properly maintaining the air brake system and sanding system. Sand should be used on slippery rails and gradient to improve adhesion during both traction and braking mode.
2. Wheel slip relay should be in proper working condition.
3. Ensure that the proportionate air brake for the locomotives are in good working order so that whenever automatic brake application is made the locomotives are braked proportionately to the air brake applied on the train. This would avoid any severe jerks on the coupling of the coaches.
4. Brake cylinder pressure on locomotive should not be more than 1.8 kg/ cm^2 during automatic brake application by A-9 valve as per instruction bulletin No.MP.IB.BK.02.16.08 dated 03.06. 2008. However, brake cylinder pressure on loco during brake application by SA-9 valve should be 3.5 kg/ cm^2.</td></tr>
</table>

5. As far as wheel skidding is concerned following measures will help in reducing wheel skidding on locomotive. C-3W distributor valve is fitted on all pure air braked locomotives and some dual air braked locomotive.On C-3W distributor valve two positions (G&P) are provided for goods and passenger trains. These positions vary the release and application time of brakes on locomotives. The timings are given in RDSO Test Programme No.MP.TP-029/87 (Rev 02) October 08. The timings are as under:

	Description	Condition	Time (Seconds)	
			Passenger	Goods
1.	Full Service Brake Application	Brake Application	7 to 10	15 to 25
		Release After Application	10 to15	25 to 40
2.	Emergency Brake Application	Brake Application	6 to 9	12 to 22
		Release After Application	12 to 18	25 to 40

Mismatching of G & P handle position with trailing stock results in mismatching of brake application of locomotive and trailing stock. Therefore G & P position of C-3W distribution valve should be kept as per trailing stock i.e. passengers and goods.

On other locomotive on which C-3W distributor valve is not provided, the brake application and release timings should be maintained as per RDSO Test Programme No. MP.TP-019/81 (Rev 02) November 08. The timings are as under :

	Description	Condition	Time (Seconds)	
			Passenger	Goods
1.	Full Service Brake Application	Brake Application	7 to 10	15 to 25
		Release After Application	10 to15	25 to 40
2.	Emergency Brake Application	Brake Application	6 to 9	12 to 22
		Release After Application	12 to 18	25 to 40

6. Excessive brake cylinder pressure and uneven adjustment of brake cylinder piston travel also contribute wheel skidding & brake binding. Hence it is desirable to maintain the brake system as per standards ensuring that it does not exceed specified values.

7. Shunting operation without train brakes should be avoided.

23.	Gauge and Measuring Instruments	1. Gauge to RDSO drawing no. SKDL-3592 Alt-6 should be used for Measurement of root wear, flange wear, tread wear & flatness for all BG locomotives excluding WAP 5 loco. In position wheel dia. for BG locos may also be measured with this gauge . Measurement instructions are shown in RDSO drawing no. SKDL- 4260 Alt- 2. (Both the drawings are attached). 2. The practice of using star gauge as per drawing no. CSL-2222/M by some of the sheds should be discontinued. 3. For WAP5 locomotive, gauge to RDSO drawing no. SKDL-4444 Alt. Nil for root wear, gauge to SKDL-4445 Alt. Nil for flange wear & gauge to SKDL-4446 Alt. Nil for wheel diameter and tread wear should be used. The instructions for measuring wheel diameter are given in drawing no. SKDL-4447 Alt. Nil with gauge to drawing no. SKDL-4446 Alt. Nil 4. Follow the instructions for measuring the loco wheel diameter (BG) vide RDSO's letter SD.WATP dated 11-10-1999 (letter attached). 5. Periodical calibration of these gauges once in six month should be done.
24.	Height of Center Pivot and Side Bearer in Co-Co Trimount bogies	Check & record the heights of load pads and centre pivots and observe the condition of liner in stipulated schedule or in case of biased wear. Heights are to be maintained as per RDSO Drg.No. SKDL-2069 Alt.1 for Co-Co trimount bogie (drawing attached).

5. AGENCY AND SCHEDULE OF IMPLEMENTATION

1. DLW, CLW, DMW
2. All Broad Gauge locomotive maintenance sheds and workshops.

6. APPLICATION TO CLASS OF LOCOMOTIVES

BG Diesel and Electric locomotives.

7. MATERIALS REQUIRED AND SOURCES OF SUPPLY

As contained in respective IB, Modification sheet.

8. ADDITIONAL INFORMATION

Nil

9. DISTRIBUTION

As per attached list.

10. REFERENCE

Issues of wheel failures and wear raised by Zonal Railways.

11. DOCUMENTS REFERRED

	Drawing / Specification/ Maintenance Instruction/ Instruction Bulletin/ Modification Sheet Nos.	Descriptions
Drawings		
1.	SK.DP- 3630 (Alt.2)	'K' type Composite brake block
2.	SK.DP- 3650 (Alt.1)	'L' type Composite brake block
3.	D/BG-1753	'Cast iron brake block
4.	SK.DL-1476/ M Alt. 1	Equaliser safety bar& brake rigging safety strape
5.	SK.VL- 478 Alt. Nil	Brake gear arrangement
6.	SK.VL- 326 Alt. Nil	Brake gear arrangement
7.	53.08.01 Alt. 2	Brake gear arrangement
8.	SK.DL- 4199 Alt. 4	Brake gear arrangement
9.	SK.VL- 232 Alt. 1	Brake gear arrangement
10.	VL.FM5.h.01 Alt. 1	Conventional brake gear arrangement
11.	29.08.01 Alt. 5	Brake gear arrangement
12.	SK.VL- 023 Alt. 6	Brake gear arrangement (with TBU)
13.	SKVL-139 Alt 8	Modified lubricating pin arrangement
14.	CSL- 2127/ M.	Condemning tyre profile for IRS locos
15.	SKDL-3592 Alt. 6	Wheel wear measurement gauge
16.	CSL-2222/M	Condemning gauge for locos tyre flanges
17.	SKDL-4444 Alt. Nil	Root wear gauge for thick flange
18.	SKDL-4445 Alt. Nil	Flange wear gauge for thick flange
19.	SKDL-4446 Alt. Nil	Wheel dia/ tyre thickness & tread wear gauge for thick flange
20.	SKDL- 4447 Alt. Nil	Trammel Gauge
21.	Drg.No. SKDL-2069 Alt. 1	Loading pad & centre pivot assly.
22.	SKDL-2561 Alt. 8	Wear adopted profile
23.	SKDL- 4461	Intermediate profile
24.	SKDL- 4260 Alt 2	Measurement instructions
25.	CSL- 3040 Alt. 2	Wheel profile thick, thin & standard
26.	CSL- 2127/M Alt 3	Limits of root, tread &flange wear
Specifications		
1.	MP.0.0100-10 Rev. (Latest)	'K' type Composite brake block
2.	MP.0.01.00.04 Rev. (Latest)	'L' type Composite brake block
3.	M&C/MTD/101/94	Brake block material made from phosphoric iron for tractive & trailing stock
4.	RDSO/ 2006/ MC/ 43.	Procedure for hard facing of Equaliser beam ends of Co-Co trimount bogies

Modification Sheets		
1.	MP.MOD.VL- 01.03.09 (Rev 00) dated 29.01.2009	Provision of conventional brake rigging in WAP7 locos in lieu of TBU
2.	MP.MOD.VL.03.09.01 (Rev 00) dated 29.03.2001	Modification to the design of tie bar
3.	MP.MOD.VL.07.13.01 dated 08.08.2001	Modified design of top slack adjusters
4.	MP.MOD.BK.05.34.09 (Rev 00) dated 04.11.2009	Modification of CCB software reduction in BC pressure on WDP4/WDG4 locomotives from 4.4 kg/cm^2 to 1.8 kg/cm^2 during automatic brake application
Instruction Bulletins		
1.	MP.IB.VL-03.11.01 (Rev 00) dated 16.07.2001	Revised instruction for Brake Shoe release and adjustment of piston travel in locomotive bogies.
2.	MP.IB.VL-01.04.01 (Rev 00) dated 23.03.2001	Adjustment of Brake Rigging on Co-Co trimount bogies.
3.	MP.IB.VL-14.50.09 (Rev 01) dated 30.11.09	Instruction to avoid breakage of Brake Rigging mounting bolts of dead lever in EMD locomotives.
4.	MP.IB.VL- 04.19.01 (Rev 01) dated 29.11.05	Instruction on colour coding of coil springs fitted in Co-Co trimount bogies.
5.	MP.IB.VL- 05.20.01 (Rev 00) dated 05.10.01	Instruction for flexi coil MK-V WDP3A locomotives.
6.	MP.IB.VL- 01.06.02 (Rev 00) dated 18.04.02	Instruction on colour coding of WDG3A/WAG7 locomotive during IOH/POH.
7.	MP.IB.VL-01.21.08(Rev 00) dated 28.07.08	Instruction for use of Nylatron bushes in equaliser & Compensating beam of WDG3A & WAG7 locomotives
8.	MP.IB.VL-01.02.07(Rev 00) dated 24.03.09	Instructuctions for movemnt of locomotives fitted with Trimount bogies having one axle defective.
9.	MP.IB.VL-01.05.07(Rev 00) dated 24.03.09	Instructuctions for movemnt of locomotives fitted with high adhesion bogies having one axle defective.
10.	MP.IB.VL.05.07.07 (Rev.00) dated 27.08.2007	Instructions for wheel monitoring of Diesel and Electric Locomotives
11.	MP.IB.VL-06.42.08 (Rev00) dated 28.11.08	Instructions for using wheels with reduced condemning diameter for BG Alco locomotives
12.	MP.IB.BD.02.07.06 dated 12.09.2006	Optimisation of wheel profile for BG Diesel and Electric Locomotives.
13.	MP IB no. 01.02.09 (Rev00) dated 27.02.2009	Procedure for pressing –in of wheels on axles and defining interference to be maintained between wheel bore and axle wheel seat in diesel & electric locomotives.
14.	MP.IB.BD.01.01. 05 dated 01.02.2005	Permissible difference in diameter of wheels on same axle in Alco Co-Co trimount locomotives
15.	MP.IB.BK.02.16.08 dated 03.06.2008	Reduction of BC pressure on diesel & electric locos (conventional type) from 2.5 kg/cm^2 to 1.8 kg/cm^2 during automatic brake application by A9
16.	MP.IB.VL-03.04.06 (Rev 01) dated 28.11.2008	Revised procedure for checking of Lateral clearances between Axle box & Bogie pedestal liners of End axles

17.	MP.IB.VL-01.02.06 (Rev 00) dated 27.01.2006	Revised procedure for checking of Lateral clearances between Axle box & Bogie pedestal liners of End axles in WDG3A Locomotives.
18.	MP.IB.VL-05.06.06 (Rev 01) dated 03.08.2006	Revised procedure for checking of Lateral clearances between Axle box & Bogie pedestal liners in WDP1 Locomotive.
19.	MP.IB.VL-03.28.08 (Rev 00) dated 30.09.2008	Tolerance on Lateral Clearances between bearing adapter and lateral thrust pad in WDG4 & WDP4 locomotives.
20.	MP.IB.VL-04.05.06 (Rev 00) dated 03.08.2006	Revised procedure for checking of Lateral clearances between Axle box & Bogie pedestal liners of End axles in WAP1 & WAP4 Locomotives.
21.	MP.IB.VL-02.03.06 (Rev 00) dated 27.01.2006	Revised procedure for checking of Lateral clearances between Axle box & Bogie pedestal liners of End axles inWAG7 Locomotive.
Letters		
1.	SV.Tow. Equipt dated 15.12.2005	Procedure for movement of WAG9/WAP7 locomotives for clearing the blocked section by floating/ lifting the locked axle in the event of axle getting locked on line
2.	SV.Tow. Equipt dated 24.01.2006	Procedure for movement of WAG9/WAP7 & WAP5 locomotives for clearing the blocked section by floating/ lifting the locked axle in the event of axle getting locked on line
3.	SD.WATP dated 11.10.1999	Instructions for measuring loco wheel diameter
4.	SD.WATP dated 14.11.2006	Issue of SK.DL-2561 Alt 8.
5.	Rly Bd`s letter no. 83/M(N/960/ 1 Vol.1Pt dt. dated 24.08.2005	Instructions on Wheel flat
Test Programme		
1.	MP.TP- 029/87 (Rev02) October 08	Test programme for diesel electric locomotives fitted with IRAB-1 twin pipe pure air brake system
2.	MP.TP- 019/81 (Rev02) November 08	Test programme for diesel electric locomotives fitted with 28 LAV-1 twin pipe dual brake system (with C3W Distributor valve)

The above documents are contained in Media CD/ DVD titled "Wheel Wear and Application Management".

(Naresh Kumar)
Director Standards /MP (VDG)
For Director General/MP

ANNEXURE-I

CLEARANCES FOR DIESEL LOCOMOTIVES
(All Dimensions are in mm)

Loco	New Wheel diameter	Root wear limit	Flange Wear	Total tread wear	Lateral & Longitudinal clearances			Difference in Wheel diameter		
					Measurement	New Condition	Service Limit	Location	Diff. In Dia.	Permissible limit
WDM2 (Co-Co Trimount Bogies without conical thrust pad)	1092+5/-0.0	6.0	3.0	6.5	As per MP.MI 71/78			As per MP.IB.BD- 01.01.05 dt. 01/02/05		
					Lateral clearances End Axle (C1+C2) per axle	6.0	12.0	On same Axle	0.5	-
					Lateral clearances Middle Axle (B1+B2) per axle	25.0	31.0	On same Bogie	2.0	8.0
					Longitudinal Clearances for Middle & End axles (A1+A2) per axle box	0.363-1.9	5.0	On same Loco	15.0	25.0
WDM3A & WDM3C (Co-Co Trimount Bogies with conical thrust pad)	1092+5/-0.0	6.0	3.0	6.5	As per MP.IB.VL-03.04.06 (Rev.01) dt.28.11.08			As per MP.IB.BD- 01.01.05 dt. 01/02/05		
					Lateral clearances End Axle (C1+C2+C3+C4) per axle	22.4-24.8	30.0	On same Axle	0.5	-
					Lateral clearances Middle Axle (B1+B2+B3+B4) per axle	4.0-6.6	12.0	On same Bogie	2.0	8.0
					Longitudinal Clearances for Middle & End axles (A1+A2) per axle box	0.4-1.9	3.5	On same Loco	15.0	25.0

Loco	New Wheel diameter	Root wear limit	Flange Wear	Total tread wear	Lateral & Longitudinal clearances			Difference in Wheel diameter		
					Measurement	New Condition	Service Limit	Location	Diff. In Dia.	Permissible limit
WDG3A/ WDM3D	1092+5/-0.0	6.0	3.0	6.5	**As per MP.IB.VL-01.02.06 (Rev.0.00) dated 27.01.0-2006**			**As per MI. VL-02/96**		
					Lateral clearances End Axle (C1+C2+C3+C4) per axle	22.0-25.2	30.7	On same Axle	0.5	2.5
					Lateral clearances Middle Axle (B1+B2+B3+B4) per axle	2.4-6.0	11.5	On same Bogie	2.0	8.0
					Longitudinal Clearances for Middle & End axles (A1+A2) per axle box	2.0-4.0	6.0	On same Loco	15.0	25.0
						(SV.WDG2 dt. 19.02.99)				
WDP1	1092+5/-0.0	6.0	3.0	6.5	**As per MP.IB.VL-05.06.06 (Rev.0.00) dated 03.08.2006**			**As per DLW MI – CHS-009**		
					Lateral clearances All Axles (C1+C2+C3+C4) per axle	22.0-25.0	31.0	On same Axle	0.5	1.5
					Longitudinal Clearances for Middle & End axles (A1+A2) per axle box	0.6-2.2	5.0	On same Bogie	2.0	5.0
								On same Loco	15	20
WDP3A	1092+5/-0.0	6.0	3.0	6.5	As per MI. VL-04/98					
					Lateral clearances Middle Axle (C1+C2) per axle box	1.2-3.0	6.0	On same Axle	0.5	2.5
					Longitudinal Clearances (Middle axle) (A1+A2) per axle box	2.0-4.0	6.0	On same Bogie	2.0	8.0
								On same Loco	15	25

Loco	New Wheel diameter	Root wear limit	Flange Wear	Total tread wear	Lateral & Longitudinal clearances					Difference in Wheel diameter		
					Measurement	New Condition		Service Limit		Location	Diff. In Dia.	Permissible limit
WDG4	1092+5/-0.0	6.0	3.0	6.5	IB No. MP.IB.VL-03.28.08 (Rev 00) dated 30.09.08					EMD Maintenance Instruction no. 1517 (Rev. A)		
					For End Axle Lateral clearances between thrust pad & bearing adapter (A1+A2) per axle	Nominal Inch/ mm	Min. Inch/ mm	Max Inch/ mm	Service limit Inch/ mm	On same Axle	0.5	1.6
						0.38/ 9.6	0.3/ 7.6	0.5/ 12.7	0.62/ 15.7			
					For Middle Axle Lateral clearances between thrust pad & bearing adapter (B1+B2) peraxle	0.62/ 15.7	0.54/ 13.7	0.74/ 18.8	1.0/ 25.4	On same Bogie	3.2	6.4
										On same Loco	14.2	31.8
WDP4	1092+5/-0.0	6.0	3.0	6.5	IB No. MP.IB.VL-03.28.08 (Rev 00) dated 30.09.08					EMD Maintenance Instruction no. 1517 (Rev. A)		
					For End Axle Lateral clearances between thrust pad & bearing adapter (A1+A2) per axle	Nominal Inch/ mm	Min. Inch/ mm	Max Inch/ mm	Service limit Inch/ mm	On same Axle	0.5	1.6
						0.24/ 6.1	0.16/ 4.1	0.36/ 9.1	0.5/ 12.7			
					For Middle Axle Lateral clearances between thrust pad & bearing adapter (B1+B2) peraxle	0.62/ 15.7	0.54/ 13.7	0.74/ 18.8	1.0/ 25.4	On same Bogie	3.2	6.4
										On same Loco	14.2	31.8

CLEARANCES FOR ELECTRIC LOCOMOTIVES

(All Dimensions are in mm)

Loco	New Wheel Diameter	Wear Limits			Axle Box Clearances				Difference in Wheel Diameter		
		Root	Flange	Tread	Measurements	New Condition		Service Limit	Location	As Turned/ New	Service Limit
						Min.	Max.				
WAM4	1092 (+ 5/-0)	6	3	6.5	**As per MP.IB.VL - 03.04.06 (Rev0.0) dated 28.11.08**				**As per MP.MI 71/ 78 Jul 92**		
					Lateral Clearances End Axle per axle (C1+C2+C3+C4)	22.4	24.8	30.0	Same Axle	0.5	2.5
					Lateral Clearances Middle Axle per axle (B1+B2+B3+B4)	4.0	6.6	12.0	Same Bogie	2.0	8.0
					Longitudinal Clearances Middle & End Axle per axle box	0.4	1.9	3.5	Same loco	15.0	25.0
WAP1/ WAP4	1092 (+ 5/-0)	4	2.5	6.5	**As per MP.IB.VL.04.05.06 (Rev.00) dt. 03.08.06**				**No. SD. WA1 dated 10.10.2003**		
					Lateral Clearances End Axle per axle (C1+C2+C3+C4)	15.4	18.2	24.0	Same Axle	0.5	1.5
					Lateral Clearances Middle Axle per axle (B1+B2+B3+B4)	3.6	7.2	12.0	Same Bogie	2.0	5.0
					Longitudinal Clearances Middle & End Axle per axle box	0.4	2.0	4.0	Same Loco	15.0	20.0

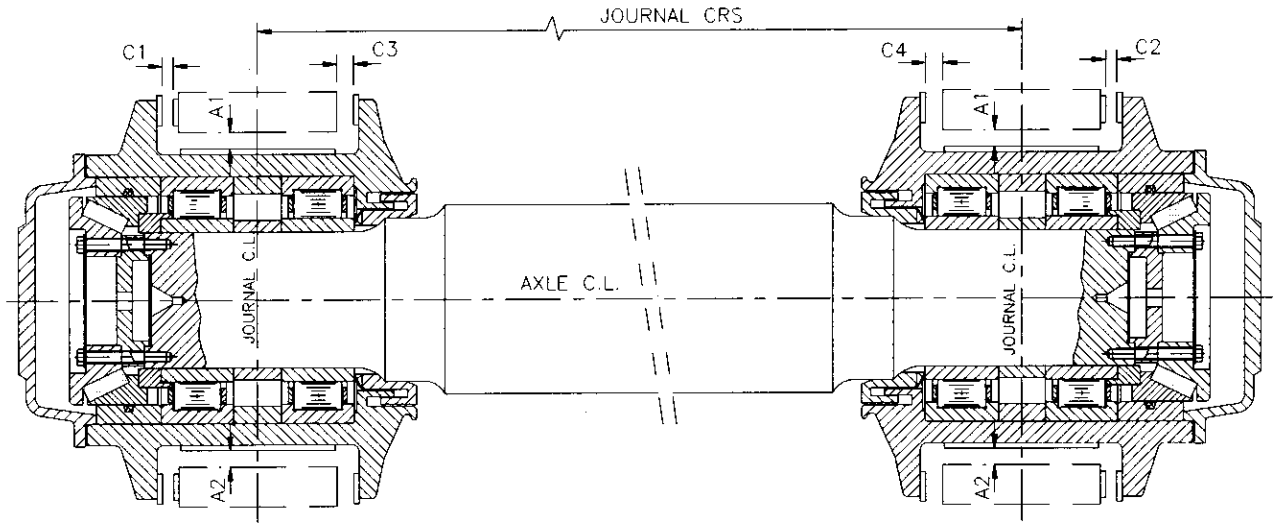
Loco	New Wheel Diameter	Wear Limits			Bogie Clearances				Difference in Wheel Diameter		
		Root	Flange	Tread	Measurements	New Condition		Service Limit	Location	As Turned/ New	Service Limit
						Min	Max				
WAP7,	1092 (+0.5/-0)	4	2.5	6.5	**Technical Circular No. ELRS/ TC/ 0082 (Rev 00) dated 29.06.05**				**No. SD. WA1 dated 24.06.05**		
WAG9	1092 (+0.5/-0)	6	3.0	6.5	Vertical Clearance between Axle Box & Bogie Frame	30	35	27 to 35	Same Axle	0.5	2.5
					Lateral Clearance between Axle Box & Bogie Frame	15	19	15 to 22	Same Bogie	2.0	4.0
					Vertical Clearance between Bogie Frame & Under Frame	35	40	32 to 40	Same Loco	15.0	20.0
					Lateral Clearance between Bogie Frame & Under Frame	45	50	45 to 55			
WAP5	1092 (+0.5/-0)	4	2.5	6.5	**Report No. MT-60 September 96 & drawing no. 1A011-00140 Sheet 2**				**No. SD. WA1 dated 01.09.02**		
					Vertical Clearance between Axle Box & Bogie Frame	27	35	--	Same Axle	0.5	2.5
					Lateral Clearance between Axle Box & Bogie Frame	15	20	--	Same Bogie	2.0	4.0
					Vertical Clearance between Bogie Frame & Under Frame	30	40	--	Same Loco	15.0	20.0
					Lateral Clearance between Bogie Frame & Under Frame	20	40	--			

Loco	New Wheel Diameter	Wear Limits			Bogie Clearances				Difference in Wheel Diameter		
		Root	Flange	Tread	Measurements	New Condition		Service Limit	Location	As Turned/ New	Service Limit
						Min	Max				
WCAM1, WCAM2	1092 (+ 5/-0)	6	3	6.5	**As per MP.IB.VL- 03.04.06 (Rev.00) dt 13.06.06**				**As per MP/MI 36/73 April 79**		
					Lateral Clearances End Axle per axle (C1+C2+C3+C4)	22.4	24.8	30.0	Same Axle	0.5	1.5
					Lateral Clearances Middle Axle per axle (B1+B2+B3+B4)	4.0	6.6	12.0	Same Bogie	2.0	5.0
					Longitudinal Clearances Middle & End Axle per axle box (A1+A2)	0.4	1.9	3.5	Same Loco	15.0	20.0
WCAM3/ WCAG1	1092(+ 5/-0)	6	3	6.5	**Letter no. EL/ 3.2.108 dated 16.10.07**				**As per VL.MI - 01/ 96**		
					Lateral Clearances End Axle per axle (C1+C2+C3+C4)	22.0	25.2	30.0	Same Axle	0.5	2.5
					Lateral Clearances Middle Axle per axle (B1+B2+B3+B4)	2.4	6.0	11.5	Same Bogie	2.0	8.0
					Longitudinal Clearances Middle & End Axle per axle box (A1+A2)	2.0	4.0	6.0	Same Loco	15.0	25.0

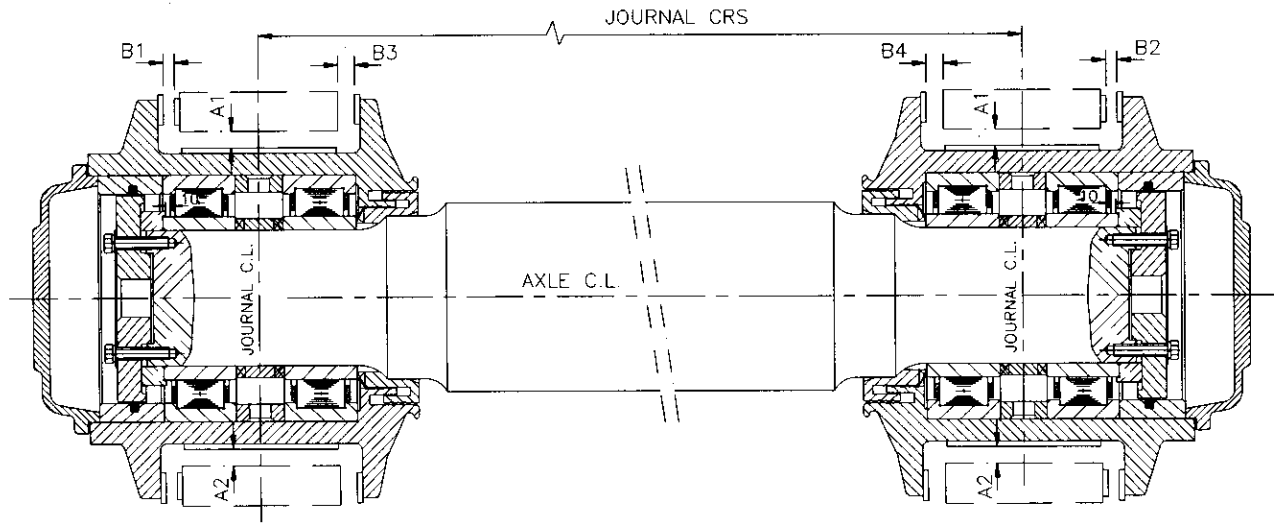
Loco	New Wheel Diameter	Wear Limits			Bogie Clearances				Difference in Wheel Diameter		
		Root	Flange	Tread	Measurements	New Condition		Service Limit	Location	As Turned/ New	Service Limit
						Min	Max				
WAG7	1092+5/- 0.0	6.0	3.0	6.5	**As per MP.IB.VL-02.03.06 (Rev.0.00) dated 27.01.0-2006**				**As per MI. VL-01/96**		
					Lateral clearances End Axle per axle (C1+C2+C3+C4)	22.0	25.2	30.7	On same Axle	0.5	2.5
					Lateral clearances Middle Axle per axle (B1+B2+B3+B4)	2.4	6.0	11.5	On same Bogie	2.0	8.0
					Longitudinal Clearances for Middle & End axles per axle box (A1+A2)	2.0	4.0	6.0	On same Loco	15.0	25.0

SCHEMATIC DIAGRAM SHOWING LATERAL AND LONGITUDINAL CLEARANCES OF LOCOMOTIVES WITH AXLE BOXES HAVING CONICAL THRUST PADS

END AXLES



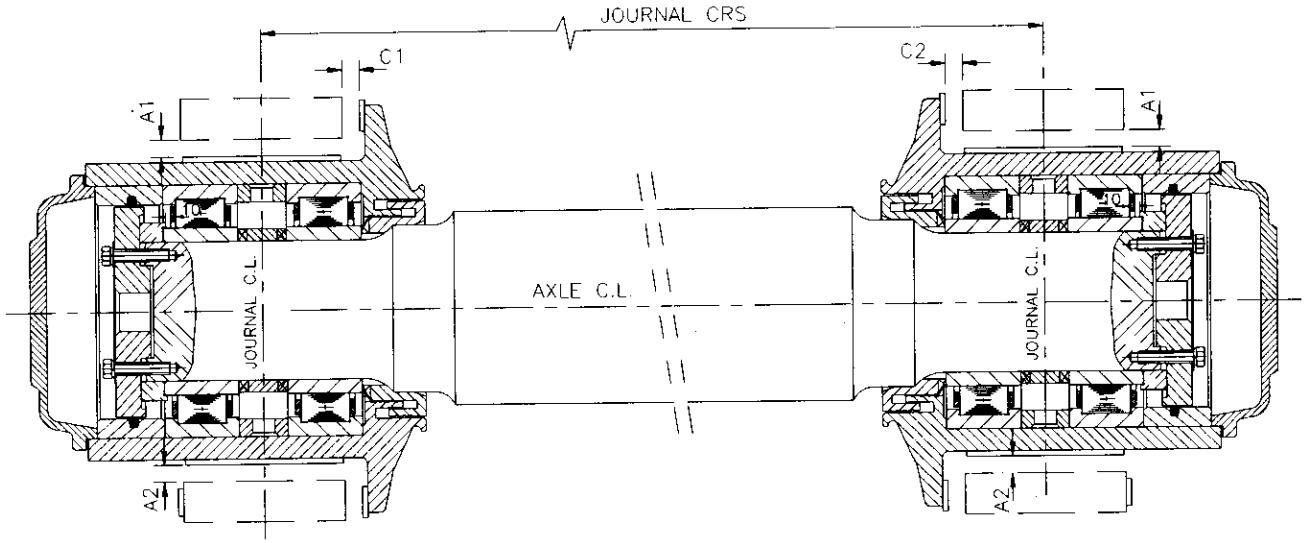
MIDDLE AXLES



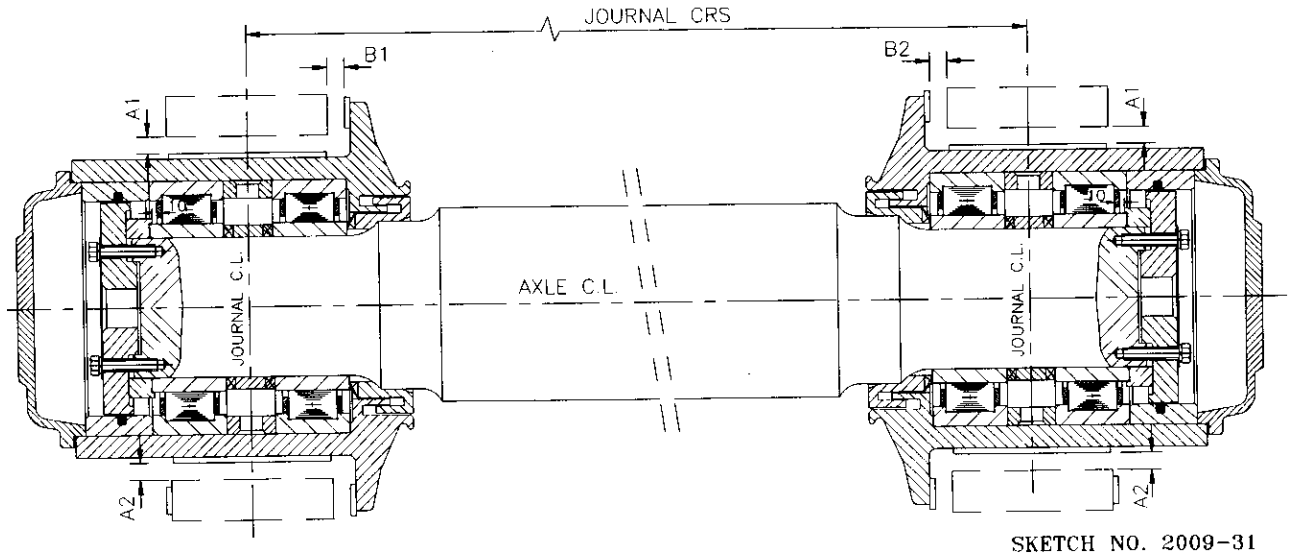
SKETCH NO. 2009-30

SCHEMATIC DIAGRAM SHOWING LERAL AND LONGITUDINAL CLEARANCES
OF LOCOMOTIVES WITH AXLE BOXES HAVING WITH OUT CONICAL THRUST PAD

END AXLES

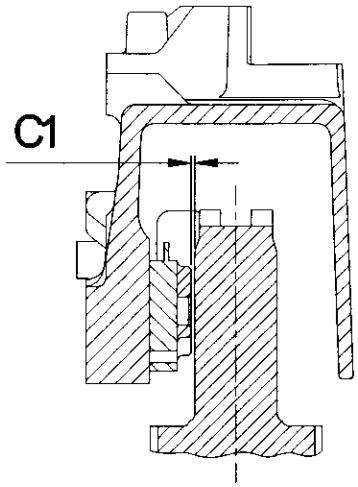


MIDDLE AXLES

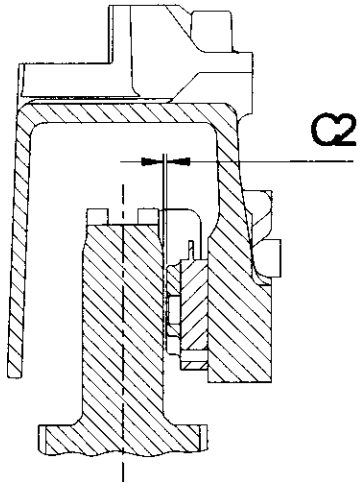


SKETCH NO. 2009-31

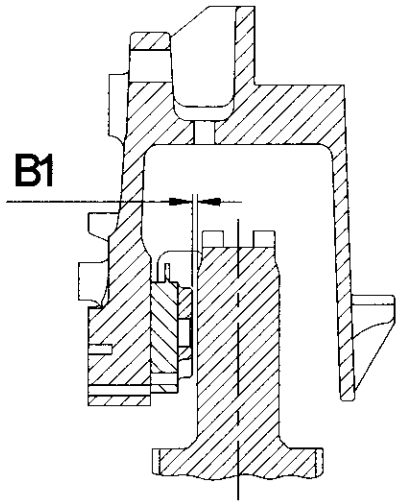
Lateral Clearances for EMD locomotives



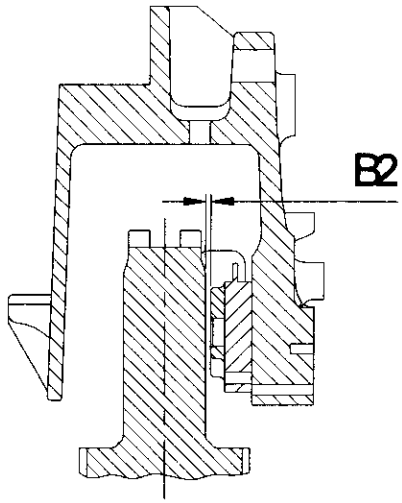
END AXLE (LH)



END AXLE (RH)

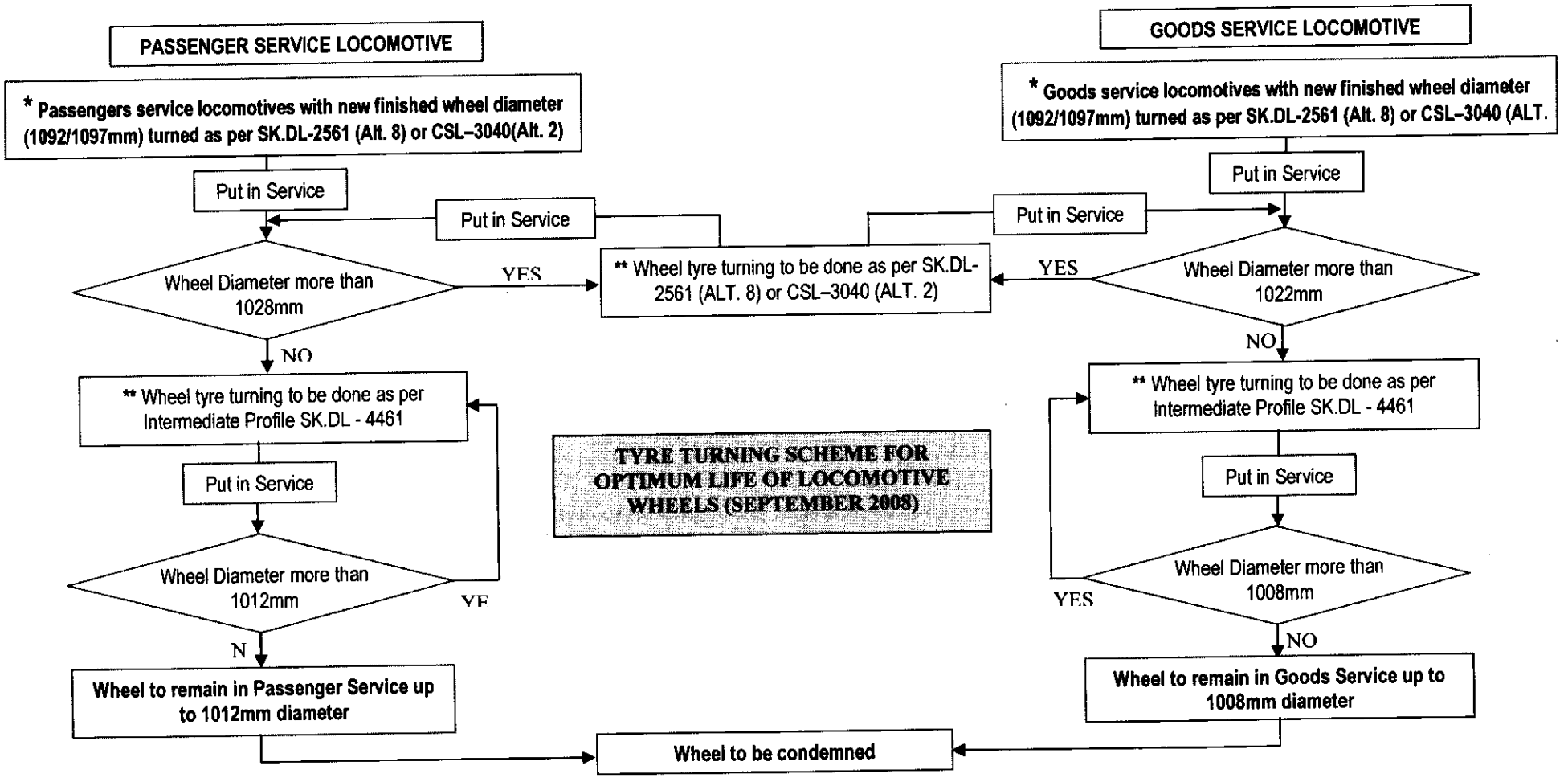


MIDDLE AXLE (LH)



MIDDLE AXLE (RH)

Flow Chart of MP. IB.VL-06.42.08

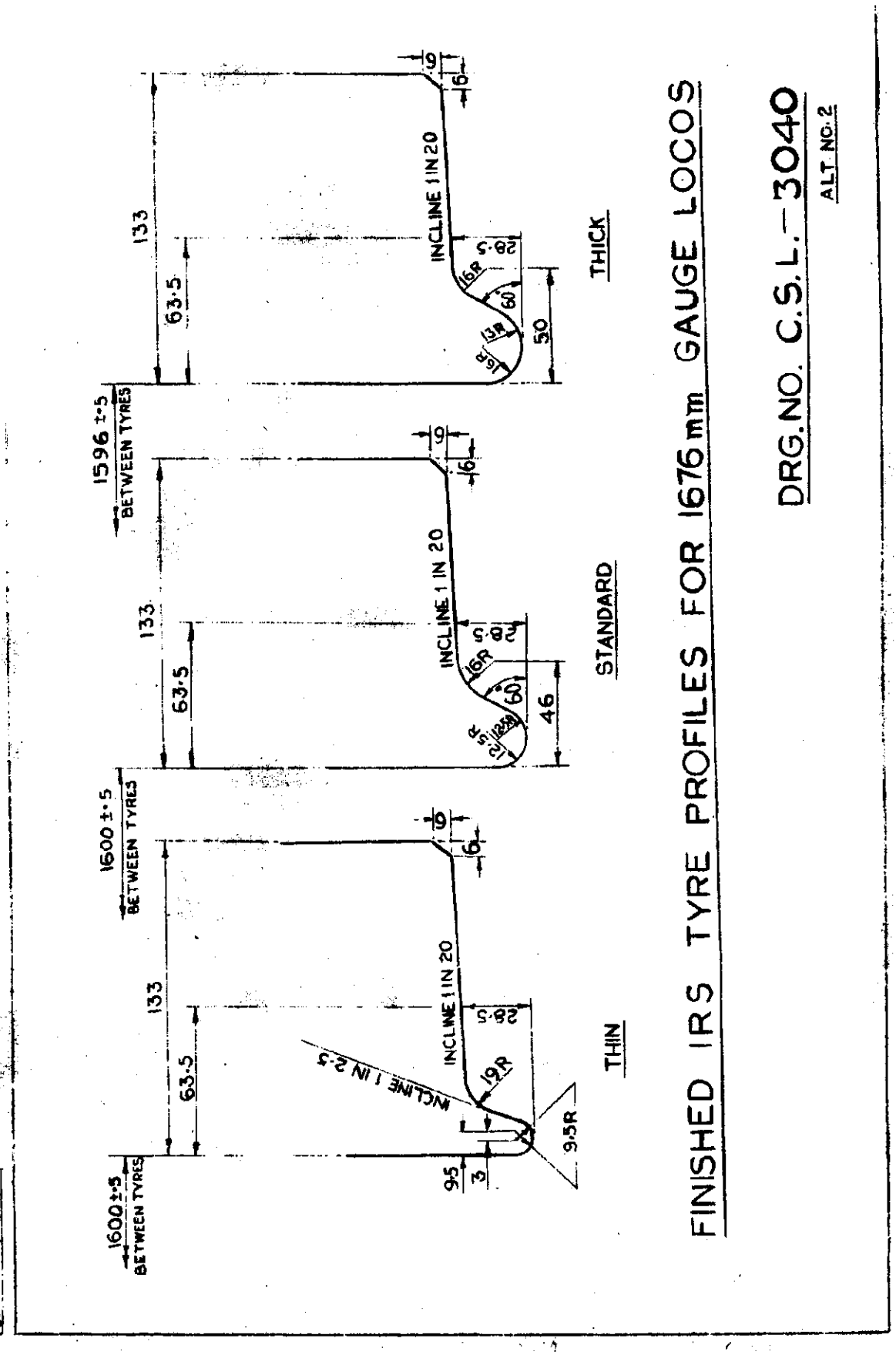


** Tyre turning has to be done as per current instructions, i.e. if any of the following three conditions are reached:

i. Root Wear = 6 Mm (Max.)
ii. Flange Wear = 3 Mm (Max.)
iii. Total Tread Wear = 6.5 Mm (Max) (Inclusive Wheel Flats)

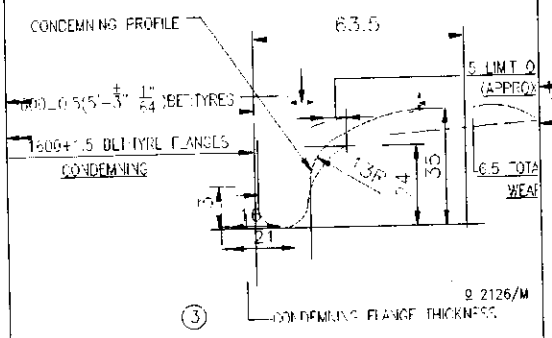
*Lower limits of these permissible wheel diameters (beyond 1016 mm) are applicable with following conditions:

i. IB No. MP.IB.VL.**05.07.07 (Rev.00)** dated 27.08.07 for punch mark & wheel monitoring to be followed.
ii. Brake cylinder pressure of 1.8 kg /cm^2 to be applied as per RDSO IB **No. MP.IB.BK.02.16.08** dated 03.06.2008.
iii. Use of dynamic braking to be ensured where composite brake blocks are used.
iv. **IB No. MP.IB.BD.02.16.01** dated 29.08.2001 for wheel wear management to be followed.
v. Review of these wheel condemning diameter limits by 31.12.09 based on the field performance, after their implementation on Zonal Rlys.
vi. Subject to maintenance of minimum rail clearance.
vii. Applicable for diesel & electric BG locomotives annexed in RDSO's letter no. SD.WATP dated 17.09.08.

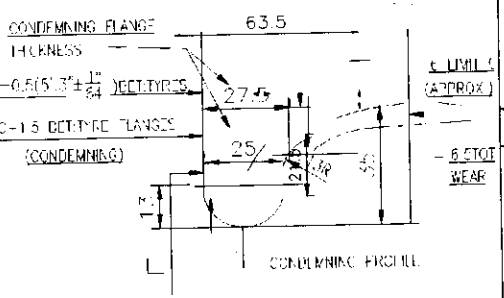

FINISHED IRS TYRE PROFILES FOR 1676mm GAUGE LOCOS
DRG.NO. C.S.L.-3040
ALT NO. 2
THICK
STANDARD
THIN
1596 ±5 BETWEEN TYRES
1600 ±5 BETWEEN TYRES
1600 ±5 BETWEEN TYRES
133
63.5
INCLINE 1 IN 20
INCLINE 1 IN 2·5
28·5
16R
60
13R
50
46
19R
9·5R
9·5
3
6
9
D
T
C
TC
APP'D.
Dt 28-11-86

BROAD GAUGE

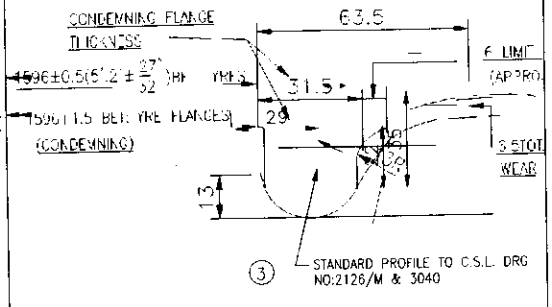
THIN FLANGE, INT: & DRG: WHEELS.



STANDARD FLANGE,LDG:& TRG:WHEELS.

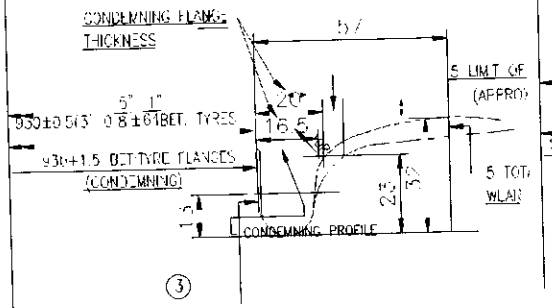


THICK FLANGE, CARRYING WHEELS.

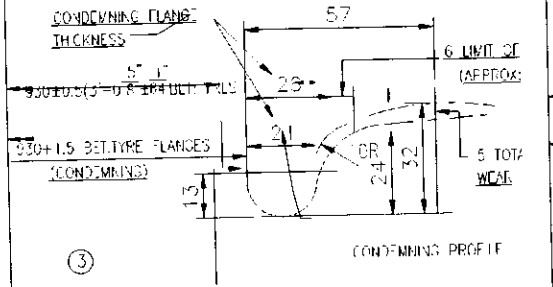


METRE GAUGE

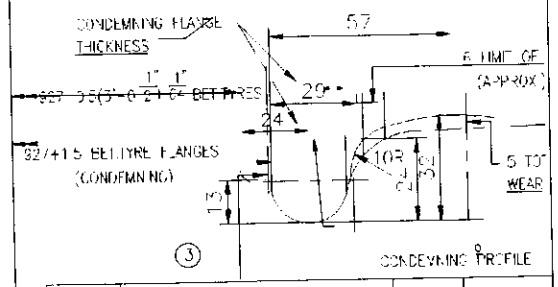
THIN FLANGE,INT: & DRG:WHEELS.



STANDARD FLANGE,LDG:& TRG: WHEELS.



THICK FLANGE, CARRYING WHEELS.



3	—	RDSO	D.G. NOTES 3040 & ADDED 20.2.91
2	—	RDSO	ARROW HEADS CORRE 9/86
1	—	RDSO	DRG: REVISED 2/70
ALTERATION	LETTER	AUTHY	DESCRIPTION DATE

C051 192 10.1.91

NOTE:- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

US			
D.			
T			
C			

B.G. & M.G.

CONDEMNING TYRE PROFILES FOR I.R.S. LOCOS.

REF:LET:	DESCRIPTION	NO./ENG.	MTL:&SPECN:
3	REFERENCE:-C.S.L. DRG. NO 2126/M,3040 & 3050		

DRG:NO. C.S.L.-2127/M