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Recommended Good Practice Requirements
for
Construction Operations

Tentatively Adopted at the 1930 Annual Meeting of the
National Fire Protection Association

Reprinted from the PROCEEDINGS

National Fire Protection Association
International
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Note.

This is the first formal report of this committee. It covers the fire hazards of buildings in course of construction and methods of fire prevention and control. The committee also has under its jurisdiction the fire hazards of construction operations in bridges, dams, etc.; these will be considered by the committee in a subsequent report.

Report of Committee on Construction Operations.

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[*This report has been submitted to ballot of the Committee, consisting of fifteen members, of whom fourteen have voted affirmatively and one affirmatively with reservations.*]

RECOMMENDED GOOD PRACTICE REQUIREMENTS FOR CONSTRUCTION OPERATIONS.

Foreword.

Buildings in course of construction have many additional fire hazards not found in completed structures. Fire protection equipment to restrict the spread of fire and extinguish it promptly has not yet been installed. Fires are often difficult of access by the fire department. Every opportunity exists for serious fire loss, as is amply evidenced by the partial fire record incorporated in this report. Such fires are apt to cause losses far beyond the actual physical property destroyed, by delaying completion of buildings with consequent loss of revenue. Important business projects, contingent upon occupancy of a structure at a given date, may thus be seriously deranged even by a fire causing a relatively small direct loss. These suggested good practice requirements are intended to indicate the measures through which these fires may be prevented or controlled in their incipiency with a minimum of damage.

1. Scope.

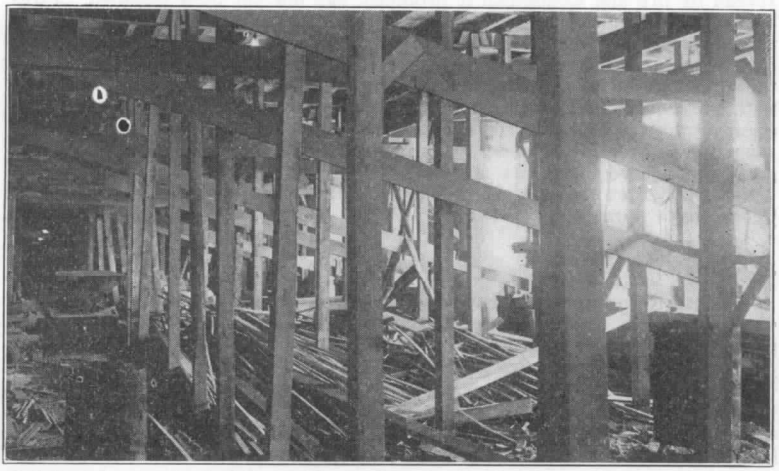
These Recommended Good Practice Requirements are intended to apply to all buildings in course of erection, except that incombustible or flameproofed scaffolding may not be necessary in buildings four stories and/or fifty-five feet in height and which do not have a ground area of more than 10,000 sq. ft. provided they are located so as to be readily available and accessible to the operations of the fire department. They are intended to apply to all buildings of the auditorium type of construction irrespective of height and area.

2. Scaffolding.

Undoubtedly of the many hazards affecting building, especially the high modern type of fire-resistive buildings, flammable scaffolding is the predominating one. Fires have occurred in scaffolding erected on the outside as well as the inside of buildings. They have occurred on the sidewalk bridging as well as high above the street and the fire damage in either case has been extremely heavy.

Scaffolding can be separated into two units—one the supporting members and the other the platforms. Numerous recent scaffold installations at various locations and on differing types of structures have shown the practicability of all metal supporting members. In the matter of platforms the problem is different. To undertake to require all metal platforms is probably going too far from a practicable and workable viewpoint. To allow combustible platforms is to allow fire hazards of serious proportions. The evident solution appears to be a compromise between the two and to allow the platforms to be constructed of lumber that has been flameproofed to make it slow burning. There is one instance recorded where flammable scaffolding has been protected by the installation of temporary automatic sprinklers. The installation of such equipment admits of the seriousness of the hazard and to a degree affords protection, but it seems a wise endeavor to attempt to eliminate the hazard rather than to diminish it. Interior and exterior scaffolding should be treated alike, except possibly for the methods employed to flameproof the wood.

The records indicate there is little to choose between the hazard of high scaffolding and low scaffolding once it is afire. This brings the question as to the proper method of measuring the hazard of the construction, which should be in the quantity of board feet used in the erection of the scaffolding rather than the square feet or bulk area covered by the scaffolding. It would hardly seem fair to require that a small scaffold whether located at a high or a low point be treated the same as scaffolding at similar points



Reinforced concrete building with wooden shoring in place; also, large quantity of combustible refuse.

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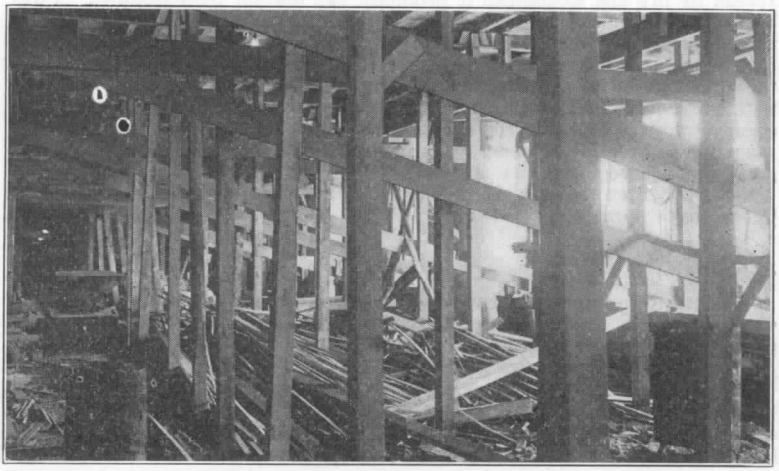
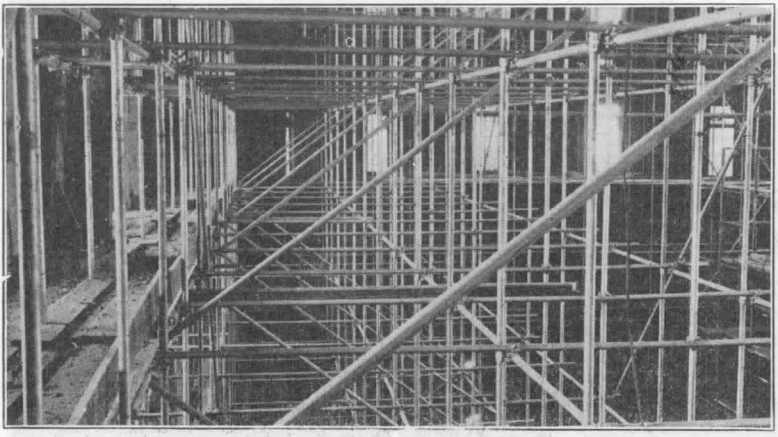


Reinforced concrete building with wooden shoring in place; also, large quantity of combustible refuse.



All steel scaffolding supports.

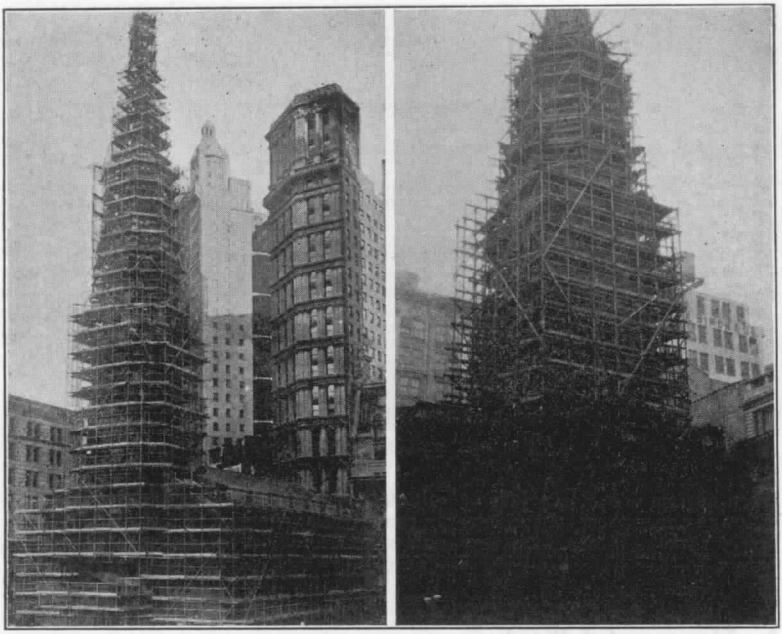
when of considerable surface or volume. The possibilities of severe damage exists in the amount of combustible construction entering into the scaffolding rather than its location whether high or low, modified of course to a certain extent in the latter case by its availability and accessibility to the fire department.

3. Flameproofed Wood.

Experience indicates the limited value of such relatively inexpensive treatment as have been observed in the past; that no treatment can make wood truly fireproof. A word of warning is not amiss on the lack of permanence of ordinary treatments when exposed to the weather. Despite considerable ill repute of the process, due to the marketing in previous years of so-called fireproof paints of little merit, there are at present available processes which are of real value in materially decreasing the susceptibility to ignition from a small source of heat and retarding the spread of flame along the surface.

4. Wooden Forms.

In the construction of fire resistive buildings large quantities of lumber are used in the form work to support the floors until they set. It seems impracticable to use flameproofed wood for this purpose. However, the shoring should be of incombustible material and a limit placed upon the number of floors that may have the forms in place at the same time. The practice in New York City is to limit the number of floors to not more than three at one time in advance of the three floors in progress of setting. When the forms are removed, such woodwork as is broken and unsuited for further use should be carried away from the building, and not disposed of by making bonfires upon the floor arches or by burning in the salamanders. No part of such building where the forms are in place should be used for the storage of combustible materials.



Church—Flameproofed scaffolding and metal supports.

Church—Wood scaffolding and wood supports.

5. Wind Breakers.

All temporary closures in window and door openings and around scaffolding should be of incombustible material.

6. Salamanders and Heaters.

Next in importance to temporary woodwork is probably the hazard of temporary heating appliances, such as salamanders. Salamanders should be substantially constructed, stable, not readily overturned, and restricted to the use of coal, coke or kerosene oil as fuel. They should be under the constant supervision of an attendant on every floor where they are in use.

The coal or coke heater should have an ash receiving metal bottom, supported on legs six inches high or on four inches of tile blocks, placed on the floor and a clearance maintained of at least two feet horizontally and six feet vertically between the heater and combustible material of any kind. The top of the salamander should be fitted with a substantial wire screen of one-half inch mesh. In no case should the heaters be suspended from the ceiling.

The kerosene heated type of salamander is usually supported on high legs and the oil supplied to burner under air pressure from a seamless pressed steel tank located six to ten feet distant from the salamander; tank is usually ten to fifteen gallon oil and air capacity and connected to the burner by substantial oil resisting hose; the top of the salamander fitted with a cone-shaped cover raised on lugs about an inch above the sides to distribute the heat. Similar clearance maintained as the coal or coke salamander.

7. Tarpaulins.

Many fires are caused by tarpaulins blowing loose and igniting from salamanders. It is important they be securely fastened. A good arrangement is to provide vertical shores spaced approximately four feet on centers to serve as a rigid frame for attaching the tag lines.

8. Fusion Welding and Cutting Processes.

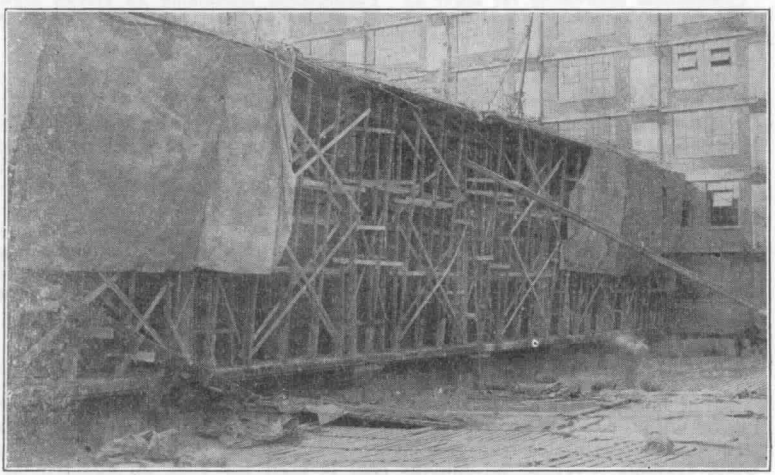
Proper protection of surroundings should be made before such devices are put in service by the use of asbestos blankets or other fire resisting materials and all openings in floors closed where sparks are likely to drop on persons or combustible material. Ashes or sand should be used for the absorption of oil and such other precautions taken as will preclude the possibility of sparks igniting combustible surroundings. When operations cease for the noon hour or at the end of the day, the surroundings adjacent to the operations should be thoroughly wet down.

9. Gasoline and Other Volatiles.

Flammable liquids should not be stored or handled in the building except in approved portable tank wagon or safety cans. Reserve storage in barrels should be in yard or court well away from the structure and kept under lock and key. When mixed in plastic floor covering or in waterproofing compounds or in the application of paint by the spray process, adequate ventilation is most essential, smoking should be strictly prohibited and the workmen should not wear shoes with steel nails or other metal that might cause a spark.

10. Smoking in Hazardous Locations.

It is not practicable to prohibit smoking generally, but it is entirely reasonable to enforce "no smoking" rules in hazardous portions of the building.



Reinforced concrete building with wooden shoring and scaffolding; also, temporary enclosing tarpaulins.

Combustible scaffolding for lower 23 floors; steel scaffolding and flameproofed planking on upper floors.

Combustible scaffolding 23 stories high. Near view of lower portion of picture on the left.

11. Tar Kettles.

Should be located outside of the building or on a non-combustible roof. It is desirable to use electricity or other safe heating in preference to a wood fire.

12. Hoists.

Temporary construction hoists on the interior or exterior of any building over four stories or fifty-five feet in height or over 10,000 sq. ft. ground area, should be of incombustible material. If platforms are erected for handling materials, flameproofed wood should be used in the construction.

13. Hoisting Machinery.

The hoisting machinery if operated from steam boiler within the building or within ten feet of any part of the building, should be enclosed in a structure of corrugated iron or other sheet metal, which may be attached to wood framing. Where bituminous coal is used for fuel, an effective arrester should be provided on the boiler stack.

14. Elevators.

In all buildings over six stories or 75 feet in height, at least one elevator should be installed and be in charge of a competent operator and ready for service at all times both night and day.

15. Stairs.

In all buildings six stories or 75 feet in height, unless one or more permanent stairways have been installed, at least one temporary stairway should be provided, continued in height as rapidly as the work progresses to the highest floor that has been installed and maintained in serviceable condition until a permanent stairway has been completed.

16. Fireproofing.

In every building of steel frame construction, the columns in all stories below grade and to a point at least 30 feet above grade should be insulated with approved fireproofing before additional form work and floor arches are erected in excess of 75 feet above grade. Until such fireproofing has been installed, these lower floors of the building should not be used for the storage of combustible material.

17. Storage of Materials.

Materials stored within the building or within ten feet of the building which require covering, should be protected by incombustible material.

18. Workmen's Shanties.

In all buildings the workmen's shanties for the storage of tools and materials that contain in their construction more than 500 board feet of lumber, should be constructed of incombustible materials.

19. Standpipes.

In all buildings in which standpipes are to be installed, such standpipes should be carried up as the construction progresses, in such a manner that they are always ready for fire department use to the topmost floor construction that has been installed. The standpipes should be provided with siamese fire department connection on the outside of the building at the street level, conspicuously marked and have at least one standard hose outlet at each floor. Where a building exceeds 500 feet in height, the standpipe should be connected to a water supply satisfactory to the inspection department having jurisdiction. For detailed requirements of pipe sizes, hose valves, hose, water supply, etc., refer to the Regulations on Standpipe and Hose Systems.

20. First Aid Fire Appliances.

In every building operation wherever a tool house, a storeroom, or other shanty is placed, or a room or space is used for storage, dressing room or workshop at least one approved portable chemical extinguisher of non-freezing type or protected against freezing should be provided and maintained in an accessible location. A similar fire extinguisher should also be provided on each floor located at the working stairway where the majority of the workmen pass up and down. An equipment of fire pails and water casks may replace one-half the number of fire extinguishers recommended, if

equally distributed. If fire pails or casks are subjected to freezing, a solution of calcium chloride should be used. For information on the methods of operation, maintenance, etc., of extinguishers, see Regulations on First Aid Fire Appliances.

21. Access to Fire Extinguishing Equipment.

During building operations, free access from the street to fire hydrants, and to outside connections for standpipes, sprinklers or other fire extinguishing equipments, whether permanent or temporary, should be provided and maintained at all times. No material or construction equipment should be placed within five feet of such hydrant or connection, nor between it and the center line of the street. Signs designating the location of first aid equipment and standpipe connections should be conspicuously displayed.

22. Heating Apparatus.

The permanent heating equipment should be installed and put in operation as soon as practicable.

23. Electrical Equipment.

All electrical wiring apparatus or equipment for light, heat or power purposes should be installed in compliance with the special requirements approved by the inspection department having jurisdiction and a temporary certificate of acceptance issued by such department.

24. Watch Service.

Preferably an approved combination fire alarm and central station watch service covering all parts of the building and watchman making half-hourly rounds for two hours after suspension of work for the day, and hourly rounds thereafter, should be provided for nights, Sundays and holidays. When such service is not available, the building should be patrolled in a similar manner by a competent watchman or watchmen registering to approved watchman's clock from stations covering all parts of the building. Watchmen should also be on duty at all entrances during the day or other times when mechanics are at work.

25. Disposal of Waste.

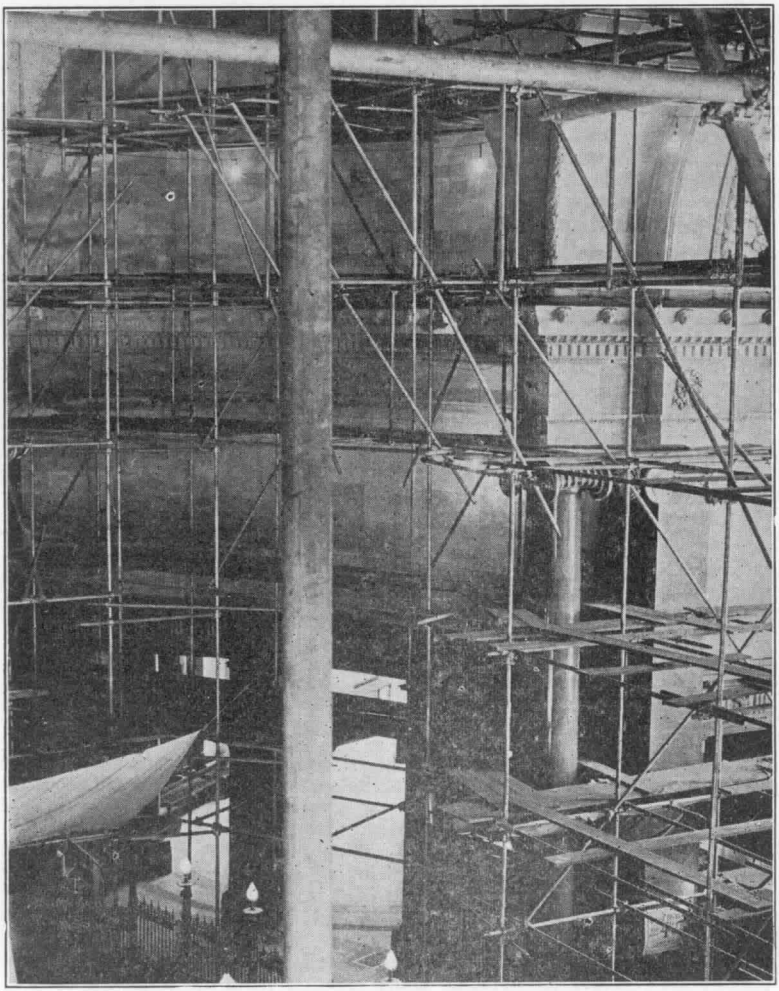
Waste material and rubbish should not be stored nor allowed to accumulate within the building or in the immediate vicinity, but should be removed from the premises. Combustible waste and rubbish which if on fire might cause sufficient heat to injure unprotected steel, spall concrete, stone, etc., should be removed at least daily. No material should be disposed of by burning on the premises or in the immediate vicinity. Woodwork used in the construction of rubbish chutes should be flameproofed.

26. Fire Warden.

A person of intelligence and diplomacy should be appointed as a fire warden and vested with authority to supervise the installation and maintenance of the recommended fire protection appliances and fire prevention measures, the removal of all unnecessary combustible material and waste and the supervision of adequate watchman and supervisory service.

27. Demolition or Extensive Alterations.

The provisions of Sections 3, 6, 10, 17, 24 and 25 also apply to buildings which are being demolished or extensively altered.



Steel scaffolding and flameproofed planking.

FIRE RECORD.

Fire losses in buildings under construction have been numerous and costly. Even where the buildings have been of fire-resistive construction, the use of a large amount of temporary woodwork in the construction has been responsible for bad fires. These losses have been further increased by lack of or deficient fire protection.

A partial record of severe losses in buildings under construction in New York City follows:—

Fire-Resistive.

	Contents heavy Building slight
Vanderbilt Hotel, January 13th, 1912	
Pennsylvania Hotel, April 8, 1918	$33,130.00
James Butler Warehouse, January 7, 1923	45,925.87
Aeolian Building, April 22, 1926	143,000.00
Sherry-Netherlands Hotel, April 13, 1927	516,000.00
Riverside Drive Church, Dec. 21, 1928	*1,500,000.00
	$2,238,055.87

Ordinary.

Dwellings	—2226-36 E. 7 St., Brooklyn, Nov. 8, 1923	$ 14,588.84
"	2227-35 E. 7 St., Brooklyn, Nov. 8, 1923	11,672.06
Apartments	—Timpson Pl. and St. Johns Ave., Bronx, Jan. 18, 1924	75,000.00
"	1920-30 Davidson Ave., Bronx, Oct. 26, 1927	* 30,000.00
"	941 Jerome Ave., Bronx, Feb. 19, 1928	*116,000.00
"	Shakespeare Ave. and Jessup Pl., Mar. 25, 1928.	208,305.59
"	1220-50 Grant Ave., Bronx, July 2, 1928	89,375.00
"	70 St. Marks Pl., St. George, S. I., Jan. 24, 1929	179,549.16
"	354-64 91st St., Brooklyn, June 2, 1929	113,500.00
"	Jerome and Anderson Ave., Bronx, June 25, 1929	*645,000.00
"	Seaman and Payson Ave., Bronx, July 2, 1929.	*225,000.00
"	Bronx Boulevard and 219 St., July 29, 1929	*100,000.00
"	Phlox Pl. and Beach Ave., Queens, Aug. 1, 1929	* 65,000.00
"	Newbold and Pugsley Ave., Bronx, Aug. 22, 1929	*200,000.00
"	221-33 West 23rd St., Sept. 24, 1929	50,000.00
"	501 West 183rd St., Oct. 29, 1929	*100,000.00
"	1653-9 Unionport Ave., Bronx, Dec. 24, 1929	* 25,000.00
Total		$2,247,990.65

In practically all of the buildings of fire-resistive construction in the foregoing list, the fire originated in, or its spread was largely augmented by the use of woodwork for the temporary construction of scaffolding, bridging, arch forms, hoists and elevator enclosures.

The origin of fires in the list of ordinary buildings was from varying causes, a number being open to suspicion of incendiarism, especially some of those in 1929 ascribed to "racketeering" in the building industry. Most of the fires occurred before plastering had been applied to the wooden lathing and their spread was very rapid.

Various other smaller fires have occurred in New York City in buildings of fire-resistive construction under erection from the following causes:

Builders in two instances set fire to broken used lumber forms removed after the arches had set and these fires gained sufficient headway to necessitate calling out the fire department.

*Estimated.