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MONITORING INSTRUCTION FOR INSPECTION		Issue No. 01 Rev. No. 01
		Date of Issue 23.02.19
ALUMINIUM ALLOY BAR Ø135mm		HAPP/QA/SC/G/002
Rev no	Amendment	Date
01	Type testing procedure included (ARDE 1/1/10 – Tech dated 4.10.18)	23.02.19

BASIC SPECIFICATION : ALUMINIUM ALLOY BAR AS PER ASTM B221
Alloy 7075 T 6510.(HAPP/QA/SPEC/008 REV-02 dtd:01.12.05)

SAMPLING SPECIFICATION : MIL-STD-105/ANSI ASQC Z 1.4

END USE : 125 mm FSAPDS (SABOT)

TABLE A. INSPECTION CHECK TO BE CARRIED OUT AT FIRM'S PREMISES BY THE FIRM

SL. NO.	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	WORKMANSHIP (VISUAL)	THE MATERIAL SHALL BE UNIFORM AND FREE FROM LAMINATION, PIPES, SILVERS, LAPS, CRACKS, KINKS, WARPS, WRINKLES, DEEP SCRATCHES AND OTHER INJURIOUS DEFECTS.	100%
2	MARKING	EACH BAR TO BE MARKED BY SUPPLIER'S NAME OR CODE AND HEAT NUMBER	
3	PACKING	BARS TO BE PACKED SUITABLY TO AVOID TRANSIT DAMAGES.	
4	DIMENSIONS	Diameter - Ø 135.0 ± 0.5 mm, Length - Multiples of 333+5mm Minimum length - 3663+5mm Max length - 4662+5mm	
5	CHEMICAL COMPOSITION (%)	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
6	MECHANICAL TEST (LONGITUDINAL)	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
7	MECHANICAL TEST (TRANSVERSAL)	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
8	HARDNESS TEST	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
9	ULTRASONIC TEST	AS PER SPEC ASTM B 594, TYPE 1 CLASS 'A'	100%
10	ELECTRICAL CONDUCTIVITY	30.5 – 36.0% IACS	100%
11	PERIPHERAL GRAIN GROWTH	1.25mm max	****
12	INTERNAL STRESS TEST	NO SPRING BACK ALLOWED DURING CUTTING	****

**** THREE SAMPLES PER HEAT/CAST

NOTE:

1. THE RAW MATERIAL TO BE TESTED BY THE FIRM BY SELECTING THE SAMPLE BY THE FIRM ITSELF FOR CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES IN NABL ACCREDITED OR GOVERNMENT APPROVED LAB OR INTERNATIONALLY REPUTED LABORATORY AS PER TABLE A
2. THE FIRM HAS TO CHECK FOR THE DIMENSIONS, VISUAL DEFECTS, PACKING AND MARKING AS PER TABLE A. AFTER COMPLETION OF TESTS AS PER NOTE- 1, THE FIRM HAS TO SUBMIT THE FOLLOWING DOCUMENTS TO HAPP.
 - I. THE RAW MATERIAL CERTIFICATE FROM THE ORIGINAL MANUFACTURER, HEAT NUMBER, QUANTITY PURCHASED, AND NUMBER OF BARS ARE TO BE MENTIONED IN THE INSPECTION LETTER TO HAPP.
 - II. THE CHEMICAL AND MECHANICAL TEST CERTIFICATES FROM NABL ACCREDITED OR GOVERNMENT APPROVED LABORATORY OR INTERNATIONALLY REPUTED LABORATORY AS PER TABLE A.
 - III. DIMENSIONAL REPORTS INCLUDING VISUAL AS PER TABLE A.
 - IV. GUARANTEE /WARRANTEE CERTIFICATE OF SUPPLIER.

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3. ALL THE ABOVE DOCUMENTS MENTIONED AT NOTE NO.2 ABOVE ARE TO BE FORWARDED TO GM/HAPP. HAPP SHALL VERIFY ALL THE DOCUMENTS AS ABOVE AND ACCORD CLEARANCE FOR DESPATCH OF THE MATERIAL TO HAPP IF ALL DOCUMENTS ARE IN ORDER

TABLE B. INSPECTION CHECK TO BE CARRIED OUT ON RECEIPT AT FACTORY.

SL. NO.	CHARACTERITICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	WORKMANSHIP (VISUAL)	THE MATERIAL SHALL BE UNIFORM AND FREE FROM LAMINATION, PIPES, SILVERS, LAPS, CRACKS, KINKS, WARPS, WRINKLES, DEEP SCRATCHES AND OTHER INJURIOUS DEFECTS.	100%
2	MARKING	EACH BAR TO BE MARKED BY SUPPLIER'S NAME OR CODE AND HEAT NUMBER	
3	PACKING	BARs TO BE PACKED SUITABLY TO AVOID TRANSIT DAMAGES.	
4	DIMENSIONS	Diameter - Ø 135.0 ± 0.5 mm, Length - Multiples of 333+5mm Minimum length - 3663+5mm Max length - 4662+5mm	
5	CHEMICAL COMPOSITION (%)	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
6	MECHANICAL TEST (LONGITUDINAL)	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
7	MECHANICAL TEST (TRANSVERSAL)	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
8	HARDNESS TEST	As per spec : HAPP/QA/SPEC/008-Rev No 2	****
9	ELECTRICAL CONDUCTIVITY	30.5 – 36.0% IACS	100%
10	PERIPHERAL GRAIN GROWTH	1.25mm max	****
11	INTERNAL STRESS TEST	NO SPRING BACK ALLOWED DURING CUTTING	****

**** THREE SAMPLES PER HEAT/CAST

TABLE C. TYPE TESTING SAMPLES FOR NEW SOURCES OF COMPONENT

The firm should supply 3 tons of raw material for manufacturing 200 no's of sabot pilot sample for Application/Type test before bulk supply. Out of 200nos, in case of Import source – 24 nos & Indigenous source – 48nos will be proof tested. On satisfactory result clearance will be given for bulk production. If results are not satisfactory, double samples are to be tested and if the results are not meeting the requirements, the lot/batch shall be rejected



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TABLE D. VERIFICATION OF ADEQUACY OF INSPECTION DOCUMENTS.

SL. NO.	INSPECTION DOCUMENTS
1	RAW MATERIAL TEST CERTIFICATE FOR EACH HEAT DULY TESTED FROM NABL OR GOVT. APPROVED OR INTERNATIONALLY REPUTED LABORATORY FOR CHEMICAL, MECHANICAL AND ULTRASONIC PROPERTIES, MICROSTRUCTURE, STRAIGHTNESS, CORROSION PREVENTIVE COATING ETC AS PER SPECIFICATION NO. HAPP/QA/SPEC/007-A..
2	FIRM'S DIMENSIONAL INSPECTION REPORT
3	CERTIFICATE OF INSPECTION ISSUED BY THIRD PARTY INSPECTOR (BVQI)
4	PACKING SLIP INDICATING HEAT NUMBER AND QTY. DETAILS
5	DECLARATION IN FIRM'S LETTER HEAD HAVING DETAILS OF RAW MATERIAL PURCHASED QTY., SOURCE, EXPECTED YIELD FROM PURCHASED QTY. ETC. TO BE ENCLOSED (FOR EACH HEAT SEPARATELY)
6	IN ADDITION TO THE ABOVE SOFT COPIES OF ALL THE CERTIFICATES MENTIONED IN TABLE – A SHALL BE SENT TO E-MAIL ID'S. happqa.ofb@ofb.gov.in , mmhapp.ofb@ofb.gov.in
NOTE	1. ALL TEST REPORTS / CERTIFICATES MUST BE COUNTER SIGNED BY FIRM'S HEAD OF QUALITY AND SHOULD HAVE LINK TO HAPP SUPPLY ORDER NUMBER, QTY. IN EACH CASE 2. EXPLICITLY DEVIATION(S) IF ANY SUCH AS TYPOGRAPHICAL ERROR, VALUES, NUMERIC, OTHER PARAMETER, ETC IS/ARE FOUND IN MONITORING INSTRUCTION OF THE ABOVE STORES, CONFORMING TO THE RELEVANT STANDARDS AND SPEC: HAPP/QA/SPEC/008 REV-02 dtd:01.12.05.



AKHILESH GAUR
AWM / P
MEMBER / MI COMMITTEE



MITHLESH CHANDRA
WM/MAINT (ALTERNATE OFFICER)
CHAIRMAN / MI COMMITTEE



D. BHASKAR RAO
WM / PM
MEMBER / MI COMMITTEE

ISSUED BY
STANDARD CELL
M/S No: 180205 dtd: 5/2/19
DATE: 29/2/19 SIGNATURE: 

TECHNICAL SPECIFICATION
FOR ALUMINIUM ALLOY 7075-T6510 EXTRUDED BARS TO ASTM B 221 M

No. **HAPP/QA/SPEC/008**
Revision No. : **02**
Revn. Date : **01-12-05**

1. INSPECTION AND TESTING PROCEDURE

This specification shall be used in conjunction with the relevant sections of ASTM STANDARD B 221 M-96. Alloy 7075 T 6510.

2. QUALITY OF MATERIAL

The material shall be made from Aluminium and alloying constituents, with or without approved scrap, at the discretion of the manufacturer.

Preference : Material Shall be Single Strand Extrusion.

3. CHEMICAL COMPOSITION

The chemical composition of the material shall be :-

Elements	Percentage	
	Min	Max
Copper	1.2	2.0
Magnesium	2.1	2.9
Silicon	-	0.4
Iron	-	0.5
Manganese	-	0.3
Zinc	5.1	6.1
Titanium	-	0.2
Chromium	0.18	0.28
Other Elements*	Each 0.05 max	Total 0.15 max
Aluminium	The remainder	

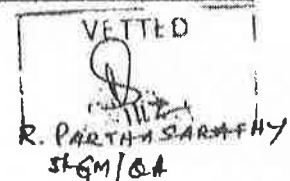
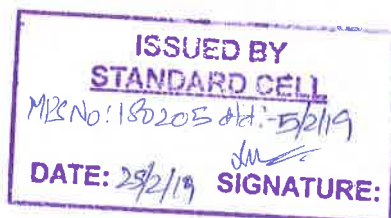
*Subject to the discretion of the Inspection Authority, determination of these elements need be made on a small proportion only of the samples analysed.

4. CONDITION

4.1 BARS AND EXTRUDED SECTIONS

Unless otherwise agreed and stated on the order, bars for machining and extruded sections shall be supplied in solution treated, stress relieved (by control stretching to a permanent extension not less than 1.5 % and not more than 2.5 %) and precipitation treated condition to T 6510.

The material shall be uniform in quality and shall be free from lamination pipes, slivers, cracks, kinks, warps, wrinkles, deep scratches, and other injurious defects. However, minor marks on the surface of the bars due to heat treatment in the furnaces, minor spots which have been ground in preparation for the ultrasonic testing is acceptable. Material will be supplied having Diameter **135.00 ± 0.50 mm**.



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Length will be in multiples of 333 mm. Minimum Length will be 3663 mm and maximum Length will 4662 mm with tolerance of plus 5 mm (+ 5 mm).

Departure from straightness over any selected length of 1000 mm shall not exceed 1.5 mm. Both faces of the bars are to be parallel and evenly machined.

The extruded Aluminum alloy bars shall be protected by an effective corrosion preventive coating immediately after manufacture.

Each bar shall be continuously marked stating Alloy, size, temper, ultrasonic inspection and producers name / trade mark.

5. HEAT TREATMENT

The material shall be heat treated as specified in relevant sections of ASTM B 221M Alloy 7075 T 6510.

6. PERIPHERAL GRAIN GROWTH

Thickness of peripheral coarse grain by etching test shall be less than 1.25 mm on the radius.

7. MECHANICAL PROPERTIES

7.1 TENSILE TEST

Test pieces (Longitudinal / Transversal) to be made as shown in Annexure - 1a (fig. 2 & fig. 3) & 1b. from each Heat (minimum 3 rods) and test result should meet the requirement specified below.

7.1.1 LONGITUDINAL TENSILE TEST

Diameter or minor sectional dimensions of the bar or extruded section		0.2% Proof stress	Tensile Strength	Elongation on gauge length of 50 mm
		MIN	MIN	(%) MIN
		MPa	MPa	
Over 100 mm	Up to including 150 mm	470	540	6

7.1.2 TRANSVERSAL TENSILE TEST

- UTS, 0.2 % PS & Elongation % - for information only.

Note: Conversion factor : 1 MPa = 1 N/mm² = 0.102 kg/mm² = 0.065 ton f / in²
Information on SI units is given in BS 3763

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VERIFIED
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No. **HAPP/QA/SPEC/008**
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8. HARDNESS TEST

140 HB – for information only for each rod tested for Tensile test.

9. ULTRASONIC TESTING

Extruded bars shall be 100 % inspected ultrasonically as per Standard practice ASTM B 594 – 02, Type 1 Class “A”, Discontinuity Class is as given in ASTM B 221 M – 96 Table 5 (i.e. Class “A”). Defect level shall be as per ASTM B 594-02, as specified for Class “A” in Table 1 and section 11 of the Specification ASTM B 594-02.

10. ELECTRICAL CONDUCTIVITY TEST

Electrical conductivity, to be carried out for each rod tested for Tensile test on 15mm section as shown in Annexure – 1a, fig1. Data to be furnished for each rod tested for tensile test. Electrical conductivity should be **30.0 to 36.0 % IACS**.

6.5 RESIDUAL INTERNAL STRESS DETERMINATION


Absence of residual internal stress should be checked on minimum 3 rods in each heat / cast by cutting Slices having approximately 15 mm thickness. Each slice shall be cut through as shown in Annexure – 1a of fig. 4 up to the center. The width of the slot “r” is the width of the sawing tool. If spring back of material is attained, causing the sawing tool not to move freely, then the test is considered to have failed and material rejected or otherwise accepted.

7.0 TEST CERTIFICATE

Each consignment shall be accompanied with a test certificate indicating the following :-

- i. Test results for Mechanical test (Longitudinal & Transversal), Hardness in BHN, Residual Internal stress determination test, Electrical conductivity in % IACS shall be submitted for minimum 3 rods for each Heat / Cast.
- ii. Conformance to 100 % Ultrasonic test to ASTM B 594, Type 1 Class A for each consignment.
- iii. Chemical analysis & Peripheral grain growth for each Heat / Cast.
- iv. Batch size of manufacture.
- v. Lot size offered for delivery i.e. details of the number of rods and quantity of material in each Cast / Heat.
- vi. Details of Sampling Procedure adopted.
- vii. Procedure adopted for testing (Chemical / Physical / Mechanical properties), equipment (with make) used. Indicate standards to which they conform ASTM, BS, DIN etc.
- viii. Accuracy of test results referred.(Uncertainty of test results for chemical analysis.)
- ix. Brief note on the Quality Assurance Scheme adopted during manufacture.
- x. Each rod to be marked with Inspector's acceptance.

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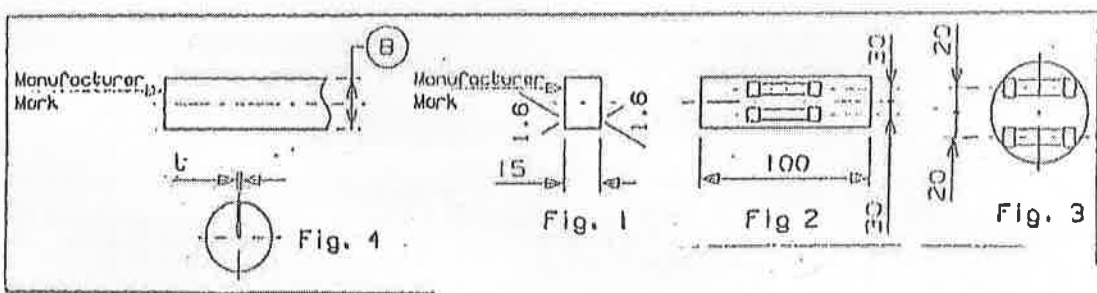
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Annexure - 1a



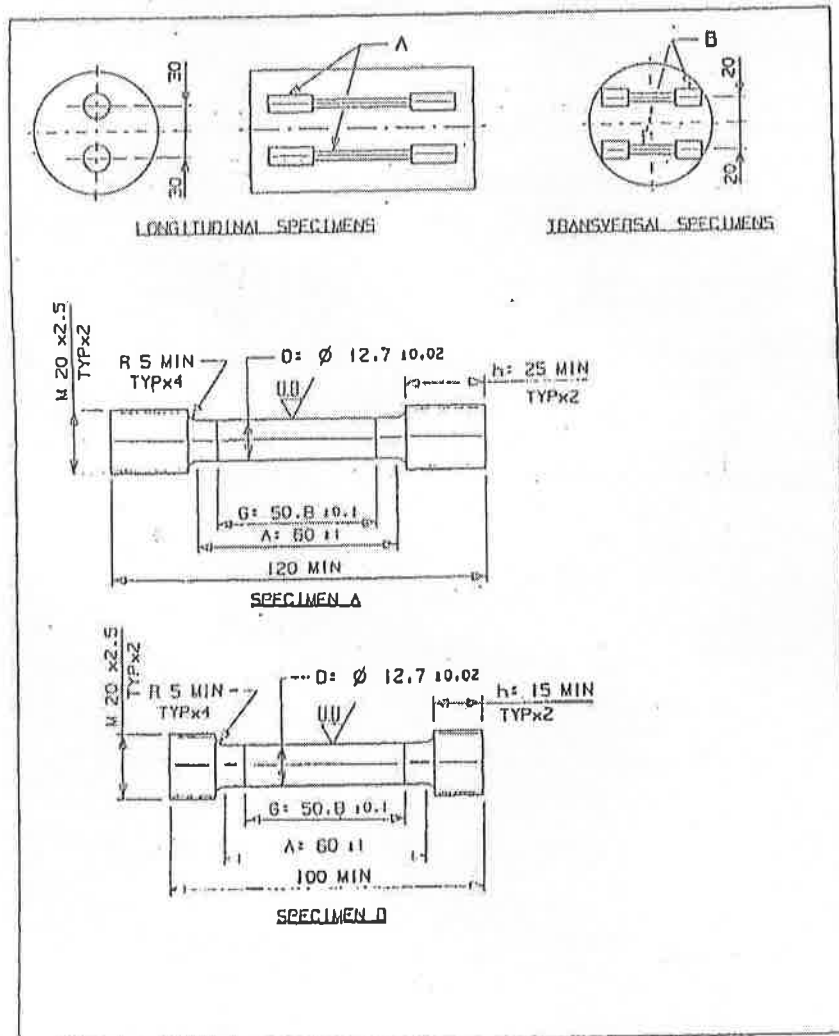
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Annexure - 1 b



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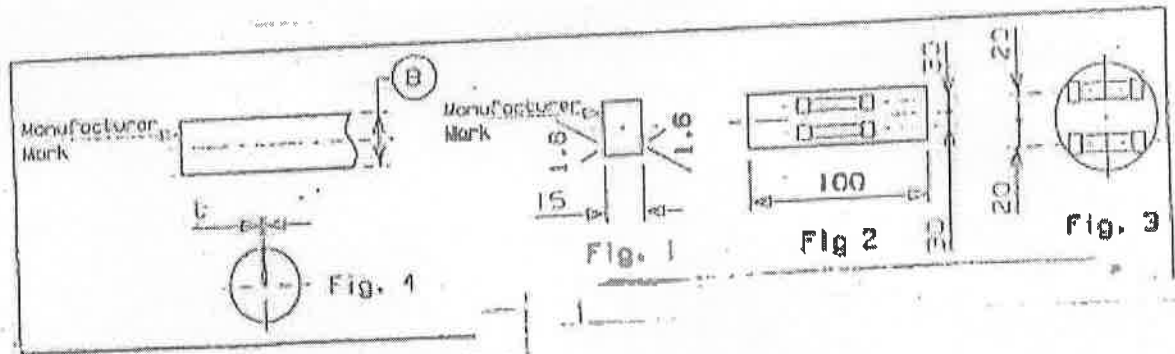
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**TECHNICAL SPECIFICATION
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No. HAPP/QA/SPEC/008
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Annexure - 1a



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