OHIO BOARD OF BUILDING STANDARDS

UNDERSTANDING THE CODES

CODES: UNDERSTANDING THE PROCESS

Each state's building code enabling legislation, which is grounded within the police power of the state, is the source of all authority to enact building codes. In terms of how it is used, police power is the power of the state to legislate for the general welfare of its citizens. This power enables passage of such laws as building codes. While the municipality may not further delegate its police power (e.g., by delegating the burden of determining code compliance to the building owner, contractor or architect), it may turn over the administration of the building code to a municipal official such as a building official, provided that sufficient criteria are given to the building official to establish clearly the basis for decisions as to whether or not a proposed building conforms to the code.

The Board of Building Standards is largely concerned with maintaining "due process of law" in enforcing the building performance criteria contained in the body of the code. Only through careful observation of the administrative provisions can the building official reasonably hope to demonstrate that "equal protection under the law" has been provided. While it is generally assumed that the administration and enforcement section of a code is geared toward a building official, this is not entirely true. The provisions also establish the rights and privileges of the design professional, contractor and building owner. The position of the building official is merely to review the proposed and completed work and to determine if the construction conforms to the code requirements. The design professional is responsible for the design of a safe structure. The contractor is responsible for constructing the structure in conformance with the plans.

During the course of construction, the building official reviews the activity to ascertain that the spirit and intent of the law are being met and that the safety, health and welfare of the public will be protected. As a public servant, the building official enforces the code in an unbiased, proper manner. Every individual is guaranteed equal enforcement of the provisions of the code. Furthermore, design professionals, contractors and building owners have the right of due process for any requirement in the code.

A building code, as with any other code, is intended to be adopted as a legally enforceable document to safeguard health, safety, property, and public welfare. A building code cannot be effective without adequate provisions for its administration and enforcement. The official charged with the administration and enforcement of building regulations has a great responsibility and with this responsibility goes authority. No matter how detailed the building code may be, the building official must, to some extent, exercise his or her own judgment in determining code compliance. The building official has the responsibility to establish that the structures in which the citizens of the community reside and the buildings in which they work are designed and constructed to be structurally stable, with adequate means of egress, light and ventilation and to provide a minimum acceptable level of protection to life and property from fire.

There are three basic factors that are considered in determining code compliance of a building design - building use (the way a building is intended to be occupied and the related risk for that use as well as the fire load brought into the particular building type after they are built - furniture, stored materials, etc), building construction type (what it is made of), and building size (height and area). By considering the height and area of buildings, classifying construction types, classifying how buildings have been and are proposed to be occupied, and evaluating other requirements for various building systems and components assures that the associated risks are managed equitably in all buildings. As we have done this in Ohio, we have seen a steady decrease in lives lost in structure fires, so much so that Ohio is consistently below the national average in building fire deaths. As is the case with medicine so it is with architecture and engineering; any gains that have benefited us all have made it necessary to involve practitioners who understand the complexities and opportunities presented by Ohio's legally adopted building code provisions.

Occupancy Classifications:

First, when trying to assure that people will live in a safe built environment, it is imperative to understand how a building's is intended to be used. The code classification system for buildings is therefore based upon how the building is intended to be used. The safety of building occupants cannot be assured if only the construction type and the height and area of a building are considered. How a building is used affects the ability of the building service equipment to deal with the risk of fire and the occupants' ability to respond to an emergency. A building's occupancy classification also takes into consideration the various types of things moved into a building for use in that occupancy type. One can imagine a drastic change in fire risk if a building that was originally designed and used as an office building was changed to be used as a warehouse for flammable materials or as a nursing home. Consideration of the building's use is critical to properly evaluating the appropriate equipment and systems needed to assure the occupants' safety. The model code classification system designates occupancy types as follows:

Assembly (Group A)

Assembly occupancies are those in which the density or number of occupants is generally high, occupants are usually unfamiliar with their surroundings, various lighting and sound levels are present, and various activities can reduce occupant's awareness in emergency conditions. These risk factors make the potential for multiple fatalities and injuries from fire comparatively high and therefore make compliance with the code important. Since there are differing levels of risk, the assembly occupancy is broken into five sub-classifications: Groups A-I through A-5.

Business (Group B)

The risks to life safety in the business occupancy classification are low. Exposure to the potential effects of fire is limited because business-type facilities most often have low fuel loads, are normally occupied only during the daytime and, with some exceptions, are usually occupied for a set number of hours. The occupants, because of the nature of the use, are alert and ambulatory, conscious and aware of their surroundings and generally familiar with the building's features, particularly the means of egress.

Historically, this occupancy has one of the better fire safety records for the protection of life and property.

This occupancy type recognizes the need for limited storage spaces that are incidental to office occupancies. Although occupancies such as fire stations, police stations and post offices are listed as business occupancies, not all can be solely classified in Group B.

In their simplest form, fire stations, police stations and post offices are viewed primarily as civic administration facilities and are considered business occupancies. A high percentage of fire and police stations and post offices also serve as places for other purposes [e.g., restraint of prisoners (Group I), courtrooms (Group A), combustible material storage (Group S), dormitories (Group R) and vehicle parking (Group S). The only time a fire or police station or a post office can be considered solely Group B is when civic administration is the only function of the building—otherwise the building must be considered as a mixed occupancy and is subject to other code provisions.

Classrooms and laboratories that are located in colleges, universities and academies for educating students above the 12th grade and which have an occupant load of less than 50 people, are classified in Group B. Classrooms with an occupant load greater than 50 are classified in Group A. Classrooms for children through the 12th grade with an occupant load of less than 50 are classified in Group E. When lecture facilities for large groups (i.e., occupant load greater than 50) are located within the same building where classrooms (i.e., occupant load less than 50) are found, the building is a mixed occupancy (Groups A and B) and is subject to additional code provisions.

Educational (Group E)

The risks to life safety in this occupancy vary with the composition of the facilities and also with the ages of the occupants. In general, children require more safeguards than do older, more mature persons. Day care centers are a special problem since they are generally occupied by preschool children who are less capable of responding to an emergency. The hazards found in a day care center are far greater than in normal educational facilities, not so much because of the occupant or fuel load, but because of the inability of the occupants to respond

The two fundamental characteristics of Group E are that the facility is occupied by more than five persons (including the instructor) and the purpose of the facility is for educating persons at the 12th-grade level and below, but not including more than five occupants less than 2 ½ years of age.

Occupants who are older than 2 ½ years of age are typically capable of walking and talking and have an instinct for self-preservation. As such, it is expected that these occupants are able to recognize an emergency situation and respond to instructions in an appropriate manner. If more than five occupants under the age of 2 ½ years are being cared for, then the facility is considered a childcare facility (Group I).

Occupancies used for the education of persons above the 12th-grade level are not included in Group E. These facilities are occupied by adults, who are not expected to require special supervision, direction or instruction in a fire or other emergency. By the same measure, however, they also are not closely supervised. Therefore, classrooms and laboratories located in colleges, universities and academies for students above the 12th grade are classified in Group B, because the occupancy characteristics and potential hazards to life safety present in these facilities more nearly resemble those of a business occupancy than educational occupancy. Similarly, lecture halls for students above the 12th grade with an occupant load of greater than 50 are classified in Group A. It is common for a school to also have gymnasiums, auditoriums and libraries (Group A), offices (Group B) and storage rooms (Group S). When this occurs, the building is a mixed occupancy and is subject to additional code provisions.

Factory and Industrial (Group F)

Because of the vast number of diverse manufacturing and processing operations in the industrial community, it is more practical to classify such facilities by their level of hazard rather than their function. In industrial facilities, experience has shown that the loss of life or property is most directly related to fire hazards, particularly the fuel load contributed by the materials being fabricated, assembled or processed.

Statistics show that property losses are comparatively high in factory and industrial occupancies, but the record of fatalities and injuries from fire has been remarkably low. This excellent life safety record can, in part, be attributed to fire protection requirements of the code.

All structures that are used for fabricating, finishing, manufacturing, packaging, assembling or processing products or materials are to be classified in either moderate hazard or low hazard. These classifications are based on the relative level of hazard for the types of materials that are fabricated, assembled or processed. Where the products and materials in a factory present an extreme fire, explosion or health hazard, such facilities are classified in Group H. Since there are differing levels of risk, the factory and industrial occupancy is broken into two sub-classifications: Groups F-I and F-2.

High Hazard (Group H)

The high-hazard occupancy classification relates to those facilities where the storage of materials or the operations are deemed to be extremely hazardous to life and property, especially when they involve the use of significant amounts of highly combustible, flammable or explosive materials, regardless of their composition, i.e., solids, liquids, gases or dust. Although they are not explosive or highly flammable, other hazardous materials—such as corrosive liquids, highly toxic materials and poisonous gases—still present an extreme hazard to life. Many materials possess multiple hazards, whether physical or health related.

There is a wide range of high-hazard operations in the industrial community and, therefore, it is more practical to categorize such facilities in terms of the degree of hazard they present, rather than attempt to define a facility in terms of its function. This method is similar to that used to categorize factory and storage occupancies.

Group H is handled as a separate classification because it represents an unusually high degree of hazard that is not found in the other occupancies. It is important to isolate those industrial or storage operations that pose the greatest dangers to life and property

and to reduce such hazards by providing systems or elements of protection through the regulatory provisions of building codes.
Operations that, because of the materials utilized or stored, cause a building or portion of a building to be classified as a high-hazard occupancy are identified in this section. While buildings classified as Group H may not have a large occupant load, the unstable chemical properties of the materials contained on the premises constitute an above-average fuel load and serve as a potential danger to the surrounding area.
The dangers created by the high-hazard materials require special consideration for the abatement of the danger. The classification of a material as high hazard is based on information derived from National Fire Protection Association (NFPA) standards and the Code of Federal Regulations (DOL 29 CFR).
The wide range of materials utilized or stored in buildings creates an equally wide range of hazards to the occupants of the building, the building proper and the surrounding area. Since these hazards range from explosive to corrosive conditions, the high-hazard occupancy is broken into five sub-classifications: Groups H-I through H-5. Group H-5 is used to represent structures that contain hazardous production material (HPM) facilities. Each of these sub-classifications addresses materials that have similar characteristics and the protection requirements attempt to address the hazard involved. These sub-classifications are defined by the properties of the materials involved with only occasional reference to specific materials. This performance-based criterion may involve additional research to identify a hazard, but it is the only way to remain current in a rapidly changing field. Material Safety Data Sheets (MSDS) will be a major source for information.

Institutional (Group I)

Institutional occupancies are comprised of two basic types. The first relates to health care facilities that are intended to provide medical care or treatment for people who have physical or mental disabilities or diseases and other infirmities. This includes persons who are ambulatory and capable of self-preservation as well as those who are restricted in their mobility or totally immobile and need assistance to escape a life-threatening situation, such as a fire, i.e., children 2 ½ years or less, the infirm and the aged. The second type of occupancy relates primarily to detention and correctional facilities. Since security is the major operational consideration in these kinds of facilities, the occupants (inmates) are under some form of restraint and may be rendered incapable of self preservation without assistance in emergency situations.
The degree of hazards in each type of institutional facility varies respective to each kind of occupancy. The code addresses each occupancy separately and the regulatory provisions provide the proper means of protection so as to produce an acceptable level of safety to life and property.
Institutional occupancies are divided into four individual occupancy classifications: Groups I-1, I-2, I-3, and I-4. These classifications are based on the degree of detention and physical mobility of the occupants.

Mercantile (Group M)

Because mercantile occupancies normally involve the display and sale of large quantities of combustible merchandise, the fuel load in such facilities can be relatively high, potentially exposing the occupants (customers and sales personnel) to a high degree of fire hazard. Mercantile operations often attract large crowds (particularly in large department stores and covered malls and especially during weekends and holidays). There are two factors that alleviate the risks to life safety: the occupant load normally has a low-to-moderate density and the occupants are alert, mobile and able to respond in an emergency situation. The degree of openness and the organization of the retail display found in most mercantile occupancies is generally orderly and does not present an unusual difficulty for occupant evacuation.

Mercantile buildings most often have both a moderate occupant load and a high fuel load, the fuel load being in the form of furnishings and the goods being displayed, stored and sold.

The key characteristics that differentiate occupancies classified in Group M from those classified in Group B are the larger quantity of goods or merchandise available for sale and the lack of familiarity of the occupants with the building, particularly its means of egress. To be classified in Group M, the goods that are on display must be accessible to the public. If a patron sees an item for sale, then that item is generally available for purchase at that time (i.e., there is a large stock of goods). If a store allows people to see the merchandise but it is not available on the premises, such as an automobile showroom, then the occupancy classification of business (Group B) should be considered. A mercantile building is accessible to the public, many of whom may not be regular visitors. A business building, however, is primarily occupied by regular employees who are familiar with the building arrangement and, most importantly, the exits. This awareness of the building and the exits can be an important factor in a fire emergency.

Motor vehicle service stations are included in the mercantile occupancy. These include quick-lube, tune-up, muffler and tire shops. These facilities typically conduct only minor automotive repair work and, as such, more closely resemble a mercantile occupancy than a repair garage (Group S).

Residential (Group M)

Residential occupancies represent some of the highest, if not the highest, fire safety risks of any of the occupancies. There are several reasons for this condition. Structures in the residential occupancy house the widest range of occupant types, i.e., infants to the aged, for the longest periods of time. As such, residential occupancies are more susceptible to the frequency of careless acts of the occupants, therefore, the consequences of exposure to the effects of fire are the most serious.

Most residential occupants are asleep approximately one-third of every 24-hour period. When sleeping, they are not likely to become immediately aware of a developing fire. Also, if awakened from sleep by the presence of fire, the residents often may not immediately react in a rational manner and delay their evacuation. The fuel load in residential occupancies is often quite high, both in quantity and variety. Also, in the construction of residential buildings, it is common to use extensive amounts of combustible materials.

Another portion of the fire problem in residential occupancies relates to the occupants' lack of vigilance in the prevention of fire hazards. In their own domicile or residence, people tend to relax and are often prone to allow fire hazards to go unabated. Thus, in residential occupancies, fire hazards tend to accrue over an extended period of time and go unnoticed or are ignored.

Most of the nation's fire problems occur in Group R buildings and in particular, one- and two-family dwellings, which account for more than 80 percent of all deaths from fire in residential occupancies and about two-thirds of all fire fatalities in all occupancies. One-and two-family dwellings also account for more than 80 percent of residential property losses and more than one-half of all property losses from fire.

Because of the relatively high fire risk and potential for loss of life in buildings classified in Groups R (hotels, motels, apartments and dormitories), there are stringent provisions for the protection of life in these occupancies. Due to the growing trend to care for people in a residential environment, residential care/assisted living facilities are also classified as Group R.

Residential occupancies are divided into four individual occupancy classifications: Groups R-1, R-2, R-3, and R-4. These classifications are based on the degree of risk to which the occupants are subject.

Storage (Group S)

The life safety problems in structures used for storage of moderate- and low-hazard materials are minimal, because the number of people involved in a storage operation is usually small, and normal work patterns require the occupants to be dispersed throughout the facility. The problems of fire safety, particularly as they relate to the protection of stored contents, are directly associated with the amount and combustibility of the materials (including packaging) that are housed on the premises.

Even though a storage facility may be part of another occupancy, or stand alone as a separate building or operation, the characteristics of the occupancy and the level of hazards present in such facilities require that storage occupancies be treated as separate and distinct considerations in the code enforcement process. All structures (or parts of structures) designed or occupied for the storage of moderate- and low-hazard materials are classified either moderate hazard or low hazard.

Storage facilities typically contain significant amounts of combustible or noncombustible materials that are kept in a common area. Because of the combustion or explosive characteristics of certain materials, a structure (or portion) that is used to store high-hazard materials may not be classified in Group S. A building that has hazardous materials in storage in quantities that exceed the limitations in the code is classified in Group H, high-hazard uses.

Storage occupancies consist of two basic types: Groups S-1 (moderate hazard) and S-2 (low hazard), which are based on the properties of the materials being stored.

Utility and Miscellaneous (Group U)

Structures that are classified in Group U are typically accessory to another building or structure and are not more appropriately classified in another occupancy.
Structures classified as Group U, such as fences, equipment, foundations, retaining wails, etc., are somewhat outside the primary scope of the code (i.e., means of egress, fire resistance, etc.). They are not usually considered to be habitable or occupiable. Nevertheless, many code provisions do apply and need to be enforced, e.g., structural design and material performance.

Fire-Resistance Ratings:

The second factor to examine therefore is fire-resistance. Critical to building safety is an understanding of fire behavior and how different materials react when subjected to fire conditions. Because materials have different rates of combustion, the building code classifies buildings by construction type according to the materials of which they are built.
The codes contain the requirements that allow the classification of buildings into one of five types of construction. Code tables provide the minimum hourly fire-resistance ratings for various building elements based on the type of construction of the building and fire separation distance.
Correct classification of a building by its type of construction is essential. Many code requirements applicable to a building, such as allowable height and area (see below), are dependent on its type of construction. If a building is placed in an incorrect construction classification, for example, one that is overly restrictive, its owner may be penalized by increased construction costs. When a building is classified in an overly lenient type of construction, it will not be constructed in a manner that takes into account the relative risks associated with its size or function. The code establishes the basis for the "equivalent risk" theory on which the entire code is based.
The purpose of classifying buildings or structures by their type of construction is to account for the response or participation that a building's structure will have in a fire condition originating within the building as a result of its occupancy or fuel load.
The code requires every building to be classified as one of five possible types of construction: Types I, II, Ill, IV and V. Each type of construction denotes the kinds of materials that are to be used, i.e., wood, concrete, steel, etc., and the minimum fire-resistance ratings that are associated with the structural elements in a building having that classification i.e.,1, 1 ½, 2, or 3 hours. Type I and II construction have building elements that are noncombustible. Type III construction has noncombustible exterior walls and combustible or noncombustible interior elements. Type IV construction has noncombustible exterior walls and heavy timber (HT) interior elements. Type V construction has building elements which are combustible. Types I, II, Ill, and V construction are further subdivided into two categories (IA and IB, IIA and IIB, IIIA and IIIB, VA and VB)
The provisions found in the codes represent fundamental concepts of fire performance that all buildings are expected to achieve. These concepts have been addressed in the codes since their inception. Provisions require materials or assemblies to have a fire-resistance

rating because of the relative fire hazard associated with the occupancy, type of construction, and function associated with the material or assembly. The desired performance of the material or assembly is then evaluated based on test standards and acceptance criteria as set forth in the codes or based on an approved alternative method of fire protection.

The design professional or permit applicant is responsible for determining and providing documentation on the fire performance characteristics of a material or assembly. The construction documents are required to indicate the desired performance characteristics along with substantiating data indicating how the desired performance is to be achieved. The building official must then evaluate the indicated characteristics to ascertain that compliance with the applicable code provisions has been achieved. The building official is also required to evaluate the details of the material or assembly to determine that the required performance criteria are achieved. Even though the construction documents provide the proper information and details, it is critical that the field inspection verify that the assembly or material is installed in accordance with those approved documents.

For example, if a wall assembly is required to have a fire-resistance rating, the construction documents are required to indicate the fire-resistance rating intended to be provided. A detail of the wall assembly could refer to the design number of a specific assembly that has been tested and provides sufficient information to the contractor to verify construction and installation in accordance with the details of the tested assembly. The building official is required to review the design documents to determine that the designated fire-resistance rating is in compliance with the required fire-resistance rating. The building official should also determine that the detail is consistent with the details of the tested assembly. Lastly, the design professional, if contracted to perform post-design services, and the code official should determine that the assembly is constructed or installed as designed and tested.

The tests or analytical procedures acceptable in determining the fire-resistance rating of assemblies and combustibility of materials are addressed in the code. In addition to the fire-resistance rating requirements, special fire protection requirements are included in the code for certain uses of interior partitions.

The code contains provisions for protection features such as fire walls, fire barriers, shafts, fire partitions, smoke barriers, floor-ceiling and roof-ceiling assemblies, penetration protection, fire-resistant joints, fire-resistance rating of structural members, fire opening protectives, duct openings, and concealed spaces—fireblocking and draftstopping. The code also includes prescriptive and calculation methods for determining fire-resistance ratings.

The code identifies the acceptable techniques and methods by which proposed construction can be evaluated to determine its ability to limit the spread and effects of fire. It also contains general provisions, including fire performance requirements for interior and exterior walls, opening protectives, fireblocking and draftstopping. Ideally, fire growth and fire spread will be contained in the building of origin and any adjacent buildings will be protected against fire exposure. Where compartmentation is required by other sections of the code, fire spread will be restricted to the compartment (fire area) of origin.

The use of multiple construction classifications in a single building is very limited and can only be done when specifically called out in the code. An example of combining types of construction is an office building of Type IIA construction located above an open parking structure of Type IB construction. A more common example is that in which a single structure is divided into two compartments by using a fire wall, resulting in two separate buildings or structures—each of which may be of a different type of construction. Typically, each building is to be individually assigned a type of construction.

The code also establishes the minimum fire-resistance ratings for all exterior walls. The required ratings are based on the fuel load, probable fire intensity of the various use groups and the fire separation distance. Once the occupancy classification of the building and the fire separation distance of the walls is determined., the required fire-resistance rating is obtained from the code.

Height and Area Limitations:

The third consideration, given a buildings' construction type and occupancy classification, is of the allowable height and area of the building. Considering construction type alone does not assure building safety. Clearly, as a building grows in height or area there are potentially more people inside the building who must be able to evacuate the building in an emergency. The same level of occupant risk in buildings is maintained by allowing buildings to grow in height and area in proportion to the increases in the building's fire resistance. In other words, a less fire resistant building of Type 5 construction is limited in the height to which it can be built and the area it may contain. A building is therefore permitted to increase in height and area as the construction type becomes more fire resistive because the increased fire resistance contributes to an increased amount of time to evacuate a larger building in an emergency. These increases in fire resistance provide the greater number of occupants more time to travel a greater distance to the building's exits.

There are other methods used to provide additional time for occupants to exit buildings safely as they become larger and taller. In addition to increases in fire resistance of building components, designers can use a variety of fire protection systems that automatically detect fire, notify occupants, and provide early fire suppression or control of smoke (detectors, strobe lights, alarms, sprinklers).

The provisions for governing the height and area of buildings on the basis of use group classification and type of construction are established in the code. All buildings are subject to these limits unless more specific code provisions for a building type provide for different height or area limits. For instance, certain buildings are permitted to be unlimited in area due to lack of exposure, low hazard level, construction type, the presence of fire safety systems or a combination of these characteristics.

Other code provisions are used to determine acceptable risk and fire safety levels for a building. Classification by occupancy can be considered as establishing the level of "risk" associated with use of a building. The various construction types, described in can be thought of as various levels of safety in regard to fire resistance. Code provisions then set a minimum level of safety (construction type) in accordance with the risk (the occupancy classification).

By linking the height and area requirements for buildings, classifying construction types, classifying how buildings are to be occupied, and adding other requirements for various building systems and components assures that the associated risks are managed equitably in all buildings built to the requirements of the codes. This guide will deal with these issues and the mechanisms used for managing risk in the built environment in enough detail to give the reader an insight into the intent of the code and a broad understanding of its application.

Codes: Understanding Chapter 34

Beginning in 1981, as uncodified Section 3 of House Bill 351, the Ohio legislature mandated that the Board of Building Standards (BBS) conduct a study of the feasibility of developing special construction standards for the rehabilitation or reconstruction of existing buildings. The BBS held five public hearings around Ohio to receive testimony and information from individuals concerning problems resulting from then extant requirements for existing buildings. Within six months after the effective date of the bill the Board submitted their findings to the General Assembly together with recommended changes in state law or administrative rules.

With the input of Ohio's public, building officials, design professionals, and with information from the National Bureau of Standards, the National Institute of Building Sciences, and the U.S. Department of Housing and Urban Development, the Board developed provisions entitled *Repair, Alteration, Addition to, and Change of Use of Existing Buildings*. The scope of these provisions was based upon the fact that there are a large number of existing buildings in the nation that do not meet the current code requirements. Although these buildings are potentially salvageable, rehabilitation is often cost prohibitive because these building may not be able to comply with current construction codes. To make the rehabilitation process easier, these provisions allowed for a controlled departure from full code compliance without compromising the safety of rehabilitated buildings. It also offered a logical, straightforward method for evaluating existing buildings. Minimum values for fire, egress, and overall safety features were established through quantitative analysis of existing and proposed building attributes. Additionally, sixteen individual parameters were required to be analyzed, with each parameter affecting the final determination of the building's safe reuse.

In the 1984 code change cycle, a new chapter concerning the rehabilitation of existing buildings was added to Ohio's building code. It introduced an analytic, objective approach not only to the repair, alteration of, and addition to buildings, but the adaptive use of such buildings as well. This article, which was modified in subsequent code changes, became Article 32 of the *BOCA National Building Code - 1985*. Since that date it has remained an integral part of Ohio's building code requirements as an option to owners and design professionals seeking to rehabilitate existing structures.

The three model code organizations in the U.S. agreed to merge their organizations and their separate model construction codes and, in 2000, the International Code Council (ICC) produced the first full set of coordinated construction codes. The provisions developed in Ohio in 1981 became a part of the code requirements for adoption across the United

States. Further, the ICC has proposed and is nearing completion of a document called the *ICC Existing Building Code* which will use the original Ohio-developed provisions and language from all its other codes to create a stand-alone document that communities may adopt if they choose not to adopt the entire family of ICC construction codes.

It is frustrating that many design professionals never use or are unfamiliar with these provisions even though they have been an option in Ohio for over twenty years. Although the Board of Building Standards cannot direct the training of design professionals, the Board has sponsored mandatory training on these provisions for code officials taught by Board staff and those individuals who assisted in authoring the original provisions. The Board has provided each building department with copies of the construction code commentaries that explain these requirements, and have regularly responded to inquiries from owners and design professionals.

Owners or designers who are contemplating the use of the "Alternate Compliance" provisions in Section 3408 of the "Existing Buildings" chapter of the OBC, are usually making multiple, major changes to an existing structure and probably changing the occupancy dramatically. Otherwise the building code includes other options for additions or alterations to existing structures in Sections 3401 through 3407 of Chapter 34 of the OBC. Design professional regularly contact the Board of Building Standards with questions and difficulties or in dealing with certified building departments in applying the existing building provisions of the OBC to a project.

In making these existing structure evaluations, there are three primary factors that must be considered in determining safety in buildings: building use (the way a building is intended to be occupied and the related risk inherent with that use as well as the fire load brought into the particular building type after it is built or modified - furniture, stored materials, etc), building construction type (what it is made of), and building size (height and area).

In a larger sense, however, it must be agreed that there is no more difficult problem to solve than, for instance, converting an old residence to a nightclub, a warehouse to a place of assembly, or a school to residence for the elderly. While it may initially appear difficult, consideration must be given to factors such as building height, building area, the internal division of space, corridors, construction type, vertical openings, mechanical systems, fire alarms and communication, smoke control, exiting, elevators, lighting, and mixing uses with vastly differing occupancy risks. Chapter 34 of the OBC accomplishes this in a logical, straightforward method to enable an evaluation of the safety of new uses in existing buildings in a way that does allow for a recognition of the special consideration from full code compliance existing buildings should receive while maintaining a safe an sanitary built environment for Ohio's public.

By considering the height and area of buildings, classifying construction types, classifying how buildings have been and are proposed to be occupied, and evaluating other requirements for various building systems and components assures that the associated risks are managed equitably in all buildings, especially those that were originally built fifty to one hundred years ago. As we have done this in Ohio, we have seen a steady decrease in lives lost in structure fires, so much so that Ohio is consistently below the national average in building fire deaths. As is the case with medicine so it is with architecture and engineering; any gains that have benefited us all have made it necessary to involve practitioners who understand the complexities of rehabilitating and reusing existing buildings.

GENERAL COMMENTS

Statewide adoption of codes consistently enforced by trained personnel in conjunction with design professionals familiar with this basic design program tool, modern building regulations, substantially contribute to the decades long continuing decrease in fire deaths and property loss in Ohio, maintenance of affordable construction, as well as assure essential economic growth in the state.

The BBS staff is available to discuss the application of the OBC and how the provisions contained therein provide uniform life safety requirements for the citizens of the state of Ohio.

OHIO BOARD OF BUILDING STANDARDS

UNDERSTANDING THE CODES
APPENDIX

OHIO CODE HISTORY

In 1973, the Ohio Building Officials Association (OBOA) requested the Board of Building Standards to adopt a national model code in place of the Ohio Building Code (OBC). The OBC had originally been developed by the Board in conjunction with several professors at Case Western University and the University of Akron in the 1950's. OBOA made this request because the Board had not continued to update the building code since 1971. After receiving the request, the Board decided that it would explore having the Building Construction Laboratory at Ohio State University update the existing code.

In 1976, there was a change in administrations. OBOA again requested the Board to adopt one of the national model building codes. The Board instructed staff to compare the ICBO uniform code, the BOCA national code, and the SBCCI southern standard code. In 1977, the Board held a series of open hearings (hearings open to the public, but not mandated by the Ohio Administrative Procedures Act) to get input from the building construction industry and from the code enforcement agencies. In 1978, the Board decided to use the BOCA National Building and Mechanical Model Codes. Staff changed those sections of the basic model codes that conflicted with the Ohio Revised Code (statutory law) to bring it into compliance with the General Assembly's legislation. Rule filings were then done in accordance with Sections 119.03 and 119.04, Ohio Revised Code, and a public hearing was held (see attachment chart of rule-making procedures in Ohio). After public hearing, the Board adopted the BOCA codes as the Ohio Basic Building Codes on September 29, 1978. The Board set an effective date of July 1, 1979, for the OBBC.

The July 1, 1979, effective date was set to allow the building construction industry, design professionals, and enforcement agencies to familiarize and educate themselves concerning the code. The Board also made several major changes to the original adoption in May and June, 1979, as a result of industry input. The enforcement agency at the state level (Ohio has a dual enforcement system; i.e., local governments have the option of being certified to enforce the state code and, if they don't, a state agency does the enforcement) allowed plans to be submitted between July 1, 1979, and September 30, 1979, under either OBC (the outgoing code) or under OBBC, the new code. This allowed for a smooth transition.

Since that time the Ohio Board of Building Standards has adopted building code requirements based upon BOCA model code documents that were modified to be consistent with Ohio law. Beginning in 2000, the Board has adopted building code requirements based upon International Code Council's Building, Mechanical, and Plumbing model code documents The adoption history for the codes has been as shown in the table below.

OHIO CODE HISTORY MATRIX:

Effective Date:	Code:	Base Document:
1 July 1979	Building Mechanical	1978 BOCA - 7th Edition 1978 BOCA - 3rd Edition
1 January 1981	Supplement	1980 BOCA
1 July 1982	Building Mechanical	1981 BOCA - 8th Edition and 1982 Supplement 1981 BOCA - 4th Edition and 1982 Supplement
1 March 1985	Building Mechanical	1984 BOCA - 9th Edition 1984 - 5th Edition
1 March 1986	Supplement	1985 BOCA
January 1989	Building Mechanical	1987 BOCA - 10th Edition 1987BOCA - 6th Edition
1 September 1992	Building Mechanical	1990 BOCA - 11th Edition 1990 BOCA - 7th Edition
1 July 1995	Building Mechanical	1993 BOCA -12th Edition 1993 BOCA - 8th Edition
1 March 1998	Building Mechanical Plumbing	1996 BOCA - 13th Edition 1996 IMC - 1st Edition 1995 IPC - 1st Printing
1 January 2002	Building Mechanical Plumbing	2000 IBC – 1st Edition and March 2001 Supplement and ICC Errata 2000 IMC – 1st Edition and March 2001 Supplement and ICC Errata 2000 IPC – 1st Edition and March 2001 Supplement and ICC Errata
1 March 2005	Building Mechanical Plumbing	2003 IBC – 1st Printing and ICC Errata 2003 IMC – 2nd Printing and ICC Errata 2003 IPC – 2nd Printing and ICC Errata
1 July 2007	Building Mechanical Plumbing	2006 IBC – 1st Printing and ICC Errata 2006 IMC – 1st Printing and ICC Errata 2006 IPC – 1st Printing and ICC Errata

TABLE 503
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building," per floor.

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
GROUP	HGT(feet) / Hgt(S)	UL	160	65	55	65	55	65	50	40
A-1	S	UL	5	3	2	3	2	3	2	1
	A	UL	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500
A-2	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
A-3	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
A-4	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
A-5	S	UL	UL	UL	UL	UL	UL	UL	UL	UL
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	S	UL	11	5	4	5	4	5	3	2
	A	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000
E	S	UL	5	3	2	3	2	3	1	1
	A	UL	UL	26,500	14,500	23,500	14,500	25,500	18,500	9,500
F-1	S	UL	11	4	2	3	2	4	2	1
	A	UL	UL	25,000	15,500	19,000	12,000	33,500	14,000	8,500
F-2	S	UL	11	5	3	4	3	5	3	2
	A	UL	UL	37,500	23,000	28,500	18,000	50,500	21,000	13,000
H-1	S	1	1	1	1	1	1	1	1	NP
	A	21,000	16,500	11,000	7,000	9,500	7,000	10,500	7,500	NP
H-2	S	UL	3	2	1	2	1	2	1	1
	A	21,000	16,500	11,000	7,000	9,500	7,000	10,500	7,500	3,000
H-3	S	UL	6	4	2	4	2	4	2	1
	A	UL	60,000	26,500	14,000	17,500	13,000	25,500	10,000	5,000
H-4	S	UL	7	5	3	5	3	5	3	2
	A	UL	UL	37,500	17,500	28,500	17,500	36,000	18,000	6,500
H-5	S	3	3	3	3	3	3	3	3	2
	A	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000
I-1	S	UL	9	4	3	4	3	4	3	2
	A	UL	55,000	19,000	10,000	16,500	10,000	18,000	10,500	4,500
I-2	S	UL	4	2	1	1	NP	1	1	NP
	A	UL	UL	15,000	11,000	12,000	NP	12,000	9,500	NP
I-3	S	UL	4	2	1	2	1	2	2	1
	A	UL	UL	15,000	11,000	10,500	7,500	12,000	7,500	5,000
I-4	S	UL	5	3	2	3	2	3	1	1
	A	UL	60,500	26,500	13,000	23,500	13,000	25,500	18,500	9,000
M	S	UL	11	4	4	4	4	4	3	1
	A	UL	UL	21,500	12,500	18,500	12,500	20,500	14,000	1,900
R-1	S	UL	11	4	4	4	4	4	3	2
	A	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
R-2[a]	S	UL	11	4	4	4	4	4	3	2
	A	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
R-3[a]	S	UL	11	4	4	4	4	4	3	3
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL
R-4	S	UL	11	4	4	4	4	4	3	2
	A	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
S-1	S	UL	11	4	3	3	3	4	3	1
	A	UL	48,000	26,000	17,500	26,000	17,500	25,500	14,000	9,000
S-2	S	UL	11	5	4	4	4	5	4	2
	A	UL	79,000	39,000	26,000	39,000	26,000	38,500	21,000	13,500
U	S	UL	5	4	2	3	2	4	2	1
	A	UL	35,500	19,000	8,500	14,000	8,500	18,000	9,000	5,500

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2.
UL = Unlimited
a. As applicable in Section 101.2.

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A[d]	B	A[d]	B	HT	A[d]	B
Structural frame[a] Including columns, girders, trusses	3[b]	2[b]	1	0	1	0	HT	1	0
Bearing walls Exterior[f] Interior	3 3[b]	2 2[b]	1 1	0 0	2 1	2 0	2 1/HT	1 1	0 0
Nonbearing walls and partitions Exterior Interior[e]	See Table 602 See Section 602								
Floor construction Including supporting beams and joists	2	2	1	0	1	0	HT	1	0
Roof construction Including supporting beams and joists	$1^1/_2$[c]	1[c]	1[c]	0[c]	1[c]	0	HT	1[c]	0

For SI: 1 foot = 304.8 mm.

a. The structural frame shall be considered to be the columns and the girders, beams, trusses and spandrels having direct connections to the columns and bracing members designed to carry gravity loads. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.

b. Roof supports: Fire-resistance ratings of structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.

c. 1. Except in Factory-Industrial (F-1), Hazardous (H), Mercantile (M) and Moderate-Hazard Storage (S-1) occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.

2. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.

3. In Type I and Type II construction, fire-retardant-treated wood shall be allowed in buildings not over two stories including girders and trusses as part of the roof construction.

d. An approved automatic sprinkler system in accordance with Section 903.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 506.3 or an allowable height increase in accordance with Section 504.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.

e. For interior nonbearing partitions in Type IV construction, also see Section 602.4.6.

f. Not less than the fire-resistance rating based on fire separation distance (see Table 602).

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a]

FIRE SEPARATION DISTANCE (feet)	TYPE OF CONSTRUCTION	GROUP H	GROUP F-1, M, S-1	GROUP A, B, E, F-2, I, R[b], S-2, U
< 5[c]	All	3	2	1
≥ 5 < 10	IA Others	3 2	2 1	1 1
≥ 10 < 30	IA, IB IIB, VB Others	2 1 1	1 0 1	1 0 1
≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.

b. Group R-3 and Group U when used as accessory to Group R-3, as applicable in Section 101.2 shall not be required to have a fire-resistance rating where fire separation distance is 3 feet or more.

c. See Section 503.2 for party walls.

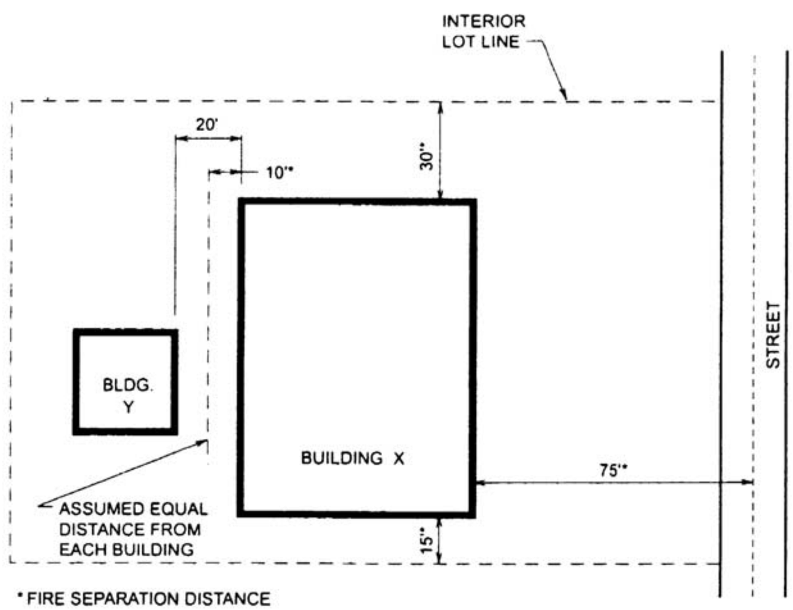

Figure 602
DETERMINING FIRE SEPARATION DISTANCE