

**TESTING**  
**for Soft Hip Protectors**

**Report No. 2**  
**Secure**  
**February 27, 2008**

**Personal Safety Corporation**  
**Cedar Rapids, Iowa 52402**

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## PURPOSE OF TEST

### **Purpose:**

The purpose of this test was to determine the amount of force reduction the usage of Secure Hip Pad, validation of first test results and complete a degradation test through multiple hits.

### **Test Procedure:**

Using drop weight impact system, a weight of 5.2 kg was dropped from a height of 38 cm establishing a baseline impact force of 7,753N. With a simulated ½” soft tissue a baseline impact force of 5,738N (an absorption of approximately 25% of load). After these baselines were established the left and right hip pads were placed on top of the ½” simulated soft tissue and impacted 3 times in different areas of the pad. At 3<sup>rd</sup> impact location hit an additional 5 times.

## PARTS DESCRIPTIONS

### **TEST 2:**

<u>#</u>	<u>MANUFACTURER</u>	<u>PART NAME</u>	<u>PART #</u>	<u>Test ID</u>	<u>DESCRIPTION</u>	<u>GRADE</u>
4	Personal Safety Corp	Female Hip Protector	SHP-S	HIP 4	Pink Ladies	Pass
5	Personal Safety Corp	Male Fly Front Hip Protector	SHP-S	HIP 5	Pink Ladies	Pass
6	Tytex	Hard Shell	07022 1	HIP 6	White Unisex	Pass
7	Posey	Tan Soft	6016M	Hip 7	Tan Unisex	Fail
8	Alimed	Hipshield	Large	Hip 8	White Unisex	Fail
9	Fallgard	Semi Hard	Medium	Hip 9	White Male	Pass

## RESULTS

In Table 1 the complete results are tabulated from first testing. The reduction is calculated from the Soft Tissue Load. Table 2 is summary from first testing done. Table 3 is a reference from results in testing conducted for the paper “Biomechanical comparison of hard and soft hip protectors, and the influence of soft tissue,” authors N.M. van Schoor, A.J. van der Veen, L.A. Schaap, T.H. Smit, and P. Lips appearing in Bone Journal January 2006.

With a hip fracture threshold of an elderly person being 3100N (+/- 1200N) all the hip pads reduced the force below the fracture point.

In Test 2 the average force of Secure fit hip pads were 1760N – 1838N (first hit versus 3 hits). Secure fit were below the lower level of hip fracture level. Posey (2048N) was above the lower edge limits of hip fracture. Alimed performed the worst (2820N) not reducing any impacts below the fracture levels. Fallgard had a semi-hard shell and was slightly better then the Secure Fit results at (1666N). Finally the Tytex hard shell performed the best (1050N) with all impacts, including the repeated hits location, well below the fracture limits.

The degradation of multiple impact in the same location the 3 soft hip pads (Secure Fit, Posey and Alimed) all reduced the force absorption ability putting them in the fracture range (2400N, 2400N and 3400N respectively). The semi-hard and the hard shell hip pads had little change in results and still maintained absorption properties below the fracture limits.

In comparison to the testing (results in Table 2) done in the bone journal, the Secure hip pads are better then the soft hip pads tested and on the high range of the hard hip pad protectors tested.

**TABLE 1**

Test	Hip Pad Description	Color	Side	Force (N)	Peak G's	Velocity (m/s)	Reduction
1	Posey	Tan	left	1935.911	62	2.58	65.4%
				2062.596	63	2.60	63.2%
				2082.391	65	2.61	62.8%
				2339.72	71	2.59	58.2%
				2466.406	73	2.59	56.0%
				2422.858	74	2.60	56.7%
				2403.063	73	2.60	57.1%
				2573.296	76	2.62	54.0%
2	Posey	Tan	right	1955.705	60	2.61	65.1%
				2125.939	65	2.60	62.0%
				2125.939	64	2.60	62.0%
				2315.967	69	2.61	58.6%
				2300.131	69	2.60	58.9%
				2403.063	73	2.58	57.1%
				2470.365	74	2.60	55.9%
				2470.365	73	2.61	55.9%
3	Secure 1	Pink	left	1765.677	51	2.60	68.5%
				2042.801	62	2.62	63.5%
				1848.815	54	2.60	67.0%
				2252.624	67	2.60	59.8%
				2339.72	71	2.60	58.2%
				2486.2	74	2.59	55.6%
				2529.748	78	2.60	54.8%
				2553.502	78	2.60	54.4%

<b>4</b>	<b>Secure 1</b>	<b>pink</b>	<b>right</b>	<b>1678.581</b>	<b>51</b>	<b>2.60</b>	<b>70.0%</b>
				<b>1829.02</b>	<b>56</b>	<b>2.62</b>	<b>67.3%</b>
				<b>1765.677</b>	<b>54</b>	<b>2.64</b>	<b>68.5%</b>
				<b>2189.281</b>	<b>65</b>	<b>2.62</b>	<b>60.9%</b>
				<b>2252.624</b>	<b>71</b>	<b>2.60</b>	<b>59.8%</b>
				<b>2339.72</b>	<b>73</b>	<b>2.62</b>	<b>58.2%</b>
				<b>2403.063</b>	<b>74</b>	<b>2.60</b>	<b>57.1%</b>
				<b>2521.83</b>	<b>78</b>	<b>2.62</b>	<b>55.0%</b>
<b>5</b>	<b>Secure 2</b>	<b>pink</b>	<b>left</b>	<b>1765.677</b>	<b>54</b>	<b>2.62</b>	<b>68.5%</b>
				<b>1785.472</b>	<b>57</b>	<b>2.62</b>	<b>68.1%</b>
				<b>2019.048</b>	<b>64</b>	<b>2.62</b>	<b>63.9%</b>
				<b>2145.733</b>	<b>65</b>	<b>2.64</b>	<b>61.7%</b>
				<b>1912.157</b>	<b>61</b>	<b>2.64</b>	<b>65.9%</b>
				<b>2272.419</b>	<b>71</b>	<b>2.61</b>	<b>59.4%</b>
				<b>2213.035</b>	<b>68</b>	<b>2.62</b>	<b>60.5%</b>
				<b>2315.967</b>	<b>71</b>	<b>2.62</b>	<b>58.6%</b>
<b>6</b>	<b>Secure 2</b>	<b>pink</b>	<b>right</b>	<b>1829.02</b>	<b>58</b>	<b>2.62</b>	<b>67.3%</b>
				<b>1741.924</b>	<b>52</b>	<b>2.60</b>	<b>68.9%</b>
				<b>1979.459</b>	<b>59</b>	<b>2.61</b>	<b>64.7%</b>
				<b>2062.596</b>	<b>63</b>	<b>2.60</b>	<b>63.2%</b>
				<b>2062.596</b>	<b>64</b>	<b>2.62</b>	<b>63.2%</b>
				<b>2169.487</b>	<b>67</b>	<b>2.61</b>	<b>61.3%</b>
				<b>2082.391</b>	<b>66</b>	<b>2.64</b>	<b>62.8%</b>
				<b>2213.035</b>	<b>68</b>	<b>2.60</b>	<b>60.5%</b>
<b>7</b>	<b>Tytex</b>	<b>white</b>	<b>left</b>	<b>958.0581</b>	<b>31</b>	<b>2.57</b>	<b>82.9%</b>
				<b>934.3045</b>	<b>31</b>	<b>2.59</b>	<b>83.3%</b>
				<b>870.9619</b>	<b>28</b>	<b>2.58</b>	<b>84.4%</b>
				<b>1021.401</b>	<b>32</b>	<b>2.59</b>	<b>81.8%</b>
				<b>1128.292</b>	<b>36</b>	<b>2.62</b>	<b>79.9%</b>
				<b>1235.182</b>	<b>39</b>	<b>2.60</b>	<b>77.9%</b>
				<b>1084.743</b>	<b>36</b>	<b>2.58</b>	<b>80.6%</b>
				<b>1148.086</b>	<b>37</b>	<b>2.59</b>	<b>79.5%</b>
<b>8</b>	<b>Tytex</b>	<b>white</b>	<b>right</b>	<b>1064.949</b>	<b>34</b>	<b>2.62</b>	<b>81.0%</b>
				<b>1702.335</b>	<b>52</b>	<b>2.58</b>	<b>69.6%</b>
				<b>1298.525</b>	<b>41</b>	<b>2.59</b>	<b>76.8%</b>
				<b>1148.086</b>	<b>35</b>	<b>2.59</b>	<b>79.5%</b>
				<b>1211.429</b>	<b>38</b>	<b>2.62</b>	<b>78.4%</b>
				<b>1318.32</b>	<b>42</b>	<b>2.62</b>	<b>76.5%</b>
				<b>1381.662</b>	<b>43</b>	<b>2.60</b>	<b>75.3%</b>
				<b>1381.662</b>	<b>42</b>	<b>2.59</b>	<b>75.3%</b>
<b>9</b>	<b>Alimed</b>	<b>white</b>	<b>left</b>	<b>2636.639</b>	<b>82</b>	<b>2.62</b>	<b>52.9%</b>
				<b>2763.324</b>	<b>82</b>	<b>2.62</b>	<b>50.7%</b>
				<b>2890.01</b>	<b>88</b>	<b>2.62</b>	<b>48.4%</b>
				<b>3083.997</b>	<b>95</b>	<b>2.62</b>	<b>44.9%</b>
				<b>3190.888</b>	<b>98</b>	<b>2.62</b>	<b>43.0%</b>

				3210.682	98	2.62	42.7%
				3210.682	97	2.60	42.7%
				3274.025	100	2.60	41.5%
10	Alimed	white	right	2806.873	86	2.62	49.9%
				2826.667	89	2.62	49.5%
				2996.901	93	2.62	46.5%
				3254.23	97	2.62	41.9%
				3361.121	101	2.60	40.0%
				3380.916	102	2.62	39.6%
				3424.464	101	2.62	38.8%
				3507.601	103	2.64	37.4%
11	Fallgard	white	-	1658.786	54	2.63	70.4%
				1638.992	51	2.60	70.7%
				1702.335	55	2.64	69.6%
				1741.924	56	2.62	68.9%
				1741.924	56	2.64	68.9%
				1765.677	56	2.64	68.5%
				1765.677	56	2.64	68.5%
				1741.924	56	2.64	68.9%

	Average 1st hit	Average 3 hits	Degradation	Reduction
Secure Fit	1759.739	1837.598	563.4859	67.2%
Posey	1945.808	2048.08	473.7505	63.4%
Ali,,	2721.756	2820.069	570.744	49.6%
Fallgard	1658.786	1666.70	75.22	70.2%
Tytex	1011.503	1051.42	213.45	79.7%

TABLE 2

Model	Load (N)	Speed (m/s)	Measured G's	Reduction
Secure Fit	1581.5	2.59	52.61	72.44%

TABLE 3

Calibration	7806		
1/2" soft tissue	6378		
<b>Soft hip protectors</b>			
Gerhip	4948		22.42%
Hip Saver	3472		45.56%
Lyds Hip Pro	4423		30.65%
Safety P\ants Finland	5186		18.69%
Safety Pants Netherlands	3415		46.46%
<b>Hard hip protectors</b>			

Hornsby Health Hip	862		86.48%
KPH2	900		85.89%
Safehip – Old	1298		79.65%
Safehip – New	1817		71.51%
Impactwear Hip	2105		67.00%

## DISCUSSION

Testing was conducted with different skin material between test 1 and test 2. This caused a slight difference in energy absorption. The overall test method was validated between tests and calculated expected results.

Tested by: Michael Callahan \_\_\_\_\_  
 Scott Huber \_\_\_\_\_  
 Reviewed by: John Bogler \_\_\_\_\_

# **TEST EQUIPMENT**

## **EQUIPMENT INFORMATION**

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Channel # Apparatus Serial #/ID

1 ACCELEROMETER GE557

Sampling Rate: 10,000 Hz

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Channel # Apparatus Serial #/ID

2 L.V.D.T. LD610

Sampling Rate: 1,000 Hz

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Channel # Apparatus Serial #/ID

1 5,000lb Sensotec Load Cell Serial Number 984923

Sampling Rate: 10,000 Hz