

JINDAL ALUMINIUM LIMITED			
(ROLLING AND EXTRUSION DIVISION)			
PROCEDURE FOR EXTRUSION QUALITY ASSURANCE			
Doc. No. JAL/R&E/EQA/PR/11		Title Page	
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Verified by	QMS COORDINATOR		
Approved by	DGM (C)		

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1.0 PURPOSE:

The purpose of this procedure is to document and lay down the procedures for Quality Assurance of aluminium extrusions.

1.1 OBJECTIVES:

- To reduce customer complaints.

2.0 SCOPE :

ISO 9001:2015 Clause No	Description
7.1.5	Monitoring and measuring resources
8.1	Operational planning and control
8.4.2	Type and extent of control
8.5.2	Identification and traceability
8.5.3	Property belonging to customers or external providers
8.5.4	Preservation
9.1	Monitoring, measurement, analysis and evaluation
8.6	Release of products and services

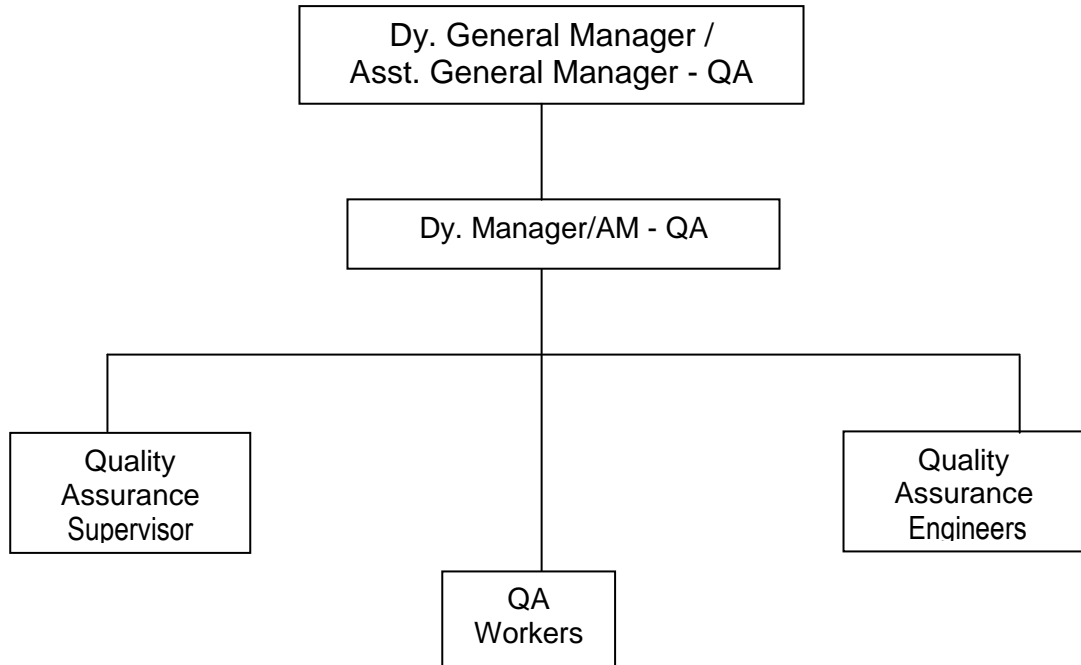
- Final Inspection and Testing
- Co-ordination with other departments for Receiving and In-Process Inspection
- Control of Inspection, Measuring and Test Equipment
- Coordination with outside suppliers for quality aspects related to fabrication and anodizing of extrusions

3.0 INTERFACE

- Marketing
- Extrusion Foundry
- Extrusion Production
- Extrusion Tool shop
- Purchase Ind
- Stores
- Shipping and Dispatch

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4.0 FUNCTIONAL CHART: (Cl: 5.3 of IS/ISO-9001:2015)



4.1 ROLES, RESPONSIBILITIES AND AUTHORITY

4.1.1 Dy. General Manager - QA (DGM-QA) / Asst. General Manager - QA (AGM-QA)

Reporting to DGM (ED) of Extrusion Division and be fully responsible for overall activities of Quality Assurance Department. The responsibilities are:

- a) To lay down proper systems and guidelines for checking of finished goods for aluminium extruded products. To ensure follow of quality plan by Foundry, Extrusion and QA departments as per document No. JAL/R&E/EQA/ANX/01.
- b) To ensure that the finished goods are released for despatch strictly as per the customers specifications after proper checking by the Quality Assurance Department.
- c) To make thorough investigation of the quality complaints received from the customers and take preventive measures for avoiding the complaints in future.
- d) Responsible for smooth functioning of Chemical, Mechanical and Metallurgical Laboratory.
- e) To review process and product non-conformity reports to ensure effectiveness of actions.
- f) To ensure timely calibration of the Measuring, Inspection & Testing equipment related to Quality Assurance and Production Departments.
- g) To identify training needs of the departmental personnel and to ensure that they are trained for necessary skills to ensure quality of the product.

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4.1.4 Assistant Manager - Quality Assurance (AM-QA)

Reporting to Quality Assurance Manager and be responsible for:

- a) Conducting all necessary final inspection & tests related to products.
- b) Maintenance of Inspection & Test records
- c) Coordinating with other departments for receiving and in-process inspection
- d) Instructing for inspection of special & critical sections.
- e) Monitoring & controlling product quality during rectification.

4.1.5 Quality Assurance Engineer (QAE)

Reporting to Quality Assurance Manager and be responsible for:

- a) Conducting all necessary final inspection & tests related to the product.
- b) Maintenance of Inspection & Test records.
- c) Release of conforming products.
- d) Instructing for inspection of special & critical sections.
- e) Calibrating the measuring, inspection & test equipment.
- f) Participation in pre-shipment inspection.
- g) Submission of trial samples to marketing.

4.1.6 Quality Assurance Supervisors (QAS)

Reporting to Quality Assurance Manager and be responsible for conducting all the necessary inspections & tests related to the product, maintenance of the Inspection & Test records and release of the product for despatch after ensuring that all the necessary tests & inspections have been conducted on the product.

4.1.8 Quality Assurance Workers

The Quality Assurance Workers are responsible for carrying out online hardness testing, sample preparations for tests and other related works.

5.0 REFERENCES

IS:1285, IS:733 & IS:3965, IS:6477, IS:2673 and Extrusion Foundry Procedure (JAL/R&E/EFOU/PR/08) & Extrusion Production Procedure (JAL/R&E/EPRN/PR/09), Ultrasonic testing documented instruction, ASME-SB221, JAL/STD/0003.

6.0 ABBREVIATION

Special Sections = Sections extruded against Acceptance of Order

EPA = Export Production Advice;

EPF = Extrusion Press Form

AO = Acceptance of order;

PO = Purchase Order;

QC = Quality Control;

QA = Quality Assurance.

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7.0 INPUTS

- Materials for testing.
- IS & ASTM, ASME, EN Standards.
- EPA
- AO

8.0 OUTPUTS

- Products for despatch
- Test certificate (if specified in PO)
- Special section release
- Dimensional reports for trial dies
- Test results and reports.

9.0 PROCEDURE

9.1 The extruded products are received from the Extrusion Production Department.

9.2 Acceptance Criteria: The acceptance criteria for the extruded sections shall be the conformance to the minimum requirement of hardness in Webster/Barcole/BHN or Tensile Strength, as indicated in Annexure No. JAL/R&E/EQA/ANX/02 or as per relevant standards. The test results of Hardness Tests are maintained in a register as per Format No. JAL/R&E/EQA/F/01 & in Format No. JAL/R&E/EQA/F/01A as soft copy in ERP.

9.2.1 All sections shall be checked for dimensions as per the drawings. If the tolerances are not mentioned in the drawings, tolerances shall be taken as per relevant standards. The results are maintained in Format No. JAL/R&E/EQA/F/06 for special sections.

9.2.2 The chemical composition of the extruded special sections can be derived from that batch of logs, as indicated in Format No. JAL/R&E/EQA/F/04 and the results shall be as per relevant standards or customer requirement.

9.2.3 Tensile tests shall be carried out as per Work Instruction given and proof stress & elongation determined thereby, in accordance with IS: 1608 – 1995 and the results shall be as per the relevant standards. The results are maintained in Format No. JAL/R&E/EQA/F/02.

9.3 Export Orders:

The tests will be carried out as mentioned under clause 8.2 of this procedure. In case of export orders, instead of AO copy, EPA copy is received.

9.4 Sections for Electrical Purposes: For extruded sections used for electrical purposes, apart from the inspection & test, as indicated under clause 8.2, bend test & electrical conductivity test shall also be carried out and the specification for this purpose shall be as per IS:5082-1998.

9.4.1 The minimum electrical conductivity values shall be 60% IACS (International Annealed Copper Standard) for Grade 19501 (E1E) and 56.5% IACS for grade 63401 (E91E) in WP (Range-1). For 63401 (E91E) WP (Range-2), the minimum conductivity value shall be 55% IACS. Unless otherwise specified by the customer, the material in 63401 (E91E) WP shall be supplied in Range-1 condition as per IS:5082-1998.

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9.4.2 The bend test shall be carried out only for flat sections up to 12 mm thickness. One test piece of suitable length from each lot shall be bent through an angle of 90° over a mandrel. After bending, no crack shall be visible on the outer surface of the bend.

Alloy	Temper	Thickness of Section in mm	Minimum Inside Bend radius
19501	M, O	Up to 12.0 mm	1.0 x thickness
63401	WP Range-1	3.0 mm – up to 9.5 mm	1.0 x thickness
		Above 9.5mm–upto12.0mm	1.5 x thickness
	WP Range-2	3.0 mm – up to 9.5 mm	2.0 x thickness
		Above 9.5mm–Upto12.0mm	2.5 x thickness

9.4.3 The test results of Conductivity and Bend Tests are maintained in ERP as per Format No. JAL/R&E/EQA/F/01A.

9.5 Ultrasonic Test:

Ultrasonic flaw detection test shall be carried out for heavy rods & bars above 50mm dia/thickness, which are used by customers for machining or as per customer's requirement. Material will be accepted if defect echo height is less than 20% of back wall echo height or if the back wall echo height drops down not more than 50% of back wall echo. The test results shall be recorded in Format No. JAL/R&E/QA/F/12.

9.6 Final checks and release for despatch

9.6.1 For ensuring that the material which is being despatched to the customer has been tested for all tests, the details of the test are entered in the relevant formats JAL/R&E/EQA/F/01A, JAL/R&E/EQA/F02, and JAL/R&E/EQA/F/10. The material is despatched only after checking that all the tests are performed and it meets the requirements. The details of the material ready for despatch is sent to shipping department in format JAL/R&E/EQA/F/05 after verifying completion of inspection records. Inspecting authority responsible for release of conforming products are DGM / AGM (EQA) / Assistant Quality Assurance Manager.

9.6.2 Test certificates are issued to all export orders & to customers when specified in A.O, as per Format No. JAL/R&E/EQA/F07 with reference to relevant IS specifications or any other relevant standard.

9.6.3 Material awaiting pre-shipment inspection shall be kept separate and released to despatch only after completion of pre-shipment inspection by the customer and the reports are maintained in Format No. JAL/R&E/EQA/F/08.

9.6.4 Die failure Report is circulated to Tool Shop / Production as per Format No. JAL/R&E/EQA/F/09 & also maintain in the ERP system.

9.7 The Quality Assurance Department co-ordinates with the following departments:

- a) With Extrusion Foundry for inspection & testing of raw material samples (alloying elements).
- b) With Tool Shop for chemical composition & ultrasonic test of die steel material. The ultrasonic test report shall be given as per Format No. JAL/R&E/EQA/F/12.

9.8 The Quality Assurance Department co-ordinates and assists the following departments for in- process inspection:

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- a) Production Department by giving guidelines for extrusion of special sections at planning stage.
- b) In Foundry: (i) standardizing and setting up of the Spectro, verification of batch samples. If any batch does not fall within the internal standard limits for chemical composition (Ref. JAL/STD/003), it may be accepted under deviation or re-graded as a different internal alloy by AGM (QA). The details of acceptance with or without re-grading shall be entered in JAL/R&E/EQA/F/04. If the batch does not conform to national or international standard for which it is intended, the procedure JAL/R&E/NCO/PR/01 is followed for getting it approved. If the batch is not approved, it is sent for re-melting. (ii) Ultrasonic testing of special alloy logs for cracks, etc.
- c) Tool Shop by giving instructions for dimensional corrections (if any) through Format No. JAL/R&E/EQA/F/06 and dimension reports for trial runs.

9.9 The Quality Assurance department coordinates & assists Marketing department for the following:

- a) In providing feed back during new product manufacturing.
- b) Closure of complaints on analyzing root cause and implementation of corrective & preventive action.
- c) In providing initial response on obtaining customer complaint.

10.0 CONTROL OF EXTERNAL DOCUMENTS:

The following external documents are controlled and verified by AGM (QA) / Sr. Manager (Q) / Manager (QA) once in a year for latest revision status and recorded in the format JAL/R&E/EQA/F/24. The documents are: IS:733, IS:1285, IS:5082, IS:3965, IS:6477, IS:2673, ISO:9001.

11.0 FINAL INSPECTION & TEST RECORDS

The inspection & test records are maintained for the final inspection and/or test conducted on special section. The details of records have been given in Annexure No.JAL/R&E/EQA/ANX/03.

12.0 FINAL INSPECTION

Extrusion is grouped under lots as per specification mentioned below:

- a) Bars, Flats & Sections as per IS:733-1983
- b) Bars, Rods & Sections for Electrical Purpose as per IS:5082-1998.
- c) Any customer reference are specified national/international standard.

The tests are conducted as per details addressed in this procedure and the relevant standards

13.0 MONITORING AND MEASURING RESOURCES

(Cl: 7.1.5 of IS/ISO-9001:2015 – Monitoring and measuring resources)

The Quality Assurance Department controls, calibrates & maintains inspection, measuring & test equipment as explained below.

The following measurements are identified to demonstrate the conformance of product to the specified requirements.

- a) Linear measurements in mm.
- b) Hardness in Webster, Barcole, BHN and Vickers.
- c) Tensile strength in MPa or N/mm².
- d) Electrical Conductivity in % IACS
- e) Chemical Composition in Percentage.

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13.1 The following types of instruments are identified for inspection, measuring & test equipments with following criteria:

Sl. No.	Measurements	Instruments Identified	Acceptable Criteria (Max allowable error)	Calibration Frequency
01.	<u>Dimensions</u> a) Linear b) Angular c) Radius	a) Vernier Calipers b) Digital Calipers c) Micrometers d) Measuring Tape Bevel Protractor Radius Gauges	± 0.1 mm with known error ± 0.1 mm with known error ± 0.01 mm ± 3 mm $\pm 0.5^\circ$ ± 0.1 mm	One Year One year One Year One Year Three Years Five Years
02.	Hardness	a. Webster Tester b. Barcole Tester c. Rockwell Hardness Tester d. Micro Hardness Tester e. Brinell Hardness Tester.	± 1 Webster unit ± 2 Barcole unit $\pm 3\%$ of Standard Block value ± 14 HV $\pm 3\%$ of Standard Block value	Prior to use Prior to use 3 Months 3 Months 3 Months
03.	Tensile Strength	Tensile Testing Machine	$\pm 2\%$ of FSD	One Year
04.	Electrical Conductivity	Conductivity Meter	$\pm 1\%$ IACS	Three Years
05.	Chemical Composition	Metal Analyser Spectrolab (Spectrometer)	5% with ref. To Standard	One year
06.	Internal cracks	Ultrasonic Tester	Horizontal linearity $\pm 1\%$ Vertical linearity $\pm 5\%$	2 years

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MASTER STANDARDS

01.	<u>Dimension</u>			
	a) Linear	Slip Gauge	± 60 Microns	Once in 5 Yrs.
	b) Angular	Bevel Protractor	± 0.5°	Once in 5 Yrs.
02.	Hardness Tests	Reference Block Webster Standard Barcole Standard	As per certificate	- - -
03.	Chemical Composition	CRM Standards (Certified)	As per certificate	---
04.	Conductivity	Conductivity Standards	± 1% IACS	Once in 5 Yrs.
05.	Straightness	Spirit Level	Zero Setting	Once in 5 Yrs.

All the measuring & test equipments are listed & maintained as per format No.JAL/R&E/CAL/F/01 with details.

AGM (QA) approves the inclusion and removal of the instruments from the list.

All the inspection, measuring & test equipments, used by QA and Production are calibrated by Quality Assurance Department. The Quality Assurance supervisor and Chemist are authorized & responsible for calibration.

Note: SI.No: 04 & 05 are for future requirement.

13.2 Calibration Status:

All inspection, measuring and test equipment are identified with a label or sticker showing the status of calibration. Instruments calibrated by external agencies will have the sticker of the external agency who did the calibration. If the sticker put by the external agency is damaged or lost before the next due date of calibration, then our own sticker / label may be put on the equipment, by referring to the relevant details from the calibration certificate given by the external agency.

13.3 Environmental Condition:

All the measuring, inspection & testing equipments except Hardness tester & tensile tester are calibrated at 20 deg C and used for inspection at room temperature.

The environmental condition for the Metal Analyzer is a room installed with Air Conditioner and protected from direct sunlight & dirt. The room temperature shall be maintained at 20 ± 3°C.

13.4 Handling, Preservation & Storage:

Instruments like Vernier, Micrometers, Bevel Protractors & Dial Indicators shall be stored and preserved in suitable covers or boxes to avoid damages or inaccuracy. Other instruments like Spectrometer, Tensile Testing Machines & Conductivity Meter shall be in the specified location and shall be operated by the authorized personnel.

13.5 Calibration Records: List of instruments & calibration status are maintained as per Annexure No.JAL/R&E/EQA/ANX/04.

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14.0 PROCESS MONITORING

- a) For every section, Quality and Production Supervisors check the extruded product dimensions from the first off sample as per the drawing. If the sample dimensions are conforming to the dimensional tolerances given in the drawing, the extrusion is continued, otherwise, the die is unloaded and sent for die correction. Remarks related to deviation / die unloading is entered in format No.JAL/R&E/EPRN/F/04.
- b) For sections where machining is involved or which go for critical applications, end defect (piping) is checked by etching and cut off before bundling.
- c) The end pieces are marked with yellow paint and again checked by Quality by etching, prior to final release.
- d) Process Capability index is verified for various parameters
- e) EPF is monitored with respect to AO for any deviations.
- f) Based on the customer's requirement or previous complaints, the EPF is verified and special instructions will be put in the EPF and then sent to production.
- g) The Special section release is verified by QA manager before sending to Despatch / marketing.
- h) All the customer complaints are discussed in QC meeting based complaint received and minutes of the meeting is maintained. The action planned in the previous meeting is also reviewed. Major customer complaints are listed as per Format No. JAL/R&E/EQA/F/20.
- i) Measurement Analysis is done for linear measurements once in 3 months, where the sample tested by a particular operator is given to the other operators for testing the same measurement and the measurement is analyzed by statistical techniques. The details are recorded as per JAL/R&E/EQA/F/11.
- j) Calibration due date is monitored on a monthly basis and the instruments due for calibration is calibrated.

15.0 SAFETY AND ENVIRONMENTAL REQUIREMENTS

The following safety and environmental requirements are to be followed in Extrusion QA:

- a. Use safety shoes while moving on the shop floor.
- b. Use proper tools while working on the moulds.
- c. Avoid loose clothing while working.
- d. Use facemask and hand gloves during charging ingots in melting furnace and while casting rolling sheets.
- e. Avoid oil spillage on the floor.
- f. To clean oil spillage immediately to avoid slipping and accidents.
- g. While lifting load by the crane, ensure that the load is within the safe working capacity of the crane.
- h. To clean the machine and take utmost care while cutting Magnesium and to collect the boring and store separately in a safe area.
- i. In the event of any accident / shock, to give First Aid immediately.
- j. To have full knowledge of operating the fire extinguisher in the event of fire hazards like for oil - Foam type, paper & gunny; Electrical - Carbon Dioxide and dry powder.
- k. Use sufficient light below the work spot to avoid accidents.
- l. In addition to above, any safety orders/instructions issued by Management from time to time, are also to be followed.

16.0 CONTROL OF NON CONFORMING OUTPUTS

The details of disposal of Non Conforming Product is recorded in the Non Conforming Product register JAL/R&E/NCO/F/01 and sent to DGM(C) for appropriate decision. Procedure reference: JAL/R&E/NCO/PR/01.

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17.0 NONCONFORMITY AND CORRECTIVE ACTION:

The corrective action is taken for the non-conformities and action is taken for potential non-conformities as explained in the procedure for corrective action JAL/R&E/NCA/F/01 & JAL/R&E/CPA/F/01.

18.0 RISKS AND OPPORTUNITIES

Risk & opportunities are defined as separate procedure. JAL has established, implemented & maintained this procedure for managing risk & opportunities.

19.0 ANALYSIS AND EVALUATION

The following data are analyzed and evaluated by using statistical techniques.

CHARACTERESTICS	PARAMETER	STATISTICAL TECHNIQUES	FREQUENCY
Product Characteristics	Hardness	Control Charts	Once in 2 months selecting at random 1 section with minimum 25 samples.
	Defects	Control Charts	Once in 3 months – 1 section selected at random
	<i>Dimensions</i>	Control Charts	Once in 3 months selecting 1 batch at random with minimum 25 samples.
Measurement Analysis	Linear Measurements	-	Once in 3 months covering min 3 operators

20.0 CONTINUAL IMPROVEMENT

The quality objectives are monitored for improvement during the department meeting and the current level of the objectives is noted down and target level is fixed for the next period and action plan is developed to attain the target level and monitored for improvement. The details are recorded in the format JAL/QMSC/F/01.

The effectiveness of corrective and preventive action taken for the non-conformities is also monitored for improvement

21.0 EXTERNALLY PROVIDED SERVICES:

The servicing, maintenance and calibration of critical equipments like Spectro, tensile testing machine, etc, is entrusted to outside agencies in the form of Annual Maintenance contract.

The AMCs are finalized through Purchase dept. The details regarding the required number of service visits, breakdown visits, etc., are specified in the AMC. Purchase dept. co-ordinates with the AMC provider to ensure that the work is carried out as specified in the contract. The record of the visits done, visit due date, etc, is also maintained by Purchase dept. Quality dept. will check and certify after each service visit whether the work has been satisfactorily carried out.

22.0 ORGANIZATIONAL KNOWLEDGE, COMPETENCE & AWARENESS:

Training is defined as separate procedure. The purpose of this procedure is to define the requirements for positions in the company affecting quality, for hiring and training employees to ensure these requirements are met, and for evaluating the effectiveness of training provided.

List of training records is shown in the Annexure No JAL/R&E/EQA/ANX/04 & maintained by HOD.

Competency chart is identified for all position in the QA department as per Annexure No JAL/R&E/EQA/ANX/05.

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QUALITY PLAN FOR EXTRUSIONS

Process	Check parameter	Responsibility
Raw material receiving -Aluminium	Chemical composition	Foundry
Raw material receiving -Alloying elements	Chemical composition	QA
Melting , Holding, Casting	Chemical composition	Foundry / QA
	Ultrasonic testing *	QA
Homogenizing	Temperature and time	Foundry
Hot extrusion	Dimensions, finish, etc.	Prod. / QA
Cutting	Piping *	Prod/ QA
	Cut length	Prod. / QA
Bundling inspection	Visual	Prod. / QA
	Bend / twist	Prod.
Ageing	Temperature and time	Prod.
Final inspection and disposition	Hardness	QA
	Tensile test	QA
	Conductivity and bend test*	QA
	Piping*	QA
	Ultrasonic testing*	QA
	Visual	QA
	Dimensional	QA
Bend/ twist*	QA	
Checking of outsourced (anodized)material	Surface finish/ coating thickness	QA

* denotes if applicable / required.

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REQUIREMENT OF HARDNESS AND / OR TENSILE STRENGTH

TYPE OF SECTIONS	HARDNESS			TENSILE STRENGTH Mpa (Min)
	WEBSTER (Min)	BARCOLE (Min)	BHN	
<u>HE9WP SI 1 & 2 – Alloy Sections</u>				
01. Architectural, Transport, Heavy Angle & Shapes, Furniture Tubes, Rods, Bars in Flats 6063/6360/6060	10	68	60	185
02. Antenna Tubes, Lighter Sections, Sections as per list /6063/6360/6060	7	61	47	150
03. HE30WP/6082T6/6351T6 Alloy Sections	15	79	90	295
04. HE30W/6082T4/6351T4 Alloy Sections	10	68	60	185
04. HE20WP/6061T6 Alloy Sections	14	78	85	260
05. E91EWP/6101T6	8	63	50	170
06. 64423WP Alloy Sections	16	82	103	330
07. 6005-T6 Alloy Sections	14	78	83	260

NOTE:

- 1) For sections in any other alloy & temper, the requirements shall be the tensile strength as per relevant standards / customer specifications.
- 2) The Barcole and Webster readings given above are approximate and are for guidance only. The conformance will be decided based on BHN or tensile strength.
- 3) For other alloys and tempers, the required BHN may be calculated from the tensile strength. The corresponding Barcole and / or Webster readings may be arrived at by actual measurement from a sample with known BHN.

JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)			
TITLE: PROCEDURE FOR EXTRUSION QUALITY ASSURANCE			
Doc.No.: JAL/R&E/EQA/ANX/03	Rev. No.: 00	Date: 01.07.2017	Page # 14

INSPECTION AND TEST RECORDS

Sl. No	Name Of Record	Format No.	Verified & Approved By	Retention Period
01	Hardness Test	JAL/R&E/EQA/F/01	Head of Department	6 Months
02	Hardness, Conductivity & Bend Tests	JAL/R&E/EQA/F/01A		Soft copy only
03	Tensile Test	JAL/R&E/EQA/F/02		Soft Copy only
04	Chemical Analysis Report	JAL/R&E/EQA/F/04		Soft Copy only
05	Special section Release	JAL/R&E/EQA/F/05		2 Months
06	Dimension Report	JAL/R&E/EQA/F/06		Soft Copy only
07	Test Certificate	JAL/R&E/EQA/F/07		Soft Copy only
08	Pre-Shipment Inspection Report	JAL/R&E/EQA/F/08*		6 Months
09	Die failure Report	JAL/R&E/EQA/F/09		Soft /hard copy in 1 month
10	Ultrasonic Flaw Detection Test Record of Logs & Extruded Profiles	JAL/R&E/EQA/F/10		1 Year
11	Measurement capability sheet	JAL/R&E/EQA/F/11		3 months
12	Ultrasonic Flaw Detection Test Report	JAL/R&E/EQA/F/12		1 Year
13	Lead Time Dimension Report	JAL/R&E/EQA/F/13		1 Year
14	Customer Complaint Report	JAL/R&E/EQA/F/16		2 Years
15	Extrusion Report	JAL/R&E/EQA/F/17		Soft Copy only
16	List of Major Complaints	JAL/R&E/EQA/F/20		1 year
17	Extrusion Press Temperature Monitoring Record Sheet	JAL/R&E/EQA/F/21		6 Months
18	Checklist for Material Release	JAL/R&E/EQA/F/22		1 Year
19	Porosity and Eutectic Melting Tests	JAL/R&E/EQA/F/23		1 year
20	Control of External Documents	JAL/R&E/EQA/F/24		1 year
21	Quality Objectives monitoring record	JAL/R&E/QMS/F/01		3 years
22	Control of Nonconforming outputs	JAL/R&E/NCO/F/01		1 year
23	Nonconformity and corrective action	JAL/R&E/NCA/F/01		Until CA is implemented
24	Corrective & preventive action	JAL/R&E/CPA/F/01		

Note: 1. Format Nos: JAL/R&E/EQA/F/13, F22 and F/23 are future requirement.
2. In-case absence of head of department for approval, next level will be approved.

JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)			
TITLE: PROCEDURE FOR EXTRUSION QUALITY ASSURANCE			
Doc.No.: JAL/R&E/EQA/ANX/04	Rev. No.: 00	Date: 01.07.2017	Page # 15

CALIBRATION RECORDS

Type of Records	Format Reference	Responsible Person	Retention Period
a. List of instruments & Calibration Status	JAL/R&E/CAL/F/01	AGM-QA	1 Year
b. Calibration Results	JAL/R&E/CAL/F/02	AGM-QA	1 year

TRAINING RECORDS

Type of Records	Format Reference	Responsible Person	Retention Period
a. Employee Details	JAL/R&E/TRG/F/01	} HOD	Till person in service
b. Training needs identified during April__to March__	JAL/R&E/TRG/F/02		1 Year
c. Record of Training Imparted	JAL/R&E/TRG/F/03		1 year
d. Review of Effectiveness of Training	JAL/R&E/TRG/F/04		1 year

Note:

The computer generated documents (soft copy) will not be having the signature of the generating department. However, if a hard copy is taken out, it has to have signature of the concerned person.

JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)		
TITLE: PROCEDURE FOR EXTRUSION QUALITY ASSURANCE		
Doc.No.: JAL/R&E/EQA/ANX/05	Rev. No.: 00	Date: 01.07.2017 Page # 16

COMPETENCE CHART

Name of department: EXTRUSION QA			
IS/ISO 9001:2015 clause number 7.2			
Sl.No.	Position	Required qualification*	Experience required
1	Asst. Gen. Manager	M.Sc/BE/BTech in Mechanical	12 Years
2	Sr. Manager	BE/BTech in Mechanical	10 Years
3	Manager	BE/BTech in Mechanical	08 Years
4	Dy. Manager	DME	06 Years
5	Asst. Manager	DME	04 Years
6	Engineer	DME	02 Years
7	Sr. Supervisor	DME	02 Years
8	Supervisor	DME	01 Years
9	Management Trainee	DME	00 Year
10	Helpers	-	00 Year
*Note: Relaxation in qualification can be given in case the candidate is having sufficient experience in relevant field.			
Prepared by: HOD		Approved by: GM	

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

HARDNESS TEST
(JAL/R&E/EQA/F/01)

Sl.No.	Date	Sec.No.	Alloy & Temper	Hardness		Remarks
				Webster	Barcole	

CHECKED BY
Q.A. WORKER

VERIFIED & APPROVED BY
AGMQA /Asst. QA/Supervisor/QAS/Chemist

Retention Period: 6 Months

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

Run Date:

Page No:

(For future requirement)

HARDNESS, CONDUCTIVITY & BEND TEST REPORT

Format No: JAL/R&E/EQA/F/01A

FOR THE PERIOD FROM _____ TO _____

Sl. No	P-Form No.	Test Date	AO/JV No	Section No.	Alloy & Temp	Length	Batch No	Hardness			Conductivity	Remarks	Released by
								Webster	Barcole	Brinell			

Remarks:

Checked By:

(Q.A. Worker)

Retention Period: Only soft copy maintained by QA.

Verified & Approved By:

(AGM-QA/AQAS/CHEMIST/QA Supervisor)

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

TENSILE TEST
(JAL/R&E/EQA/F/02)

Date of Testing	P-Form No.	Date of Extrusion	Section Details		Alloy & Temper	AO No/ JV No.	Customer	Dimensions
			Sec. No	Description				
01	02	03	04	05	06	07	08	09

Cross Sectional Area mm ²	0.2% Proof Load Kgf	Max. Load Kgf	0.2% Proof Strength MPa	Tensile Strength MPa	% Elongation	Remarks
10	11	12	13	14	15	16

TESTED BY
Asst.Q.A.Supt. /
QAE/QAS/Chemist

VERIFIED & APPROVED BY
AGM-QA

Retention Period: Only soft copy maintained by QA.

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

Date:

Time:

CHEMICAL ANALYSIS REPORT
(JAL/R&E/EQA/F/04)

Sample No	Quality	Id-1	Id-2	Id-3	Id-4	Date	Time
Element wise Chemical analysis results							

Tested / Verified by

Approved by

AGM-QA

RETENTION PERIOD: Soft copy only

JINDAL ALUMINIUM LIMITED	
ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

DIMENSION REPORT

(JAL/R&E/EQA/F/06)

Customer Name				Date of extrn.		Date of inspection	
Press No.		Description				Section No.	
Alloy & Temper		Batch No.				Die No.	
Sl. no.	Specified Dimensions (mm)	Required Dimension (mm)		Observed Dimension (mm)	RESULT		
		Minimum (mm)	Maximum (mm)		Acptd	AUD	Not Acptd

AUD = Accepted under deviation
Acptd= Accepted

Remarks:

Prepared by:
(Asst QA Mgr /QA Supervisor/Chemist)

Verified & Approved by :
(AGM-QA)

RETENTION PERIOD: Soft copy only

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

JINDAL ALUMINIUM LTD.
 Regd. Office & Works :
 Jindal Nagar, Tumkur Road,
 BANGALORE – 560 073,
 jindal@jindalaluminium.com
 INDIA
 www.jindalaluminium.com

Ph: 2371 5555 (6 lines)
 Grams : JINDALEX
 Fax: 080-2371 3333
 E-mail :
 Website:

TEST CERTIFICATE
 (JAL/R&E/EQA/F/07)

CUSTOMER :	REPORT NO. :	DATE:
	ORDER REF :	DATE:
SECTION NO. AND DESCRIPTION	AO NO:	AO DATE:
	ALLOY TEMPER	HEAT No.

CHEMICAL COMPOSITION PERCENT

SPECIFIED	Mg	Si	Mn	Fe	Cu	Zn	Ti	Cr	Al Remainder
ACTUAL									

MECHANICAL TESTS

ELECTRICAL TEST

	0.2% proof strength MPa	TENSILE STRENGTH Mpa	ELONGATION PERCENT ON 50mm G.L.	RESISTIVITY MICRO OHM-CM AT 20° C	CONDUCTIVITY % IACS AT 20° C
SPECIFIED					
ACTUAL					
OTHERS :					
REMARKS :					

TESTED BY

CHECKED BY

Asst.Q.A.Supdt./Q.A.S./ Chemist/Q.A.E.

AGM-QA

Retention Period: Only soft copy maintained by QA.

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

DIE FAILURE REPORT
(JAL/R&E/EQA/F/09)

Date:

Press	Total no. of Dies run	Dies Failed	% of Failure	Trial	DWA
DP1					
DP2					
DP3					
DP4					
DP5					
TOTAL					

Sl No	Press No	Sec No	Die No	Die failure reason	Alloy	Batch No	Reqd Qty	Push	Corrective Actions	Remarks

PREPARED BY:
(QA Supervisor/Chemist)

CIRCULATED TO:
DGM (TS) / PM / FM ----->AGMQA

APPROVED BY:
(AGM - QA)

Retention Period: Soft copy /hard copy for 1 Month

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

**ULTRASONIC FLAW DETECTION TEST RECORD OF
LOGS AND EXTRUDED PROFILES**
(JAL/R&E/EQA/F/10)

Sl. No	Tested On	Type Of Probe	Energy db	Ext. Profile Sec. No.	LOGS / EXTRUSION PROFILE				Test Status (No. of pieces)			Tested By	Remarks	
					Dia mm	Press	Alloy	Batch No.	Tested	OK	Not OK			

APPROVED BY:

AGM-QA

Retention Period: One Year

JINDAL ALUMINIUM LIMITED	
ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

MEASUREMENT CAPABILITY SHEET

(JAL/R&E/EQA/F/11)

Date:

Part Name :	Characteristics:	Gauge Name:
Part No. :	Specification:	Gauge No.:
Machine :	Total Tolerance:	Measurement Unit:

Operator	A				B				C			
	1 st Trial	2 nd Trial	3 rd Trial	Range	1 st Trial	2 nd Trial	3 rd Trial	Range	1 st Trial	2 nd Trial	3 rd Trial	Range
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
Totals												
	1 st		Range A		1 st		Range B		1 st		Range C	
	3 rd				3 rd				3 rd			
	Sum				Sum				Sum			
	Average A				Average B				Average C			

Range A	
Range B	
Range C	
Sum	
Average R	

# Trials	D4
2	3.27
3	2.58

Average R x D4 = UCL R*)

Max Average (A,B,C)	
Min Average (A,B,C)	
X- bar diff	

Note:

*) Limit for individual R's. circle those that are beyond limit.

Identify the cause and correct by repeating the readings using the same appraiser and unit.

Re-compute all calculations.

Continued....

Measurement Capability sheet Continued.....

CALCULATIONS

Repeatability = Equipment Variations (EV)	Trials	2	3	% EV = 100xEV / Tolerance
EV = Average R x K1 =	K1	4.56	3.05	% Ev = 100x
EV =				%EV=

Reproductability = Operator Variations (OV)	Operat ors	2	3	% OV = 100 x (OV) / Tolerance
OV=(X-bar diff) x K2)2 – (EV2 / n x r)1/2	K2	3.65	2.70	% OV= 100x
OV =				% OV =

Repeatability & Reproductability (R&R)	Number of samples n		% R&R =100x(R&R) / Tolerance
R&R = (EV2 +OV2)1/2	Number of Trials r		% R&R = 100x
R&R =			% R&R =

Conclusion Gauge is :	
% R&R < 10%	OK
10% < %R&R <30%	???
%R&R > 30%	Not OK

Prepared by:

Approved by:

AGM-QA

Retention Period: 3 Months

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

<u>ULTRASONIC FLAW DETECTION TEST REPORT</u> (JAL/R&E/EQA/F/12)			
Customer:		Report Ref	
		Date	
		Order Ref	
		Date	
Test and Equipment Details:			
Make:		Model:	
Type of Probe used:		Frequency:	
Reference Block used:		Couplant used:	
Test Method used:		Technique used:	
Energy dB used:		Scale used:	
Type of Scanning:		Registration Level:	
Material Specification:			
Alloy:		Batch No:	
Sl.No	Description	Qty	Results
Test description and remarks:			

Tested by:

Verified by:

QAS/Chemist

AGM-QA
Jindal Aluminium Limited

Retention Period: One Year

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

Jindal Aluminium Limited
Bangalore-73

Run Date:

CUSTOMER COMPLAINT REPORT

For the Period: From.....To.....

(JAL/R&E/EQA/F/16)

Sl No	Comp No.	Customer Name	Place	Section No	Alloy / Temper	Qty Sup

Invoice No	Inv. Date	Qty Rej Kg	Comp Nature	Comp Code	Correct Act	Corr. AC Status	Press No

Retention Period: Two Years

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

Jindal Aluminium Limited
Bangalore-73

Run Date:

EXTRUSION REPORT

Extrusion Date From.....To.....

(JAL/R&E/EQA/F/17)

Sl No	Extr Date	Time Start	Time End	P-Form	Sec No/ Die No	Customer	AO/JV NO	A&T	Cut Length	Req Qty	Push Kg	Batch No	Int Alloy

RETENTION PERIOD: Soft copy only

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

LIST OF MAJOR* COMPLAINTS FROM.....TO.....

(JAL/R&E/EQA/F/20)

Sl No	Date of complaint	Customer's name	Sec No	Alloy/ Temper	Inv. No/ Date	Qty Supld	Nature of complaint	Root Cause	Action Taken	Status	Type of defect	Severity

*Complaints are considered as "Major", when customer returns the reject material.

Prepared & checked by:

Retention period: 1 year

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

EXTRUSION PRESS TEMPERATURE MONITORING RECORD SHEET

(JAL/R&E/EQA/F/21)

Date:

PRESS	TIME	SEC.NO	ALLOY	BILLET. TEMP ° C	CONT. TEMP ° C	DIE HEATING OVEN TEMP. ° C						OPERATOR	SUPERVISOR	CHECKED BY	REMARKS
						1	2	3	4	5	6				

Prepared by: QAS

Checked by: AGM-QA

Retention Period: 6 Months

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

(FOR FUTURE REFERENCE)

CHECKLIST FOR MATERIAL RELEASE
(JAL/R&E/EQA/F/22)

Date :

Section No	Customer	DOE	AO NO	A&T	Check parameters						Remarks	Cked by	Appr. by
					Finish	Dim'n	B&T	Piping	Hardness	Conductivity			

Prepared by: QAS
Retention period: 1 year

Checked by: AGM-QA

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

**Jindal Aluminium Ltd
Bangalore**

POROSITY AND EUTECTIC MELTING TESTS

(JAL/R&E/EQA/F/23)

(FOR FUTURE REQUIREMENT)

Date	Section No	Date of extrusion	Batch No	Alloy Temper	AO / JV No.	Customer	Porosity Observed (Yes/No)	Eutectic melting Observed (Yes / No)	Tested by	Verified by

RETENTION PERIOD: ONE YEAR

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

CONTROL OF EXTERNAL DOCUMENTS

(JAL/R&E/EQA/F/24)

Sl. No	IS Std. No.	Title of IS Std.	Revision status of document available with JAL	Latest revision status as per BIS website	Remarks
1	IS/ISO-9001	Quality Management Systems Requirements			
2	IS733	Specification for Wrought aluminium and aluminium alloys, bars, rods and sections for general engineering purpose			
3	IS1285	Wrought aluminium & aluminium alloys - extruded round tube and hollow sections for general engineering purpose			
4	IS5082	Wrought aluminium & aluminium alloy bars, rods, tubes, sections, plates & sheets for electrical applications			
5	IS3965	Dimensions for wrought aluminium and aluminium alloys, bar, rod & section.			
6	IS6477	Dimensions for wrought aluminium and aluminium alloys, extruded hollow sections.			
7	IS2673	Dimensions for wrought aluminium and aluminium alloys extruded round tube - specification.			

Reviewed By:

AGM-QA

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

CALIBRATION RESULTS

(JAL/R&E/CAL/F/02)

INSTRUMENT NO		ROOM TEMPERATURE		
DESCRIPTION		DATE OF CALIBRATION		
LOCATION		DUE FOR CALIBRATION		
MASTER STANDARD USED				
CALIBRATION PROCEDURE REFERENCE				
SL.NO.	STANDARD VALUE	OBSERVED VALUE	ERROR ±	REMARKS

CALIBRATED BY:

VERIFIED BY:

DEPARTMENT HEAD

Rétention Period : One year

JINDAL ALUMINIUM LIMITED	
ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

LIST OF INSTRUMENTS FOR CALIBRATION
(JAL/R&E/CAL/F/01)

Sl. No	Instruments	Make	Identification mark	Location	Calibration on	Calibration due date	Frequency of calibration	Acceptance criteria	Calibrated by

APPROVED BY:

DEPARTMENT HEAD

RETENTION PERIOD: ONE YEAR

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

NONCONFORMITY AND CORRECTIVE ACTIONS

As per clause number 10.2 of IS/ISO 9001 : 2015)
(JAL/R&E/NCA/F/01)

NC & CA No.	DATE:	DEPARMENT:
NON-CONFORMITY RELATED TO:		
i. PRODUCT <input type="checkbox"/> iv MAINTENANCE <input type="checkbox"/>		
ii. PROCESS <input type="checkbox"/> v OTHERS <input type="checkbox"/>		
iii RECORDS <input type="checkbox"/>		
DESCRIBE OF NON- CONFORMITY:		
ROOT CAUSE OF NON-CONFORMITY:		
CORRECTIONS:		
CORRECTIVE ACTION	RESPONSIBILITY	DATE OF COMPLETION
Checked by:		Verified and Approved by:
		(Department Head)

Retention period: Until Nonconformity is closed and corrective action is implemented.
CC: QMS COORDINATOR

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

CORRECTIVE AND PREVENTIVE ACTION

Format No.JAL/R&E/CPA/F/01

Department		Date:
01	NAME OF THE CUSTOMER	
02	NATURE OF COMPLAINT	
03	DESPATCH DETAILS:	
04	QUANTITY REJECTED	
05	REASON FOR THE COMPLAINT	
06	ROOT CAUSE	.
07	CORRECTION	
08	CORRECTIVE ACTION	
09	PREVENTIVE ACTION	
10	REVIEWED AT MANAGEMENT REVIEW MEETING ON	
Prepared by:		Verified & Approved by:
		Department Head
Note: This format applicable only for customer complaint		

JINDAL ALUMINIUM LIMITED ROLLING & EXTRUSION DIVISION	
REV NO:00	REV DATE:01.07.2017

REVIEW OF EFFECTIVENESS OF TRAINING

Format No: JAL/TRG/F/04

Department:

SI No	Name	Topic	Effectiveness Criteria	Excellent	Good	Average	Poor	Date of Review	Sign of HOD
1			Job performance						
			Knowledge & Communication skill						
			Attitude						
2			Job performance						
			Knowledge & Communication skill						
			Attitude						
3			Job performance						
			Knowledge & Communication skill						
			Attitude						
4			Job performance						
			Knowledge & Communication skill						
			Attitude						
5			Job performance						
			Knowledge & Communication skill						
			Attitude						
6			Job performance						
			Knowledge & Communication skill						
			Attitude						
7			Job performance						
			Knowledge & Communication skill						
			Attitude						

Prepared By

Approved By

Note: Effectiveness of Training will be reviewed by concerned HOD after 2 months of training.

Retention Period: One Year