§ 572.176  Knees and knee impact test procedure.

(a) The knee assembly for the purpose of this test is the part of the leg assembly shown in drawing 420–5000 (incorporated by reference, see §572.170).

(b) When the knee assembly, consisting of lower upper leg assembly (420–5200), femur load transducer (SA572–S10, included in drawing 420–0000) or its structural replacement (420–5121), lower leg assembly (420–5300), ankle assembly (420–5400), and foot molded assembly (420–5500) (all incorporated by reference, see §572.170) is tested according to the test procedure in subsection (c) of this section:

(1) The peak resistance force as measured with the test probe-mounted accelerometer must not be less than 2.6
kN (585 lbf) and not more than 3.2 kN (719 lbf).

(2) The force shall be calculated by the product of the impactor mass and its deceleration.

(c) Test Procedure. The test procedure for the knee assembly is as follows:

(1) Soak the knee assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Mount the test material and secure it to a rigid test fixture as shown in Figure T6. No part of the foot or tibia may contact any exterior surface.

(3) Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur.

(4) Guide the pendulum so that there is no significant lateral, vertical, or rotational movement at the time of initial contact between the impactor and the knee.

(5) The test probe velocity at the time of contact shall be 2.1 ±0.03 m/s (6.9 ±0.1 ft/s).

(6) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

§ 572.177 Test conditions and instrumentation.

(a) The following test equipment and instrumentation is needed for qualification as set forth in this subpart:

(1) The test probe for thoracic impacts is of rigid metallic construction, concentric in shape, and symmetric about its longitudinal axis. It has a mass of 6.89 ±0.012 kg (15.2 ±0.05 lb) and a minimum mass moment of inertia of 2040 kg-cm² (1.81 lbf-in-sec²) in yaw and pitch about the CG. One-third (1/3) of the weight of the suspension cables and their attachments to the impact probe may be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis, is at least 25.4 mm (1.0 in) long, and has a flat, continuous, and non-deformable 121 ±0.25 mm (4.76 ±0.01 in) diameter face with a maximum edge radius of 12.7 mm (0.5 in). The probe’s end opposite to the impact face has provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. No concentric portions of the impact probe may exceed the diameter of the impact face. The impact probe has a free air resonant frequency of not less than 1000 Hz, which may be determined using the procedure listed in the PADI (incorporated by reference, see §572.170).

(2) The test probe for knee impacts is of rigid metallic construction, concentric in shape, and symmetric about its longitudinal axis. It has a mass of 1.91 ±0.01 kg (4.21 ±0.02 lb) and a minimum mass moment of inertia of 140 kg-cm² (0.124 lbf-in-sec²) in yaw and pitch about the CG. One third (1/3) of the weight of the suspension cables and their attachments to the impact probe may be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis, is at least 12.5 mm (0.5 in) long, and has a flat, continuous, and non-deformable 76.2 ±0.2 mm (3.00 ±0.01 in) diameter face with a maximum edge radius of 12.7 mm (0.5 in). The probe’s end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. No concentric portions of the impact probe may exceed the diameter of the impact face. The impact probe has a free air resonant frequency of not less than 1000 Hz, which may be determined using the procedure listed in the PADI (incorporated by reference, see §572.170).

(3) Head accelerometers have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572–S4 (included in drawing 420–0000) and are mounted in the head as shown in drawing 420–0000 (both incorporated by reference, see §572.170), sheet 2 of 6.

(4) The upper neck force and moment transducer has the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572–S11 (included in drawing 420–