NPRM 214
SIDE IMPACT PROTECTION

Federal Motor Vehicle Safety Standard (FMVSS) 214 was established in 1971. It began as a quasi-static test in which a rigid 12-inch diameter cylinder is pressed against the side of the vehicle to test how well it resists intrusion. This is performed by loading the side structure of a vehicle with the cylindrical form while measuring the force-deflection characteristics. The compliance criteria are based on the force-deflection characteristics measured during the first 18” of crush.

The National Highway Traffic Safety Administration (NHTSA) added a dynamic compliance test for cars in 1990. This test uses a 3,000-pound moveable deformable barrier to evaluate how well cars respond to an actual lateral impact.

In May 2004, a Notice of Proposed Rulemaking (NPRM) was issued to upgrade the dynamic portion of FMVSS 214 - Side Impact Protection.

There are two dynamic tests proposed: 32 kph (20 mph) 75 degree Rigid Pole and 54 kph (33.5 mph) Moving Deformable Barrier (MDB). Both of these tests use the SIDII-S-FRG (5th percentile) and ES-2re (50th percentile) dummies. These are two new side impact dummies with improved injury measurement capabilities and more human-like response.

Side impacts are a leading source of motor vehicle deaths and severe injuries. More than one-third of serious to severe injuries sustained each year by occupants in passenger vehicle crashes are the result of side impacts. The safety problem of side impact crashes has become more acute over the past decade because of the rapid, disproportionate growth in the popularity and market share of light trucks and vans (LTVs), particularly sport utility vehicles (SUVs). Even though LTVs are still only one-third of registered passenger vehicles, about half of all deaths in side impact crashes are the result of crashes in which an LTV strikes another vehicle.
The upgraded MDB test will be effective four years after publication of the final rule with no proposed phase-in. The MDB test applies to vehicles with a GVWR of 2,722 kg (6000 lbs) or less.

The oblique pole test will be implemented through a three year phase-in process beginning four years after the publication of a final rule. The oblique pole test applies to vehicles with a GVWR of 4,536 kg (10,000 lbs) or less.

### Component Level Interior Impact Testing

Based on customer requests, component-level door trim impacts have become common tests at MGA's laboratory in Troy, Michigan. These testing configurations try to replicate the energy absorbed by the door trim in full-vehicle crash tests, such as the dynamic FMVSS 214. Depending on the specification, tests have been conducted with a mass range of 10 lbs to 60 lbs, and an impact velocity of 6 mph to 25 mph. MGA’s Fabrication Center in NY has supported these projects with custom impact forms built according to the test specifications (as shown below). The impact form usually represents a human (ATD) shoulder, abdomen, or pelvis. These impact forms are mounted to the end of a linear impact piston, with accelerometers mounted inside the piston end. The instrumentation measures the impactor acceleration and is then used to calculate the force and energy of the event.

This type of testing can either examine the properties of the entire door, or just the interior door trim. In order to test only the door trim, the door frame must be made rigid. This can be achieved in one of two ways: either the outer layer of the sheet metal door can be cut and reinforced with epoxy, or the inner sheet metal door layer can be fabricated with an epoxy mold from computer-aided design data. These two options are accurate methods of creating a rigid door for trim evaluation. MGA has been working with Nationwide Design and Prototype for the door molds in order to meet the needs of the customer.

If you need dynamic testing performed, including door trim impacts, please contact us by e-mail (david.gotwals@mgaresearch.com) or call directly at (248) 577-5001.
Anthropomorphic Test Dummies

The NHTSA proposes using two new side impact dummies for these tests: the ES-2re 50th percentile male and the SIDII-FRG 5th percentile female. The current FMVSS 214 regulation uses the Side Impact Dummy (SID) 50th percentile male. The ES-2re is more human-like and offers more injury measurement capabilities than the SID. The SIDII-FRG provides a tool to evaluate protection of small stature occupants.

ES-2re 50th Percentile Male

The ES-2re is an upgraded version of the EuroSID-1 test dummy that is used in ECE Regulation 95 and European Union (EU) directive 96/27/EC for side impact testing.

SIDII-FRG 5th Percentile Female

The development of the SIDII began in 1993 due to the need for a small statured dummy to evaluate the performance of side airbags. The NHTSA Vehicle Research and Test Center helped to develop floating rib guides (FRG) to help keep the ribs in place during testing. The NHTSA continues to evaluate the FRG through research testing.

214 Quasi-Static

Quasi-static tests were recently performed on vehicles from the mobility industry. This testing was conducted to determine if the modifications made to them comply with the FMVSS 214 static side impact protection standard.

These vehicles have modified structural features, including lowered floors. Lowering the vehicle’s floor increases both the door entry height and the interior headroom. This newly acquired interior area within the vehicle can vary greatly from model to model.

In addition to the increased door entry height and interior headroom, lowered floors offer an excellent line of sight for the wheelchair occupant. The lowered floor changes the dynamics of side impact and must be tested to prove FMVSS 214 compliance.

<table>
<thead>
<tr>
<th>Injury Criteria</th>
<th>SAE J211 CFC</th>
<th>ES-2</th>
<th>SIDII-FRG</th>
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<td>HIC&lt;sub&gt;36&lt;/sub&gt;</td>
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<td>&lt; 1000</td>
<td>&lt; 1000</td>
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<tr>
<td>Thorax Deflection</td>
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<tr>
<td>Res. Lower Spine Acc.</td>
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<td>&lt; 82 g’s</td>
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<td>Summed Abd. Force</td>
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<tr>
<td>Pubic Symphysis</td>
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<td>&lt; 6000 N</td>
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<tr>
<td>Summed Acetabular &amp; Iliac Force</td>
<td>600</td>
<td>&lt; 5100 N</td>
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</tbody>
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Reducing Traffic Deaths

Friends often ask, “How many people are killed annually in traffic accidents?” My answer is a little over 40,000 (in ‘04 42,800 were killed). This is a number which is hard to grasp, but it means that on average about 800 traffic deaths occur each week. Or, over 100 per day, or about one every 15 minutes.

About 31,500 passenger vehicle occupants were killed last year. The remaining fatalities involved heavy trucks, buses, motorcyclists and pedestrians. Because of the high proportion of vehicle occupant deaths, the National Highway Traffic Safety Administration (NHTSA) continues to upgrade safety standards for passenger vehicles. An important example is the upgrade to the side impact standard (FMVSS 214) that is discussed in this issue.

The most noticeable change in future vehicles will be the addition of airbags which protect the occupant’s head. The purpose of the head air bag will be to provide a cushion between the head and other objects during side collisions. Although this standard upgrade is an important initiative, its effect on highway deaths will be modest. It is estimated that annual traffic deaths will be reduced by 700-1000.

One of the more interesting results in analyzing the ‘04 accident data is the effect seat belt usage appears to have on fatalities. During the ‘04 year, 56% of all passenger vehicle deaths were with people not using the available seat belt. It is believed that between 70% and 80% of vehicle occupants now use seat belts. This means that over one-half of the deaths occur within about the one-fourth of the population that does not use seat belts.

If seat belt usage were 100% and all other factors were equal to that for seat belt users, then an estimated reduction of 11,000 to 14,000 deaths annually could be expected. This reduction would take place with no additional cost by just changing some individuals’ behavior. Although upgrades in safety standards will be helpful in reducing traffic deaths, the most important contribution each of us can make is to use seat belts.

So, when friends ask about the number of traffic deaths, I also point out that they can help reduce the number by using seat belts and by encouraging others to do the same.