This document outlines Cummins Emission Solutions™ (CES) recommendations and requirements for the installation and application of Diesel Particulate Reactors (DPR). It is recommended that systems incorporating Cummins Emission Solutions™ diesel particulate reactors be designed by, or in conjunction with, Cummins Emission Solutions™ Engineering. In order to receive Cummins Emission Solutions™ approval of the installation, the installation must meet the following requirements. Exceptions to these requirements must be approved by Cummins Emission Solutions™ Engineering.

- The diesel particulate reactor coated substrate and housing must be the correct part for the particular application.
- The diesel particulate reactor must be mounted to the vehicle with a mounting system strong enough to support its additional weight and dynamic load.
- The diesel particulate reactor must be placed within 384 cm [155 in] tube length from the engine turbocharger outlet flange or manifold.
- The tubing between the engine and the diesel particulate reactor must be made of material listed in these guidelines.
- The diesel particulate reactor substrate must be protected from contact with water. On installations with vertical exhaust stacks, the exhaust system must incorporate a Cummins Emission Solutions™ approved water trap. The device must be installed in the orientation for which it was designed.
- The vibration levels on the diesel particulate reactor assembly in service must not exceed the values listed in these guidelines.
- The vehicle must not use fuel blended with lubricating oil.
- The vehicle must not use fuels with sulfur content greater than 0.05 percent sulfur by weight (500 ppm).
- Exhaust gas temperatures must be sufficiently high to ensure proper reactor regeneration.
- A back pressure monitoring system must be installed on all applications using a diesel particulate reactor.
- The diesel particulate reactor assembly or piping between the engine and the diesel particulate reactor must have an accessible port for checking back pressure in service.
- Thermal insulation must not be applied to the diesel particulate reactor housing, unless it is supplied by Cummins Emission Solutions™ as an integral part of the housing.

**Temperature Data-Logging**

The diesel particulate reactor is designed to capture and burn (or regenerate) particulate matter resulting from the diesel combustion process. In order for the reactor to regenerate properly, the exhaust gas temperature entering the diesel particulate reactor must be sufficiently high for a significant portion of the engine’s duty cycle. To evaluate the suitability of an application for use with diesel particulate reactors, temperature data must be collected on at least one vehicle in the fleet over several days of operation. The vehicle should represent the worst case scenario in terms of
temperature (i.e., the lightest-duty application in the fleet).

Cummins Emission Solutions™ offers equipment and assistance in data logging applications. Refer to the Data Logger Instructions.

**Mounting Systems**
The muffler mounting system should be adequate to support the additional weight of a diesel particulate reactor. Generally, the weight of a diesel particulate reactor is 30 percent heavier than a similarly sized catalytic exhaust muffler and at least 100 percent heavier than a similarly sized conventional muffler. The mounting system should restrain motion in all three directions and rotations. The mounting system should keep the entire exhaust system from contacting adjacent vehicle components during its entire operating cycle. The shock from such impact can be detrimental to the substrate retaining system.

It is recommended that diesel particulate reactors be mounted using a minimum of two mounting straps or clamps around the body of the device, spread over at least 50 percent of the length of the body, as shown in the illustration above. Some designs may use brackets or mounting pads that are welded directly to the body of the diesel particulate reactor housing. These should not be modified or added without Cummins Emission Solutions™ approval. All supports should be securely mounted to rigid vehicle frame members.

Mounting straps should be made of 11-gauge steel, or heavier. Cummins Emission Solutions™ recommends that new brackets and hangers be used when installing new retrofit catalysts to reduce the risk of bracket failure due to corrosion and the transfer of rust. When more than two supports are used, the supports should incorporate elastomeric mounts to allow additional movement and reduce alignment difficulties.

It is not recommended to support a diesel particulate reactor entirely by the inlet and outlet tubes. If it is impractical to do otherwise, contact Cummins Emission Solutions™ Engineering for special construction options.

**Vibration Levels**
The diesel particulate reactor assembly must not be exposed to extreme shock and vibration levels. Generally, the vibration levels on the diesel particulate reactor assembly should not exceed 5 Grms under normal operating conditions and 10 Grms under rare conditions, not to exceed 10 percent of the equipment’s duty cycle. For applications exceeding these vibration levels, contact Cummins Emission Solutions™ for assistance in designing the mounting system.

To reduce the level of engine-related vibration at the diesel particulate reactor, flex tubing should be installed between the engine and the diesel particulate reactor assembly. The diesel particulate reactor assembly should also be isolated from chassis vibration through the use of an elastomeric or flexible mounting system. The diesel particulate reactor assembly must not be hard-mounted directly to the vehicle frame or attached to the engine.

**Thermal Protection**
During normal use diesel particulate reactors do not significantly increase exhaust gas temperatures. Typically, the skin temperatures of the outer body of the housing will not exceed 260°C [500°F]. However, in the unlikely event of an engine failure, the exhaust temperature may be elevated to extreme levels. Therefore, it is best to avoid locating combustible or heat sensitive materials in close proximity to the device or the exhaust system downstream of the device. If this is unavoidable, a heat
Shield should be installed on the device to help protect the surrounding materials from excessive temperatures.

Blanket-type insulation should not be applied around the body of the diesel particulate reactor housing. The use of such material will degrade the integrity of the device.

**Mounting Orientation**

The diesel particulate reactor assembly should be installed in the orientation for which it was designed. Vertically mounted devices must incorporate a water trap to prevent water from entering the reactor section. Horizontally mounted devices used with vertical exhaust stacks must have either a water trap or a drain built into the device. For horizontal designs using drains, the device must be installed with the drain oriented downward. Install the device so the identification labels are visible when installed on the vehicle. Sensor ports and body clamps should also be oriented so they are accessible for maintenance, once installed.

**Inlet Tubing**

To minimize the potential for leakage or contamination of the diesel particulate reactor from rust particles, it is recommended that the exhaust tubing between the engine and the diesel particulate reactor be type 409 or higher-grade stainless steel. For retrofit applications, existing non-aluminized or painted carbon steel inlet tubing or inlet tubing in poor condition must be replaced with new tubing made from aluminized steel, or type 409 or higher grade stainless steel.

Other components located between the engine and the diesel particulate reactor such as elbows, exhaust brakes, and turbocharger conveyors must also be designed to prevent rust or coatings from plugging the device. The internal surfaces of these parts should not be painted or coated. Stainless steel is recommended for fabricated parts. Cast parts should be made of ferritic ductile iron meeting ASTM A536, grade 60-40-18 with a minimum of 2.6 percent silicon. This material has good high-temperature corrosion resistance and is commonly used in exhaust manifolds.

Since flexible sections are commonly used in exhaust systems and allow some leakage of exhaust, and clamping systems are not leak-free, some leakage of exhaust prior to the diesel particulate reactor is acceptable. Exhaust gas leakage between the engine and the diesel particulate reactor should not exceed 1 percent of the volume flow of exhaust passing through the system. This should be calculated or tested at the maximum exhaust flow rate indicated on the engine data sheet. Typical flex sections and clamps currently in use should meet this limit.

The length of exhaust tubing connecting the diesel particulate reactor housing to the engine should be minimized so the temperature of the exhaust gas entering the device is high enough to ensure proper operation of the diesel particulate reactor. Generally, the length of this tubing should be 394 cm [155 in] or less. If data logging indicates that gas temperatures are insufficient, tube insulation can raise inlet temperatures 10 to 30 °C [18 to 54 °F], depending on the application, and is available in various forms from Cummins Emission Solutions™.

**Lube Oil Blending**

Diesel particulate reactor-equipped installations should not use fuel blended with lubricating oil since the oil causes deposits on the diesel particulate reactor coating, which causes reduced engine performance.

**Service Access Port**

The diesel particulate reactor housing has a 3/4-inch NPT port that may be used for service and diagnostic purposes. It is located at the inlet of the catalyst and must be plugged when not in use for service needs. See service publications for further information on these troubleshooting procedures.

**Back Pressure Monitor**

CARB and EPA regulations require that a back pressure monitor be installed to notify the operator when back pressure limits are approached for all filter-based diesel emission control systems. In addition to a
visible indicator, Cummins Emission Solutions™ recommends and supplies monitoring systems that provide engine derate in the event of excessive back pressure. Such a derate feature protects the engine and the diesel particulate reactor in case the back pressure indicator is missed by the operator or service personnel. Any monitor used with a diesel particulate reactor must be approved by Cummins Emission Solutions™ Engineering.