OUTDOOR POWER EQUIPMENT INSTITUTE

June 15, 2011

Ms. Caroleene Paul
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U.S. Consumer Product Safety Commission
4330 East West Highway
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Dear Ms. Paul:

This letter, submitted on behalf of the OPEI/ANSI B71.9 Committee (the "Committee"), addresses CPSC Staff's comments to the second canvass draft of ANSI/OPEI B71.9-20XX, *American National Standard for Multipurpose Off-Highway Utility Vehicles* ( the "MOHUV Standard"). Your letter raises four issues: the acceptance criteria for the J-Turn test; the desire for a steering gradient test with criterion; the absence of a passenger car type seat belt warning requirement; and the lack of testing procedures and performance requirements for side retention devices. Each of these items is addressed below.

A. Acceptance Criteria for the J-Turn Test

The Committee's determination to apply a J-Turn test was based upon its members' experiences with various types of dynamic testing, a review of the ROV IDIs [1], and testing conducted by SEA on various off-road vehicles. The Committee has also more recently considered the data contained in the recent April 2011 SEA Report.

[1] A review of these IDIs is contained in the Committee's March 15, 2010 letter to the CPSC in Docket No. CPSC-2009-0087.

The Committee presented its proposed standard for dynamic testing to the CPSC on November 2, 2010. This was a J-Turn test at curb weight plus operator and one passenger with a 20 MPH test speed, a 180 degree hand wheel steer input ("HWS"), an input rate [2] of 500-600 degrees/sec, and an acceptance criterion of no two wheel lift above 2 inches. The J-Turn test is described in Section 8.8 of the MOHUV Standard. The Dynamic Test as defined in the draft standard represents a very straightforward, simple procedure that includes the effects of vehicle stability, steering ratio, steering gradient, suspension and tire reactions, and operator capability.

The Committee's main objective was to select a verifiable and repeatable test that was also based on real world setup and input. The curb weight reflects the most common load case in the CPSC IDIs. Likewise, the test requirement for operator and one passenger represents the majority of appropriately occupied cases in the CPSC IDIs. The inputs to the dynamic test (vehicle speed and hand wheel steer angle) create a test which would establish a threshold above the level where many rollovers occurred in the CPSC IDI data. The Committee selected the input speed of 20 MPH on the basis of an examination of the accident scenarios in the CPSC IDIs where a lateral rollover was identified and speed prior to rollover was recorded. For example, there were 22 reports in the SEA IDI summary of lateral rollover accidents with one particular vehicle model where vehicle speed was identified. Of those, 18 were at speeds at or below 20 MPH. Additionally, the 180 degree steering input and specified steering rate is essentially the limit of what an operator could reasonably apply to a vehicle. The steering rate was verified by studying available test data to determine a reasonable value based on test driver input. The vehicle speed and hand wheel steer angle inputs will be repeatable from test to test and from test operator to test operator.

One of the issues the Committee considered was whether the acceptance criteria should include lateral acceleration in addition to two wheel lift. The primary advantage of two wheel

[2] The input rate has since been revised in the draft standard to a requirement that steering wheel input be completed in 0.3 to 0.5 seconds.

lift as the acceptance criteria is that it can be verified visually and is repeatable. The problem with including a single lateral acceleration value is the likelihood of inconsistent results, even when the tests are run with the same vehicle.

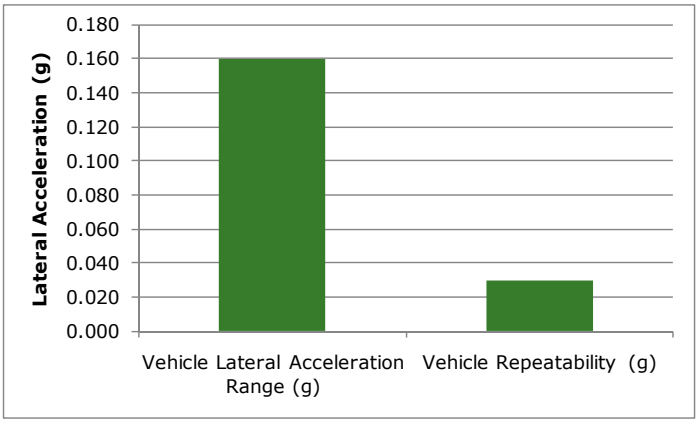
The variability associated with lateral acceleration data has three main components: vehicle response, instrumentation, and driver input. Variability in vehicle response is caused by tire to ground interaction and damper response. Instrumentation inconsistency can be caused by dynamic input, whether it is GPS or accelerometer based, and the location of the instrumentation on the vehicle. The speed and steering input required to attain a specific lateral acceleration response may vary from driver to driver and from test to test. An additional complicating factor is that there are different techniques for post processing of the collected data which could result in additional variation in reported numbers. These potential problems would make it difficult to designate a single lateral acceleration value that would correspond with two wheel lift over many different vehicles and many different test setups.[3]

In order to study this issue, SEA conducted drop throttle testing on a vehicle in an operator and passenger configuration with the same outrigger design and weight used in the SEA/CPSC testing. This was done with an input speed resulting in two wheel lift, a 500 deg/sec input rate and a 180 degree hand wheel angle turn. This data was presented to the CPSC on November 2, 2010, although the baseline lateral acceleration was not identified. In this testing SEA reported the following results for 6 coast and turn runs with a 500 HWS with two wheel lift:

[3] The speed and steering inputs were as consistent as technically foreseeable during the SEA conducted tests because of the robotic steering system.

| Direction | Run # | Test Type | Max Ay (g's) | Input Velocity (mph) | HWS Input Rate (deg/sec) | Comments |
|---|---|---|---|---|---|---|
| R | 115 | C&T - 2 | 0.7 | 27 | 500 | 2WL |
| R | 116 | C&T - 5 | 0.71 | 27 | 500 | 2WL |
| R | 117 | C&T - 11 | 0.73 | 27 | 500 | 2WL |
| | | Range | 0.030 | | | |
| | | Standard Deviation | 0.015 | | | |
| | | 3*Std Dev | 0.046 | | | |

| Direction | Run # | Test Type | Max Ay (g's) | Input Velocity (mph) | HWS Input Rate (deg/sec) | Comments |
|---|---|---|---|---|---|---|
| L | 137 | C&T - 2 | 0.67 | 26 | 500 | 2WL |
| L | 138 | C&T - 5 | 0.68 | 26 | 500 | 2WL |
| L | 139 | C&T - 11 | 0.7 | 26 | 500 | 2WL |
| | | Range | 0.030 | | | |
| | | Standard Deviation | 0.015 | | | |
| | | 3*Std Dev | 0.046 | | | |




The testing showed that there is a 0.03 range of acceleration values when measuring one vehicle with a common instrumentation set-up. This accounts for 19% of the total range of lateral acceleration at two wheel lift of the 11 vehicles measured by the CPSC. This variation is from a test using the same vehicle with as many of the previously mentioned variables controlled as possible. If other variables are included the variation would conceivably be higher than 19%. This percent of variability versus the measurement is too high for a required standard test. Based upon the data that has been reviewed, the Committee concluded that lateral acceleration was not a robust criterion for acceptance and that two wheel lift was more accurate and repeatable.

The Staff had two comments in its April 2011 letter with respect to the acceptance criteria in the MOHUV Standard. The first was that that some vehicles with high rolling resistance and low sensitivity steering may be accepted by this test and still have inferior lateral

stability characteristics. From the SEA report, the Committee was unable to identify any vehicles with high rolling resistance and low sensitivity steering but inferior lateral stability characteristics that one could reasonably conclude would pass the J-Turn test in the MOHUV Standard. The Committee would like to review any CPSC data supporting the Staff's concern that a vehicle with inferior stability characteristics would comply with the MOHUV Standard.

The Staff has also suggested that a more meaningful test would be based upon a lateral acceleration value at the point of two wheel lift and that such an acceptance value can be determined. The Committee disagrees for two reasons. First, as noted above, the lateral acceleration value is not consistent over different runs with the same vehicle. This potential variation in test values is too large to accept a single point as a valid acceptance criterion. Second, any "relevant value for minimum lateral acceleration at two-wheel lift" must be supported by empirical data. The Committee cannot assign a fixed value based on a value it or the Staff might believe is acceptable such as the lowest lateral acceleration value reported for Vehicle D (0.625). There must be data supporting the conclusion that a higher or lower value has a direct impact upon the likelihood of a rollover. The Committee is unaware that such empirical data exists. If the Staff has additional data to support a particular lateral acceleration value for MOHUVs and it is inconsistent with the variability reported by the SEA, the Committee would welcome the opportunity to review it.

B. The Constant Radius Test

The April 2011 letter indicated Staff's opinion that the MOHUV Standard should include a test measuring steering gradient. Presumably, the Staff was referring to a SAE J266 type constant radius test, which is intended for on-road vehicles.

The Committee believes that MOHUV manufacturers should be encouraged to design them for the best handling characteristics in the off-road environment and not be subjected to test

and acceptance criteria intended for an on-road class of vehicles. The differences in front vs. rear side slip angle during steady-state (constant throttle) driving on a specified paved surface (per SAE J266) are not correlated to driving in an off-road environment and does not represent how MOHUVs will perform on various and constantly changing surfaces, at various speeds, and in turns of different radii. Moreover, steady-state steering gradients will vary with the selected drive mode (i.e. 2wd, 4wd, locked/unlocked front/rear differential) or load condition (e.g. with/without passengers or cargo) and the steady state SAE J266 type test has no correlation to transient steering events where the operator is accelerating, decelerating, or braking, as is the case in the majority of the CPSC's IDIs.

It would be helpful for the Committee to understand the technical basis for the CPSC Staff's belief that a steering gradient criterion correlates with an elimination or reduction of injuries. If it is the Staff's intention to correlate vehicle overturns to vehicles that exhibit steady state oversteer on a paved surface, the Committee is unaware of any factual (i.e., accident or test) data or vehicle dynamics theory that supports that conclusion.

C. Occupant Protection

1. Seat Belt Reminder

The Staff has commented that there should be a seat belt warning system dependent upon the latch status of the seat belt similar to that required for on-road passenger cars. The Committee recognizes the importance of seat belts. However, substantial experience by several Committee members with automobiles (closed vehicles) has shown a strong tendency for seat belt latch receivers to become contaminated with a wide variety of detritus, including dust, lint, food, and mechanical obstructions. Open vehicles, such as MOHUVs would be subject to even greater levels of environmental contamination, as well as directly exposed to wet and freezing conditions. This could affect the reliability of the entire warning system. The Committee

believes the warning light as proposed, in combination with the seat belt reminder messages on vehicle labels and the Owner's Manual, represent a viable approach. It will, however, consider in a future revision of the standard whether sufficient information can be developed to allay its concerns in order to modify the standard.

2. Occupant Side Retention Devices

The Staff has suggested, based upon its review of incidents involving recreational off-highway vehicles (ROVs), that OPEI members conduct vehicle rollover simulation tests on MOHUVs to develop performance-based occupant protection systems where seat belts have been used. Given the differences in MOHUV vehicle design and the fact that they are intended for a range of users and uses, the side retention solution needs to be appropriate for the intended use. The intent of the Committee is to not be design prescriptive but to allow for design flexibility and individual testing in meeting the MOHUV Standard requirement. As design solutions evolve, the Committee can consider more detailed requirements for future revisions to the standard if needed.

As acknowledged by CPSC Staff, the draft MOHUV Standard includes significant changes and the Committee believes these changes are most appropriate for the MOHUV class of vehicles while also being responsive to concerns identified in the CPSC IDIs. The Committee would be willing to discuss any of the information contained in this letter with Staff.

Respectfully submitted,

Kathleen M. Woods