U.S. Department of Veterans Affairs

# Code Comparison of IBC 2006 and NFPA 101 2006

**Task Order #006**

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HDR RJA

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# Introduction

The purpose of IDQ A/E Task Order #006 is to compare the fire and safety requirements of the International Building Code (IBC) 2006 and the National Fire Protection Association (NFPA) 101 – 2006 to:

- find the differences between these two documents in terms of their philosophy, purpose, content and scope; and their implications to the Department of Veterans Affairs
- present all conflicting requirements related to fire and safety issues concerning health care facilities
- develop a Code Policy Document that incorporates the IBC 2006 and NFPA 101 2006 based on an evaluation of those code requirements and the implementation of this code policy to actual projects.

HDR, Inc. in conjunction with Rolf Jenson & Associates, Inc. is pleased to present their findings in reference to this task order. The following sections 3-11 compare various requirements of each code. The comparisons of the two codes include definitions, some occupancy classifications, special occupancy requirements, building heights and areas, types and fire ratings of construction, interior finishes, fire protection systems, and finally, means of egress. Certain building uses that are not generally found at VA facilities are not included in these comparisons. A few examples of these excluded uses are malls, athletic/sporting buildings, mercantile buildings, manufacturing plants and single family homes. Also not included in the comparisons are the IBC occupancy classifications for High-Hazard Group H or Mercantile Group M and their equivalents in the NFPA 101.

Section 2 provides the analysis of the comparisons of the philosophy or approach to fire and safety issues of each code. It also indicates the recommended code policy to be used by the Department of Veterans Affairs to blend the best features of both codes. This recommended strategy will accommodate both the JCAHO constraints and a holistic approach to life safety for the design professional.

## Analysis & Recommendations

This analysis has identified the differences between the IBC and NFPA 101 for the Department of Veterans Affairs. Those differences are highlighted in the previous sections. Conceptually, the codes are very different in scope. NFPA 101 primarily addresses construction, protection, and occupancy features necessary to minimize the danger to life from the effects of fire as well as conditions associated with non-fire emergencies. The IBC address a wide range of considerations, including structural strength, stability, sanitation, means of egress, adequate light and ventilation, and energy conservation.. In evaluating the application of these codes for the development of a code policy document, the difference in scope has been considered. Another factor that was considered is that, while other government agencies have flexibility in code selection, VA buildings must meet the requirements of NFPA 101 and documents referenced by NFPA 101 due to the accreditation requirements of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

A code policy document should incorporate a capacity for implementation by a design team and the flexibility to meet future Veterans Affairs program needs. Both the IBC and NFPA 101 incorporate a holistic implementation of fire protection and life safety requirements within the scope of each code, and both codes are revised on a regular basis. Because compliance with NFPA 101 is required for JCAHO accreditation, utilizing NFPA 101 as the starting point for fire and life safety design within the Department of Veterans Affairs appears to be a reasonable choice. For design considerations not addressed by NFPA 101, use of the IBC to provide supplemental criteria would also appear to be reasonable, since the IBC has been selected by the VA as the design basis for other design features (e.g., structural strength, stability, light and ventilation, energy conservation, etc.). For design considerations that are addressed by both NFPA 101 and the IBC, use of the criteria from NFPA 101 and the documents referenced by NFPA 101 would ensure compliance with JCAHO requirements.

An example of a design issue that is treated differently by NFPA 101 and the IBC is the protection of shaft penetrations. Several jurisdictions including the Commonwealth of Virginia have eliminated the requirement for smoke and fire dampers at shaft penetrations as specified in the IBC. In fully sprinklered buildings there is little fire incident history to show that combination smoke/fire dampers at shaft penetrations provides a significant increase to the level of safety for occupants of the building. This smoke damper feature can become a long term maintenance challenge, particularly depending on the number of dampers within a building. When coupled with the favorable historic data of building performance in fire incidents with fully sprinklered facilities, this feature of smoke dampers can appear to be an undue maintenance challenge that results in little to no positive life safety impact.

The preceeding issue is eliminated with the use of NFPA 101, which references NFPA 90A. NFPA 90A does not require the fire and smoke dampers specified in the IBC.

In summary, use of NFPA 101 as the starting point for fire and life safety design along with use of the IBC for issues not addressed by NFPA 101, will provide criteria for a safe environment of care for patients and will incorporate those features necessary to meet JCAHO accreditation requirements. This strategy serves to blend the best features of both codes and results in a holistic approach that can be readily utilized by design professionals and that will meet the needs of the VA.

## DEFINITIONS: IBC Chapter 2 and NFPA 101 Chapter 3

Each Code document has set aside a separate chapter for definitions of words or terms used through out each respective code. Both documents utilize its Definitions Chapter to define words or terms that may fall outside their generally recognized meaning to the lay community. The definitions of such words or terms are to provide their meanings as used within the context of each Code.

When a word is not found in either Code's Definitions Chapter, that word's meaning is generally recognized as the same as that found in a dictionary of the English language and has its ordinarily accepted meaning as used in the context of the sentence.

The attached comparison does not list definitions of one code that are essentially the same as those of the other. This definitions comparison only addresses either definitions that are found in one code, but not the other, or where the definitions appreciably differ. There are several definitions found in the IBC that are not found in the NFPA 101. There are only two definitions that differ appreciably:

- **Historic Buildings**: The IBC defines as buildings listed or eligible for listing on the National Historic Register for Historic Places. NFPA 101 defines these buildings as those deemed having significance by a local, regional or historic jurisdiction. This difference may affect some of the buildings sited on Veterans Affairs campuses.

- **Design Professional:** The IBC defines the Design ***Professional*** as a registered or licensed individual in the state where the project is to be constructed. The NFPA 101 defines the Design ***Team*** as a group of stakeholders in a project. This includes Architects and Engineers as well as other designers that may or may not be registered or licensed. The difference here may be semantics, but it also may affect the Veterans Affairs projects if they should find it necessary to gain permitting from a local jurisdiction.

The analysis of these definitions chapters concludes that generally one word or term used in one code has essentially the same or similar meaning as the other code. Because the definitions are written to supplement and be integral with their respective codes, it is essential that the definitions of one code be referenced and utilized only with that code.

| INTERNATIONAL BUILDING CODE 2006 | | | NFPA 101 2006 | |
|---|---|---|---|---|
| Title | Section | Requirements | Section | Requirements |
| Terms Defined in Other Codes | 201.3 | Terms defined in the family of International Codes shall have the meanings ascribed in those codes. | | No related section |
| Approved | 202 | Acceptable to the code official or authority having jurisdiction. | | Undefined |
| Approved Source | 202 | An independent person, firm or corporation, approved by the building official, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses. | | Undefined |
| Areaway | 202 | A subsurface space adjacent to a building open at the top or protected at the top by a grating or guard. | | Undefined |
| Attic | 202 | The space between the ceiling beams of the top story and the roof rafters. | | Undefined |
| Awning | 202 | An architectural projection that provides weather protection, identity or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight, rigid skeleton structure over which a covering is attached. | | Undefined |
| Building Line | 202 | The line established by law, beyond which a building shall not extend, except as specifically provided by law. | | Undefined |
| Building Official | 202 | The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized agent. | | Undefined |
| Canopy | 202 | An architectural projection that provides weather protection, identity or decoration and is supported by the building to which it is attached and at the outer end by not less than one stanchion. A canopy is comprised of a rigid structure over which a covering is attached. | | Undefined |
| Construction Documents | 202 | Written, graphic, and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. | | Undefined |
| Controlled Low-Strength Material | 202 | A self-compacted, cementitious material used primarily as a backfill in place of compacted fill. | | Undefined |
| Corrosion Resistance | 202 | The ability of a material to withstand deterioration of its surface or its properties when exposed to its environment. | | Undefined |

| INTERNATIONAL BUILDING CODE 2006 | | | NFPA 101 2006 | |
|---|---|---|---|---|
| Title | Section | Requirements | Section | Requirements |
| Decorative Materials | 202 | All materials applied over the building interior finish for decorative, acoustical or other effect, and all other materials utilized for decorative effect, including foam plastics and materials containing foam plastics. Decorative materials do not include floor coverings, ordinary window shades, interior finish and materials .025 inch or less in thickness applied directly to and adhering tightly to a substrate. | | Undefined |
| Fire Lane | 202 | A road or other passageway developed to allow the passage of fire apparatus. A fire lane is not necessarily intended for vehicle traffic other than fire apparatus. | | Undefined |
| Grade Floor Opening | 202 | A window or other opening located such that the sill height of the opening is not more than 44 inches above or below the finished ground level adjacent to the opening. | | Undefined |
| Habitable Space | 202 | A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces. | | Undefined |
| Historic Buildings | 202 | Buildings listed or eligible for listing on National Register for Historic Places or determined historic per local or state law. | 3.3.28.8 | A building or facility deemed to have historical, architectural, or cultural significance by a local, regional, or national jurisdiction. |
| Jurisdiction | 202 | The governmental unit that has adopted this code under due legislative authority. | | Undefined |
| Light-Frame Construction | 202 | A type of construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or light gage steel framing members. | | Undefined |
| Lot Line | 202 | A line dividing one lot from another; or from a street to any public place. | | Undefined |
| Marquee | 202 | A permanent roofed structure attached to and supported by the building and that projects into the public right-of-way. | | Undefined |

| INTERNATIONAL BUILDING CODE 2006 | | | NFPA 101 2006 | |
|---|---|---|---|---|
| Title | Section | Requirements | Section | Requirements |
| Occupiable Space | 202 | A room or enclosed space designed for human occupancy in which in which individuals congregate for amusement, educational or similar purposes or in which occupancies are engaged at labor, and which is equipped with means of egress and light and ventilation facilities meeting the requirements of this code. | | Undefined |
| Owner | 202 | Any person, agent, firm, or corporation having a legal or equitable interest in the property. | | Undefined |
| Permit | 202 | An official document or certificate issued by the authority having jurisdiction which authorizes performance of a specified activity. | | Undefined |
| Registered Design Professional | 202 | An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed. | 3.3.49 | Design team definition is similar, but does not include a registration requirement. |
| Skylight, Unit | 202 | A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural light through an opening in the roof assembly while preserving the weather resistant barrier of the roof. | | Undefined |
| Skylights and Sloped Glazing | 202 | Glass or other transparent or translucent material installed at a slope of 15 degrees or more from vertical. Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls, are included in thus definition. | | Undefined |
| Sleeping Unit | 202 | A room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units. | | Undefined |
| Story Above Grade | 202 | Any story having its finished floor surface entirely above grade plane, except that a basement shall be considered a story above grade plane if the floor above the basement is 6 feet above grade plane, or 12 feet above the finished ground level at any point. | 3.3.72.1 | Level of exit discharge is similar |
| Walkway, Pedestrian | 202 | A walkway used exclusively as a pedestrian traffic way. | | Undefined |

## OCCUPANCY CLASSIFICATION: IBC Chapter 3 and NFPA 101 Chapter 6

Each code addresses the need for classifying the use of a structure based on its Occupancy and the attendant life safety needs of each classification. The correct classification of the structure with respect to Occupancy is critical since the design factors and patterns of use are unique for each of the occupancies.

Each code generally accounts for each unique use, although each use may not be referred to with the same name of classification. A quick comparison of the Occupancy use groups pertinent to the VA reveals a very close alignment between the two codes in most cases:

- **Assembly:** IBC divides the Assembly group into 5 divisions – A-1 through A-5. Only two are anticipated to be utilized by the VA. The VA would use the IBC classification of A-2 for Cafeterias or Restaurants and A-3 for Exercise rooms, Lecture halls, Libraries and the like. NFPA 101 also has the Assembly occupancy, but does not differentiate between the various types.

- **Business:** Both codes utilize the Business occupancy. Both the IBC and the NFPA 101 define the Business occupancy as the transaction of business other than mercantile.

- **Health Care:**

    1. The IBC places this occupancy into the Institutional group I. It further divides this occupancy in to 4 groups: I-1 through I-4. Group I-1 is used for facilities such as Residential board and care, assisted living, convalescent facilities and alcohol and drug centers. Group I-2 is used for hospitals, nursing homes, mental hospitals and detoxification centers. Group I-3 is used for prisons and is not addressed in this document. Group I-4 is used for Day Care centers.
    2. The NFPA 101 divides this use into separate occupancies: Heath Care (used for hospitals, limited care facilities and nursing homes), Ambulatory Health Care (outpatient care for emergency or urgent care) and finally Day Care.
    3. Differences: A minor difference between the two codes is that the IBC restricts adult day care to 5 or more adults (Institutional I-4). The NFPA 101 restricts adult day care to 4 or more adults (Day-Care Occupancy). Another difference is also in numbers. The IBC minimum for hospitals is 5 people; for the NFPA 101 it is 4 people.

- **Lodging:** The IBC defines this occupancy as that which contains sleeping units for the occupants who are primarily transient in nature. Its classification is Residential Group R-1. It does not limit the number of occupants. The NFPA 101 defines this occupancy (Lodging or Rooming Houses) as that which provides sleeping accommodations for 16 or fewer persons on either a transient or permanent basis.

- **Residential Board and Care:** The IBC defines this occupancy as that which contains more than two sleeping units for occupants who are primarily permanent in nature (Residential R-2). The IBC reserves the R-4 designation for Residential Care/Assisted Living facilities for more than 5 but less than 16 persons. The IBC classifies Assisted Living facilities of 16 persons and larger as Institutional I-1. The NFPA 101 only restricts this occupancy to 4 or more residents for the purpose of receiving personal care

services. All Assisted living facilities with a population over 4 would be in this classification.

- **Industrial:** Both codes recognize this occupancy as that in which products are manufactured, processed, assembled, mixed, packaged, repaired etc. The IBC further defines it for facilities not classified as High-hazard or Storage. The IBC refers to this occupancy as the Factory Group F or Factory Industrial Group F. The NFPA 101 refers to it as the Industrial Occupancy.

- **Storage:** Both codes utilize the Storage occupancy. The IBC additionally divides this occupancy into groupings, this time according to hazard: Group S-1 is for Moderate-hazard and Group S-2 is for Low-hazard.

  With regard to the types of occupancies common to the Department of Veterans Affairs, the International Building Code and the Life Safety Code have minimal differentiation. As previously discussed, the IBC defines hospitals as facilities that serve more than five people, while the NFPA 101 defines the same occupancy as serving four or more people. Such minor differentiations between the two codes should not be construed as major conceptual differences. The comparison of codes should be evaluated with the understanding that each code was developed in holistic manner, and that piecemeal implementation of specific code requirements can pose enhanced challenges to meeting program requirements and achieving design compliance.

There are, however, differences between the two codes that are more than just semantics or variant numbers. There is a major difference in the way each handles the relative hazard of the contents in facilities of the various occupancies.

The IBC allows facilities with low and moderate levels of hazard to remain classified in their original group (see Storage and Factory Industrial above), but as levels of certain materials that pose a physical or health hazard exceed certain quantities in the facility, the facility is then classified as High-hazard Group H occupancy. The IBC goes into great detail classifying these High-hazard contents (Section 307) and provides extensive detailed construction requirements in Section 414 for this Occupancy.

The NFPA 101 allows each facility to retain its occupancy classification, but then assigns a hazard rating to each of the occupancies based on the relative danger of fire, smoke, gases and explosion. These ratings are also referred to as Low, Moderate and High. The code provides for fire separation between the various occupancies and their hazard ratings. The NFPA 101 tables for the fire separation are found in Tables 6.1.14.4.1 (a) and (b) (shown at the end of Chapter 6 of this document).

The important distinction here is that the NFPA 101 does not directly address what constitutes high hazard materials nor does it provide construction requirements for structures housing high hazard materials whereas the IBC does both.

| INTERNATIONAL BUILDING CODE 2006 | | | NFPA 101 2006 | |
|---|---|---|---|---|
| **Title** | **Section** | **Requirements** | **Section** | **Requirements** |
| Adult Care Facility | 308.5.1 | Facility providing accommodations, supervision, and personal care for less than 24 hours for more than five adults. | 6.1.6 | Ambulatory Healthcare: A building or portion thereof used to provide services or treatment simultaneously to four or more patients that provides, on an outpatient basis. |
| Group I-2 | 308.3 | Hospitals serving more than five people. | 6.1.5 | Healthcare serving four or more people. |
| Group H-2 Structures | 307.4 | Facilities containing materials that present a deflagaration or accelerated burning hazard | | No related section |
| Group H-3 Structures | 307.5 | Facilities containing materials that present a physical hazard or readily support combustion. | | No related section |
| Group H-4 Structures | 307.6 | Facilities containing health hazard materials. | | No related section |