

12. COMPLIANCE TEST EXECUTION....Continued

- C. The pendulum deceleration vs. time curve must conform to the following specifications:

NECK EXTENSION	
TIME	DECELERATION LEVEL
10 ms	17.20 Gs - 21.20 Gs
20 ms	14.00 Gs - 19.00 Gs
30 ms	11.00 Gs - 16.00 Gs
Above 30 ms	22.0 Gs Maximum

- D. The decaying deceleration vs. time curve shall first cross the 5 Gs level between 38 ms and 46 ms after time-zero.
- E. The maximum rotation of plane "D" shall be 81° to 106° and occur between 72 ms and 82 ms after time-zero. The decaying rotation vs. time curve shall cross the zero angle between 147 ms and 174 ms after time-zero.
- F. The moment about the "Y" axis of the head measured with respect to the occipital condyles shall have a minimum value between -39 lbf-ft and -59 lbf-ft and occur between 65 ms and 79 ms after time-zero. The decaying negative moment shall first cross the zero level between 120 ms and 148 ms after time-zero.

With the six (6) axis neck transducer, the moment is calculated using the formula:

$$\text{Moment lbf-ft} = [\text{My (lbf-ft)}] - [0.05833 \text{ ft}] [\text{Fx (lbf)}], \text{ where -}$$

- My = Moment in lbf-ft measured by the transducer
- Fx = Force, in lbs measured by the transducer

12. COMPLIANCE TEST EXECUTION....Continued

NECK PENDULUM SPECIFICATIONS

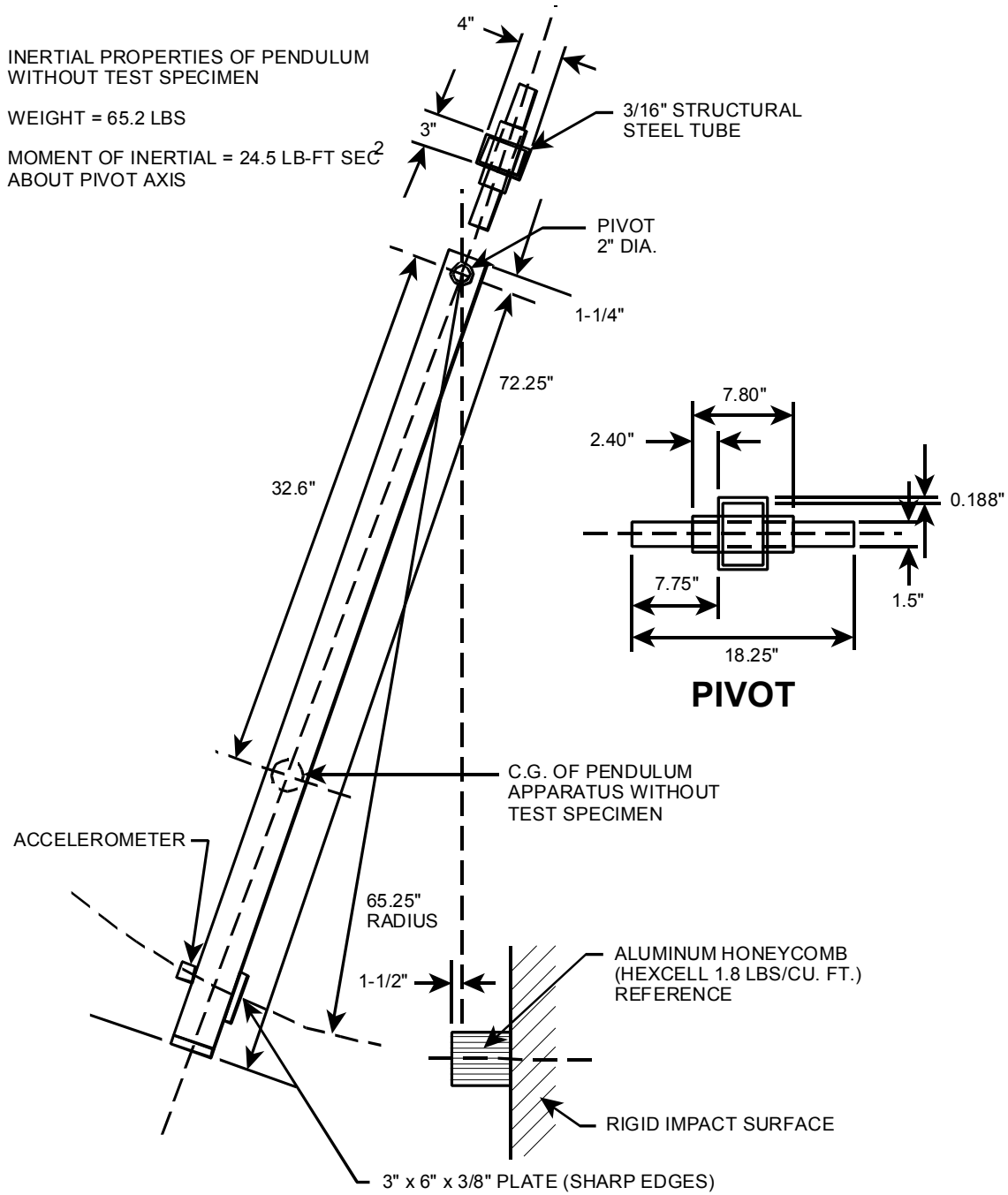


FIGURE 8A

12. COMPLIANCE TEST EXECUTION....Continued

NECK FLEXION TEST SETUP SPECIFICATIONS

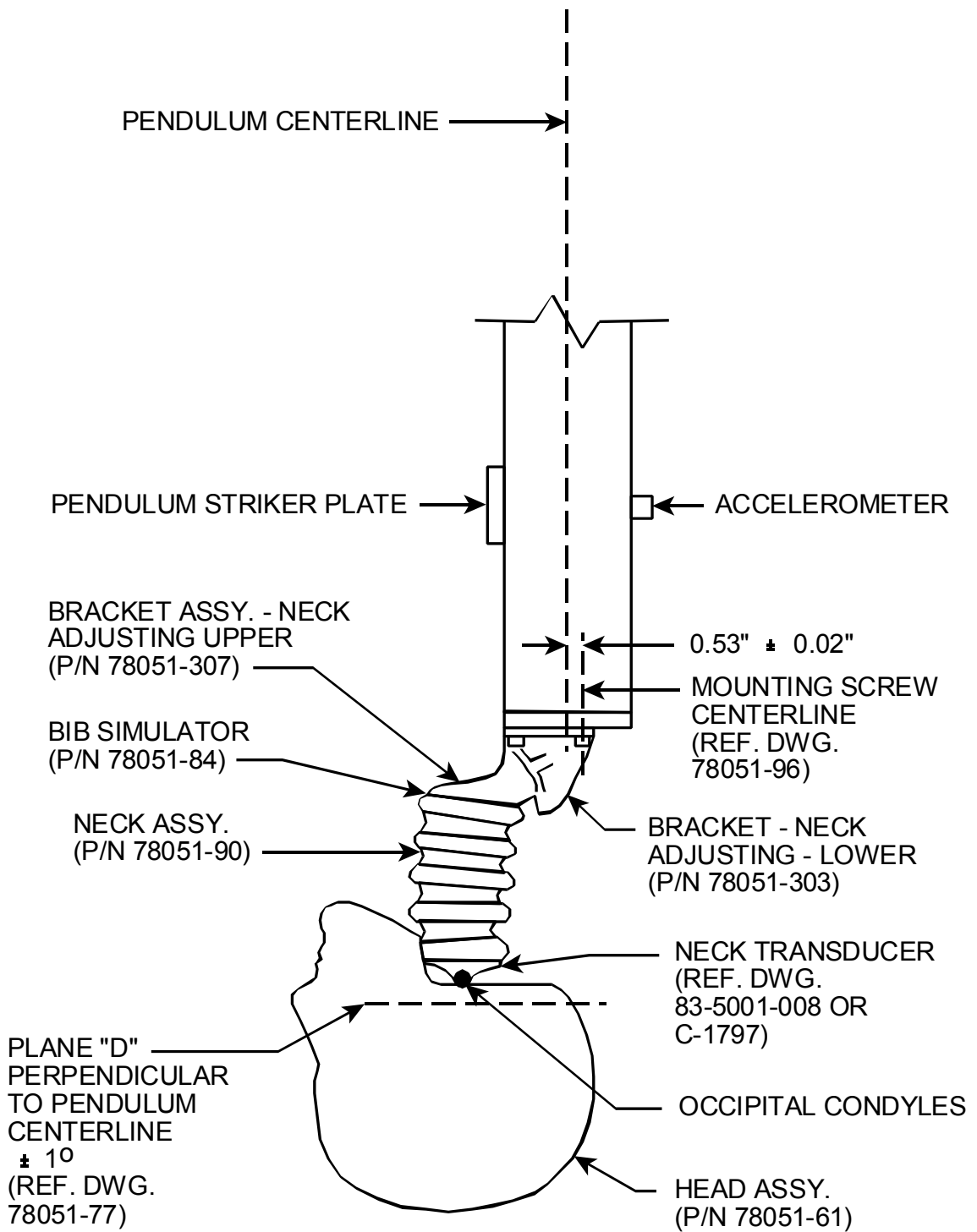


FIGURE 9A

12. COMPLIANCE TEST EXECUTION....Continued

NECK EXTENSION TEST SETUP SPECIFICATION

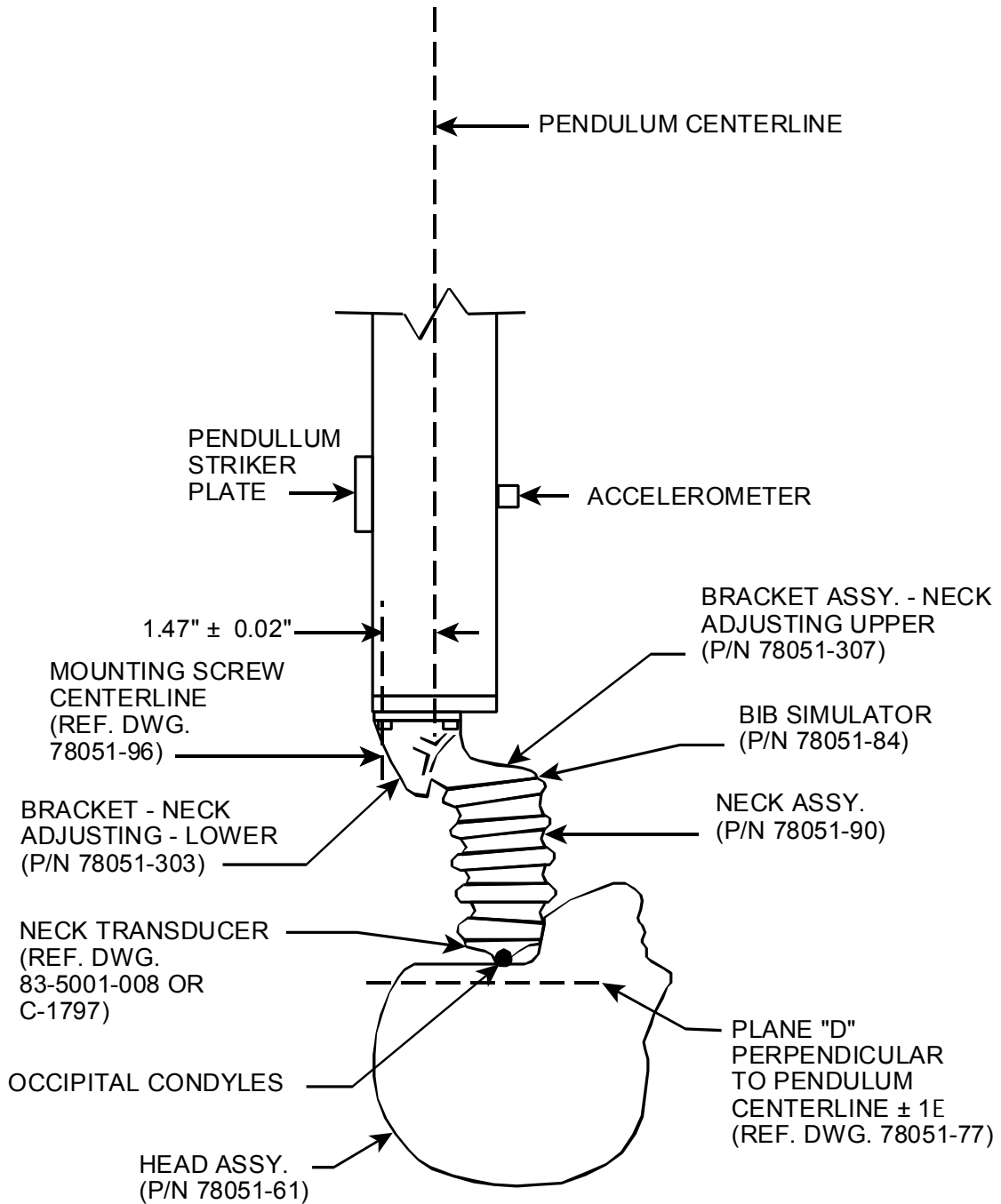


FIGURE 10A

12. COMPLIANCE TEST EXECUTION....Continued

ROTATION TRANSDUCER ASSEMBLY

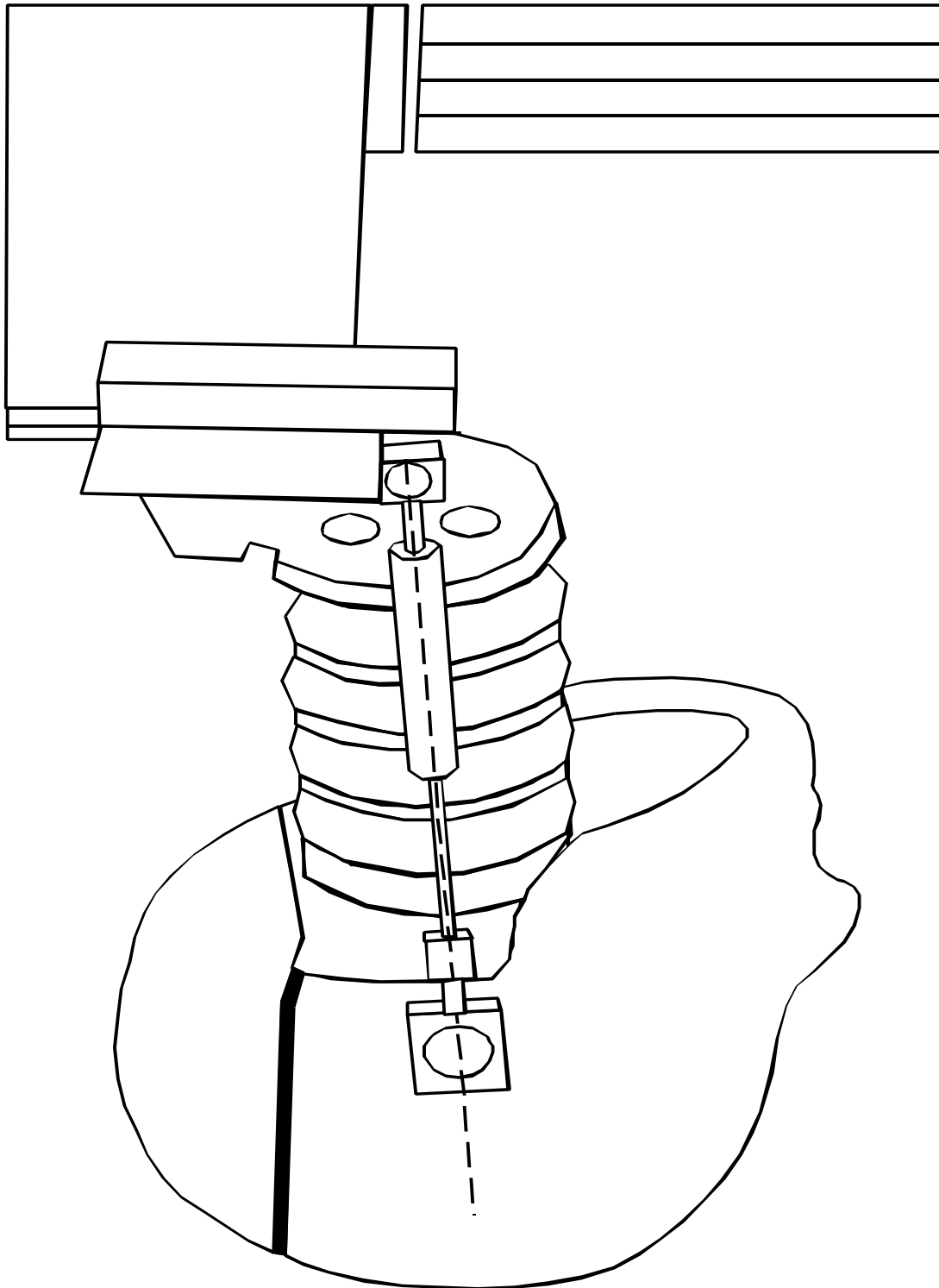


FIGURE 11A

12. COMPLIANCE TEST EXECUTION....Continued

12.4 FEMUR IMPACT TEST

- A. The components required for the knee impact test include the leg assemblies (86-5001-001, revision A) left and (86-5001-002, revision A) right with the upper leg assemblies, (78051-46) left and (78051-47) right removed.
- B. The test fixture, Figure 12A, consists of a rigid test probe and a method of rigidly supporting the knee and lower leg assembly. The probe mass is 11 lbs \pm 0.02 lbs including instrumentation. The diameter of the impacting face is 3 inches \pm 0.01 inches with an edge radius of 0.02 inch. An accelerometer is mounted on the end opposite from the impacting face with its sensitive axis collinear to the longitudinal centerline of the test probe.
- C. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (Appendix H) for Channel Class 600.

12.4.1 TEST PROCEDURE

- A. Inspect the knee assembly for cracks, cuts, abrasions, etc. Repair or replace damaged components. NOTE: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged areas are to be documented with photography and the post-test calibration testing completed before any repairs or replacements are made.
- B. Soak the test material in an environment at any temperature between 66°F and 78°F and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to its application in a test.
- C. Mount the knee/lower leg assembly to the fixture using the load cell simulator (78051-319 revision A). Torque the load cell simulator bolts to 30 lbf-ft to ensure there is no slippage of the assembly during the impact. Adjust the lower leg so the line between the knee and ankle pivots is at an angle of 24° rearward of vertical. No contact is permitted between the foot and any exterior surface.
- D. Align the longitudinal centerline of the test probe so it is collinear within 2 degrees with the longitudinal centerline of the femur load cell simulator at the time of impact.
- E. Guide the probe so there is no significant lateral, vertical or rotational movement at time-zero.
- F. Time-zero is defined as the time of initial contact between the test probe face and the knee skin.
- G. Impact the knee so the longitudinal centerline of the test probe is within 0.5° of a horizontal line parallel to the load cell simulator at time-zero.

12. COMPLIANCE TEST EXECUTION....Continued

H. The velocity of the test probe at the time of impact is 6.9 ft/sec \pm 0.1 ft/sec.

12.4.2 PERFORMANCE SPECIFICATIONS (S572.35 (b))

The peak impact force, defined as the product of the test probe mass and the deceleration, shall be between 1060 and 1300 lbs.

12. COMPLIANCE TEST EXECUTION....Continued

KNEE IMPACT TEST SETUP SPECIFICATIONS

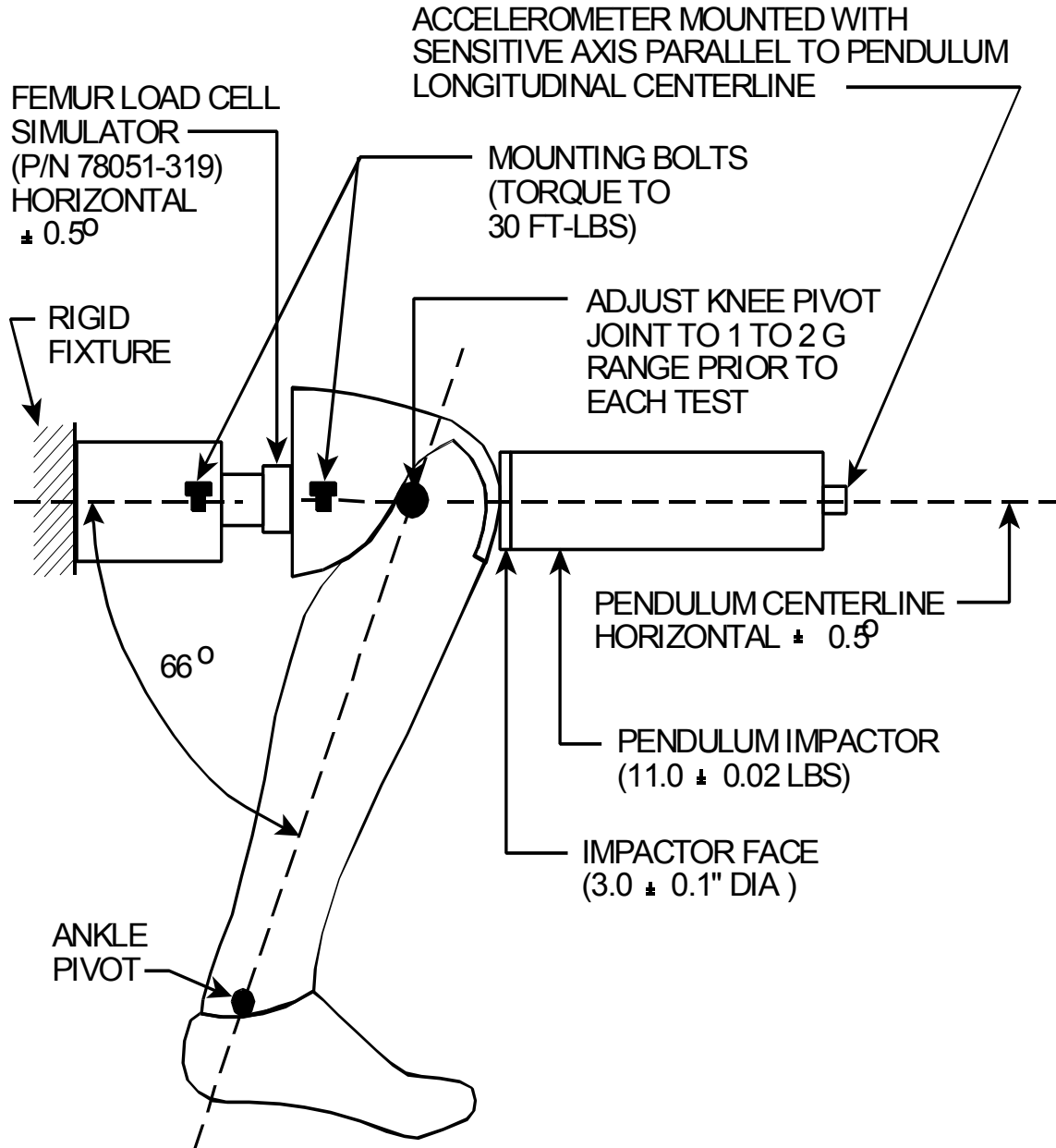


FIGURE 12A

12. COMPLIANCE TEST EXECUTION....Continued

12.5 THORAX IMPACT TEST

- A. The complete assembled dummy (78051-218 revision T) is required including the clothing (vest (78051-292) and panty (78051-293)) but without the shoes, (78051-294) left and (78051-295) right.
- B. The test setup specifications are shown in Figure 13A. The fixture consists of a smooth, clean, dry, steel seating surface and a test probe. The test probe is a 6 inches \pm 0.01 inch diameter rigid cylinder with a mass of 51.5 lbs \pm 0.05 lbs including instrumentation. The impacting surface has a flat, right angle, face with an edge radius of 0.5 inch. An accelerometer is mounted on the end opposite from the impacting end with its sensitive axis collinear to the longitudinal centerline of the test probe. A test setup is shown in Figure 14A.
- C. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J2111/1 MAR95 (Appendix H) Class 180.

12.5.1 TEST PROCEDURE

- A. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material (78051-17 thru 78051-22), chest displacement transducer assembly (78051-317) and the rear rib supports (78051-304). Inspect for rib deformation using the chest depth gage (83-5006-007). If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration testing completed before any repairs or replacements are made.
- B. Soak the test dummy in an environment with a relative humidity from 10% to 70% for at least four (4) hours and until the temperature of the ribs have stabilized at a temperature between 69°F to 72°F. The temperature as measured on the surface of the ribs and also the ambient within the laboratory are recorded.
- C. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 13A. The surface must be sufficiently long enough to support the pelvis and outstretched legs.
- D. Align the adjustable neck bracket 78051-303, revision E, and 78051-307, revision X, index marks to the "zero" position.

12. COMPLIANCE TEST EXECUTION....Continued

- E. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut (78051-251) which holds the arm yoke to the clavicle assembly (78051-141). Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $13^\circ \pm 2^\circ$. (A special tool is required which inserts into the pelvic structure and extends outward beyond the pelvic skin surface.) The tool permits the use of an angle measurement device to determine the pelvis angle. The midsagittal plane of the dummy is vertical $\pm 2^\circ$ of being perpendicular to the centerline of the test probe. The longitudinal centerline of the test probe is centered on the midsagittal plane of the dummy centerline is 0.5 inch \pm 0.04 inch below the horizontal centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. After the initial locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference measurements are recorded from locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- F. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- G. Impact the thorax with the test probe so the longitudinal centerline of the probe is 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact.
- H. Guide the probe so there is no significant lateral, vertical or rotational movement during the impact.
- I. The velocity of the test probe at the time of impact is 22 ft/sec \pm 0.4 ft/sec.
- J. Time zero is defined as the time of initial contact between the test probe and the chest skin.
- K. Allow a period of at least thirty (30) minutes between successive tests on the same thorax.

12.5.2 PERFORMANCE SPECIFICATIONS (S572.34)

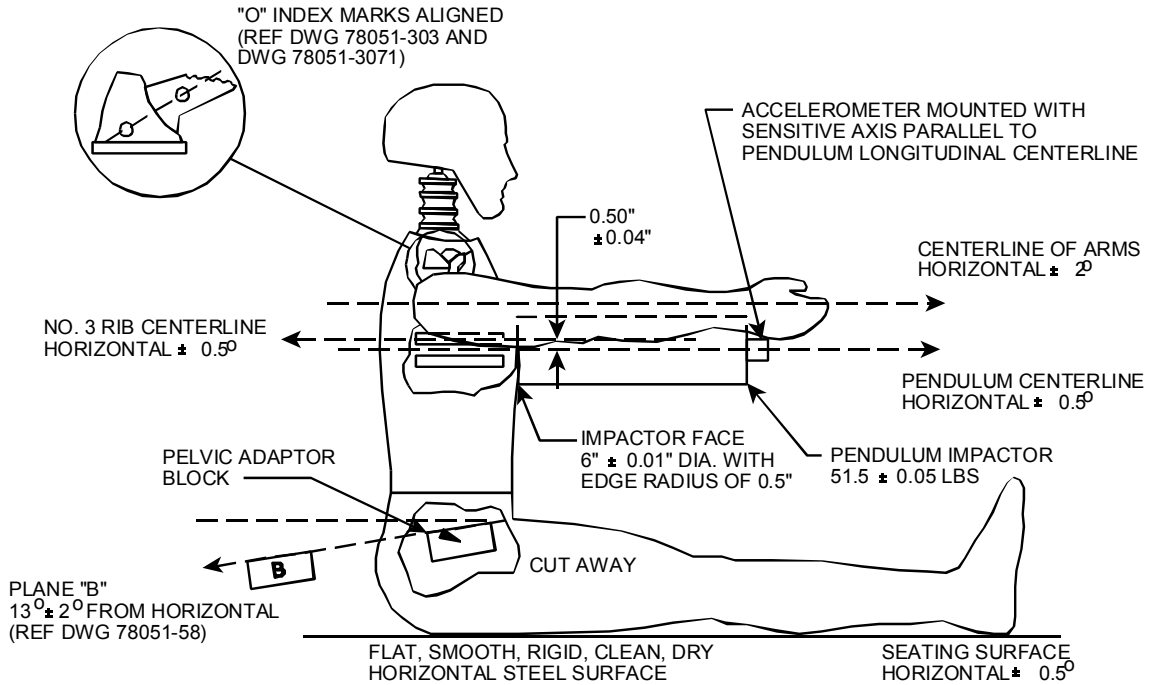
- A. The resistive forces of the thorax as measured by the test probe shall be between 1160 lbs and 1325 lbs. The resistive force is the product of the test probe deceleration and mass.
- B. The sternum displacement as measured by the chest displacement transducer shall be between 2.50 inches and 2.86 inches.

12. COMPLIANCE TEST EXECUTION....Continued

- C The internal hysteresis shall be more than 69% but less than 85%. The hysteresis is determined from the force vs deflection curve and is the ratio of the area between the loading and unloading portions of the curve to the area under the loading portion of the curve as shown in Figure 15A.

12. COMPLIANCE TEST EXECUTION....Continued

THORAX IMPACT TEST SETUP SPECIFICATIONS



- NOTE:
- (A) NO EXTERNAL SUPPORT IS REQUIRED ON THE DUMMY TO MEET SETUP SPECIFICATIONS
 - (B) THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL (0°) AND WITHIN ± 2° OF PENDULUM CENTERLINE
 - (C) THE MIDSAGITTAL PLANE OF THE DUMMY IS CENTERED ON THE PENDULUM CENTERLINE WITHIN 0.12"

12. COMPLIANCE TEST EXECUTION....Continued

THORAX IMPACT TEST SETUP

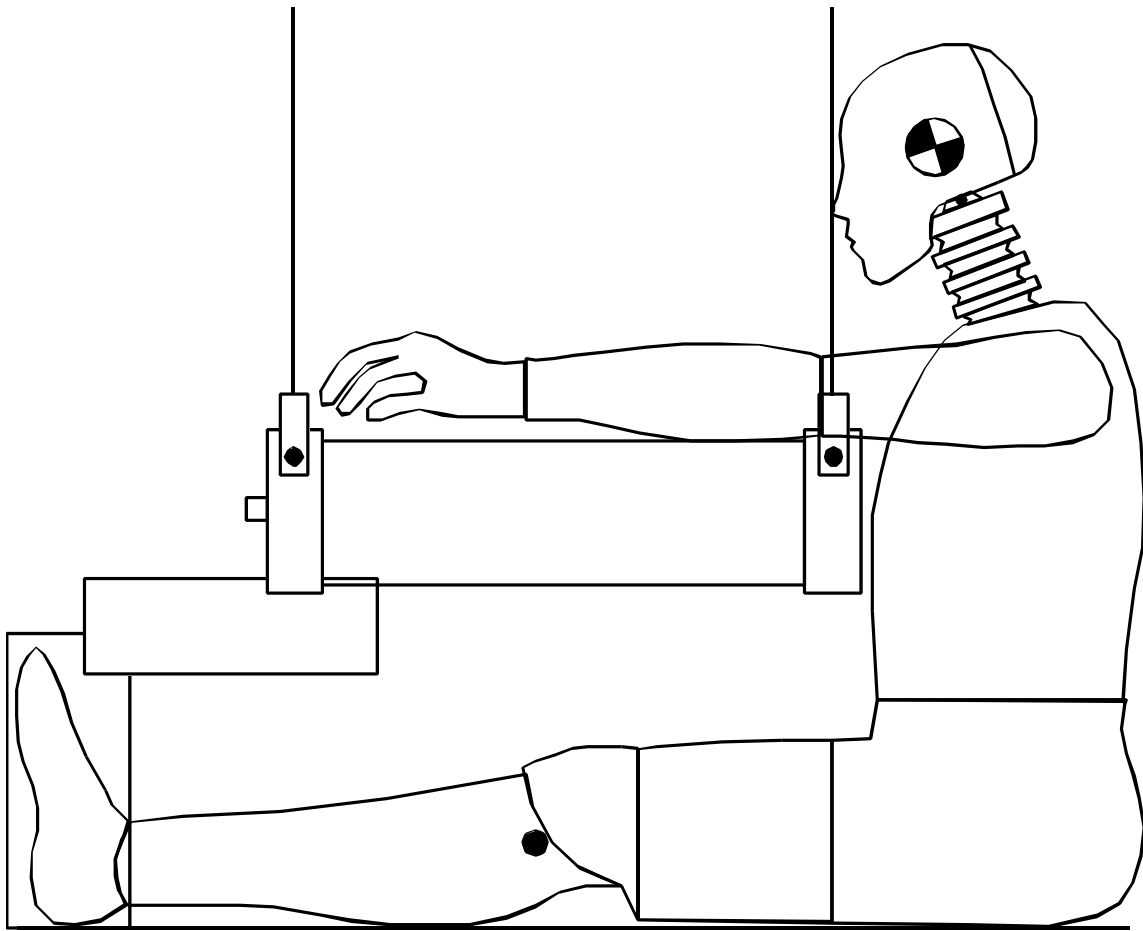


FIGURE 14A

12. COMPLIANCE TEST EXECUTION....Continued

PART 572E HYBRID III THORAX CALIBRATION - HYSTERESIS

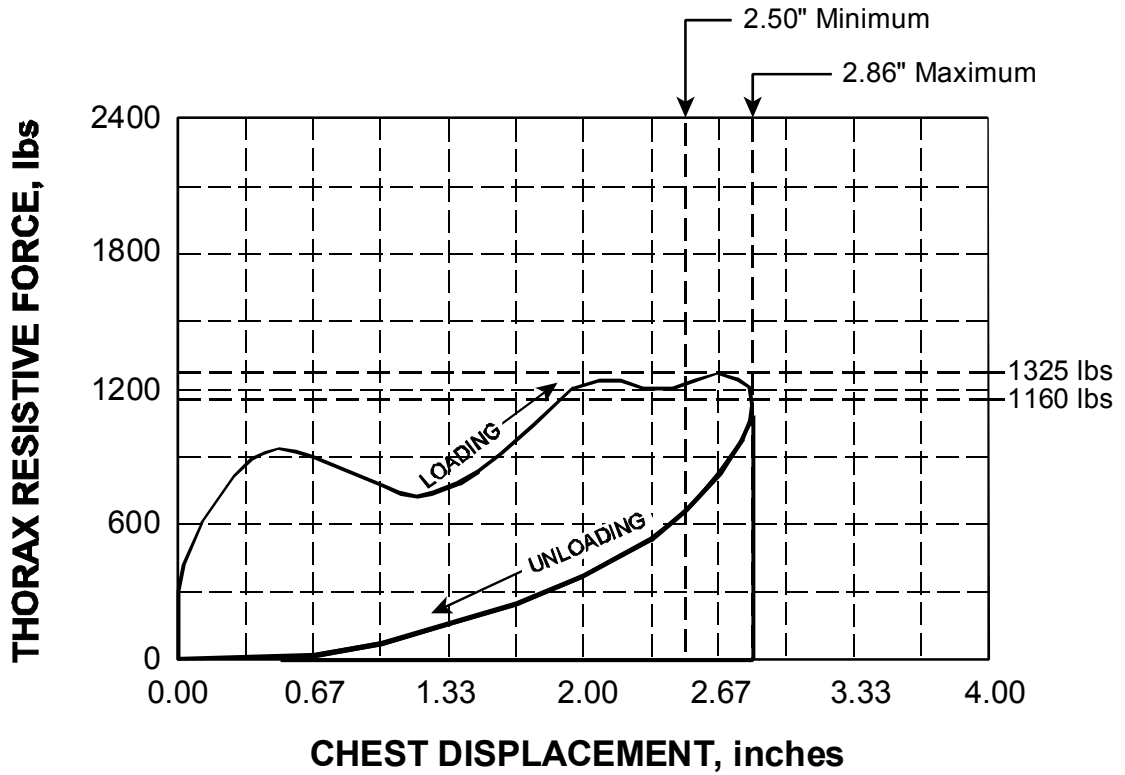


FIGURE 15A

12. COMPLIANCE TEST EXECUTION....Continued

12.6 HIP JOINT FEMUR FLEXION TEST

The complete assembled dummy (78051-218 revision S) is used except that (1) leg assemblies (86-5001-001 and 86-5001-002) are separated from the dummy by removing the 3/8-16 Socket Head Cap Screw (SCHS)(78051-99) but retaining the structural assembly of the upper legs (78051-43 and 78051-44), (2) the abdominal insert (78051-52) is removed and (3) the instrument cover plate (78051-13) in the pelvic bone is replaced by a firmly secured rigid pelvic bone stabilizer (Figure 16A).

12.6.1 TEST PROCEDURE

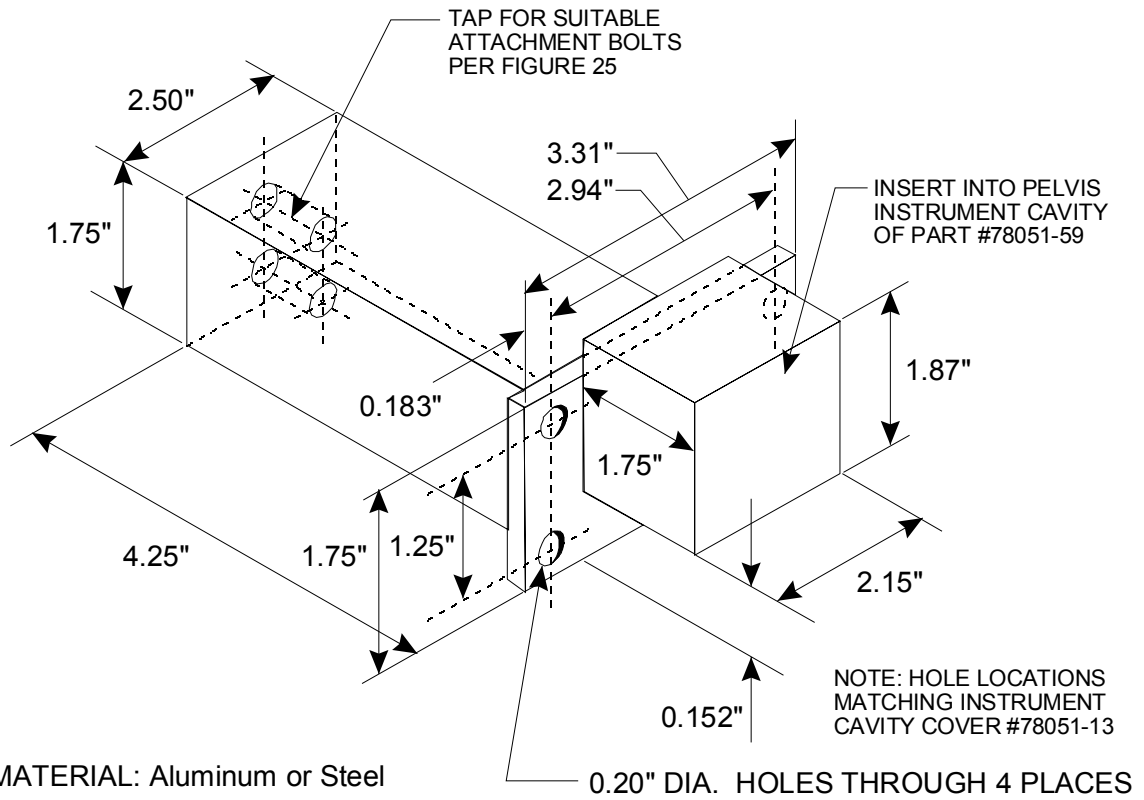
- A. Soak the test material in an environment at any temperature between 66°F and 78°F and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to its application in a test.
- B. Seat the dummy on a rigid seat fixture (Figure 17A) and firmly secure it to the seat back by bolting the stabilizer insert and the rigid support device (Figure 18A) to the seat back of the test fixture (Figure 19A and 20A) while maintaining the pelvis (78051-58) "B" plane horizontal.
- C. Insert a lever arm into the femur shaft opening of the upper leg structure assembly (78051-43/44) and firmly secure it using the 3/8-16 socket head cap screws.
- D. Lift the lever arm parallel to the midsagittal plane at a rotation rate of 5 to 10 degrees per second while maintaining the 1/2 in. shoulder bolt longitudinal centerline horizontal throughout the range of motion until the 150 ft-lbf torque level is reached. Record the torque and angle of rotation of the femur.
- E. Test right and left hip joint femur flexion.

12.6.2 PERFORMANCE SPECIFICATIONS

- A. The femur torque at 30 degrees rotation from its initial horizontal orientation will not be more than 70 ft-lbf.
- B. Femur rotation at 150 ft-lbf of torque will not be less than 40 degrees nor more than 50 degrees from its initial horizontal orientation.

12. COMPLIANCE TEST EXECUTION....Continued

PELVIC BONE STABLIZER INSERT



MATERIAL: Aluminum or Steel
FIGURE 16A

12. COMPLIANCE TEST EXECUTION...Continued

HIP-JOINT TEST FIXTURE ASSEMBLY

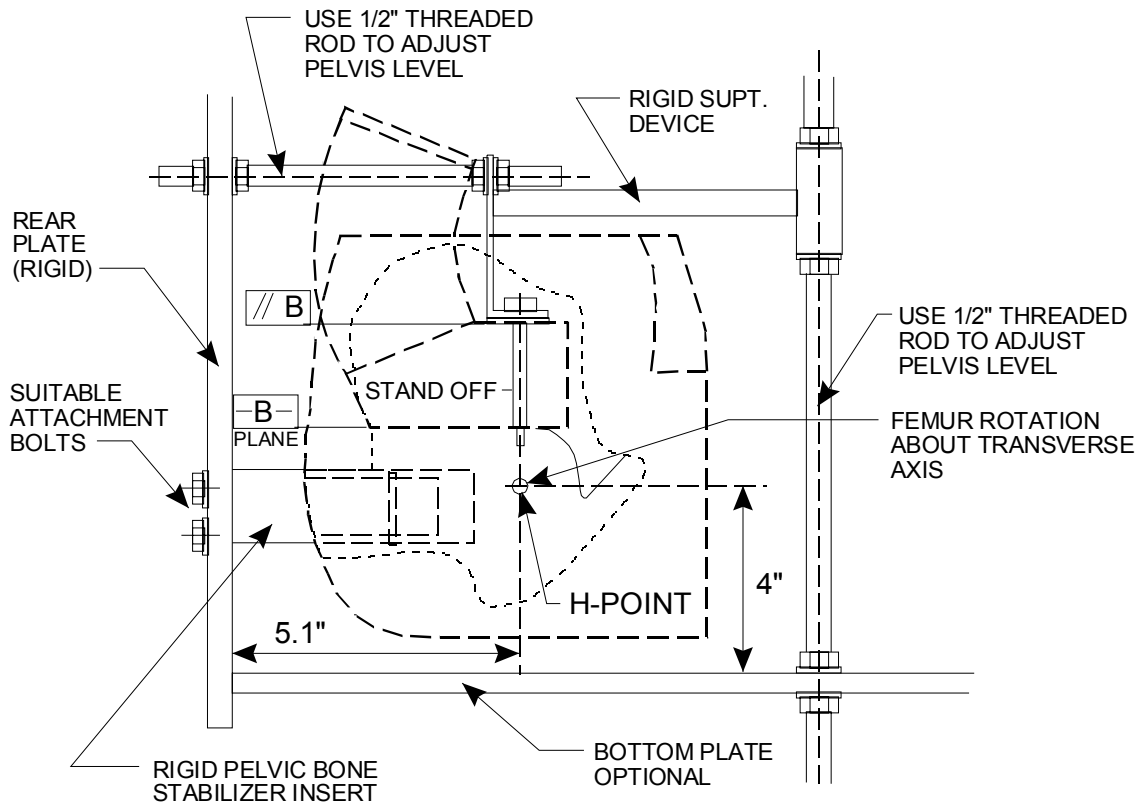
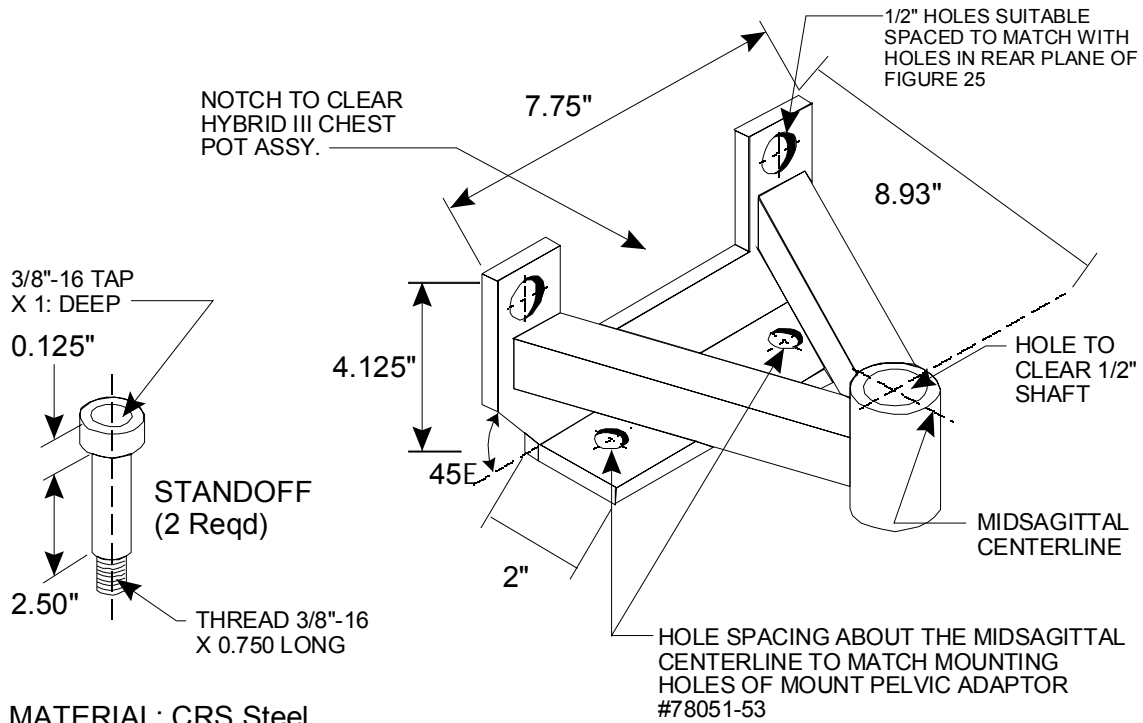


FIGURE 17A

12. COMPLIANCE TEST EXECUTION...Continued

PELVIS UPPER SUPPORT DEVICE

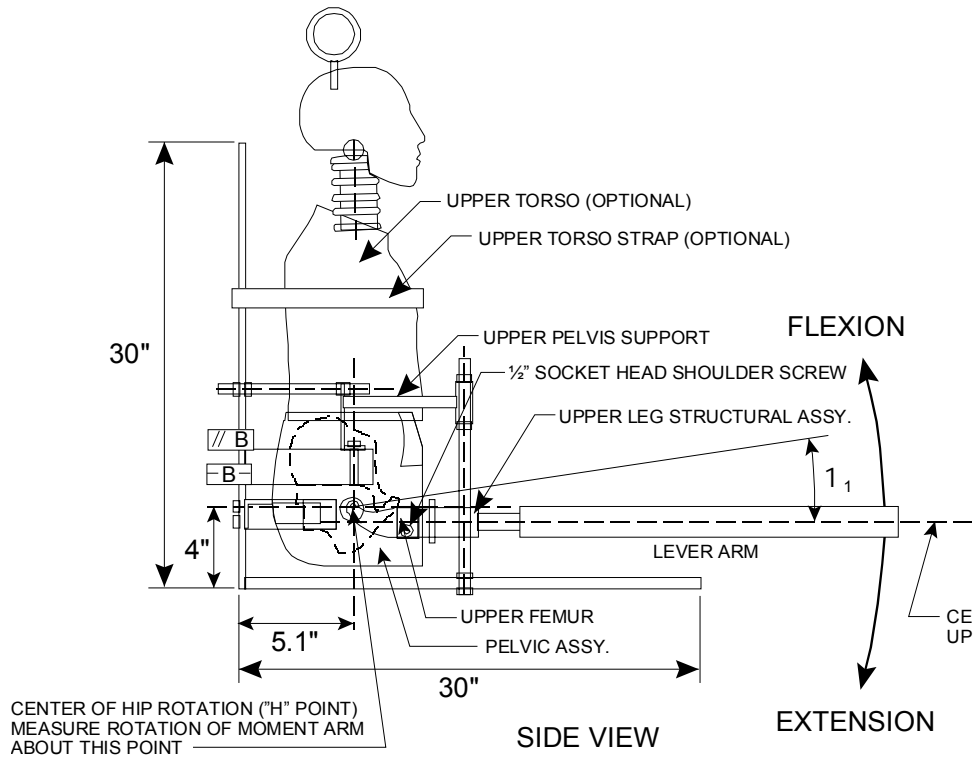


MATERIAL: CRS Steel

FIGURE 18A

12. COMPLIANCE TEST EXECUTION...Continued

HIP JOINT TEST FIXTURE AND TORSO ASSEMBL



HIP JOINT TEST FIXTURE AND TORSO ASSEMBLY

