7.1 Building Design (continued)

7.1.4.1 Explosion venting windows, roof wall panels, skylights, light windows, diaphragms, etc. may be used to minimize building damage due to explosion pressures.

7.1.4.2 Since the required area of explosion vents depends upon such factors as the intensity of an explosion, vapor temperature, type of structure, the type of vent closure, etc. the determination of vent ratios should be made by experienced engineers and fire and safety protection specialists. (Reference NFPA Fire Codes Vol. 9-#68).

7.1.4.3 Vinyl chloride processing buildings equipped with internal water deluge and emergency ventilation systems controlled by flammable gas monitors are preferred for dissipation of flammable vapor clouds resulting from equipment failures within the building.

Section 7 ENGINEERING CONTROL OF HAZARDS

UCC 099970

7.1 Building Design

7.1.1.1 Equipment and vessels containing vinyl chloride should preferably be isolated from other facilities by walls and floors of fire resistive construction or by adequate spacing.

7.1.1.2 Standard fire walls are recommended for isolation of larger equipment and storage tanks, while partitions of plaster and expanded metal lath may be used to isolate smaller equipment from other combustible materials.

7.1.1.3 Not less than two means of exit should be provided from each separate room or building in which VCM is stored, handled or used. No portions of such a room or building should be farther than 75 feet from the nearest exit. Additional exits should be provided depending upon the number of persons in the building (see NFPA Standard #101 Life Safety Code or OSHA Standard 28 CFR 1910 Subpart E).

7.1.1.4 All exit doors should open out in the direction of travel and should be provided with panic hardware. Fire doors should open out in the direction of travel and be an approved type.

7.1.1.5 For multistory buildings consideration should be given to the use of escape slides or external ramps instead of stairways or ladders from the higher levels. Most [illegible] have resulted from ignition of flammable

7.2 Equipment Design (continued)

7.2.2 Special Equipment and Design

The design of vinyl chloride piping and equipment is highly specialized because of the reactive, flammable and toxic properties of the material. Prior to the start of any plant or equipment design the Occupational Safety and Health Administration Standard for Vinyl Chloride (29 CFR §1910.1017) and the Environmental Protection Agency National Emission Standard for Vinyl Chloride (40 CFR 61f) as well as any other pertinent regulations should be thoroughly understood. The EPA Standard in particular requires specific equipment items. The technical problems of designing equipment, providing adequate ventilation and formulating operating procedures which ensure maximum safety and economy can be handled best by experienced engineers and safety and fire protection specialists.

7.2.3 In handling of vinyl chloride or the operation of any type of vinyl chloride system, all valves, pipelines, vents, safety devices, etc. should be located that they can be readily inspected and repaired. Consideration should be given to redundant facilities in critical areas. All handling and storage equipment should be located away from any source of sparks, flames, heated surfaces and other sources of ignition. The use of excess flow valves, valves with fusible links and remotely operated valves should be considered on large tanks in the case of fires or major leaks near these vessels. Bottom connections are to be avoided if practical.

7.2.4 Safety requires that equipment be used and maintained as recommended by the manufacturer or within design limits such as the ASME Pressure Vessel Code. All process equipment including safety devices should have regularly scheduled testing and inspection.

7.3 Ventilation

7.3.1 Good ventilation is essential in rooms or confined areas where vinyl chloride is handled to prevent the unsafe accumulation of toxic or explosive concentrations. Consideration should also be given to emergency ventilation to remove dangerous concentrations resulting from leaks and/or equipment failures. Good practice indicates that a normal ventilation system should yield at least fifteen air changes per hour for enclosed processing areas.

7.3 Ventilation (continued)

7.3.1 Many companies also provide emergency ventilation rates of thirty air changes per hour controlled by automatic analyzers in the work space air.

Pressurized control rooms or buildings with ventilation air intakes located upwind or some distance from sources of contamination can be used to provide a "safe" area for operating personnel where respirators need not be worn.

Good ventilation is a valuable tool in achieving the required one ppm or lower concentration in the work space air, but it is effective only when used in conjunction with good equipment and process design and proper equipment maintenance. In the design of a good mechanical ventilation system, consideration should be given to employee comfort and to control of the system; i.e. under what conditions should it operate normally, when should it be off, when should emergency speed be used and should control be automatic or manual.

7.3.2 Air Analysis-Monitoring

Analysis of the air for vinyl chloride in the work area is required by the EPA Standard (40 CFR 61.60F) as a means of detecting and measuring emissions to the air. The standard requires a system which obtains air samples from one or more points on a continuous sequential basis and analyzes the samples with gas chromatography or by alternative methods. The OSHA standard (29 CFR 1910.1017) requires that when employees are wearing air purifying respirators a continuous monitoring and alarm system be in use if there is a likelihood of exceeding the vinyl chloride concentration allowable for the respirator in use. In addition, these analyzers are invaluable in providing data for work in meeting the OSHA permissable exposure limits.

Flammable gas detectors are also used to indicate danger from fire or explosion and may activate water deluge as well as mechanical ventilation systems.

Automatic analyzers are complicated pieces of equipment and should be checked and maintained to meet the EPA standard requirements as a minimum.

The OSHA Standard also requires monitoring employee exposures to vinyl chloride on a specific basis. Sampling and analysis may be done in any fashion so long as acceptable levels of accuracy are achieved. This type of monitoring requires the consultation with a trained industrial hygienist.

7.4 Electrical Equipment

7.4.1 Vinyl chloride is normally handled in closed systems and all work areas should be ventilated and controlled to low concentrations of vinyl chloride. Flammable concentrations may exist only occasionally. Under normal condition, electrical equipment approved for Class I Division 2 locations may be used.

The selection of electrical equipment for a plant requires skilled evaluation by a competent process engineer as well as an electrical engineer. All equipment and wiring should be purchased and installed to meet the appropriate sections of the National Electric Code.

7.4.2 Separate power supply to lights, analyzers and automatic control systems is provided by many companies in their plants. These separate power supplies are often backed up by auxiliary generators or batteries for critical control items.

7.4.3 Static electricity is generated when vinyl chloride or polyvinyl chloride flows through or is discharged from a pipe. To drain off static charges and avoid spark discharges, a continuous path from the point of generation to ground should be provided. This is best accomplished by electrically interconnecting all vessels and piping (bonding), by grounding all vessels and piping or by a combination of bonding and grounding.

Bonds or grounds for static electricity protection may be of any conductor size and any ground that is adequate for power or lightning protection is more than adequate for grounding static electricity. Ground wiring should be of sufficient size to provide reasonable protection against physical wear. Periodic checks of continuity to ground should be made. Systems using non-conductors such as glass, plastic and ceramic piping or coatings should be carefully checked for continuity. Some types of Teflon lined plug valves have required electrical bonds between the plug and the body to reduce sparking.

For a more complete discussion of static electricity see NFPA #77.