

<b>JINDAL ALUMINIUM LIMITED</b>			
<b>ROLLING &amp; EXTRUSION DIVISION</b>			
<b>PROCEDURE FOR ROLLING</b>			
<b>DOC. NO. JAL/R&amp;E/ROL/PR/07</b>		<b>TITLE PAGE</b>	
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**AMENDMENT RECORD**

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Sl. No	Date	Description	Page No.	Rev. No.	Page No.	Rev. No.

	POSITION	SIGNATURE	DATE
Prepared by	QMS COORDINATOR		
Verified by	DY. MANAGER -ROLLING		
Approved by	GM(O)		

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**1.0 PURPOSE**

The purpose of this procedure is to have control on the processes to establish and maintain optimum production and quality of aluminium foil, sheets and slug & circle – during all stages of rolling.

**1.1 OBJECTIVES**

- To reduce consumption of rolling oil in CRM
- To reduce consumption of rolling oil in Foil Mill

**2.0 SCOPE**

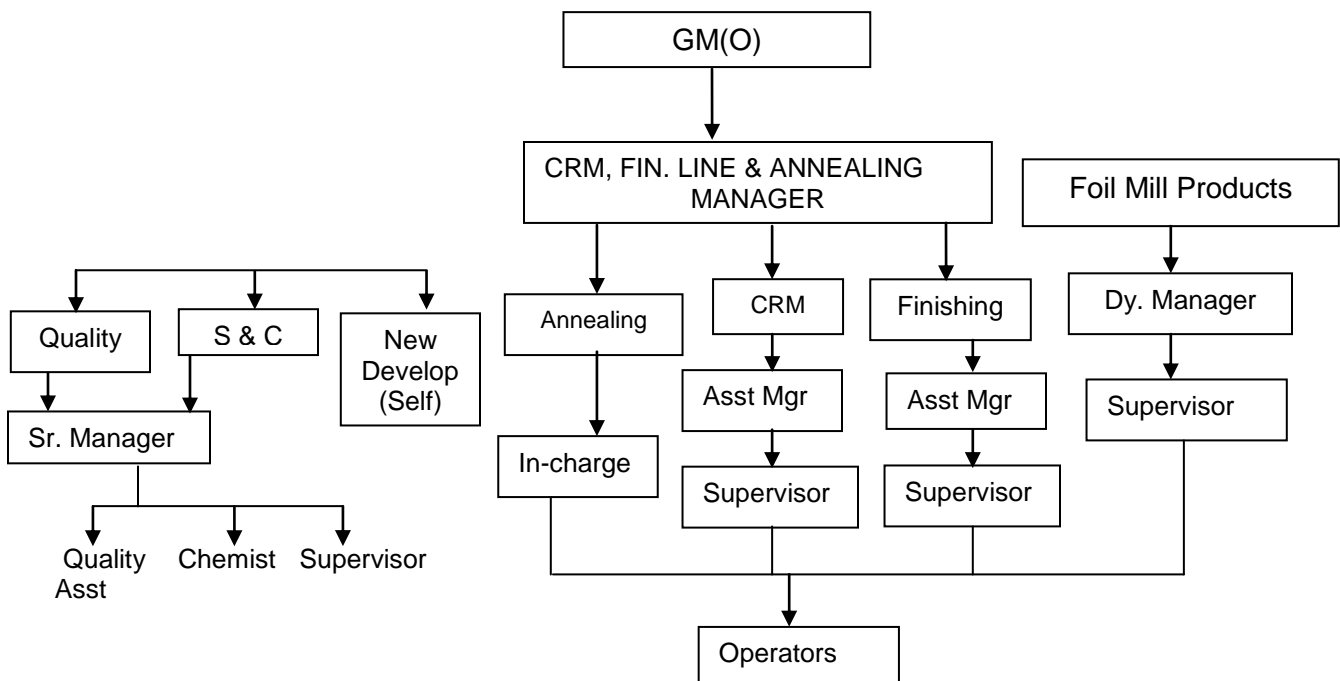
The procedure covers the manufacture to cold roll the aluminium material from the caster and foil stock to achieve intermediate and or final gauge as per lot ticket issued by PPC.  
(Cl 8.1 Operational planning and control and Cl 8.5 Production and service provision of IS/ISO 9001:9015).

**3.0 INTERFACE**

- a) Production planning and control
- b) Cast House
- c) Quality assurance
- d) Stores
- e) Shipping
- f) Marketing
- g) Maintenance
- h) Administration

**4.0 ORGANIZATION CHART:**

Organizational roles, responsibilities and authorities (cl 5.3 of IS/ISO 9001:2015)



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#### **4.1 RESPONSIBILITIES AND AUTHORITY (CI 5.3 of IS/ISO 9001:2015)**

4.1.1 The responsibilities of GM(O) are detailed in Apex Manual.

##### 4.1.2 **MANAGER (CRM) :-**

Reporting to GM(O) and be responsible for

- Cold Rolling of cast coils
- Finishing
- Annealing
- To work as ISO coordinator for CRM
- Maintaining of WIP, inventory in coordination with PPC on daily basis
- Implementation of monthly target plan as per PPC
- Preparation of monthly reports
- Conduct monthly meeting with staff and operators and give proper guidance
- Attend monthly review meeting of Works committee
- Interaction with interface departments
- Organizing input raw material i.e., castor coils from cast house

##### 4.1.3 **DEPUTY MANAGER(FOIL MILL)**

Reporting to GM (O) and responsible for:

- Foil Rolling Mills
- Rewinder
- Implementation of monthly target plan as per PPC
- Conduct monthly meeting with staff and operators and give proper guidance
- Maintaining of WIP, inventory in coordination with PPC on daily basis
- Attend monthly review meeting of Works committee
- Preparation of monthly reports
- Interaction with interface departments
- To work as ISO coordinator for Foil Rolling Mill and Rewinder
- Organizing input material from CRM

##### 4.1.4 **ASSISTANT MANAGERS**

Reporting to Manager (CRM) and responsibilities assigned to Manager (CRM).

##### 4.1.5 **ASSISTANT EXECUTIVE(SLUG AND CIRCLE)**

Reporting to OSD and Senior Manager (QA) and be responsible for

- Manufacture of Slug and Circle
- Issue of daily plan as per PPC
- Maintaining of WIP, inventory in coordination with PPC on daily basis
- Issue of Packing plan
- Coordination with all interface departments
- Preparation of monthly reports
- To work as ISO coordinator for Slug and Circles

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#### 4.1.6 SUPERVISORS

Reporting to Manager (CRM) and Deputy Manager Production and be responsible for :-

- To meet daily production as well as shift target as per plan.
- Start-up and setting up of machines to see production targets are met.
- Start-up of Annealing furnaces
- To ensure that the production records are maintained by the operators.
- To guide the operators in operation parameters.
- To enter production details in the lot ticket.
- To position all input material in the shop floor, which are required as per production plan.

#### 4.1.7 OPERATORS

Reporting to supervisors and be responsible for:-

- To enter non-productive time (NPT) of production and wastage in the NPT register.
- The raw material and production consumables are positioned in the designated area against work order issued.
- To maintain quality output interaction with quality assurance department and take corrective action, wherever required.
- To ensure that good housekeeping is maintained in and around the machine.

### 5.0 REFERENCES

The products are manufactured as per ASTM B209 and IS 737: 2008 standards.

### 6.0 DEFINITIONS

- **Intermediate gauge** – thickness of sheets, foils or slug and circle at various stages of rolling
- **Final gauge** – thickness of sheets or foil required by customer
- **Cold rolling** – rolling at temperature lower than critical temperature of aluminium
- **Mill start-up** – sequence of steps to start the machine
- **Mill warm-up** – heating the work roll for required rolling temperature
- **Mill shut down** – sequence of steps to shut down the machine
- **Work roll change** – sequence of steps to change the work roll
- **X-Ray Gauge check** – sequence of steps for X-ray gauge check

### 7.0 INPUTS

- Coil stock/ castor Coil
- Rolling oil
- Rolling blades

### 8.0 OUTPUTS

- Sheets
- Foil
- Slug and Circles

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**9.0. PROCEDURE FOR COLD ROLLING**

**9.1** One cold rolling machine ZHUOSHEN make is used.

**9.2** Cold rolling of aluminium material is carried out in the above machine based on the Coil card/ schedule issued by PPC.

**9.3** The cold rolling of aluminium material is carried out in either of these mills depending on the Coil card / schedule. The process parameter schedule is as per Annexure JAL/R&E/ROL/ANX/06. The Roll History Card to be maintained as per format No. JAL/R&E/ROL/F/07. The Foil Stock Rewinder Log Book to be maintained as per format No. JAL/R&E/ROL/F/08. The Rolling Plan will be issued by PPC as per following:

- H.G. Rewinder Planning in format No.JAL/R&E/ROL/F/01
- Slitter Planning / SCHMouth Slitter format No.JAL/R&E/ROL/F/02
- Finishing Line Planning in format No.JAL/R&E/ROL/F/03
- Coil Cord (Rolling) Planning in format No.JAL/R&E/ROL/F/04
- Coil Cord (Strip Planning) in format No.JAL/R&E/ROL/F/04A
- R&E log sheet in format No. JAL/R&E/ROL/F/05
- Daily log sheet (MSL/SCHMUT/KAMPH) in format No. JAL/R&E/PPC/F/03
- Waste reconciliation statement No. JAL/R&E/ROL/F/09
- A/F Temperature log sheet in format No: JAL/R&E/ROL/F/10

**9.4** There are two Foil Mills

- Varia 850
- Achenbach

Rolling Mills have the following activities are available in work instruction

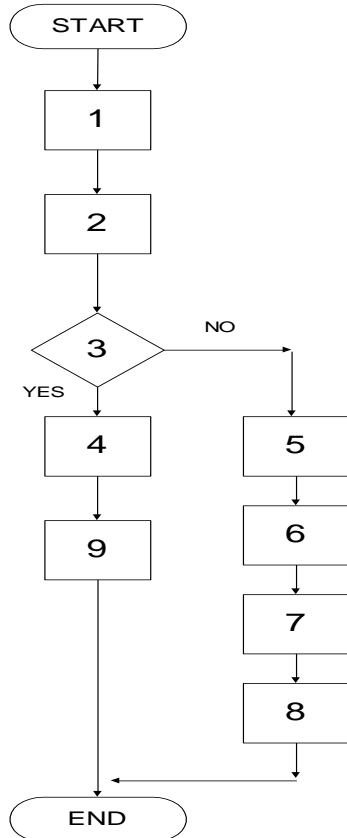
a.	Mill start-up
b.	Mill Warm-up
c.	Mill shut Down
d.	Work Roll change
e.	X-Ray Gauge check
f.	Standardization of X-ray gauge

**9.5** Rolling Mills are provided with inter-pass cooling facility of coils. This facility is utilized for forced cooling of coils as and when required for maintaining uninterrupted operations of downstream equipment (kerosene based neat coolant oil)

**9.6** The records of rolling department are maintained in the formats which are listed in the List of Formats.

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### 9.6 Flow chart of procedure



- 1) Get schedule & Coil card from planning.
- 2) Cold roll the material according to the schedule and plan.
- 3) Inspect for surface defects and thickness as per quality plan.JAL/R&E/ROL/ANX/08.
- 4) Store conforming material.
- 5) Hold Non-Conforming material & record details on Coil &/or coil card or Machine Log.
- 6) Generate NCR.
- 7) Take corrective action, if necessary
- 8) Store & dispose of "Hold" material as per NCRDT.
- 9) Generate Machine Log.

### 9.7 Annealing

Heat Treatment (Annealing) will be performed in China Furnace as per product requirement i.e., Homogenization, intermediate annealing and Temper annealing.

The type of furnaces, cycles are as addressed below:

- FRP annealing is carried out in the China furnace numbering 5 and the parameters of the furnace and cycle are as per Annealing Annexure JAL/R&E/ROL/ANX/10.
- The sheet/foil/slug and circle annealing is carried out in Turkey furnace numbering 2 and the parameters of the furnace and cycle is as per Annealing JAL/R&E/ROL/ANX/10
- The annealing of slug / circle is carried out in electrical furnace numbering 2 and the parameter of the furnace and cycle is as per Annealing JAL/R&E/ROL/ANX/10.

### 9.8 SLITTING

The foils and sheets are slit as per customer requirement in different types of slitting machines. The process involved is the jumbo reel is loaded on unwinder and through trimming blade mounted on grooved cutter shaft. The foils/sheets are rewound on 3" or 6" core as per requirement.

The slitter planning/Schmouth slitter to be as per format No.JAL/R&E/ROL/F/02.

The separator log book to be as per format No. JAL/R&E/ROL/F/06.

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9.8.1 SEPARATION AND SLITTING (1 - KAMPH & 1 - SCHMUTZ)

9.8.2 CUT TO LENGTH

The cut to length required for finished sheet received from CRM, will be carried out in CTL machines (1 - China CTL, Roofing-3 & 1 - Bhoomi CTL).

9.8.3 SLUG & CIRCLE PUNCHING

The final gauge material received from CTL and CRM will be punched in Slug & Circle punching machines (2 - 100MT, 1 - 150MT and 1 - 200MT capacity machines)  
The process of aluminium slug and various circles are detailed in the Annexure No. JAL/R&E/ROL/ANX/09

#### **10.0 INSPECTION: IN-PROCESS - QUALITY**

The inspection in-process quality is to be followed as per Annexure JAL/R&E/ROL/ANX/11

#### **11.0 RECONCILIATION STATEMENT**

To prepare as per format No. JAL/R&E/ROL/F/09.

#### **12.0 WASTE**

The waste generated during processing is discussed in the monthly production meeting conducted by GM (Operations). The details are filled up as per Format No, JAL/R&E/ROL/F/09.

#### **13.0 HANDLING OF MATERIAL**

Process Materials such as sheets, foils, foil stock, castor coils and intermediate coils are handled using overhead cranes and fork lift trucks. Slug and circle products are handled manually.

#### **14.0 CONTROL OF NON-CONFORMING OUTPUTS**

The non-conforming outputs are controlled & maintained record by QA person.

#### **15.0 NONCONFORMITY AND CORRECTIVE ACTION**

The nonconformity and corrective actions are detailed in procedure JAL/R&E/NCA/PR/05.  
The actions taken are recorded in format no. JAL/R&E/NCA/F/01.

#### **16.0. SAFETY AND ENVIRONMENTAL REQUIREMENTS**

The following safety and environmental requirements are to be followed.

01. While working, all operators shall use hand gloves to protect their hands and fingers from getting injured. Safety Instructions are detailed in documented Instructions.
02. Rolling Mill operators shall use care during cutting of sheets or foils by stopping the machine.
03. During fire or other accidents, immediate action should be taken. If the things do not come under control it should be informed to safety department for alarm.
04. Use safety shoes while moving on the shop floor.
05. Avoid loose clothing while working.
06. Avoid oil spillage on the floor.
07. To clean oil spillage immediately to avoid slipping and accidents.
08. While lifting load by the crane, ensure that the load is within the safe working capacity of the crane.



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09. To clean oil spillage immediately to avoid slipping and accidents.
10. While lifting load by the crane, ensure that the load is within the safe working capacity of the crane.
11. To clean the machine and take utmost care during operation..
12. In the event of any accident / shock, to give First Aid immediately.
13. 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.
14. Use sufficient light below the work spot to avoid accidents.
15. In addition to above, any safety orders/instructions issued by Management from time to time, are also to be followed.

#### 17.0 RISKS AND OPPORTUNITIES

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

#### 18.0 ANALYSIS AND EVALUATION:

The following data are analyzed by using the statistical techniques:

Area	Parameter	Statistical technique	Frequency
a) Foils for rolling b) Foils for slitting	Size Finish Surface Visual Damages	Process capability	One each foil every 3 months

#### 19.0 CONTINUAL IMPROVEMENT:

The quality objectives are monitored for improvement once in 12 months 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/R&E/QMSC/F/01.

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

#### 20.0 COLOUR CODES

The following colour codes are to be followed:-

- GREEN - representing good quality
- YELLOW – representing starting to be completed
- RED - representing waste

#### 21.0 EXTERNALLY PROVIDED SERVICES:

Depending on the need the department may use external manpower for various jobs in the department. The external person will be given on-the-job training in-house. The records of such training will be maintained in format no. JAL/R&E/TRG/F/04.

#### 22.0 ORGANIZATIONAL KNOWLEDGE, COMPETENCE, AWARENESS AND COMMUNICATION

Training is defined as separate procedure. List of training records is shown in the Annexure No JAL/R&E/ROL/ANX/01 & responsible by HOD

The competency requirements are identified for all positions in the department as per Annexure No.JAL/R&E/ROL/ANX/09.

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### LIST OF ROLLING RECORDS

SL NO.	DESCRIPTION	FORMAT NO	RETENTION PERIOD (MIN)
1	HG REWINDER PLANNING	JAL/R&E/ROL/F/01	ONE YEAR
2	SLITTER PLANNING / SCHMOUTH SLITTER	JAL/R&E/ ROL /F/02	ONE YEAR
3	FINISHING LINE PLANNING	JAL/R&E/ROL/F/03	ONE YEAR
4	COIL CORD (ROLLING) PLANNING	JAL/R&E/ROL/F/04	ONE YEAR
5	COIL CORD (STRIP PLANNING)	JAL/R&E/ROL/F/04A	ONE YEAR
6	ROLLING LOG SHEET	JAL/R&E/ROL/F/05	ONE YEAR
7	SEPARATOR LOG BOOK	JAL/R&E/ROL/F/06	ONE YEAR
8	ROLL HISTORY CARD	JAL/R&E/ROL/F/07	ONE YEAR
9	FOIL STOCK REWINDER LOG BOOK	JAL/R&E/ROL/F/08	ONE YEAR
10	WASTE RECONCILIATION STATEMENT	JAL/R&E/ROL/F/09	ONE YEAR
11	A/F TEMPERATURE LOG SHEET	JAL/R&E/ROL/F/10	ONE YEAR
12	ZCRM MILL LOG SHEET	JAL/R&E/PPC/F/01	ONE YEAR
13	CUT TO LENGTH BHOOMI LOG SHEET	JAL/R&E/PPC/F/02	ONE YEAR
14	DAILY LOG SHEET (KAMPH/MSL/SCHMUT)	JAL/R&E/PPC/F/03	ONE YEAR
15	SLITTING MILL LOG SHEET	JAL/R&E/PPC/F/04	ONE YEAR
16	COIL CORD ISSUE SHEET	JAL/R&E/PPC/F/05	ONE YEAR
17	NONCONFORMITY AND CORRECTIVE ACTION	.JAL/R&E/NCA/F/01	3 YEARS
18	QUALITY OBJECTIVES MONITORING RECORD	JAL/R&E/QMSC/F/01	3 YEARS

### TRAINING RECORDS

Type of Records	Format Reference	Responsible Person	Retention Period
a. Employee details	JAL/R&E/TRG/F/01	} HOD	Until end of service
b. Training Needs identified	JAL/R&E/TRG/F/02		One Year
c. Training Record & effectiveness	JAL/R&E/TRG/F/03		One Year
d. Review of training effectiveness	JAL/R&E/TRG/F/04		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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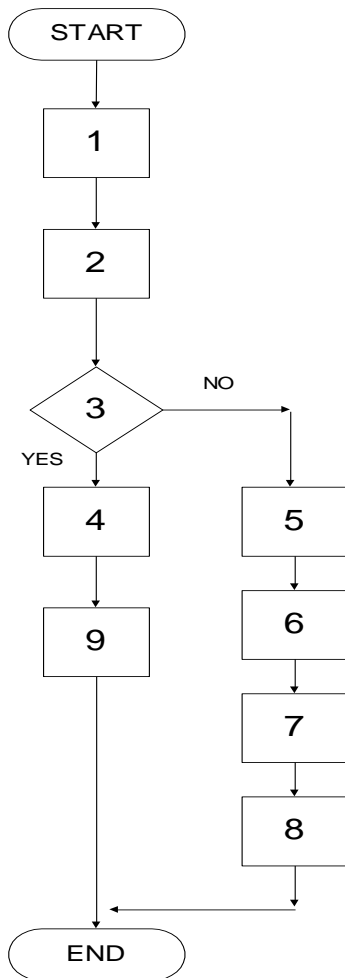
### Separation & slitting

1. **PURPOSE:** To separate and slit final gauge material received from rolling mill after finishing as per Lot Ticket

2. **INSTRUCTION:**

1. There are four machines for Separation and Slitting  
(2- KAMPH, 1- MSL & 1 SCHMUTZ)
2. All finish coil to separate and slit according to the Lot ticket.
3. After slitting and separating all the silted and separated materials are sent to their destination either packing , annealing or conversion as per Schedule

3. **PROCEDURE:**



- 1) Get schedule & Lot ticket from planning.
- 2) Slit or Separate material as per planning given.  
By PPC.
- 3) Inspect for surface defects and thickness as per quality plan.
- 4) Store conforming material.
- 5) Hold Non-Conforming material & record details on Coil &/or Lot Ticket or Machine Log.
- 6) Generate NCR.
- 7) Take corrective action, if necessary
- 8) Store & dispose of "Hold" material as per NCRDT.
- 9) Generate Machine Log.

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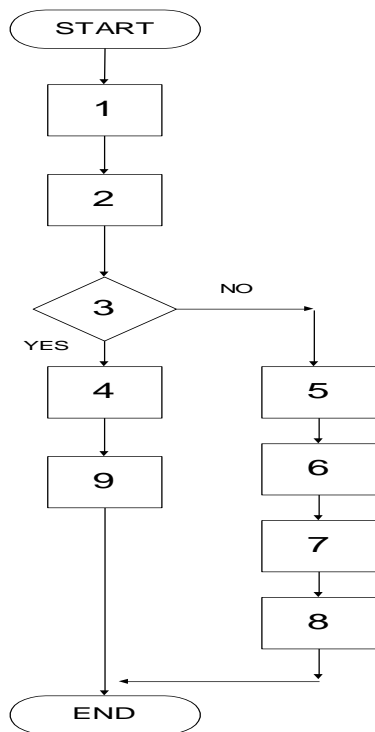
### Cut to Length in CTL

1. **PURPOSE:** To cut to length required finished sheet received form cold rolling mill.

### 2. INSTRUCTION

1. There are Two CTL machines (1- china CTL, 3-Roofing &1-Bhoomi -CTL).
2. All finish coil to cut in to required length manufactured as per Lot ticket.
3. After cutting materials are sent to their destination i.e. either for packing annealing or conversion.

### 3. PROCEDURE:



- 1) Get schedule & Lot ticket from planning.
- 2) Cut material as per planning given. By PPC.
- 3) Inspect for surface defects and thickness as per quality plan.
- 4) Store conforming material.
- 5) Hold Non-Conforming material & record details on Coil &/or Lot Ticket or Machine Log.
- 6) Generate NCR.
- 7) Take corrective action, if necessary
- 8) Store & dispose of "Hold" material as per NCRDT.
- 9) Generate Machine Log.

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### Slug & circle punching

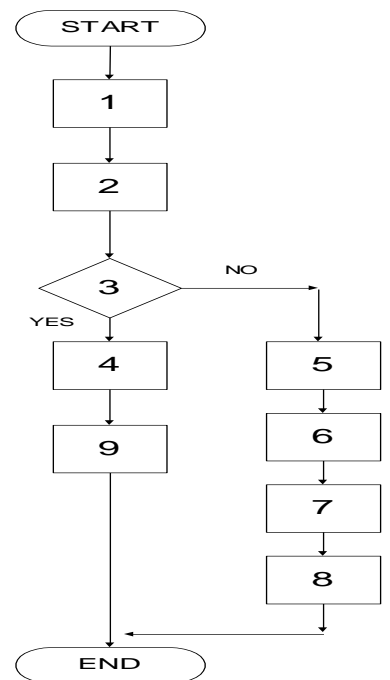
**1. PURPOSE:** To Punch all final gauge material received from **CTL and Cold Rolling Mill** as per Lot Ticket.

### **2. INSTRUCTIONS:**

1. There are four Slug And Circle punching machines (1-80 M T capacity, 1-150 MT capacity and 1- 180 MT capacity )
2. All finish sheet or coil received from Stamco and CTL are punched according to require size as per to the Lot ticket.
3. After punching materials are sent to annealing, and then shifted to packing.

### **3. PROCEDURE:**

- 1) Get schedule & Lot ticket from planning.
- 2) Cutting material as per planning given. By PPC.
- 3) Inspect for surface defects and thickness as per quality plan.
- 4) Store conforming material.
- 5) Hold Non-Conforming material & record details on Coil &/ or Lot Ticket or Machine Log
- 6) Generate NCR
- 7) Take corrective action, if necessary
- 8) Store & dispose of "Hold" material as per NCRD.
- 9) Generate Machine Log.



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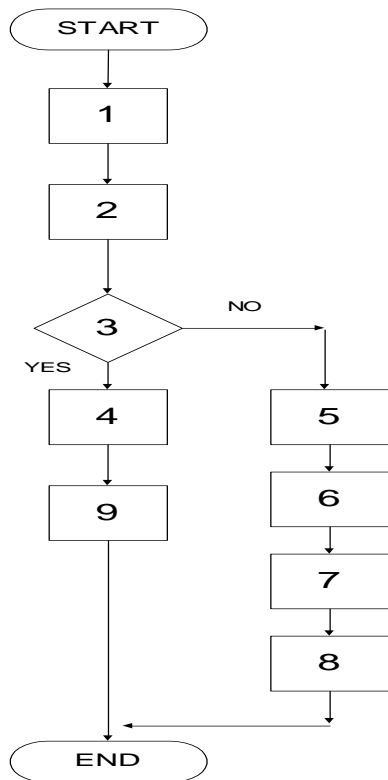
**SLIT/REWIND IN TO COIL**

**1. PURPOSE:** To Slit or Rewind in to coil all final gauge material received from Cold Rolling Mill as per Lot Ticket.

**2. INSTRUCTION:**

1. Stamco machine the coil is loaded as per Lot Ticket
2. All finish coil rewind or slit as required length according to the Lot ticket.
3. After slitting, rewinded materials are sent to foil rolling mill or packing as per Lot Ticket.

**3.0 PROCEDURE:**



- 1) Get schedule & Lot ticket from planning.
- 2) Rewind and slit material as per planning given. By PPC.
- 3) Inspect for surface defects and thickness as per quality plan.
- 4) Store conforming material.
- 5) Hold Non-Conforming material & record details on Coil &/or Lot Ticket or Machine Log.
- 6) Generate NCR.
- 7) Take corrective action, if necessary
- 8) Store & dispose of "Hold" material as per NCRDT.
- 9) Generate Machine Log.

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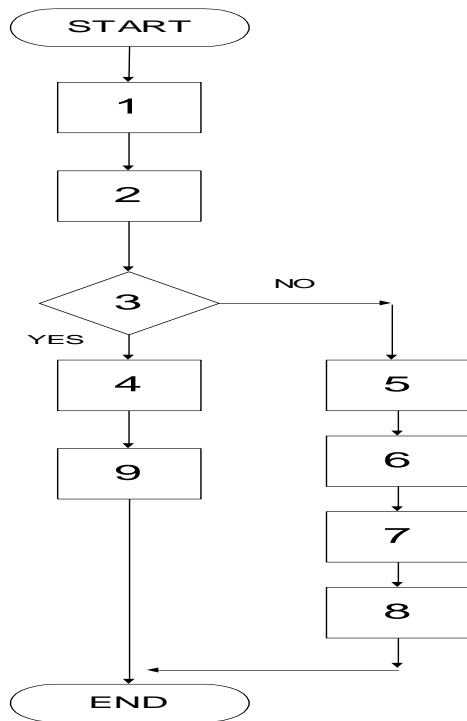
### SLIT/REWIND IN TO COIL

**3. PURPOSE:** To Slit or Rewind in to coil all final gauge material received from Cold Rolling Mill as per Lot Ticket.

**4. INSTRUCTION:**

4. Stamco machine the coil is loaded as per Lot Ticket
5. All finish coil rewind or slit as required length according to the Lot ticket.
6. After slitting, rewinded materials are sent to foil rolling mill or packing as per Lot Ticket.

**5. PROCEDURE:**



- Get schedule & Lot ticket from planning.
- Rewind and slit material as per planning given by PPC
- Inspect for surface defects and thickness as per quality plan.
- Store conforming material.
- Hold Non-Conforming material & record details on Coil &/or Lot Ticket or Machine Log.
- Generate NCR.
- Take corrective action, if necessary
- Store & dispose of “Hold” material as per NCRDT
- Generate Machine Log

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### PROCESS PARAMETER SCHEDULE

#### 1. Speeds ( Mill run speeds) Foil Mill

Speeds	Load	For alloys AA1xxx AA8xxx	For alloys AA1xxx AA8xxx	For alloys AA1xxx AA8xxx	For alloys AA1xxx AA8xxx	For alloys AA1xxx AA8xxx
( In MPM)	(in psi)	Exit gauge range	Exit gauge range	Exit gauge range	Exit gauge range	Exit gauge range
		➤ = 0.009 mm	➤ = 0.012 mm	➤ = 0.03 mm	➤ = 0.04 mm	➤ = 0.05 mm
125	600-800	0.3-0.16	0.3-0.16	0.3-0.16	0.3-0.16	0.3-0.16
150	1000-1200	0.16-0.08	0.16-0.08	0.16-0.09	0.16-0.08	0.16-0.09
200	1800-2000	0.08-0.040	0.08-0.040	0.089-0.050	0.0-0.04	0.09-0.05
300	2800-3000	0.04-0.020	0.04-0.025	0.05-0.030	0.04-0.020	0.050-0.025
300	2800-3000	0.020-0.009	0.025-0.012	0.030-0.015		

These speeds can be over-ruled if running at these speed causes

- a. Rolling load to drop below 400PSI
- b. Mill Current Overload
- c. Breakage
- d. Bad shape
- e. Gauge fluctuation
- f. Other issues like Tearing, Heat mark, Reduction marks
- g. Build-Up weave more than 10 mm
- h. Oil carryover in excess
- i. Any other restriction in running the mill

#### 2. Mill Thread Speed – corresponding 5 mpm

#### 3. Anticipated Load – This data is Rolling Load divided by strip width)

To be seen from rolling model or from the actual from already been run at the mill.



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4. **Rolling Mode:** Manual mode
5. **Bow target:** Visible flatness with edge slightly loose
6. **Load thread Enabled:** Generally kept at 0 (Zero)
7. **Threading load:** Generally kept at 100 psi
8. **Coiler / Uncoiler Motor Selection (Single / Double)**  
 Single Motor – For all alloys with exit gauge less than 0.070 mm  
 Double motor – For all alloys with exit gauge more than or equal to 0.070 mm
9. **Coiler High / Low Gear Selection:**  
 Double motor – All passes with Speeds less than or equal to 300 rpm  
 Single motor – All passes with Speeds more than 300 rpm
10. **Upper / Lower Gauge tolerance**  
 Generally kept at 1%
11. **Tensions**

**FOR ALL ALLOYS STARTING WITH AA1xxx and AA8xxx**

Pass	Entry Gauge range (mm)	Entry Tension (kg/mm <sup>2</sup> )	Exit Tension (kg/mm <sup>2</sup> )
1 <sup>st</sup> pass after Cold Rolling / Annealing			
	0.30-0.16	1.5-2.0	1.8 - 2.2
2 <sup>nd</sup> pass after Cold Rolling / Annealing			
	0.16-0.09	2.0	2.5
3 <sup>rd</sup> pass after Cold Rolling / Annealing			
	0.09-0.05/0.045	2.1	2.8
4 <sup>th</sup> pass after Cold Rolling / Annealing			
	<=0.05-0.03/0.025	2.0	2.7
5 <sup>th</sup> pass	All gauges	2.0	2.7
6 <sup>th</sup> pass	All gauges	2.2	3.0

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**FOR ALL ALLOYS NOT STARTING WITH AA1xxx and AA**

<b>Pass</b>	<b>Entry Gauge range (mm)</b>	<b>Entry Tension (kg/mm<sup>2</sup>) Range</b>	<b>Exit Tension (kg/mm<sup>2</sup>) Range</b>
<b>1<sup>st</sup> pass after Cold Rolling / Annealing</b>	<b>0.30-0.16</b>	<b>1.5 - 2.0</b>	<b>1.0 - 2.2</b>
<b>2<sup>nd</sup> pass after Cold Rolling / Annealing</b>	<b>0.16-0.09</b>	<b>2.0</b>	<b>2.5</b>
<b>3<sup>rd</sup> pass after Cold Rolling / Annealing</b>	<b>0.09-0.05/0.045</b>	<b>2.1</b>	<b>2.8</b>
<b>4<sup>th</sup> t pass after Cold Rolling / Annealing</b>	<b>&lt;=0.05-0.03/0.025</b>	<b>2.0</b>	<b>2.7</b>
<b>5<sup>th</sup> pass</b>	<b>&lt;=0.05-0.03/0.025</b>	<b>2.0</b>	<b>2.7</b>
<b>6<sup>th</sup> pass</b>	<b>All gauges</b>	<b>2.0</b>	<b>2.7</b>

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**Product: Aluminium slug AA-1050/O' :**

**1) Charging composition for melting :**

- a) Ingots - 100%

**2) Alloy 1050 with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.20 (max)	0.35 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.02- 0.03	99.50 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5/10.0 mm (+/-0.025mm)  
b) Thickness profile  
i) Variation: 30mic max from one end to another end across  
ii) Crown : Permitted in strip +0.50% to +0.90%  
iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

- i) From input thickness 6.5/10 mm  
Roll down as per standard pass schedule to final gauge

**5) Annealing temperature :**

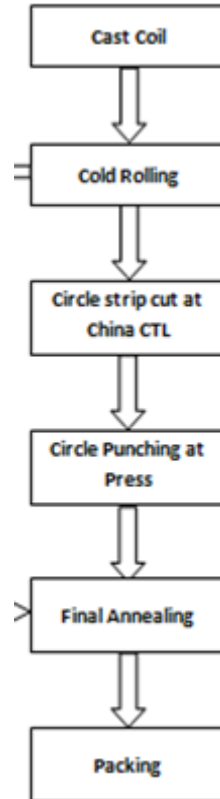
Annealing temperature (degree cent.)	Time	Soaking
520° C	20 hrs	12 hrs

**6) Quality checks**

- a) BHN before tumbling 19 to 20.4  
b) BHN after tumbling 21.2 to 23.2  
c) Dia. Tolerance (+0.50/-0 mm)  
d) Thickness tolerance (+0.050/-0)  
e) No burr is present during punching and having good flatness

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7) Scheme of operation Aluminium slug AA-1050/'O' :



**Product: Aluminium Circle Non stick (tawa/fry pan) AA-8011/ 'O':**

**1) Charging composition for melting :**

- a) Ingot – 70%
- b) SAME ALLOY CIRCLE SCRAP - 30%

**2) Alloy 8011 GEQ with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.50 (max)	1.0 (max)	0.1 (max)	0.1 (max)	0.1 (max)	0.1 (max)	0.1 (max)	0.02- 0.03	97.50 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

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**4) CRM pass schedule: To run on Zhuoshen CRM :**

Roll down as per standard pass schedule to final gauge.

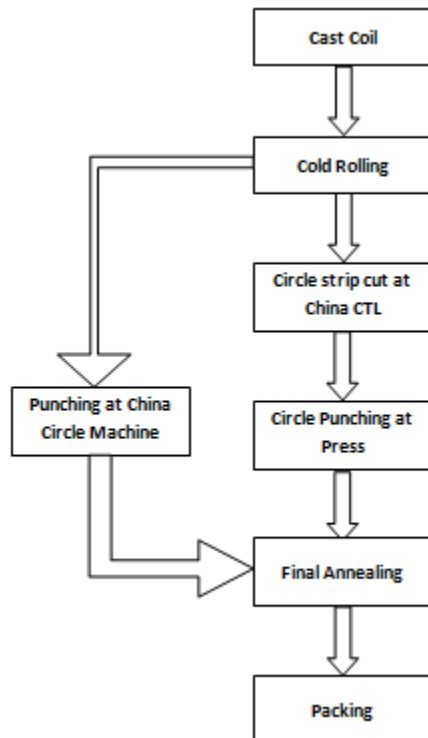
**5) Annealing temperature :**

<b>Annealing temperature (degree cent.)</b>	<b>Time</b>	<b>Soaking</b>
480° C (after punching)	18 hrs	6 hrs

**6) Quality check**

- a) BHN after annealing 26.4 to 31.1
- b) UTS after annealing 8.5 – 11.2 Kg/mm sq., Elongation – 20 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No scratch, burr is present during punching and having good flatness

**7) Scheme of operation Aluminium Circle Non stick (tawa/fry pan) AA-8011/ 'O' :**



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**Product: Aluminium Circle (Roller coating) AA-8011'O':**

**THICKNESS: 1.9 mm and 2.10 mm**

**1) Charging composition for melting :**

- a) INGOTS – 70%
- b) SAME ALLOY CIRCLE SCRAP- 30%

**2) Alloy 8011 circle with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.60- 0.80	0.70- 0.90	0.02 -0.05	0.03 (max)	0.03 (max)	0.02 (max)	0.01 (max)	0.02- 0.025	98.0 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

Roll down as per standard pass schedule to final gauge

**5) Annealing temperature :**

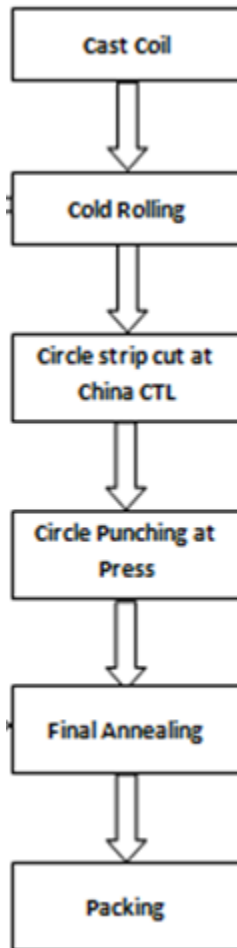
Annealing temperature (degree cent.)	Time	Soaking
380° C (After punching)	12 hrs	-----

**6) Quality checks**

- a) BHN after annealing 26.4 to 31.1
- b) UTS after annealing 8.5 – 11.2 Kg/mm sq., Elongation – 22 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness

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7) Scheme of operation Aluminium Circle (Roller coating) AA-8011/'O' :



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**Product: Aluminium Circle (Roller coating) AA-1100'0' :**

**THICKNESS: FROM 2.4 TO 3.90 mm**

**1) Charging composition for melting :**

- a) INGOTS – 70%
- b) SAME ALLOY CIRCLE SCRAP- 30%

**2) Alloy 1100 with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	Fe + Si = 0.95 (MAX)		0.05 - 0.20	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.02- 0.03	99.0 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

Roll down as per standard pass schedule to final gauge

**5) Annealing temperature :**

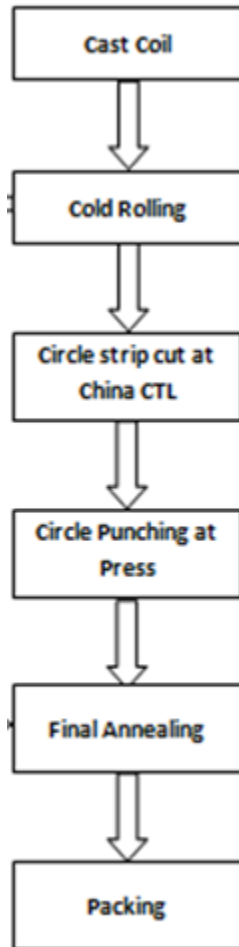
Annealing temperature (degree cent.)	Time	Soaking
350° C (After punching)	11 hrs	4 hours

**6) Quality checks**

- a) BHN after annealing 19.1 to 21.7
- b) UTS after annealing 7.8 – 9.3 Kg/mm sq., Elongation – 30 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness



7) **Scheme of operation Aluminium Circle (Roller coating) AA-1100/'O' :**



**Product: Aluminium Circle for Pressure cooker body and Lid (FORWARD STROKE) AA-8011/H14:**

1) **Charging composition for melting :**

- c) INGOTS – 70%
- d) SAME ALLOY CIRCLE SCRAP- 30%

2) **Alloy 8011 circle with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.60-0.80	0.70-0.90	0.02 - 0.05	0.03 (max)	0.03 (max)	0.02 (max)	0.01 (max)	0.02-0.025	98.0 (min)

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**3) Caster strip specification as per following :**

- c) Gauge 6.5 mm (+/-0.025mm)
- d) Thickness profile
  - iv) Variation: 30mic max from one end to another end across
  - v) Crown : Permitted in strip +0.50% to +0.90%
  - vi) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

**i) For circle (body) :**

Roll down as per standard pass schedule to TA gauge and take reduction percentage from 8 to 10% after TA for final gauge

**ii) For circle (lid):**

Roll down as per standard pass schedule to TA gauge and take reduction percentage from 10 to 15% after TA for final gauge

**5) Annealing temperature :**

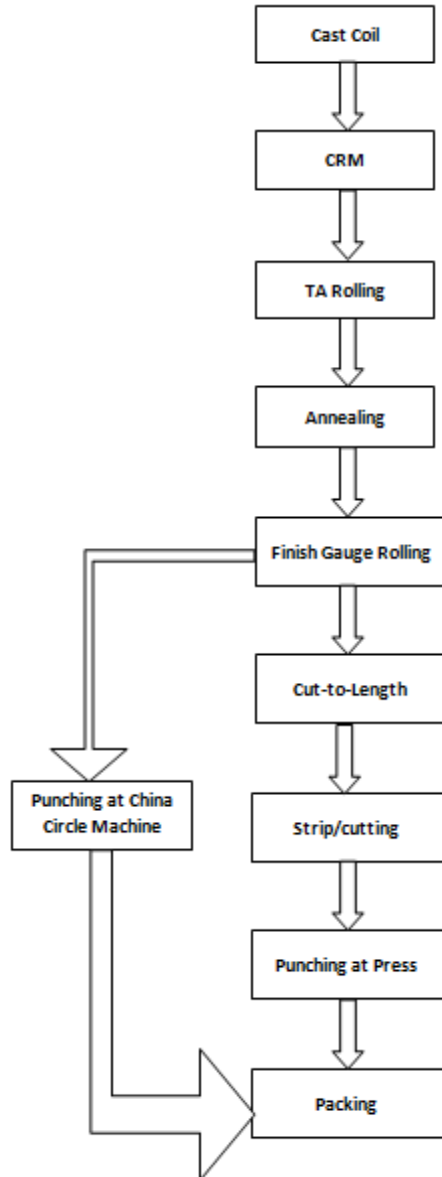
<b>Annealing temperature (degree cent.)</b>	<b>Time</b>	<b>Soaking</b>
520° C (TA annealing)	16 hrs	-----

**6) Quality checks**

- f) BHN after annealing 31.1 to 34.5
- g) UTS after annealing 10.7 – 11.9 Kg/mm sq., Elongation – 22 % (min)
- h) Dia. Tolerance (+0.500/-0 mm)
- i) Thickness tolerance (+0.050/-0)
- j) No Scratch, burr is present during punching and having good flatness and **fine grain**

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**7. Scheme of operation for Pressure cooker body and Lid (FORWARD STROKE) AA-8011/H14:**



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**Product: Aluminium Circle (body) AA-3003/H14 for thickness 1.5 and above:**

**1) Charging composition for melting :**

- a) INGOTS – 70%
- b) CIRCLE SCRAP(AA-3003 ONLY ) - 30%

**2) Alloy AA-3003 with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.60 (max)	0.50- 0.70	0.05 - 0.15	1.0- 1.30	0.03 (max)	0.05 (max)	0.10 (max)	0.02- 0.03	Reminder

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.050mmmm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

**i) For circle (body) :**

Roll down as per standard pass schedule to Final gauge.

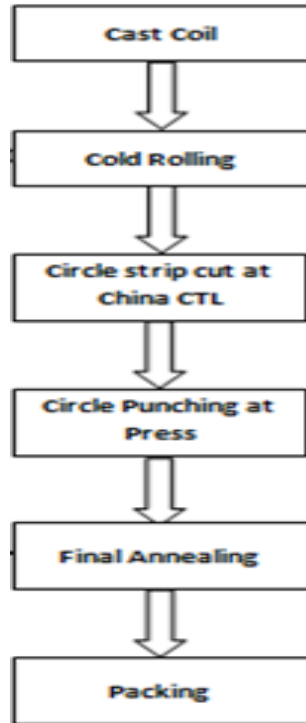
**5) Annealing temperature :**

<b>Annealing temperature (degree cent.) after punching</b>	<b>480°/14 hrs then 425°/18 hrs</b>
--	-------------------------------------

**6) Quality checks**

- a) BHN after annealing 35 to 48
- b) UTS after annealing 13 – 17 Kg/mm sq., Elongation – 15% (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness and fine grain.

**7) Scheme of operation for Aluminium Circle (body )AA-3003/H14 :**



**Product: Aluminium Circle (EXPORT) AA-1050/'O':**

**1) Charging composition for melting :**

- a) INGOTS + SAME ALLOY CIRCLE SCRAP – 100%

**2) Alloy 1050 with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.20 (max)	0.35 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.02- 0.03	99.50 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

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4) **CRM pass schedule: To run on Zhuoshen CRM :**

- a) **FOR THICKNESS 1.4 mm and above:** When final thickness is more than 1.4 mm then Roll down as per standard pass schedule to final gauge.
- b) **FOR THICKNESS below 1.4 mm:** Roll down as per standard pass schedule to HOMO gauge and then after homo annealing roll down to final gauge.

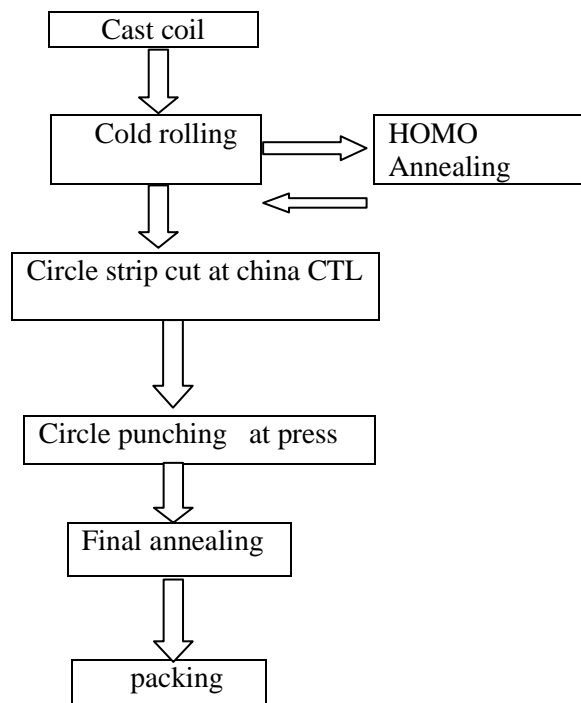
5) **Annealing temperature :**

<b>Annealing temperature (degree cent.)</b>	<b>Time</b>	<b>Soaking</b>
550° C (HOMOANNEALING)	24 hrs	-----
350° C (FINAL ANNEALING)	10 hrs	4 hrs

6) **Quality checks**

- a) BHN after annealing 18 to 23
- b) UTS after annealing 6.5 – 9.5 Kg/mm sq., Elongation – 30 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness and **Fine grain.**

7) **Scheme of operation Aluminium Circle (EXPORT) AA-1050/'O':**



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**Product: Aluminium Circle (EXPORT) AA-1100/'O':**

**1) Charging composition for melting :**

- a) INGOTS + SAME ALLOY CIRCLE SCRAP –100%

**2) Alloy 1100 with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	Fe + Si = 0.95 (MAX)		0.05 - 0.20	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.02- 0.03	99.0 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mm)  
b) Thickness profile  
i) Variation: 30mic max from one end to another end across  
ii) Crown : Permitted in strip +0.50% to +0.90%  
iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

- a) **FOR THICKNESS 1.4 mm AND ABOVE:** When final thickness is more than 1.4 mm then Roll down as per standard pass schedule to final gauge.  
b) **FOR THICKNESS BELOW 1.4 mm:** Roll down as per standard pass schedule to HOMO gauge and then after homo annealing roll down to final gauge.

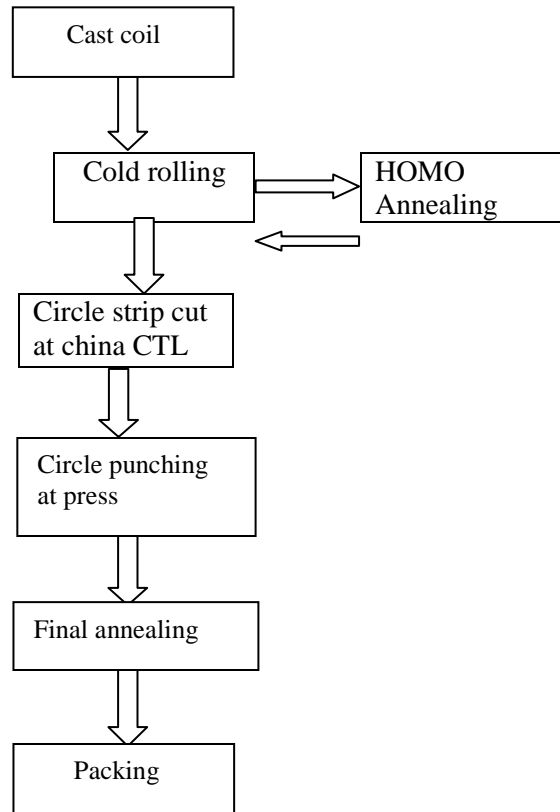
**5) Annealing temperature :**

Annealing temperature (degree cent.)	Time	Soaking
550° C (HOMOANNEALING)	24 hrs	-----
350° C (FINAL ANNEALING)	10 hrs	4 hrs

**6) Quality checks**

- a) BHN after annealing 20 to 24  
b) UTS after annealing 7.5 – 11.5 Kg/mm sq., Elongation – 30 % (min)  
c) Dia. Tolerance (+0.500/-0 mm)  
d) Thickness tolerance (+0.050/-0)  
e) No Scratch, burr is present during punching and having good flatness and **Fine grain.**

8) **Scheme of operation Aluminium Circle (EXPORT) AA-1100/O':**



**Product: Aluminium Circle (DEEP DRAWING) AA-1100 D/O':**

1) **Charging composition for melting :**

a) INGOTS + SAME ALLOY CIRCLE SCRAP –100%

2) **Alloy 1100 with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
Percentage	0.20-0.30	0.60-0.80	0.05-0.20	0.01 (max)	0.01 (max)	0.01 (max)	0.01 (max)	0.02-0.03	99.0 (min)



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**NOTE: Fe: Si ratio must be maintained 3:1**

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mmmm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

- a) **FOR THICKNESS 1.4 mm AND ABOVE:** When final thickness is more than 1.4 mm then Roll down as per standard pass schedule to final gauge.
- b) **FOR THICKNESS BELOW 1.4 mm:** Roll down as per standard pass schedule to HOMO gauge and then after homo annealing roll down to final gauge.

**5) Annealing temperature :**

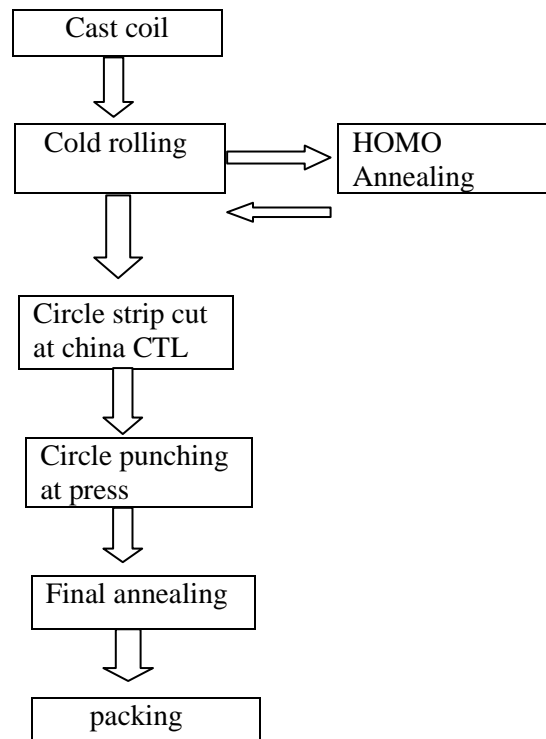
<b>Annealing temperature (degree cent.)</b>	<b>Time</b>	<b>Soaking</b>
550° C (HOMOANNEALING)	24 hrs	-----
350° C (FINAL ANNEALING)	10 hrs	4 hrs

**6) Quality checks**

- a) BHN after annealing 20 to 24
- b) UTS after annealing 7.5 – 11.5 Kg/mm sq., Elongation – 25 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness and **Fine grain.**

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7) Scheme of operation Aluminium Circle (DEEP DRAWING) AA-1100 D'O':



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**Product: Aluminium circle (REVERSE DRAWN PRESSURE COOKER BODY) AA-8011/H14:**

**1) Charging composition for melting :**

- a) INGOTS – 70%
- b) SAME ALLOY CIRCLE SCRAP- 30%

**2) Alloy 8011 circle with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.60-0.80	0.70-0.90	0.02 - 0.05	0.03 (max)	0.03 (max)	0.02 (max)	0.01 (max)	0.02-0.025	98.0 (min)

**3) Caster strip specification as per following :**

- a) Gauge 10.0 mm (+/-0.025mm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

Roll down as per standard pass schedule to TA gauge and take reduction percentage from 8 to 10% after TA for final gauge

**5) Annealing temperature :**

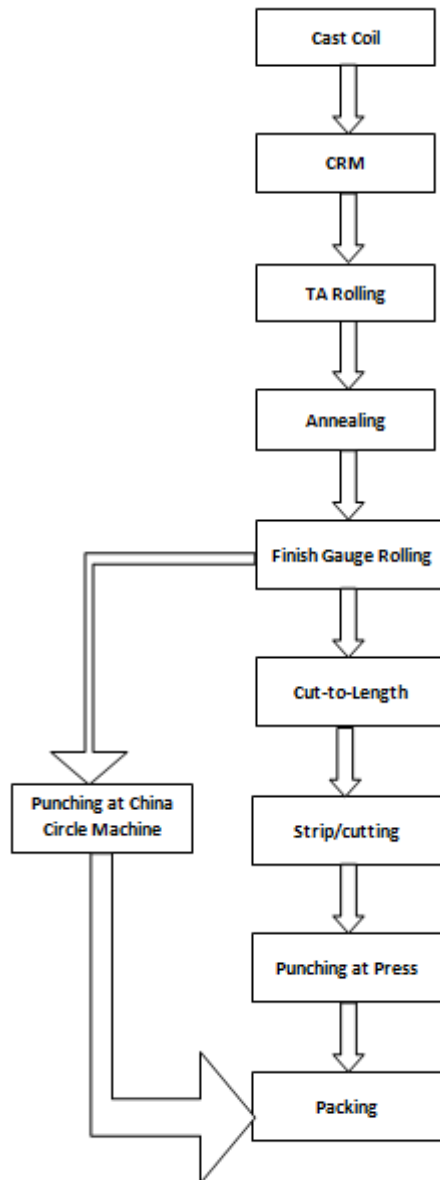
Annealing temperature (degree cent.)	Time	Soaking
520° C (TA annealing)	16 hrs	-----

**6) Quality checks**

- a) BHN after annealing 30 to 35
- b) UTS after annealing 10.7 – 11.8 Kg/mm sq., Elongation – 22 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness and **fine grain**

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**Product: Aluminium circle (REVERSE DRAWN PRESSURE COOKER BODY) AA-8011/H14:**



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**Product: Aluminium Circle (HANDI & KADAI) AA-8011/'O':**

**1) Charging composition for melting :**

- a) INGOTS – 70%
- b) SAME ALLOY CIRCLE SCRAP- 30%

**2) Alloy 8011 circle with following composition :**

Components	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
percentage	0.60- 0.80	0.70- 0.90	0.02 -0.05	0.03 (max)	0.03 (max)	0.02 (max)	0.01 (max)	0.02- 0.025	98.0 (min)

**3) Caster strip specification as per following :**

- a) Gauge 6.5 mm (+/-0.025mm)
- b) Thickness profile
  - i) Variation: 30mic max from one end to another end across
  - ii) Crown : Permitted in strip +0.50% to +0.90%
  - iii) Grain structure should be fine and there should not be any band marks and any inclusion

**4) CRM pass schedule: To run on Zhuoshen CRM :**

Roll down as per standard pass schedule to final gauge

**5) Annealing temperature :**

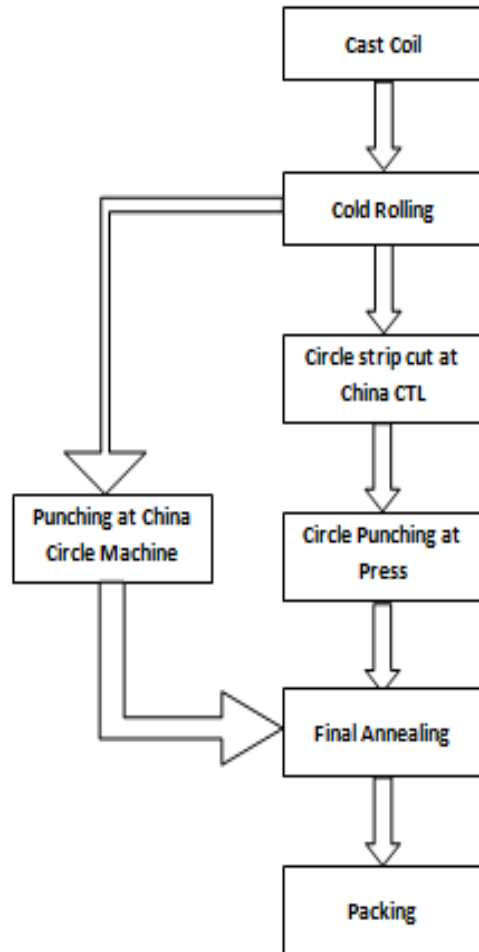
Annealing temperature (degree cent.)	Time	Soaking
380° C (After punching)	12 hrs	-----

**6) Quality checks**

- a) BHN after annealing 26.4 to 31.1
- b) UTS after annealing 8.5 – 11.1 Kg/mm sq., Elongation – 22 % (min)
- c) Dia. Tolerance (+0.500/-0 mm)
- d) Thickness tolerance (+0.050/-0)
- e) No Scratch, burr is present during punching and having good flatness and **fine grain**

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7) Scheme of operation Aluminium Circle (HANDI & KADAI) AA-8011/'O' :

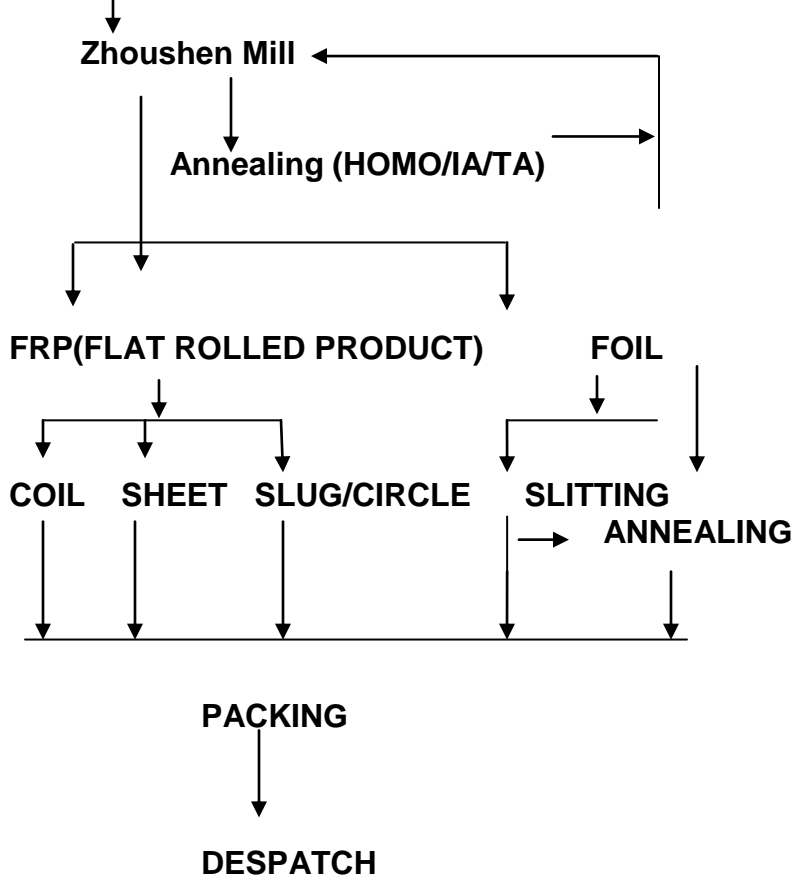


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**QUALITY PLAN**

**ROLLING : -**

**7.5 mm Cast sheet – Input**



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**The following inspections are carried out: -**

<b>PP cap</b>	<b>Foil</b>
1. Thickness	1. Pin Holes
2. Tensile strength	2. Surface finish - visual
3. % Elongation	3. Oil carryover - visual
4. Cupping and % Earing	4. Thickness
5. Shape	

**After slitting: -**

<b>PP cap</b>	<b>Foil</b>
6. Thickness	1. Pin Holes
7. Tensile strength	2. Surface finish - visual
8. % Elongation	3. Dyne level
9. Cupping and % Earing	4. Thickness
10. Build-up straightness - visual	5. Slitting quality
11. Width - measurement	6. Width
12. Slitting quality - visual	7. Build-up straightness Bare foil - visual
13. Joints - visual	
After QA clearance Send material to Packing after intimation	After QA clearance Send material to Conversion or Packing
	Foils which are going for Lamination will be annealed first 1. Thickness 2. Dyne level 3. Width 4. Bursting strength



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### COMPETENCY CHART

Name of department: ROLLING			
IS/ISO 9001:2015 clause number 7.2			
Sl.No.	Position	Required qualification*	Experience required
1	Gen Manager	BE/BTech in Mechanical	15 Years
2	Dy. Gen Manager	BE/BTech in Mechanical	12 Years
3	Asst Gen Manager	BE/BTech in Mechanical	10 Years
4	Manager	BE/BTech in Mechanical	06 Years
5	Asst. Manager	DME	03 Years
6	Sr. Supervisor	DME	02 Years
7	Supervisor	DME	02 Years
8	Management Trainee	DME	00 year
9	Skilled Operator	DME/ITI	02 Years
10	Semi Skilled Operator	DME/ITI	02 Years
11	Asst. Operators	DME/ITI	02 Years
12	Helpers	Literates	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: HR	

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<b>Annealing Cycles for China furnace-1,2,3&amp;4</b>					
<b>No. of furnace</b>	<b>Heating Type</b>	<b>Height(mm)</b>	<b>Length(mm)</b>	<b>width(mm)</b>	<b>Max. capacity</b>
4	Gas Burner	3010	9040	2030	20 MT
<b>Sr. No</b>	<b>Product</b>	<b>WIDTH</b>	<b>Homogenizing Cycle</b>	<b>Inter Annealing</b>	<b>Temper Annealing</b>
1	<b>PP CAP</b>	1000-1680 MM	550 °C/ 24 Hrs	520 °C/ 12 hr +2 hrs =15hrs	520 °C/ 14 hrs+3 hrs=17Hrs
2	<b>Foil Stock</b>	1650 MM	550 °C/ 24 Hrs	not applicable	500 °C /12+1 =13 hrs
3	<b>GEQ</b>	1300 MM 1000 MM 1600 MM	not applicable	not applicable	480 °C / 13 =13 hrs 460/480 °C / 11+1 = 12 hrs 480 °C / 13 =13 hrs
4	<b>Roofing Sheet</b>	( 1300 to 1600 mm)	not applicable	not applicable	425 °C/ 16 hrs
5	<b>CTL- SHEET</b>	1220-2440 mm	not applicable	not applicable	470 °C/ 12+410 °C/ 06 hrs

**Prepared By**

**Checked By**

**Approved By**

(QA SUPERVISOR)

SR MANAGER QA

GENERAL MANAGER(O)

<b>JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)</b>			
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<b>Annealing Cycles for SLUG/CIRCLE Furnace NO.- 1 &amp; 2</b>						
<b>Sr. No</b>	<b>No. of furnace</b>	<b>Heating Type</b>	<b>Height(mm)</b>	<b>Length(mm)</b>	<b>width(mm)</b>	<b>Max. capacity</b>
1	1	Electrical Heater	1800	3000	1620	8 MT
2	2	Electrical Heater	1275	8040	2020	20 MT

<b>SI No</b>	<b>Product</b>	<b>Alloy</b>	<b>Temper</b>	<b>Root</b>	<b>Annealing temp</b>
1	NON STICK	8011(GEQ)	O	H18	480/12+6 HRS = 18
2	ROLLER COATED	8011	O	H18	380/12 HRS = 12
3	ROLLER COATED	1100	O	H18	380/11 + 4 HRS = 15
4	BODY & LID	8011	H14	TA	520 /16 HRS = 16
5	SLUG	1050	O	H18	520/20+12 HRS =32
6	CIRCLE	1050/100	O	H18	350/10 + 4 HRS = 14
7	CIRCLE	3003	O	H18	480/14 + 425/18 HRS = 32
8	CIRCLE	1050/1100	H14	TA	520 /16 HRS

**Prepared By**

**Checked By**

**Approved By**

(QA SUPERVISOR)  
MANAGER (O)

SR MANAGER QA

GENERAL

<b>JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)</b>		
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<b>Annealing Cycles for Turkey Furnace -1 &amp;2</b>						
<b>No. of Furnace Max. Capacity</b>		<b>02 No's 20 M T</b>	<b>Heating Type</b>	<b>Height(mm)</b>	<b>Length(mm )</b>	<b>Width (mm)</b>
			Gas Burner	2060	6054	1840
<b>Sr. No.</b>	<b>Product</b>	<b>Gauge (Mic.)</b>	<b>WIDTH / Diameter</b>	<b>Annealing cycles</b>		
				<b>Temperatur e ° C</b>	<b>Heating (hr)</b>	<b>Socketing( hr)</b>
1	Light Gauge(8011)	9 & 12	400-700 mm	280	12	16
			700-1000 mm	280	16	16
2	Pharma/Medium gauge(8011)	30 & 40	350-660 mm	370	11	4
			700-920 mm	370	14	6
3	Fin Stock (8011)	100-160	340 mm	370	14	6
	Fin Stock (8021)	140-190	Coil Form	300 °C-3½ hr / 230°C-23 hr		4
4	Alu -Alu(8021)	47-50	925 mm	380	20	6
5	SRC (8006)	35-40	Coil Form	280 °C-3½ hr /200°C-12hr /194°C-20hr + 4 hr		4
		50-65	Coil Form	280 °C-3½ hr /200°C-23hr /197-200°C-18hr + 5hr		5
6	House Foil(BSB)(8011)	9 to 18	295/300 mm	250 ° C	3	20
7	House Foil(DSO/BSO)	9 to 18	295/300 mm	250 ° C	3	20

**Prepared By**

**Checked By**

**Approved By**

(ANNEALING INCHARGE)

SR MANAGER QA

GENERAL MANAGER(O)

<b>JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)</b>			
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### IN-PROCESS QUALITY INSPECTION

1. **PURPOSE:** To inspect operate Mills for cold working of Aluminium and its alloys.

#### 2. INSTRUCTION

Deviations from any of these guidelines have to authorize by HOD.

- 1) Inspection plan at Mills is as follows:
  - a) Inspect sample for surface after every work roll change
  - b) Inspect sample for surface after breakage of coil in the mill, other than for start breakage. In case, Mill is down for more than one hour, check sample for start breakage also.
  - c) For On Line Inspection Every 5<sup>th</sup> coil of final pass and every 7<sup>th</sup> coil of Temper Annealing pass and intermediate pass shall be checked for gauge and surface defects.  
For Off Line Inspection Every 4<sup>th</sup> coil of final pass and every 6<sup>th</sup> coil of Temper Annealing pass and intermediate pass shall be checked for gauge and surface defects.  
Write down details of inspection, in Machine Log and / or Lot Ticket. Even if more than one sample is inspected, details of inspection shall be entered in Machine Log and Lot Ticket. Ironing Roll to be lowered for rolling when sample inspection is done is done other than Litho products.
  - d) Samples for Hindalco GEQ and Cablewrap to be checked "Online" and mention inspection result in machine log.
  - e) "OK" to be written on the coil found OK after inspection for foil less than 120 microns
  - f) While inspecting surface, if defects are observed, decision to either go for work roll change or go for schedule change is taken by operator in former case and Shift In charge / SIC in latter case. In case Back-up rolls need change, decision to change back up rolls is taken by SIC/HOD and communicated to Mechanical Maintenance department. Work roll change is to be done by respective mill crew.
- 2) Standard machine setting.
- 3) Work roll change.
- 4) Nozzle checking to be done once in fortnight.
- 5) Operator may resort to X-ray gauge check whenever there is discrepancy between thickness indicated and thickness measured.
- 6) Schedule of last 2 passes of FOIL, SEMI / Tagger, and Fin to be rolled back-to-back. Decision to do otherwise in case of Surface defects / other issues in the Mill may be taken by Supervisor / SIC.
- 7) Hood Cleaning shall be done twice in a week and shall be recorded in the machine log.
- 8) In case of Breakage while running, identify the correct reason for breakage in machine log / lot ticket.

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- 9) In case the initial layers of the coil are shifted on spool or have folds, cut the layers and start threading afresh on a new spool. This is to prevent breakage at end of next pass / shape defects.
- 10) Whenever tearing is seen at the start of rolling, further rolling of the coil to be continued after taking on next spool and Sample checking
- 11) In case of Litho finish pass top surface critical coils, ironing roll to be engaged only at start and end half inches of coil. Engaging at end half inch will prevent loose build-up due to breakage
- 12) In case, heat marks are observed while rolling Closure, reduce the speed initially by 100mpm lower to the current speeds to prevent occurrence of severe heat marks. If still heat marks continue lower speed by further 50mpm and observe. Repeat till speed is 250mpm or less. Stop rolling if heat marks continue at 250 or less. Take Closure for rolling only after one or more coils of other products have been rolled or after Work roll has been changed.
- 13) Ensure Cleaning of bridle rolls, tucking roll, deflector roll and ironing rolls at least once in the shift
- 14) Use only those rolls with diameter > 285mm for Closure rolling
- 15) For Rolling any product or Gauge, Please input actual width of coil which is Seen in Panel View Screen
- 16) For Safety Length, following table and guidelines to be used
- | ENTRY thickness | Safety Length in metres   |
|-----------------|---|
| >- 0.70 mm      | 10  |
| 0.51-0.69       | 20  |
| 0.26-0.50       | 30  |
| 0.161-0.26      | 40  |
| upto 0.16mm     | 75 if speed is below 750 mpm<br>100 if speed is 750 mpm and above |
- Safety Length may be increased in case of gauge variation, Build-Up weave or other related problems in input coil In case of 0.47-0.28 mm pass in 1165 mm Litho, Safety Length to be 50 m to avoid coil breakage and coil getting loose.
- 17) Keep Steer Potentiometer of Ironing Roll in position 5. In case, Build-Up Weave is seen in a coil, increase Force potentiometer by 2 positions from next coil onwards. Repeat the same till position 10 is reached if build-up weave is still seen. In case, Weave occurs even after keeping Force Potentiometer in position 10, Roll next coil with Ironing Roll in Manual mode. In case, Weave still persists, inform Mechanical Maintenance.
- 18) Keep Steer potentiometer of ironing Roll in position 5 under normal condition. In case, folds are seen at start of rolling on one side, contact Mechanical maintenance for checking pressure on both sides.

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### **3.0 SAFETY AND ENVIRONMENTAL REQUIREMENTS:**

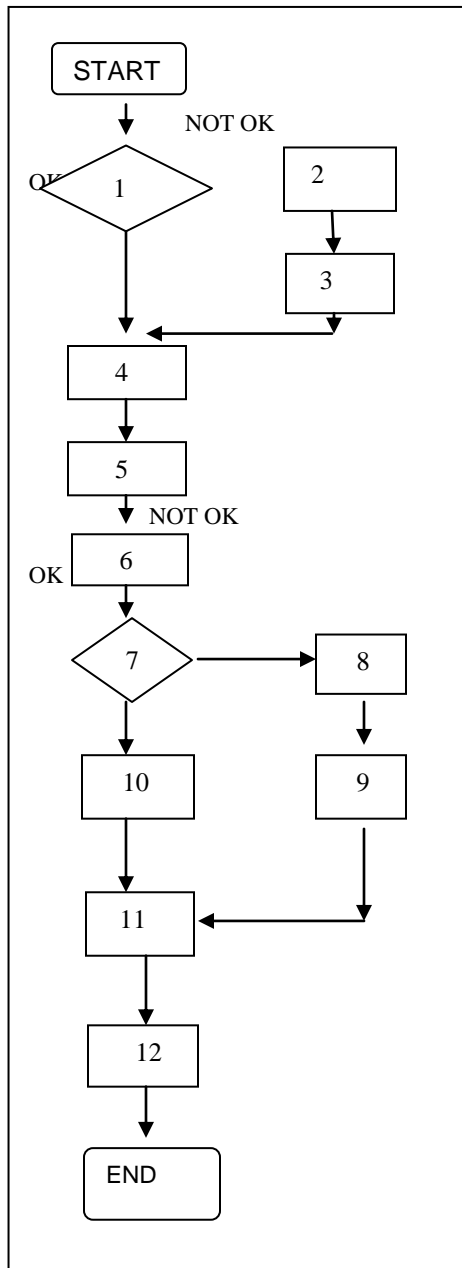
1. Coil temperature to be checked before feeding it to mill, by using contact type temperature indicator.
2. Oiling of conveyor is not to be carried out while coil is moving on conveyor.
3. Entry operator to remain alert while discharge of spool of previous coil from uncoiler.
4. Operator to use proper judgment and follow coil loading practice while transferring coil from conveyor to coil car.
5. Operators to remain alert and avoid manual sequence during movement of coil car to loading position.
6. Operators to use good quality spool with proper keyway.
7. Heavy damage coil to be dressed offline.
8. Person should not do X-ray cleaning while RED light is ON.
9. Bride roll should not be taken down during X- ray cleaning or bridle cleaning.
10. Operator to enter safety length as per gauge.
11. Entry operator to give feedback to pulpit operator in case of bad build up of coil.
12. Operator to use normal stop at appropriate time while rolling, by paying attention to remaining length of coil on Panel View PC and remaining build-up on monitor.
13. In case of excessive fumes, blowers near mill to be put "ON".
14. Coil exceeding safe working load of pup crane to be removed by 40 T crane.
15. Only one coil to be loaded before sample inspection, in case of surface critical products.
16. Floor to be made free from oil after roll change to avoid slippage.
17. During roll change, connections not to be removed before engaging spindle support.
18. Air connections to changer rig through quick release coupling to be cross-checked for tightness.
19. Use Level and Tilt sequence to ensure spool is leveled under mill.
20. Operator to stop auto sequence if he observes shifting of coil on coil car while unloading from Coiler.
21. During Tucking/Pass line Roll Cleaning, nose and floor plate not to be retracted.
22. In event of strip breakage in high speed, use Ironing roll to avoid build up shifting and use of Rubber pads to reset the coil, in case the build is shifted
23. Abnormal Off gauge to be indicated on lot ticket.

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24. Rolls should not be rotated when hook is being used, for removing Scrap from roll bite
25. The practice of writing name, clock no and time of entry, on the board, to be followed while entering basement.
26. In case person to enter the mill housing for back up roll Inspection, following is to be done
  1. Coolant pump to be switched "OFF".
  2. Air valve to be closed and wait for 30 seconds before entering mill.
  3. Spacers to be put in NDS and DS to avoid closing of backup roll Gap in case of AGC pump failure.
  4. Keep Co2 in Manual Mode.
  5. Display Caution Board in Mill Housing & CO2 Bank.
27. While walking, 1) Proper walkway to be followed.  
2) Walking on aluminium scrap to be avoided.
28. Wire to be tied on pup coil before removing it.
29. Coils with loose layers on top should be dressed offline or not to be loaded
30. Physically gauge to be checked during sample inspection.
31. Incoming coil slitting quality to be visually checked before feeding coil to mill.
32. Entry operator to put entry tension ON only after getting signal of close gap done from pulpit operator.
33. As far as possible, two operators should enter into the basement, while mill is in running condition and should not remain there for more than half an hour.
34. Cathment tray to be cleaned when rolling oil is overflowing and at least once every week under normal conditions
35. Work instructions for Entering Basement during Mill running.
  - Persons entering basement during rolling has to inform mill operator.
  - He/they has to write their name on black board next to stair case while entering
  - He/they has to light indicator before entering the basement.
  - Persons going for cleaning purpose (time more than 10 mins) has to inform authorized persons related to that area.
  - Following is list of authorized persons:
    1. Production Personnel.
    2. Maintenance crew related to that area.
  - Persons going for general checking have to follow first three instructions only.



#### 4.0 STANDARD PRACTICE: - FLOW CHART



1)	Inspect visually in and around the mill for any instructions regarding operations and/or maintenance
2)	Inform Shift In charge and Maintenance crew for rectification.
3)	Get rectified.
4)	Start up Mill as per practice mention in POT4III18863
5)	Load material on Mill conveyors as per the Lot ticket /Schedule given by planning.
6)	Cold-roll the material as per Lot ticket/schedule through the following steps <ul style="list-style-type: none"> <li>i. Feed coil to mill and data in the KS2100Operators PC.</li> <li>ii. Load the coil on Uncoiler.</li> <li>iii. Load the spool on the Coiler.</li> <li>iv. Feed the coil to mill upto Belt Wrapper</li> <li>v. Then press Close Gap.</li> <li>vi. Thread the mill</li> <li>vii. Wind the coil on coiler mandrel using Belt Wrapper</li> <li>viii. Correct shape, as required. Use negative/ positive bend/tilt to get flat strip.</li> </ul>
7)	Inspect cold rolled material for surface defects, such as roll marks, R.I.S., I.L.F., metal sticking, pinch marks, skidding marks,etc. (Refer to Guidelines).
8)	Write "Hold" on the coil, with reasons and also in Machine Log and Lot Ticket, and inform the Shift In-charge.
9)	Store "Hold" material for disposition. Generate Product non-conformity report.
10)	Identify the material by writing Lot No. And specification on it .If the coil is outgoing from the Mill, Write Date and Shift of Rolling.
11)	Shut down Mill if there is no subsequent rolling.
12)	Generate Machine Log. Write whether the coil has been rolled through GEMMS Database

<b>JINDAL ALUMINIUM LIMITED (ROLLING AND EXTRUSION DIVISION)</b>	
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**H.G. REWINDER PLANNING**

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

Sr No	Date of Issue	Coil No.	Alloy / Temp	I/p Gauge	Thick	Width & Length	Current Status	Net Wt.	Customer	Remarks

**Prepared by**

**Approved by**

**JINDAL ALUMINIUM LIMITED  
(ROLLING AND EXTRUSION DIVISION)**

Rev. No.: 00

Rev Date: 01.09.2017

**SLITTER PLANNING / SCHMUTZ SLITTER**  
(JAL/R&E/ROL/F/02)

Date:

Date	Supplier No.	JAL Coil No	Alloy	Temper	Input G x W	Coil Wt (In Kg)	Slitting Size	Surface	Type of Core	Reel OD (in mm)	Max Reel Wt (in Kg)	Qty (In Kg)	Max No of joints	Type of joint	Next Operation	Customer

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Approved By

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**FINISHING LINE PLANNING**

JAL/R&E/ROL/F/03

CTL / SLITTING  
PLANNING CARD No:

Date:

Sr. No	Coil No.	Alloy	Temper	Coil Input Size (in mm)	Input Wt. (In Kg)	Sheet / Coil Output Size (in mm)	Planned No. of Pcs./Wt	Actual No. of Pcs./Wt	Packing	Remarks
1										
2										
3										
4										
5										
6										
7										

Initiated By:

Authorized By:



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**COIL CARD (STRIP PLANNING)**

Format No: JAL/R&E/ROL/F/04A  
Date:.....

Route No:
FGTN No:

**PPC INSTRUCTION:**

Customer Name:	
Order No:	Order Qty:
Alloy / Temper:	Delivery Date:
Finish Size:	ID (mm): Unit Weight:
Tolerances (mm)	
Thickness (mm)	Width (mm):
Special requirements, if any:	
Signature: (PPC)	

**CAST COIL:**

Coil No:	Weight (kg):
Alloy:	Composition:
Size (mm):	Thickness (mm):
OD (mm):	End use:
Signature: Quality shift incharge / Caster Operator / Caster Sup.	

**CRM:**

M/c	Pass No	Output thickness (mm)		Output Width (mm)		No. of parts	Quality remarks of Supervisor	Operator	Supervisor
		Planned	Actual	Planned	Actual				

**ANF (Including homogenizing):**

Required Temper	Between passes No	Input time	Output time	Planned cycle	Actual cycle	Quality remarks of Supervisor	Operator	Supervisor

**FOIL MILL:**

M/c	Pass No	Output thickness (mm)		Output Width (mm)		No. of parts	Quality remarks of Supervisor	Operator	Supervisor
		Planned	Actual	Planned	Actual				

**CTL/SLITTER/FINISHING:**

Machine	Pass No	Planned Output width	Input width	Actual output width	Date/ Shift	Planned length	Actual OD/ length	Output No. of pcs	Quality remarks of Supervisor	Operator	Super-visor

Contd...2)

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Format No: JAL/R&E/ROL/F/04A

Page...2)

Date:.....

**QUALITY CARD**

Cast coil Q.A. approval:		
Coil No:	Alloy:	OK
Diverted for:		Not OK
		Reason:

QUALITY TESTS DONE (Supporting documents attached):

Sl. No	Date & Time of test	Name of test	Sample & Coil No.	Test done after what stage	Results	Remarks (OK / Not OK)	Test done by	Checked by

SLITTING LINE:

Coil No.	Alloy	Input size	Input weight	Output size	Output		Signature of supervisor
					No. of pieces	Total weight	Date/Shift
	Temper		OD:				

CUT TO LENGTH:

Coil No.	Alloy	Input size	Input weight	Output size	Output		Signature of supervisor
					No. of pieces	Total weight	Date/Shift
	Temper		OD:				

QA APPROVAL FOR PACKING:

Coil No:	OK	Not OK
Alloy / Temper:	Hold / Reject	No. of parts / pcs
Product:	Diverted:	

F.G.T.N. STATUS:

Coil No:	Total No. of pkt. or No. of part FGTN Made
Alloy / Temper:	
Size:	

**JINDAL ALUMINIUM LIMITED  
(ROLLING AND EXTRUSION DIVISION)**

Rev. No.: 00      Rev Date: 01.09.2017

Date: OPERATOR ----- SHIFT _____			<b>SEPERATOR LOG BOOK</b> <b>ROLLING MILL LOG SHEET</b> of the No: L/O & S/E/6 Format No: JAL/R&E/ROL/E/05							DATE ----/----/----			SHIFT ---- MILL NO. ----	
SR. NO.	Sr. No. L NO.	GAUGE X WIDTH IN MM		Input		Out put		Out Put		Input Wt.		Output wt.		Remarks REMARKS
		INPUT	OUTPUT	Gauge x Width INPUT	OUTPUT	Gauge x Width SCRAP	FROM	Rol No. O L	NO. OF COILS	INPUT	OUTPUT	Kg	SPEED	

Prepared by

Approved by









**JINDAL ALUMINIUM LIMITED  
(ROLLING AND 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  
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Rev. No.: 00

Rev Date: 01.07.2017

**QUALITY OBJECTIVES MONITORING RECORD**

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

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

Sr. No.	Month	Target	Actual	Target period	Action Plan	Remarks

DEPT. HEAD

Retention Period: 3 Years

<b>JINDAL ALUMINIUM LIMITED R&amp;E DIVISION</b>	
<b>Rev No: 00</b>	<b>Rev Date:01.07.2017</b>

**EMPLOYEE DETAILS**  
(JAL/R&E/TRG/F/01)

Div Code :                      Dept. Code :                      Staff Code :  
Name :                              Designation:  
Sex :                                  D.O.B :                                  D.O.J. :

Educational Qualifications	Year	Current knowledge (Professional Training)	Year
<b>Previous Experience</b>			
<b>Nature of Job</b>		<b>Duration</b>	
<b>Promotions</b>		<b>Year :</b>	
<b>Training &amp; Additional knowledge</b>			
<b>Programme</b>	<b>Duration</b>	<b>Conducted By</b>	<b>Remarks</b>

DEPT. HEAD

<b>JINDAL ALUMINIUM LTD</b> <b>Rolling &amp; Extrusion Division</b>	
<b>Rev No: 00</b>	<b>Rev Date: 01.07.2017</b>

**TRAINING NEEDS IDENTIFIED**

Format No. JAL/R&E/TRG/F/02

**DEPARTMENT:**

**PERIOD:**

Sl. No.	Name	Designation	Topic	Type of training	Source		Tentative Schedule
					Internal	external	

Prepared By

Approved By

Retention Period: One Year

<b>JINDAL ALUMINIUM LTD</b>	
<b>Rolling &amp; Extrusion Division</b>	
<b>Rev No: 00</b>	<b>Rev Date: 01.07.2017</b>

**RECORD OF TRAINING IMPARTED**

Format No: JAL/R&E/TRG/F/03

**DEPARTMENT:**

**PERIOD:**

Sl No	Name	Designation	Topic	Date of Training	Type of training	Signature of Trainee	Training given by	
							Name	Sign

Retention Period: One Year



<b>JINDAL ALUMINIUM LTD</b> <b>Rolling &amp; Extrusion Division</b>	
<b>Rev No: 00</b>	<b>Rev Date: 01.07.2017</b>

**REVIEW OF EFFECTIVENESS OF TRAINING**

Format No: JAL/R&E/TRG/F/04

**DEPARTMENT:**

Sl 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

