

Polymer Matrix Composites: Guidelines for Characterization of Structural Materials

CMH-17
COMPOSITE MATERIALS HANDBOOK



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SUMMARY OF CHANGES

Note: A consistency review of Volume 1 has been completed changing MIL-HDBK-17 to CMH-17, verifying cross references to Tables, Figures, References, Equations, etc., and identifying withdrawn or updated test methods.

Chapter	Section	Title	Change type / Proceedings
	Cover	Cover	Ottawa Accelerated YP (8/08)
	Foreword	Foreword	Ottawa Accelerated YP (8/08)
1		<u>Objectives</u>	
	1.1 through 1.5	Objectives	revision / Cocoa Beach (1/08)
	1.1 - 1.2	Introduction to the Handbook	Ottawa Accelerated YP (8/08)
		Overview of Handbook Content	
	1.6	Material Orientation Codes	new / Chicago (7/06) (current 1.6 changed to 1.7; current 1.7 changed to 1.8)
	1.7	Definitions	revision and new / Miami (4/02), Charleston (10/03)
	1.7.1	Figure 1.7.1 Mechanical Property Notation	Ottawa Accelerated YP (8/08)
	1.8	Definition: Debond and Disbond	revision / Cocoa Beach (1/08)
	1.8	Definition: Batch (or Lot), Lot	revision / Ottawa Accelerated YPs (8/08)
2		<u>Guidelines for Property Testing of Composites</u>	
	2.2.1	Overview	revision / Charleston (10/03)
	2.2.4	Test Methods Selection	revision / Chicago (7/06) revision / Cocoa Beach (1/08)
	2.2.5.2	Batch Quantity Effects on ANOVA	revision / Charleston (10/03)
	2.2.10	Space Environmental Effects on Material Properties	new / Monterey (2/03) (submitted as Section 6.13)
	2.2.10.1	Introduction	revision / Chicago (7/06)
	2.3	Recommended Test Matrices	revision / Cocoa Beach (1/08)
	2.3.5	General Laminate/Structural Element Test Matrices. Includes subsections	revision / Charleston (10/03)
		2.3.5.1 Introduction	
		2.3.5.2 Suggested Unnotched Laminate Strength Test Matrix	
		2.3.5.3 Suggested Open Hole Laminate Strength Test Matrix	
		2.3.5.4 Suggested Filled Hole Laminate Strength Test Matrix	
		2.3.5.5 Overview of Mechanically-Fastened Joint Testing	
		2.3.5.6 Suggested Mechanically-Fastened Joint Test Matrices	

Chapter	Section	Title	Change type / Proceedings
	2.4.3.3	Practical Application of Normalization	revision / Cocoa Beach (1/08)
	2.5.1	B18 Reduced Sampling Data	revision / Charleston (10/03)
	2.5.1	Introduction	revision / Santa Monica (12/05)
	2.5.2	Material and Processing Specification Requirements	revision / Santa Monica (12/05) revision / Cocoa Beach (1/08)
	2.5.3	Sampling Requirements	revision / Santa Monica (12/05), Ottawa Accelerated YPs (8/08)
		2.5.3.1 Additional Requirements for B and A Data Classes	
		2.5.3.2 Data Pooling	
	2.5.4	Conditioning Requirements	revision / Santa Monica (12/05)
	2.5.5	Test Method Requirement	revision / Dallas (3/07) revision / Santa Monica (12/05)
	2.5.6	Data Documentation Requirements	revision / Chicago (7/06)
	2.5.7	Data Normalization	revision / Cocoa Beach (1/08)
	2.5.8	Statistical Analysis	revision / Santa Monica (12/05)
	2.5.9	Unidirectional Properties from Laminates	revision / Santa Monica (12/05)
		2.5.9.1 Unidirectional Properties from Laminates	
		2.5.9.2 Strength and Strain-to-Failure	
		2.5.9.3 Elastic Moduli, Poisson's Ratios, and Stress/Strain Curves	
	2.5.9.3	Failure Modes and Locations	New / Cocoa Beach (1/08)
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3	<u>Evaluation of Reinforcement Fibers</u>		
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4	<u>Matrix Characterization</u>		
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5	<u>Prepreg Material Characterization</u>		
	Chapter 5		revision / Seattle (6/04)
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6	<u>Lamina, Laminate, and Special Form Characterization</u>		
	6.6.14	Absorptivity and Emissivity	new / Monterey (2/03)
	6.6.15	Thermal Cycling	new / Seattle (6/04)
	6.6.16	Microcracking	new / Seattle (6/04)
	6.7.5	Electrical Property Tests - Electro-Magnetic Interference (EMI) Shielding Effectiveness	new / Seattle (6/04)

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	6.8.2.3	Out-of-Plane Tension Test Methods	Revision / Dallas (3/07)
		6.8.2.3.1 Introduction	
		6.8.2.3.2 Direct-Out-of-Plane Loading	
		6.8.2.3.2.1 Introduction	
		6.8.2.3.2.2 Flatwise Tension Strength Test Method	
		6.8.2.3.3 Curved Beam Test Methods	
		6.8.2.3.3.1 Introduction	
		6.8.2.3.3.2 Curved Beam Strength Test Method of ASTM D6415	
	6.8.4	Shear Properties	Revision/new / Cocoa Beach (1/08)
		6.8.4.2.4 V-Notched Rail Shear Test	
		6.8.4.3.3 V-Notched Rail Shear Test	
	6.8.6	Fracture Toughness	revision / Monterey (2/03)
	6.8.6.2.3.3	Other Mode II Tests	Revision / Cocoa Beach (1/08)
	6.9	Uniaxial Fatigue Testing	Revision/new / Cocoa Beach (1/08)
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		6.9.2 Fatigue Test Key Parameters	
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	7.2	Specimen Preparation	revision / Charleston (10/03)
	7.3	Conditioning and Environmental Exposure	revision / Charleston (10/03)
	7.4	Notched Laminates	revision / Charleston (10/03)
	7.4.2	Notched Laminate Tension	Revision / Cocoa Beach (1/08)
		7.4.2.1 Open-Hole Tensile Test Methods	
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	7.4.3	Notched Laminate Compression	Revision / Cocoa Beach (1/08)
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	7.5	Mechanically-Fastened Joint Tests	revision / Charleston (10/03)
	7.5.3	Bearing/Bypass Evaluation	Revision/new / Cocoa Beach (1/08)
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	7.6.2.3	Fracture Mechanics Properties	revision / Charlotte (3/05)

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	7.7.2	Damage Resistance	revision / Cocoa Beach (1/08)
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		7.7.3.1.3 NASA 1142, B.11 "Compression after Impact Test"	
		7.7.3.1.4 ASTM D7137 "Standard Test Method for Compressive Residual Strength Properties of Damaged Polymer Matrix Composite"	
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		<u>Statistical Methods</u>	
	8	Rev G Outline approved	revision (Chicago 7/06)
	8.1	Introduction	revision (Chicago 7/06)
	8.2	Background	revision (Chicago 7/06)
	8.3	Calculation of Statistically-Based Material Properties	revision (Chicago 7/06)
	8.3.1	Figure 8.3.1.1 only	revision / Charleston (10/03) revision / Costa Mesa Accelerated (1/11)
	8.3.1	Guide to Computational Procedures (Flowcharts)	revision / Santa Monica (12/05)
	8.3.1.2	Significant Figures	New / Cocoa Beach (1/08)
	8.3.5.2.7	Calculations for Three or More Batches	revision / Charleston (10/03)
	8.3.5.5	Pooling of Data	revision / Costa Mesa Accelerated (1/11)
	8.3.6.5.4	Selection Among Several Modes (Rev G)	new / Santa Monica (12/05) revision / Costa Mesa Accelerated (1/11)
	8.3.6.7.2.6	Cases with Three or Four Batches (Rev G)	revision / Santa Monica (12/05)
	8.3.8	Guidelines for Applying Experience and Judgment to Statistical Results (Rev G)	new / Santa Monica (12/05)
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	8.3.11	Examples	revision / Cocoa Beach (1/08)
		8.3.11.1 AGATE statistical analysis program (ASAP)	
		8.3.11.1.1 ASAP 1 Example 1 - data that fails poolability tests	
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	8.3.11.2	Single-point analysis using the STAT17 program	
		8.3.11.2.1 STAT17 Example 1 - nonparametric distribution	
		8.3.11.2.2 STAT17 Example 2 - ANOVA	
	8.3.11.3	Example - Linear regression - Problem 1	
	8.3.11.4	Example - Simple linear regression with a random effect - Problem 2	
	8.3.11.5	Example - One-way mixed-model ANOVA: basis values with data from multiple sources - Problem 3	
	8.4.4	Modified Coefficient of Variation Approach	new / Cocoa Beach (1/08)
		8.4.4.1 Modified Rules	
		8.4.4.2 Modified Standard Deviation	
		8.4.4.3 Pooling Across Environments Using the Modified CV	
		8.4.4.4 Transformation of Data for the Anderson-Darling k-Sample Test	
		8.4.4.5 Guidelines for Use of the Modified CV Approach	
	8.4.5	Section 8.4.5 Statistical Procedures for Process Control	revision/new - Cocoa Beach (1/08)
		Section 8.4.5.1 Basics of Control Charts	
		Section 8.4.5.1.1 Purpose of Control Charts	
		Section 8.4.5.1.2 Two Charts are Better than One	
		Section 8.4.5.1.3 Types of Control Charts	
		Section 8.4.5.1.4 Rules for Flagging Samples as Being "Out-of-Control"	
		Section 8.4.5.2 \bar{x} Bar Chart Including Batch Effect	
	8.5.16	Table 8.5.16 Critical Values for Approximate Confidence Limits on the Coefficient of Variation	revision / Cocoa Beach (1/08)