

JINDAL ALUMINIUM LIMITED			
TOOL SHOP PROCEDURE			
Doc.No.JAL/TS/PR/01		Title Page	
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AMENDMENT RECORD

Amendment			Discard		Insert	
Sl. No	Date	Description	Page No	Rev. No	Page No	Rev. No
1	01/12/12	Title page amended for Amendment Record	Title Page	00	Title Page	01
		Annex JAL/TS/ANX/02 amended	14	00	14	01
		Annex JAL/TS/ANX/04 amended at Sl.No.12 & 14 of Solid Dies	16	00	16	01
		Annex JAL/TS/ANX/04 amended at Sl.No.15 & 16 of Hollow Dies	17	00	17	01
		Annex JAL/TS/ANX/05 amended at Sl.No: 7 & 14	22	00	22	01
2	25/11/13	Title page amended for Amendment Record	Title Page	00	Title Page	01
		Format No: JAL/TS/F/15 amended for merging of 3 rd & 4 th columns	41	00	41	01

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Prepared by	Manager (T/S)		
Verified by	MR		
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1.0 PURPOSE

The purpose of this procedure is to ensure that proper check and controls are exercised at the time of manufacture of the die & toolings required for various extrusion presses.

1.1 OBJECTIVES: (Cl: 7.1 of IS/ISO-9001:2008 - Planning of Product Realization and
Cl: 7.5 of IS/ISO-9001:2008 - Production & Service Provision)

- a) To Minimize Die Failures
- b) To Improve the Die Life
- c) To Improve Productivity

2.0 SCOPE

2.1 The procedure covers the manufacture of:

- a) Solid Dies
- b) Hollow Dies
- c) Tooling for the above dies

3.1 3.0 ORGANIZATION (Cl: 4.2.1 of IS/ISO-9001:2008)

The Organization Chart is shown in Annexure No. JAL/TS/ANX/01.

3.2 RESPONSIBILITIES & AUTHORITY: (Cl: 5.5.1 of IS/ISO-9001:2008)

3.2.1 VICE PRESIDENT (OPERATIONS)

- a) To keep check on the quality of dies manufactured, their performance and taking trials of new dies and quality of heat treatment.
- b) Improvement in die designs for better performance in respect of production rate and die life.
- c) To ensure prompt and corrective action in case of die failure.
- d) For increased production, to check if any modification is required, i.e., in die design and also check number of holes and die correction. Also ensure that losing sections are reduced to the maximum extent.
- e) To check for efficient working of Tool shop, with respect to number of holes made, consumption of die steel and operations of wire cut and EDM machines.
- f) To approve die design of all new sections.

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3.2.2 AGM – TOOL SHOP:

- a) Overall in charge of Tool Shop and ensure that all the Tool Shop works are done as per planning.
- b) To accept under deviation the sub-contract jobs / manufactured in TOOL SHOP / die & tooling.
- c) To produce the required extrusion, he is authorized for any change in design of dies & tooling. The changes will be incorporated in respective drawings after successful trials.
- d) To maintain all machines in the department for trouble-free operation adopting the concept of preventive maintenance scheme. Maintenance department to inform to carry out as per AMC.
- e) To keep watch on the performance of dies and take corrective action to avoid failures.
- f) To check the life of each die rejected and analyze & suggest improvements for better designs.
- g) To study the performance of dies of problematic sections on the press to have a clear analysis for implementing corrections.
- h) To check the design of dies and ensure that dies are manufactured with best possible design to achieve better productivity. Die design to be finally approved by AGM-TS / VP(O).
- i) To ensure that the dies procured from outside are checked and timely trials taken. In case there is any defect in the dies procured from outside, to inform concerned sub-contractor if any expenses have been incurred by the company so that the same can be recovered from them.
- j) To monitor die failures/trials in respect of new dies and take immediate corrective action.
- k) To monitor the performance of all the staff and workers in Tool Shop and take action for their lapses.
- l) To approve indents originating from Tool Shop as head of the department.
- m) To attend to all the works of Tool Shop Manager in his absence.

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3.1.3. TOOL SHOP MANAGER:

- a) He will be responsible for sending dies to the presses and the entire die correction of all the presses. He will ensure that dies to the presses are sent on time. In case of any delay, he will inform the shipping department.
- b) To plan dies & tooling as per production programme and tool wear.
- c) To arrange the dies on the presses as per production programme after thorough checking and ensure that dies are sent correctly and in time to the press. He is authorized to change the EPF for any specific section in consultation with Despatch Manager.
- d) To keep record of the trials taken of extruded sections and circulated to TSM /AGM-TS/ DGM-P / VP(C) / VP(O) / ED / VC.
- e) To have regular co-ordination with Packing Department to see the stock level of heavy / light material and to run the dies accordingly to see that material does not get accumulated.
- f) To maintain Die Rejection Register in consultation with AGM-TS and get computer printout of fully rejected dies / tooling and circulate as per format No.JAL/TS/F/13.
- g) To monitor the performance of all critical dies where there is more die failures or where the material requires more correction. Design of dies should be checked by him personally. He should also bring it to the notice of AGM-TS / VP(O) / for further action.
- h) To guide Asst. Manager for placing orders for dies to be procured from outside. He will place indent for procuring dies from outside based on the requirement. He will ensure that no dies are procured which are not used later.
- i) He should monitor die failures on all the presses and should take remedial action so that die failures are minimized.
- j) He should also ensure that minimum material is going to correction department. If from any particular die more material is going to correction department, he should check the design of such dies and ensure necessary correction. He should take the guidance of AGM-TS/ VP(O)/ for difficult and complicated designs.
- k) He should go to the presses frequently and check the running of dies. Ensure that nose pieces are sent to Tool Shop. He should also consult press operators about any problems being faced in any of the dies.
- l) He will be fully responsible for manufacture of dies under AGM-TS.
- m) To check the design of dies and ensure that dies manufactured with best possible design to achieve better productivity.

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- n) To monitor the performance of all critical dies where there is more die failure or the material requires more correction.
- o) To monitor die failures/trials in respect of new dies & take immediate corrective action.
- p) To monitor the performance of staff / workers in Tool Shop and take action for their lapses & to ensure all workers are fully loaded to check their efficiency.
- q) To maintain all the machines in the department for trouble free operation with the concept of Preventive Maintenance scheme.
- r) To check the life of each die rejected & analyze and suggest improvements for better designs.
- s) To monitor die failures on all the presses and should take remedial action, so that die failures are minimized.
- t) To ensure that all the machines are used to the full capacity so that maximum dies are manufactured.
- u) To check the performance of dummy blocks & press toolings of each Press to ensure that we get more life out of them. Also give suggestions as to how to improve the life of press toolings.
- v) To read technical magazines, books and adopt latest technology/equipment in Tool Shop for maximum automation and reduction in cost.
- w) To ensure that dies procured from outside are checked and timely trials are taken. In case there is any defect in the dies procured from outside, to inform concerned sub-contractor. To call job work parties for discussion to improve quality.

3.1.4: DY. MANAGER:

- a) To ensure that dies are sent to heat treatment after proper inspection/ checking and received back in time. If any die is spoiled during heat treatment, the same should be reported to AGM-TS/ VP(O).
- b) To prepare indent for all consumable items required for manufacture of dies in consultation with AGM-TS.
- c) To monitor the performance of workers under him and take action for any lapses/losses caused by them.
- d) Maintenance department to be informed well in time to carry out preventive maintenance as per AMC.
- e) To attend all the works of Tool Shop Manager in his absence.
- f) He will be fully responsible for manufacture of dies under the guidelines of TSM / AGM-TS /
- g) To give requirement of all consumable items required for manufacture of dies in consultation with AGM-TS.

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3.1.5 ASST. MANAGER / SUPERVISOR:

- a) To monitor the performance of workers under him and take action for any lapses/losses caused by them.
- b) Overall in charge of CNC Jig Boring Machine and ensure that all works are done as per drawing / sketch / instructions by programming. Also store the programme in PC after checking.
- c) To ensure work performance of Operators.
- d) To decide the priority for die manufacturing in consultation with AGM-TS/TSM/ Dy.Manager.
- e) To have regular co-ordination with Wire cut Operators, Lathe Operators and Die Fitters.
- f) To analyze the breakdowns of CNC / Wire cut machines and take proper action.

3.1.6 MACHINE OPERATORS:

- a) To carry out the work as per drawing/sketch/instructions of Supervisor/Asst. Manager/ Dy. Manager/TSM.
- b) To maintain the machine trouble-free and keep the working area clean.
- c) To handle the dies and tooling with due care.
- d) To co-ordinate with other Operators for proper outflow of die / tooling manufacturing.

3.1.7 DIE FITTERS:

- a) To carry out the work as per drawing/sketch/instructions of Supervisor/Asst. Manager/ Dy. Manager/TSM.
- b) To upkeep the die profilers / grinders and other equipments / machines which they are using.
- c) To correct the dies as per nose piece and flow pattern.
- d) To study at the press the performance of die wherever required.
- e) To keep the nearby area clean and to use safety devices.

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3.1.8 HELPERS:

- a) To carry out the work as per instructions of seniors.
- b) To use safety devices and handle the dies & tooling properly. Also to keep the dies & tooling at respective places.
- c) To co-ordinate with all Machine Operators for proper flow of work.

4.0 REFERENCES

- 4.1 INTERFACE: Tool Shop has cross functions with the following departments with respect to dies and tooling:

Drawing Office
Heat Treatment
Production
Quality Assurance
Marketing & Despatch
Purchase
Stores

- 4.2 The related procedures of the above departments will have reference with the processes carried out in this department.

5.0 DEFINITIONS

- 5.1 Definitions of the terms appearing in the procedure are given below:

- a) **Backer:** A hardened steel support disc having an aperture larger than that of the Special Backer.
- b) **Special Backer:** A hardened steel support disc having an aperture larger than that of the die.
- c) **Bolster:** A hardened steel disc with the same diameter as the Die Ring. It supports the Die & Backer and helps to minimize deflection.
- d) **Mandrel:** A core fixed in relation to the die cap, which produces inner profile of sections.
- e) **Die Cap:** A steel disc, which makes the outer profile of the sections and, which is assembled with core or mandrel.
- f) **Solid Die:** A steel disc with one or more orifices of the same cross-section area and contour, as desired product through which metal is forced.

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- g) **Hollow Dies:** Hollow shapes are produced with hollow dies either port hole or spider types. Sections produced on such dies have two or more longitudinal weld lines due to the metal flow around the supports that holds the mandrel. The later determines the inside contour of the section being extruded. After flowing around the supports, the metal is fused in a weld chamber before passing through the die proper aperture or orifice.
- h) **Die Ring:** A cylindrical sleeve that holds the die and backer in axial relationship to each other.
- i) **Weld Chamber:** A disc, which controls the metal flow, and to keep continuity of extrusion.
- j) **Bearing:** Aperture surface length at right angles to the die face controls the metal flow.
- k) **Bolster Holder:** A cylindrical holder that holds the bolster to support the die ring assembly.

6.0 INPUTS

- Raw Materials for die preparations
- Dies & Tooling Approval
- Drawings
- JAL /STD /001 (Specification Standards)

7.0 OUTPUTS

- Dies & Tools
- Die Performance report
- Approved Trial report (other than dealer order)

8.0 PROCEDURE

8.1 The Quality Plan of Die manufacturing process is shown in Annexure No.JAL/TS/ANX/02 and Activity Chart in Annexure No. JAL/TS/ANX/03. The reference to records, which are maintained at various stages, is shown on the side under column "Reference to Records". The general process for the manufacture of following is detailed in Annexure No. JAL/TS/ANX/04:

- a) Solid Dies
- b) Hollow Dies
- c) Tooling

8.2 Die performance reports Format No. JAL/QA/F/09 are analyzed everyday to find out potential causes of die failures. These data's are plotted in the "PARETO DIAGRAM". From the Pareto Diagram, high percentage defects are analyzed for taking corrective steps. The routine corrective action is taken and is recorded in appropriate Format Nos.JAL/TS/F/07, JAL/TS/F/10, JAL/TS/F/10A & JAL/TS/F/14. The potential causes are recorded in Format No.JAL/CPA/F/01 (Corrective and Preventive Action).

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8.3 Dies and tooling are manufacturing as per the approval taken and a monthly completion report is prepared vide Format No.JAL/TS/F/16. Pending dies report is forwarded vide Format No.JAL/TS/F/15 (Dies and Tooling Manufacturing Program In Process and Pending). AGM-TS is authorized to delete certain dies & tooling from the Dies & Tooling Manufacturing Program (JAL/TS/F/15) due to change in manufacturing programme.

Approval for making Urgent dies and tooling will be obtained through Supplementary Dies / Tooling (Format No.JAL/TS/F/11).

8.4 Preservation Method of Dies & Toolings: All dies and toolings, after use, are cleaned and kept neatly at proper place.

8.5 Handling of Dies and Toolings

- 8.5.1 Dies are transferred from assembly shop to ground by lift.
- 8.5.2 From the lift Dies are transferred to the respective press by means of manual trolley or by Pallet truck.
- 8.5.3 Die opening should be covered with protective tape to avoid dust accumulation on bearing.
- 8.5.4 Heavy Dies and tooling will be lifted with the help of crane and chain pulley blocks.
- 8.5.5 Bearing face of the dies is kept in such a way that it always be towards bottom side.
- 8.5.6 Wooden blocks / Aluminium plates are used for assembly of dies in rings.
- 8.5.7 Ring sealing face is not to be kept on floor.
- 8.5.8 During transit from one place to another it is ensured that dies should not fall on each other to prevent any damage.

8.6 Incoming Material Inspection

8.6.1 Specification of Material: For specification of Hot Die Steel and High Speed Steel, refer JAL/STD/0001.

8.6.2 Acceptance Criteria: Materials accepted based on the supplier conformance certificate.

Imported - Accepted based on supplier's conformance certificate.

Indigenous – Material is accepted as per our analysis or outside analysis reports.

8.9 Maintenance of Machines:

Breakdown records of Wire EDM / CNC are maintained in Format No.JAL/TS/F/04 and for other machines, the records are maintained in Maintenance Department as per Format No.JAL/MAT/F/01.

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8.10 CALIBRATION

8.10.1 The following types of instruments are identified for inspection, measuring & test equipments with required accuracy:

SL. NO.	MEASURE-MENTS	INSTRUMENTS IDENTIFIED	ACCURACY REQUIRED	CALIBRATION FREQUENCY
01.	<u>Dimensions</u> Linear	i) Vernier Calipers ii) Digital Calipers iii) Micrometers iv) Vernier Height Gauge v) Digital vernier height gauge vi) Vernier depth gauge	± 0.1 mm ± 0.1 mm No Error ± 0.1 mm ± 0.1 mm ± 0.1 mm	One Year One year One Year One Year One Year One Year
02	Hardness	Hardness Tester	± 2 HRC	3 Months

8.10.2 All the measuring & test equipments are listed & maintained as per format No.JAL/CAL/F/05 with details.

8.10.3 The Dy.Manager and AGM-TS approve the inclusion and removal of the instruments from the list.

8.10.4 All the inspection, measuring & test equipments kept in Tool Shop are calibrated by Tool Shop Department. The Dy. Tool Shop Manager is authorized for calibration and approved by Department Head.

8.10.5 The procedure employed to calibrate all inspection, measuring & test equipments are given in Annexure No.JAL/TS/ANX/06.

8.10.6 Calibration Status: All the inspection, measuring & test equipments are identified with a Label as shown in the Annexure No.JAL/TS/ANX/07 to determine the calibration status mentioning the

- a) Instrument Number
- b) Calibration Date
- c) Calibrated by
- d) Error
- e) Due Date

8.10.7 Calibration Records: The calibration records with retention period are identified in the JAL/TS/ANX/05.

8.10.8 If any instrument is noticed out of order, the material inspected till then is kept separate and tests are carried out after calibrating the instrument and material is released accordingly.

8.10.9 Environmental Condition: All the measuring, inspection & testing equipments are calibrated and used for inspection at room temperature.

8.10.10 Handling, Preservation & Storage: Instruments shall be stored and preserved in suitable covers or boxes to avoid damages or inaccuracy.

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9.0 PROCESS MONITORING

- a) Die Analysis report JAL/QA/F/09 is analysed every day to find out the potential cause of the failures if any.
- b) Pending Die order report JAL/TS/F/15 is monitored for any delay in manufacturing of the Dies.
- c) AGM-TS/TSM/Dy.Manager monitors that the Dies are handled & preserved safely to ensure no damage to the dies.
- d) The Calibration due date is monitored on a timely basis and the instruments due for calibration are calibrated.

10.0 ANALYSIS OF DATA

The following data's are analysed by statistical techniques.

SL. NO.	PARAMETERS	STATISTICAL TECHNIQUES	DATA TO BE COLLECTED	FREQUENCY
1	Die performance report	Pareto diagram	Die failures	Every Month
2.	Die life	Bar chart	Actual Die Life achieved	Every Month

11.0 NON CONFORMITIES

- 11.1 If any deviation is found in chemical composition, a sample piece is subjected to heat treatment and is accepted, if the hardness achieved is as per the release hardness range mentioned in JAL/STD/0001 with the approval of VP(O).
- 11.2 Dies & Tooling not serviceable are rejected and cross marked with Red paint and is transferred to "Die Rejected Godown". A report of rejected dies and tooling is circulated to AGM-TS / VP(O) / DGM-P / VP(C) / ED / VC as per Format No.JAL/TS/F/13. Number of all rejected dies and tooling are deleted from computer.

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12.0 CORRECTIVE ACTIONS

The non conformities are analysed for causes and suitable corrective action is taken to ensure that the non-conformities are not repeated. These actions are verified for effectiveness during subsequent processing. The details are recorded in JAL/TS/F/07,10,10A & 14.

13.0 PREVENTIVE ACTIONS

The potential Non-conformities are analysed for causes and preventive action is taken to avoid the occurrence of the non-conformities. The action taken is monitored for effectiveness. The details are recorded in the register in the format JAL/CPA/F/01

14.0 CONTINUAL IMPROVEMENT

The quality objectives are monitored for improvement 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/MR/F/01.

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

15.0 TRAINING

To ensure a system for enriching the skills and attitudes of employees required for specific job and in line with the technology development, innovations and growth of the organization, the training needs are identified and provided.

The educational background, professional training of the employee, etc are recorded in format No.JAL/TRG/F/01.

The heads of the department are responsible for identifying the training needs and to ensure that the training is imparted to meet these needs.

The training can be: - (i) On-the-job Training or (ii) Specialized Training

The training needs are based on: - (i) Qualification (ii) Experience (iii) Job requirements

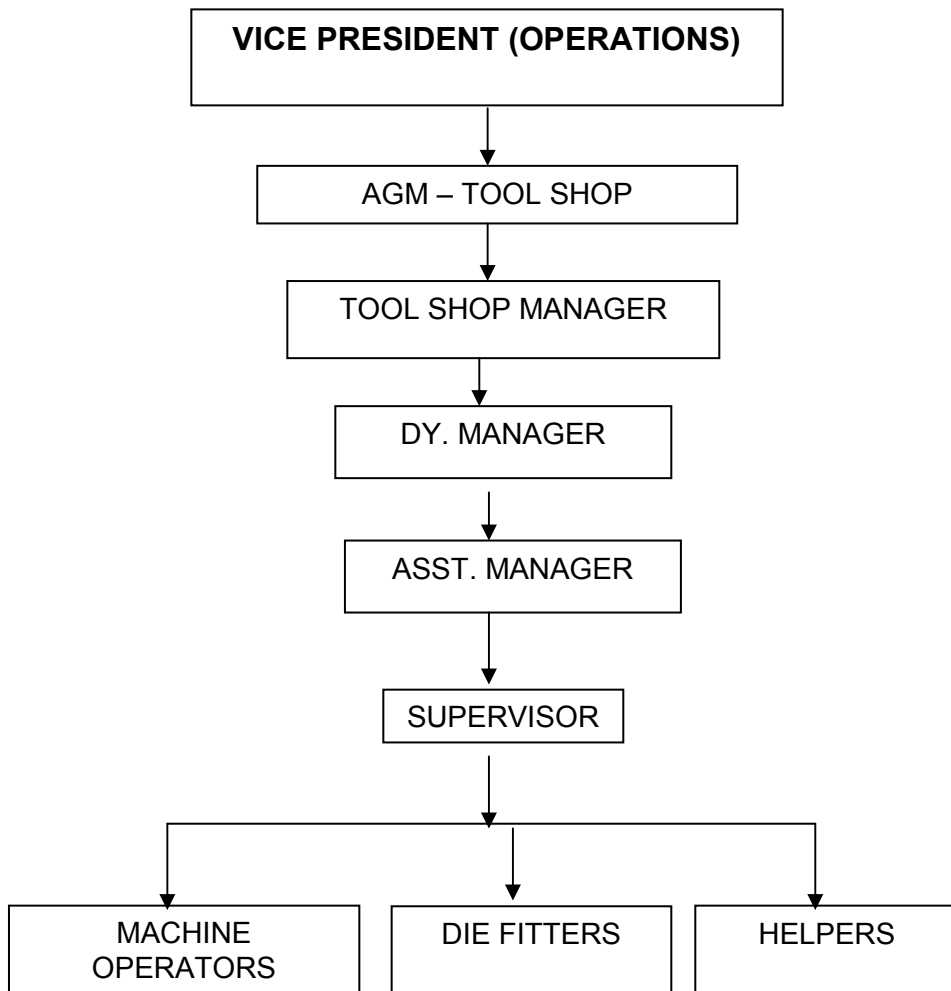
After the training needs are identified (as per format No.JAL/TRG/F/02), the training is planned and scheduled. The training can be imparted by:-

- i. Qualified and experienced internal staff
- ii. External experts through in-house training programmes
- iii. Professional institutions through their open courses / seminars / workshops

After the training is imparted, the training records are maintained in format No.JAL/TRG/F/03. Training review is conducted to assess effectiveness of the training Programme. Training review will be done six months after the training has been imparted by HOD in format No.JAL/TRG/F/03.

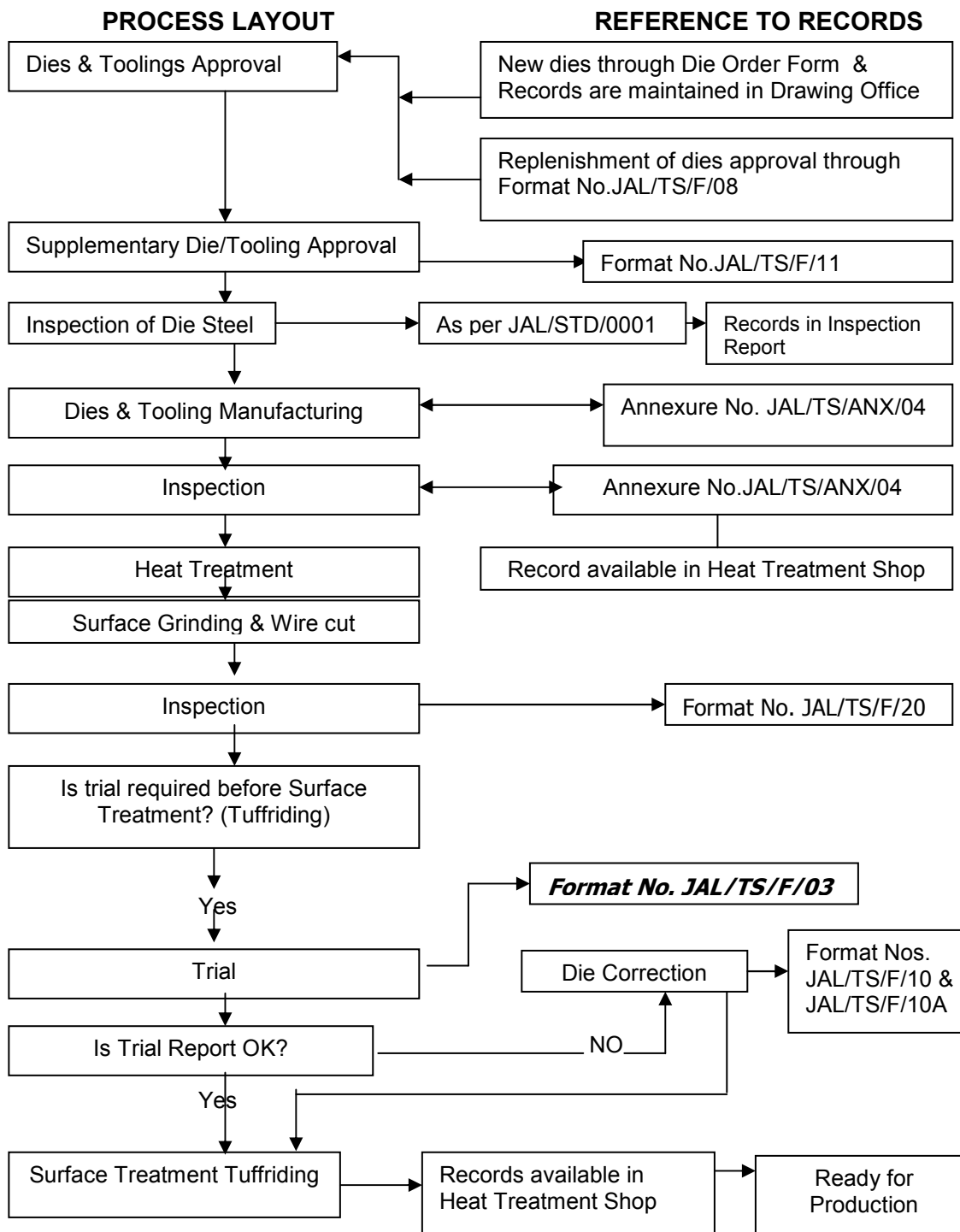
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ORGANISATION CHART



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QUALITY PLAN FOR DIE MANUFACTURING PROCESS
 (Cl: 7.5 of IS/ISO-9001:2008 - Production & Service Provision and
 Cl: 7.1 of IS/ISO-9001:2008 - Planning of Product Realization)



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ACTIVITY CHART

01. Planning for new dies, toolings and repair of old dies, tooling and its execution.
02. Die supplies on press as per Production Schedule.
03. Link with Production Department and Marketing Department.
04. Discard of dies & tooling, which are not serviceable.
05. To keep up-to-date the stock position of dies and tooling in computer.
06. Preservation and storage of the dies & tooling in proper manner.
07. Timely indent of die steel, cutting tools and measuring instruments.
08. Inspection of purchased items required for TOOL SHOP and gets the bills of the suppliers cleared for payment.
09. To guide the Marketing Department for acceptance of new sections with acceptable tolerances.
10. To inform the customer through Marketing Department, if any delay is there in execution of the order due to die under repair or die not available or die out of tolerance.
11. To accept the material procured as per JAL Standard / National Standard / International Standard and other Standards available with Drawing Office (Technical Library).

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SECTION – 01 - MANUFACTURING PROCESS

I. SOLID DIES

01. Blank cutting by Band Saw Machine. Production data's are maintained in Format No. JAL/TS/F/12.
02. Turning on Lathe as per sketch.
03. CNC Jig Boring operations as per drawing. Profile checked on machine itself through CAM Software, before machining by giving 0.1 mm depth cut. Production data relevant to CNC Jig Boring machine is maintained in Format No. JAL/TS/F/02.
04. Back Milling on CNC / Conventional Milling as per decision by Asst. Manager / Dy. Manager / AGM-TS.
05. Final_bearing milling and slot milling for putting die number on conventional milling machine. Slot can be made at any convenient place.
06. Burrs removing, cleaning, marking from backside to front side. (Die Fitter).
07. Die number punching, inspection and to keep ready for heat treatment.
08. After heat treatment and surface grinding to final thickness, transfer to Sand Blasting (random checking for hardness as per Format No. JAL/TS/F/09) and transfer to wire cut.
09. Wire cut: Profile cutting as per drawing after adding shrinkage allowance and approved by Dy. Manager / TSM / AGM-TS. Profile checked on machine itself by plotting, before machining. Production data relevant to Wire EDM are recorded in Format No. JAL/TS/F/01.
10. Front step finish on lathe.
11. Inspection and tufftriding.
12. Trial / Production. (***Trial records maintained in Format No.JAL/TS/F/03***)
13. Repair of Dies: TSM will approve repair of dies where appropriate. Necessary instructions will be given by Asst. Manager / TSM / AGM-TS.
14. **Outsourcing: As & when required, the complete manufacture of Solid dies to be sub-contracted through Purchase dept. The Sub-contractor to manufacture the Solid dies as per JAL's drawing.**

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II. **HOLLOW DIES – (Mandrel & Die cap)**

01. Blank cutting by Band Saw Machine. Production data's are maintained in Format No. JAL/TS/F/12.
02. Turning on Lathe as per sketch.
03. CNC Jig Boring operations as per drawing. Profile checked on machine itself through CAM Software, before machining by giving 0.1 mm depth cut. Production data relevant to CNC Jig Boring machine is maintained in Format No. JAL/TS/F/02.
04. Back Milling of die cap on CNC / Conventional Milling as per decision by Dy. Manager /TSM / AGM-TS.
05. Final bearing milling and slot milling for putting die number on conventional milling machine. Slot can be made at any convenient place.
06. Deburring, grinding & polishing of mandrel before heat treatment.
07. Burrs removing, cleaning.
08. Die number punching, inspection and to keep ready for heat treatment.
09. After heat treatment and surface grinding of die-cap, transfer to Sand Blasting. (Random checking for hardness as per Format No. JAL/TS/F/09) and transfer to wire cut.
10. Wire cut: Profile cutting as per drawing after adding shrinkage allowance and approved by Dy. Manager / TSM / AGM-TS. Profile checked on machine itself by plotting, before machining. Production data relevant to Wire EDM are recorded in Format No. JAL/TS/F/01.
11. After wire cut, fitting of mandrel & die cap on lathe machine.
12. Inspection & final size making by fitter.
13. After final size, total thickness maintained on surface grinder. Front step finish on Lathe machine.
14. Final inspection and tufftriding.
15. Trial / Production. (***Trial records maintained in Format No. JAL/TS/F/03***)
16. **Outsourcing:**
 - a) ***Whenever necessary for hollow dies, machining of mandrel and die cap inserts sub-contracted through Purchase Department.***
 - b) ***As & when required, the complete manufacture of Hollow dies (consisting of mandrel & die cap) to be sub-contracted through Purchase dept. The Sub-contractor to manufacture the Hollow dies as per JAL's drawing.***

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III. **TOOLINGS**

- a) Welding chamber
- b) Special backer
- c) Backer
- d) Bolster
- e) Rings
- f) Sub-Bolster

01. Blank cutting – Bandsaw Machine
02. Turning – Lathe
03. Dowelling holes – CNC Jig Boring Machine
04. Marking of welding chamber, backers and bolsters on CNC Jig boring machine / manually as per decision by TSM / Dy. Mgr / AGM-TS on spot.
05. Milling on CNC Jig boring machine / conventional milling machine as per decision by TSM / Dy. Mgr / AGM-TS. For special backers, marking to be done after completion of bearing and tapering by taper end mill. Then the profile of die / die cap to be taken and clearance to be given from 1 mm to 3 mm as per decision of TSM / Dy. Mgr/ AGM-TS by seeing the criticality of die. (Die Fitter)
06. Deburring and filing - Die Fitter
07. Inspection with respect to die / die cap – Die Fitter
08. Bolting holes / Dowelling, if any – Die Fitter
09. Heat Treatment – Heat Treatment Section
10. Surface Grinding – Surface Grinder – Maintain total thickness
11. Fixing of Dowels and check assembly – Die Fitter
12. Outside diameter turning with respect to die / die cap. Step making if any, in case of welding chamber and rings (Lathe).

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SECTION - 02 - INSPECTION

The following points are to be checked:

01. All the sizes and dimensions have been completed as per drawing.
02. Bearings have been made, burrs removed, blended die polished.
03. All dowelling holes made and number slots milled at any convenient place.
04. Sharp corners rounded off wherever required as per drawing.
05. Section number and die number have been punched correctly and distinctly and recording done in Heat Treatment register as per Format No. JAL/TS/F/05.
06. To check whether the mandrel and die cap have been finished properly. Welding chambers are smooth and streamlined.

SECTION 03

DIE CORRECTION

01. **Twisted / Wavy:** To correct uneven balance of flow. To reduce bearing where the flow is slow, to speed up the slow side.
02. **Screw Holes Tearing Problem**
 - a) Improper flow
 - b) Improper extrusion speed and temperature
03. To adjust the flow in mandrel and to select the proper speed.
04. **Length Variation:**
 - a) To make equal bearing
 - b) Extrusion speed improper
 - c) To select correct temperature
05. **Split Corners:**
 - a) Improper lubrication
 - b) Improper quality billets
 - c) Improper feed at corners

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SECTION 04

DIES REJECTION DURING (Month & Year) **AND TOOLINGS REJECTION DURING (Month & Year)**

Dies and tooling should be rejected periodically wherever it is observed that condition of die is not good and it is not repairable too, also cannot be used for new higher thickness, then it should be rejected, marked with red paint and kept in rejected dies godown. Tooling should be examined periodically. If hardness is low and total thickness also optimum and also not possible to convert for any other use, it should be rejected, marked with red paint and transferred to reject dies godown. Monthly statement should be made as per Format No.JAL/TS/F/13 and should be circulated to AGM-TS / VP(O) / DGM-P / VP(C) / ED / VC and as per Format No.JAL/TS/F/19, to be circulated to VP(O) / DGM-P / VP(C) / ED / VC. All numbers of rejected dies should be deleted from computer.

Records of dies rejected during manufacturing are maintained in Format No.JAL/TS/F/06.

01. If any die / tooling is rejected during manufacturing process, it is cross-marked with Red paint and is transferred to "Die Rejected Godown".

SECTION 05 - DIE COOKING

01. To keep the dies in Caustic solution for an optimum time only.
02. As far as possible Aluminium on the dies should be drilled and milled.
03. Settled water should be reused.
04. Do not allow any Caustic solution to go out in drain.
05. During cutting the Aluminium outside the Cooking Room, a sharp chisel should be used. If blunt, it should be sharpened again and then to use.

Note: Concentration of Caustic Solution:
20 kgs. Caustic Soda in 100 litres fresh water

Time for keeping dies in Caustic Soda solution tank:
1½ hour with die-assembly of die cap & mandrel and 2 hours after
Drilling & milling of mandrel.

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SECTION 06- SAFETY MEASURES

1. To use GOGGLES while grinding to prevent iron particles from entering his eyes.
2. To use hand gloves while removing chips from machines.
3. To wear shoes.
4. To wear tight dress.
5. To use crane for lifting heavy dies.
6. To wear helmet during crane operation.
7. In addition to the above, any safety orders / instructions issued by Management from time to time, are also to be followed.

SECTION 07 – PHYSICAL STOCK TAKING OF DIES

Physical stock taking of all dies in Tool Shop should be done once in three years and report submitted to VC. Stock taking will be done under the supervision of Accounts Manager and Manager (T/S) and is recorded in Format No.JAL/TS/F/21.

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LIST OF QUALITY RECORDS

Type of Records	Format Reference	Responsible Person	Retention Period
a. Wire EDM Working Record	JAL/TS/F/01	Dy. Mgr	3 months
b. CNC Jig Boring Working Record	JAL/TS/F/02	Dy. Mgr	3 months
c. Trial Report	JAL/TS/F/03	Dy. Mgr	3 months
d. Wire EDM/CNC Breakdown Record	JAL/TS/F/04	Dy. Mgr	6 months
e. Heat Treatment Record	JAL/TS/F/05	Dy. Mgr	3 months
f. Die Rejected During Manufacturing	JAL/TS/F/06	Dy. Mgr	6 months
g. Die Failure Record	JAL/TS/F/07*	TSM	Till Correction is over
h. Dies and Tooling Approval	JAL/TS/F/08	TSM	2 months
i. Hardness checking at Random	JAL/TS/F/09	Dy. Mgr	6 months
j. Die Correction	JAL/TS/F/10	TSM	1 month
k. Die Correction	JAL/TS/F/10A	TSM	1 month
l. Supplementary Die/Tooling Approval	JAL/TS/F/11	TSM	Retained till entered in computer list of pending.
m. Band Saw Working	JAL/TS/F/12	Dy. Mgr	1 month
n. Dies Rejection during	JAL/TS/F/13	TSM	2 months
o. Dies A/Cs Query	JAL/TS/F/14*	TSM	Last 3 Run
p. Dies and tooling manufacturing programme in process pending as on---	JAL/TS/F/15	Dy. Mgr	1 month
q. Dies and tooling manufacturing programme completed from..... to.....	JAL/TS/F/16	Dy. Mgr	1 month
r. Tooling Rejection during	JAL/TS/F/19	TSM	1 month
s. Die Inspection Report	JAL/TS/F/20	Dy. Mgr	1 year
t. Die Stock as on.....	JAL/TS/F/21	TSM	3 years
u. Quality Objectives Monitoring Record	JAL/MR/F/01	Dy. Mgr	3 years

* **Soft copies maintained in JIIS.**

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CALIBRATION RECORDS

Type of Records	Format Reference	Responsible Person	Retention Period
a. Instruments Calibration Record	JAL/CAL/F/01	Dy. Mgr	1 Year
b. Calibration Results	JAL/CAL/F/04	Dy. Mgr	1 year
c. List of instruments for Calibration	JAL/CAL/F/05	Dy. Mgr	1 year

TRAINING RECORDS

Type of Records	Format Reference	Responsible Person	Retention Period
a. Training Record	JAL/TRG/F/01	} Head of Department	Till person is in service.
b. Training Needs during Apr_____ to Mar_____.	JAL/TRG/F/02		One Year
c. Record of Training Imparted & Review of Effectiveness of Training from Apr_____ to Mar_____.	JAL/TRG/F/03		One 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.

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WORK INSTRUCTIONS FOR CALIBRATION

MICROMETERS

01. The Micrometers are calibrated once in a year by using Slip Gauges and Standard Blocks, which are in turn, calibrated by recognised institution and traceable to National Standard, once in 5 years. No error is allowed for micrometers.
02. The Standard IS 2967 – 1983 has to be referred for calibrating the Micrometers.

VERNIER CALLIPERS/VERNIER HEIGHT GAUGE/VERNIER DEPTH GAUGE

01. The Vernier Calipers, Vernier Height Gauge & Vernier Depth Gauge are calibrated once in a year by using Slip Gauges and Vernier Checkers, which are in turn, calibrated & certified by recognised institutions and traceable to National Standards, once in 5 years.
02. The vernier calipers, vernier height gauge & vernier depth gauge can be used with a known error of ± 0.1 mm, beyond which the instrument is rejected.
03. The Standard IS 3651 (part 2) 1985 has to be referred while calibrating the vernier calipers.

ROCKWELL HARDNESS TESTER

01. The tester is calibrated prior to use by using Secondary Standards.
02. The tester is calibrated with the Master Standard once in three months.
03. The Master Standard is calibrated by any NABL accredited laboratory once in 5 years.
04. Error: Variation of ± 2 HRC is acceptable.

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LABELS

CALIBRATION NOT
REQUIRED

CALIBRATED	
INSTRUMENT NO:	ERROR
CALIBRATED ON:	DUE ON:
CALIBRATED BY:	

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Format No.JAL/TS/F/01

WIRE EDM

Date	Section / Die No.	Description	File No.	Holes	Starting Time	Complete Time

Actual Machine Time	Setting Time	Total Time	Feed mm/min.	Cutting Length (mm)	Remarks

PREPARED BY

CHECKED BY

CAD / CAM ENGR

Dy. Mgr

Circulated To: TSM / AGM-TS / VP(C) / VP(O)

RETENTION PERIOD – 3 MONTHS

JINDAL ALUMINIUM LIMITED			
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Format No.JAL/TS/F/02

CNC JIG BORING

Date	Section / Die No.	Holes	Description	Details of work done
1	2	3	4	5

Starting Time	Finishing Time	Actual M/c. Time	Remarks
6	7	8	9

PREPARED BY

CHECKED BY

CAD / CAM ENGR

Dy. Mgr

Circulated To: TSM / AGM-TS / VP(C) / VP(O)

RETENTION PERIOD: 3 MONTHS

JINDAL ALUMINIUM LIMITED			
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DIE REJECTED DURING MANUFACTURING

Month	Description	Remarks

PREPARED BY
Dy. Manager

CHECKED BY
TSM

CIRCULATED TO
AGM-TS / VP(O) / VC

RETENTION PERIOD: 6 MONTHS

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Format No.JAL/TS/F/07

DIE FAILURE
(For Presses P1, P2, P3, P4, P5, P6 & P7)

Date	Section / Die No.	Performance	Remarks

PREPARED BY
Asst. Manager

CHECKED BY
TSM

RETENTION PERIOD: TILL CORRECTION IS OVER

JINDAL ALUMINIUM LIMITED			
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Format No.JAL/TS/F/08

DIES AND TOOLING APPROVAL FOR MONTHLY PLANNING

SL NO	DATE	SECTION/TOOL	PLANT	REASON FOR DIES/TOOL
		DIE NO SEC. DESC	DIE MFG DATE	TOTAL PROD. QTY
		OLD SECTION		

STOCK	ITEMS TO BE MADE	LAST MONTH PUSH QTY	QTY	REMARKS	TYPE
PRESS NO					
				STD LIFE	

PREPARED BY
TSS / Asst Manager

CHECKED BY
Dy. Mgr / TSM

APPROVED BY
AGM-TS / Mgr-Mktg /
VP(C) / DGM-P / VP(O)

RETENTION PERIOD: 6 MONTHS

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Format No.JAL/TS/F/09

HARDNESS CHECKING AT RANDOM

Date	Section/ Die No.	Description	Plant Code	Hardness (HRC)	Remarks

PREPARED BY
Dy. Mgr

CHECKED BY
TSM

CIRCULATED TO
AGM-TS / VP(O) / DGM(P)

RETENTION PERIOD: 6 MONTHS

JINDAL ALUMINIUM LIMITED			
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Format JAL/TS/F/10

DIE CORRECTION

DATE : SECTION NO. :

PLANT CODE : DIE NO. :

REFER DOCUMENT NO. : NO. OF PIECES IN

LAST DATE OF RUN : 100 kg AS PER LAST RUN :

LAST PERFORMANCE : DATE OF RUN OF

CORRECTED DIE :

DIE CLEARANCE IN THOU

DIMENSIONS CHECKED AFTER HEAT

TREATMENT :

VISUAL INSPECTION :

EXISTING SETTING	CORRECTION

PREPARED BY
OPERATOR

CHECKED BY
Asst. Manager / Dy. Manager / TSM

RETENTION PERIOD: 1 MONTH / TILL CORRECTION IS OVER

JINDAL ALUMINIUM LIMITED			
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Format No.JAL/TS/F/10A

DIE CORRECTION REPORT

Section Number	
Die Number	
Press Number	
No. of Holes	
Dimension with Sketch	

Prepared by
OPERATOR

Checked By
Asst. Manager / Dy.Manager / TSM / AGM (T/S)

RETENTION PERIOD: ONE MONTH

JINDAL ALUMINIUM LIMITED			
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Format No.JAL/TS/F/11

SUPPLEMENTARY DIE / TOOLING APPROVAL

SL NO	DATE	SECTION/TOOL	PLANT	REASON FOR DIES/TOOL
		DIE NO SEC. DESC	DIE MFG DATE	TOTAL PROD. QTY
		OLD SECTION		

STOCK	ITEMS TO BE MADE	LAST MONTH PUSH QTY	QTY	REMARKS	TYPE
PRESS NO		STD LIFE			

PREPARED BY
TSS / Asst. Manager

CHECKED BY
TSM

CIRCULATED TO
AGM-TS / Mgr-Mktg / DGM (P)
VP(C) / VP(O)

RETENTION PERIOD:
RETAINED TILL ENTERING COMPUTER LIST OR PENDING LIST

JINDAL ALUMINIUM LIMITED			
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DIES REJECTION DURING.....
(Month & Year)

Sl. No	Plant	Sec No.	Die No.	Die Description	Prodn in Kgs.	Reason for Rejection	Average life in MT	Remarks/ Performance

PREPARED BY
Asst. Manager

CHECKED BY
TSM

APPROVED BY
AGM-TS

CIRCULATED TO: VP(O) / DGM-P / VP(C) / ED / VC

RETENTION PERIOD: 2 MONTHS

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Format No.JAL/TS/F/14

DIES ACCOUNTS QUERY

Plant:.....Section:..... Retrieve Die No.....Detail

Plant no.	Die no.	Manufacturing date	Push	Holes	Last Nitriding Date	Remarks

Backer	Bolster	Spl. Backer	W. Chamber	Ring	Die type

RETENTION PERIOD: LAST THREE RUNS

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Format No.JAL/TS/F/15

DIES & TOOLING MANUFACTURING PROGRAMME
IN-PROCESS & PENDING AS ON

Sr. No	Sec. No.	Die / Tooling No.	Description	App. Date	App. Qty.	Process Date	Proc. Qty.	Remarks
Plant:								
Category:								

PREPARED BY
Dy. Manager

CHECKED BY
TSM

APPROVED BY
AGM-TS

Circulated to: SM / VP(C) / VP(O) / VC

RETENTION PERIOD – 1 MONTH (MINIMUM)

JINDAL ALUMINIUM LIMITED			
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Format No.JAL/TS/F/16

DIES & TOOLING MANUFACTURING PROGRAMME COMPLETED
FROM TO.....

Sl. No.	Sec. No.	Die / Tool No.	Description	Process Qty.	Remarks
Plant:					
Category:					

PREPARED BY
Dy. Manager

CHECKED BY
TSM

APPROVED BY
AGM-TS

Circulated to: SM / VP(C) / VP(O) / VC

RETENTION PERIOD: 1 MONTH

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TOOL SHOP

Format No.JAL/TS/F/20

Date:

DIE INSPECTION REPORT

Section Number	
Die Number	
Press	
No. of Holes	
Dimension	

Other dimensions are as per drawing No.:

Prepared by
OPERATOR

Checked By
Asst. Manager / Dy.Manager / TSM / AGM(T/S)

RETENTION PERIOD: 1 YEAR

JINDAL ALUMINIUM LIMITED			
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TOOL SHOP

Format No.JAL/TS/F/21

DIE STOCK AS ON: _____

Sl.No	Section	Die No.	Holes	Mfg Date	Die Type	Remarks

Prepared by:
Accounts Dept/Asst. Mgr (T/S)

Checked by:
Accounts Manager/TSM / AGM(TS)

Circulated to: VC

Retention period: 3 Years.

JINDAL ALUMINIUM LIMITED			
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INSTRUMENTS CALIBRATION RECORD

SL. NO.	DESCRIPTION OF THE INSTRUMENT	MAKE	SL.NO.OF INSTRUMENT	LOCATION	CALIBRATED ON
01	02	03	04	05	06

ERROR	CALIBRATION DUE ON	CALIBRATED BY	APPROVED BY	REMARKS
07	08	09	10	11

RETENTION PERIOD: ONE YEAR

JINDAL ALUMINIUM LIMITED			
TITLE: FORMATS FOR TOOL SHOP PROCEDURE			
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Format No: JAL/CAL/F/04

CALIBRATION RESULTS

INSTRUMNT 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

Retention Period: One Year

JINDAL ALUMINIUM LIMITED			
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Format No.JAL/MR/F/01

QUALITY OBJECTIVES MONITORING RECORD

- 1.0 Department
- 2.0 Quality Objectives:
- 3.0 Reference Document:
- 4.0 Responsibility:

Sl.No.	Date	Current level	Target level	Target date	Action Plan	Remarks

RETENTION PERIOD: 3 YEARS

JINDAL ALUMINIUM LIMITED			
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TRAINING NEEDS IDENTIFIED
DURING APR TO MAR
Format No.JAL/TRG/F/02

DEPARTMENT:

Sl. No.	Name	Designation	Dept	Type of Training required	Schedule of Training

Prepared By

Approved By
Dept. Head

