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## 1. SCOPE

This specification establishes the requirements for the manufacturing of a Finished Goods Feedstock from receipt of Raw Feedstock Lot and Raw Resin Lot.

This specification does not cover the process of NCAMP Qualification and is limited to establishing requirements only. It does not establish implementation.

The Finished Goods Feedstock detailed in this document is Carbon Fiber FR-A™ (T300 1K tow), a Type 1 Form 1 PACF50FR05 filament. Carbon Fiber FR-A™ cannot be used on its own and is intended to be used with Onyx FR-A™.

### 1.1. TYPE

The type must specify the predominant resin used in the feedstock. The resin type must use ASTM D4000 abbreviations (a.k.a. standard symbols); if the resin type is not listed in ASTM D4000, abbreviations known in the industry must be used. All material must be Type 1. The resin is placed in and around the fiber. Melt compounding is method by which the additive and polymer were combined in the manufacturing of the final material form performed via MF-PCD-001, Section 6. Melt compounding is also the process of including polyamide in and around the carbon fiber.

Table 1 – Material Types

Type	Resin Type
Type 1	Polyamide

### 1.2. COMPOSITION

The composition must specify the type of fillers and/or reinforcements.

Table 2 – Material Composition

Composition	Filler / Reinforcement Material
CF	Carbon Fiber
FR	Flame Retardant

### 1.3. CLASS

The Class must specify the amount, to the nearest weight percent, of the filler or reinforcement. The value for the Class must be immediately appended to the Composition abbreviation (e.g. CF30 for 30% carbon fiber and the remaining 70% is a Type 1 and FR blend).

## 2. REFERENCES

29 CFR 1910.1200









## **10. STORAGE AND HANDLING OF FIBER**



## 16. REVISION HISTORY

REV	DESCRIPTION	DATE	WHO
-	Initial release	4/21/2021	NCAMP
A	<ol style="list-style-type: none"> <li>Added "Section 6" to referred MF-PCD-001 in section 1.1.</li> <li>Added Line weight requirements of "0.0610 - 0.0694" in Table 4 and Table 7. (Values provided by Markfroged)</li> <li>Incorporated fiber density, tensile strength, and Young's modulus requirements in Table 4</li> <li>Removed filament class, melt and glass transition temperature, and composition requirements was removed from Table 7, Table 8, Section 7, and Appendix A.</li> <li>Section 7.4 "Fiber density, tensile strength, &amp; Young's modulus was added for further definition</li> </ol>	8/9/23	Neville Tay
B	<ol style="list-style-type: none"> <li>Table 2: Composition lead in was removed from CF and FR.</li> <li>Added "and the remaining 70% are of Type 1 and FR blend" to the end of the sentence in section 1.3.</li> <li>14 CFR 25.853 reference was removed from Section 2.</li> <li>MMPDS reference was removed from Section 2.</li> <li>MF WI-213 – Line Weight Test was added as reference in Section 2.</li> <li>"MMPDS (formerly MIL-HDBK-5)" reference removed from Section 3.</li> <li>The "Units" column was deleted from Table 4 through 7 to align table formats across material specification documents.</li> <li>"Raw Feedstock Supplier Proprietary" test method was changed to "Raw Feedstock Supplier COA" in Table 4.</li> <li>"Markforged Proprietary" test method in Table 6 was changed to "PCD-000A Onyx FR-A".</li> <li>"Un-verified" was removed from the title for Section 10.</li> </ol>	11/1	

## APPENDIX A - KEY PROCESS VARIABLES

The following table outlines parameters and characteristics determined to be critical to the quality of a Fiber Spool. A brief description of each parameter, along with SPC requirements, is also included. “Discrete” parameters are a specific value, and do not deviate. “Range” parameters may fall within an allowable range.

Table 8 – Key Process Variables

Variable	Description	Control Type	SPC Required
Fiber Line Die Design Parameters	Conformance to design of the die used on the fiber line	Range	N/A
Fiber Line Temperature(s)	Temperature of various zones in the fiber line die	Range	Yes
Melt Flow Ratio	Ratio of coating material to raw fiber	Discrete	N/A
Moisture	Moisture of Raw Feedstock Lot, Fiber Lot, or Fiber Spool sample measured in accordance to ASTM D7191	Range	N/A
XX/YY Cross-Sectional Area	Cross-sectional area of the Fiber Spool calculated using a single-axis non-contact micrometer	Range	Yes
XY Cross-Sectional Area	Cross-sectional area of the Fiber Spool calculated using a 2-axis non-contact micrometer	Range	Yes