

<b>MONITORING INSTRUCTION FOR INSPECTION</b>		Issue No. 01 Rev. No. 03
		Date of Issue 15.12.23
<b>ALUMINIUM ALLOY BAR Ø75mm</b>		<b>HAPP/QA/SC/C/014</b>
Rev no	Amendment	Date
2	Material spec amended as per Document No.: DRDO-ARDE-DOA-TOT-209-2017 Rev No:00Dtd: May 2021	17.06.21
3	TYPE TESTING ADDED AS PER PROOF SCHEDULE OF 125mm PRACTICE SHOT	15.12.23

**MATERIAL SPECIFICATION** :Aluminum Alloy to specification DTD 5124, or Specification ASTM B 221M, Grade 7075-T6510, or HAPP/QA/SPEC/008

**DOCUMENT** :DRDO-ARDE-DOA-TOT-209-2017 Rev No: 00Dtd: May 2021

**END USE** :Tail unit 120/125mm MK-I FSAPDS& 125mm Practice Shot

**TABLE A. INSPECTION CHECK TO BE CARRIED OUT AT FIRM'S PREMISES BY THE FIRM&ON RECEIPT AT HEPF**

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	Dimensions	Outer Diameter = $75.0 \pm 0.5$ mm ,Length = 3360mm( min), 5580mm(max). In Integral Multiples of 111mm Having Tolerance+ 5mm	
3	Chemical Composition (%)	Aluminum Alloy to specification DTD 5124, or Specification ASTM B 221M, Grade 7075-T6510 or HAPP/QA/SPEC/008	One sample for each heat/ cast
4	Mechanical Test	UTS – 540 MPa(min) 0.2% PS - 470 MPa (min) % Elongation – 6% Min.	2 samples for each heat/ cast
5	*Ultrasonic Testing	ASTM B 594 Type 1 Class A	100%
6	Peripheral Grain Growth	Limited upto 1.25mm on max diameter	
7	Marking	Each bar shall be legibly stamped with <b>manufacturer's identity &amp; heat number.</b>	Each Consignment
8	Packing	Packing of the material shall be done in such a manner to avoid <b>damage</b> in handling and transit.	

**NOTE:**

1. The raw material to be tested by the firm by selecting the sample by the firm itself. And forwarded to nearby NABL accredited laboratory or Govt. approved lab for testing,  
\*Ultrasonic testing to be carried out at firms premises by the firm.
2. The firm has to check for the dimensions, visual defects and marking as per **TABLE A**. After completion of dimensional, chemical and mechanical properties. The firm has to forward the following documents to HEPF/TRICHY.
  - I. The raw material original manufacturer's certificate, heat number, quantity purchased and number of bars are to be mentioned in the inspection letter to HEPF/TRICHY.
  - II. The chemical and mechanical test certificates from NABL accredited lab or Govt approved lab as per**TABLE A**.
  - III. Dimensional report including visual as per **TABLE A**.
3. All the above documents mentioned at **NOTE NO.2**above are to be forwarded to **GM/HEPF**.

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4 Material has to be dispatched to HEPF only after due submission of all related documents as detailed in TABLE A and after getting clearance from HEPF / TRICHY.


**5. TYPE TESTING (FOR NEW SOURCE OF SUPPLY)**


- I. For initial type approval of Aluminum alloy from new source of supply, Type Testing to be conducted as per latest proof schedule (i.e. Dynamic Proof with 64 nos. of proof samples selected from 264 nos. of type testing lot).
- II. Supplier has to supply 450 kgs. as a pilot batch for manufacturing the type testing lot.
- III. After achieving satisfactory results in the Type Testing trial, Pilot batch will be accepted and supplier will be given clearance for bulk supply.
- IV. If Type Testing results are not satisfactory, supplier has to manufacture a fresh batch as a pilot batch for Type Testing Trials.

**TABLE B. VERIFICATION OF INSPECTION DOCUMENTS.**

FOLLOWING INSPECTION DOCUMENTS MUST BE ENCLOSED WITH EACH SUPPLY.

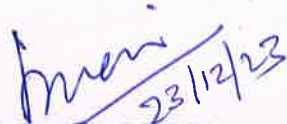
SL. NO.	INSPECTION DOCUMENTS
1	THE RAW MATERIAL ORIGINAL MANUFACTURER'S CERTIFICATE, DETAILS OF HEAT NUMBER, QUANTITY PURCHASED AND NUMBER OF BARS ETC.
2	THE CHEMICAL AND MECHANICAL TEST CERTIFICATES FROM NABL ACCREDITED OR GOVT APPROVED LAB.
3	DIMENSION REPORT INCLUDING VISUAL
4	PACKING SLIP DETAILS
5	IN ADDITION TO THE ABOVE SOFT COPIES OF ALL THE CERTIFICATES MENTIONED IN TABLE - A SHALL BE SENT TO E-MAIL ID's. <a href="mailto:happqa@ord.gov.in">happqa@ord.gov.in</a> , <a href="mailto:mmhapp@ord.gov.in">mmhapp@ord.gov.in</a>
NOTE	1. IN CASE OF ANY DIFFERENCES, QAP & DRAWING SHALL PREVAIL 2. EXPLICIT DEVIATION(S) IF ANY SUCH AS TYPOGRAPHICAL ERROR, VALUES, NUMERIC, OTHER PARAMETER, ETC IS/ARE FOUND IN MONITORING INSTRUCTION OF THE ABOVE STORES, THE RELEVANT STANDARD CONFORMING TO THE SPECIFICATION SHALL BE REFERRED TO CONFIRM THE PARAMETER

  
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**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  $135.00 \pm 0.50$  mm.


VETTED  
  
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SQM/QA

TABLE 1 Chemical Composition Limits A,B,C

Alloy	Silicon	Iron	Copper	Manga- nese	Magne- sium	Chromium	Zinc	Titanium	Vanadium	Other Elements <sup>D</sup>		Aluminum
										Each	Total <sup>E</sup>	
1060	0.25	0.35	0.05	0.03	0.03	...	0.05	0.03	0.05	0.03	...	99.60 min <sup>F</sup>
1100	0.95 Si + Fe	0.7	0.05-0.20	0.05	...	...	0.10	...	...	0.05	0.15	99.00 min <sup>F</sup>
2014	0.50-1.2	0.7	3.9-5.0	0.40-1.2	0.20-0.8	0.10	0.25	0.15 <sup>G</sup>	...	0.05 <sup>G</sup>	0.15	remainder
2024	0.50	0.50	3.8-4.9	0.30-0.9	1.2-1.8	0.10	0.25	0.15 <sup>G</sup>	...	0.05 <sup>G</sup>	0.15	remainder
2219	0.20	0.30	5.8-6.8	0.20-0.40	0.02	...	0.10	0.02-0.10	0.05-0.15	0.05 <sup>H</sup>	0.15 <sup>H</sup>	remainder
3003	0.6	0.7	0.05-0.20	1.0-1.5	...	...	0.10	...	...	0.05	0.15	remainder
Alclad 3003	...	...	3003 Clad with 7072 alloy	...	...	...	...	...	...	...	...	remainder
3004	0.30	0.7	0.25	1.0-1.5	0.8-1.3	...	0.25	...	...	0.05	0.15	remainder
3102	0.40	0.7	0.10	0.05-0.40	...	...	0.30	0.10	...	0.05	0.15	remainder
5052	0.25	0.40	0.10	0.10	2.2-2.8	0.15-0.35	0.10	...	...	0.05	0.15	remainder
5083	0.40	0.40	0.10	0.40-1.0	4.0-4.9	0.05-0.25	0.25	0.15	...	0.05	0.15	remainder
5086	0.40	0.50	0.10	0.20-0.7	3.5-4.5	0.05-0.25	0.25	0.15	...	0.05	0.15	remainder
5154	0.25	0.40	0.10	0.10	3.1-3.9	0.15-0.35	0.20	0.20	...	0.05	0.15	remainder
5454	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.20	...	0.05	0.15	remainder
5458	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.20	...	0.05	0.15	remainder
6005	0.8-0.9	0.35	0.10	0.10	0.40-0.6	0.10	0.10	0.10	...	0.05	0.15	remainder
6005A	0.50-0.9	0.35	0.30	0.50 <sup>I</sup>	0.40-0.7	0.30 <sup>I</sup>	0.20	0.10	...	0.05	0.15	remainder
6060	0.30-0.6	0.10-0.30	0.10	0.10	0.35-0.6	0.5	0.15	0.10	...	0.05	0.15	remainder
6061 <sup>J</sup>	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.35	0.25	0.15	...	0.05	0.15	remainder
6063	0.20-0.6	0.35	0.10	0.10	0.45-0.9	0.10	0.10	0.10	...	0.05	0.15	remainder
6066	0.9-1.8	0.50	0.7-1.2	0.6-1.1	0.8-1.4	0.40	0.25	0.20	...	0.05	0.15	remainder
6070	1.0-1.7	0.50	0.15-0.40	0.40-1.0	0.50-1.2	0.10	0.25	0.15	...	0.05	0.15	remainder
6082	0.7-1.3	0.50	0.10	0.40-1.0	0.6-1.2	0.25	0.20	0.10	...	0.05	0.15	remainder
6105	0.6-1.0	0.35	0.10	0.15	0.45-0.8	0.10	0.10	0.10	...	0.05	0.15	remainder
6162	0.40-0.8	0.50	0.20	0.10	0.7-1.1	0.10	0.25	0.10	...	0.05	0.15	remainder
6262	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.14	0.25	0.15	...	0.05 <sup>K</sup>	0.15 <sup>K</sup>	remainder
6351	0.7-1.3	0.50	0.10	0.40-0.8	0.40-0.8	...	0.20	0.20	...	0.05	0.15	remainder
6463	0.20-0.6	0.15	0.20	0.05	0.45-0.9	...	0.05	...	...	0.05	0.15	remainder
6560	0.30-0.7	0.10-0.30	0.05-0.20	0.20	0.20-0.6	0.05	0.15	0.10	...	0.05	0.15	remainder
7005	0.35	0.40	0.10	0.20-0.7	1.0-1.8	0.08-0.20	4.0-5.0	0.01-0.06	...	0.05 <sup>L</sup>	0.15 <sup>L</sup>	remainder
7072 <sup>M</sup>	0.7 Si + Fe	0.10	0.10	0.10	0.10	...	...	...	...	...	...	remainder
7075	0.40	0.50	1.2-2.0	0.30	2.1-2.9	0.18-0.28	5.1-8.1	0.20 <sup>N</sup>	...	0.05 <sup>N</sup>	0.15	remainder
7116	0.15	0.30	0.50-1.1	0.05	0.8-1.4	...	4.2-5.2	0.05	0.05	0.05 <sup>O</sup>	0.15	remainder
7129	0.15	0.30	0.50-0.9	0.10	1.3-2.0	0.10	4.2-5.2	0.05	0.05	0.05 <sup>O</sup>	0.15	remainder
7178	0.40	0.50	1.6-2.4	0.30	2.4-3.1	0.18-0.28	6.3-7.3	0.20	...	0.05	0.15	remainder

<sup>A</sup> Limits are in weight percent maximum unless shown as a range, or stated otherwise.  
<sup>B</sup> Analysis shall be made for the elements for which limits are shown in this table.  
<sup>C</sup> For the purpose of determining conformance to these limits, an observed value or a calculated value obtained from analysis shall be rounded to the nearest unit in the last right-hand place of the figures used in expressing the specified limit, in accordance with the rounding-off method of Practice E29.  
<sup>D</sup> *Others* includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the specification. However, such analysis is not required and may not cover all metallic *Others* elements. Should any analysis by the producer or the purchaser establish that an *Others* element exceeds the limit of *Each* or that the aggregate of several *Others* elements exceeds the limit of *Total*, the material shall be considered nonconforming.  
<sup>E</sup> *Other Elements*—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.  
<sup>F</sup> The aluminum content shall be calculated by subtracting from 100.00 % the sum of all metallic elements present in amounts of 0.010 % or more each, rounded to the second decimal before determining the sum.  
<sup>G</sup> Upon agreement between the purchaser and the producer or supplier, a Zr + Ti limit of 0.20 % max is permitted. Properties in Specification (Table 2) are not based on the Zirconium and Titanium algorithm.  
<sup>H</sup> Zirconium, 0.10-0.25 %. The total for other elements does not include zirconium.  
<sup>I</sup> Manganese plus chromium shall total 0.12-0.50.  
<sup>J</sup> In 1985 the requirements for 6062 were combined with those for 6061 by revising the minimum chromium from "0.15 %" to "0.04 %." This action cancelled alloy 6062.  
<sup>K</sup> Bismuth and lead shall be 0.40-0.7 % each.  
<sup>L</sup> Zirconium 0.08-0.20 %. The total for other elements does not include zirconium.  
<sup>M</sup> Composition of cladding alloy applied during the course of manufacture. Samples from finished tube shall not be required to conform to these limits.  
<sup>N</sup> Upon agreement between the purchaser and the producer or supplier, a Zr + Ti limit of 0.25 % max is permitted. Properties in Specification (Table 2) are not based on the Zirconium and Titanium algorithm.  
<sup>O</sup> Gallium 0.03 % max.

E607 Test Method for Atomic Emission Spectrometric Analysis Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere  
 E716 Practices for Sampling Aluminum and Aluminum Alloys for Spectrochemical Analysis  
 E1004 Test Method for Determining Electrical Conductivity Using the Electromagnetic (Eddy-Current) Method  
 E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Atomic Emission Spectrometry  
 G47 Test Method for Determining Susceptibility to Stress-

Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products  
 Method of Test for Exfoliation Corrosion Susceptibility in 7XXX Series Copper-Containing Aluminum Alloys (EXCO Test) (G34-72)<sup>1</sup>  
 2.3 ANSI Standards:<sup>2</sup>

<sup>1</sup> The applicable edition in the use of this specification is G34-72, which is available in the gray pages of the Annual Book of ASTM Standards, Vol 02-02.

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<b>Technical Specification &amp; Quality Document</b>			<b>Document No.: DRDO-ARDE-DOA-TOT-209-2017</b>				
Issue:01	Date	May 2021	Revision No.	00	Date:	May 2021	Page 24
Component / Assembly			125mm FSAPDS Practice Shot Assembly (Empty)				

**TAIL UNIT**

1. Drawing No. : 9607 01 03 01 03 001 00TC
2. Method of manufacture : Machining and Hard Anodizing
3. Receiving Inspection :
- 3.1 Raw material : Aluminum Alloy to specification DTD 5124, or Specification ASTM B 221M, Grade 7075-T6510, or HAPP/QA/SPEC/008

Tests/checks and acceptance criteria for raw material:

1. Chemical analysis as per specification DTD 5124 or ASTM B 221M, Grade 7075-T6510 or HAPP/QA/SPEC/008

2. Mechanical properties:

Sr. No.	Properties	Acceptance criteria
1.	UTS	540 MPa (min)
2.	0.2 % Proof Stress	470 MPa (min)
3.	% Elongation	6% (min)

3. Metallographic Inspection:

1.	Peripheral Grain Growth	Limited up to 1.25mm on max Dia
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4. In-process inspection : Nil
5. Stage inspection : Nil
6. Final Inspection:

6.1. Visual inspection:

6.1.1 Features for visual examination and acceptance criteria:

Sr. No.	Details of features	Sample size	Acceptance criteria
1.	Burrs	100 %	Not permitted
2.	Damage to Thread	100 %	Not permitted
3.	Poor surface finish	100 %	Not permitted