

HISTORY OF BUILDING CODES

A Global Review

History of Building Codes

- Today, we view Building Codes as a comprehensive collection of regulations covering all aspects of construction including structural, mechanical, energy, electrical, plumbing, population density, spatial relationships, setbacks, heights, areas and much more.
- However, as with many things, codes didn't begin with a complex and intricate number of regulations.

History of Building Codes

- A building code is a set of rules that specify the standards for constructed objects such as buildings and non-building structures.
- Buildings must conform to the code to obtain planning permission, usually from a local council.
- The main purpose of building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structure

History of Building Codes

- The practice of developing, approving, and enforcing building codes varies considerably among nations
- . In some countries building codes are developed by the government agencies or standards organizations.
- Codes are then enforced across the country by the central government.
- Typically, these codes are known as the national building code.

History of Building Codes

- In some countries., where the power of regulating construction and fire safety is vested in local and state authorities, a system of model building codes is used.
- Model building codes have no legal status unless adopted or adapted by an authority having jurisdiction.
- The developers of model codes urge public authorities to reference model codes in their laws, ordinances, regulations, and administrative orders can be documented for legal purposes.

History of Building Codes

- When referenced in any of these legal instruments, a particular model code becomes law. This practice is known as 'adoption by reference'.
- When an adopting authority decides to delete, add, or revise any portions of the model code adopted, it is usually required by the model code developer to follow a formal adoption procedure in which those modifications can be documented for legal purposes.

History of Building Codes

- In the USA , model codes are promulgated by the International Code Council. On a three-year cycle, the “family of codes” are updated and made available to state and local jurisdictions for legal adoption.
- All fifty states, the District of Columbia, and several federal agencies have adapted the I-Codes as their legal instrument.
- In Canada, the national model codes are produced by the National Research Council of Canada.

History of Building Codes

- In Europe, the Eurocode was developed for uniformity.:
- Basis of structural design, is a pan-European building code that has superseded the older national building codes.
- Each country now has National Annexes to localize the contents of the Eurocodes. Nationally determined parameters permit the member states to choose the level of enforcement applicable within their country.

History of Building Codes

- The first known written code is attributed to King Hammurabi (1792-1750 B.C.) in the ancient city of Babylon. King Hammurabi's codes demanded severe punishment if a builder failed to perform in a professional manner.
- King Hammurabi decreed if an architect/master builder constructed a building, and that building failed or collapsed and killed the owner, then the builder could be put to death.
- This punishment might be viewed as the "eye for an eye, tooth for a tooth" doctrine.

History of Building Codes

- Another code reference from scripture states “When you build a new structure it must have a parapet wall as part of the roof so no quilt of blood shall be brought upon your house if anyone should fall from it.”
- Greek and Roman regulations dealt with contractual relationships on what materials were permitted such as the size of stones and iron dowels, as well as the procedures to properly place the stone, dowels, mortar, etc. and the inspections necessary to monitor construction progress.

History of Building Codes

- Byzantine and Islamic codes have direct routes in practice and customary laws in the ancient civilizations of the near east, but they evolved separately.
- Evidence suggests the Islamic rules developed from existing practices utilized throughout the Arabian peninsula during the 7th century.
- The Byzantine code written from 531-533 CE, is the oldest source specifically from construction and design rules that have been discovered to date.

History of Building Codes

- The Byzantines and Muslims developed common roots that spread throughout the Mediterranean region.
- Teachings and writings of importance came from Medina, Cairo, Cordova, and Corona.
- Byzantine stipulations extended from the Balkan counties to Greece where its influence continued into the early 20th century.

History of Building Codes

ZONING



History of Building Codes - Zoning

- The focus of early codes dealt with regulations focused on what would be considered zoning issues today.
- The goal of the documents was to ensure minimum damage to pre-existing structures by stipulating fairness of rights and responsibilities of all parties.
- The freedom for a property owner to do what they wished was allowed.
- However, the rights of neighboring properties must be recognized and not damaged.

History of Building Codes - Zoning

- The public areas must not be damaged from activities, construction, or waste generated by the private area.
- A generic rule discussed the right of a neighbor to abut an existing structure, recognizing the adjacent owner's property rights.
- Also, the relationship between the street and building façades was addressed.

History of Building Codes - Zoning

- These regulations were meant to govern the demands and expectations of change that might create a benefit for an owner without creating a detriment to a neighbor.
- Overtime, the effect of these regulations would tend to harmonize issues among neighbors and reduce conflicts
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- Both Byzantine and Islamic law recognized local, customary practices to determine the validity of a claim in a jurisdiction.

History of Building Codes - Zoning

- Byzantine courts respected the concept of consensus; while Islamic laws relied on customary practice as long as it did not conflict with Islamic values.
- The Fina is a space about 1m to 1 1/2m wide between building walls and public access space. The space extends vertically parallel to the face of the building. This provides the limitations of building control for balcony projections, lights, stairs, etc.; and establishes the relationship between a building and the public way.

History of Building Codes - Zoning

Note the projecting lamp is high enough for traffic below and is within the finia of the house

The sabat belongs to the house on the right.

The arch spanning the street is built to reinforce the stability of the walls, implemented after agreement between owners of the facing houses



History of Building Codes - Zoning

- An important issue to address within the Fina was the placement of windows.
- Byzantine and later Greek cultures considered views of the sea, mountains, orchards to be of utmost importance and should not be restricted by neighboring properties.
- While views were greatly appreciated in Islamic culture, protection from visual intrusion into the private areas of buildings was the major concern.

History of Building Codes - Zoning

- Before 1840, the Ottoman powers issued many building orders such as:

heights of houses to maintain social order

widening of main roads , increasing building setbacks

creating public squares and controlling land use.

History of Building Codes

HEALTH

History of Building Codes - Health

Repeated outbreaks of typhus, yellow fever, and smallpox led to significant changes regarding the spatial relationship of buildings.

**London
1800s -**



History of Building Codes - Health

- Major cities around the world started to recognize the importance of controlling the size and location of buildings.
- In 1844, London surveyors began to enforce building regulations and activities that might threaten public health.

History of Building Codes - Health

In the 1800s, France began an aggressive campaign to demolish the existing structures within the tightly cramped neighborhoods.



History of Building Codes - Health

As in many cities, additional space increased sanitation, light and ventilation considered essential to reduce the spread of disease.



History of Building Codes - Health

The small, crowded streets gave way to expansive boulevards.

The adjacent buildings were limited to five or six stories with strict controls on the size and number of rooms within each building



History of Building Codes

FIRE

History of Building Codes - Fire

- From the earliest times, the threat of severe damage by fire has plagued the built environment.
- Causes of fires included open burning, candles, cooking fires, heating fires using wood or coal.
- Flammable material used for construction added to the spread of fires from one structure to the next.
- Structures built in proximity with overcrowded conditions contributed greatly to fire related disasters.

History of Building Codes - Fire

- Almost every country can identify a horrific fire that has left an indelible mark on its history.
- For purposes of this effort, we will explore a quick history of only a few tragedies.

History of Building Codes - Fire

- An early example is the Great Fire of Rome. Reportedly, as Emperor Nero watched as half of the city of Rome burned to the ground.
- Combustible materials, overcrowding, open burning and close adjacent buildings and multi-storied structures contributed to the inferno .



History of Building Codes - Fire

- **The Great Fire of London - 1631**
- Fire started in a bakery. Small distance between buildings.
- Combustible material used for the construction of walls and roofs
- Numerous obstacles of the fire fighting process
- Resultant caused major damage and loss of life.



History of Building Codes - Fire

- In 1631, Boston, Massachusetts, outlawed the building of wooden chimneys and thatched roofs of homes
- These were found to cause dangerous fires throughout the community.
- This became the **first American Building Code**

History of Building Codes - Fire

- There were two major fires in Boston's history: the Great Boston Fire of 1760 and the Great Boston Fire of 1871.
- **The Great Boston Fire of 1760** was a major conflagration that occurred on March 20, 1760, in Boston in the Province of Massachusetts
- The fire **destroyed 349 buildings** in the area between the modern Washington Street and Fort Hill, as well as several ships in port, and it left more than a thousand people homeless

History of Building Codes - Fire

The Great Chicago Fire – 1871

- America's fastest growing city in 1871 was Chicago.
- Construction of city was primarily wood and other combustible material.
- Terrible conditions of drought coupled with high winds helped to spread the flames.
- **1/3 of Chicago's buildings were destroyed before the fire was under control.**

History of Building Codes - Fire

The Great Chicago Fire – 1871

The fire killed approximately 300 people

Destroyed roughly 3.3 square miles (9 km²) of the city including over **17,000 structures**

More than 100,000 residents homeless



History of Building Codes - Fire

- **Great Boston Fire - 1872**
- The Great Boston Fire of 1872 was Boston's largest fire, and still ranks as one of the costlier fire-related property losses in American history.
- Most buildings in Boston, Massachusetts were thought to be "Fireproof."
- **65 acres of buildings were destroyed.**

History of Building Codes - Fire

Great Boston Fire - 1872

The fire had consumed about 65 acres (26 ha) of Boston's downtown, **776 buildings** and much of the financial district, and caused \$73.5 million in damage (equivalent to \$1.513 billion in 2021).

- The destruction to the buildings was valued at \$13.5 million and the personal property loss was valued at \$60 million.
- At least 30 people died, including 12 firefighters

History of Building Codes - Fire

• **Iroquois Theater - 1903**

- Iroquois Theater in Chicago was believed to be "Absolutely Fireproof." but a spark from an arc light ignited a curtain.
- Fire and smoke spread quickly throughout the theater
- The fire killed 602 people.
- The Iroquois Theater Fire was the deadliest theater fire and single building fire in the history of the United States.



History of Building Codes - Fire

- **The Rhythm Club, Natchez, Mississippi – 1940**
- The fire quickly engulfed the single story building due to the flammable decorations used and destroyed it within an hour

209 people died from smoke inhalation, crushing injuries, and burns



History of Building Codes - Fire

- **Coconut Grove Nightclub Fire - 1942**
- Building was recently under construction, rooms had a confusing floor plan, and interior decorations were combustible materials.
- Occupancy rating of club was 600 people but was overcrowded with over 1,000 people.



History of Building Codes - Fire

- **Coconut Grove Nightclub Fire - 1942**
- A match ignited the gauze draperies in the Melody Lounge located in the basement. The building was completely involved with fire within 5 minutes.
- 492 people died in the fire and 200 people injured.



History of Building Codes - Fire

- **Beverly Hills Supper Club – Kentucky 1977**
- The investigation into the fire found the following deficiencies:
- Overcrowding
- Inadequate fire exits
- Faulty wiring
- Lack of fire walls
- Poor construction practices
- No sprinkler system, no fire alarms
- Poor oversight by authorities



History of Building Codes - Fire

- **MGM Grand Hotel - Las Vegas, Nevada - 1980**
- **The fire was caused by an electrical ground fault inside a wall-mounted electrical receptacle**
- **A total of 85 people were killed, including 78 guests and 7 employees**



History of Building Codes - Fire

- **List of accidental fires in nightclubs**

- 1929 Study Club fire 1940 Rhythm Club fire 1942 Cocoanut Grove fire 1947 Karlslust dance hall fire 1961 Top Storey Club fire 1970 Club Cinq-Sept fire 1972 Play Town Club fire 1973 Summerland disaster 1977 Beverly Hills Supper Club fire 1981 Stardust fire 1983 Alcalá 20 nightclub fire 1993 Kheyvis fire 1996 Ozone Disco fire 2000 Luoyang Christmas fire 2001 Volendam New Year's fire 2001 Canecão Mineiro nightclub fire 2002 Utopía nightclub fire 2003 The Station nightclub fire 2004 República Cromañón nightclub fire 2008 Wuwang Club fire 2009 Santika Club fire 2009 Lame Horse fire 2012 Sighetu Marmăției explosions 2013 Kiss nightclub fire 2015 New Taipei water park fire 2015 Colectiv nightclub fire 2016 Ghost Ship warehouse fire 2022 Yaoundé nightclub fire 2022 Mountain B nightclub fire 2022 Binh Duong karaoke bar fire 2022 Kostroma café fire 2022 Poipet casino hotel fire 2023 Fonda Milagros nightclub fire

History of Building Codes - Fire

Knights of Columbus Hall – 1942 Newfoundland, Canada

Building housed 500 people at the time the fire started.

Windows boarded up for war blackout purposes.

Doors locked and barred from the exterior.

Arson fire started in building's Dance Hall spread quickly through the building.

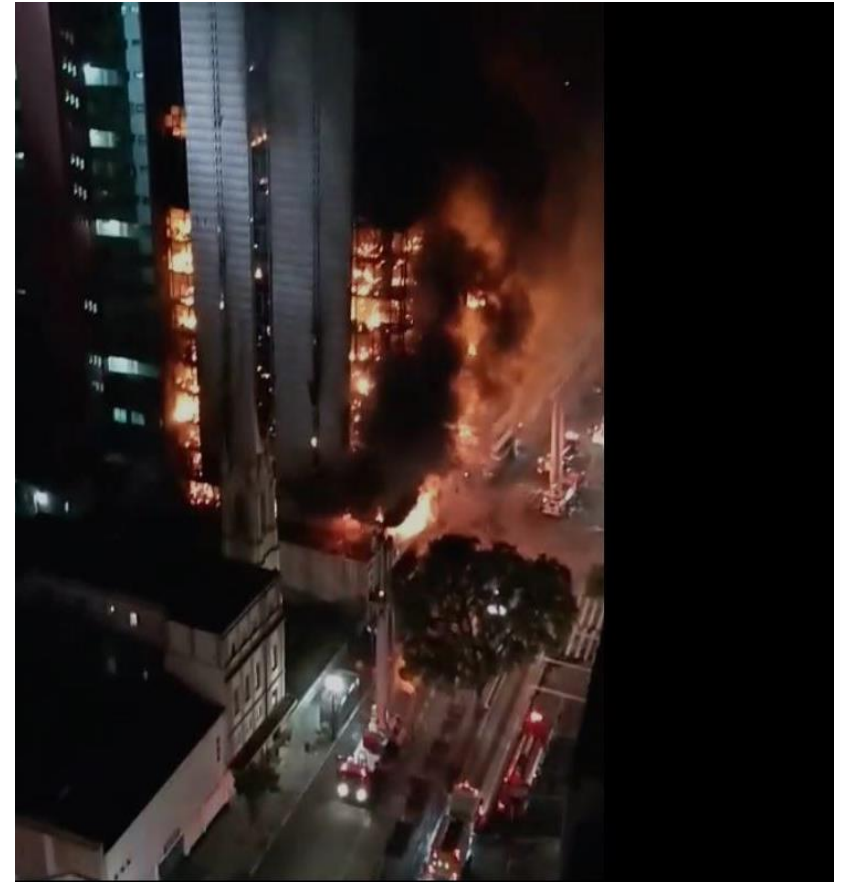
100 people killed- 107 people injured.



Aerial view from above the NE corner of the building. (Photo by State Fire Marshal's Office)

History of Building Codes - Fire

- **Sao Paulo, Brazil - 2018**
- A massive fire engulfed **two high-rise structures** in Sao Paulo, Brazil causing one of the buildings to collapse.
- a 24-story building crumbling to the ground as flames raced toward the top floor.
- Half of the floors in a second building were engulfed in flames



History of Building Codes - Fire

- The previous slides are a small sampling of fires that have persistently happened.
- Fires continue to create devastating losses of life and property throughout the world.
- Greater emphasis must be placed on fire prevention activities

History of Building Codes

Disasters

History of Building Codes - Disasters

- Disasters are commonly divided into two categories.
 - Manmade Disasters and Natural Disasters
- **Manmade Disasters :**
- Human history is riddled with man-made disasters, from nuclear meltdowns and underwater oil spills to chemical explosions and mine collapses. Most of these do not directly impact building codes. However, one man made disaster has caused dramatic changes - WAR.

History of Building Codes - Disasters

- The impact of war has been with us since earliest times. However, a clear example of a building code impact can be viewed from post World War II Germany.
- The bombing raids against the Nazi regime left most of Germany and its capital Berlin in shambles.
- Massive destruction and an influx of refugees presented immense urban development problems.
- The building laws inherited from the past were completely inadequate.

History of Building Codes - Disasters

- From 1933 – 1945, the Third Reich Ministry of Labour drafted the German Building Code.
- The war prevented progress on the code and post war decisions on building issues remained fragmented with the state territories.
- Major reconstruction of cities occurred from 1945-1960.
- Finally in 1986, the Federal Building Code was enacted bringing together the whole of urban planning law.

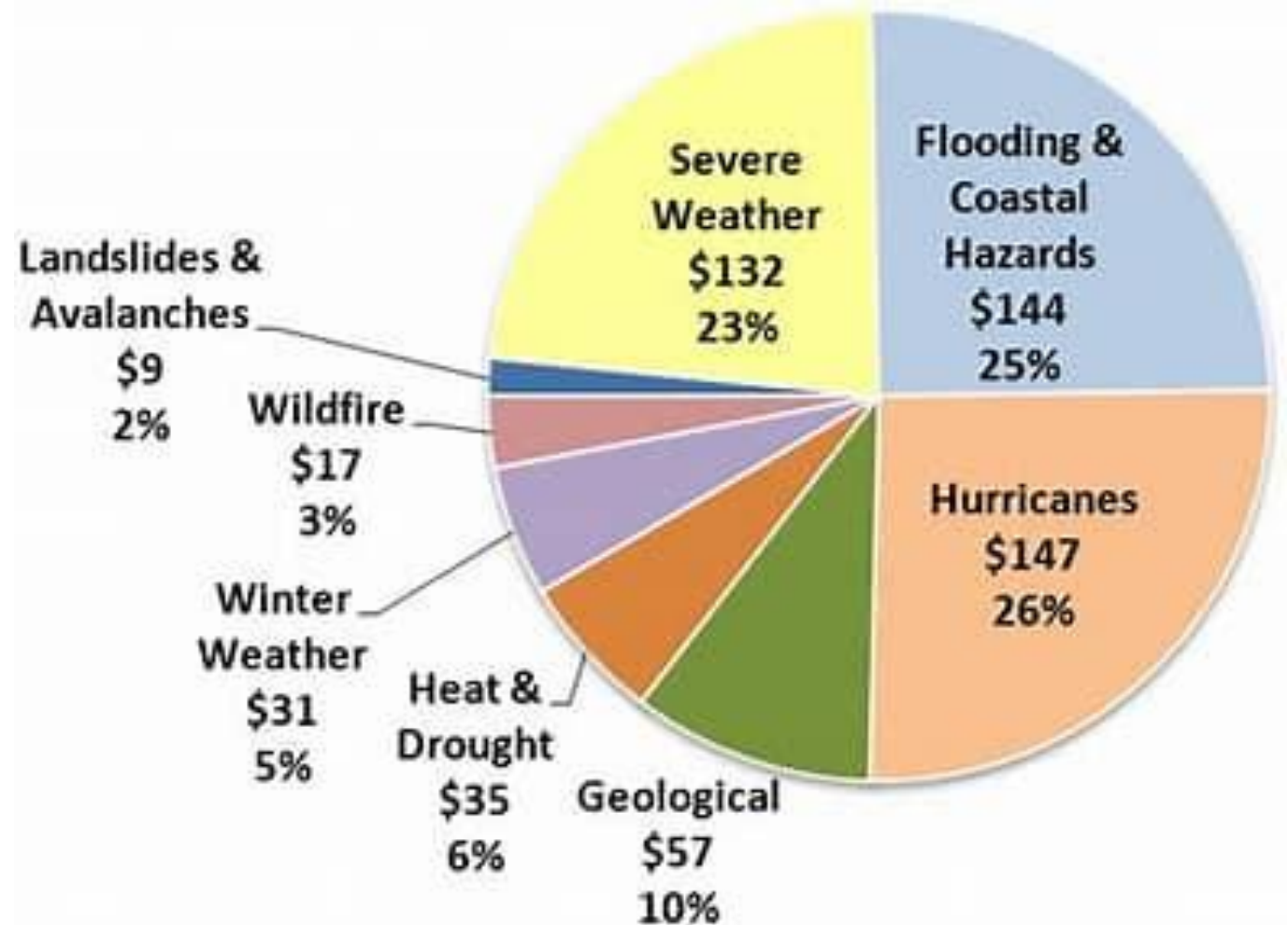
History of Building Codes - Disasters

- **A natural disaster** can be defined as any event with an environmental cause or process that negatively impacts humans.
- Natural disasters are extreme events that cause significant damage to life, property, and environment.
- They can be triggered by natural forces such as earthquakes, volcanoes, landslides, storms, floods, droughts, wildfires, and more.
- Some natural disasters are influenced by human activities, such as climate change, deforestation, urbanization, and pollution.

History of Building Codes - Disasters

Natural disasters can have devastating impacts on human health, safety, security, and well-being.

They can also disrupt essential services, infrastructure, and economy.



History of Building Codes - Disasters

- **There are 24 types of natural disasters:**
- Avalanches , Blizzards, Cold Waves , Ice Storms
- Droughts, Earthquakes, Floods, Flash Floods,
- Hailstorms, Heat Waves, Impact Events (Asteroids)
- Landslides, Limnic Eruptions (Exploding Lakes)
- Mudslides, Pea-soup fog, Sinkholes, Subsidence
- Solar Flares, Thunderstorms, Tornadoes, Tsunamis,
- Tropical Cyclones, Volcanoes, Wildfires

History of Building Codes - Disasters

- Unfortunately, there's usually no way to prevent natural disasters from occurring.
- However, we can be more prepared to handle natural disasters by creating infrastructure that makes our societies more resilient, like reinforced buildings that can handle major earthquakes.

History of Building Codes - Disasters

Although deaths from natural disasters have decreased overall, people in lower-income countries often suffer disproportionately, because these locations have fewer resources and thus greater vulnerability to the elements and to food insecurity.



History of Building Codes - Disasters

- **Haiti Earthquake in 2010** , killed 300,000 people
- **Haiti Earthquake of 2021** - At least 2,248 people were confirmed killed and more than 12,200 injured.
- . An estimated 650,000 people needed assistance
- . At least **137,500 buildings** were damaged or destroyed



History of Building Codes - Disasters

- In contrast, highly developed countries have better infrastructure and can implement policies that limit construction in flood-prone areas or mandate the construction of more earthquake-resistant structures, thereby reducing the risk of crushing injury and death stemming from building collapses.
- Consequently, relatively few people die from earthquakes in California, a location known for its strong building codes with respect to withstanding earthquakes, compared with places such as Iran and Pakistan, where building codes are either less stringent or whose codes frequently go unenforced

History of Building Codes

- The above presentation is a historical perspective on building codes.
- The emphasis on fire, health issues, and disasters is a necessary effort because those failures have driven advances in building safety technology and development of building code changes.
- Unfortunately, building tragedies have not been relegated to the past.
- Every year brings a new series of mishaps that must be addressed.

History of Building Codes

- Rules can and will change as experiences are accumulated.
- Any jurisdiction in the world might be negatively impacted by fire, natural or man-made disasters, and health related events. .
- We must strive to identify necessary procedures and methods to prevent or at least minimize the risks of these events.
- Having updated, contemporary code documents, and a quality code enforcement program is absolutely essential.

History of Building Codes

?? QUESTIONS ??