

Motorcycle Skidding (rear only vs front & rear)

When reconstructing motorcycle accidents, the nature of the pre-impact skid mark left by the motorcycle is of much interest. By examining this skid mark closely, a trained investigator can tell what type of braking was performed by the motorcycle driver. This is important when attempting to accurately calculate the speed of the motorcycle. If during the skidding only the rear brakes were applied, the motorcycle would skid much further than if at the same time the driver also applied front brakes.

Recent VCE, Inc. testing showed that at 40mph on dry asphalt, a motorcycle (with rear wheel skidding only) skidded to a stop in 166 feet, but when the same motorcycle also used (moderate to heavy front wheel braking), the skid distance was shortened to 94 feet.

Typical drag factors for motorcycles (rear wheel braking only) is approximately .40 to .50 of that of a car skid. For instance, if the car has a drag factor of .7g's the motorcycle on the same surface with (rear braking only) will have a drag factor of .28g to .35g's. If the same motorcycle has front brakes applied heavily at the same time the rear wheel is skidding, the drag factor can approach or even be higher than the .7 drag factor of the car. While this higher drag factor is possible, it

takes a very experienced motorcycle driver to apply the front brakes hard enough to obtain it without locking the front brakes and tipping over. It is much more common to lock the rear wheel and apply moderate front braking and obtain a higher drag factor without approaching the front wheel lock-up point and losing control. Testing at VCE, as well as published articles from the Traffic Institute of Northwestern University and others, has shown that this type of braking is within a range of approximately .77 to .89 to that of a car drag factor. As seen in the photograph on the right (rear wheel locked no front braking), the skid mark is not straight, but is curved from one side to the other. This occurs when the rear wheel stops rotating and loses lateral stability while at the same time the rolling front wheels gyroscopic effect keeps it stable. When the slightest steering is applied or roadway irregularity occurs, the rear wheel slides from side to side, leaving a weaved type or curved skid mark.



As seen in the photograph to the left (rear wheel locked with front wheel braking), the skid mark is straight. This occurs because the added front wheel braking produces a more stable ride by shifting the motorcycle/rider weight towards the front while at the same time slowing down the rotational speed of the front wheel. This makes it harder to steer left to right, which results in a straight skid mark. As seen here, a proper interpretation of a motorcycle skid mark is crucial to an accurate speed calculation.

by Todd Hutchison

Plumbing Related Water Damage Cases

VCE, Inc. has been involved in several investigations involving extensive water damage to newly constructed homes. Since the losses occurred in systems that had been tested and even used for short periods of time, it was suspected that defective products have been the cause of the leaks. It was determined, however, that improper installation by the plumber was the predominant cause of the water damage.

In one case, several copper joints were made using a solder paste that also contained powdered solder. The paste is applied to both the fitting and the pipe before assembly. After the pipe is inserted into the fitting, the joint is heated by propane torch. The paste cleans the surface and the powdered solder melts, completing the sweat joints. In this case, the problems occurred in an apartment complex. After sitting empty for sometime, several units were eventually occupied. After several days of apparent problem-free use, several leaks occurred.

VCE's investigation determined that the leaks occurred in joints in which the plumber failed to perform the sweat operation. It was apparent that as the system was installed, several sections, including fittings and various lengths of pipe, were assembled with the intention of

going back and applying heat to accomplish the sweat joint.

However, several sweat joints were overlooked during the heating operation. With time, the paste dried and hardened, which provided a temporary leak free joint. However with use, the paste eventually washed away by the water flow and a leak occurred.

In another case, a new home was extensively damaged when a leak occurred in a second story bathroom. The damage was to ceilings, hardwood floors, and other structural systems on the first floor.



VCE's investigation determined that during installation of a bathtub, the plumber had over-tightened a metal fitting into a female PVC adapter. It was experimentally determined that excessive strain was induced when metal fittings are over-tightened into plastic female fittings. This strain results in eventual stress fatigue and failure of the plastic fitting. This type failure typically occurs some period of time after the assemble is made and tested. In this case, this was several days later.

In another case, a refrigerator ice maker connection failed four days after it was installed, tested, and put in use. In this case, the plastic supply tube was connected to a cut-off valve using a compression fitting.

The joint parts consist of a metal insert inside the end of the plastic tube, a beveled brass ferrule that is slid over the end of the plastic tube, and finally, a brass nut that screws onto the valve. As the nut is tightened, the ferrule is compressed, capturing the plastic wall of the tubing, between the ferrule and the metal insert.

VCE found that the tubing had come out of the compression fitting. The compression nut appeared to be more than finger tight, in other words, could not be loosened by using the fingers. The plastic tubing could be,

however, reinserted into the compression nut and ferrule, and in fact, the water was turned on and no leakage was observed. Again, it was experimentally determined that a leak free joint could be accomplished by partially tightening the compression nut, but repeated "on and off" cycling under pressure would cause the tubing to work free and come out of the compression fitting. This was the cause of the leak that occurred in this case.

Even though defective products do occasionally cause leaks which result in water damage, this investigator has found many of the problems actually are caused by human error.

by Herb Stewart

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What is the significant difference between a skid mark and a yaw mark?

Answers to May/June 1999 Issue:

Which stops in a shorter distance a loaded tractor/trailer or an unloaded tractor/trailer?
An unloaded tractor/trailer stops in a shorter distance than a loaded tractor/trailer. The loaded tractor/trailer has more kinetic energy to be dissipated which occurs primarily through braking.

The truck will keep moving until the kinetic energy (energy in motion) reaches zero.

$$KE = 1/2 MV^2$$



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