U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety Administration**

FEB 23 2007

400 Seventh Street, S.W.
Washington, D.C. 20590

Mr. E. A. Altemos
HMT Associates
603 King St., Suite 300
Alexandria, VA 22314-3105

Ref. No. 07-0012

Dear Mr. Altemos:

This is in response to your letter requesting clarification of the applicability of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) to gas sensors containing a small amount of a Class 8 (corrosive) material. You ask whether these articles are regulated under the HMR.

According to your letter, the sensors contain two electrodes separated by a thin layer of electrolyte and connected by a low resistance external current. The electrolyte is contained within a matting to prevent the flow of liquid. The sensor produces a current from a chemical reaction on contact with the gas it is designed to detect. The current is proportional to the concentration of the gas the sensor is designed to detect and can be measured across a load resistor in the external circuit. Gas diffusing into the sensor causes oxidation or reduction, which generates a low current that flows through the external circuit. You state that the electrolytes vary in the sensors; however, the Class 8 (corrosive) material (phosphoric or sulphuric acid) never exceeds 1 milliliter and if the sensors are punctured, no corrosive liquid will flow from the devices. You also state that there is no energy in the sensors when being transported and no risk of heat generation or sparking.

It is our determination that the hazardous material contained in the gas sensors, as described in your letter, with no more than 1 milliliter of Class 8 (corrosive) material (phosphoric or sulphuric acid), is not transported in a quantity or form that poses a risk to health and safety or property during transportation. Therefore, the gas sensors are not subject to regulation under the HMR.

I hope this information is helpful. If you have additional questions, please contact this office.

Sincerely,

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

070012

173.136(b)

McIntyre
§173.136(b)
Definitions
07-0012

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January 17, 2007

Mr. Edward T. Mazzullo
Director, Office of Hazardous
Materials Standards (PHH-10)
Pipeline and Hazardous Materials
Safety Administration
Department of Transportation
Washington, D.C. 20590-0001

Dear Mr. Mazzullo:

Pursuant to the provisions of 49 CFR 173.136(b), this is to request a determination that an article containing a small amount of a Class 8 (corrosive) material is not subject to the requirements of the Hazardous Materials Regulations ("HMR", 49 CFR Parts 171-180) since in that quantity and form the corrosive material presents no hazard to health and safety or property in transportation.

The articles for which this determination is requested are gas sensors that operate on an electrochemical principle. The sensors are used in a variety of applications to sense the presence of various gases at low concentrations in order to provide warning of the presence of the gas. The sensors are disk-shaped, typically with a diameter of approximately one inch, and a height of approximately 5/8 inch. Two or three metal pins extend an additional approximately 3/16 inch from the bottom of the sensor to make electrical contact when the sensor is installed in an amplifier in the gas detector warning system.

As mentioned above, the sensors work on an electrochemical principle. The basic operation of these devices is as follows. Two electrodes are contained within the sensor - a "sensing" electrode and a "counter" electrode. These electrodes are separated by a thin layer of electrolyte, and are connected by a low resistance external circuit. Gas diffusing into the sensor is reacted at the surface of the sensing electrode by oxidation or reduction, causing a current to flow through the external

circuit. This current is proportional to the concentration of the gas the sensor is designed to detect, and can be measured across a load resistor in the external circuit. The current generated is very low, and is never sufficient to pose any safety hazard. Thus, in terms of its construction and operation the sensor similar in some respects to a battery - but rather than storing energy the sensor produces a small current from chemical reaction on contact with the gas it is intended to detect. Since, unlike a battery, there is no energy stored within the sensor when transported, the sensors pose no risk of heat generation or sparking as would a battery in the event of a short circuit.

The electrolyte in the sensor will vary depending on the gas the sensor is designed to detect. In some cases, the electrolyte will be a Class 8 material (phosphoric acid or sulphuric acid). However, the quantity of corrosive electrolyte in any sensor does not exceed 1 ml. In addition, the electrolyte is always contained within a matting (similar to the "starved electrolyte" system in many large batteries), so there is never any free liquid present. Therefore, if punctured, no corrosive liquid will flow from the sensor. Based on the very small quantity of corrosive liquid in the sensors, and because there is no free liquid present and liquid will not flow from the device if punctured, the sensors are not considered to pose a risk to life, health or property during transport by any mode. Therefore, pursuant to the provisions of § 173.136(b) of the HMR, a determination is requested that these sensors are not subject to the requirements of the HMR in transport.

It is noted that the requested determination would be fundamentally consistent with certain regulatory exceptions currently appearing in the HMR. For example, Special Provision 47 attached to the Hazardous Materials Table entry for "Solids containing flammable liquid, n.o.s." (UN 3175), excepts from regulation packets and articles containing up to 10 ml (ten times the quantity of hazardous material contained in the sensors for which this determination is sought) of flammable liquid in Packing Group II or III absorbed onto a solid material, provided there is no free liquid in the packet or article. In addition, electric storage batteries (some of which may be very large and contain relatively large quantities of electrolyte) in which the liquid electrolyte is contained in the same sort of matting as the electrolyte in the sensors for which this determination is sought, have for many years been excepted from regulation provided that there is no free electrolyte contained in the battery and that electrolyte will not flow from the casing if it were ruptured. Any possible risk posed in transport by the sensors for which this determination is requested would most certainly not exceed that posed by the packets, articles, and batteries currently excepted from regulation under the conditions described above.

In conclusion, owing to the very small quantity of hazardous material involved, and because there is no free liquid present and liquid will not flow from the device if punctured, the gas sensors concerned pose no hazard to health and safety or property under normal conditions of transport. Accordingly, it is requested that a determination be made pursuant to the provisions of § 173.136(b) that the sensors described above are not subject to the requirements of the HMR in transportation.

Thank you for your consideration in this matter. Please do not hesitate to contact me if you have questions concerning this request, or if you require additional information.

Sincerely,

E. A. Altemos

cc: Dr. Charles Ke (PHH-21)