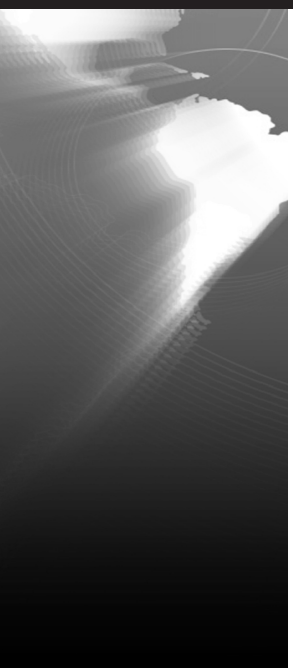
WorldSID 5th Small Female



Technical Product Sheet

The European commission has been supporting new developments in vehicle safety through subsequent framework projects. Worldwide, vehicle safety experts agree that significant reductions in fatalities and injury numbers could be achieved by deploying appropriate passive safety strategies. In an effort to reduce the road injuries, the FP6 Advanced Protection System, APROSYS Integrated Project (IP) developed and introduced critical technologies that improve passive safety for all European road users for prioritized accident types and levels of crash severity.

Under this European commission strategy, the SP5 biomechanics project, one of the nine Sub-projects, was tasked to develop a new WorldSID 5th percentile female dummy. Since the WorldSID 50th percentile dummy was successfully developed with an overall Biofidelity of 7.6 on a scale of 10 according to ISO TR9790, the SP5 decided to scale down the design concepts from the WorldSID 50th dummy to develop this new WorldSID small female dummy.

The first prototype dummy was assembled at the beginning of October 2005. The prototype dummies were evaluated in 2006-2007 by Transport Canada and by the APROSYS members BASt, INRETS, LAB, PDB, TRL and UPM INSIA. Revision 1 was developed in 2007-2008 to address comments from these groups based on the prototype tests.

The revision 1 dummy, SBL B, is comprised of changes in the half arms and the suit (anthropometry and arm biomechanics), the thorax (rib durability, sternum), the abdomen area and the lower legs (mass distribution). Also an optional 2D IR-TRACC was developed to measure deflection in anterior posterior and lateral direction to address thorax oblique loading sensitivity. Further, the internal wiring system was developed to improve connector reliability and durability.

Dummy Features

Head & Neck

The head consists of a molded one-piece PVC skin, polyurethane skull, and an instrument core. The one-piece molded skin and skull provide greater repeatability for both testing and manufacturing. The instrumented core consists of an aluminum core with an accelerometer and a dual axis tilt sensor. The neck was developed based on the EuroSID-2 neck with aluminum discs and rubber end buffers to simulate the dynamic response of the human neck under rotation, flexion and extension conditions.

Shoulders & Arms

The shoulder is represented by a rib module and a shoulder joint to simulate human range of motion. The thorax rib case consists of three rib modules, and the abdomen consists of two rib modules. Each rib module has an inner rib with dampening material and an outer rib to form the contour of a human body. The dummy was designed symmetrical about the middle sagittal plane. Each rib is instrumented with a deflection measurement device, IR-TRACC, and a linear triax accelerometer. Two optional DTS G5 data acquisition units were built inside the spine box. The WorldSID small female dummy features 2D IR-TRACC's as an option to enhance the oblique impact sensitivity.

Lower Torso

The lower torso consists of a compliant polymer pelvic bone structure and a pelvis flesh with PVC skin filled with urethane polymer. This structure simulates a human like mass distribution and stiffness. A flexible lumbar spine was designed to simulate the shear motion between the upper and lower torso.

Half Arm

The half arm consists of a plastic bone, PVC skin, urethane polymer and foam. The design provides additional range of motion for the shoulder. The half arm bone bending characteristic is based on small female biomechanical test data. The half arm is left-right symmetric and features a reference line for set-up purposes.

Leg & Foot

The upper and lower leg consists of PVC skin, urethane polymer with a lightweight metallic bone structure. The femur bone represents an anthropometric Greater Trochanter and the knee provides human-like joint range of motion. The foot and shoe are combined in one piece molded urethane with a composite bone. The ankle joint has rubber elements to represent human-like ankle joint stiffness and range of motion.

Technical Specifications

Weight Specification

Body Segment	Target Mass (kg) (UMTRI	Mass (kg) (WorldSID 5F Rev 1)
Head	3.70	3.66
Neck	0.60	0.54
Thorax (includ-ing h	15.23	15.81
Abdomen	1.61	1.33
Pelvis	6.98	6.98
Upper Legs	11.83	11.83
Lower Legs, Feet & Shoes	6.00	6.61
Suit	1.52	1.52
Pair of Shoes	0.64	-
Total	**48.10**	**48.27**

Instrumentation

Locations	Descriptions
Head	Linear Acceleration (Ax, Ay, Az)
	Rotational Acceleration (Ax, Ay, Az)
Neck	Upper Neck Load Cell (Fx, Fy, Fz, Mx, My, Mz)
	Lower Neck Load Cell (Fx, Fy, Fz, Mx, My, Mz)
Shoulder	Load Cell (Fx, Fy, Fz)
Thorax	Deflection (Dy)
	Linear Acceleration (Ax, Ay, Az)
	Linear Acceleration (Ax on part W5-3156 (alt)
	T1 Linear Acceleration (Ax, Ay, Az)
	T4 Linear Acceleration (Ax, Ay, Az)
	T12 Linear Acceleration (Ax, Ay, Az)
	T12 Rotational Acceleration (Ax)
	5x Rib Deflection (Dy alt)
	5x 2D Rib Deflection (Dy, Dz alt)
	5x Rib Linear Acceleration (Ay on part W5-4040 alt)
	5x Rib Linear Acceleration (Ax, Ay, Az)
Lumbar Spine	Load Cell (Fx, Fy, Fz, Mx, My, Mz)
Pelvis	Sacro-iliac Load Cell (Fx, Fy, Fz, Mx, My, Mz)
	Linear Acceleration (Ax, Ay, Az)
	Pubic Load Cell (Fy)
	Rotational Acceleration (Ax)
Upper Leg	Femoral Neck Load Cell (Fx, Fy, Fz)
	Femur Load Cell (Fx, Fy, Fz, Mx, My, Mz)
	Knee Load Cell In/Outboard (Fy)
Lower Leg	Upper Tibia Load Cell (Fx, Fy, Fz, Mx, My, Mz)
	Lower Tibia Load Cell (Fx, Fy, Fz, Mx, My, Mz)
Static	Temperature Sensor Thorax 3x 2-axis Tilt Sen-sors (Dx, Dy)