

INDUSTRIAL BUILDINGS AND PLANT LAYOUT

all floors of industrial buildings two or more stories high. One must be a stair tower made of fire-resistive material, leading directly to the outside at grade (ground) level.

To a considerable extent, number and width of exits are determined by the building occupancy. In high hazard occupancy, no part of a building should be farther than 75 ft from an exit. For medium and low hazard occupancy, 100 to 150 ft is permissible. NFPA Std No 101 also specifies that access to exits provided by aisles, passageways, or corridors shall be convenient to every occupant and that the aggregate width of passageways and aisles shall be at least the required width of the exit. Exit doors should be clearly visible, illuminated, provided with signs, and must open in the direction of exit travel.

Exterior door openings used for hoisting equipment or material on the outside of buildings should be protected by guard rails or gates. Such doors are a serious hazard when open and not in use.

Windows

Windows involve various hazards, of which the most common is that men may fall while cleaning them. Window sashes that swing back into the room eliminate the necessity for washing windows from outside the building. Some types of these windows provide good control over ventilation and can be opened and closed readily.

It is recommended that awning type sash not be installed adjacent to walkways unless it is more than 7 ft above them.

A monorail with cage may be used for window cleaning and other outside work. The window cleaning code* specifies the design of belts, belt terminals, and anchors when this work is to be done by standing on the outside sill. The code requires that the belt be so designed and constructed that, if in case one terminal is loosened from the window anchor, the terminal cannot pass through its fastening on the belt. The entire belt assembly must be capable of holding a suspended load of 1,000 pounds.

The standards for design and use of fastening anchors should be strictly followed. Heavy forged metal anchors of brass, Monel, or copper-nickel alloy equivalent to Monel metal are recommended for their strength, toughness, and resistance to cor-

rosion. Bolts for securing the anchors to the frames must be of the same material. In hollow metal frame construction, the bolts on combination anchor fittings are at least $\frac{3}{8}$ in in diameter and must pass through a wrought iron or steel plate not less than $\frac{3}{8}$ in thick by 6 in long.

The plate is in the form of a Z, or equivalent. One portion reaches behind the exposed face of the frame and is bolted or riveted by at least two $\frac{1}{4}$ -in bolts, screws, or rivets of the same material as the anchor to the part of the frame protected by masonry or concrete. The code also contains standards for swinging scaffolds, boatswain's chairs, and ladders.

Flooring materials

Comfort, health, and safety are closely related to the design and specifications for floors. Requirements often vary sharply from department to department, so that a careful study of many factors is essential to determine the best type of floor for a particular location. These factors include

Load	Illumination
Durability	Maintenance
Noise	Dustiness
Drainage	Heat conductivity
Resilience	Electrical conductivity
Appearance	Chemical composition

Since a principal cause of floor accidents is slippiness, the inherent slipping hazard of various types of floor surfaces should be ascertained.

Ordinary smooth iron or steel plates are unsafe. Marble, slate, asphalt tile, linoleum, cement, and wood are reasonably safe if properly maintained and kept clean. The safest floor materials are cork, dry rubber, creosoted wood blocks, asphalt, roughened concrete, and checkered plate. The anticipated traffic and the nature of the process will influence floor choice.

Inserts of various materials can be used to reduce slippiness in specific areas or to combat conditions that cause rapid deterioration of flooring. For example, cast metal inserts are used around woodworking machines. Sheets of soft lead may cover

*American Standards Association, 10 East 40th St., New York City. *Safety Code for Window Cleaning* A39.1.