

WORKING DRAFT HFCV GTR - 8-11-09

Work assigned on page 20:

Japan will provide a risk assessment to justify all three following components for each container: main shut off valve, a container check valve (=container non-return valve) and a container safety valve (= pressure relief device)

Report by Japan:

Crash test conditions (speeds, impact points, impact directions) represent those that are statistically most likely to be encountered in crashes based on data on many traffic accidents in various regions. These conditions are representative from the standpoint of occupant protection and do not fully address all the conditions from the standpoint of fuel leakage. To avoid the risk of hydrogen leakage to the most possible extent, it is essential to include both crash test procedures (performance requirement) and the “main shut off valve, PRD, and container non-return valve shall be mounted directly on each container” provision (installation requirement).

In Japan, fuel leakage in crashes is tested in four directions: front, offset, side, and rear. The front, offset, and side crash tests are conducted primarily for the purpose of occupant protection (fuel leaks are checked at the same time), whereas the rear crash test is conducted solely for the purpose of fuel leak check. Comparison of impact directions between these tests and actual traffic accidents that occurred in Japan in 2005 shows that the tests cover 80% of the actual directions, but not all.

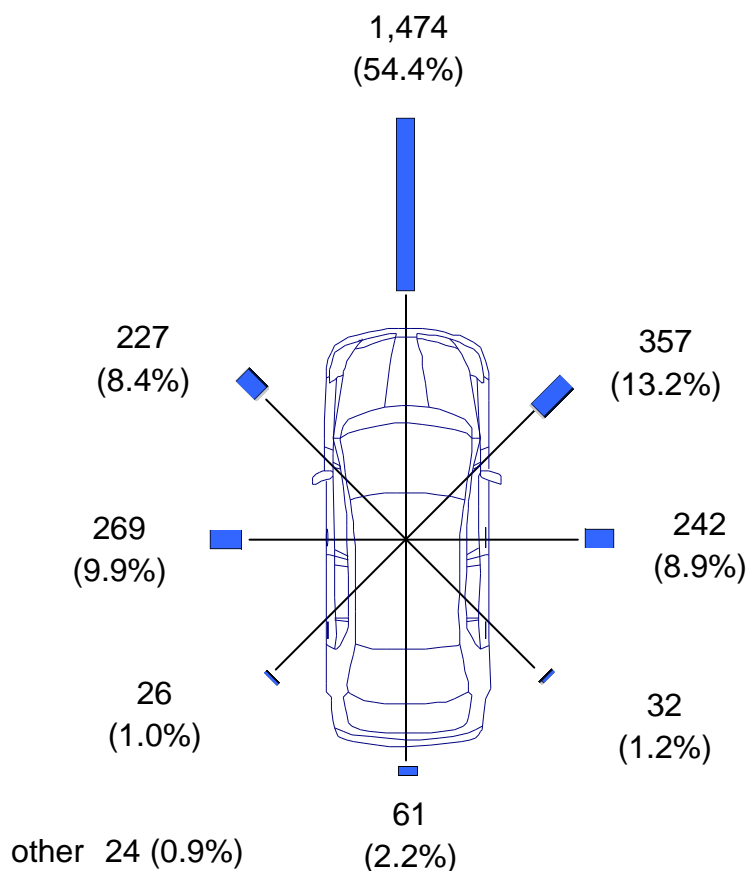
When a crash occurs at a speed higher than the test speeds or when actual impact points differ from those in the crash tests even if the speed is lower than the tests, it is possible that hydrogen will leak in an amount that exceeds the limit. This clearly indicates that the crash tests cannot cover all the real-world accidents.

Some provision other than crash testing is necessary for addressing real-world crashes around fuel containers that cannot be fully covered by the crash tests; in particular, for avoiding, to the most possible extent, the risk of hydrogen leakage at high-pressure portions where there is no way to stop a leak once it occurs.

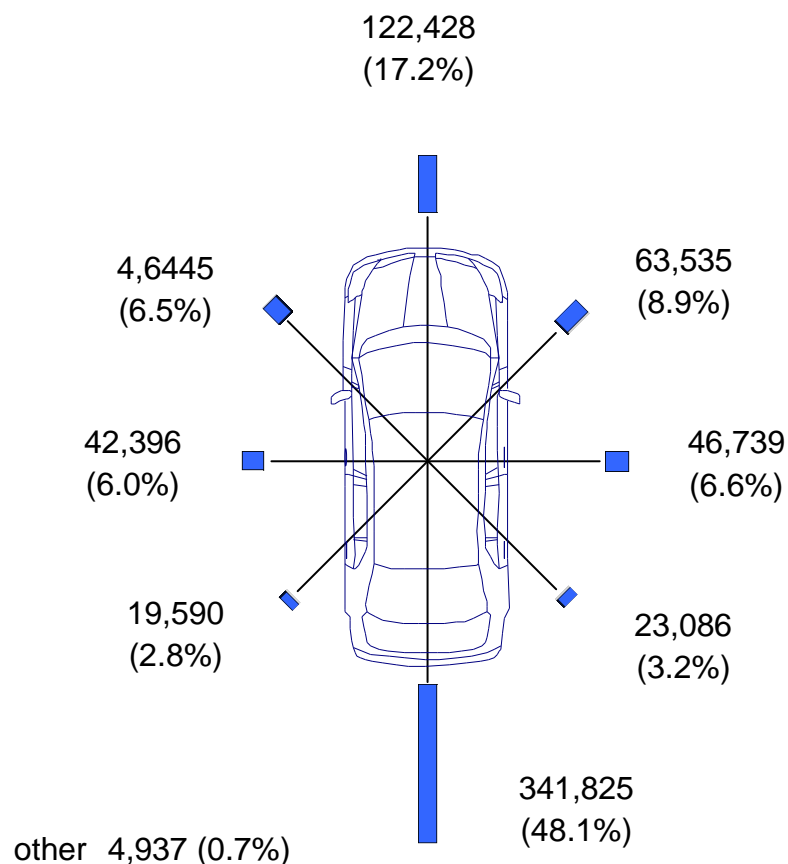
The real-world safety should come first. If the performance requirement is not sufficient, we should supplement it with an effective installation requirement and/or functional requirement.

Analysis of the Collision Direction Based on Traffic Accident Data (2005 Japan)

Fatalities (n = 2,712)

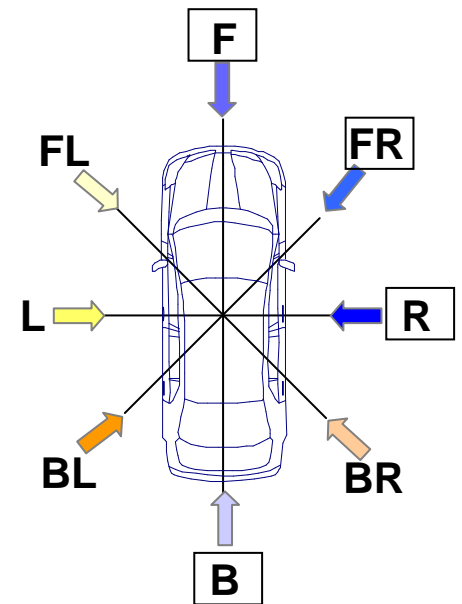
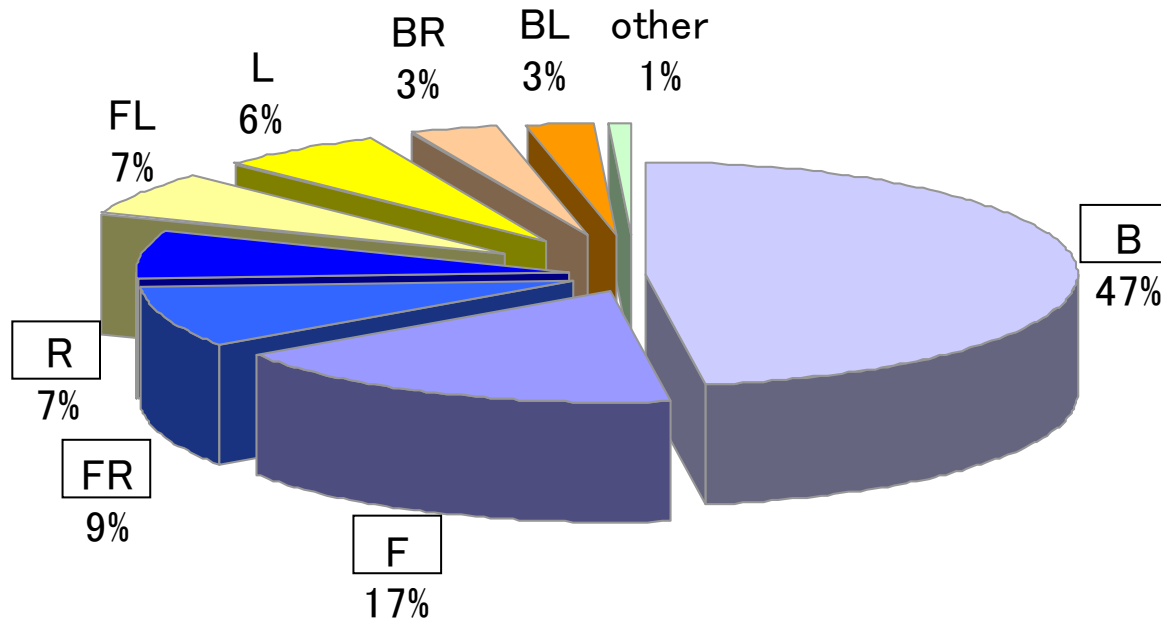


The injured (n= 701,981)



Impact Directions in Tests and Actual Traffic Accidents

Fuel leakage in crashes is tested in the three directions (front, offset, and side), plus the fourth direction (rear), as indicated by squares below. Comparison of directions between these tests and actual traffic accidents shows that the tests cover 80% of the actual directions, but not all.



Risks in Using One Main Shut off Valve, Container Non-Return Valve and/or Pressure Relief Device in Common on More than One Container

In the case of multiple containers linked together, for example, such as the one in the photo below, if they are designed to have only one main shut off valve or have only one container non-return valve, and especially if the container non-return valve is installed far from the containers (as shown in the figure below), hydrogen will leak when a pipe breaks or a joint becomes loose in a crash, etc. There is absolutely no way to stop this leak. To avoid these risks, the installation requirement “main shut off valve, PRD, and container non-return valve shall be mounted directly on each container” is inevitable.

