**Process Control Document (PCD) for**

**Non-Metallic Materials like Paints, Adhesives, Sealants, Composites**

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| Prepared By | <Design Rep Name>, < Designation> <Agency Name> |  |
| Reviewed By | <Project Leader Name>, <Designation> <Agency Name><AWG/QA HOD Name>, <Designation> <Agency Name> |  |
| Approved By | <Project Leader Name>, <Designation><Design Agency><Officer\_Name>, <Designation>RCMA <Name> |  |
|  **<Design Firm Name & Address>** |

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**Note / Disclaimer:**

1. **This Process Control Document template is applicable for Non-metallic materials like paints, adhesives, sealants, composites, etc.**
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 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.**

 **1.0 INTRODUCTION & SCOPE**

**1.1 INTRODUCTION:**

Product Name:

Description of product

Design Agency/Firm:

Developing Agency/Firm:

Manufacturing Agency/Firm:

Specification

Project Description:

End use application

System applications / end use/Platform details

**1.2 SCOPE:**

This process document prescribes the raw material requirements, manufacturing process and Sampling, testing and storage requirements of the Product <Product Name>. This document specifies the requirements for controlling the process of manufacture of <product Name> to the conformance of the product to the governing specification requirements and maintenance of quality & product consistency.

**2.0 RAW MATERIALS**

**2.1 RAW MATERIALS AND DETAILS OF CHEMICALS**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Raw Material** | **Detailed description / Type / Purpose of the Raw material** |
| 1 | RM1 | Base Polymer / etc… |
| 2 | RM2 |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  | etc…. |

**2.2 DETAILS OF SOURCESOF RAW MATERIAL**

The following details show the source for raw material.

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Nomenclature** | **Manufacturers / OEM details**  | **Supplier details** |
| **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **4** |  |  |  |

 **2.3 RAW MATERIAL SPECIFICATION**

The Raw materials specification refers to the test report /certificate (or) Certificate of Conformance for raw materials attached as Annexure-1. (annexure-1 shall list the properties and specification limit values)

**2.4 INWARDS INSPECTION& TESTING FOR RAWMATERIAL**

1. At inwardsinspection stage; the following details are checked for raw materials,
2. RM qty as per PO & expired date
3. Supplier test certificate for the intended properties / specification limits
4. Shelf life
5. Date of manufacturing
6. Packing
7. Preservation/storage

These are all recorded in Receiving inspection report <Document reference no. to be mentioned> and Stock register.

1. The following properties will be tested for the following raw materials as part of Inwards Inspection:

|  |  |  |
| --- | --- | --- |
| **S. No** | **Raw Material** | **Properties**  |
| 1 | RM1 |  |
| 2 | RM2 |  |
| 6 |  | etc…. |

**2.5 PROCESS OF APPROVING NEW RAW MATERIAL SOURCING**

1. In case of getting materials from new raw materials source, all testing to be carried out as per the specification.
2. If the materials meet the specifications requirement, the material shall be used for fabrication of the parts in line with test schedule requirements as applicable.
3. If materials not meeting the requirements that material shall be rejected and removed to quality clinic.
4. The new source shall be considered for approval by RCMA ;once the material meets all-testing requirements as per the specification.

**2.6 STORAGE OF RAW MATERIALS**

After inwards inspection, the raw materials and chemicals shall be stored at Non–Metallic storage area. It should be free from moisture. The proper MSDS should be pasted at Non-Metallic area. And should ensure the knowledge of MSDS for all working employees.

 **Preferable Storage conditions (as per standard document ref No. \_\_\_\_\_\_\_\_\_):**

Temperature range:

Max Relative Humidity:

Other preferable storage conditions:

The work Instruction for Preservation and storage of Raw Materials / Products (Document no. reference to be mentioned) to be followed.

**3.0 FORMULATION**

|  |  |  |
| --- | --- | --- |
| **S.No.** | **RAW MATERIAL** | **WEIGHT PERCENT (%)** |
|  |  |  |
| **Total** |  |  |

**For rubber compounds:**

|  |  |  |
| --- | --- | --- |
| **S.No.**  | **Raw Material** | **Qty** |
|  | **Master batch** |
|  |  |  |
|  |  |  |
|  |  |  |
|  | **Final batch** |
|  |  |  |
|  |  |  |
|  | **Total** |  |

**Note: Formulation is given in the sequence of addition of raw materials.**

1. **MANUFACTURING PROCESS:**

The Manufacturing process shall include the contents on following topics:

1. Process flow diagram explaining the step-by-step process and document control
2. Sequence of addition of raw materials
3. Process parameters for each process stage/step as applicable

For example:

Temperature

Pressure

Flow rate

Stirring speed

Process time etc…. as applicable

1. In-process checks for each process stage/step as applicable
2. Other details involving process control along with the internal control document reference as applicable.

**Note: For example; a process flow diagram for rubber compound is represented below for your reference. Similar way it shall be given for any non-metallic material.**

**SAMPLE: PROCESS FLOW DIAGRAM FOR MANUFACTURING PROCESS (RUBBER COMPOUND)**

**I SEQUENCE OF MANUFACTURING PROCESS** (Document reference)

**4) Weighing**

As per material mixing record(Document reference)Weighing machine be used.

**3) Storage of RM & chemicals**

Parameter: Store stock & FIFO register, Preservation and storage of raw materials/ products/rubber components-(Document reference)

**1) Purchase of Raw materials & chemicals**

RM & chemicals purchase as per recipe for making the<…….> rubber compound.

**2) Receiving inspection of RM &chemicals**

AS per Aerospace inspection plan (<Document reference>)Parameters: RM Weight, TC/COC verification, MSD.

**12)** Documentation and records submission for RCMA / CEMILAC.

**5) Mixing**

Rubber mixing mill used for this process. Mixing operation as per (Document reference)

**6) Testing**

<……….> used to test the curing time and temperature of rubber compound.

**7) Moulding**

Moulding process as per (Document reference no.). Test button and test slab to be produced for testing. Test button size per ASTM standard:OD-29 x Thickness – 12.5 mm & Test slab size as per ASTM standard: 170 x170 x 2.0 mm thickness.

**8) Trimming**

Flashes to be removed manually.

**9) Testing**

 The test button and slab to be tested. Test button used for check thehardness by Shore A hardness tester. And Test slab is used for check the tensile strength and % elongation by Universal testing machine. The test result should be as per < Specification>. The results are recorded in lab test record (Document reference)

**10) Visual inspection**

Test button and test slab should free from air bubbles, air lock, peel off, porous and distortions and it ensured with 10X magnification lens.

**11) Final testing**

Test as per< Specification>.Test to be conducted at third party NABL Lab.

**II MIXING OF RUBBER COMPOUND:**

|  |  |
| --- | --- |
| **COMPOUND MIXING** | **DOCUMENT CONTROL** |
| Raw materials weighing as per the Mixing Log (Refer doc no.1)Stage-2 Mixing: Add the Accelerators for final mixing to produce the final compound(Refer doc. no: …)Finally, go for moulding. If excess rubber compound found then store it in a freezer (Refer doc. no: …)After final mixing, keep the batch for at least<….>hours at room temperatureBatch will be stored at Room temperature for 4 hours (Refer doc. no: …)After mixing allow to cool at room temperature. Then give the Identification Tag for each batch (Batch Number, processing date & Time, Next process stage)Stage-1 Mixing: Mixing the raw material as per work instruction in the mixing mill to produce the master batch (Refer doc. No..) | 1. PROCESS LOG SHEET (i.e. MIXING LOG SHEET) –………

2.WORK INSTRUCTION (MIXING) –…..3. In-Process Control:4. In-Process Checks:5. Inspection requirements:  |

**Note: Additional stages if any for process control shall be brought out in this PCD.**

 **III. MOULDING**

|  |  |
| --- | --- |
| **MOULDING (TEST SLAB & BUTTON)** | **DOCUMENT CONTROL** |
| Found okFound NOT OKReject the product & make new oneAllow to control Room Temperature Trimming of flash in moulded productIn-house testing of basic parameters (Tensile strength, Elongation Hardness)GO FOR COMP**O**NENT FABRICATIOMNOLoad the rubber compound in the die as per required weightVisual Inspection for absence of cracks, porosity, air bubbles etc. \*\*\* YesMeets the SpecificationRejected the BatchAllow the compound to cure as per process time.After finishing, remove the moulded product from the dieTesting at NABL accredited LAB for as per specification 21ABSwitch on the press and set the temperature at panel board and pressure in the hydraulic unit.Keep the die in the press, unit it reaches the setting temperature  | 1.MOULDING LOG SHEET –………1. WORK INSTRUCTION (MIXING) –…..

3. In-Process Control:4. In-Process Checks:5. Inspection requirements: |

 **5.0 DETAILS OF MANUFACTURING EQUIPMENTS AND TESTING INSTRUMENTS:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.NO** | **MACHINE NAME** | **CAPACITY** | **MAKE/MODEL** | **IDENTIFICATION** | **CALIBRATION****DETAILS** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |

**6.0 SAMPLING PROCEDURE FOR FINAL TESTING OF PRODUCT:**

Standard sampling procedure is to be brought out.

**7.0FINAL TESTING OF PRODUCT AS PER SPECIFICATION…………, ISSUE NO:00,YEAR:……**

Three batches of the product shall be tested to the full specification requirements as per spec\_\_\_\_\_\_\_\_\_\_\_\_\_\_ / Qualification test schedule (QTS) Ref.\_\_\_in NABL accredited Laboratory..

Before forwarding the samples to NABL Laboratory the following in house testing of basic parameters is carried out and ensured to meet the requirements as per specification / QTS.

i)Test 1

 ii) Test 2

iii)Test 3 etc.

**8.0DETAILS OF PACKING, STORAGE & SHELF LIFE**

**8.1 PACKING**

The product shall be packed and supplied in suitable containers as agreed between the airborne user and manufacturer. Packing done by the manufacturer should not be removed till items are actually required for use.

<Suitable package details shall be included by the manufacturer>

* Container make:
* Container Sealing:
* Capacity / Quantity:
* Other relevant details:

**8.2 IDENTIFICATION OF PACKING:**

Every packaging/Envelope shall be marked with at least the following information whatever applicable shall be visible from outside of the package without breaking the seal.

1. Product Name
2. Net Content / Quantity
3. Specification No.
4. Batch No.
5. Date of Manufacturing
6. Date of Retesting
7. Total Shelf Life
8. Consignee Details
9. Order No.
10. Name and address of the manufacturer
11. Quarter and year of cure (applicable for rubber compound)
12. Life grouping/ Category (if applicable and known)

**8.3 STORAGE, SHELF LIFE, MSDS, SERVICE LIFE:**

**(i) Storage:**

* Temperature range:
* Max relative humidity:
* Other Storage conditions/stipulations to be followed by the User:

**(ii) Shelf life:**

The following life is applicable; if stored under conditions as stipulated by the manufacturer as mentioned in 8.3 (i) (with supporting documents)

* Initial Shelf life:
* Retest:
* Total Shelf life:
1. **MSDS:** MSDS shall be prepared and submitted to TAA and User
2. **Service life:**Note: Recommended Service life of the product in actual end use application to be mentioned by the manufacturer along with supporting technical documents

**9.0 Certification**

**9.1 Issue of provisional clearance**

Application by main contractor for provisional clearance along with Process compliance report (PCR) to process control document (PCD) & 3 batches test compliance report (TCR) to specification; both reports are to be duly witnessed and coordinated by DGAQA. Provisional clearance is valid for 2 years & may be extended for another 2 years if main contractor requests. Failing to convert to LOA (Letter of

 Approval) within 4 years will lead to Revoking the provisional clearance as per procedure stipulated by CEMILAC.

 **9.2 Issue of LOA (Letter of Approval)**

Application by main contractor for LOA (Letter of Approval) with Form 21G along with type record, performance feedback report of the product (or) component made out of the subject product (for rubber compound) duly signed by main contractor / user and the DGAQA / competent QA authorities and batch test reports. LOA is valid for 10 years.

**10.0 Traceability**

All the batches produced at <Company name & address> for Defence supplies shall be traceable and available for verification by relevant authorities as and when required.

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