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 SHAKAMBHARI GROUP #SteelWithin		SHAKAMBHARI ISPAT & POWER LTD. (Formerly known as Ess Dee Aluminium Ltd.)	
STANDARD OPERATING PROCEDURE			
Title: Operation for Lamination Machine			Page No. 1 of 5
SOP No.	Version No.	Effective Date	Next review date
SIPL/PDI/008	00	06.07.2026	05.07.2028

1.0 PURPOSE

- 1.1 To define the standard procedure for heat and pressure lamination of aluminium foil and LDPE film to achieve uniform bond strength and defect-free laminate.

2.0 SCOPE

- 2.1 This SOP applies to Production Department

3.0 REFERENCE(S) & ATTACHMENTS**3.1 References**

- 3.1.1 In-house

3.2 Attachments

- 3.2.1 Attachment: Lamination Log Book - SIPL/PDI/008/F01/00

4.0 RESPONSIBILITY**4.1 Production Department Person**

- 4.1.1 To prepare the SOP.

4.2 Production Head

- 4.2.1 To ensure the training of the SOP to all concerned personnel involved in implementation of the SOP.

- 4.2.2 To ensure the implementation of the SOP after training.

4.3 Quality Assurance Person

- 4.3.1 To check the SOP and to maintain the original copy of the SOP.

- 4.3.2 To issue the controlled copy of the SOP and maintain its issuance record.
To retrieve the controlled copy of the SOP when it is superseded/obsolete and maintain its record.

4.4 QA Head / Plant Head

- 4.4.1 To approve new or revised SOP.

- 4.4.2 To ensure the implementation of the defined system.

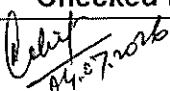
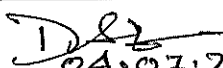
5.0 DISTRIBUTION

- 5.1 Quality Control

- 5.2 Production

6.0 DEFINITION(S) & ABBREVIATION(S)**6.1 Definitions**

- 6.1.1 **Heat & Press Lamination:** A process in which soft aluminium foil and treated natural polyethylene film are combined between two rollers at the nipping point. One of the rollers is hot, which transfers heat to the aluminium foil, and the other is a rubber impression roller. At the nipping point both the aluminium foil and polyethylene film combine together. Due to the temperature and pressure, the lamination process takes place to produce a composite structure pharma laminate.

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Samrat Banerjee 04.07.2026	 04.07.2026	 04.07.2026

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6.1.2 **LDPE (Low-Density Polyethylene):** A flexible, lightweight thermoplastic polymer made from ethylene. It is widely used in pharmaceutical and food packaging as a heat-sealable layer because of its excellent sealing properties, flexibility, moisture resistance and chemical resistance.

6.1.3 **Soft Bare Foil:** Annealed (soft temper), uncoated and unlaminated aluminium foil supplied without any printed or protective coating. It has excellent flexibility, dead-fold properties and high barrier performance against moisture, oxygen and light.

6.2 Abbreviations

- 6.2.1 QC: Quality Control
- 6.2.2 M/C: Machine
- 6.2.3 MPM: Meters Per Minute
- 6.2.4 HMI: Human Machine Interface
- 6.2.5 PSI: Pound per square inch (1 lb/in²; one pound-force applied to an area of one square inch).

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7.0 PROCEDURE

7.1 Make Ready

- 7.1.1 Check the raw materials are as per planning.
- 7.1.2 Check the treatment level of the polyethylene film is 42 dynes.
- 7.1.3 Check the nipping roll for damage every shift.
- 7.1.4 Check the machine parameters.
- 7.1.5 Daily visual check-up of the anilox cylinder to be ensured by the operator.
- 7.1.6 After completion of every output roll, Q.C. checks and records and gives feedback (verbal or in writing) for correction.

7.2 Roles During Operation

- 7.2.1 **Machine Operator** – Process execution and monitoring.
- 7.2.2 **Production Supervisor** – Process verification.
- 7.2.3 **QA / QC** – Inspection and approval.

7.3 Safety Precautions

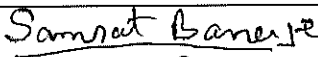
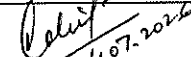
- 7.3.1 Wear safety gloves and safety shoes.
- 7.3.2 Avoid contact with heated rollers / plates.
- 7.3.3 Ensure machine guards are in place.
- 7.3.4 Follow the lockout / tagout procedure during maintenance.

7.4 Lamination Operation

- 7.4.1 Load aluminium foil and LDPE rolls.
- 7.4.2 Thread materials through the machine path.
- 7.4.3 Set the required temperature and pressure.
- 7.4.4 Allow the machine to reach the set temperature.
- 7.4.5 Start the machine at low speed.
- 7.4.6 Check laminate appearance and bonding.
- 7.4.7 Increase speed gradually after approval.

7.5 In-Process Inspection

- 7.5.1 Temperature
- 7.5.2 Pressure
- 7.5.3 Alignment
- 7.5.4 Wrinkle formation
- 7.5.5 Bond quality

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7.6 Process Monitoring for Heat & Press Lamination

Sr. No	Description	Temperature Parameter	Responsibility
1	Nipping Heating Drum	120 - 200 °C	Operator
2	Pressure (Silicon Roll)	3.0 - 7.0 kg	
3	Pressure (Shellac Roll)	3.0 - 7.0 kg	
4	Speed	60 - 100 mpm	

7.7 Process Monitoring for Shellac Coating

Sr. No	Coating Type	Solid Content (%)	Solvent	Required Coating on Substrate	Speed (mpm)	Chilled Water Temp °C	Dryer Temp °C	Responsibility
1	Foil Wash	0.9 to 1.3	Denatured Spirit	P.T. Test ok with ½ to 2" cello tape	60 - 100	10 - 22	100 - 150	Operator

7.7.1 Ensure that the following visual checks are done after lamination:

7.7.1.1 Shellac patches.

7.7.1.2 Poly centring.

7.7.1.3 Shellac missing.

7.7.1.4 Dents on laminates due to shellac deposition.

7.7.1.5 Proper bonding strength.

7.7.1.6 Crease / poly missing.

7.7.1.7 Other objectionable surface defects.

7.8 Acceptance Criteria

7.8.1 After initial setup, the first-off sample shall be given to Q.C. for testing all properties as per specification and approval.

7.8.2 Run the machine after Q.C. approval.

7.8.3 Do not touch any moving part of the machine.

7.9 Area Line Clearance

7.9.1 Once the job is finished, stop the machine from run mode and switch to idling mode at the speed of 10 mpm.

7.9.2 Take the shellac tray down by rotating the screw.

7.9.3 Pour solvent on the cylinder from the doctor blade side.

7.9.4 Take the doctor blade up. Clean all the cylinders properly by cotton cloth and apply petroleum jelly on the cylinder surface evenly.

7.9.5 Stop the machine from idling mode. Disengage all the cylinders.

7.9.6 Cover the cylinder with PET or poly film, then cover the cylinder with corrugated sheet.

7.9.7 Remove shellac from the shellac tank and pour it into the shellac can.

7.9.8 Remove all the rubber rollers.

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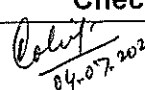
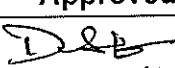
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- 7.9.9 Remove all the poly, aluminium foil and LDPE film from the machine.
7.9.10 Remove all the materials as mentioned in the line clearance. Fill the line clearance record.
7.9.11 Fill the details of quantity, time, etc. in the Lamination log book.

8.0 REVISION HISTORY

Revision No.	00	Effective Date	06.07.2026	CC No.	NA
Details of revision: New SOP					

Prepared By:	Checked By:	Approved By:
Samsat Banerjee 04.07.2026	 04.07.2026	 04.07.2026