2052 B

No. EL/3.1.35/2 (Brake Lever) Date: 07/09/2009

SAIL-25

MODIFICATION SHEET NO. RDSO/2009/EL/MS/0381 Rev'0'

1.0 **TITLE**:

Provision of Conventional Brake Rigging Arrangement in 25kV AC 3-Phase Electric Locomotive type WAP-7 for High speed operation.

2.0 **OBJECT**:

To ensure the safe, reliable and effective working of brake rigging arrangement at speed upto 140 kmph in WAP-7 class of Electric Locomotive.

3.0 **BRIEF BACKGROUND & EXISTING ARRANGEMENT**:

a) Railways have been reporting breakages of brake hanger of TBU/PBU in WAP7 locomotives. It is noted that the breakages are taking place at higher speed due to higher level of vibration and higher weight of PBU/TBU. Worldwide, PBU/TBU are not in use on high speed passenger locomotives. The existing TBU arrangement in WAP7 can be replaced with brake system similar to WAG7. The braking effort of 12 t as in WAP4/WAP5 will be adequate with the adoption of WAG7 brake assembly in WAP7. It is to mention here that the similar brake rigging arrangement have been in use in high speed WDP2 locomotive which is working at a maximum speed of 120 km/h and fit to work upto maximum speed of 160 km/h.

b) Accordingly a feasibility study was done by RDSO and two bogies were modified and fitted with conventional brake rigging arrangement of WAG-7 in one WAP7 Locomotive No. 30226 based at ELS/Gomoh. The field trials of this Locomotive was carried out upto the speed of 110 kmph for more than a month. The emergency braking distance trials were also carried out upto the maximum speed of 155 kmph. The results have been found quite satisfactory and with this brake rigging arrangement, the WAP-7 Locomotive is fit to work upto the maximum service speed of 140 kmph subjected to statutory compliance and clearances.

4.0 **MODIFIED ARRANGEMENT & SCOPE OF WORK**:

The details of work content and its procedure is given as under:

(A) Modifications in Bogie Frame:

a) Dismantle the bogie frame and clean it with caustic soda or other recommended cleaning agent. The dust, dirt, oil/grease shall be removed with hot water jet.

b) Remove all the TBU/PBU hanger brackets by oxy-cutting cleanly. Care should be taken during cutting operation to prevent formation of notches and excess removal of material. There should not be any mark or traces of foreign material on the bogie frame from where TBU/PBU brackets are removed.

c) Yaw damper bracket and vertical stop pad shall also be removed by the same process and care.

d) Bottom plate of transom shall be cut smoothly, followed by grinding for free movement of vertical levers.

e) Also the grinding should be done at all the cut locations smoothly for removal of stress raiser point.

f) Bogie shall be examined after this for smooth finish and inspected for any cracks/abnormality at all the locations.

g) Bogie frame shall be placed on a levelled surface plate/surface table and shall be marked for locating brake rigging brackets as per RDSO drawing no. SKVL-582 alt.1

h) The brackets of different shapes/sizes for various locations shall be manufactured as per RDSO Drawing No. SKVL-582 alt.1

i) All the brackets shall be welded at appropriate location by MIG welding. The welding procedure and inspection/testing of weld quality shall be done in accordance with the procedure as laid down in RDSO Specification No. VL.SPEC.06 (Rev. '1' of 2001) (Specification for Fabricated Bogie frame and Bolster Assembly for Locomotive).

j) The record of testing results of weld joints shall be kept and maintained.

k) After welding of brackets, the bogie frame shall be stress relieved in one go i.e. complete frame at a time as per the procedure given in RDSO Specification No. VL-06.

l) After stress relieving, bogie shall be subjected to shot/sand blasting for cleaning of rust, scale etc.

m) After cleaning the bogie frame, all the brackets weld joints and critical areas shall be checked for cracks and distortion, if any.

n) Bogie frame shall be coated with one coat of anti-corrosive paint in order to prevent rusting.

o) Bogie frame shall be placed on marking table/surface table to ensure the correct profile/geometry and absence of distortions.

p) The bogie frame shall be machined wherever the machining is required in one setting.

q) The brake rigging arrangement as per RDSO drawing no. SKVL-582 alt.1 shall be assembled. There are total 57 items. Majority of the items are common to the existing WAG-7 brake rigging. The detailed list of such items and its comparison with the WAG-7 class of Locomotive are given in Annexure-I.

r) Yaw damper brackets and their fitments at relocated points shall be done as per RDSO Drawing No. SKVL-588.

s) All pneumatic pipe lines, brake cylinders shall be mounted on bogie frame as per RDSO Drawing No. SKVL-584 alt.1 & 585.

(B) Modifications in Locomotives

a) The existing yaw damper brackets from the underframe shall be removed by oxy-cutting. This should be relocated in the underframe of locomotive as per RDSO Drawing No. SKVL-588.

b) The relocating procedure shall have to be same as mentioned for welding of brackets in bogie frame.

c) On the Cab-I side, inside the machine room just behind the assistant driver side, the conventional hand brake arrangement shall be mounted as per the layout shown in sketch-1.

d) The foot step shall be suitably modified as per layout shown in sketch-2.

e) Three (3) nos. pneumatic pipe lines and their brackets shall be suitably relocated as per layout shown in sketch-3.

f) The existing indication lamp for parking brake on the driving desk (BPPB) shall be removed.

g) Suitable instructions for availability of conventional hand brake shall be displayed in both the cabs of the Locomotives.

h) The hand brake assembly mounted in machine room shall be covered with enclosures as per RDSO sketch no. 4. This is to eliminate leakage through the hole made in the under frame of the locomotive for movement of hand brake chain.

5.0 (A) The work contained in Para 4.0 (A) as above, can only be done by the outside agencies. The essential M&Ps, testing facilities and other infrastructure required for carrying out the work is given below –

i) **Heat treatment furnace**: Cera wool lined heat treatment furnace or similar having connected with 14 point thermo couples (6 on faces + 8 corners) and 14 point temp. recorder for recording the rate of heating, soaking, cooling time in a graph. The heat treatment furnace must have the capacity for raising the temp. upto 900°C. The size of the heat treatment furnace should be such that it preferably of size (length 6 mtrs x W 3 mtrs x H 3 mtrs) and can accommodate the co-co bogie for carrying out the heat treatment in one go.

ii) **Plano milling cum planning machine**: This is required for machining of horn chick & bracket mounting point besides some intricate boring of levers and brackets used for brake rigging arrangement.

iii) **Shot blasting facilities**: Adequate shot/sand blasting arrangement suitable for operation.

iv) EOT crane facility of min 10 t capacity for bogie frame shall be available.

v) Agency shall have facilities for low Metal Inert Gas (MIG) welding using CO_2/Argon gas as shielding media.

vi) Tenderers shall submit documentary evidence for procurement of steel plates for replacement of brake rigging bracket in bogie frame as per IS: 2062 grade as specified in Specification No. VL.Spec-6. Procurement shall be made only from approved and/or RDSO approved sources. The testing facilities for plates must be available.

vii) The welders should be capable of carrying out MIG welding of highest standard

viii) MPT & Dye penetrate test equipments must be available in-house.

ix) **Radiographic facilities**: For detection of cracks & checking of soundness of weld after the work.

x) For squaring of bogies suitable jig and fixtures should be available.

xi) Surface table/marking table must be available of adequate size to accommodate complete bogie at a time.

5.0 (B) **Documents to be submitted by the outside agencies for carrying out the work**

Detailed Quality Assurance Programme (QAP) for the work is required to be made. QAP shall consist of the following –

i) The dimensional check sheets including bogie trammelling and machining indicating tolerances.

ii) Checks to be carried out for welding defects in critical and non-critical areas.

iii) Method for maintaining record of defects in welding rectification and inspection.

iv) The detailed marking plan for welding of brackets.

v) Final inspection check sheet.

vi) Agency shall submit a detailed statement showing the type, make of various machinery and plants available with them along with their present working status.

vii) Agency shall submit details of qualified technical personnel and laboratory personnel for giving their names and educational qualifications.

viii) Agency shall submit details of qualified welders as per norms stipulated in IS: 817/ & IS: 7310 (Approval test of welders work to approved welding procedure).

ix) Clause wise comments on this specification and test programmes and deviations if any in terms of the cause

x) In case the firm is not able to submit the above mentioned information and fail to comply STR their offer will be rejected without assigning any reason whatsoever by the Railways.

xi) In case of any problem and lack of clear cut understanding with respect to dimensions, clearances and other technical details, the

agency should consult the consignee for clarifications. The decision of the consignee shall be final.

5.0 (C) The list of brake rigging items including the common items with WAG7 brake rigging is enclosed as Annexure I. The procurement of brake rigging components and other items shall be done from CLW/RDSO approved sources by the implementing agency during modification work.

5.0 (D) The work contained in para 4.0(B) can be done by the Electric Loco Sheds in electric locomotives on shed floor. However, adequate care should be taken to remove and fit yaw damper brackets in respect of its quality of welding and positioning. The welding quality shall be checked by radiography.

6.0 **Application to class of locomotives**:

Type WAP7.

7.0 **Material required and source of supply**:

i) Materials required as per relevant drawings & specifications:

SN	Title of drawings	RDSO Drawing no
1	Brake rigging brackets (assembly & details for conventional brake rigging arrangement)	SK.VL-582 alt.1
2	Brake rigging arrangement	SK.VL-584 alt.1
3	Brake rigging details	SK.VL-585 (three sheets)
4	Brake rigging bushes	SK.VL-586
5	Vertical stop & Yaw damper brackets (assembly and details)	SK.VL-588
6	Hand brake arrangement	Sketch-1
7	Foot step arrangement	Sketch-2
8	Modification to pneumatic pipe lines in underframe of locomotives	Sketch-3
9	Enclosure for hand brake assembly in machine rooms	Sketch-4

II) Sources of supply:

As per CLW/RDSO approved vendor list, as the case may be.

8.0 **Materials rendered surplus**:

The released TBU/PBU and pivot/brackets shall be used as rotational spares for the existing fleet of WAG9 & balance WAP7 locomotives till such time all WAP7 locomotives are modified. Therefore, the surplus materials will be NIL.

9.0 **Agency & periodicity for implementation:**

Electric Loco Sheds, POH Workshops during major schedules.

10.0 **Maintenance schedules:**

After fitment of conventional brake rigging arrangement, the overhauling of brake cylinders, replacement of pins and bushes, replacement of rubber hoses etc shall be done as per existing schedule of WAP4 class of locomotives. The schedules of checking, testing and monitoring of brake system shall be identical to WAP4 locomotives during minor schedules. However, the replacement of pins and bushes should be done annually till such time the more experience is gained for the wear pattern of the pins and bushes.

11.0 **References:**

i) RDSO's specification no. VL.06 of 2001 for fabricated bogie frames of locomotives.
ii) MP Dte/RDSO's modification sheet no. VL.01.03.09 Rev '00'
iii) RDSO's specification no. RDSO/2008/EL/SPEC/0057 Rev 0 – Feb'2008 for scope and schedule of work for repair, rehabilitation of bogie frame of electric locomotives.
iv) RDSO's report no. RDSO/2007/EL/IR/0124 of October 2007 on breakages of brake hanger of TBU/PBU WAP7/WAG9 locomotives.

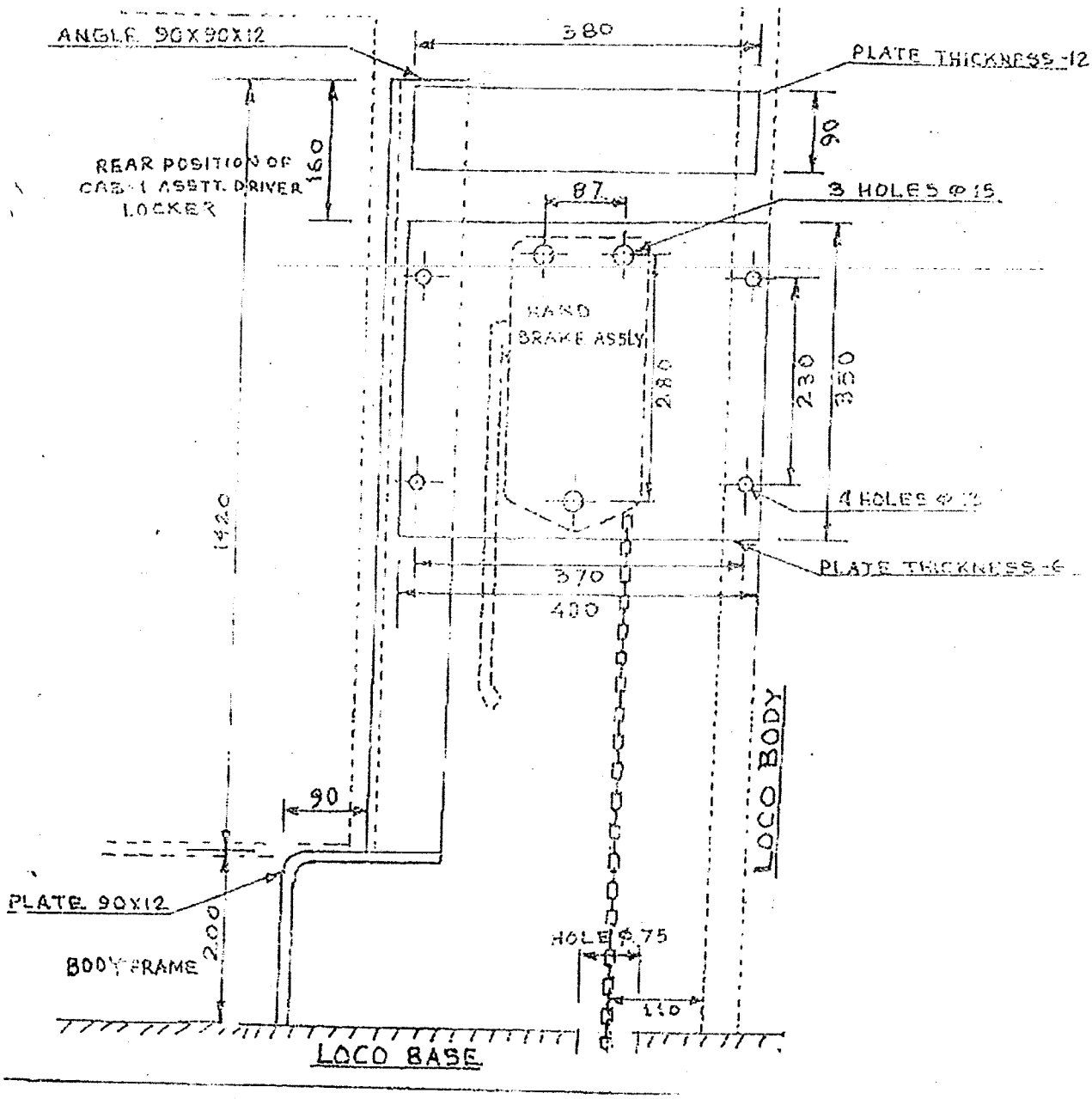
12.0 Distribution:

All concerned Chief Electrical Engineers.

(M K GUPTA)
-for Director General/Electrical

SKETCH-1

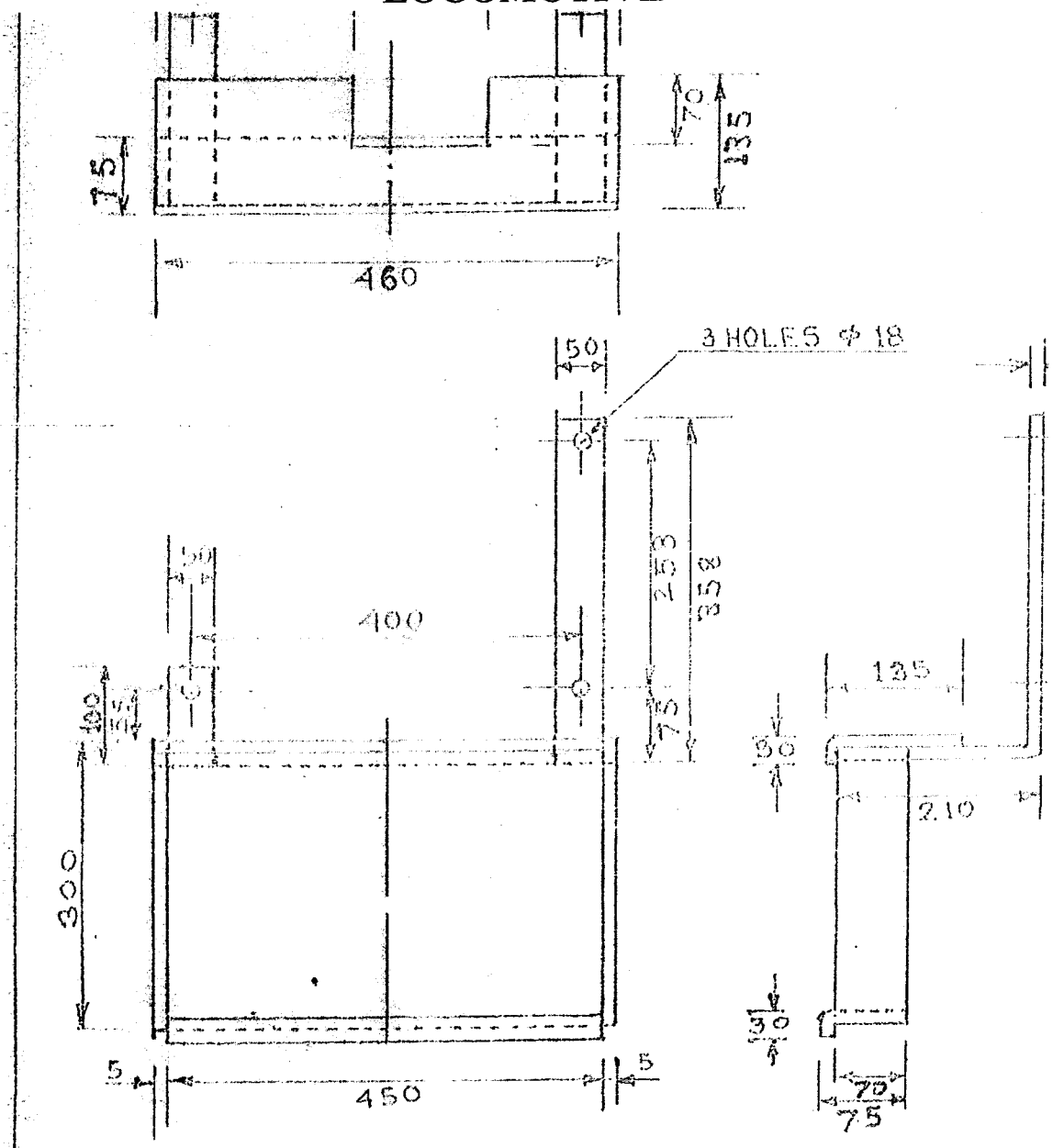
CONVENTIONAL HAND BRAKE ARRANGEMENT IN WAP7 ELECTRIC LOCOMOTIVE



Note: This is an enclosure to Modification sheet no. RDSO/2009/EL/MS/0381 Rev'0'

SKETCH-2

FOOT STEP ARRANGEMENT FOR WAP7 ELECTRIC LOCOMOTIVE

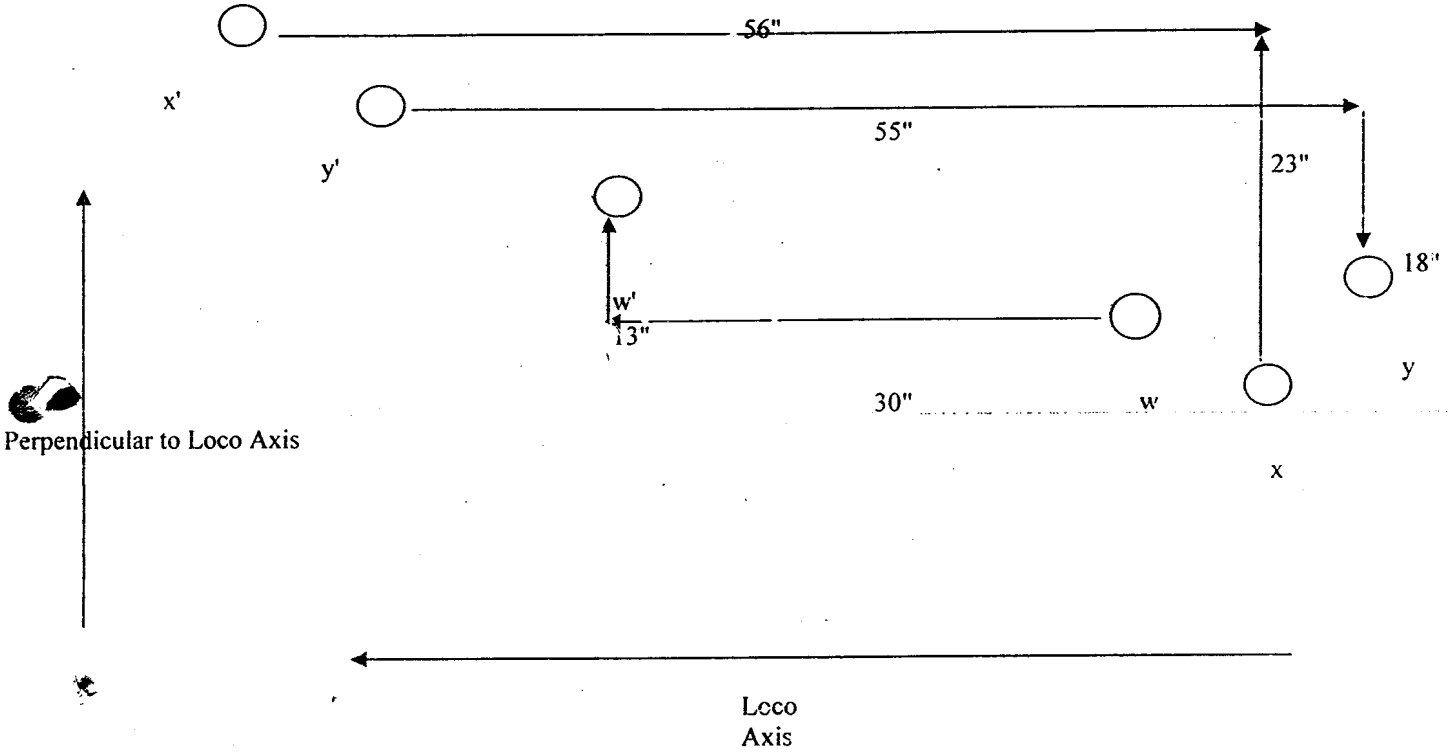


NOTE- This is an enclosure to Modification sheet no. RDSO/2009/EL/MS/0381 Rev'0'

All Dimensions are in mm.
Material Steel IS:226
One advanced sample to be got approved before bulk manufacturing.

SKETCH-3

MODIFICATION TO PNEUMATIC PIPE LINES IN UNDERFRAME OF WAP7 ELECTRIC LOCOMOTIVE

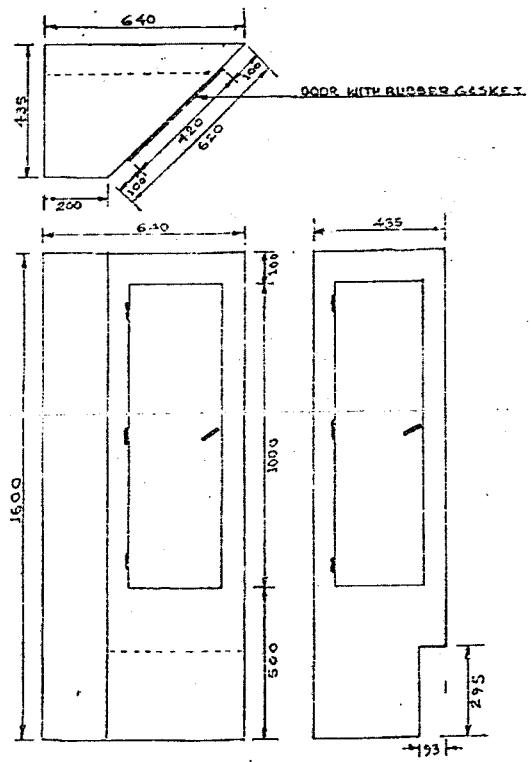


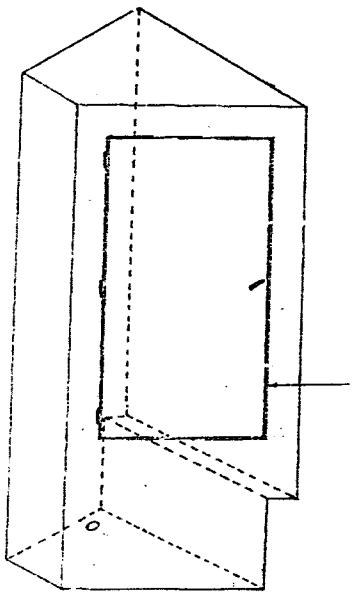
- **X,Y and W are existing arrangement, where W is MR incoming to Pneumatic panel, X is outgoing MR equalizing from Pneumatic panel**
- **X', Y' and W' are modified arrangement.**

Note- This is an enclosure to Modification sheet no. RDSO/2009/EL/MS/0381 Rev'0'

SKETCH-4

AIR TIGHT BOX ARANGEMENT WITH DOOR FOR HAND BRAKE IN WAP7 ELECTRIC LOCOMOTIVE





Note- **This is an enclosure to modification sheet no. RDSO/2009/EL/MS/0381 Rev - '0'.**

1. **All dimensions are in mm.**
2. **Material :- steel plate thickness 1.5 mm.**
3. **Hand brake to be fitted in this box.**