APPENDIX J

ADDITIONAL RECOMMENDATIONS FOR ATMOSPHERIC TESTING AND MONITORING

WARNING

NEVER TRUST YOUR SENSES TO DETERMINE IF THE ATMOSPHERE IN A CONFINED SPACE IS SAFE! YOU CAN NOT SEE OR SMELL MANY TOXIC GASES AND VAPOURS, NOR CAN YOU DETERMINE THE CONCENTRATION OF OXYGEN OR FLAMMABLE CONTAMINANTS PRESENT.

General

Testing of the atmosphere when required and a survey of other hazards should be conducted from outside the confined space and from as many nozzles and openings as are available before any entry occurs. The results should be recorded on the written authority. The tests should be conducted in the order listed and should include those for oxygen concentration, flammability, airborne contaminants (for example, carbon dioxide, carbon monoxide and dusts) and thermal extremes.

Atmospheric testing of more remote regions within the confined space, away from entry or exit, may be conducted once the area adjacent to the point of entry to the confined space has been made safe for entry.

Only when the test results show the confined space is safe, should normal entry be considered.

The normal means of evaluating the atmosphere is to test it for specific substances with a suitable portable analyser. There are many different kinds of analysers available but the results are only as good as the competency of the operator and the state of analyzer maintenance and calibration.

The functionality of the test equipment (and sensors) shall be checked (Bump Test) prior to use for testing of the atmosphere in a confined space. For electronic testing equipment, the sensors shall be challenged by exposing them to calibration gas and testing to 80% of the span value of the gas. Equipment that fails the functional bump test should be recalibrated in accordance with the manufacturer's specification or removed from service.

Other test equipment, such as chemical detector tube pumps, should be regularly checked for leaks to avoid low readings. The detector tubes themselves also have a finite shelf-life beyond which their accuracy may be suspect. For large confined spaces, portable analyzers with audible alarms should be inserted using appropriate non-sparking equipment.

Atmospheric testing and monitoring equipment

Combustible atmospheric substance detectors should comply with AS/NZS 61779.1. Atmospheric monitoring equipment should comply with AS 4641(Int):2005.

The competent person is to have a thorough knowledge of the measurement strategy to be used. Factors to be taken into account include the following:

1. Properties of the gas / vapour.
2. Humidity and temperature in the space.

3. Presence of airborne contaminants that may reduce the accuracy of the reading or 'poison' the sensor.
4. Presence of corrosive gases and mists which may damage the sensor and give misleading results caused by a false zero reading.
5. Calibration, adjustment and maintenance requirements.
6. Need for recalibration during testing.
7. Condensation and / or absorption of gas into the walls of sampling lines where these are used.
8. Response of the instrument to high and low concentrations of gas or vapours (for example, false zeros).
9. Oxygen deficiency causing a low percentage of the LEL flammable gas reading.
10. Oxygen enrichment where the instrument may act as an ignition source causing an explosion.
11. Differences in atmospheric pressure which may cause erroneous readings in some sensors.

Equipment for testing and monitoring of flammable gases, dusts and vapours should be intrinsically safe. All electronic equipment for monitoring should be equipped with an audible or visual alarm. Instruments used for testing the atmosphere in a confined space should be selected for their functional ability to measure hazardous concentrations. Instruments should be calibrated in accordance with the manufacturer's guidelines or manuals.

After atmospheric purging or ventilation has been completed, forced draft devices, such as inductors or fans, should be turned off for a sufficient time to allow a normal atmospheric condition to exist for the atmospheric testing of the confined space. If an acceptable result cannot be obtained without continuous forced draft ventilation, then the ventilation device should be suitably tagged and / or locked to ensure it is not disconnected while the inspection or other work is in progress. The stand-by person is responsible for monitoring the proper operation of the forced draft ventilation device.

Atmospheric testing of the confined space consistent with the risk assessment should be carried out before the permit to work is issued. The risk assessment can require atmospheric testing for contaminants including, but not limited to the following:

1. Oxygen concentration;
2. Flammable airborne contaminants;
3. airborne contaminants; and
4. Chemical deposits on surfaces.

A satisfactory result should be obtained before proceeding.

Retesting and monitoring

Retesting and monitoring of the atmosphere may be necessary; for example, as indicated from the testing of the atmosphere or because of the potential for later release of hazardous material from sludge, scale or other deposits, behind loose

linings, liquid traps, instrument fittings, joints, bends, and the like. The hazardous material may be released if disturbed or if heat is applied.

Arrangements should be made for repeat tests for oxygen and airborne contaminants at intervals which take account of the likelihood of a change in conditions. No set time can be applied for all circumstances, but periods between tests should not exceed 12 hours and should only be extended to this maximum period when the risk assessment has confirmed that the atmosphere is stable and unchangeable. There should not be a significant delay between tests and the first entry to the confined space.

The frequency of retesting should be determined by a competent person having knowledge of the equipment and processes. Use of continuous monitors with alarms is the most conservative approach.

Where the confined space has not been occupied for a period of time consideration should be given to retesting before re-entry.

Interpretation of measurement results

Measurements of all relevant airborne contaminants and the interpretation of results should be conducted by a competent person. The results should be compared with the relevant exposure standard and with the LEL if the contaminant is flammable or combustible. The regulations require that no entry into a confined space be permitted if the concentration of the flammable contaminant in the atmosphere exceeds 5 percent of its LEL. A measurement less than 5 percent of the LEL may still result in airborne contaminants exceeding occupational exposure standards.

Where persons have entered a confined space and are using continuous monitoring, they may remain in the confined space at concentrations of flammable airborne contaminant of less than 10 percent of its LEL before evacuation of the confined space is necessary. Care should be taken to ensure that the concentration of airborne contaminants does not exceed occupational exposure standards.

This Code of Practice requires that the results be compared with the relevant exposure standards so as to ensure that exposure does not exceed the exposure standard. The interpretation and intended use of exposure standards is described in HSIS.

Where no exposure standard exists, a competent person should develop a standard based on the available scientific data.

Information on explosive limits for many gas mixtures may be found in AS/NZS 60079.20. Where a substance is not listed, then an information search is to be undertaken to identify the LEL.

Combustible dust detectors

Persons who will be using instruments to detect the presence of airborne dust concentrations, should be made aware of the difficulties involved in establishing flammability limits for combustible dusts.

The explosiveness of dusts generally increases as the particle size decreases since smaller dust particles can be more easily thrown into suspension. Moreover, small dust particles disperse more uniformly and remain in suspension longer than large dust particles.

Additionally, a given mass of smaller particles has a greater specific surface and thus can absorb more oxygen per unit mass and can oxidize more rapidly than a similar mass of large ones. A greater electrical charge can develop on finer particles because of increased capacitance.

The level of uncertainty associated with flammability limits of combustible dusts, also stems from the transient nature of dust clouds, particularly with respect to local concentrations in a cloud as a function of time and space.

Calibration of continuous dust monitoring equipment should be performed with the same type of dust as that to be measured. The preparation of dynamic dust-in-air mixtures of known concentration for calibrating continuous dust measuring equipment requires considerable laboratory instrumentation and good quality control.