

seasonal changes in the pavement as well as changes in ambient temperature.

Additionally, NHTSA performed a study using the same 4Runner and Blazer mentioned above for J-Turn and Fishhook tests at Daimler Chrysler's

Arizona Proving Grounds (APG) and General Motors Desert Proving Grounds (DPG) as well as TRC of Ohio, where our maneuver test development has been conducted (NHTSA Technical Report "Testing to Determine the Effects of

Surface Variability on Dynamic Rollover Testing", docketed with this notice).

Table 3 shows the peak and slide braking coefficients (multiplied by 100) measured at these facilities.

TABLE 3.—FRICTION NUMBERS FOR ALL TEST FACILITIES

Test facility	Peak braking coefficient		Skid number	
	Dry	Wet	Dry	Wet
TRC .....	94–96	69–83	81–84	47–54
DPG .....	86–93	74–77	83–85	60–64
APG .....	90–93	75–80	81–84	56–59

Table 4 shows the results of the maneuver tests. As in Table 2, the vehicles were loaded with the equivalent of a 2-occupant load, like the light load condition of the 25 vehicle test. The 4Runner did not tip up at TRC and it did not tip up at the other facilities. The Blazer did not tip up in the J-Turn at TRC, but it did at the other

facilities. We do not think that this is a result of the surface coefficient of friction (due to the similarities of the ranges) but rather due to the greater degree of vertical irregularities and pavement cracks at DPG and APG than at TRC. Tip-up is often triggered by vertical oscillations of the vehicle suspension during high cornering forces

in maneuver tests. DPG had the most vertical surface irregularities that caused the Blazer to tip up most easily. The Blazer tipped up in the Fishhook at TRC, and it also tipped up in the Fishhook at the other facilities. Again, the tip-up speeds were lower at APG and DPG, which would be expected due to the greater surface irregularities.

TABLE 4.—RESULTS FROM NHTSA J-TURN AND FISHHOOK TESTS

Test vehicle and configuration	Test maneuver	Test facility	Commanded handwheel angle, deg	Initial steer left		Initial steer right	
				Moderate or major lift	Maneuver entrance speed, mph	Moderate or major lift	Maneuver entrance speed, mph
				Yes/No		Yes/No	
Toyota 4Runner, VSC enabled	NHTSA J-Turn <sup>1</sup>	TRC	354	No	58.21	No	59.29
		DPG	402	No	61.56	No	61.21
		APG	362	No	61.68	No	62.11
	Fishhook <sup>2</sup>	TRC	287	No	48.75	No	50.13
		DPG	327	No	53.05	No	50.94
		APG	294	No	52.63	No	51.44
Toyota 4Runner, VSC disabled	NHTSA J-Turn <sup>1</sup>	TRC	354	No	60.4	No	60.00
		DPG	402	No	60.97	No	61.63
		APG	362	No	62.38	No	62.27
	Fishhook <sup>2</sup>	TRC	287	No	49.84	No	49.79
		DPG	327	No	52.20	No	51.93
		APG	294	No	51.04	No	51.14
Chevrolet Blazer	NHTSA J-Turn <sup>1</sup>	TRC	401	No	60.90	No	62.27
		DPG	382	Yes	49.80	Yes	44.90
		APG	395	Yes	57.36	Yes	58.68
	Fishhook <sup>2</sup>	TRC	326	Yes	40.32	Yes	40.09
		DPG	311	Yes	37.80	Yes	38.01
		APG	321	Yes	35.52	Yes	38.54

<sup>1</sup> NHTSA J-Turn maximum nominal entrance speed is 60 mph.

<sup>2</sup> Fishhook maximum nominal entrance speed is 50 mph.

We recognize the potential difficulties caused by changes in surface friction coefficient, and we have tried to minimize them. We have observed the Fishhook maneuver to be less sensitive to surface conditions than the J-Turn, and we have used changes in vehicle load condition rather than changes in tip-up speed to signify degrees of test severity in a way least likely to be

influenced by surface coefficient. None of the changes of pavement and temperature in our test experience has caused a change in the Fishhook result (tip-up or no tip-up) for a vehicle. We believe the comments based on computer simulation overstate the sensitivity observed in our actual tests.

#### G. Steering Reversal

Honda commented that using a roll rate measurement within 1.5 degrees/sec of a zero crossing as shown in Figure 2 to trigger the reverse steering in a fishhook maneuver occasionally leads to an unusually long dwell time (T<sub>1</sub>) for certain vehicles at certain load conditions. It suggested setting a default value for dwell time to force a reverse