Delaware Composites Design Encyclopedia: Volume 6/Test Methods

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Test Methods, the sixth and most recent volume to be published in the Delaware Composites Design Encyclopedia, consists of three distinct sections each written by a well-known authority in the subject area. Section One is a summary of the current state of practice in the laboratory evaluation of static composite material properties. Tension, flexural, compression, and shear test methods for obtaining elastic and strength parameters are reviewed. The relevant ASTM standard for each test is presented, and, where pertinent, the required fixtures are described in detail. Additional experimental procedures such as the off-axis tension and biaxial tests are considered. The effects of temperature and moisture on the measured material properties are discussed. Numerous examples of test results illustrate the presentation of each laboratory procedure.

Section Two concentrates on nondestructive ultrasonic techniques for determining the structural integrity of laminated composite specimens. Since the transducers are available at a number of different operating frequencies, focal lengths, and focal point diameters, a thorough discussion is given of the characteristics necessary to make a transducer suitable for specific applications. Analog and digital sampling and recording devices are compared, and the effects of using a particular system on the type and quality of ultrasonic information received are presented. Examples are presented throughout the section to show the reader how to interpret the data obtained in this type of laboratory investigation.

The final section discusses test methods for determining fracture-related parameters for laminated composites. Particular attention is paid to interlaminar fracture. Theoretical and experimental procedures currently used for determining stress intensity factors for Modes I, II, and III fracture are presented and evaluated. A brief discussion of nonlinear effects on the measurement of the parameters is presented. As in the previous two sections, several examples are provided to illustrate the methods.

The encyclopedic style of the volume, with each section written by a different author or authors, gives the text a slightly choppy feeling when taken as a whole, but the individual topics are clearly and thoroughly presented. This volume is a valuable resource book that should be included with reference materials in every laboratory in which property evaluations on laminated composites are conducted.