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December 18, 2006

Mr. Kurt Gahl
National Weather Service
7220 NW 101st Terr
Kansas City, Kansas 64153

RE: Doppler Radar Emergency Generator
Fuel Storage Tanks

Dear Mr. Gahl,

Poole Fire Protection was hired by the National Weather Service to evaluate the construction of the fuel storage tanks at the Doppler radar site. Poole Fire Protection performed a review of the fuel storage tanks construction and materials to determine compliance with Underwriter's Laboratory Standard for Safety (UL) 142: Steel Aboveground Tanks for Flammable and Combustible Liquids. The intention of this review was to declare an equivalency of the site-constructed fuel storage tanks and those provided from a UL listed manufacturer. The following paragraphs describe the site-constructed tanks as compared to UL 142. The applicable sections of UL 142 are Sections 4 through 11 and Sections 16 through 18, with the exception of Section 9.

Section 4 of UL 142 provides the requirements for the capacity and dimensions of all tanks. The total (actual) capacity of a tank shall not be less than the rated nominal capacity and not more than 110% of the rated nominal capacity. The site-constructed tanks are rated at 250 gallons each (2 tanks – 500 gallons total) and will not exceed the requirements set forth by this Section.

Section 5 of UL 142 provides the acceptable materials list for steel aboveground tanks. The materials used to construct the tanks shall be commercial or structural grade carbon steel or stainless steel and only new material shall be used. Carbon steel and stainless steel are required to comply with their respective ASTM Standards. Based on the materials list provided, an assumption has to be drawn that the material was new and complied with appropriate ASTM Standards.

Section 6 of UL 142 provides the requirements for joints based on the specific tank geometries. Based on Table 6.1 of UL 142, all types of joints are allowed on

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rectangular tanks (primary and secondary). The site-constructed tanks are compliant with the types of joints allowed for shell and corner joints.

Section 7 of UL 142 provides the requirements of the tank connections. A tank connection shall be provided for each opening as illustrated in Figure 7.1 or 7.2 by a) welding a steel pipe coupling, threaded steel flange, or standard pipe nipple to the tank or b) a steel flange welded to a length of pipe that, in turn, is welded to the tank. The site-constructed tanks are equipped with welded, threaded pipe coupling, which are compliant with this section.

Section 8 of UL 142 provides the requirements of tank venting. Each tank or compartment of a tank shall have provision for normal and emergency venting. Normal venting shall be in accordance with Table 8.2 and at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 inch nominal inside diameter. Emergency venting shall be a) an opening that complies with the requirements in Section 8.4 and is provided for that purpose only or b) a manhole with cover as described in Sections 8.9 – 8.11 and a vent opening for normal venting complying with the requirements of Section 8.12. Table 8.2 requires a tank with a capacity under 2,500 gallons to have a 1-1/4 inch minimum diameter, nominal pipe size. Section 8.4 states, "A vent opening that provides for emergency venting shall have a capacity not less than specified in Table 8.1." Table 8.1 indicates that with a wetted surface area of approximately 30 ft2 the minimum opening is 2 inches nominal pipe size. The site constructed tanks are compliant with this section.

Section 9 of UL 142 provides the requirements for manholes. The site-constructed tanks are not equipped or provided with manholes; therefore this section does not apply.

Section 10 of UL 142 provides the requirements for fill, drain and gauge openings. Each site-constructed tank is equipped with fittings to accommodate filling, inventory control and product withdraw in compliance with UL 142.

Section 11 of UL 142 provides the requirements for tank painting. Unless made of stainless steel, a tank, after having been tested and found free from leakage, shall be given at least one coat of paint on exposed surfaces to protect them from atmospheric corrosion. This is intended to prevent corrosion while sitting on the factory shelf and while in use. The site-constructed tanks are provided with at least one coat of paint.

Section 16 of UL 142 provides the general requirements for rectangular tank constructions to meet Sections 4 – 11 for all tank constructions, and with the requirements of Section 17 and 18. This section does not contain any specific criteria, it only references other sections.

Section 17 of UL 142 provides the general construction requirements for rectangular tanks. This Section allows stiffening bars to be attached to the tank wall, tie rods to be used inside the tank, and baffles to be installed inside the tank. This Section also sets

forth the minimum thickness of the steel to be used in the construction of these tanks. The tanks "shall be constructed from steel not thinner than 0.093 inches if of carbon steel or 0.071 inches if of stainless steel. Based on the provided materials list for the site-constructed tanks the steel used was 12 gauge which has a nominal thickness of 0.1046 inches, which is compliant with this section.

Section 18 of UL 142 provides the minimum performance of rectangular tanks. The tank shall be hydrostatically tested to demonstrate that the strength of the assembly and the welded joints are in accordance with these requirements. The tank shall not rupture or leak when subjected to the Hydrostatic Strength Test, Section 40. Section 40 states the test shall be performed using a water source. The tank is to be completely filled with water, with all air expelled from the tank; pressure is to be applied gradually to the tank in increments of a gauge pressure of 5 psi at a rate not exceeding a gauge pressure of 2 psi per minute; the gauge pressure is to be held for 2 minutes after each increment of a gauge pressure of 5 psi until the test gauge pressure of 25 psi is attained; once the test pressure is attained the tank is to be examined for visible signs of leakage or rupture. Based on the test report dated October 5, 2006 completed by INTERSPEC, LLC, the tank complies this section (see enclosed report).

Section 18 also requires a top load test to be performed in accordance with Section 41 after which the tank shall then be subjected to a leakage test in accordance with Section 39 and shall not leak. Section 41 provides the requirements of top load tests. The top load test consists of the top surface of flat top tanks is to be subjected to a 1,000 pound load, applied to one square foot area at the weakest part of the tank top for a period of 5 minutes. After the load is removed, the tank is subjected to the tank leakage test and there shall be no permanent deformation or leakage while test is being performed. Section 39 provides the requirements and guidance to perform the tank leakage test and states, "the leakage tests is to be conducted before painting the tank by a method described in items (a) through (c). There shall be no evidence of leakage or sign of permanent deformation following the leakage test. If subjected to a leakage tests pressure, the tank wall, head, or roof may deflect but shall return to its original position and shape when the test pressure is released." The following are the allowable methods; item (c) does not apply to this situation as it is for vertical tanks only: a) Apply internal pressure and use soap-suds, or equivalent material for the detection of leaks. For a horizontal or rectangular tank, the test gauge pressure is to be not less than 3 psi or more than 5 psi. b) Completely fill the tank with water, applying the pressure specified in item (a) hydrostatically, and examine the tank for leakage. The requirements of Section 18 have not been satisfied, however Poole Fire Protection feels that for the existing conditions, this test is not needed to verify the integrity of the tanks. The load test verifies that the tank will be able to withstand a load on top of the tank. The existing conditions at the site (inside the building with little access for large equipment) do not warrant this testing.

In conclusion, it is the opinion of Poole Fire Protection that the site-constructed tanks for the National Weather Service Doppler Radar emergency generator does meet the intent

and performance requirements of Underwriters Laboratory Standard for Safety (UL) 142: Steel Aboveground Tanks for Flammable and Combustible Liquids except for Section 18. Although the constructed tanks were not assembled and tested in a manufacturing setting, Poole Fire Protection believes the site-constructed tanks are equivalent.

If you have any questions, comments or concerns feel free to contact me at my office at (913) 747-2060.

Sincerely,

Jack Poole, PE
Principal