include the inner surface, interior layer, and structural layer, but not the outer surface:

1. Type I, 0.18 in. (4.6 mm) nominal thickness
2. Type I, 0.48 in. (12.2 mm) nominal thickness
3. Type I, 0.74 in. (18.8 mm) nominal thickness
4. Type II, 0.22 in. (5.6 mm) nominal thickness
5. Type II, 0.49 in. (12.5 mm) nominal thickness
6. Type II, 0.76 in. (19.3 mm) nominal thickness
7. Type X, 0.25 in. (6.4 mm) nominal thickness
8. Type X, 0.50 in. (12.7 mm) nominal thickness
9. Type X, 0.75 in. (19.1 mm) nominal thickness

(b) When the corrosion barrier is excluded from the design as a contributor to the structural strength of the laminate per para 6-930(d)(5)(d), the following design basis laminates shall include only the structural layer:

1. Type I, 0.35 in. (8.9 mm) nominal thickness
2. Type II, 0.37 in. (9.4 mm) nominal thickness
3. Type X, 0.38 in. (9.7 mm) nominal thickness

(c) Properties of Types I, II, and noncylindrical X laminates in (a) and (b) above shall be established on flat laminates prepared under shop conditions. For Type II laminates, the woven roving is laid-up in square array with warp rovings parallel layer to layer, and test specimens are cut parallel to the warp rovings.

(b) For design purposes, properties established at the applicable ASTM test method temperature are valid up to 180°F (82°C) or up to 35°F (19°C) below the resin’s HDT, whichever is lower. Where laminates are fabricated for use at design temperatures above 180°F (82°C) or up to 35°F (19°C) below the HDT, certification of strength and modulus per paras 2A-400(a) and 2A-400(b) shall be supplied at or above the specified temperature.

(c) The thickness and glass content of laminates shall be based on the data obtained from the Fabricator’s design basis laminates. For laminate Types I, II, and X, thickness and glass content shall be determined from the data described in (a)(2). Six thickness and glass (weight percent) readings shall be taken from each corner and two readings taken from the middle of the laminate. The highest thickness and glass content percent reading taken of the six shall be 115% of the lowest reading taken. The average of the weight percent shall be averaged to give the design basis laminae thickness and glass content for each laminate. The average thickness value shall be from 85% of the nominal thickness listed in Tables 2A-1 through 2A-3.

(d) The laminate compositions and minimum properties for Type I production laminates are given in Tables 2A-1 and 2A-3.

(e) The laminate compositions and minimum properties for Type II production laminates are given in Tables 2A-2 and 2A-3.

NOTE: The laminate properties found in Table 2A-3 are conservative and historically proven. They represent a compilation of data on the most available laminating materials.

2A-400 TEST METHODS

(a) Tensile strength and tensile modulus of elasticity shall be determined by ASTM D638, ASTM D3039 at 77°F (25°C), or ASTM D5083. The tensile modulus shall be determined using the data between 400 and 1,300 microstrain unless another strain range better represents the flat portion of the curve. Any strain range other than 400 and 1,300 microstrain shall be reported with the modulus value. Specimens shall be in accordance with Type III, Figure 1 of ASTM D638, or in accordance with para. 6.1.1 of ASTM D5083, except that actual laminate thickness shall be used.

(b) Flexural strength and flexural modulus of elasticity shall be determined by ASTM D790. The molded surface (corrosion barrier) shall be tested in compression.

(c) Glass content, weight percent, shall be determined in accordance with ASTM D5284.

(d) When required, the residual undisturbed glass fibers from ASTM D5284 shall be separated carefully and counted and/or weighed to confirm standard lay-up sequence.

(e) Thickness shall be measured with a micrometer or caliper. When the configuration of the part will not allow the use of these instruments, a digital magnetic intensity instrument or an ultrasonic thickness gauge found to be accurate when measuring vessel cutouts shall be used.

(f) When required, thermal conductivity shall be measured in accordance with ASTM C177.

(g) When required, thermal expansion shall be measured in accordance with ASTM D696.

Other standard laminates may be used only after they have been listed as acceptable in Subpart 2A. In order for the new laminate to receive proper consideration,

Add paragraph:
(3) The Fabricator shall proof test the as-built laminate to verify the design values employed in the design calculations per 6-930(d)(1) through 6-930(d)(4). Proof Test values shall meet or exceed design values.