



Motorcycle Standards Comparison - Snell *and* DOT

There are two organizations setting safety standards for motorcycle helmets in the United States, the Federal Government's Department of Transportation (DOT) and the Snell Memorial Foundation. DOT sets minimum standards that all helmets sold for motorcycling on public streets must meet. The standard is Federal Motor Vehicle Safety Standard 218 (FMVSS 218) and is known commonly as the DOT helmet standard.

The Snell Memorial Foundation is a private not-for-profit organization that sets voluntary standards for motorcycle helmets, bicycle helmets and auto racing helmets, as well as other kinds of protective headgear. Snell Standards are the world's toughest. We demand quite a bit more protective capability in helmets than anybody else on the planet.

The table that follows compares the most significant parts of the Snell and DOT Standards, the impact testing. There are other tests in the standards but a helmet's impact performance determines what will happen when a motorcyclist goes headlong into the pavement.

Both Snell and DOT position the helmet on a test headform and then drop that helmeted headform through a two guided falls onto a fixed steel anvil. The test is repeated so that each helmet is impacted on at least four different sites on its surface against either a flat or hemispherical shaped anvil. Snell testing also impacts the helmet against a steel edge anvil that may simulate the edge of a sign stanchion or guardrail. The differences are in impact severity and impact criteria. How big an impact must the helmet withstand and how do the testers determine that the helmet actually withstood the impact.

The severity of an impact can be expressed in terms of how much mechanical energy is generated during the event. The amount of energy is dependent upon the speed or velocity of the head at the moment of impact and it's mass or weight. In helmet testing, the higher the fall or the heavier the headform, the more severe the impact. Since there is always some frictional loss in the test equipment, both Snell and DOT require that the headform velocity be measured just before the helmet impacts the test anvil. Snell measures impact severity in terms of energy, the mass of the headform times the square of the impact velocity divided by two. The table shows the impact energy in joules for anvil type and headform size for each standard. Snell requires that helmets withstand substantially larger impacts than DOT.

Impact criteria tell the testers how to interpret test results. Ancient wisdom has it that it's not the fall that does the damage, it's the sudden stop. Both Snell and DOT measure the suddenness of the stop with an accelerometer, a device used to measure acceleration or in this case deceleration, that is mounted inside the headform. When the helmet smacks into the anvil, the accelerometer measures the headform deceleration throughout the duration of the impact event. This acceleration pulse is generally plotted as G's versus milliseconds where one G is equal to the acceleration due to gravity on the surface of the earth. The testers analyze the acceleration pulse to determine whether the helmet passed or failed the test.

Snell and DOT use different methods to analyze these pulses. Snell limits the peak value to 300 G's. The DOT Standard requires that the peak acceleration not exceed 400 G's but they also put duration limits on the acceleration pulse. The period of time for which the pulse exceeds 200 G's must not be longer than 2 milliseconds. The period of time for which the pulse exceeds 150 G's must not be longer than 4 milliseconds. Snell, among others, questions the validity of these duration criteria. They were taken directly from a ANSI motorcycle helmet standard in 1972. The ANSI standard committee had developed the criteria for testing on an altogether different test device that was already being superseded at the time. After the DOT standard was drafted, the ANSI committee modified their duration criteria for compatibility with current impact test equipment.

DOT never accepted the modification. When the DOT draft was first prepared, DOT expected to make extensive changes in the criteria after its first eighteen months of operation. The 400 G peak and the duration criteria were to have been discarded in favor of the head injury criterion (HIC) as described in another DOT standard, FMVSS 208. However this never came to pass, instead a measure intended to serve only a year and a half has remained in place for over twenty-five years.

There are also administrative differences between Snell and DOT. Snell Certification means that Snell technicians in Snell labs tested samples of the helmet to Snell Standards before the helmet was certified. Furthermore, as a condition of certification, Snell regularly buys samples of all Snell certified products and brings them into our lab for follow-up testing.

DOT certification is done on the honor system. The helmet's manufacturer determines whether his helmets satisfy DOT and then claims the qualification for himself. There is not even a reporting requirement. The government does contract for some spot check testing at commercial and private labs but not very much. In recent years much of their effort has been spent against so-called beanie helmets that are obviously substandard and are worn only by helmet law protesters.

Around 1990 a few magazine articles appeared questioning whether Snell certified helmets met the DOT standard. Some went as far as claiming that it was impossible to meet both standards with the same helmet but others were more cautious and said only that meeting both was very difficult.

In fact, Snell certified helmets do meet DOT. If you want to be sure that your helmet meets the DOT standard, get a Snell certified helmet. Manufacturers apply for and earn Snell certification because they care about quality. These are the very manufacturers for whom the honor system works. A Snell sticker is your best assurance that the helmet meets both Snell and DOT. Without our sticker, it's purely a gamble that the helmet meets any standard at all.

ITEM	DOT FMVSS 218	SNELL M-95/M2000
<i>Impact Severity</i>		
Flat Anvil	S - 63 J / 63 J M - 90 J / 90 J L - 110 J / 110 J Nominal Fall 1.83 m	All Sizes 150 J / 110 J Nominal Fall 3.06 m and 2.3 m
Hemispherical Anvil	S - 47.3 J / 47.3 J M - 67.6 J / 67.6 J L - 82.5 J / 82.5 J Nominal Fall 1.38 m	All Sizes 150 J / 110 J Nominal Fall 3.06 m and 2.3 m
<i>Impact Criteria</i>		
Allowed Peak Acceleration	400 G	300 G
Allowed Duration Requirement	2 ms over 200 G 4 ms over 150 G	N/A
<i>Test Equipment</i>		
Impact Test Rig Type	Monorail	Twin-Wire or Monorail
Headforms	Variable Weight DOT configuration S = 3.5 kg M = 5.0 kg L = 6.1 kg	Uniform Weight - 5 Kg ISO Standard Headforms A, E, J, M, O

Want more detail? -- [Comparison of M2000, DOT FMVSS 218 and EN Regulation 22 \(European\)](#)

