

Composite design allowables

a. The determination of the allowables for composite materials shall include the following factors:

1. The level of control of the manufacturing process.

NOTE Composite materials are created at the same time as the finished component, and therefore the control of the manufacturing process has a very strong influence on the final material properties.

2. Deviation of lamina properties from the nominal values.

NOTE Lamina properties exhibit large differences in directional properties, as well as small strain to failure with limited yielding or plastic behaviour.

3. Failure modes in either the fibre, the matrix or the fibre to matrix interface.

4. The size of residual strains due to the curing process.

5. Effects of combined loading.

6. Scatter in compression strength properties.

7. Susceptibility to environmental effects.

NOTE E.g. humidity, temperature, radiation and cycling loading.

8. Dependence of the non-linearity on the specimen, load conditions and test environment.

b. The supplier shall justify his choice of composite material for approval by the customer, including the provision of the technical information on which the selection was based.

c. The supplier shall justify the allowables to use, in any pre-dimensioning phase, for approval by the customer.

d. The composite material shall be specified, including both qualification and lot control and indicates the test methods and the accept or reject criteria including the minimum acceptable mechanical and physical properties.

e. The autoclave and other manufacturing process critical parameters shall be validated by test before manufacturing the final items.

f. The autoclave and other manufacturing process critical parameters used to manufacture the samples used for allowable determination shall be the same as the ones used to manufacture the final items.

g. The test plan shall include:

1. The statistical basis for deriving the allowables.

2. Explanation on how any interpolation to allow for different lay up configurations is established.

h. The test methods used to establish the material engineering data shall be identified.

i. The requirement for any configuration related component testing, in support of the generation of design allowables, shall be established by the supplier.