

## REVISION OF SPECIFICATION / STR

**Ref:**Current Spec. No. RDSO/2007/CG-07 (Rev-1) Amendment-1, STR for Injection Moulded Thermoplastic Polyester Elastomer axle box front cover for M.G. & B.G. Mainline and EMU Coaches.

1. RDSO is reviewing the specification/STR to cater to the latest technological developments in the field, modify clauses not relevant in the present context and making them more enabling with focus on functional requirements.
2. It is requested that your comments / suggestions with regard to improvements / modifications in specification / STR of this item may be submitted in the following format alongwith the justification for the changes required.

### Part A: Basic Information

SN	Particulars	Information
1	Name	
2	Designation	
3	Professional Qualification	
4	Organization / Firm's Name	
5	Address for Correspondence	
6	Contact No.	
7	Email ID	
8	<b><u>In case of Firm / Individual:</u></b> Manufacturing experience of item (or similar Item) on which comments are offered	
9	<b><u>Where relevant:</u></b> Whether any technical document to support suggested changes is available / enclosed for better appreciation	

### Part B: Comments / suggestions on the specification

SN	Clause No. of RDSO STR / Spec	Clause, as exists in RDSO STR / Spec	Clause , as it should read after incorporation of comments / suggestions in the RDSO Spec / STR	Justification for changes

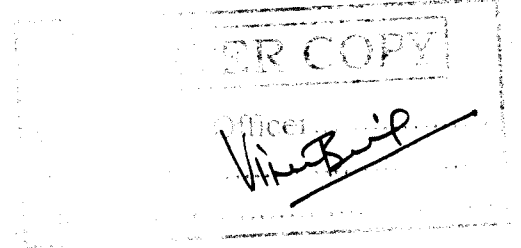
**Comments may be sent to:**

Director/SS/Carriage,  
Annexi-1, Carriage Directorate,  
Research Designs and Standards Organization  
Manak Nagar, Lucknow – 226011

Email: edcar.rds@gmail.com Or dirssrds@gmail.com

Ref: CG-WI-4.2.1-1 Ver. -1.0	Page 1 of 20	Date of Issue: August- 2016	Spec. No. RDSO/2007/CG-07 (Rev. 1)
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## INDIAN RAILWAYS



### SCHEDULE OF TECHNICAL REQUIREMENTS FOR INJECTION MOULDED THERMOPLASTIC POLYESTER ELASTOMER AXLE BOX FRONT COVER FOR M.G & B.G. MAINLINE AND EMU COACHES

S. No.	Month/Year of Issue	Revision/ Amendment	Page No.	Reason for Amendment
1.	March, 2008	-	-	First issue
2.	November, 2008	Amendment-1	5, 10, 13, 14, 16, 19	Properties modified. Test procedure corrected
3.	September-2012	Revision-1	All pages except 8, 9, 13, 16, 18, 19	Specification is generalized. Acetal Bushes modified to Metallic Bushes
4.	August, 2016	Amendment-1	3	ISO Document No: QO-D-7.1-11 has been added as new sub Clause 1.2 in Scope of section- A

**Issued By**

**Research Designs and Standards Organization  
Manak Nagar, Lucknow-226 011**

Signature	<i>M.K. Arun</i>	<i>Praveen Kumar</i> 26/8/16	<i>Vineet Singh</i> 26/8/16
Name & Designation	Prepared By:- M.K. Arun SSE/SS/Carriage	Checked By:- Praveen Kumar Dy. Director/SS/Carriage	Approved By- Vineet Singhal Director/SS/Carriage

Amendments slip No. 1 of August, 2016 to Spec No. RDSO/2007/CG-07 (Rev. 1) for Schedule of Technical requirements for Injection Moulded Thermoplastic Polyester Elastomer Axle Box Front Cover for M.G & B.G. Mainline and EMU Coaches

Add new sub **Clause 1.2** in **Scope** of section- A, as under:

All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-7.1-11 dated 19.07.2016 (titled "**Vendor – Changes in approved status**") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contract floated by Railways to maintain quality of products supplied to Railways.


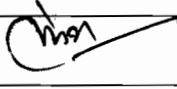
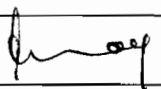
*M. Arun*



*Went*

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**SCHEDULE OF TECHNICAL REQUIREMENTS FOR INJECTION MOULDED  
THERMOPLASTIC POLYESTER ELASTOMER AXLE BOX FRONT COVER FOR  
ICF TYPE M.G. & B.G. MAINLINE AND EMU COACHES**

**0. FOREWORD**

- 0.1 This schedule consists of two parts viz. Section-A and Section-B. Section-A covers the technical requirements/provisions relating to material, manufacture and tests and does not include the necessary provisions of the contracts. Section-B covers the requirement for manufacturing, testing and quality control facilities for manufacture of Injection Moulded THERMOPLASTIC POLYESTER ELASTOMER Axle Box Front Cover of ICF type M.G & B.G. Mainline and EMU coaches.
- 0.2 This schedule draws reference to some of the relevant National/International specifications. Unless otherwise specified, latest version of these specifications shall be taken as reference.
- 0.3 For the purpose of deciding whether a particular requirement of the schedule is complied with, the final value observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2. The number of significant places retained in the rounded off value shall be the same as that of the specified values in this schedule.
- 0.4 While preparing this specification, due consideration has been given to the latest developments in the field of polymeric materials and process technologies, service requirements of the Indian Railways and practices followed in advanced countries.

**SECTION – A**


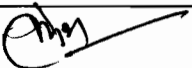
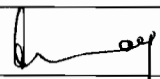
**1.0 SCOPE**

- 1.1. This section covers the technical requirements/provisions relating to material, manufacture, tests, sampling and method of tests for injection molded Axle box front cover for ICF type M.G. & B.G. Mainline and EMU coaches.

**2.0 REQUIREMENTS**

**2.1 Material**

- 2.1.1 The material used for the manufacture of Axle Box front cover shall be “THERMOPLASTIC POLYESTER ELASTOMER” material confirming to the properties specified in this schedule. Use of regenerated/reconstituted material is not permitted.


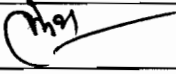
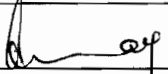
<i>Signature</i>			
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- 2.1.2 The manufacturer shall have a valid tie-up in the form of a written Memorandum of Understanding (MOU)/contract with primary manufacturer of "THERMOPLASTIC POLYESTER ELASTOMER" material, covering raw material supplies and technical support including quality control.
- 2.1.3 The manufacturer of the axle box front cover shall not change the constituents of the copolymer and shall only mould the axle box front cover out of the material supplied to them by the primary manufacturer.
- 2.1.4 The Axle Box front cover shall be supplied in natural colour of resin and use of any external colouring agents is not permitted. The firm should specify colour of resin at the time of registration.
- 2.1.5 In case alternative equivalent material other than proved material for an existing approved design is offered for manufacture of axle box front covers, the axle box front cover made from alternate material will be subjected to field trials on at least 50 coaches for one POH. Approval will be given only after satisfactory performance of axle box front covers in the field trials and capacity assessment of the firm.
- 2.1.6 The Primary manufacturer of raw material should be of international repute and shall be in the business of supplying "THERMOPLASTIC POLYESTER ELASTOMER" material in the last 10years. The Annual turnover of primary manufacturer of raw material shall be minimum of 100 Crores. The final decision authority for deciding the raw material supplier credentials will be ED/Carriage/RDSO.
- 2.1.7 The raw material will be accepted on Work Test Certificate (WTC) of OEMs. The converters will maintain records of the WTCs for each lot and shall present them for inspection whenever required.
- 2.1.8 The raw material shall be resistant to grease contamination. A certificate from the primary manufacturer of raw material will be required for compliance of this requirement.
- 2.1.9 The manufacturer shall produce to the inspection authority the record of raw material received from primary supplier and details of supplies made to Railways & Production Units.

### 3.0 Dimensions and Tolerances

- 3.1 Axle Box front cover shall be strictly manufactured as per respective RDSO drawings. The dimensions and tolerances of the Axle box front cover shall be as indicated in the relevant drawings.
- 3.2 For dimensions in which no tolerances have been indicated in the drawings, the following tolerances shall be applicable:

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Above 0.3 mm to 5 mm	± 0.1 mm
Above 5 mm to 25 mm	± 0.25 mm
Above 25 mm to 50 mm	± 0.5 mm
Above 50 mm to 75 mm	± 0.75 mm
Above 75 mm to 150 mm	± 1.0 mm
Above 150 mm to 250 mm	± 1.5 mm
Above 250 mm to 500 mm	± 2.0 mm


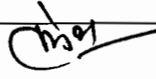
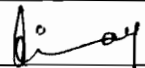
#### 4.0 Constructions, Workmanship and Finish

- 4.1 The Axle Box front cover shall be manufactured using Microprocessor Controlled fully automatic type Injection Moulding Machine having a minimum locking tonnage of 400 tonnes. "In case of power interruption or disruption of any other kind (like machine stoppage) the manufacturers should discard 5 axle box front cover on restoring of machine, in order to maintain uniformity to avoid any inclusion."
- 4.2 The surface of the Axle box front cover shall be smooth, free from moulding defects such as bubbles, surface streaks, splash marks, voids, surface sinking, crazing and blistering of the surface, cracks etc. All edges shall be neatly finished and free from flash.

#### 5. PROPERTIES:

- 5.1 The raw material used for manufacture of Axle box front cover shall conform to the requirements as given in the Table-1 and shall be measured on prepared test specimen.
- 5.2 The finished Axle Box front Cover shall conform to the requirements as given in Table-2.
- 5.3 The metallic bush fitted on axle box front cover shall conform to the requirements given in Drg. No. CG-K7131 (with latest alteration). The metallic bush will be accepted on the basis of work test certificate (WTC) for each stage i.e. chemical composition, galvanization thickness etc.

However, the samples of metallic bush will be picked up every year by inspecting authority and will be tested by outside reputed laboratory for chemical composition and galvanizing coating thickness. The testing charges will be borne by the firm. Manufacturer shall maintain the record of WTC's as well as external tests and will produce whenever asked by the inspecting authority.

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**Table -1**

(To be measured on test specimen prepared from raw material of axle box front cover)

SLNo.	Property	Value	Unit	Test Method
1	Hardness	70± 5	Durometer D	ASTM D-2240
2	Tensile Stress at break (Minimum)	30	MPa	ASTM D-638
3	Tensile Strain at break (Minimum)	300	%	ASTM D-638
4	Melt Flow Rate at 2.16 Kg. and 240 °C	20 ± 4	gm/10 min.	ASTM D 1238
5	Compression Set after 22 hrs. 9.3 Mpa at 100 °C	Less than 5	%	ASTM D 395 Method - A


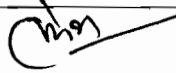
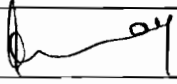
**Table -2**

(To be measured on finished axle box front cover)

Sl.No.	Property	Value	Unit	Test Method
1.	Specific Gravity	1.30 ± 0.05	-	ASTM D 792
2.	Melting Point	219 +8	°C	BS 2782-Part 1 (method 123 B)
3.	Hardness	70± 5	Durometer D	ASTM D 2240
4.	Ash Content	Less than 1	%	ASTM D 5630
5.	Weight with 4 Nos. Metallic Bushes	As Per Drg.No.CG-K7131	gms	Digital balance
6.	Impact strength test (Minimum)	6.125	Kg-m	As per Appendix A
7.	Pull out test with bush (Minimum)	900	kgf.	As per Appendix B
8.	Resistance to Grease test at 140 ± 5°C for 48 hrs.	No change in Hardness		As per Appendix C
9.	Tightening test On lugs (Minimum)	12	kg.-m	As per Appendix D
10.	Resistance to spread of flame	Shall pass	-	As per Appendix-E
11.	Compressive strength (Minimum)	3000	Kg	As per Appendix-F
12.	Shower test	Shall pass		As per Appendix-G

5.4 Unless otherwise specified, all tests shall be carried out at a temperature of 27 ± 2°C and relative humidity 65 ± 5%. Conditioning of test samples is not required.

5.5 Tests shall be carried out on “Dry As Moulded (DAM) Sample”, defined as those, which upon immediate removal from the mould, are sealed in containers impermeable to water vapour/ moisture.

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## 6.0 Tests

- 6.1 The tests for all the requirements laid down in this schedule are mandatory for product approval.
- 6.2 The tests specified in Table-1 and "Resistance to grease" in Table-2 shall constitute type test and shall be carried out at the time of approval /renewal of the firm and thereafter at an interval of one year.
- 6.3 RDSO may draw the sample for quality check at its discretion and firm shall arrange the testing of these samples in a reputed out side laboratory as decided between RDSO and manufacturer. The testing charges should be borne by the manufacturer.
- 6.4 The tests specified in Table-2 except "Resistance to grease" is acceptance test and shall be carried out on each lot/batch.
- 6.5 The "Shower test" in Table-2 shall constitute type test and shall be carried out at the time of approval /renewal of the firm.


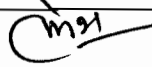

## 7.0 SAMPLING CRITERIA FOR CONFORMITY

The sampling plan for acceptance tests for Axle Box front cover and Metallic Bushes shall be as under:

- 7.1 The inspection lot shall consist of 500 numbers of Axle Box front cover and 2000 numbers of Metallic Bushes or part thereof.
- 7.2 The numbers of Axle box front cover to be selected from the lot for acceptance test shall be as under: -

a	Visual Inspection	10 % of the lot or min. 10 numbers
b	Dimensional Check, Tightening Test and product weight	5 samples shall be drawn at random from each lot.
c	Specific Gravity	5 samples shall be drawn at random from each lot/batch. Out of these samples selected, two nos. shall be tested for each test except Impact and Resistance to spread of flame. The impact and resistance to spread of flame shall be carried out on one sample.
d	Hardness	
e	Ash Content	
f	Melting Point	
g	Impact test	
h	Pull Out test	
i	Resistance to spread of flame	
j	Compressive Strength	Four Samples on each Occasion
k	Shower test	

- 7.3 The numbers of Metallic Bushes to be selected from the lot for acceptance test shall be checked for "visual Inspection" and "dimensional check" - 5 % of the lot or min. 20 numbers

<b>Signature</b>			
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- 7.4 Samples selected for Acceptance Test shall conform to the requirements as laid down under clause-6.4 of this schedule. Should any one of the test samples fail to meet the requirements of Acceptance Test, double the number of samples from the same lot shall be drawn for re-testing. Should any of these samples fail, the entire lot shall be rejected.
- 7.5 In case of non-compliance in regard to dimensional check, the manufacturer may be given one chance to segregate the lot for dimensional conformity.
- 7.6 In the event of rejection of the lot, all the Axle box front covers/ Metallic Bushes constituting the lot shall be made un-usable in the presence of the Inspecting Authority.
- 7.7 During inspection, Purchasing/Inspecting Authority, at their discretion may conduct Type Tests and the samples shall conform to the requirements as laid down under clause-6.2 of this schedule.

### 8.0 MARKING

- 8.1 Each Axle box front cover shall be suitably marked on the upper face with the following legend as per size and location indicated in the drawing.
- i. Manufacturer's name/initial/trade mark
  - ii The month and year of manufacture
  - iii Drawing Number or Part Number
  - iv Batch No.
  - v भा. रे. Mark.


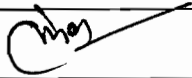
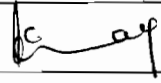
The markings should be clearly visible and readable.

### 9.0 PACKING

- 9.1 The Axle box front cover shall be securely packed individually in plastic bags indicating the above mentioned markings by a sticker on each bag. 16 nos. of such bags shall be packed in a wooden /cardboard carton strong enough to resist damage in transit/storage.


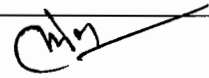
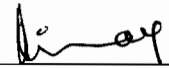
### 10.0 STORAGE

- 10.1 The Axle Box front cover shall be stored in a cool and dry place, free from constraints, in the original packing.
- 10.2 Axle box front cover shall be kept covered and free from exposure to bright light, particularly sunlight.
- 10.3 Axle box front cover shall be stocked and arranged in such order as to ensure use of old stock first.

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**11.0 WARRANTY:**

11.1 The store supplied against an order shall bear a warranty of the contractor against defective material/ workmanship and performance for a minimum period of 42 months from the date of supply or 36 months from the date of fitment whichever is earlier. In case, injection moulded Thermoplastic Elastomer Axle Box front cover cracks, deforms, fails, etc. within the warranty period, it shall be replaced by new one without any cost.

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## SECTION - B

### INFRASTRUCTURE & TESTING FACILITIES REQUIRED FOR MANUFACTURE OF INJECTION MOULDED THERMOPLASTIC ELASTOMER AXLE BOX FRONT COVER FOR ICF TYPE M.G. & B.G. MAINLINE AND EMU COACHES

#### 1.0 SCOPE

1.1. This Section covers the infrastructural requirements for manufacture of Axle Box front covers for ICF type M.G. & B.G. mainline and EMU coaches.

#### 2.0 REQUIREMENTS

2.1 All vendors seeking registration with RDSO must fulfill the requirements of this schedule.

#### 3.0 PLANT, MACHINERY & INFRASTRUCTURE REQUIREMENTS

3.1 The Manufacturer shall have adequate space and covered area with cemented floor to accommodate the following & for smooth logistics:

- a) Damp-free place for storage of raw materials
- b) Adequate manufacturing area
- c) Finishing, Assembly and Inspection area
- d) Storing and dispatch of finished products

3.2 The Manufacturer shall have at least one Micro Processor Controlled Injection Moulding Machines of minimum locking tonnage of 400 tonnes. Each machine shall be equipped with the following ancillaries:


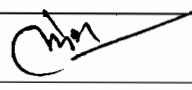
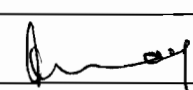
- a. Programme Logic Controlled (PLC) Electrostatic Oil Cleaning Machine.
- b. 6 Stage oil filtering machine
- c. Programme Logic Controlled (PLC) Mould Temperature Controller (MTC)
- d. Programme Logic Controlled (PLC) Hopper Dryer of type Desiccant or Dehumidifier attached with Dew Point Meter.

3.3. The firm shall have the following:

- a. One mould for Axle Box front cover
- b. Cooling Water Tank
- c. Cooling Tower

3.4 Manufacturer shall have an Air Compressor of suitable capacity.

3.5 The Manufacturer shall have suitable tools, cutters, polishing files, and Buffing Machine for de-flashing of moulded products.

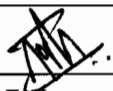
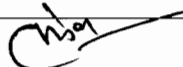
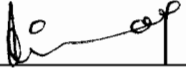
<i>Signature</i>			
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- 3.6 The Manufacturer shall have a system to ensure that moulds are checked at regular intervals and adequate mould handling facilities like Chain Pulleys or Electric Hoists or other suitable equipment for moving heavy moulds.
- 3.7 Prior to release of dies/moulds for production, these are to be checked dimensionally and records containing details of such inspection and date, maintained.
- 3.8 Two Electronic Weighing Machines of reputed make, one of maximum 3 Kg. capacity and the other of minimum 50 kg. capacity of accuracy 0.2% shall be provided.
- 3.9 Weighing machines shall be calibrated regularly by Govt. approved agency. The frequency of calibration shall be as recommended by the manufacturer of weighing machine.
- 3.10 Manufacture should have suitable in house facilities for minor repair of dies /moulds.

#### 4.0 TESTING FACILITIES

- 4.1 The Manufacturer shall have the following testing and other equipment installed in a Laboratory set up with controlled temperature and humidity.
1. Tensile Testing Machine/Universal Testing Machine
  2. Melt Flow Rate Tester
  3. Shore Hardness Tester for Durometer 'D' scale.
  4. Apparatus to measure the Melting Point.
  5. Weighing Balance with specific gravity determination kit.
  6. Muffle Furnace of suitable capacity for determination of ash content.
  7. Equipment to test Compression set as per ASTM D-395, Method A
  8. Impact Testing Arrangement/compressive load testing arrangement.
  9. Tensile Tester (Pulling test)
  10. Torque testing fixture
  11. Torque wrench –minimum 15 Kg-m
  12. Hot air oven for Grease Resistance test.
  13. Apparatus to test resistance to spread of flame
  14. Rockwell Hardness Tester
- 4.2 The Manufacturer shall have dies/moulds for preparation of various test samples for the relevant tests.
- 4.3 All gauges required to ensure that the dimensions of Axle Box front cover are as per drawings shall be available.
- 4.4 Manufacturer shall have a stopwatch with least count of 0.1 second.

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4.5 The Manufacturer shall have arrangements like vice, cutter, polishing files etc. for preparation of various samples for tests such as tensile strength, hardness, specific gravity etc.

## 5.0 QUALITY CONTROL REQUIREMENTS

5.1 The firm should have acquired ISO: 9001 certification from the agency accredited by an accreditation body which is a part of International Accreditation Forum IAF, and the product for which the approval is sought should be broadly covered in the scope of the certification for manufacture and supply.

5.2 The Quality manual of the firm for ISO: 9001 should clearly indicate at every stage the control over manufacturing and testing of the said railway product.

5.3 There should be a system to ensure the traceability of the product from raw material stage to finished product stage. The system should also facilitate to identify the raw material composition from the finish product stage.

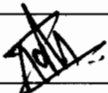
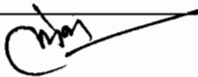
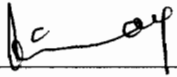
5.4 It should be ensured that there is a Quality Assurance Plan for the product detailing the following various aspects.

- Organisation chart
- Process flow chart
- Stage inspection details from the raw material stage to finish product stage.
- Various Parameters to be checked and level of acceptance of such parameters indicated and method to ensure control over them.
- Disposal system of rejected raw material and components

5.5 There should be at least one full time technologist having a minimum Master's degree in relevant field with experience of at least 3 years or Bachelor's degree in relevant field with experience of at least 5 years or a person with Diploma in relevant field with 12 years experience. He should be free from day-to-day production, testing and quality control responsibilities. He should be mainly responsible for development of a product, analysis of products, control over raw material, and corrective action in case of difficulties in achieving the parameters.

5.6 Ensure that the incharge of the Quality Control Section is having a qualification of minimum Master's degree in relevant field with experience of at least 3 years or Bachelor's degree in the relevant field with a minimum of 5 years experience or alternatively he should be a Diploma holder with minimum of 12 years experience. He should be actively involved in day-to-day activities of quality control / stage inspection / compliance of QAP etc.

5.7 The firm must ensure that proper analysis is being done on monthly basis to study the rejections at various internal stages and it is documented.

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5.8 The firm should ensure that latest version all the relevant specifications, IS Standards are available with the firm.

**6.0 DOCUMENTATION**

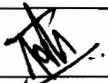
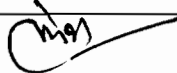
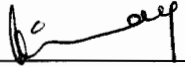
Firm shall maintain the following documents/ records

- 6.1 A well documented Quality Plan.
- 6.2 Records of raw material received from primary manufacturers, references & records of supplies made and internal test results.
- 6.3 Stage inspection results including finished products results.
- 6.4 Records of internal rejection and its analysis vis-à-vis action plan.
- 6.5 Records of final products inspection by external agencies (like RDSO), Non-conformity Reports and case analysis as well as action taken thereof.
- 6.6 Records for maintenance of dies/moulds.
- 6.7 Ensure that proper systems are available for dealing with customer complaints.

**7.0 TRAINING**

7.1 Training needs should be identified for all concerned officials and regular training shall be organized and imparted on maintenance of machines, quality assurance, safety parameters etc.

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**APPENDIX-'A'**

**IMPACT TEST - FALLING WEIGHT**

The test shall be conducted on one sample randomly selected. The Axle Box Front Cover shall be placed as shown in Figure-1. A Striker of 3.50 kg. weight with a hardened hemi-spherical striking surface of 6mm radius shall be allowed to fall **twice** at all the four locations from a height of 1.75 metre at locations shown in the Figure-1. The axle box front cover should meet the following:

- a) The impact damage area during the test shall be localized and shall not spread 10mm beyond the indentation mark on the front side of the cover.
- b) The cover shall not show any crack.

**APPENDIX-'B'**

**PULL-OUT TEST (WITH METALLIC BUSHES)**

The test shall be conducted on two samples selected at random. Two diagonally opposite lugs of Axle Box Front Cover shall be held as shown in Figure-2 using Universal/Tensile Testing Machine with suitable device. The lugs shall be pulled diagonally by applying tensile load at a speed of 50 ± 10mm per min. The sample shall withstand a load of 900 kgf without showing any crack/tear/permanent deformation on both axle box front cover and Metallic Bushes.

**APPENDIX-'C'**

**RESISTANCE TO GREASE:**


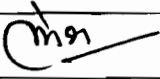
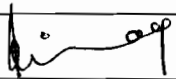
Three test specimen of size 80 mm x 90 mm shall be cut from the curved portion of the Axle box Front Cover and immersed in grease and kept in hot air oven at 140 ±5°C for 48 hrs. The sample shall not show splitting, blistering disintegration and warping. The hardness after immersion in grease shall comply with the requirement given in Table-2. Locations for cutting test specimen are indicated in Figure-3. Any one type of the grease listed below may be used for this test.

- a) Servogem-RR3 (M) of M/s Indian Oil Corporation.
- b) Balmerol Multigrease LL3 of M/s Balmer Lawire & Co. Ltd
- c) Bharat RR Grease -3 of M/s Bharat Petroleum Co.

**APPENDIX -'D'**

**TIGHTENING TEST ON LUGS:**

Two samples of axle box front cover, which are selected randomly from the lot offered for inspection, shall be tightened up on the axle box (should be available at firm's premises) or on a suitable fixture by applying 12 Kg-meter torque with torque wrench. No crack or any other sign of damage shall develop after the test.

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**APPENDIX-'E'**

**RESISTANCE TO SPREAD OF FLAME TEST:**

Two test specimen shall be prepared from the curved portion of the axle box front cover as shown in Figure-3 and test shall be carried out in the following manner:-

- (i) Test samples of the material measuring about 125 mm x 25 mm shall be subjected to the luminous flame from a Bunsen burner of 10 mm internal diameter. The sample shall be held with the longitudinal axes at an angle of 45° to the horizontal as shown in Figure-4. The flame height shall be 40 mm and the bottom edge of the sample shall be placed at the middle of the flame.
- (ii) The flame shall be applied to the sample at the end for 30 seconds and removed for a similar period of time and then applied again to the same end for a second period of 30 second and then again removed.
- (iii) Should the sample get ignited, it shall not continue to burn for more than 30 seconds after the flame has been finally removed.

**APPENDIX-'F'**

**COMPRESSIVE STRENGTH:**

The test shall be conducted on two samples selected for tests. The axle box cover shall be supported as shown in Figure-5. A uniformly distributed load of 3 tonne shall be applied on the lip of the axle box cover through a supporting plate. The load shall be applied at a rate of 15 mm ± 5 / minute. The whole assembly in loaded condition shall be kept for one minute. No crack sign/tear/break shall develop after the test.

**APPENDIX-'G'**


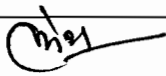
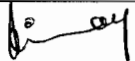
**SHOWER TEST:**

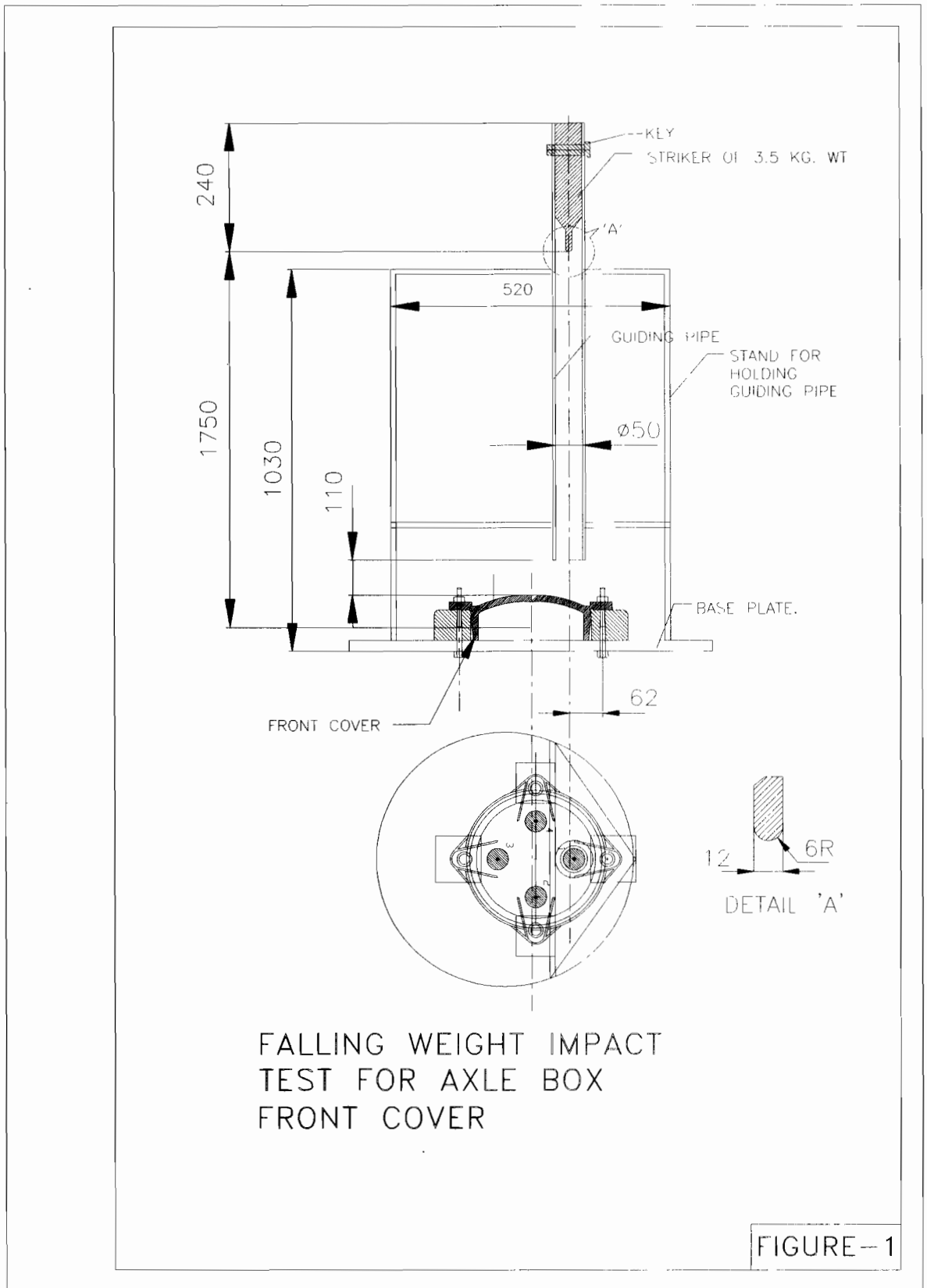
The test shall be conducted on four samples on each occasion. A container with the axle box housing is kept on ground level. The axle box housing should be placed in suitable fixture. The rear side of the axle box housing shall be securely packed so that no water shall enter from rear side. Axle box housing with Axle Box Front Cover will be kept under showering test (similar to the showering facility available in RCF Kapurthala of Indian Railways under open space of at least 4m length) to simulate the raining condition for 20 minutes, at the same time water through jet will showered/sprayed over the axle box housing from top and both sides to simulate the condition in open line during washing. After completion of 20 minutes, stop the supply of water and the part is allowed to left for 15 to 20 minutes. There after axle box housing shall be wiped off with the help of dry cotton and clean for removal of residual water drops from outer surface.

The axle box front cover has to be opened and inspect/observe inside the axle box housing whether the water ingressing/seeping inside the axle box housing has taken place or not.

**The description of monoblock pump set:** - 7.5HP, Inlet 80mm, Outlet 80mm, RPM 2880 to 3000, 5.5kw with star delta starter, Head 30Mtrs, Delivery 18 to 28 Ltrs/sec, Max. Pressure 12.5kg/cm<sup>2</sup>, Motor 415V at 50Hz, 3-Phase AC, Class-F insulator.

This test shall be conducted at facility developed at firm's premises or at RCF/KXH or at similar facility.

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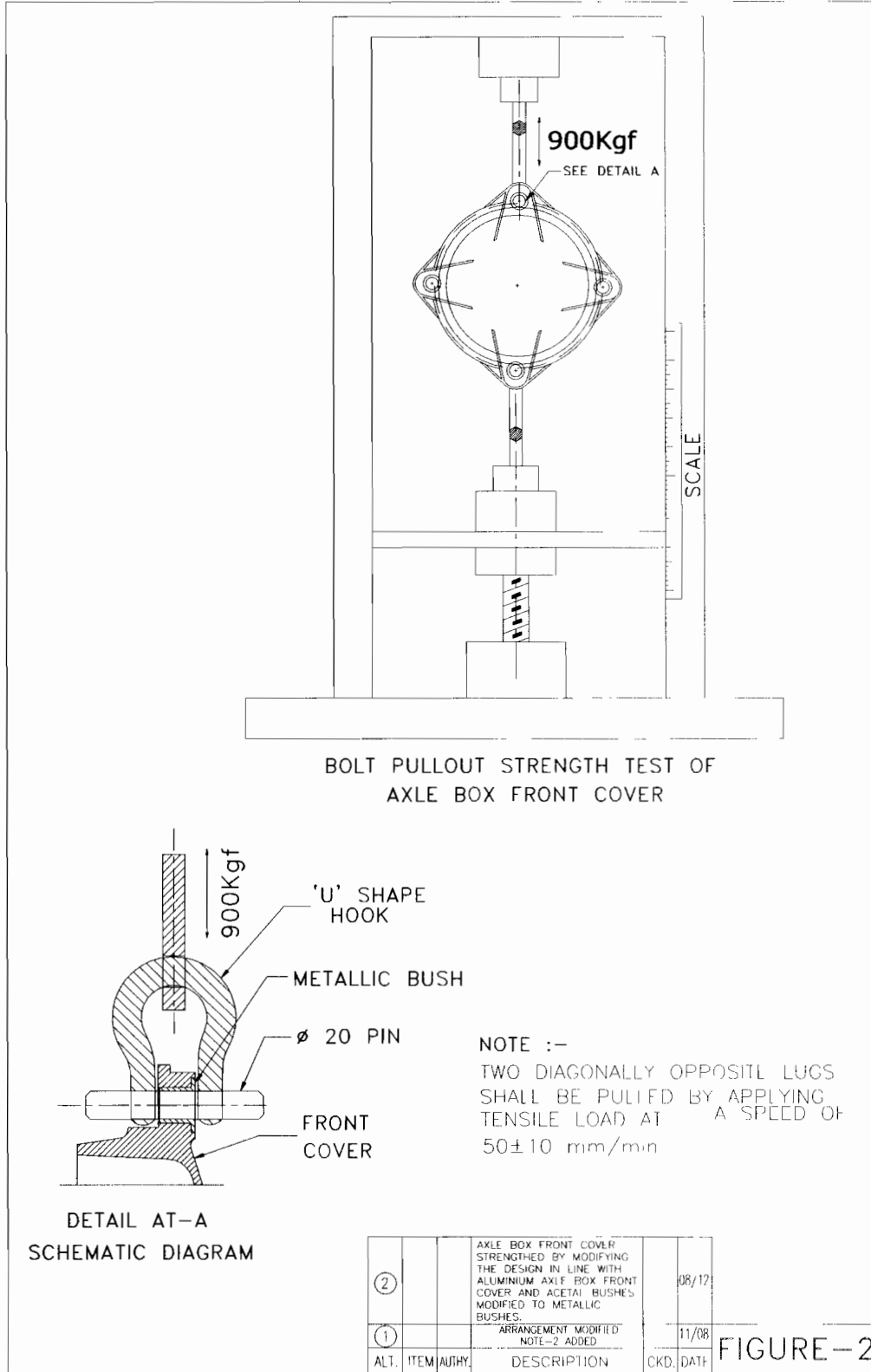
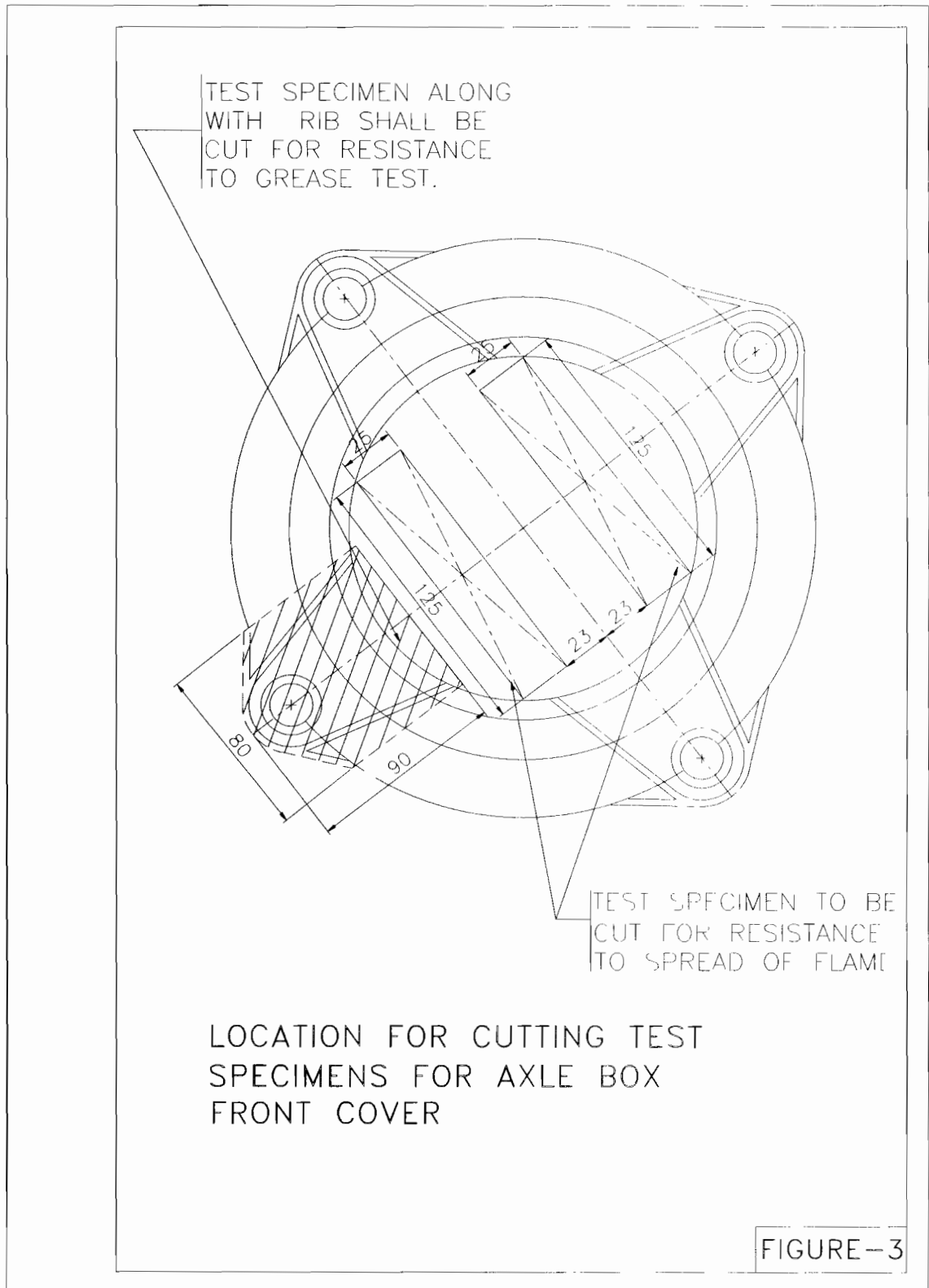
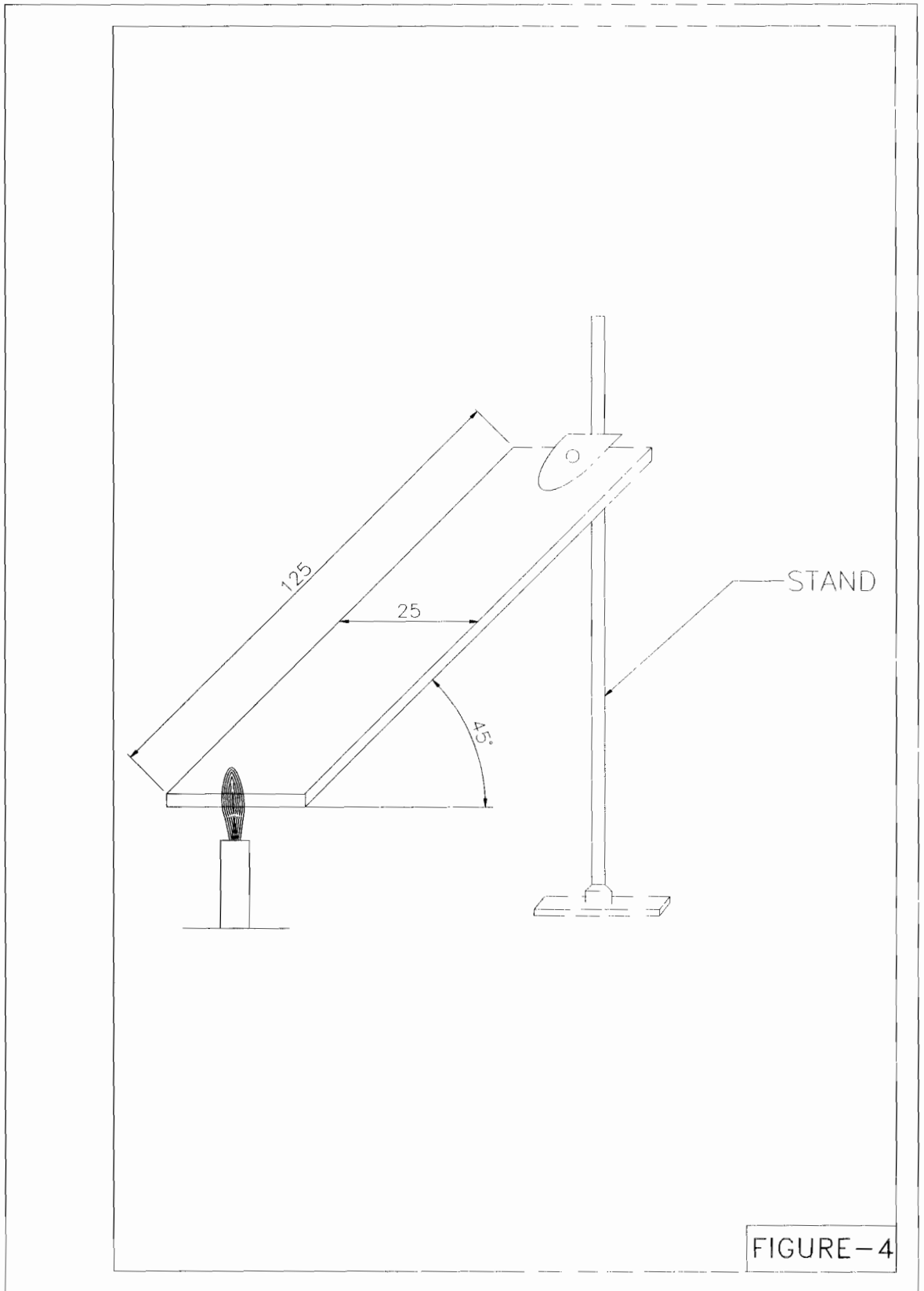


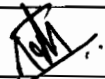
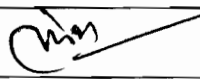
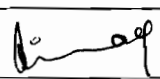
FIGURE-2

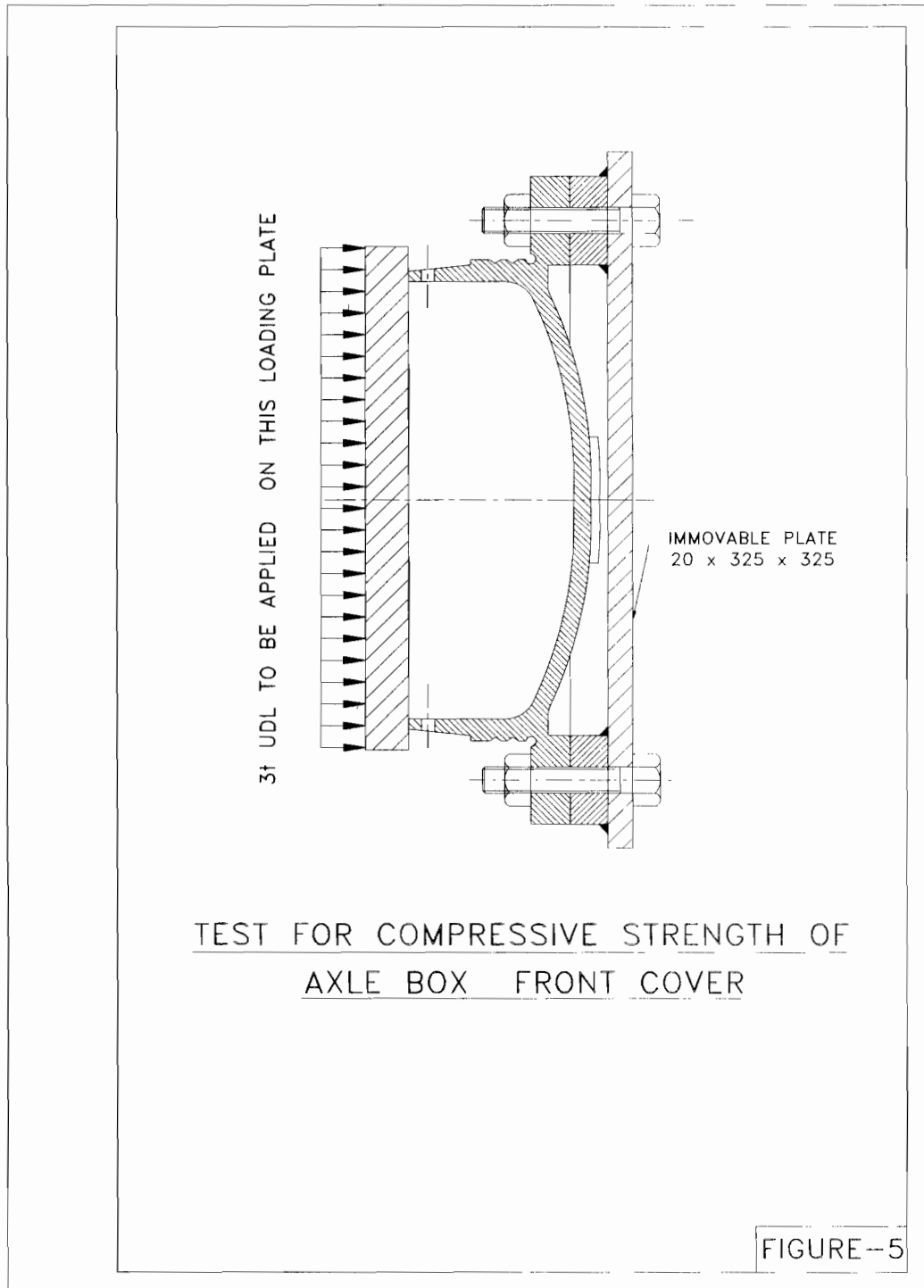
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