GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH DESIGNS AND STANDARDS ORGANISATION
Manak Nagar Lucknow - 226 011

No.EL/3.2.13/1 Dated: 28 January 98.

SPECIAL MAINTENENCE INSTRUCTION NO. RDSO/ELRS/SMI/196

1.0 Title

Cracking of Centre Pivot bottom cross plate in WAP1 locomotives.

2.0 Object:

2.1 Central and Southern Railway have reported several cases of cracking of Centre Pivot bottom cross plate in WAP1/4 locomotives.

2.2 The development of cracks in the surrounding areas of Centre Pivot is a serious matter as apart from weight transfer, it is also responsible for transmission of tractive and braking efforts.

3.0 Application

3.1 WAP1/WAP4 Locomotives.

4.0 Instructions:

4.1 For Railways:

Railways should undertake the following actions:

i) Where the centre pivot bottom cross plate already shown cracks or broken., follow repair instructions as per Annexure 'A'.

ii) Since, many more locos, which have not yet failed, may also show cracks at a later date, look for symptoms as per Annexure 'B'.

iii) Where symptoms as (ii) above are confirmed follow repair procedure as per Annexure 'C'.

iv) On locos, where symptoms as in (ii) above are not noted no action need to be taken.

4.2 For CLW:

CLW may implement the scheme as per Drg. No. SKDL- 4457 (Alt.1)

Alternatively, the old arrangement may be followed, with special precautions that vertical plates (Item No.6) are continuously welded on both sides with two vertical cross plates (Item No.5) and middle plate (Item No.14). Also for proper wielding of two vertical plates (Item No.6) with top cross

plate (Item No.3), some suitable method may be adopted similar to procedure elaborated in item (C7) of Annexure 'C'. Also special care should be taken while plug welding middle plate (Item No.14) with bottom cross plate (Item No.4).

5.0 Instruction Drawing :

- Refer Annexure 'A', 'B' & 'C'
- Drg. No. SKDL-4457 (Alt.1)

6.0 Agency of Implementation:

Electric Loco Sheds/ Workshop & CLW.

7.0 Distribution :

As per enclosed list.

Encl : As above

(O.H.Pande)
for Director General /Elect.

ANNEXURE 'A'

A. PROCEDURE FOR REPAIR OF CENTRE PIVOT BOTTOM CROSS PALTE AS PER ARRANGEMENT SHOWN IN CLW DRAWING NO. 03/1/31/2.

A1. The affected locomotive is to be lifted and placed on stands. Care is to be taken that it is normally not disturbed till the repairs are over.

A2. Centre of centre pivot casting should be located with reference to the fixed points (Geometrical centres of side bearer brackets on the underframe). The various distances of centre pivot casting centre should be noted down.

A3. The equipments including bottom tray/mounting bases /MVMT ducts/ pipe lines etc. should be removed from inside the locomotives located on the top of effected centre pivot.

A4. After step (3), the top cross plate (Item No.3 of CLW's Drg No. 03/1/31/2) and its surrounding areas should be clearly visible and accessible.

A5. Before removing the failed centre pivot beam adequate cross stiffenings should be made to prevent the misalignment of under frame due to its removal.

A6. Now remove failed centre pivot structure by weld cutting the box section, taking proper precautions without damaging the side beams (Item No.2 of CLW's Drg No. 03/1/31/2).

A7. The bottom cross plate (Item No.4 CLW's Drg. No. 03/1/31/2) is either to be collected from CLW in ready made shape or alternatively to be prepared in the workshop/shed as per following procedure:

i) Take 20 mm thick MS plates (as per IS 2062) of size 122 x 520 mm square allowing 10 mm extra margin on both sides to compensate for the variations in the transverse distance of main beam (Item No.2 of CLW"s Drg. No. 03/1/31/2) of locomotives.

ii) The plate is to be marked for four holes of M20 size as per enclosed sketch 'A' and these holes should be drilled.

iii) For bending of 20 mm plate in the required shape, a special bending fixture similar to ELW/BSL may be prepared. The plate should be mounted and fixed in the four holes to restrict the movement of plate during hot working.

iv) The plate should be heated at the bending locations by oxy-aceteleve flame and the necessary force required for bending is developed by mechanical turfer. The plate after bending from both ends should conform to enclosed drawing SKEL-4433.

v) The Shaped plate should be tested by magna-flux method for any cracks on the bend portion.

A8. Now the cross beam plate should be marked for the location of centre pivot and brackets.

A9. A simple welding fixture may be prepared as per sketch 'B' enclosed herewith as Annexure to avoid a warpage of cross beam plate during welding of centre pivot brackets. The welding fixture consist of 40 mm thick plate with M18 tapped holes in accordance with the four holes of the crossbeam plate.

A10. The crossbeam plate is fixed on 40 mm plate with the help of M18 x 40 bolts as shown in sketch `B'. The bolts are fully tightened before the commencement of welding on centre pivot and brackets. The tightness of fixing bolts should be checked frequently during continuos welding operation to prevent any distortion in the shape of the plate due to welding operation.

A11. After the welding operation of centre pivot on bottom cross plate is completed, the four holes drilled in step A7 (ii) should be closed by well filling and the whole plate should be heated to 920-950^{O} C temperature in the same position and quenched in sand or ash for relieving the accumulated stresses. The cooling period is recommended for a minimum of 08 hrs.

A12. Now the bottom cross plate along with centre pivot should be mounted on the beam
(Item No.2) of the locomotive super structure. The centre of the bottom cross plate is to be aligned with the existing centre line on the locomotives beam and at the same time, centre of the pivot casting is to be located as per the distances noted above in step (2) after the completion of adjustments, the bottom cross plate is to be take welded.

ANNEXURE 'B'

B. SYMPTOMS OF POOR WELDING OF VERTICAL PLATES (ITEM NO.6) IN WAP1/WAP4 LOCOMOTIVES :

B1. The MVMT duct as well as its mounting base are closest to the centre pivot assembly. If the welding of vertical plates item no. (6) is not proper with top cross plate (Item No.3), two vertical cross plates (Item No. 5) & middle plate then during normal running and braking, abnormal vibrations and noise will be felt in the nearby areas of centre pivot. These vibrations may cause serious cracks in MVMT duct repeatedly and mounting bolts of MVMT as well as its mounting base may become loose frequently. This experience has been found true so far in two cases of Southern Railway (Loco No.22049 & 22070). Therefore if in any WAP1/WAP4 locomotive. MVMT duct/foundation related problems are being repeatedly than it should be checked on experienced.

priority. Similarly experienced drivers, loco inspectors may be asked for their feedback during their foot plate inspections on WAP1/WAP4 locomotives for any abnormal vibrations/noises in the surrounding areas of centre pivot during normal acceleration/braking.

B2. So far the cracks in the centre pivot cross plate have been reported in the following locomotives:

SI.NO.	Loco No.	Type	Owning Shed/Railway
	22049	WAP1	Arrakonam/Southern
	22070	WAP1	Arrakonam/Southern
	22019	WAP1	Jhansi/Central
	22021	WAP1	Jhansi/Central
	22041	WAP1	Jhansi/Central
	22054	WAP1	Jhansi/Central
	22015	WAP1	Jhansi/Central
	22007	WAP1	GZB/Northern

In almost all the cases above, vertical plates (Item No.6) were found very poorly welded with top cross plate (Item No.3) , two vertical cross plates (Item No.5) and middle plate (Item No.14). Since it is due to negligence during manufacturing at CLW, it may be existing in WAP1/WAP4 locomotives manufactured subsequent to 22007 (WAP1). It is therefore necessary that sheds keep a watch on symptoms as described above in B1 and should plate inspect centre pivot bottom cross carefully, during routine lifetimes of WAP1/4 locomotives.

ANNEXURE 'C'

C. PROCEDURE FOR CHECKING THE HEALTH OF BOX SECTION FORMED BETWEEN TOP CROSS PLATE (ITEM NO.31) TWO VERTICAL CROSS PLATES (ITEM NO.5) AND MIDDLE PLATE (ITEM NO. 14) AS PER ARRANGEMENT SHOWN ON CLW DRAWING NO.03/1/31/2

NOTE:

Unless there is positive indication either by way of symptoms or by crack on centre pivot bottom cross plate, opening of box section to inspect welding of vertical plates (Item No.6) with side plate and centre pivot bottom plate is not advisable.

C1. The locomotives to be lifted and placed on stands. Care is to be taken that it is normally not disturbed till the full checking is over.

C2. Thorough checking of bottom cross plate in the surrounding areas of centre pivot should be done for any symptoms of cracks. If any cracks are noticed then the repair procedure as described above in (A) should be followed.

C3. If no cracks are found on bottom cross plate during checking in step (C2) above then follow step (A2) and step (A3) of repair procedure described in Annexure 'A' for both the centre pivots.

C4. Suitable peep holes should be cut in the top cross plate (item No.3 of Drg. No. 03/1/31/2) to check the welding condition of vertical plates (Item No.6 of Drg. No. 03/1/31/2) with two vertical cross plates (Item No.3) and middle plate (item No.14). The welding of vertical plates (Item No.6) with two verticals cross plates (Item No.5) and middle plate (Item No.14) should be continuos on all sides.

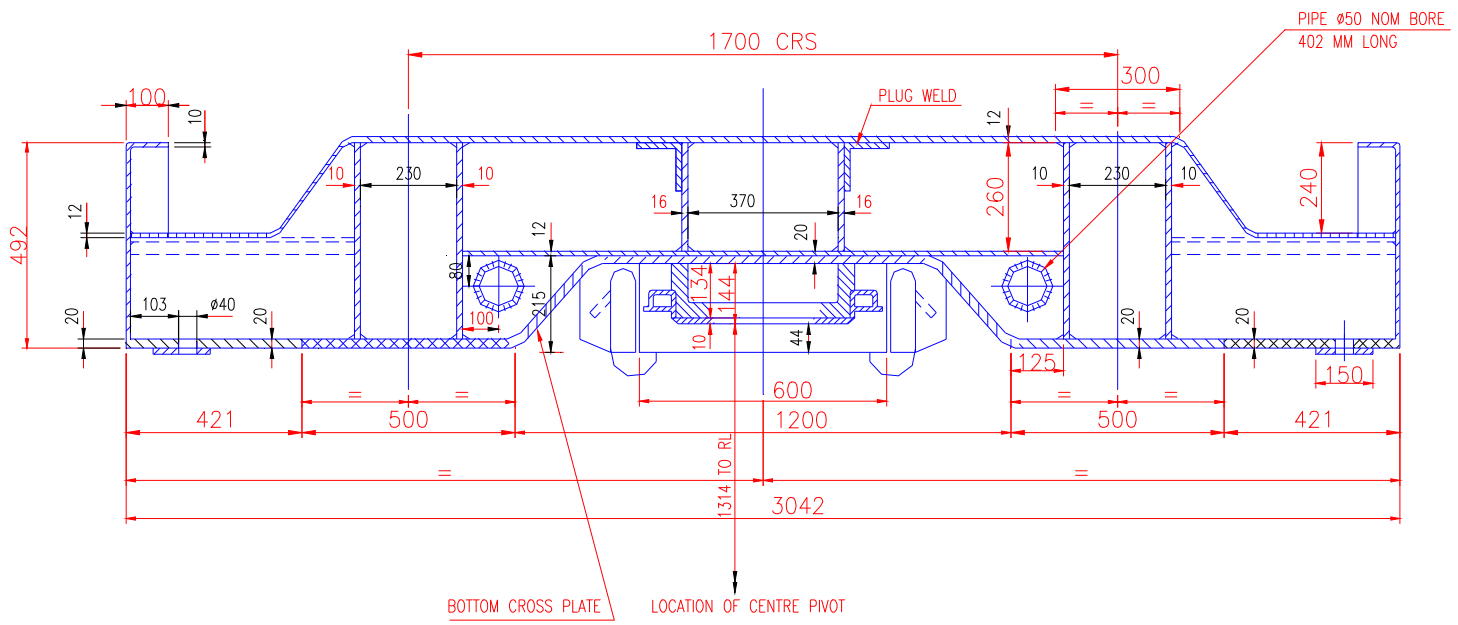
C5. If the welding of vertical plates (Item No.6) is continuos and proper on all the sides with two vertical cross plates (Item No.4) and middle plate (Item No.14) then peep holes may be suitably closed and all removed equipments should be fitted back and locomotives may be released for normal service.

C6. If the vertical plates (Item No. 6) are found only tack welded with two vertical cross plates (Item No.5) & middle plate (Item No.14) then top cross plate should be removed carefully by weld cutting and continuos welding of vertical plates (Item No.6) with two vertical cross plates and middle plate should be properly done on all sides. The condition of plug welds between middle plate (Item No.14) and bottom cross plate (Item No.4) should also be checked and redone if required.

C.7 Suitable angles of 20 mm thickness may be welded with the two vertical plates as per enclosed drawing SKEL 4432 so as to provide accessibility for welding with top cross plate (Item No.3).

C.8 Now new top cross plate (Item No.3) should be placed in original position and to be welded carefully with the longitudinal beams (Item No.2), Vertical cross plates (Item No.5) and plug welded with angles provided on vertical plates (Item No.6).

C9. Now all the removed equipments should be fitted back in the reverse and locomotives may be released for normal service.

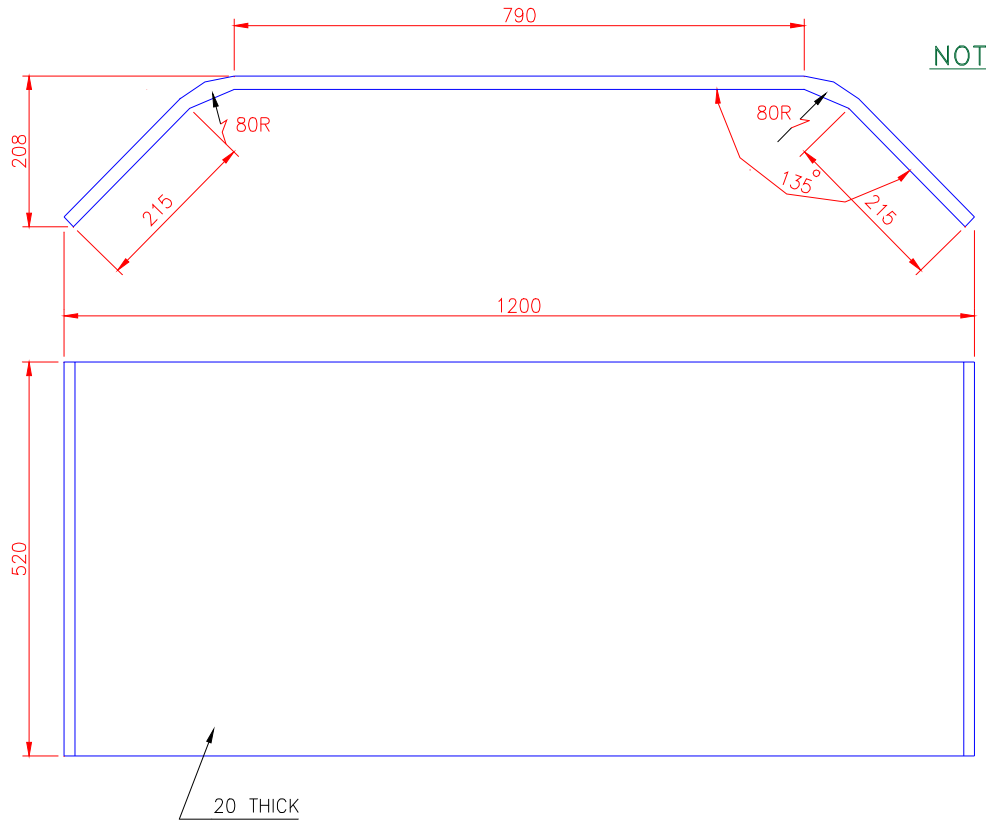


NOTE :-

1. ALL DIMENSIONS ARE IN mm.

Dt.	
D	
T	
C	

REF: DRG NO. ELW/BSL/3/SK-271-A	APPROVED BY FOR D.G.
LOCATION FOR CENTRE PIVOT COMPLETE	
R.D.S.O. ELEC. DTE.	SK.EL - 4432



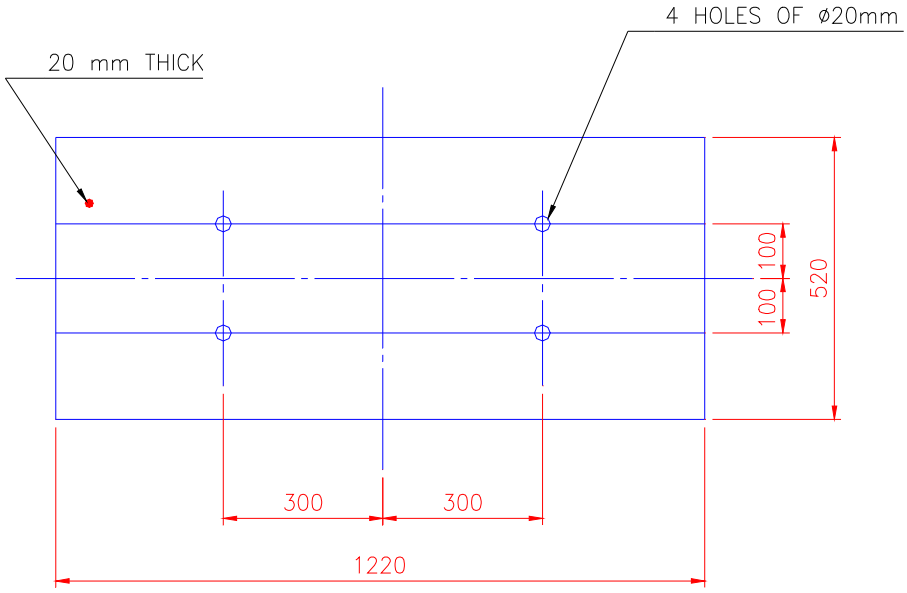
NOTE:–

1. ALL DIMENSIONS ARE IN mm.
2. GENERAL TOLERANCES AS PER IS:2102
3. MATERIAL & SPECIFICATION GIVEN AS PER CLW DRG. 03/4/31/32.

DEVELOPEMENT LENGTH–1360

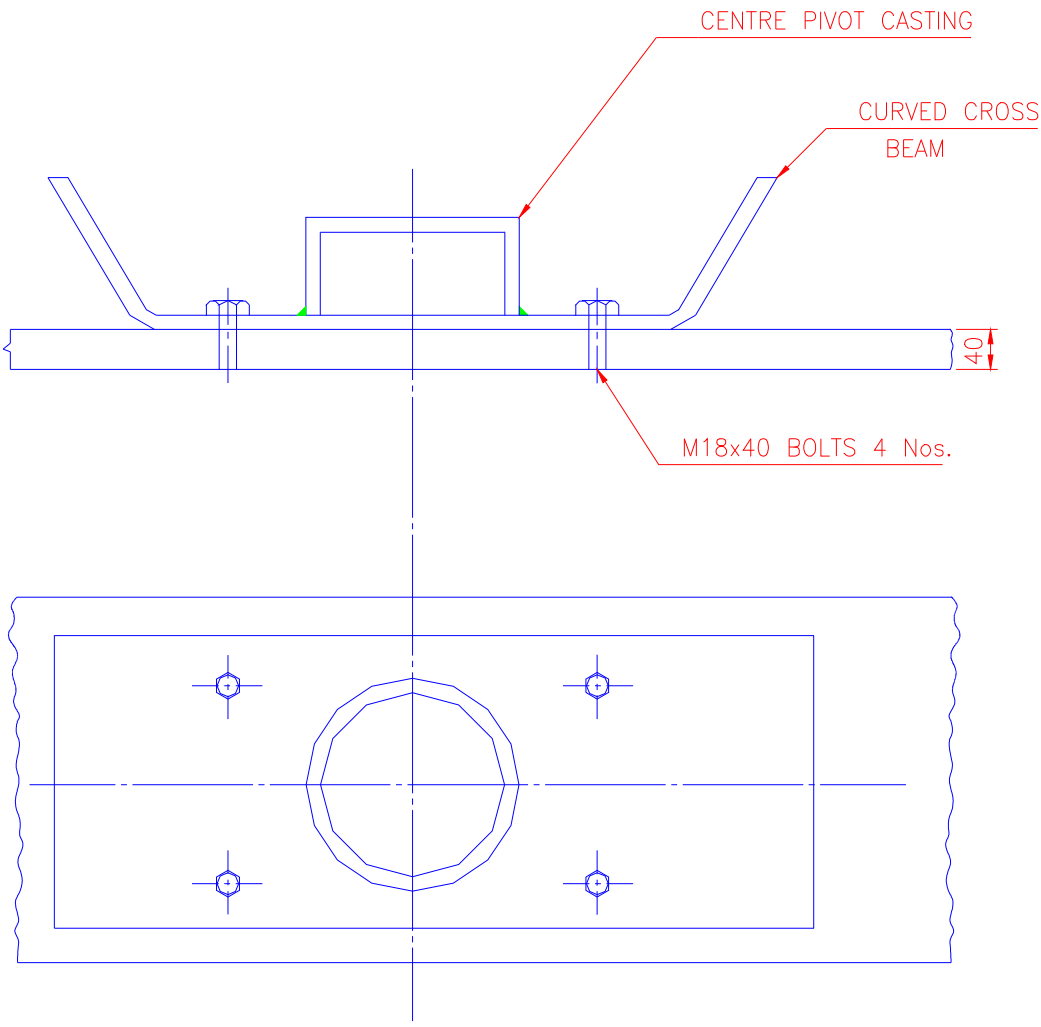
Dt.	22.12.97
D	
T	
C	

REF:– ELW–BSL DRG No. BSL/ELW/3/DEV/081	APPROVED BY:– FOR D.G.
BOTTOM CROSS PLATE	
RDSO. ELEC. DTE.	SKEL–4433



SKETCH–A

NOTE:– 1. ALL DIMENSIONS ARE IN mm.


CENTRE PIVOT CASTING
CURVED CROSS BEAM
40
M18x40 BOLTS 4 Nos.

SKETCH–B