TELEPHONE UTILITIES

INTRODUCTION

The prevailing loss prevention and control philosophy throughout most of the telecommunications industry is to use a combination of compartmentation, fire resistive construction, automatic smoke detection systems, portable fire extinguishers and Class III standpipes. As telephone switching equipment improves, its size is decreasing and switching capacity is increasing. This results in:

- Property damage exposure increases due to high value concentrations;
- Business interruption exposure increases because each switch unit serves more customers;
- Large idle areas make leasing space to tenants seem very attractive.

Automatic fixed fire suppression systems are usually installed only for areas located below grade. Mobile telephone central offices for cellular phones usually have sprinkler protection in office and storage areas, with gaseous agent protection for microwave/cell rooms, switch rooms and battery rooms.

This section describes the hazards associated with the telecommunications industry and how to protect them.

The use of stranded wire has been replace with fiber-optic wire. The use of fiber-optic wire has reduced the size of the wire bundles.

PROCESS AND HAZARDS

Cable Vault or Cable Entrance Facility

Large, multiple conductor cables enter the telephone switching center through a cable vault. For smaller, single story wire centers, the vault is a cut-off room, usually located in one corner of the building. For larger, multiple story wire centers, the cable vault is a separate structure, usually located below grade. The cables are supported by pipe racks and routed to ceiling penetrations where they enter the frame rooms.

The cables are insulated with various plastic, rubber and synthetic rubber compounds. The amount of combustibles can be large depending on the size of the switching center. One of the largest losses in the history of the telecommunications industry started in the cable vault at the 2nd Avenue Switching Center in New York City on February 27, 1975.

The use of fiber optic cables reduces the amount of cable space required by allowing more telephone traffic.

Main Distribution Frame Or Frame Room

All pair routing and interconnection is done in the Frame Room. Individual conductors from the main cables are run overhead, separated into pairs and distributed through metal supporting frames to massive terminal blocks.

The Frame Room is a “rat’s nest” of wire pairs, usually 22 AWG or smaller with combustible insulation. The combustible loading and continuity of combustibles is significant. In contrast with the numerous “normal” sources of ignition that are present in any structure, telecommunications systems are generally thought to consist of low voltages with insufficient current to cause a fire should a short circuit occur. This is only partially true. The maximum voltage usually found within the frame is 130 Vdc, and the average voltage is 50 Vdc. There is also ac ringing voltage of around 50-100 Vac. In each case the current flow is quite small, usually less than 1 ampere. Nevertheless, direct shorts can cause ignition.

Soldering is still used to make connections in older frames and presents a possible source of ignition. However, soldering has been replaced by mechanical wire-wrapping in new frames.

Switching Room

Cable pairs from the Frame Room are run overhead and connected to the actual switching equipment. Older switching equipment, such as the “step-by-step,” “panel” and “No. 5 Crossbar” are of open construction. Modern “Electronic Switch Service” (ESS) equipment is somewhat enclosed and represents a greater value per unit area. Many older switching centers are being converted to ESS.

The combustible loading and continuity of combustibles is significant in the Switching Room. ESS centers may also have 120 Vac powered multiple voltage power supplies in addition to the normal lower telephone system voltages. The value concentration per unit area is considerably higher than in the frame room or cable vault.

Battery Room

A large, cut-off room housing the standby power units, made up of rectifier, charger, regulators and batteries, is usually located near the Switching Room. The batteries consist of many large cells, each up to 4 ft $\times$ 3 ft $\times$ 2 ft (1.2 m $\times$ 0.9 m $\times$ 0.6 m) in size. It is common to have a room 40 ft $\times$ 80 ft (12 m $\times$ 24 m) dedicated to housing batteries and rectifier/charger/ regulators. See PRC.5.7.4 regarding storage batteries.

Hydrogen gas is given off during the charging and discharging process, which necessitates proper continuous ventilation.

Generator Room

Diesel engine-driven standby generators are located in cut-off rooms. These provide large capacity standby power. The normal hazards associated with engine-driven equipment are present. See PRC.6.2.1.1.

Data Processing Rooms

Extremely large, densely hardware-populated computer facilities are usually associated with modern switching centers. The computers handle traffic control, fault supervision, billing, accounting and all similar Electronic Data Processing (EDP) functions. The rooms contain telecommunication equipment and interfaces.

The combustible loading and continuity of combustibles is greater than normal for a computer room due to the large number of telecommunications cables in the underfloor space and due to the dense hardware population.

The loss exposure is magnified by the fact that the EDP operations are so complex that few personnel have the knowledge of how each EDP facility interrelates with other similar facilities in the system.

Offices

Many telephone company offices are often of combustible construction and are not occupied. Normal office occupancies with a significant amount of combustible files are a part of almost every wire center.

The combustible loading and continuity of combustibles is considered to be somewhat greater than a normal office, due to the preponderance of EDP printouts used in managing the telecommunications systems.

LOSS PREVENTION AND CONTROL

In addition to standard protection features for all portions of a telephone building, which are commonly found in all other such buildings, the following specific recommendations apply:

Management Programs

Develop a loss prevention and control policy statement that gives a clear statement of management's philosophy regarding property risk management.

Develop management programs for loss prevention and control in accordance with AXA XL Risk Consulting's OVERVIEW.

Develop a de-energization plan which may have to be in use before manual fire fighting can commence. Some fire fighting personnel may refuse to enter unless all power is off.

Provide an access key for fire department use at unoccupied telephone company offices, to prevent delays in accessing the building.

Construction

Separate the cable vault, frame room, switching center, battery room, generator room, computer rooms, tape and disk vaults and mechanical equipment rooms from each other and from adjacent areas by 2 hr fire resistive rated partitions. Protect all openings by single self-closing fire doors with 3 hr rating and maximum temperature rise of 250°F (139°C) in 30 min.

Enclose stairways, elevators, chutes and other vertical openings with 3 hr fire resistance rated walls extending to the roof deck. Protect all openings with a 1!/2 hr self-closing fire door at each level having a rated maximum temperature rise of 250°F (139°C) in 30 min.

Seal all floor, wall and ceiling penetrations in the computer, frame and switching rooms and waterproof floors to prevent the spread of water damage during fire control operations. See PRC.2.2.2.

Seal all cable penetrations through the fire walls and floors between the cable vault, frame room, switching room, battery room, generator room and computer rooms using a listed fire stop assembly having a rating equivalent to the barrier being penetrated. See PRC.5.0.3.

Heating, Ventilating, And Air-Conditioning (HVAC)

Arrange the HVAC system so that it is dedicated for telecommunications equipment use and is separate from other areas. If the HVAC system cannot be dedicated, provide automatic smoke and fire dampers in the air ducts. Install the dampers in accordance with NFPA 90A. Use only Class 1 or Class 2 air filters in air-conditioning systems.

Fabricate and install all pipe insulation and coverings, duct coverings, duct linings, vapor retarder facings, adhesives, fasteners, and tapes on air ducts, plenums, panels, and duct silencers in accordance with NFPA 90A.

Adapt the heating, ventilating and air conditioning (HVAC) system to provide smoke removal from the building in the event of fire on the basis of 300 ft3/min (8.4 m3/min) of exhaust for every 100 ft2 (9.3 m2) of floor area. See PRC.2.1.4. Transfer to the desired exhaust mode should occur

automatically upon activation of any fire alarm initiating device (manual pull station, sprinkler water flow, early warning smoke detector or heat detector).

Interior Protection

Provide wet pipe, automatic sprinkler protection throughout the facility in accordance with NFPA 13 and PRC.12.1.1.0. Use ½ in. (15 mm) nominal orifice, 165°F (74°C) rated sprinklers on a hydraulic design as noted:

- Cable vaults - 0.30 gpm/ft^2 (12.2 L/min/m^2) over 2500 ft^2 (232 m^2) or for the entire room, whichever is smaller (Extra Hazard – Group 1).
- Generator rooms - 0.14 gpm/ft^2 (5.3 L/min/m^2) over 2000 ft^2 (186 m^2) or for the entire room, whichever is smaller (Ordinary Hazard – Group 1).
- Office occupancy - 0.14 gpm/ft^2 (5.3 L/min/m^2) over 2000 ft^2 (186 m^2) (Ordinary Hazard - Group 1).
- Battery room, mechanical equipment rooms, tape and disk storage vaults, storage rooms - 0.17 gpm/ft^2 (6.3 L/min/m^2) over 3000 ft^2 (279 m^2) or for the entire room, whichever is smaller (Ordinary Hazard – Group 2).
- Frame room, switching rooms, computer rooms and interconnecting areas - 0.14 gpm/ft^2 (5.3 L/min/m^2) over 2000 ft^2 (186 m^2) (Ordinary Hazard - Group 1).

Provide a total flooding fixed pipe carbon dioxide system with connected reserve to protect the spaces beneath the raised floors in accordance with NFPA 12 and PRC.13.3.1. Design the system to operate automatically by a smoke detection system equipped with an “AND-gate” arrangement so that at least two detectors must enter an alarm condition before the extinguishing system is actuated. Upon either manual or automatic actuation, the system should cause shutdown of the ventilation system and automatic closure of dampers and doors prior to discharge.

Provide one 2A rated fire extinguisher for each 3000 ft^2 (279 m^2) of floor area throughout the building. In addition, provide one 30B:C rated CO_2 or clean agent fire extinguisher for every 3000 ft^2 (279 m^2) of floor area throughout the frame, switching and computer rooms. Do not exceed 75 ft (23 m) travel distance to nearest extinguisher. Do not use dry chemical extinguishers. With the installation of uniformly spaced hose connections, the number of 2A rated extinguishers may be reduced by one-half.

Install a 6 in. (150 mm) Class III standpipe system with a 2½ in. (65 mm) valved connection at each floor, a 1½ in. (40 mm) valved connection at each floor, and 100 ft (30 m) of 1½ in. (40 mm) woven-jacketed, lined fire hose.

Space 1 in. (25 mm) hose connections at approximately 100 ft (30 m) intervals and equip them with 100 ft (30 m) of 1½ in. (40 mm) woven-jacketed, lined fire hose and adjustable spray nozzles. Supply these hose connections from the Class III standpipe.

Special Hazards

Due to their close proximity to other utilities, a combustible gas detection system should be utilized to sense any gas leaks that may enter the vault through cable penetrations.

Remove abandoned cables in vaults and telephone frames in an effort to reduce overall combustible loading.

Provide the following for computer facilities. Refer to PRC.17.10.

- Provide an EMERGENCY SHUT-OFF SWITCH to disconnect power to all electronic equipment in the computer rooms. Install this SWITCH at readily accessible location at each principal exit door. Guard against accidental operation. Use a pull-type SWITCH rather than a push button or toggle-type.
- Provide at least one FLOOR PANEL LIFTER reserved for emergency use and stored in a permanent, placarded location.

- Store all tapes, disks or other data media in a separate room that is cut off from the computer area by 3 hr fire resistance rated construction. Protect all openings by a single self-closing fire door having a 3 hr rating and a maximum rise of 250°F (139°C) in 30 min.
- Store backup copies of tapes, disks or other magnetic media in an off-site fire resistant safe or vault.

Exterior Protection

Provide a reliable water supply adequate to supply both sprinklers and standpipes for a minimum of 3 hr.

Provide a 4 in. (100 mm) two-way fire department connection at each incoming fire protection water supply connection. Use the same hose threads as the public fire department.

Surveillance

Provide a UL certificated central station signaling system to monitor fire protection equipment such as the following:

- Manual fire alarm;
- Extinguishing system discharge;
- Sprinkler system water flow;
- Automatic early warning smoke detection in the cable vault, frame room, switching room, battery room, computer rooms, and tape and disk vaults;
- All fire protection valves of 2½ in. (65 mm) size or larger;
- Fire protection water supplies;
- Fire pumps;
- Low building temperature;
- Hydrogen gas (at dangerous levels);
- Methane gas (at dangerous levels);
- Battery room ventilation fan failure;
- Combustible gas detector system, if provided.

Make arrangements for testing of the alarm signaling system with reports filed for review by AXA XL Risk Consulting.

Remote unoccupied stations pose special problems:

- Must be able to differentiate between telephone trouble conditions and fire alarms;
- Review how fire alarms are handled;
- Consider direct alarms to fire department.