Noncombustible Schools for Omaha

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CODE RESTRICTIONS on types of construction and fire resistance requirements can have a significant effect on the cost of a building. Sometimes these restrictions are arbitrary and unnecessary, and result in higher costs without any increase in public safety or protection of property. Unduly restrictive fire protection requirements have a particularly severe impact on the cost of steel construction.

However, logical code changes can be achieved through the cooperative efforts of designers and building officials. A few years ago the author's firm participated in a successful effort to amend the Omaha Building Code to permit the use of unprotected non-combustible construction, such as steel, for most school facilities. The following description of this experience is presented in the hope that it will encourage others to work for the elimination of unduly restrictive fire protection requirements throughout the country.

AMENDING THE OMAHA CODE

The Omaha Building Code is the National Building Code adopted with modifications by ordinance. The National Building Code is produced by the American Insurance Association, formerly the National Board of Fire Underwriters, and is acknowledged to be oriented towards property protection, rather than just life protection. This is evidenced by the fact that this Code is very restrictive with regard to floor area limitations and fire resistance requirements.

The Leo A. Daly Company has been engaged for several decades in the design of a large number of educational facilities in the Omaha area. These have included elementary, junior high and high schools, as well as university buildings. For all such facilities, it is necessary to secure buildings which are not only functional, flexible, safe, and attractive, but which can also be built with the available funds. In most cases, to achieve these features and remain within the budget, the most desirable type of construction is unprotected noncombustible. However, with the area limitations of the National Building Code such construction was not permissible for many of these facilities, except by separation of areas with fire walls and doors. School authorities today require very flexible facilities which are adaptable to the "open" concept of education and which provide for free movement between the various areas. Obviously the use of separation walls with fire doors is not in conformance with these present educational requirements. To achieve this desired "open" concept under the provisions of the National Building Code required the provision of either a sprinkler system or the use of protected noncombustible construction with its required fire resistance ratings. To provide either increased the cost of the facility, and the incorporation of fire resistance limited the possible architectural treatments which could be employed.

Both the author's firm and the Omaha school authorities felt that these area limitations in the National Building Code were unduly expensive and unrealistic for such educational buildings, so it was decided to make an effort to correct the situation. To this end a study and research program was conducted by the Leo A. Daly Company in cooperation with the school authorities to determine what construction features were required for these facilities to provide safe, functional, attractive, and economical buildings for the school system. In conjunction with these studies, many conferences were held with the Omaha fire authorities to secure their requirements and cooperation. As a result of these studies and conferences, a proposed amendment to the Omaha Building Code for educational buildings was prepared and presented to the City Council. This amendment was adopted by ordinance on March 11, 1964. The text of the amendment is reproduced in Appendix A.

This ordinance amendment states that outside the fire limits buildings for educational occupancies may be unlimited in area when of unprotected noncombus-

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tible construction or better, providing the buildings do not exceed three stories in height and are horizontally separated from other buildings by at least 80 ft. Accompanying this liberalization are special requirements for the enclosure of high hazard areas such as storage rooms, chemistry laboratories, woodworking shops, etc., as well as more stringent restrictions on interior finish materials with respect to flame spread, fuel contribution, and smoke or toxic gas development. Since the adoption of this amendment, numerous school buildings have been designed and built under its provisions; these have proven to be economical, functional, and attractive. In most instances these buildings have been of steel construction, whereas under the National Building Code provisions they would probably have been of some other material.

In preparing this code amendment the basic philosophy adopted was that code requirements for adequate exits, short travel distances to exits, the use of interior materials that did not spread fire or smoke readily, and fire detection systems are much more meaningful in protecting lives than area limitations, fire resistance ratings, and fire walls. Another factor considered was the minimal combustible materials in present day schools. Basically the amendment places the major emphasis on the safety of the occupants of the facility rather than on the protection of the property. One of the major factors which influenced the adoption of this philosophy was the fact that the school occupants not only are familiar with their surroundings, but are frequently drilled in fire safety. The school authorities insisted that they could evacuate any school building within three minutes after an alarm is given.

WHAT NEEDS TO BE DONE

This experience has been presented not as an ideal solution to this particular problem, but as an example of how cooperative efforts of all parties concerned in the matter resulted in a logical change in the Omaha Building Code for educational facilities. In this case, the author's firm could afford to participate in and provide the technical assistance for such an effort, since the school system is a major and continuing client. However, for an individual project and client, such an effort would not be feasible under the present fee structure. Also, the time required to accomplish such a code change could not be fitted into the design and construction schedule usually demanded for such a project.

Although more effort needs to be expended to achieve such code changes, all such activities should be considered as only "stop-gap" measures. The building industry must proceed with the development of the science of fire protection as another technical discipline in the integrated design of buildings. This should be based on the philosophy that fire protection is to be provided in accordance with the degree of hazard present in a particular structure. The ultimate effort in this direction should be the recognition in the major building codes of rational design of adequate fire protection on a well founded technical basis. To achieve this goal will require not only a considerable expenditure of funds and technical effort, but will also necessitate an extensive educational and promotional effort toward both code authorities and the design profession.

It is encouraging to see some efforts and applications of rational fire protection design such as the U. S. Steel Buildings and the Michelson Building in Newport Beach, California. However, this is only scratching the surface and much more effort is required.

Another aspect of this problem is of vital interest to the entire country. Present and near future needs for adequate housing in the U. S. present a tremendous challenge to the building and financial industries. Accompanying this demand will be a corresponding demand for other types of buildings to support such an increase in population. To provide for these enormous demands, the building industry must develop many new techniques, including some means of mass producing housing and other facilities, which will control the costs of same. One accepted technique which must be vastly improved and expanded is the prefabrication of various elements which can be readily assembled on site. Obviously the larger and more complete these elements can be, the greater the economies which can be achieved. Since steel is very adaptable to prefabrication and shop assembly, it can be expected to have a dominant role in any mass prefabrication system. To take full advantage of the capabilities of steel for such construction, the code requirements for fire resistance must be eliminated when not absolutely necessary. What is needed is a rational discipline of fire protection design.

APPENDIX A

Ordinance Amendment to National Building Code Title 37.04.050

Revised—March 11, 1964

An Ordinance to Delete and Amend Section 312—Page 24 of the National Building Code

EDUCATIONAL OCCUPANCIES

(a) Outside the fire limits, buildings of educational occupancies may be unlimited in area as required in Section 402 when of unprotected noncombustible construction or better and complying with all of the following requirements:

1. The building shall not exceed three stories in height and shall have a minimum horizontal separation from other buildings of not less than 80 feet.
2. All floor and roof assemblies, including ceilings and suspension thereof shall be constructed entirely of approved noncombustible materials. No combustible materials whatsoever shall be used in concealed spaces formed by ceilings and floors, and ceilings and roofs, except necessary nailers, furring strips and blocking.
3. The following areas shall be entirely enclosed with noncombustible construction having a fire resistance rating of not less than one hour:

   All storage rooms exceeding 360 square feet in area.

   Woodworking shops, power mechanics shops and metal working shops.

   Chemistry laboratories.

   All interior doors that open through the required 1-hour walls shall be not less than Class "C" type construction with single point locks or latches and approved automatic closing device.
4. Interior finishes shall not exceed limits as follows: Interior finish shall include the exposed interior surfaces of buildings where the surface is an integral part of the building or affixed thereto. Ordinary paints and wall coverings less than one-fortieth of an inch in thickness ($\frac{1}{40}$″) applied directly to and adhered to a noncombustible base, floor coverings, window blinds, window shades or window drapes, furniture, cabinets and shelving, chalk and tackboards and any other type of equipment or teaching aids normally found in a classroom shall not be deemed to be interior finish. Interior finishes shall not exceed the flame spread rating of 25, a fuel contribution of 25, and smoke developed rating of 10, except that not more than five percent (5%) of finish of the aggregate wall and ceiling area of any room, space, stairway, or hallway, may have a flame spread rating in excess of the ratings listed above, but shall not exceed a flame spread rating of 100.

(b) Where structures qualify under (a) 1, 2, 3, and 4 above: Wire glass panelling of unlimited areas set in steel frames and bucks shall be deemed to meet the requirements of Section 604.2 (c). No openings, except the necessary doorways, and windows opening to the exterior of the building, shall be permitted in a stair enclosure. Such doorways shall be equipped with approved self-closing or automatic doors. Solid wood doors of the flush type or hollow metal doors, both of thickness not less than one and three quarter inches ($1\frac{3}{4}$″), shall be used, unless defined in Sections (a) and (b). Any glass areas in interior doors opening into stairway enclosures shall contain wire glass panels, and doors may be equipped with push-pull hardware.

(c) Education occupancies for 100 or more occupants shall not be located above the second story in buildings of ordinary construction, unprotected noncombustible construction (unless they meet the conditions set forth in Para (a), Sections 1, 2, 3, and 4), or wood frame construction; except that existing buildings converted from another occupancy to such occupancy shall be exempt from these restrictions if sprinklered.

AMENDMENT: Under Section 702—FIRE RESISTIVE CONSTRUCTION Type A

DELETE: Para (d) of Sec. 702.8—Page 71 of National Building Code. Fire Resisting Ceilings:

(d) The space above fire resisting ceilings shall be firestopped with approved noncombustible material to form areas of not more than 1,500 square feet. Steel not thinner than 24 gauge shall be accepted as firestopping.