Why Is Fire Safety Important?

RICH GLISSON – MARCH 8, 2023

Introduction

- U.S. Navy Deep Sea Diver
- 22 years full-time firefighter and paramedic (Retired)
- Certified Fire Safety Inspector
- Building and Electrical Safety Inspector
- MBA – Healthcare from Franklin University
- OSHA Outreach Instructor – General Industry
- Safety Manager for Reading Rock

Objectives

- Increase fire safety awareness
- Familiar with types of building construction
- Where do codes come from?
- General overview of fire behavior
- Understand the importance of fire flow paths
- See fire safety from a different perspective

“Changing conditions requires that value and quality be viewed in entirely new ways.”

(Ginter, Duncan, & Swayne, 2018)

Perspective

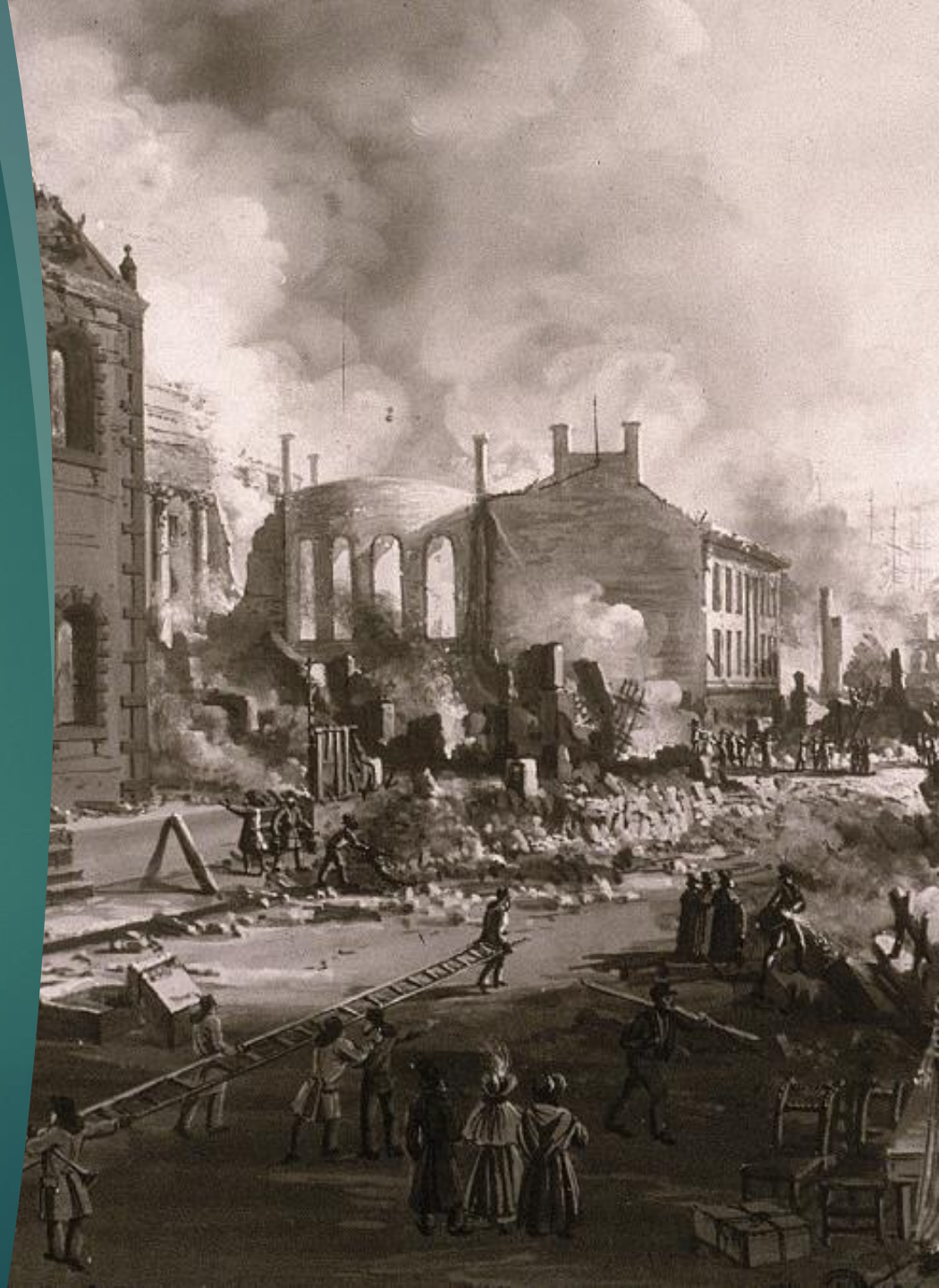
Code History

Old Testament - Deuteronomy 22:8

"When you build a new house, make a parapet around your roof so that you may not bring the guilt of bloodshed on your house if someone falls from the roof."

The Great Fire of New York – 1835

- Bitter cold and windy night in December
- Leveled 17 city blocks
- Set East River on fire as turpentine leaked from storehouses onto the water
- Water supply is woefully inadequate
- By May 1837 Croton Aqueduct built
  - 12 million gallons per day
- Surprisingly, only 2 deaths



Triangle Shirtwaist Factory – 1911

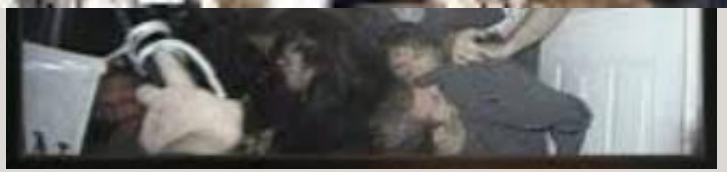
- 600 workers on upper floors.
- Fire hose rotted and valve rusted shut
- Fire escape was too narrow
- 2 stairways
  - One was locked from outside
  - One had inward swinging doors

Did You Know?

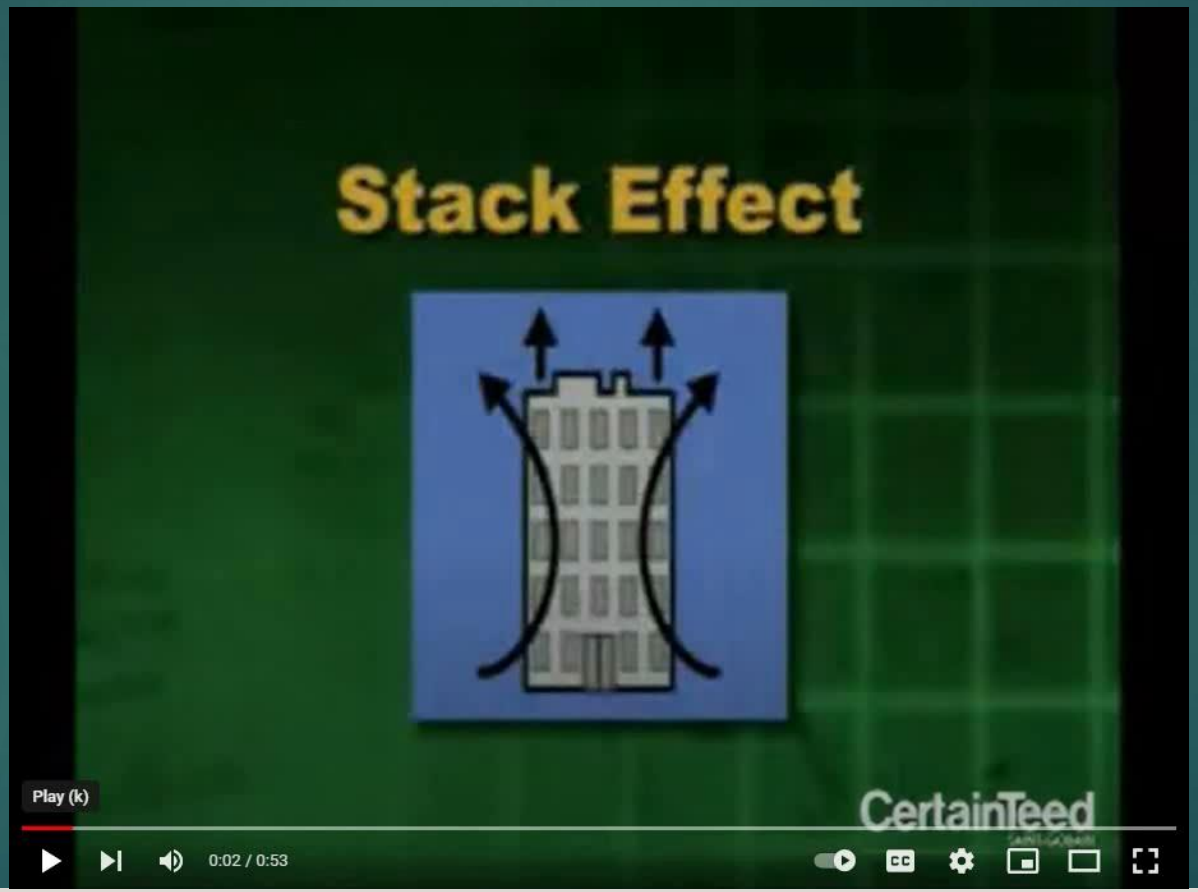
A fire can double in size every 30 seconds causing everything in a room to burn in as little as three minutes!

After you have taken two minutes to escape and call 9-1-1 a metropolitan fire department will probably take only five minutes to arrive.

From Bad to Worse Very Quickly



Naturally Occurring Phenomenon Physics



Grenfell Tower Fire – London, 2017

- The fire was started by an electrical fault in a refrigerator on the fourth floor.
- This was due to the building's new cladding and the external insulation, since the air gap between them enabled the stack effect. The fire burned for about 60 hours before finally being extinguished.
- 72 Dead

Brannigan's Building Construction for the Fire Service

- **A building and its' construction is nothing more than a gravity resistance system.**

Types of Construction

- Type V — Wood Construction
- Type IV — Heavy Timber Framing
- Type III — Ordinary (Non-combustible Wall Construction)
- Type II — Non-combustible (1-Hour Fire Resistance)
- Type I — Fire Resistive (2- to 3-Hour Fire Resistance)

Type V - Wood Framed

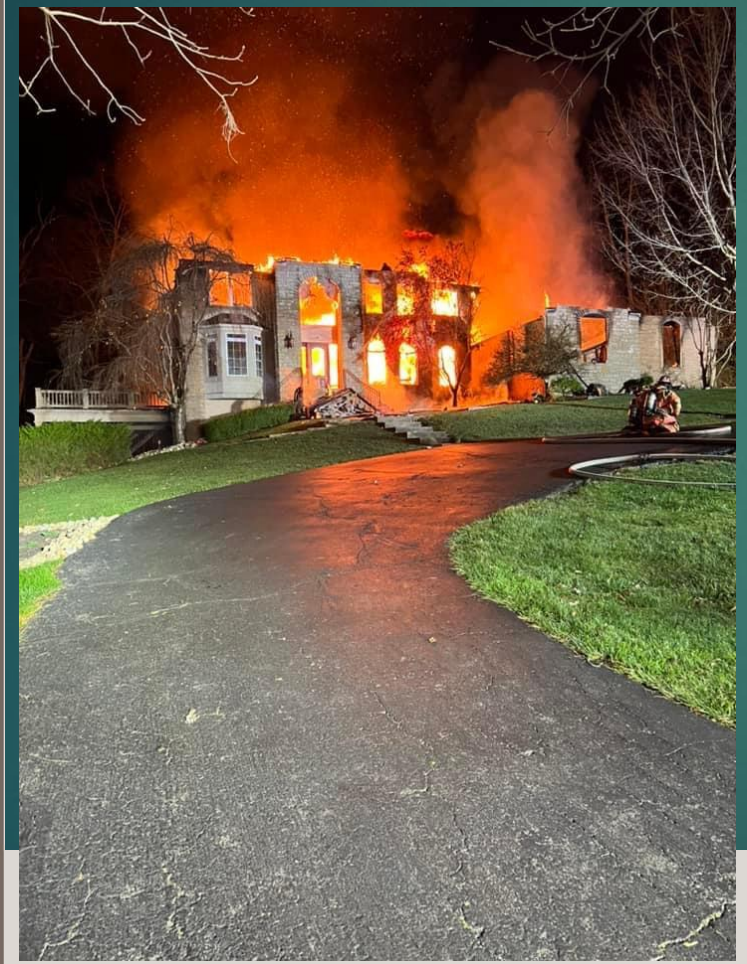
Laminated Veneer Lumber

Lightweight Trusses

The dangers of lightweight wood frame construction!

- Wooden I-beams are notorious for rapid fire spread and early catastrophic **failure in as little as four minutes** of fire involvement.
- **Floor collapse in six minutes**. Engineered wood floor assemblies have the potential to collapse very quickly under well-ventilated fire conditions. When it comes to lightweight construction, there is no margin of safety.

Legacy vs. Modern



Type IV - Heavy Timber

Type III - Ordinary

- A general definition of **ordinary construction**: exterior masonry walls non-combustible/limited combustible with combustible interior beams or truss.

Type II – Non-combustible

Type I - Fire Resistive

Exit Access, Exits, & Discharges

Exit access – portion of an exit route that leads to an exit.

Exit – portion of an exit route that is generally separated from other areas to provide a protected way of travel to the exit discharge.

Exit discharge – part of the exit route that leads directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside

Is This a Clear Path to Safety?

Is this acceptable?

- Provide lighting for exit routes adequate for employees with normal vision.

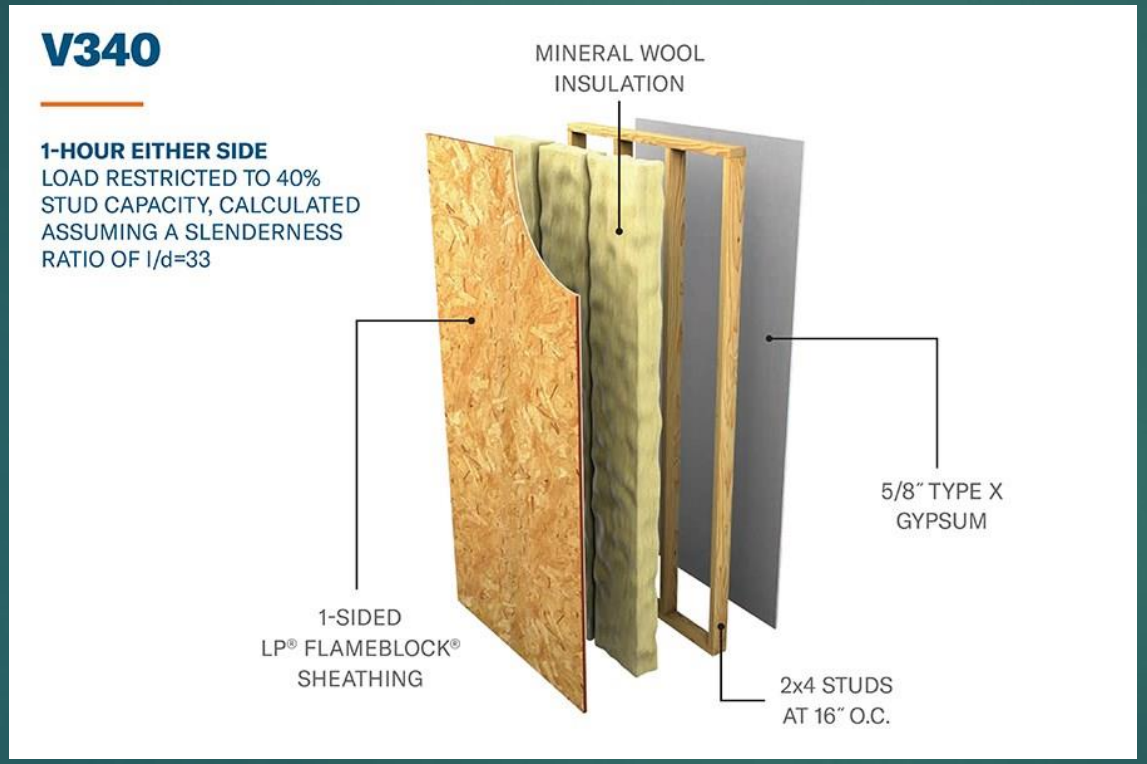
Why are fire doors important?

Is this okay?

What about this?

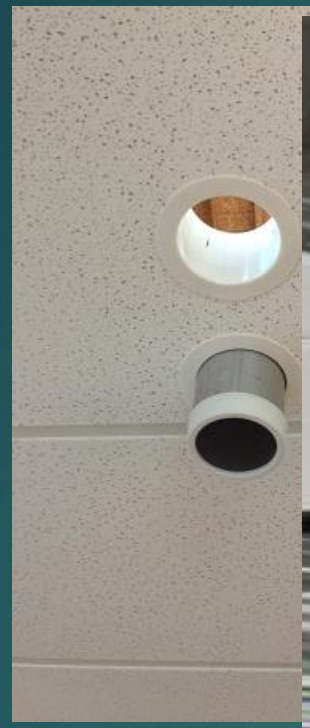
1910.36(a)(3)An opening into an exit must be protected by a self-closing fire door that remains closed or automatically closes in an emergency upon the sounding of a fire alarm or employee alarm system.

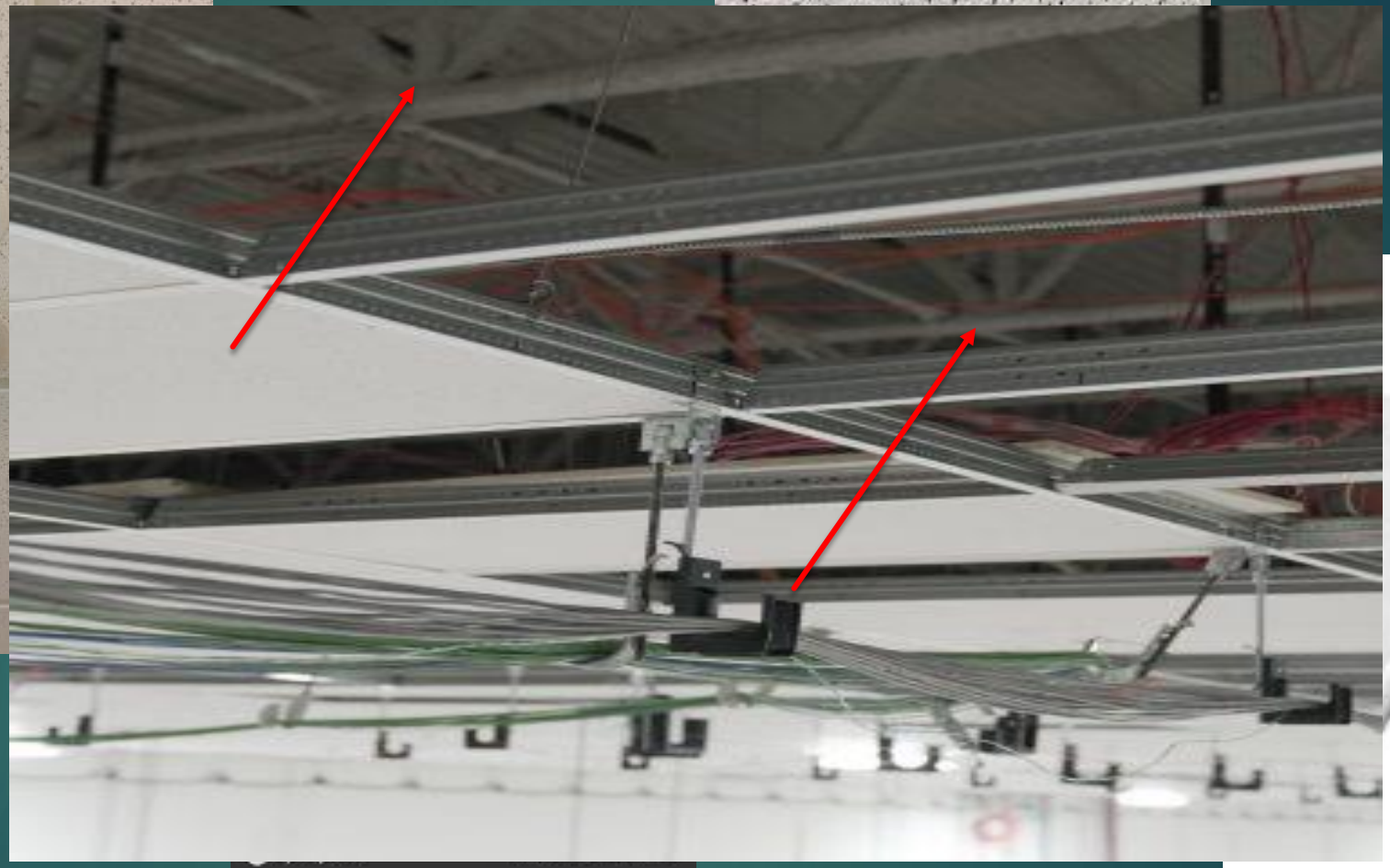
Fire Rated Assemblies



- Fire-rated assemblies define a prescriptive list of materials used and the configuration of such materials. These include fire-retardant-treated lumber and/or plywood, gypsum board, insulation batts and blankets, and in some designs, fasteners.

Ceiling Penetrations





Typical Ceiling Temperatures

- At eye level, it could be 600 degrees, hotter than the highest setting on most residential ovens. Temperatures at the ceiling could reach 1,500 degrees! At this temperature, your clothes can melt to your skin.
- Two breaths of 200-degree air is fatal.

At what temperature do gusset plates fail?

- **880 degrees Fahrenheit**

  Since the gusset plate does not penetrate the wood deeply, heat causes the gusset plate to pop off the lumber causing the bracing members to disconnect themselves. This process occurs at temperatures as low as 880 degrees Fahrenheit (Bracken Engineering, 2012).

Is Steel Any Different?

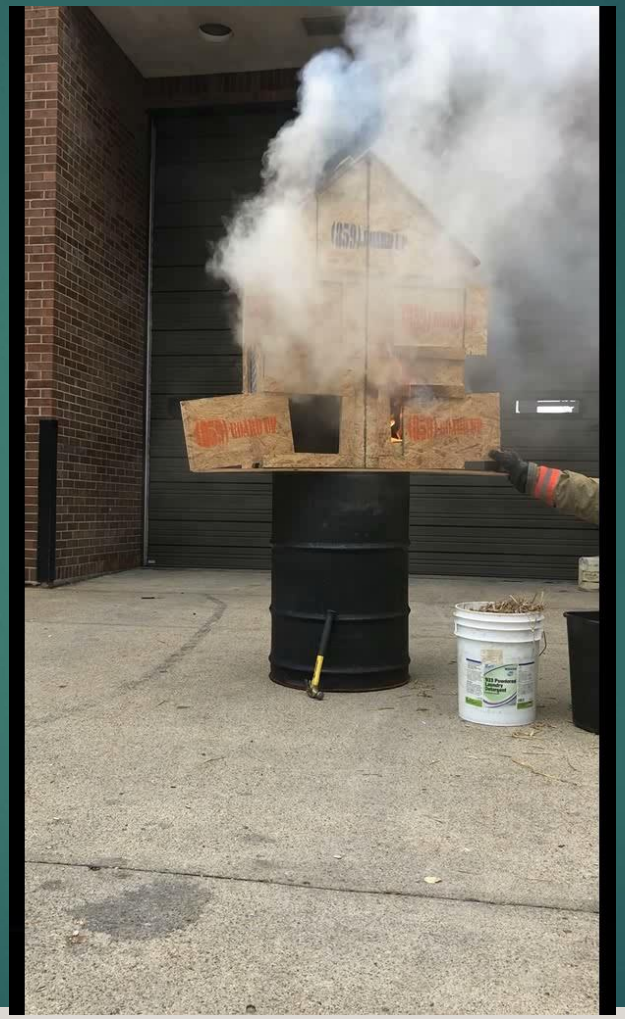
- Unprotected lightweight steel and wooden trusses **can fail after 5 to 10 minutes** of exposure. These trusses can fail from exposure to fire or **from exposure to heat alone.**

How Does Steel React To Heat Exposure?

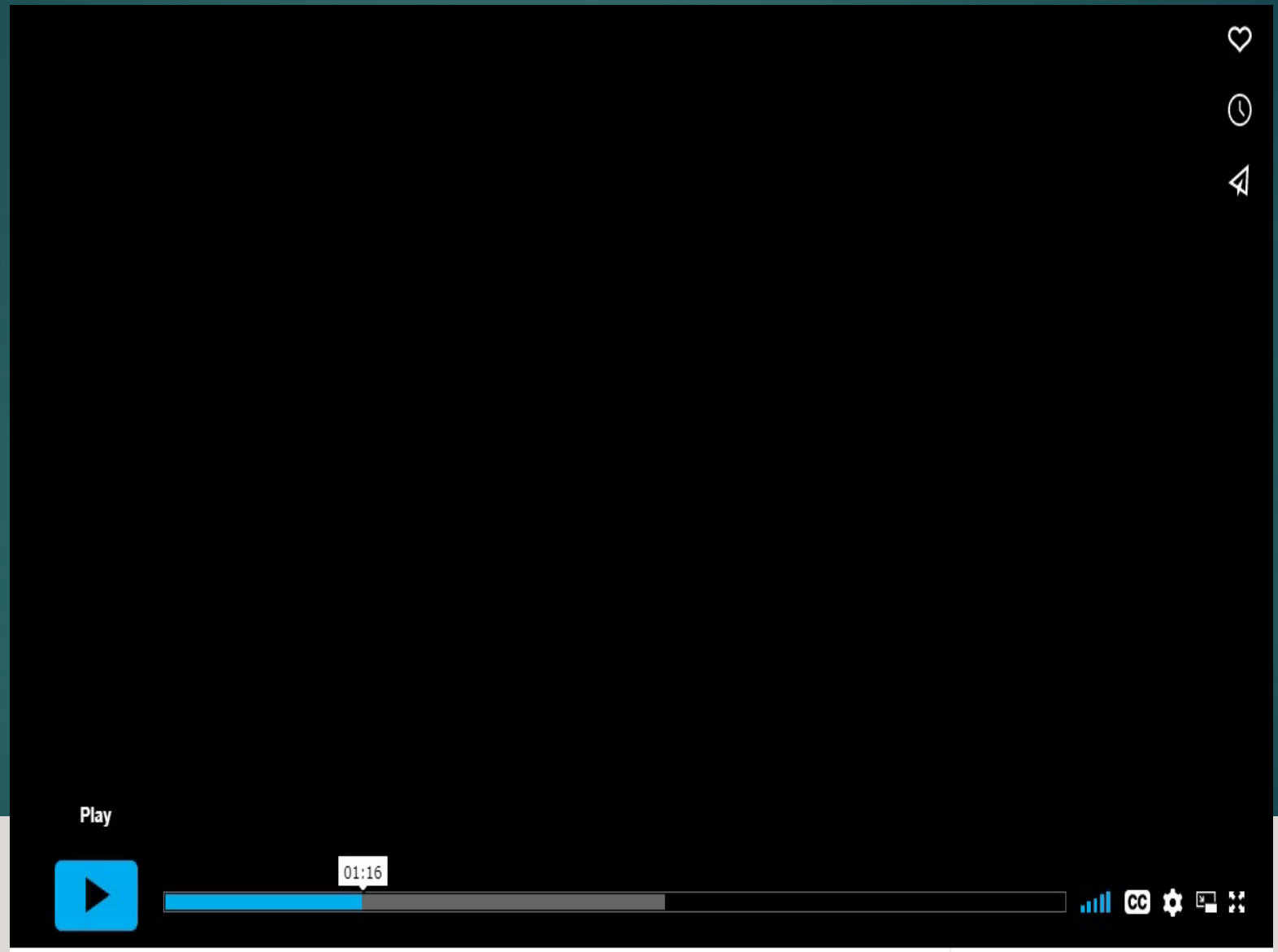
- **Steel elongates up to 9 inches per 100 feet at a temperature of 1000 degrees Fahrenheit**
- At eye level, it could be 600 degrees, hotter than the highest setting on most residential ovens. Temperatures at the ceiling could reach **1,500 degrees**! At this temperature, your clothes can melt to your skin.

Why It Matters

Fire Flow or Flowpath



Close Before You Dose



Review

What is considered exit access?

The portion of an exit route that leads to an exit.

Can exit doors be propped open?

No. It must automatically close in an emergency.

How often does a fire double in size?

Every 30 seconds.

Review

What is the typical ceiling temperature during a structure fire?

1500 degrees Fahrenheit

How much time do you have to escape your home in the event of fire?

Less than 3 minutes

Why is fire safety important?

Because your life and the lives of others depend on it.

Will you close before you dose?

Have you changed the way that you view the value and quality of fire safety?