IDRC SHOOTOUT Turbine Containment System (TCS) Rule

For the racers, crew, track staff, media and spectators, the IDRC has implemented a new rule that will improve safety in the event of catastrophic turbo failures. When a turbocharger has a serious failure at extreme shaft speeds there is a significant possibility that large portions of the turbine wheel will exit from the turbine housing at extreme velocities. Considering that the turbine wheel can be spinning at over 200,000RPM when failure occurs, the failed parts can effectively become deadly shrapnel causing serious bodily harm or death.

While many turbocharger manufacturers conduct destructive burst-containment testing to limit the risk of injury or death during a turbocharger failure, the testing assumes that an OEM full-length exhaust system in place. When the same turbocharger is put on a racecar with an exhaust system consisting of nothing more than a stubby downpipe, the failed parts can exit the turbocharged at lethal velocities. With this being the case, vehicles without a full-length exhaust system that exits behind the rear tires will require a turbine containment system that may consist of one or more of the three listed options below.

The purpose of the turbine containment system is to significantly reduce the kinetic energy (mass and velocity) of any pieces of the turbine wheel being emitted through the exhaust system. Reducing the amount of energy from these potential projectiles will reduce the potential of serious harm or death resulting from turbocharger failures.

OPTION #1-Cross Bolts: Currently, SFI specifies the following for cross bolts as a turbine containment system. If SAE bolts are used, they must have a minimum diameter of 3/8-inch and a minimum rating of Grade 5. If metric bolts are used, they must be a minimum size of M10 and a minimum grade of 8.8. The bolts must be installed in the turbine housing outlet, perpendicular to each other, and perpendicular to the turbocharger shaft. The centerline of a Cross Bolt must be less than 2” from the nose of the turbine wheel or as close as possible. Those looking for additional containment (suggested for larger turbine wheels and downpipes that are side exit) can add a second cross-bolt within two inches of the primary cross-bolt system or use larger and/or higher-grade bolts.

OPTION #2-Turbocharger containment ring or cage: A turbocharger containment ring may be used if it is installed per the manufacturer's recommendations. If the containment ring attaches to the turbocharger by means of a clamp (i.e. V-band), the other side of the ring must be welded to the downpipe. All welds must show adequate penetration into both the ring and the downpipe.

OPTION #3-Fabricated Interlocked Steel Cross: In lieu of cross-bolts or a containment ring/cage, a fabricated interlocked steel cross may be incorporated into the downpipe at its entrance. Material for the cross must be have a minimum thickness of 0.240” with a length or at least one inch. Two pieces of flat stock should be used. Each piece of stock should be notched for one half of its length with the notch matching the thickness of the material. These notches will allow the two pieces to be assembled together to create a single assembly that must be fully welded (four welds the length of the material) at the intersection point. This fabricated interlocked steel cross must have all four edges welded to the downpipe.