



JENSEN HUGHES

Advancing the Science of Safety

New Developments in the Saudi Building Codes

Jaime Paucar, P.E.

16 April 2018

Safety Design in Buildings

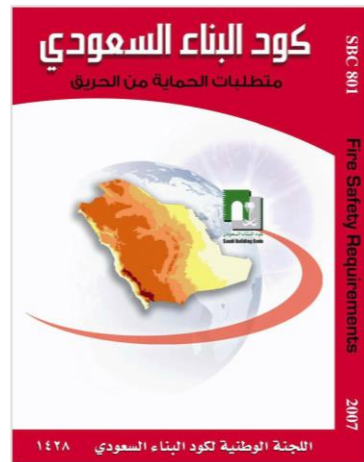


Riyadh Conference

April 16, 2018, Holiday Inn Izdihar - Riyadh

Course Description

- This presentation will discuss the evolution of the Saudi Building Code (SBC) and provide updates regarding to the fire protection and life safety provisions. In particular, the presentation will examine major differences between the GCC Code, NFPA, and SBC provisions for various elements of fire and life safety, including means of egress, compartmentation, smoke management, fire service access to high rise buildings, etc.



Presenter

Jaime Paucar, P.E..

Associate Manager – Middle East – JENSEN HUGHES

Mr. Paucar is an Associate Manager and Project Director for the Dubai Office of JENSEN HUGHES. Mr. Paucar focuses his work in building design, where he assists design teams in developing fire protection strategies that are consistent with international standards and intended to satisfy authority requirements.

Jaime Paucar graduated from The City College of New York with a Bachelor of Science in Mechanical Engineering and holds a graduate certificate in Fire Protection Engineering from Worcester Polytechnic Institute. As a registered professional engineer in the United States with over 18 years of professional experience in the fire protection engineering industry, Mr. Paucar has applied his diverse design experience to several notable projects on a national and international level.



Learning Objectives

- To have a general understanding of the fire and life safety provisions of the SBC.
- To understand the positive impact of the adoption of the SBC requirements for all new projects in the Kingdom
- To review major changes since the adoption of SBC (2007)
- To review differences between the SBC, NFPA/IBC, and the GCC Fire Code



Saudi Building Code (SBC)

- New Circular Issued on 27th February 2018.
- Adopt the existing SBC (2007) as the basis for **all new projects for 2 years**
- New Edition of the SBC will be issued at the end of a 2-year period.
- During this 2 year period the SBC National Committee is seeking feedback from Public and Private Sector.

المديرية العامة للدفاع المدني
رقم: 144344
تاريخ إصدار: 1439/06/12
المشقة

بسم الله الرحمن الرحيم
الجمهورية العربية السعودية
وزارة الداخلية
المديرية العامة للدفاع المدني
٤/٢٧/٥/٣/١٧٧

تعميم
لجميع مديريات الدفاع المدني بالمناطق

مدير الدفاع المدني بمنطقة

السلام عليكم ورحمة الله وبركاته:-
الإشارة : بقرينة معالي رئيس الديوان الملكي رقم ٢١١٩٢ وتاريخ ١٤٣٩/٥/٢ هـ المبنية على خطاب الأمين العام لمجلس الوزراء رقم ٣٧١٢ وتاريخ ١٤٣٩/٤/١٤ هـ.
الموضوع : بشأن تطبيق كود البناء السعودي (SBC) بنسخته الحالية- بشكل تجريبي- وفقاً لما ورد في البند (أولاً) من توجيه مجلس الوزراء المبلغ بقرينة الديوان الملكي رقم ١١٢٩٧ بتاريخ ١٤٣٠/٣/١٨ هـ.
الإفادة : سبق وأن تم إبلاغكم بالتعميم رقم ٢/٢/١٢ د ف وتاريخ ١٤٣١/١/٢ هـ وذلك لتطبيق كود البناء السعودي (SBC) بصفتي تجريبية .. وتضمنت البرقية المشار إليها بعاليه أنه يمكن للمديرية العامة للدفاع المدني تطبيق كود البناء السعودي بنسخته الحالية - بشكل تجريبي- وفقاً لما ورد في البند (أولاً) من توجيه مجلس الوزراء المبلغ بقرينة الديوان الملكي رقم ١١٢٩٧ بتاريخ ١٤٣٠/٣/١٨ هـ القاضي بقيام رئيس اللجنة الوطنية لكود البناء السعودي بتوزيع هذا الكود على الجهات ذات العلاقة في القطاعين العام والخاص للبدء في تطبيقه بصفة تجريبية مدة سنتين ويطلب من تلك الجهات إبداء ملاحظاتها وأرائها في شأنه، وعلى اللجنة الوطنية لكود البناء السعودي دراسة تلك الملاحظات وتعديل الكود وفقاً لما تراه. وتزويد اللجنة الوطنية لكود البناء السعودي بالملاحظات والمقترحات اللازمة . كما أن اللجنة العامة لمجلس الوزراء رأت بتوصيتها رقم (١٥٢٩) بتاريخ ١٤٣٩/٤/١٠ هـ الموافقة على ما تم التوصل إليه في محضر هيئة الخبراء رقم (٣٦٩) وتاريخ ١٤٣٩/٤/٨ هـ.
المطلوب: الاطلاع والعمل على تطبيق كود البناء السعودي بنسخته الحالية بصفة تجريبية على المشاريع الجديدة لحين صدور النسخة المحدثة.
السلام عليكم ،،
مدير عام الدفاع المدني
فريق/ سليمان بن عبد الله العمرو

157461
1439/06/12
فاكس منى (٤٩٢٥٠٤١) موقع الدفاع المدني على الانترنت
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INTERNATIONAL CODE COUNCIL (ICC) – MODEL CODES

- 1st Published in 2000
- The ICC has a family of codes providing minimum requirements for public health and safety.
- Published every 3 years so that requirements stay current with industry advances.
- Current edition is 2018 with the next edition expected in 2021



BUILDING CODES vs FIRE CODES

Building Codes address construction and design of **new** buildings and **alterations**.

Fire Codes address the **operation** of a completed building.

Building Codes: International Fire Code (IBC); NFPA 5000, Building Construction and Safety Code

Fire Codes: International Fire Code (IFC); Uniform Fire Code (NFPA 1)

For example, the Building Code sets criteria for the **number, size and location** of exits in the design of a building while the Fire Code requires the exits of a completed building to not be blocked.



LIFE SAFETY CODE (NFPA 101)

- It is NOT a building code.
- It focuses on the evacuation of occupants from a building by protecting them from fire and its effects.
- First chapters contain general requirements such description of occupancies, means of egress and fire protection requirements.
- Second half of the Code has Chapters organized by **Occupancy Type for New and Existing buildings**



STANDARDS

- Do not have legal standing until they become referenced in a code which is adopted by a jurisdiction.
- American National Standards Institute (ANSI), e.g. ANSI A117.1
- National Fire Protection Association (NFPA), e.g. NFPA 13, 72, 285
- American National Standards Institute American Society for Testing and Materials (ASTM), e.g. ASTM E-84, E-119
- Underwriters Laboratories (UL)



SAUDI BUILDING CODE (SBC) – STRUCTURE

201	Architectural
301	Structural – Loading and Forces
302	Structural – Testing and Inspection
303	Structural – Soil and Foundations
304	Structural – Concrete Structures
305	Structural – Masonry Structures
306	Structural – Steel Structures
401	Electrical
501	Mechanical
601	Energy Conservation
701	Sanitary
801	Fire Protection
901	Existing Buildings

DOWNLOAD @
<http://sbc.gov.sa>



SBC – FIRE AND LIFE SAFETY PROVISIONS

The SBC Fire Protection Requirements (SBC 801) was based on:

- International Fire Code (IFC) 2003 edition
- International Building Code (IBC) 2003 (selected Chapters)

Saudi Building Code Requirements

201	Architectural	
301	Structural – Loading and Forces	
302	Structural – Testing and Inspection	
303	Structural – Soil and Foundations	
304	Structural – Concrete Structures	
305	Structural – Masonry Structures	
306	Structural – Steel Structures	
401	Electrical	
501	Mechanical	
601	Energy Conservation	
701	Sanitary	
801	Fire Protection	
901	Existing Buildings	



SAUDI BUILDING CODE – FIRE PROTECTION (SBC 801)

SBC 801 - FIRE PROTECTION	IBC	IFC
CHAPTER 1 DEFINITIONS		CH 2
CHAPTER 2A USE AND OCCUPANCY CLASSIFICATION	CH 3	
CHAPTER 2B SPECIAL REQUIREMENTS	CH 4	
CHAPTER 3 GENERAL BUILDING HEIGHTS AND AREAS	CH 5	
CHAPTER 4A TYPES OF CONSTRUCTION	CH 6	
CHAPTER 4B FIRE-RESISTANCE-RATED CONSTRUCTION	CH 7	
CHAPTER 5A GENERAL PRECAUTIONS AGAINST FIRE		CH 3
CHAPTER 5B EMERGENCY PLANNING AND PREPAREDNESS		CH 4
CHAPTER 5C FIRE SERVICE FEATURES		CH 5
CHAPTER 5D BUILDING SERVICES AND SYSTEMS		CH 6
CHAPTER 6 INTERIOR FINISH		CH 8
CHAPTER 7 FIRE PROTECTION SYSTEMS		CH 9
CHAPTER 8 MEANS OF EGRESS	CH 10	
CHAPTER 9 EXISTING STRUCTURES	CH 34	
CHAPTER 10 FIRE SAFETY DURING CONSTRUCTION		CH 14
CHAPTER 11 THROUGH CHAPTER 42		CH 11 - 44
APPENDIX A REFERENCED STANDARDS		CH 45
APPENDIX B FIRE-FLOW REQUIREMENTS FOR BUILDINGS		APPX B
APPENDIX C FIRE HYDRANT LOCATIONS AND DISTRIBUTION		APPX C
APPENDIX D THROUGH APPENDIX G		APPX D-G



FIRE PROTECTION SYSTEMS (SBC 800)

SBC 800 - FIRE PROTECTION SYSTEM REQUIREMENTS

CH 2 - FIRE PROTECTION BASED ON OCCUPANCY CLASSIFICATION

CH 6 - FIRE PROTECTION SYSTEMS

CH 7 - FIRE ALARM SYSTEMS

CH 8 - SMOKE CONTROL SYSTEMS

CH 9 - FIRE EXTINGUISHERS

CH 10 - APPROVAL, TESTING & MAINTENANCE OF FP SYSTEMS

CH 11 - FIRE PROTECTION SYSTEMS DOCUMENTS AND DRAWINGS



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

- Significant additions and subtractions occurred since the adoption of the 2003 IBC (2nd Edition) - 15 year ago
- The 2018 Edition is the 7th edition of the IBC.
- Changes reflect design trends and safety enhancements
- Revisions reflect benefits of sprinkler protection
- New code provisions for items not previously or properly addressed (NIST World Trade Center report)



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

FIRE RESISTANCE RATING FOR BUILDING ELEMENTS

Deletes 2012 Table 601, footnote d

*“d. An approved automatic sprinkler system in accordance with Section 903.2.1.1 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.”*

Sprinkler system is no longer allowed as a substitution for 1-hour construction.



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

HIGH-RISE BUILDINGS (Post WTC)

403.4.7 - Smoke Removal (Post-fire Salvage)

403.6.2 - Occupant Evacuation Elevators

403.6.1 Second Fire Service Elevator required in 2012 Code for high-rise buildings over 120 feet (36m)

403.5.1 Interior stairs separated by 30 ft (9m) or $\frac{1}{4}$ diagonal, whichever is less

403.2.4 - Sprayed fire-resistant materials (SFRM) bond strength: Up to 420 ft. (128m) → 430 psf ; Over 420 ft. (128m) → 1000 psf

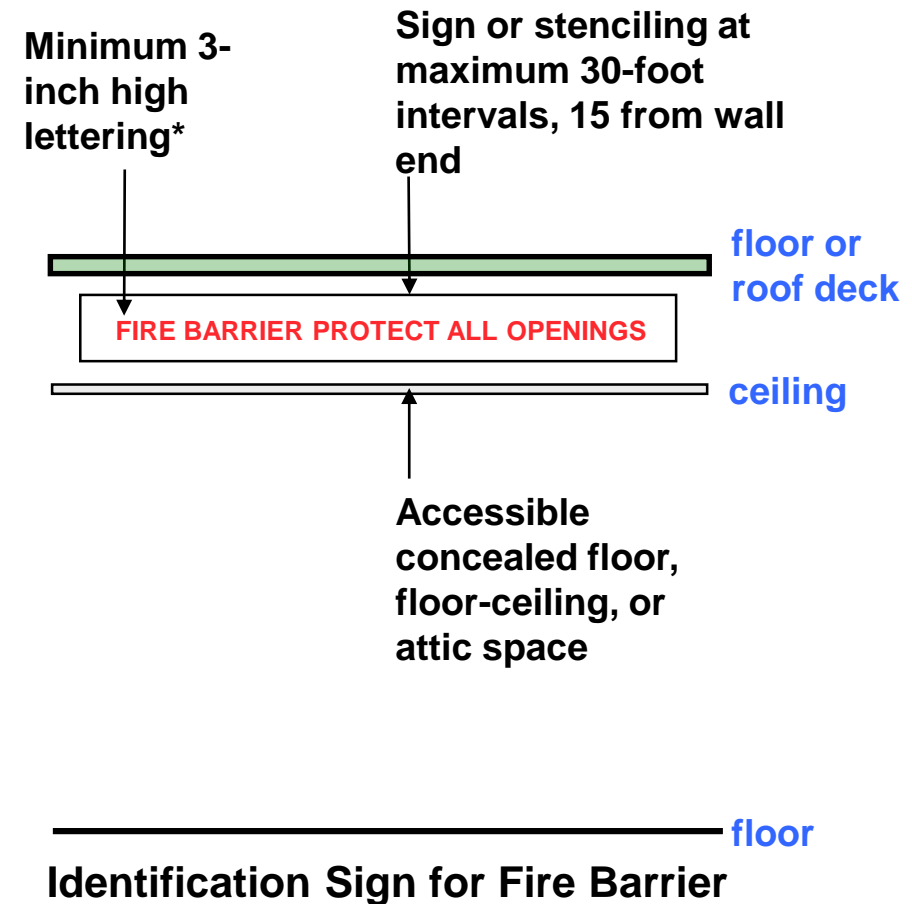


IBC UPDATES (SINCE 2003) - HIGHLIGHTS

IDENTIFICATION OF FIRE & SMOKE SEPARATION WALLS

Walls required to have protected openings or protected penetrations require identification in accessible concealed floor, floor-ceiling, or attic spaces

Letter size changed from ½ inch (12mm) to 3 inches (76mm) in 2012



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

REQUIRED AREAS OF REFUGE

No longer required for exit stairs or elevator lobbies provided the building is protected throughout with an automatic sprinkler system



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

HIGH-RISE BUILDINGS – ADDITIONAL EXIT STAIRWAY

Required for high-rise buildings > 420 ft (128m). (excluding apartments/condos)

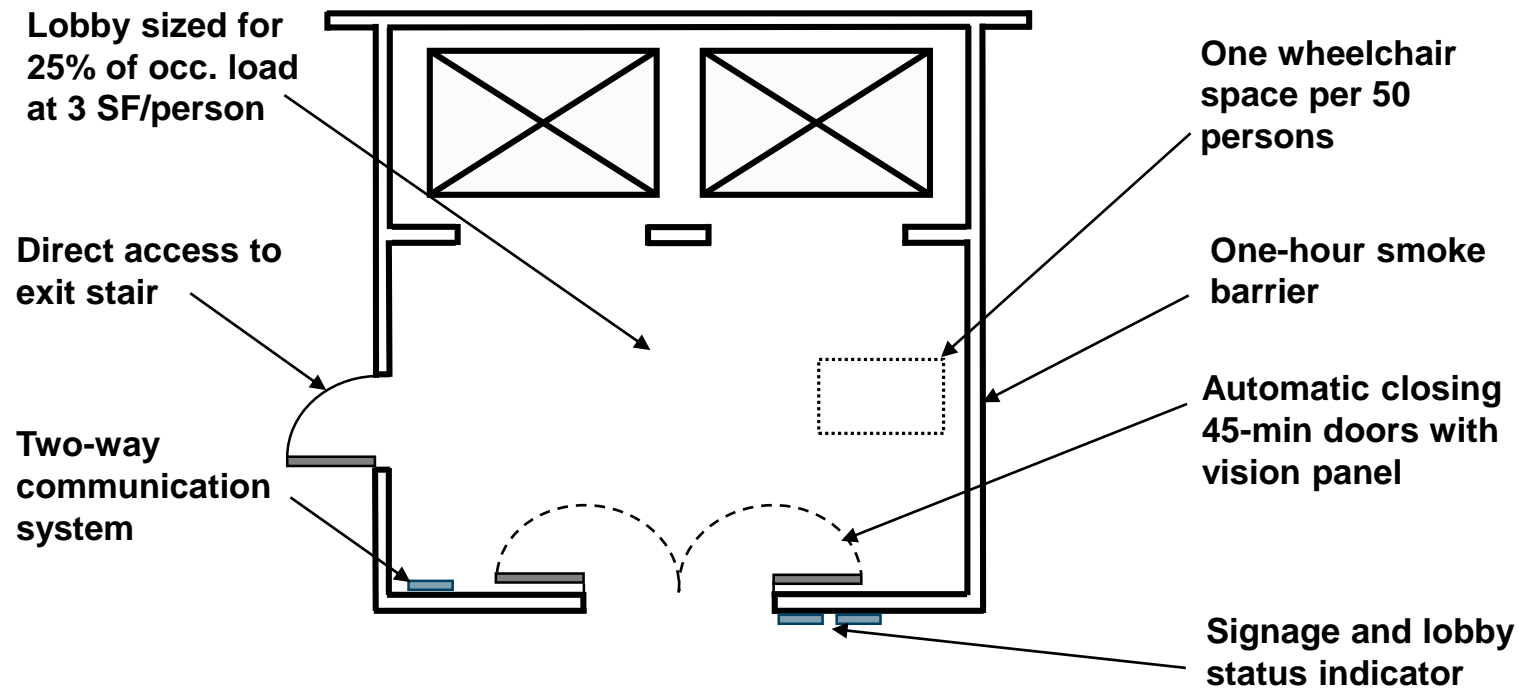
- Not required in buildings with self-evacuation elevators (Section 3008)
- Scissor stairs not considered as an additional exit stair



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

HIGH RISE BUILDINGS OCCUPANT EVACUATION ELEVATORS

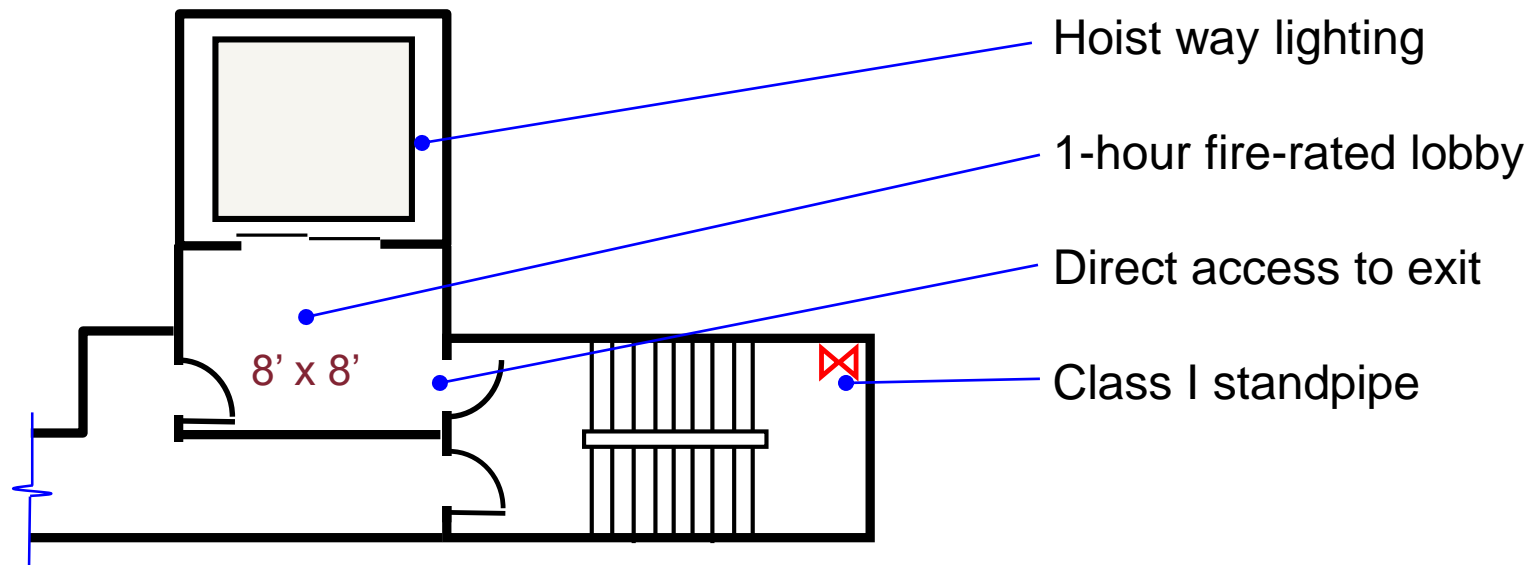
- Passenger elevators now permitted for self-evacuation in high-rise buildings



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

FIRE SERVICE ACCESS ELEVATORS

- Elevator status monitored at fire command center
- Standby power required
- Associated wiring and cables protected for 1-hour



IBC UPDATES (SINCE 2003) - HIGHLIGHTS

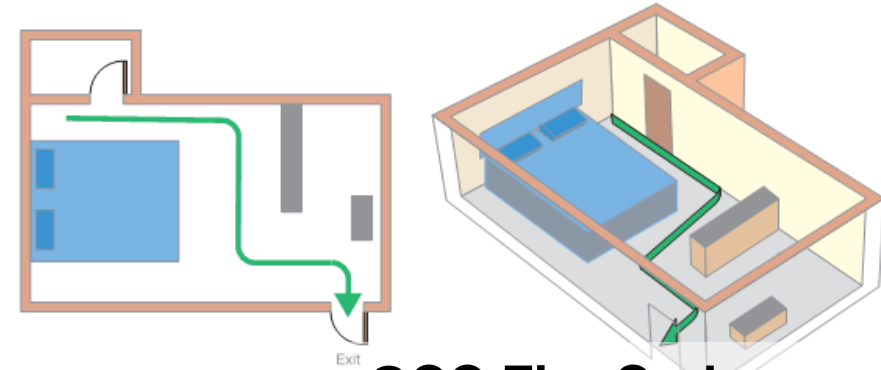
SPECIAL INSPECTION OF FIRE-RESISTANT PENETRATIONS AND JOINT SYSTEMS

- New in 2012 IBC for High-Rise Bldgs
- Requires an **approved testing agency (3rd Party)**
- Test and inspect firestops per ASTM E2174
- Test and inspect joint systems per ASTM E2393
- Includes: through penetrations; membrane penetrations; fire resistant joint systems; and perimeter fire barrier systems.



GCC vs SBC (IBC) – TRAVEL DISTANCE TO AN EXIT

Example: Hotel



Design Criteria

NFPA/IBC

GCC Fire Code

**Travel Distances
within a room to
a corridor**

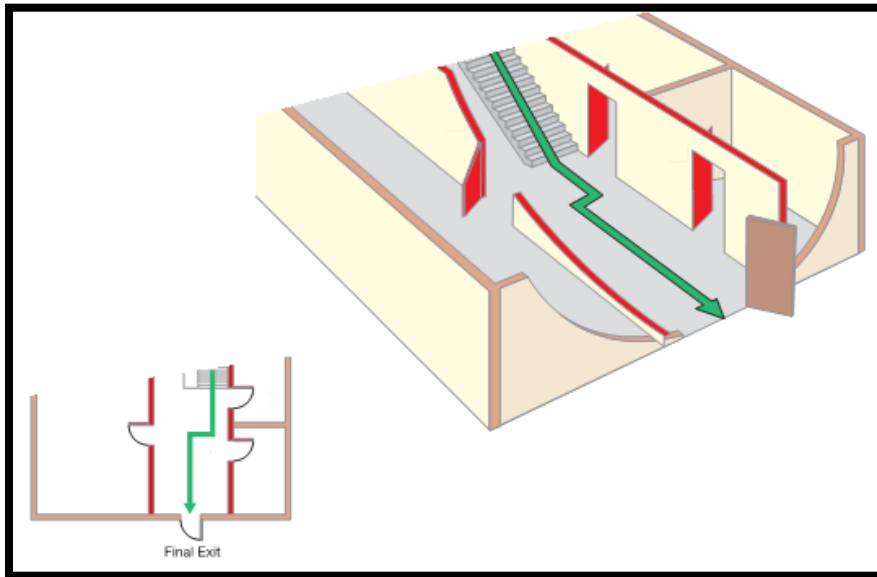
38m (125 feet)

15m (50 feet)



GCC vs SBC (IBC) – EXIT DISCHARGE TO PUBLIC WAY

Design Criteria	NFPA / IBC	GCC Fire Code
Direct Exit Discharge to Public Way	50 percent of total stairs (conditional)	100 percent of stairs: Residential Assembly (> 300 occ) 50 percent of stairs Retail Business



GCC vs SBC (IBC) – SUBDIVISION OF CORRIDORS

Design Criteria	NFPA/IBC	GCC Fire Code
Subdivision of corridors	not required in sprinklered protected bldgs	all corridors greater than 30m in length to be subdivided



GCC vs SBC (IBC) – EXIT STAIR WIDTH

Design Criteria	IBC/NFPA	GCC Fire Code
Exit width < 2,000 occupants	1,120mm (44 inches)	1,520mm (60 inches)
Exit width ≥ 2,000 occupants	1,400mm (55 inches)	1,520mm (60 inches)



GCC vs SBC (IBC) – INDEPENDENT EXIT STAIRS

INDEPENDENT EXIT STAIR IN MULTI-USE BUILDING

Design Criteria	NFPA / IBC	GCC Fire Code
Independent Exit Stair Enclosure	NA	Hotel exit stairs to be independent



Example: Commercial Use and Hotel Use



GCC vs SBC (IBC) – HAZARDOUS AREAS

Example

**Boilers & Linen
or garbage chute
collection**

IBC/NFPA

2 hours

GCC Fire Code

4 hours



GCC vs SBC (IBC) – STRUCTURAL FIRE RESISTANCE

Example: Structural Fire Resistance for **Assembly Occupancy**

Design Criteria	IBC Table 601	GCC Fire Code
Fire Resistance for Primary Structural Elements	2 hours	4 hours



GCC vs SBC (IBC) – COMPARTMENTATION

GCC CODE

- Limited maximum compartment size in enclosed carparks and storage areas to 5,000 sqm

SAUDI BUILDING CODE (IBC)

- Section 405 requires minimum of two compartments for **Underground Buildings having a floor level more than 18.3 m** below lowest level of exit discharge
 - Exception – floor areas not more than 139 sqm and having occupant load less than 10 persons
- Compartments must be separated by 1-hour fire barrier. Doors must be rated and automatic closing on smoke detection.
- Air supply and exhaust systems shall be independent for each compartment where provided
- Each compartment must have direct access to elevators where provided. Doors must be gasketed.
- Smoke control shall be provided independently



WHAT EDITION OF THE IBC/IFC SHOULD YOU USE?

- Understand how the current SBC is organized and what Chapters of the IBC/IFC were adopted and compare with the current edition
- Newer Editions have gone through changes which can be reviewed and learned the justification for the change
- When the provisions of the current SBC are outdated, have a dialog with Civil Defense and justify the use of the most current edition.
- The goal/objective of adopting newer building codes is to move forward to better and safer designs



WHAT IS NEXT?

SBC (2020 Edition?)

- Opportunity for all of us to get involved and provide feedback



QUESTIONS?

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