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Process Control Document (PCD) for Additive Manufacturing

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Note / Disclaimer:

- (i) This Process Control Document template is applicable for Additive manufacturing components
- (ii) If any details under the above headings/contents is IPR of the company, then an Internal control document shall be prepared and authenticated for those details by the company and the Internal document reference shall be mentioned in this Process control document (PCD).
- (iii)CEMILAC/RCMA has the authority to delete or add /seek any relevant details as part of this PCD as per requirement.
- (iv)This Document contains information pertinent to <company> unauthorized copy is strictly prohibited Any error or discrepancy in the process control document shall be the responsibility of the development agency (company name)

1. SCOPE

This document provides process details to be followed during the manufacturing of

..... through the process.

2. **REFERENCE DOCUMENTS**

Below are the reference documents to be followed along with this document.

SI. No	Document Title	Document Reference No.:			
3.	. MANUFACTURING PROCESS FLOW				

4. RAW MATERIAL

The metal powder shall meet the chemical composition requirements as shown in Table 1 as

per ASTM

Table 1: chemical composition requirements

Element	Limits (weight%)

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Powder sampling is to be done as per ASTM B215. Qualification tests & acceptance criteria are to be followed as per the test schedule for metal powder for use in the process.

5. MANUFACTURING OF THROUGH PROCESS

5.1 File Preparation

All the machining stock and support structure type details shall be recorded in Ref no...... AM machine parameters shall be recorded in Ref no...... Fine quality STL should be used for file preparation.

5.2 Process

5.3 Build Plan / Layout

The test specimens/samples shall be built along with the component- in the same build as per Figure 2. Coupons will be identified using the orientation and coupon numbers.

Part figure

Figure 2: Build layout of component along with test samples

5.4 Machine & Process Parameters

Table 2 shows the details of the process parameters followed during the manufacturing of the through the process.

Descr	iption	Parameter				
Machine						
Laser type &	& Power					
Powder Size	Э					
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Table 2: Powder bed fusion machine technical data

Focus diameter	
Layer thickness	
Hatch Speed (µm)	
Scan speed	
Depth of penetration (µm)	
Laser scan pattern	
Pre heating platform/material type/thickness	
Baseplate Material	
Baseplate Temperature	
Re-coater Type	
Inert gas Type	
Location of support structures	
Surface roughness of component	

5.5 Powder Handling & Build wise plan

Powder handling and blending procedure will be followed as mentioned below.

- Post completion of every build the powder will be unloaded by dedicated Integrated Process Chain Management (IPCM).
- Top-up will be done by **virgin/reuse** powder for consumed powder quantity and a record will be maintained for added quantity. The virgin and reuse powder will be mixed manually with the proper instrument.
- Before blending or mixing with **virgin/reuse** powder, ------ grams of reused powder will be collected and tests will be performed as mentioned in Table 2 of the

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Test Schedule. The reuse powder will be blended if all properties are meeting the requirements as per Table 2 of the Test Schedule.

 Record of reuse and mixing quantity shall be maintained. Powder storage shall be as per Ref no......

7. STRESS RELIEVING

Stress relieve at ------ and soak for ----- minutes ----- and the air cooling or slower to ambient temperature.

8. WIRE CUT

Parts and Coupon shall be separated from baseplate using inhouse EDM- wire cut machine as per work instruction Ref no......

9. SUPPORT REMOVAL

All the soft support indicated in Ref no...... shall be removed manually. Care should be taken during support removal so that parts shouldn't damage during support removal.

10. HEAT TREATMENT ()

Solution Treatment: Heat to a minimum of ----- and soak for ----- minutes,

followed by quenching in water/equivalent.

Aging: Heat to ----- for ----- minutes followed by air cool/equivalent.

11. SHOT PEENING

Shot peening shall be performed after HT as per work instruction Ref no......

12. MACHINING

Machining and detailing to machined drawing will be carried out in the Wipro group facility and if required to outsource. Process to be done as per stage drawings, machining process plan & Ref no......

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13. INSPECTION

Inspection and testing shall be as per the latest revision of test schedule. Also various

stages of witness / perform / review requirement is listed in the test schedule.

PROCESS COMPLIANCE CHECK POINTS

PROCESS PARAMETERS	ACCEPTANCE CRITERIA	COMPLIANCE (YES/NO)
For ex: LASER POWER	200-250W	220W, Complied
SCANNING SPEED	200-300 mm/s	220 mm/s
Powder size		

14. PART MARKING & PACKING

- The part shall be marked in accordance with Ref no...... and the stage drawing.
- The part shall be packed in such a way to prevent any damage or corrosion from occurring while handling, transportation, and storage. Each individual package of the part shall be provided with the outside marking ensuring traceability.
- 15. Traceability
- 16. Bill of materials
 - THIS DOCUMENT IS A GUIDANCE DOCUMENT. APPLICABLE SECTION/ TABLE ROWS MAY BE CONSIDERED. ANY ADDITIONAL DETAILS MAY BE ADDED. ANY NOT APPLICABLE SECTION/ TABLE ROWS MAY BE DELETED. THE TEMPLATE IS VERY GENERAL AND VARY WITH MATERIAL CLASS TO CLASS AND/OR GRADE TO GRADE, PROCESS TO PROCESS, DEVELOPMENT AGENCY PROCESS PLANT AND EQUIPMENTS. THE PROCESS CONTROL DOCUMENT MAY BE FINETUNED WITH THE TAA BEFORE LTCC BASED ON MATERIAL, APPLICATION AND EQUIPMENTS.

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