**Process Control Document (PCD) for**

**Sand/Investment/Gravity Die/Centrifugal Casting Components**

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| **Title:** | **Project/System :** |
| **Process Control Document (PCD) for****Sand/Investment/Gravity Die/Centrifugal Casting Components** | < Project/System Name> |
| **LRU/System Part No.**  |
| <No.> |
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**Note / Disclaimer:**

1. **This Process Control Document template is applicable for Sand/investment/Gravity die/Centrifugal casting components**
2. **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).**
3. **CEMILAC/RCMA has the authority to delete or add /seek any relevant details as part of this PCD as per requirement.**
4. **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)**
5. **SCOPE**

This document covers the method of manufacturing and process for casting of part name part No.---------------- and Drawing No. is ------------------

This document issued and controlled by------------.

1. **PART DETAILS**

**PART PHOTO**

|  |  |
| --- | --- |
| Part name |  |
| Drawing No. |  |
| Customer part. No. |  |
| Raw material stock (Ingot) specification |  |
| Casting specification |  |
| Overall dimension |  |
| Supply condition |  |
| Final heat treatment |  |
| Project |  |
| Manufacturing process | Sand/investment/Gravity die/Centrifugal casting |

1. **OVERVIEW OF CASTING PROCESS**

 **Pattern / Wax Pattern**

**Mould & Core preparation**

 **Shell / Mould Assembly**

**Melting & Pouring**

**Knockout & Fettling TING**

**Radiography**

**Heat Treatment**

**Sand Blast**

**FPI/MPI**

 **Visual Inspection**

**Testing’s**

**Vibro / Punch**

**Dimension Check**

**FINAL**

**YES**

**Hardness Checking**

**Gating assembly**

**Sand Blast**

**NO**

**Reject**

1. **PROJECT DESCRIPTION:**
2. **PART APPLICATION:**
3. **RAW MATERIAL**

Specifications as specified in test schedule from the imported source list or Indian suppliers with LOA/ Provisional clearance / Type approval in compliance with IMTAR 21.

Ingot size:

Source:

Bill of materials:

1. **PATTERN PREPARATION:**
2. Material of Pattern
3. Pattern dimensions
4. Pattern allowance
5. **SAND PREPARATION/WAX:**
6. Type of sand/wax
7. Sand source
8. **MOULD AND CORE PREPARATION:**
9. Type of mould
10. Mould temperature
11. Mould hardness
12. Type of ramming
13. Binder preparation
14. Type of core
15. Material of core
16. **GATING ASSEMBLY:**
17. Details about runners and raisers with dimensions
18. Gating ratio
19. Details of Sprue
20. Flow rate
21. Schematic of gating system
22. **SHELL MAKING: (FOR INVESTMENT CASTING):**
23. Slurry & Stucco coating
24. Dewaxing after shell preparation
25. **MELTING AND POURING:**
	* 1. Furnace details - Type of furnace used, calibration status, capacity
		2. Melting temperature
		3. Melting Rate
		4. Pouring Temperature
		5. Pouring time of molten metal in mould
		6. Pouring rate
		7. Flow velocity map

**Process Summary:**

1. **SPECTRO ANALYSIS (CHEMICAL ANALYSIS)**
2. Make
3. Calibration frequency
4. Standard used
5. **KNOCK OUT AND CLEANING**
6. **FETTLING:**
	* + - 1. Cut the ingates, raisers & runners etc –
				2. Fettling details
7. **HEAT TREATMENT PROCESS**

a. Heating Furnace: Electrical Resistance Furnace, Furnace calibration as per AMS 2750 and Class 4 furnace with \*\*\*\*C temperature tolerance.

b. Heat treatment cycle followed is as follows-

Full Batch + Cut part + Test bar

* Furnace details (type, tolerance, calibration)
* Type of heat treatment process – solutionizing, ageing details
* Temperature range
* Soaking time
* Type of cooling
* Quenching process details (quenching medium, quench delay, cooling rate and associated details)
* Oil temperature

**Process Summary:**

1. **SAND BLASTING**

Sand blasting is a method of resurfacing process used to clean, remove irregularities, strengthen (peen) or polish metal.

* + 1. Type of blasting
		2. Grit type
		3. Grit Size
		4. Operating Pressure
		5. Surface finish
1. **FINAL INSPECTION**
2. **PROCESS COMPLIANCE CHECK POINTS**

|  |  |
| --- | --- |
| **PROCESS PARAMETERS** | **ACCEPTANCE CRITERIA** |
| For ex: Pouring temperature | 650-680 deg C |
| Mould material |  |
| Heat treatment cycle |  |
| Operating pressure |  |

1. **PART IDENTIFICATION & PACKING**

The part shall be identified in accordance with IMTAR 21 subpart C3.

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.

1. **Bill of Material**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl NO.** | **RAW MATERIAL** | **SPECIFICATION** | **VENDOR** |
|  |  |  |  |
|  |  |  |  |

**NOTE:**

* **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.**