BUILDING CONSTRUCTION PRINCIPLES FOR FIRE INVESTIGATION

Presented to the

Louisiana Chapter, International Association of Arson Investigator

By

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Program Overview

- Introduction & Program Objectives
- Construction Classifications
- Construction Terms For The Investigator
- Building Loads – Fire Load
- Structural Hierarchy

Program Overview …

- Factors Affecting Structural Stability
- Alterations To Buildings
- Type I – Fire-resistive Construction
- Type II – Non-combustible Construction

Program Overview …

- Type III – Ordinary Construction
- Type IV – Mill or Heavy Timber Construction
- Type V – Wood Frame Construction
- Discussion & Questions???

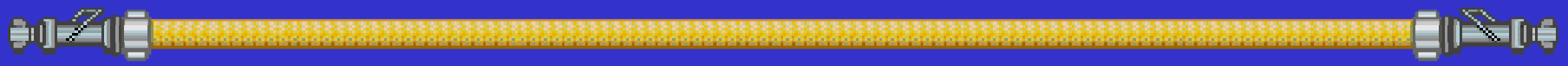
Introduction and Objectives

Many times the Fire Investigator is called upon to determine the cause of fires which have occurred in structures. In order to conduct a successful investigation it is paramount the Investigator understand and be able to describe the structure, building components and fire spread through the building in a narrative report …

Introduction and Objectives …

1. Understand the types or classification of building construction.
2. Understand construction methodologies and common building and construction terms.
3. Understand construction materials and how they react to fire.

Introduction and Objectives …



5. Understand the fire spread potential and how fire spreads through the building.
6. Enable the fire investigator to properly and effectively describe the building and the building components and the fire spread in a cause & origin report.

Construction Classifications

- Buildings are broken down or classified into five different types of construction based on the materials used in the building. The five construction classifications are as follows:
  - Type 1 – Fire resistive Construction.
  - Type 2 - Noncombustible Construction.
  - Type 3 - Ordinary Construction.
  - Type 4 - Mill or Heavy Timber Construction.
  - Type 5 - Wood Frame Construction.

ISO Construction Classifications

- Class 5 – Fire Resistive
- Class 4 – Non-combustible
- Class 3 Joisted Masonry, aka Ordinary
- Class 2 – Heavy Timber or Mill Type
- Class 1 – Wood Frame

Properties Of Common Building Materials

- Properties of Concrete
  - Good compressive strength.
  - Poor in tension & shear.
  - Non-combustible, will not add fuel to the fire.
  - Spalls when exposed to fire.
  - Fire-resistant, concrete is a good insulator.
  - Predictable under fire conditions.
  - Heavy/massive.
  - Not breachable.

Properties Of Common Building Materials …

- **Properties Of Concrete Block**
  - **Fair compressive strength.**
  - **Poor in tension and shear.**
  - **Non-combustible, will not add fuel to the fire.**
  - **Spalls when exposed to fire.**
  - **Fire-resistant, good insulator.**
  - **Predictable under fire conditions.**
  - **Less stable than poured or reinforced concrete.**
  - **Heavy.**
  - **Difficult to breach … with extreme caution.**

Properties Of Common Building Materials …

- Properties Of Structural Steel
  - Good compressive strength.
  - Good tension & shear strengths.
  - Non-combustible, will not add fuel to the fire.
  - Looses strength, bends, elongates as the result of exposure to fire.
  - Predictable, is ductile, warns of failure.
  - Is a good conductor of heat.
  - Heavy, not breachable.

Properties Of Common Building Materials …

- Properties Of Cast Iron
  - Good in compressive strength, but may vary depending on age and quality.
  - Good in tension & shear strength, but may vary with age and quality.
  - Non-combustible, will not add fuel to the fire.
  - May fracture under fire condition or if rapidly cooled.
  - Is a good conductor of heat.
  - Heavy.

Properties Of Common Building Materials …

- **Properties Of Wood**
  - **Good compressive strength.**
  - **Poor in tension and shear strengths.**
  - **Combustible, burns, adds fuel to the fire.**
  - **Predictable, looses strength as it burns.**
  - **Ductile, may warn of failure.**
  - **Fire-resistance/collapse resistance of wood structures is a function of mass.**
  - **Breachable.**

Properties Of Common Building Materials …

- Properties Of Engineered Wood Structural Elements
  - Lightweight, designed to carry the greatest weight over the largest span at the least cost to the developer.
  - Poor surface to mass ratio.
  - Connectors are dissimilar materials and offer little or no resistance to fire.
  - They are interdependent, rely on all the pieces of the assembly to remain intact to maintain structural integrity.
  - Interdependent of each other.

Construction Terms For Fire Investigators

- ➔ Protected?? Or Protected??
- ➔ Fire Walls
- ➔ Fire Separation Walls
- ➔ Trusses

Protected?? Or Protected??

- The term protected has two common meanings when describing a building or structure … it will be important to properly describe the building construction … and … the fire protection systems in the building in a cause & origin report or incident report.

Protected or Protected?? …

- #1. Protected … meaning the building is “protected” with a built-in fire protection system … such as an automatic fire sprinkler system.

Protection Criteria

- Largely based on the standard time temperature curve
- The curve shoots upward to a point and then flattens and extends further upward on a slower pace
- Developed during fire tests in Washington, DC in 1928
- More recent research supports a rising and falling fire growth development that is oxygen dependent

Protected or Protected?? …

- #2. Protected … meaning the structural members of the building are "protected" by fire rated assemblies or fireproofing materials protecting the structural members from the heat of the fire. This is always the case in buildings of fireresistive construction.

Fire Walls & Fire Separation Walls

➔ **Fire walls and fire separation walls are used to divide or separate parts or areas of the building. These walls will help reduce the fire spread potential during a fire. It is important to understand the difference between a fire wall and a fire separation wall and understand where these walls will be located in a building.**

Fire Walls

- Fire walls:
  - Separate buildings.
  - May separate parts or areas or buildings.
  - Are self supporting, have a foundation.
  - Run up through each floor and through the roof or to the underside of the roof decking.
  - Will have fire doors on openings in the fire wall.
  - Are constructed of masonry.

Fire Separation Walls

- Fire separation walls:
  - Are not self supporting.
  - Are constructed between the floor and the underside of the floor above.
  - Are constructed to “separate” areas of the building, ie …
    - Separate tenant areas.
    - Separate dwelling units from the corridor and other dwelling units.
    - Separate stairways from the floor area.
    - May be constructed of masonry or other approved rated assemblies such as metal studs and drywall.

Trusses

- A truss is a structural component which achieves stability through triangular formations. Trusses are used in roofs and floors where a wide open floor area is desired. In newer buildings lightweight wood trusses have replaced common building materials such as floor joists. The design of the truss has inherent fire problems which leads to early failure and collapse of truss assemblies.

Trusses …

- Construction features of the truss include:
  - The truss creates a confined space for the fire to gain intensity and spread through the concealed spaces of the building.
  - Trusses may be placed up to 20’ or 30’ on center, this creates a large area of collapse when a truss fails.
  - The connection on trusses are bolts, threaded rod, gusset plates which are all subject to early failure during a fire.

Building Loads – Fire Load

- Fire load is all combustible components of the structure and the combustible contents within the building. Fire load is expressed in terms of heat release rate (fire power). It is used today to establish the "fire size" for a given occupancy.

Building Loads – Fire Load

Building Loads – Fire Load

Building Loads – Fire Load

Structural Hierarchy

Columns

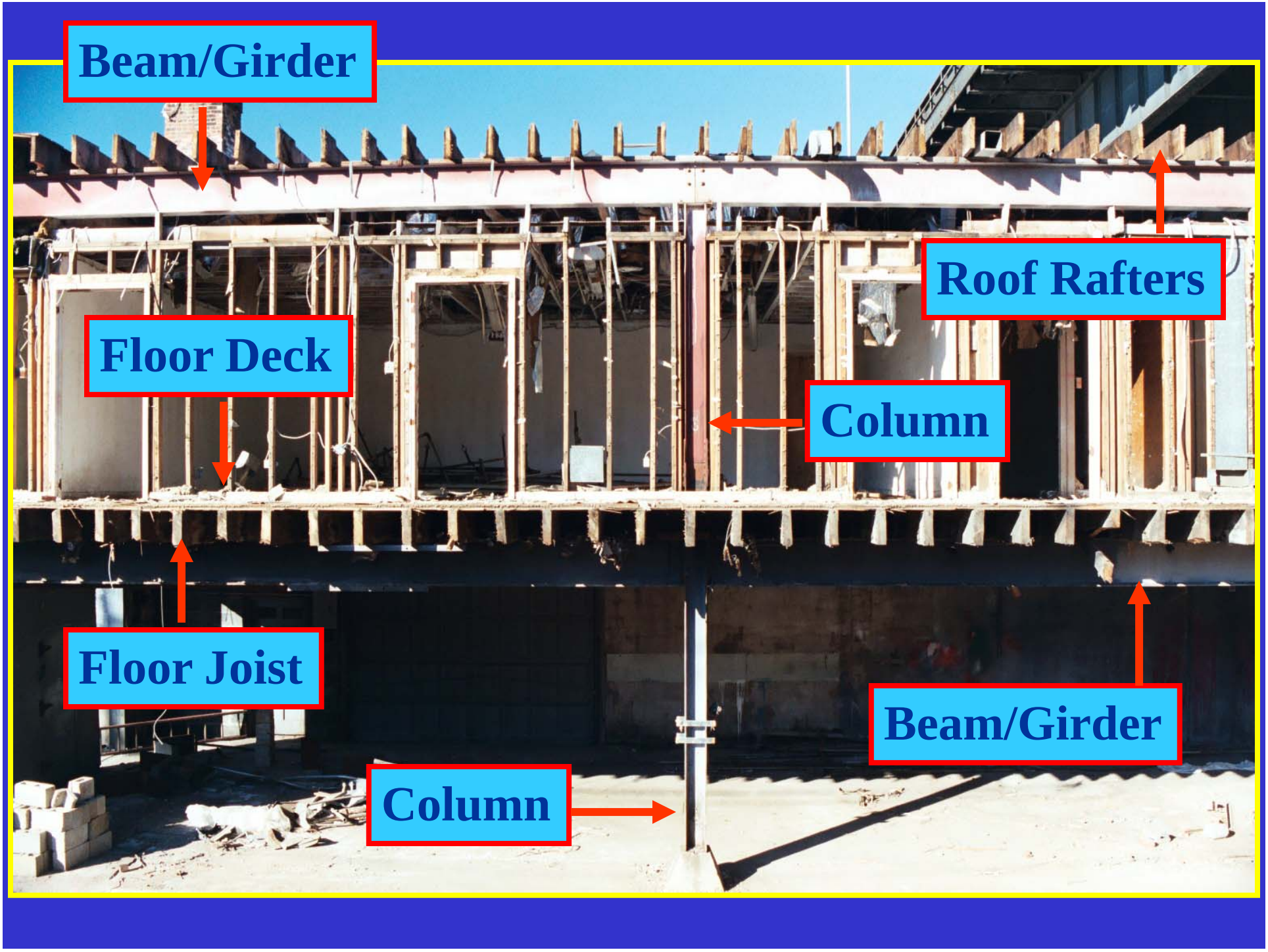
Beams/Girders

Joists & Rafters

Floor & Roof Deck

Most Important

Least Important


Beam/Girder
Roof Rafters
Floor Deck
Column
Floor Joist
Beam/Girder
Column

This illustration details the interruption of the structural hierarchy by the loss of the exterior wall leaving the second floor and the roof with no bearing surface, apparently unnoticed by the firefighters.

Factors Affecting Structural Integrity

➔Type Of Construction

Fire-resistive **vs** **Lightweight Wood Frame**

Factors Affecting Structural Integrity …

➔ Type Of Connections

Factors Affecting Structural Integrity …

➔ **Condition Of The Structure & Structural Elements**

Factors Affecting Structural Integrity …

➔Loading Of The Structure

Live Load

Factors Affecting Structural Integrity …

➔ **Loading Of The Structure**

Un-Designed Loads

Factors Affecting Structural Integrity …

➔ **Loading Of The Structure**

Environmental Loads

Factors Affecting Structural Integrity …

➔ **Loading Of The Structure**

Fire Load = Fire Intensity

Alterations To Buildings

- The impact of alterations on a building:
  - Alterations limit or impair our ability to properly “size-up” a building.
  - The actual building construction type and original building features may be disguised.
  - Alterations may have changed the structural hierarchy of the building.
  - Alterations may have changed the structural integrity of the building by removing structural components, parts of structural components or overloading existing structural components.

Alterations To Buildings ...

- The impact of alterations …
  - Lightweight structural members such as lightweight wood trusses are used to replace older more fire and collapse resistant structural components.
  - Alterations may create numerous vertical and horizontal combustible void spaces.

Alterations Case Study

Alterations Case Study ...

- **Based on the previous photo answer the following questions:**
  1. **Based on this picture what do you think the construction type of the building is?**

     _____
  2. **How old is the building?_____**
  3. **How many stories is the building? _____**
  4. **Is this a new building or a renovated structure? _____**


NO
PARKING
FIRE
LANE
PNY·23F


HESS


SOUTH CITY GRILL
SOUTH CITY GRILL
RESERVE
SUNDAY
BRUNCH

Fire-Resistive Construction

- N.F.P.A. Class I Construction Type.
- Fire-Resistive Construction Features.
  - The structural elements of the building must be protected from the heat of the fire.
  - The structural elements cannot add fuel to the fire.
  - The building design may tend to limit fire spread … depending on the type of occupancy.

Fire-Resistive Construction …

- Common building materials.
  - Reinforced cast in place concrete.
  - Concrete block.
  - Pre-cast concrete panels.
  - Structural steel, the steel must be protected from the heat of the fire, protection methods include:
    - Encasement in concrete.
    - Encased by layers of rated gypsum board.
    - Spray on fireproofing materials.

Fire-Resistive Construction …

- **Fire spread potential:**
  - **Will depend on the occupancy type, i.e., office, dwelling unit or hotel.**
  - **HVAC systems will play a role in fire and smoke spread. These systems may also be part of the buildings smoke control system.**
  - **Suspended ceilings and raised floors create void spaces.**
  - **Elevator and elevator shafts may be paths for smoke spread and fire extension.**
  - **Curtain wall construction.**
  - **Shafts, supply & return air, compactor and incinerator.**

Fire-Resistive Construction …

Example of curtain wall construction. Note how the framing of the exterior wall pass in front of the floor slab.

Fire-Resistive Construction …

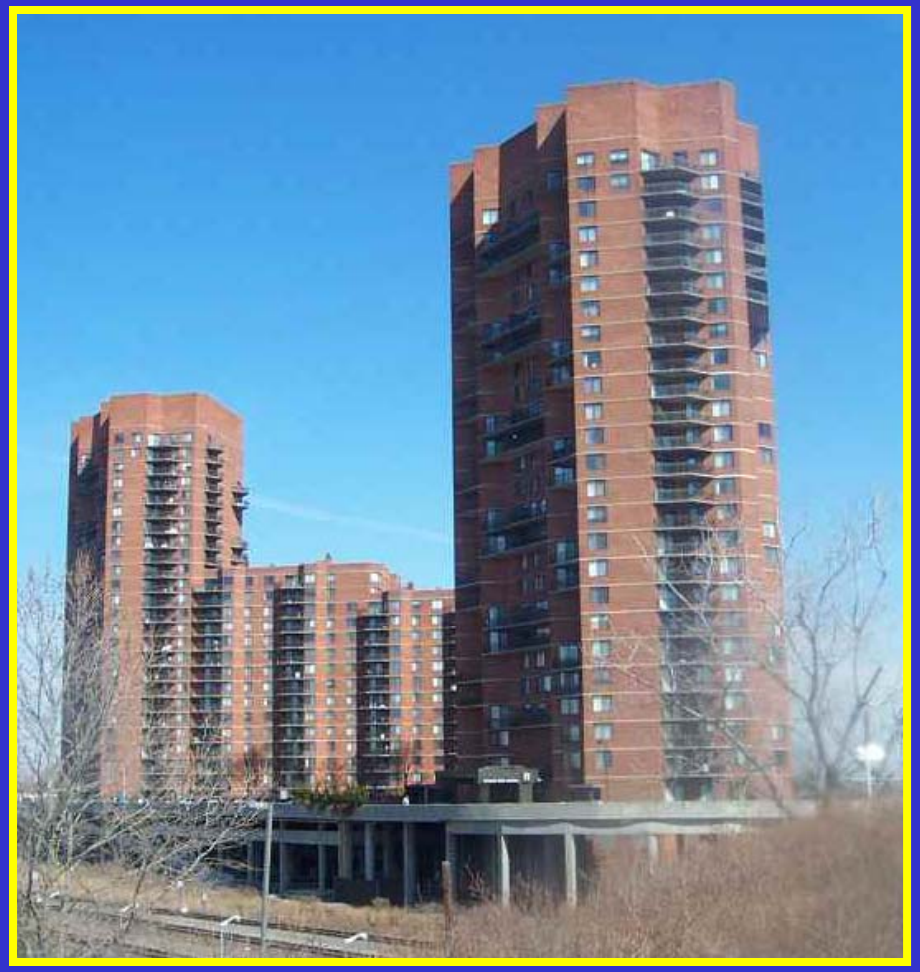
- Examples of occupancy fire spread potential.

Modern high-rise office buildings with open floor plans will provide the least compartmentation and allow for largest fire areas of all fire-resistive type buildings.

Fire-Resistive Construction …

- Examples of occupancy fire spread potential.

High-rise residential apartments will typically limit fire spread to the dwelling unit of fire origin, multi-level dwelling units may result in the fire extending to an upper floor of the dwelling unit.



Fire-Resistive Construction …

- Examples of occupancy fire spread potential.

High-rise public housing projects will typically limit fire spread to the dwelling unit of fire origin. The dwelling units in these type of occupancies tend to be smaller in square footage compared to other high-rise residential occupancies.

Fire-Resistive Construction …

- Examples of occupancy fire spread potential.

High-rise hotel under construction. Note the vertical concrete block walls. These walls support the floors and divide the floors into small fire areas.

Fire-Resistive Construction …

- Examples of occupancy fire spread potential.

High-rise hotel buildings will typically provide the greatest compartmentation because of the small area of the hotel rooms. This will help slow and limit the fire's spread.

Fire-Resistive Construction …

Example of cast in place concrete and associated form work.

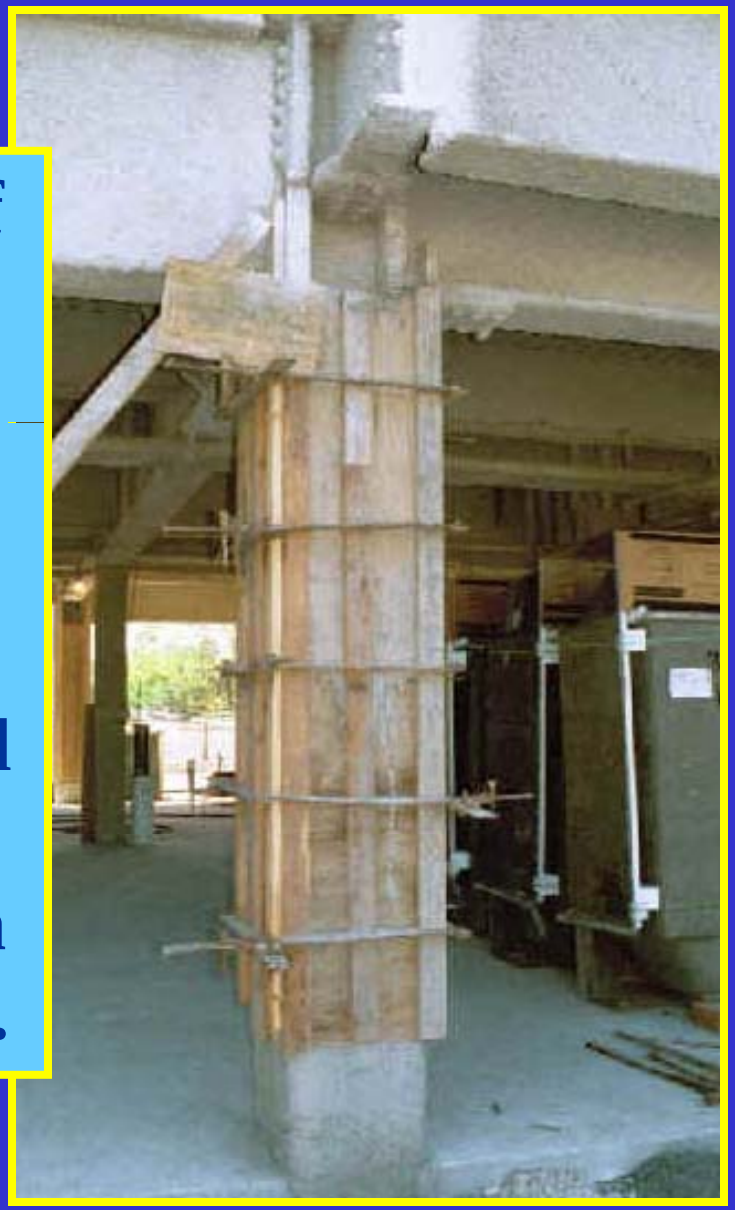
Fire-Resistive Construction …

Fire-Resistive Construction …

Example of pre-cast concrete panel construction.

Fire-Resistive Construction …

Examples of column & beam protection. Column encased in concrete and the beams are spray on fireproofing.



Fire-Resistive Construction …

- Old Style Monolithic Type Fire-Resistive Construction.
  - Concrete columns, beams and floors were of poured reinforced concrete.
  - Building where typically manufacturing or warehouse occupancies.
  - Building usually have open floor areas.
  - Buildings may contain freight elevators which negates the buildings natural ability to limit vertical fire extension.
  - Buildings usually have rows of metal factory style windows.

Monolithic Construction Features

Column Capital

Reinforced
Concrete Column

Air conditioners indicate the areas may be subdivided into office areas.

Blocked up create windowless areas in the building.

Fire-Resistive Construction

- **Features of Pre WWII High-Rise Construction:**
  - **Buildings tended to be constructed primarily of masonry materials.**
  - **Buildings had openable windows and lacked central HVAC systems.**
  - **The buildings had smaller floor areas and more compartmentation.**
  - **Less demand on electric utilities.**
  - **Buildings had true Fire Tower Stairs.**
  - **Less technology systems, computer floors, data cable, etc …**

Fire-Resistive Construction

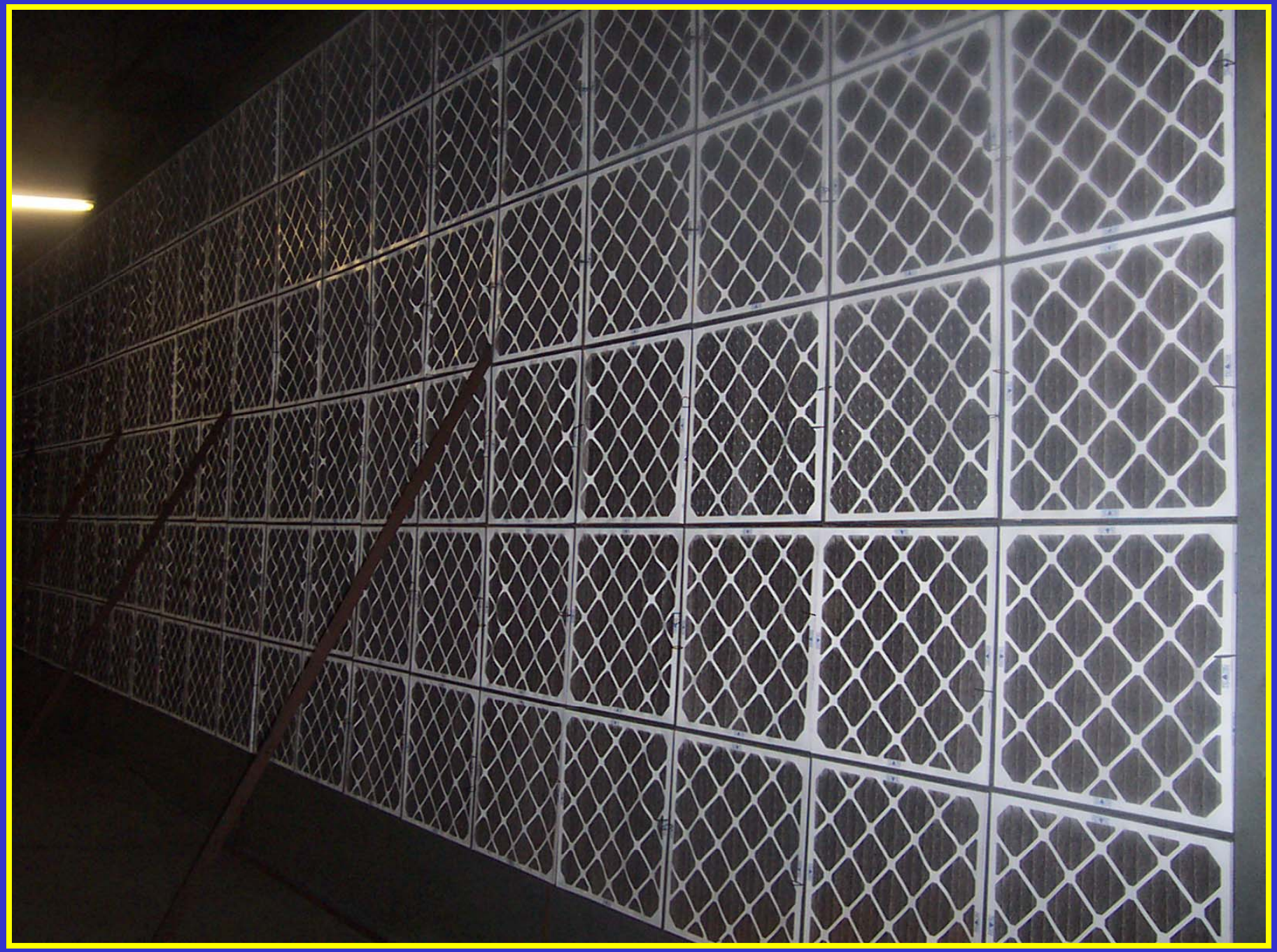
- Features of Post WWII High-Rise Construction:
  - Buildings tend to be constructed of lighter weight materials, curtain walls & rated gypsum board replaced concrete block, brick and poured concrete.
  - Buildings have central HVAC systems and few or no openable windows.
  - More complex electric and UPS systems.
  - Interior exit stairways not open to the outside air.

Fire-Resistive Construction …

- Features of Post WWII High-Rise Construction:
  - Tremendous accommodations for technology based businesses, computer centers, raised floors, fiber optic and data cables.
  - Complex fire protection and smoke control systems.
  - Center core construction , atriums …
  - Large open floor areas.
  - Multiple banks of elevators.


Employee
Entrance


EXIT
6




DANGER

Non-Combustible Construction

- N.F.P.A. Class II Construction Type
- Non-Combustible Construction Features
  - The structural elements do not add fuel to the fire.
  - The structure of the building is typically steel skeleton framing.
  - The roof structure is typically steel “I” beams or bar joist trusses.
  - Exterior and interior bearing walls are typically concrete block walls.

Non-Combustible Construction …

- **Non-Combustible Construction Features …**
  - **The exterior walls are most commonly concrete block, tilt slab masonry panels, steel siding or curtain wall construction.**
  - **The floors are most commonly poured concrete on steel decking, pre-cast concrete plank or “T” beams, or reinforced concrete.**
  - **The roof is often steel deck with a combustible rigid insulation board and combustible roofing materials.**
  - **Non-Combustible buildings are some of the least fire and collapse resistant buildings constructed.**

Non-Combustible Construction …

- Non-Combustible Construction Common Occupancies
  - Office Buildings.
  - Warehouses.
  - Schools.
  - Strip Malls, Stores, Shopping Malls.
  - Restaurants, Fast Food Restaurants.

Non-Combustible Construction …

- Fire Spread Potential In Non-Combustible Construction
  - Large open floor areas will be found in office and warehouse occupancies.
  - HVAC systems.
  - Elevators and elevator shafts.
  - Electric and communication cabling and systems.
  - Concealed spaces created by curtain walls and mansard roofs.
  - Metal deck roof fires.

Construction Features Of Non-Combustible Construction


SERCO
SERCO
SERCO

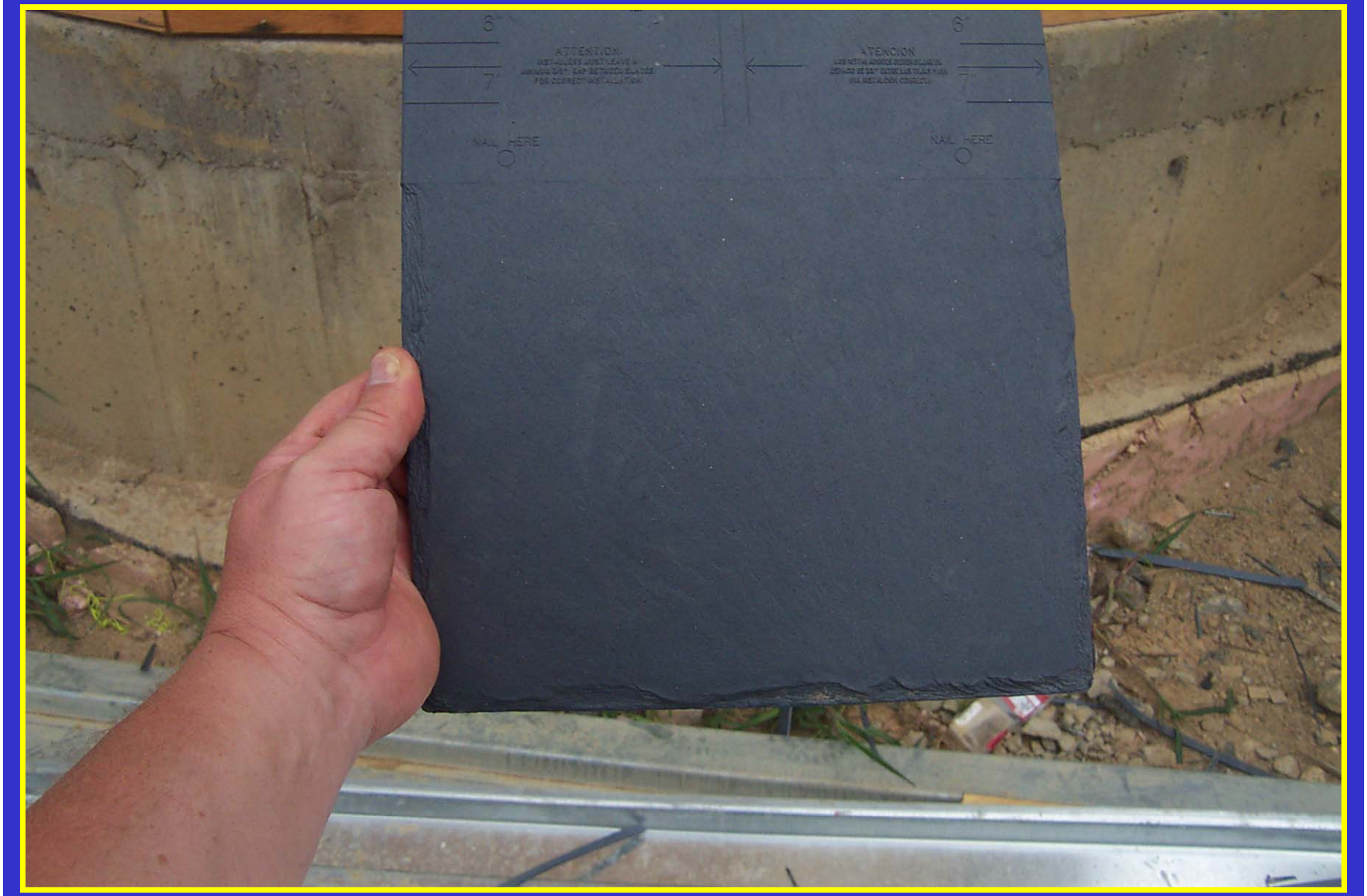

5


STOP

Non-Combustible Concrete Panel Wall Warehouse Case Study

Case Study Non-Combustible Office Building Under Construction

Case Study Non-Combustible Single Family Dwelling Under Construction


6"
7"
ATTENTION
NAIL HERE
6"
7"
ATENCION
NAIL HERE

Metal Deck Roof Fire Case Study

Ordinary Construction

- N.F.P.A. Class III Construction Type.
- Features of Ordinary Construction:
  - Ordinary constructed buildings consist of masonry load bearing walls, wood frame walls and interior partitions, and a wood roof structure.
  - Ordinary construction is also known as un-restrained masonry construction.
  - The buildings will often have some form of a truss roof.

Ordinary Construction …

- Features of Ordinary Construction …
  - The load bearing walls are usually the exterior side walls.
  - The floors joists and roof rafters usually span the shortest distance between masonry walls, usually the side walls.
  - The floor joists may be “fire cut” in order to be self-releasing from the masonry fire wall.
  - Interior wood frame walls may be balloon framed.

Ordinary Construction …

- Features of Ordinary Construction …
  - The buildings may be constructed with steel beams and channel rails as part of the structural frame.
  - Cast iron columns may be used to support beams or girders and exterior walls with large openings.

Ordinary Construction …

- Common Occupancies of Ordinary Construction:
  - Garden Apartments.
  - Multiple dwellings, typically 2 to 6 stories.
  - Taxpayer buildings.
  - Mercantile occupancies.
  - Older industrial and warehouse occupancies.
  - Churches.

Ordinary Construction …

- Features of Ordinary Constructed Garden Apartments:
  - Utilities such as plumbing waste lines will be common up through the building.
  - Floor layouts will be typical from floor to floor.
  - Buildings are usually 2 to 3 stories in height.
  - The building may have a common cockloft or attic.

Ordinary Construction …

- **Features of Ordinary Constructed Multiple Dwellings:**
  - **The buildings will typically be 3 to 6 stories in height.**
  - **The building may house a commercial occupancy on the first floor.**
  - **The building often contains a center hall/stairway.**
  - **The building may contain steel beams and channel rails as part of the structural support system.**

Ordinary Construction …

- Features of Ordinary Constructed Multiple Dwellings …
  - Utilities such as plumbing waste lines will be common up through the building.
  - Floor layouts will be typical from floor to floor.
  - Kitchen and bathrooms may be constructed back to back.
  - The building may contain active or inactive dumbwaiters/shafts.

Ordinary Construction …

- Features of Ordinary Constructed Multiple Dwellings …
  - The building may have light and air shafts, open shafts are open on one side and enclosed shafts are enclosed on all sides.
  - Cast iron columns may be used as structural components.
  - The building is likely to have a common cockloft.
  - These building contain numerous combustible void spaces, anticipate rapid fire extension!!

Ordinary Construction …

- **Features of Ordinary Constructed Taxpayer Buildings:**
  - **The buildings are typically 1 to 3 stories high.**
  - **The building have a commercial or mercantile occupancy on the first floor and offices or residential occupancies on the second and third floors.**
  - **Taxpayers are typical "Downtown USA".**

Ordinary Construction …

- Features of Ordinary Constructed Taxpayer Buildings …
  - Steel “I” beams are used to create large open store front windows.
  - Parapet walls are often supported by the steel “I” beam creating the window opening.
  - Cast iron columns may be used to support beams and/or the front wall of the building.
  - The building may have light and air shafts.

Ordinary Construction …

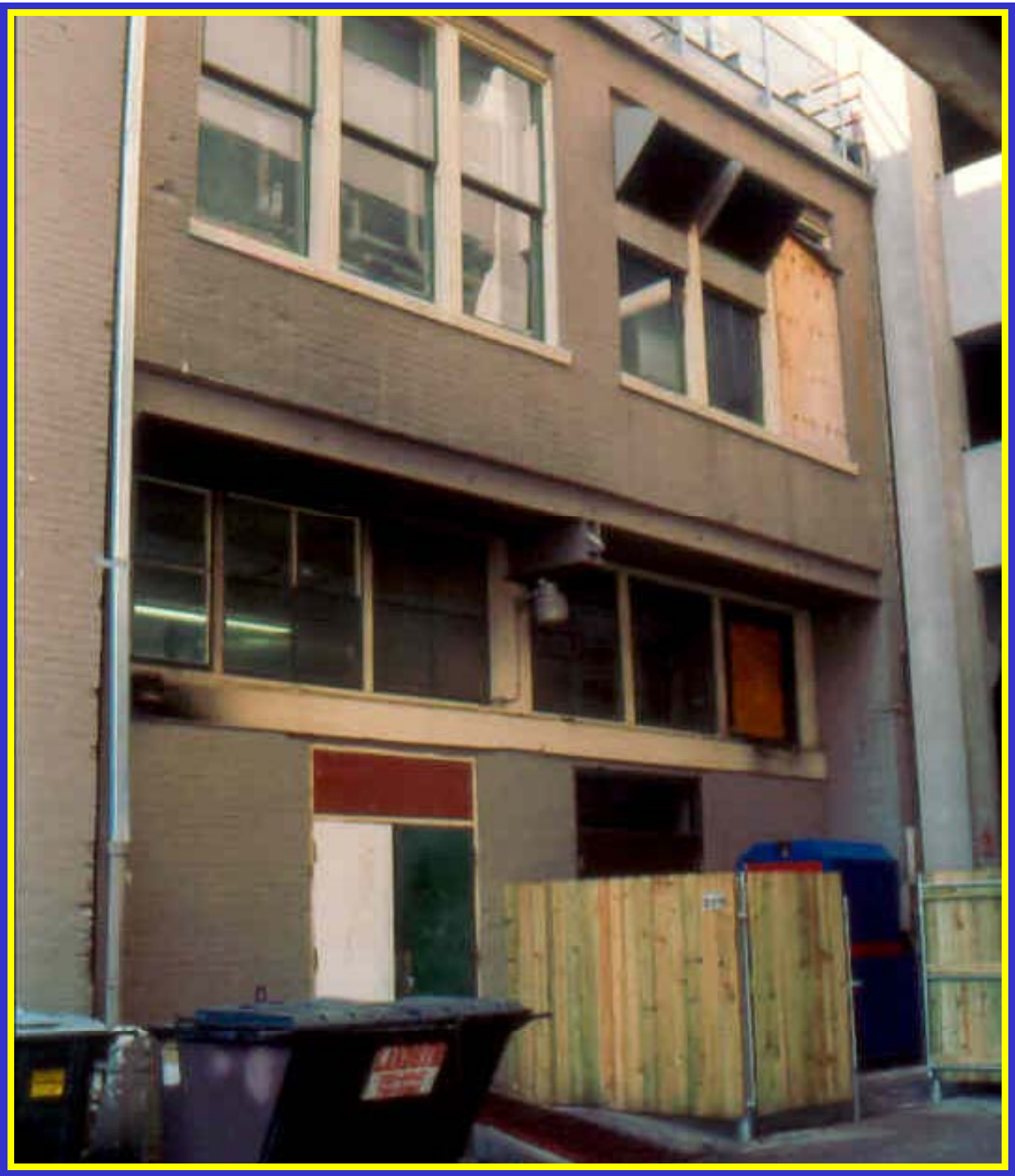
- Features of Ordinary Constructed Taxpayer Buildings …
  - These buildings usually have a common cockloft.
  - Access to the upper floors may only be from the rear of the building, this will complicate fireground management.

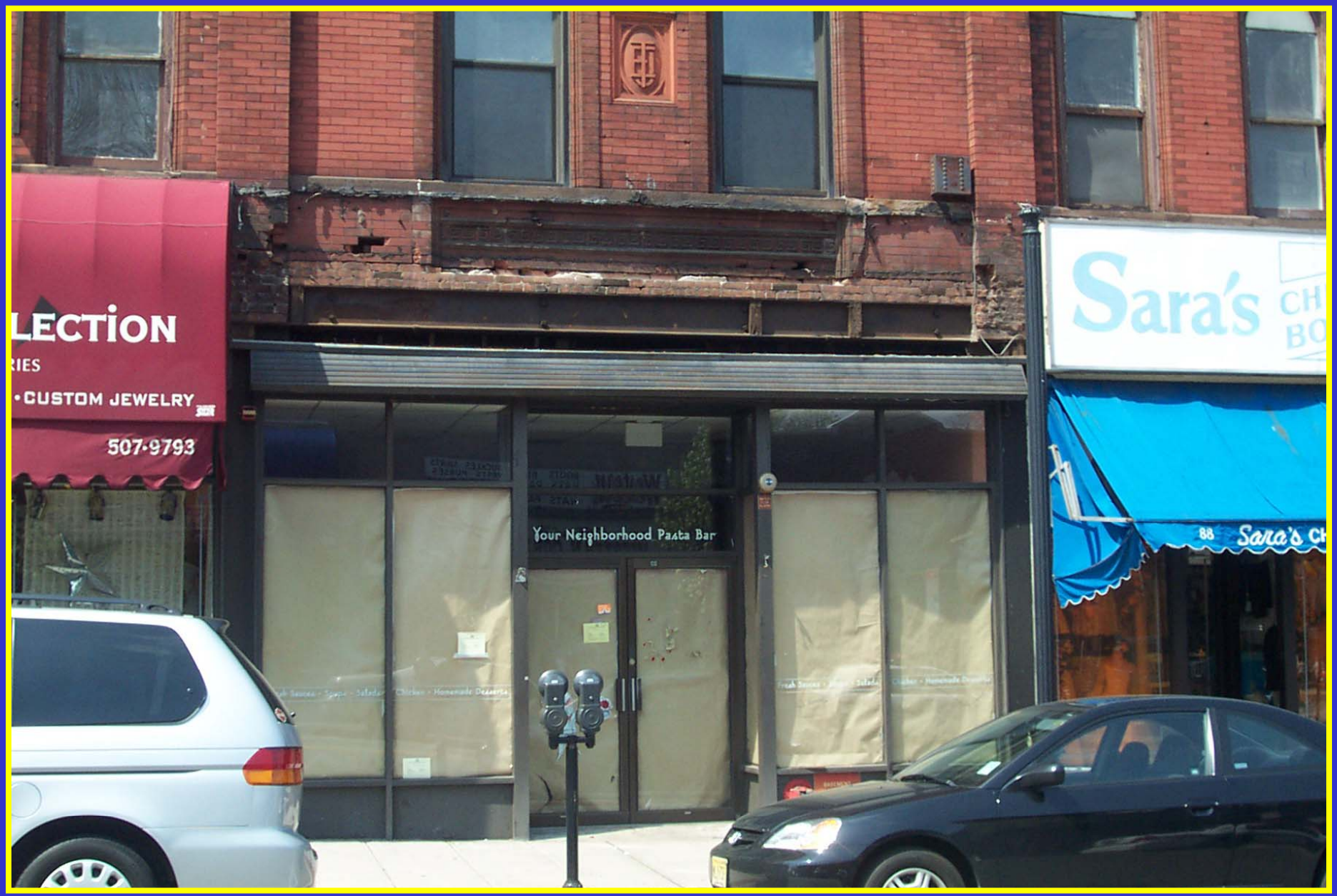
Ordinary Construction …

A typical row of ordinary constructed buildings.

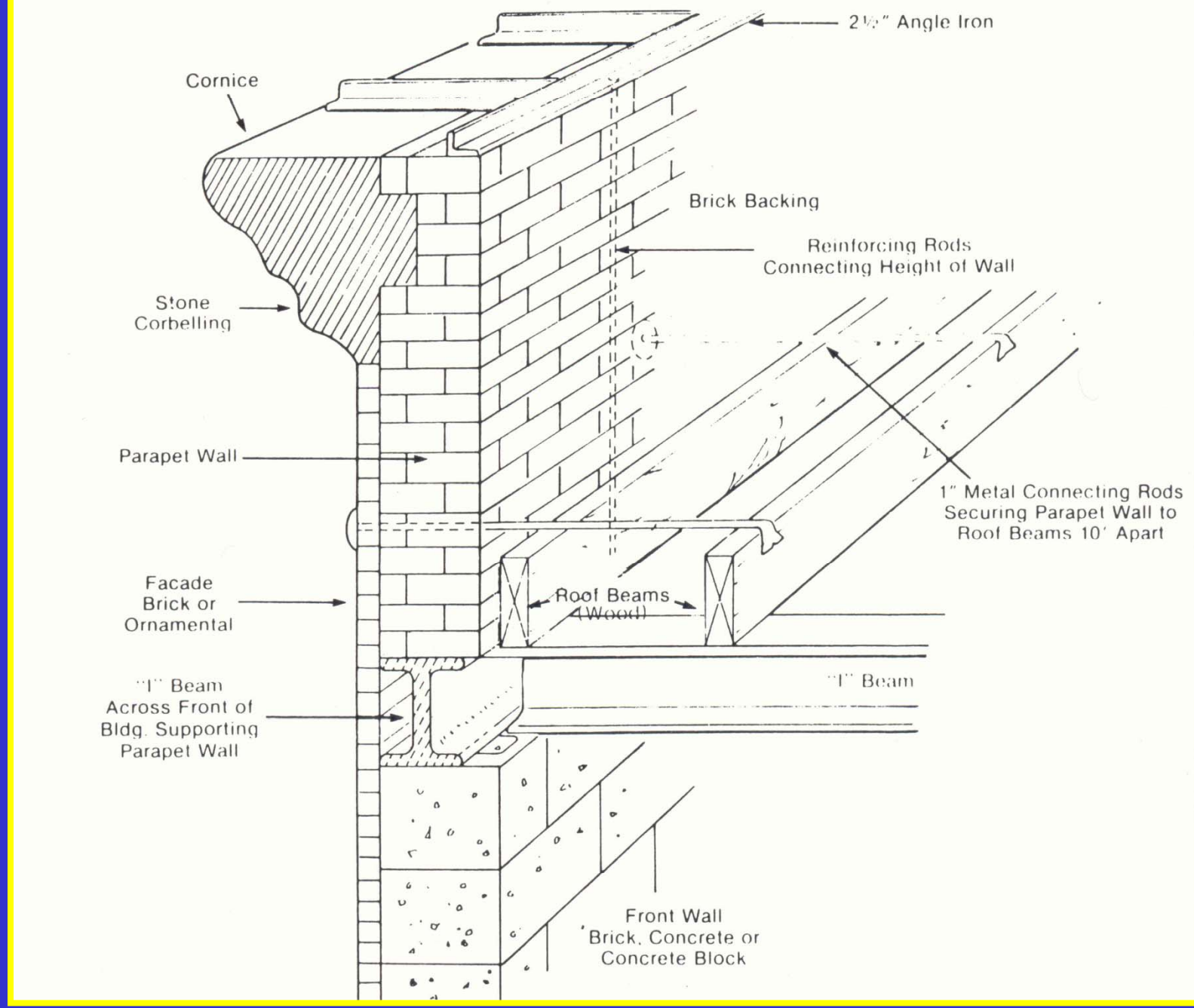
A not so typical commercial use in an ordinary constructed building.

Features Of Ordinary Construction



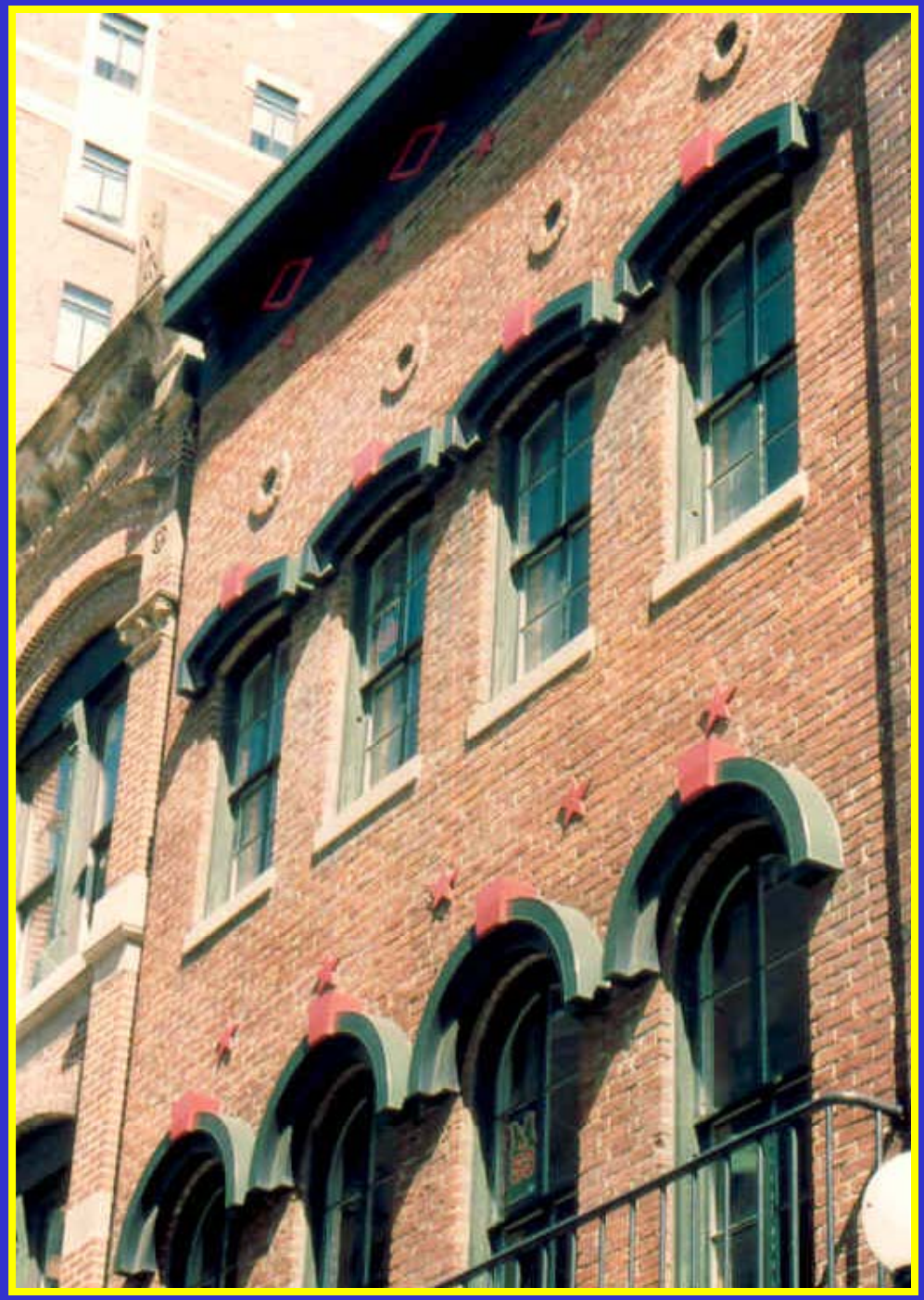

LECTION
RIES
•CUSTOM JEWELRY
507-9793
Your Neighborhood Pasta Bar
Sara's
88
Sara's


Points of support for steel beam in masonry wall.
Your Neighborhood Pasta Bar


2½" Angle Iron
Cornice
Brick Backing
Reinforcing Rods
Connecting Height of Wall
Stone
Corbelling
Parapet Wall
1" Metal Connecting Rods
Securing Parapet Wall to
Roof Beams 10' Apart
Facade
Brick or
Ornamental
Roof Beams
(Wood)
"I" Beam
"I" Beam
Across Front of
Bldg. Supporting
Parapet Wall
Front Wall
Brick, Concrete or
Concrete Block


Rutherford Florist
Rutherford Florist
PLANTS
FRUIT BASKETS
BALLOONS
201-935-6633
FLORIST
STOP
GET A FREE DISH!
$29.99


65
JEWELERS



Ordinary Construction Renovation Case Study

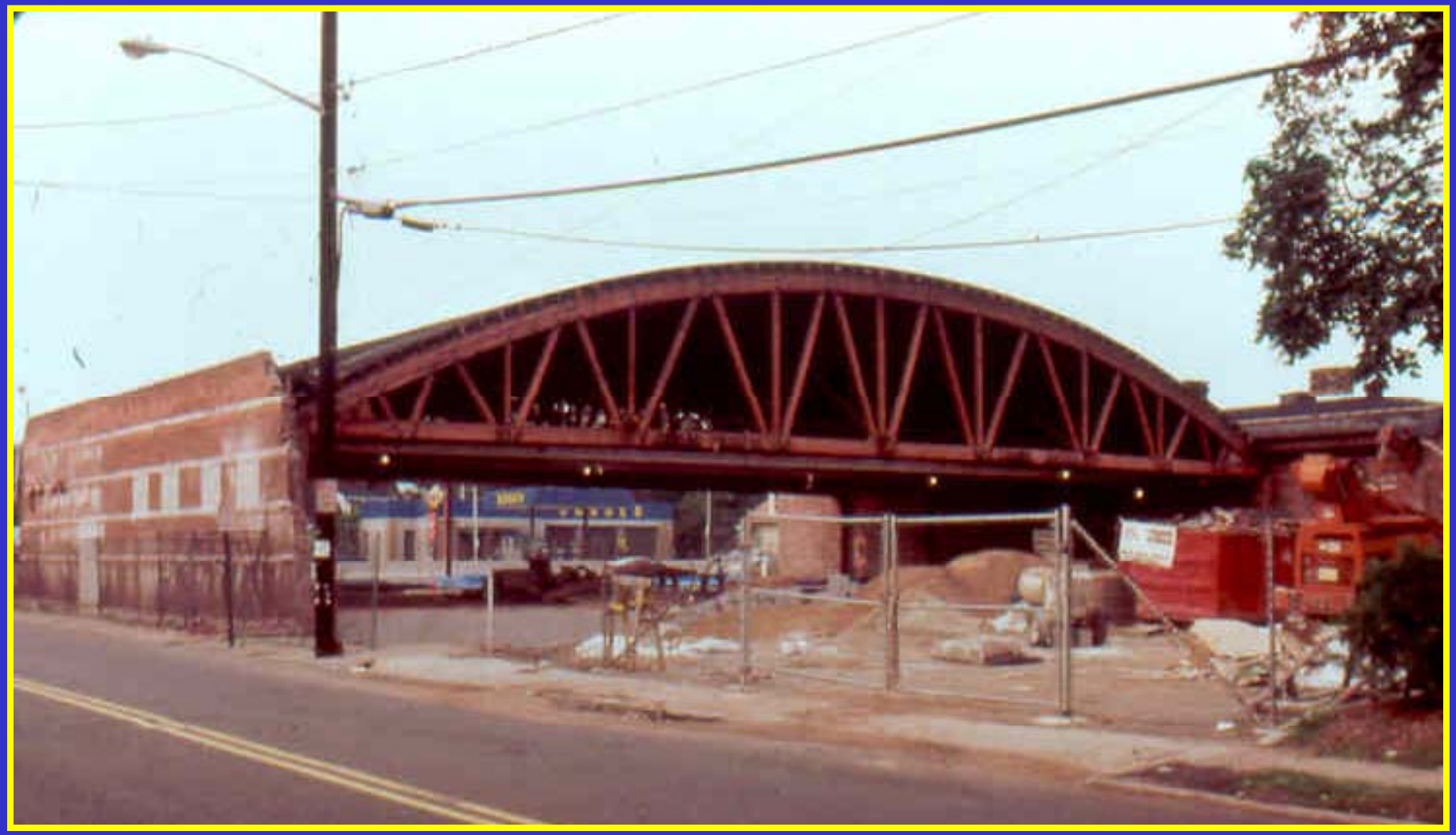

DELI-DELIGHTS
15
C.R. SNYDER
D.G. PLARRE


CHINA INN
CLEANERS


NO
PEDESTRIAN
WALK WAY


NO
PEDESTRIAN
WALK WAY

Ordinary Construction & Truss Roofs




BOWL

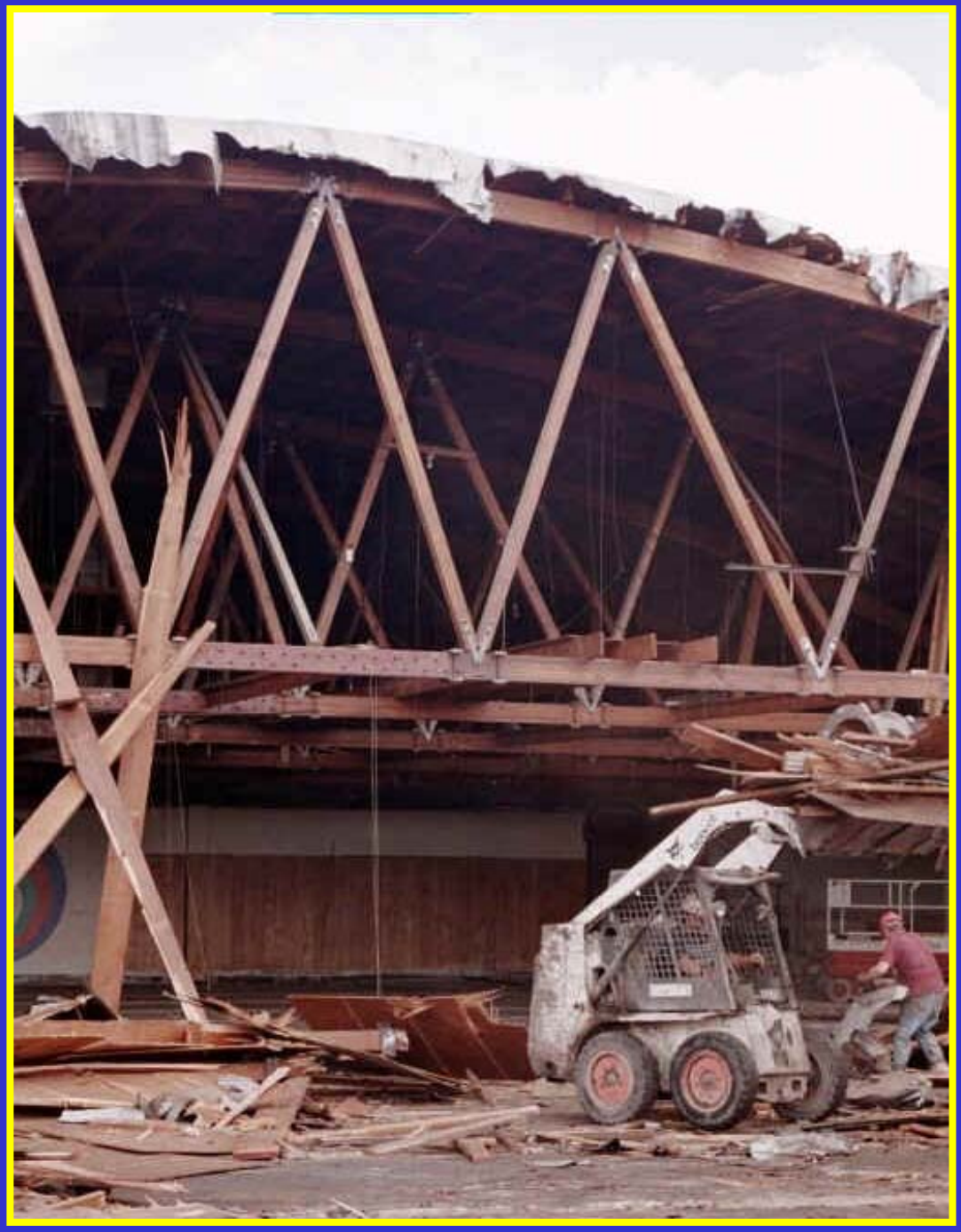

BOWSTRING TRUSS
LODI F.D.
SPRINKLED

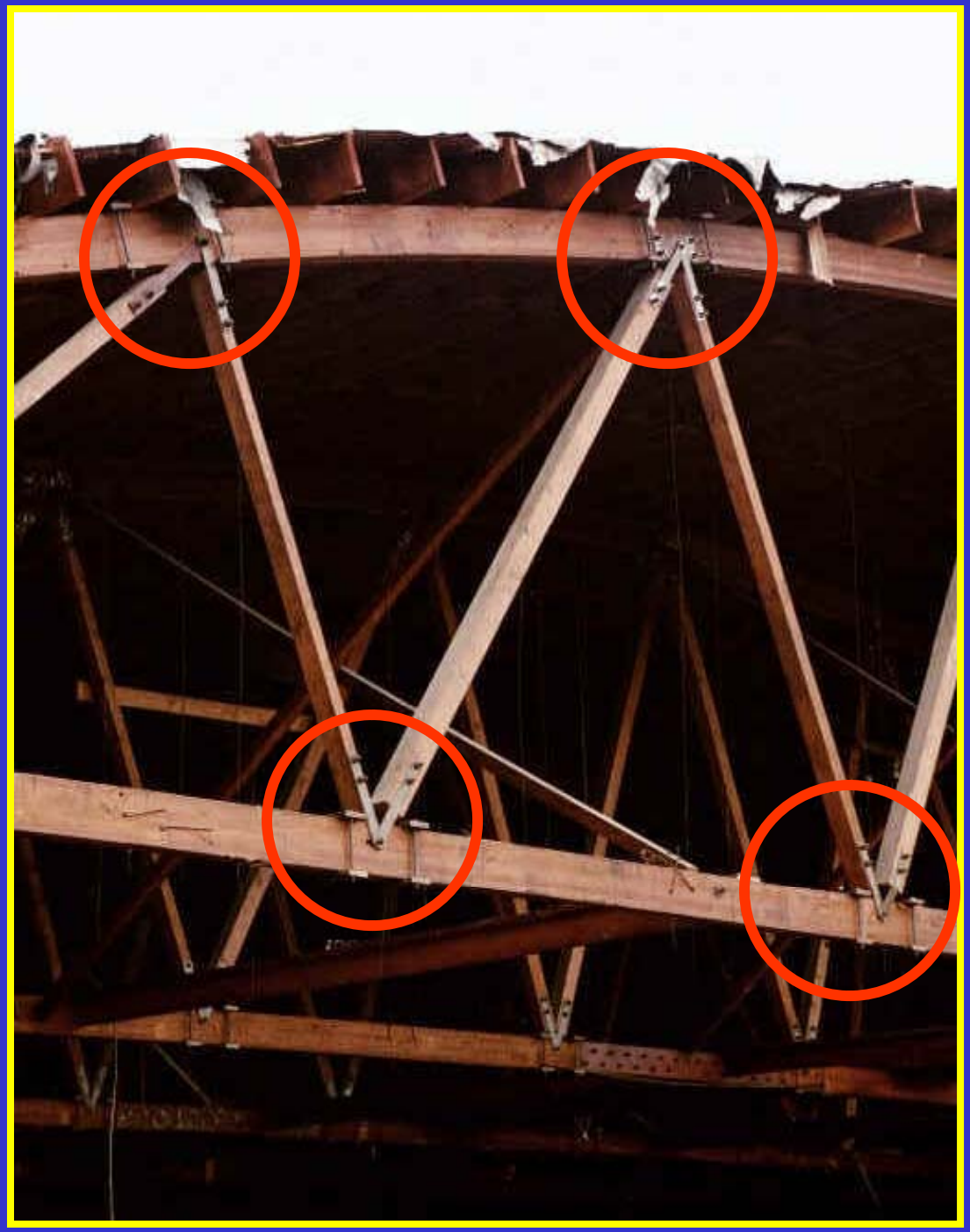

UNION CLEANERS

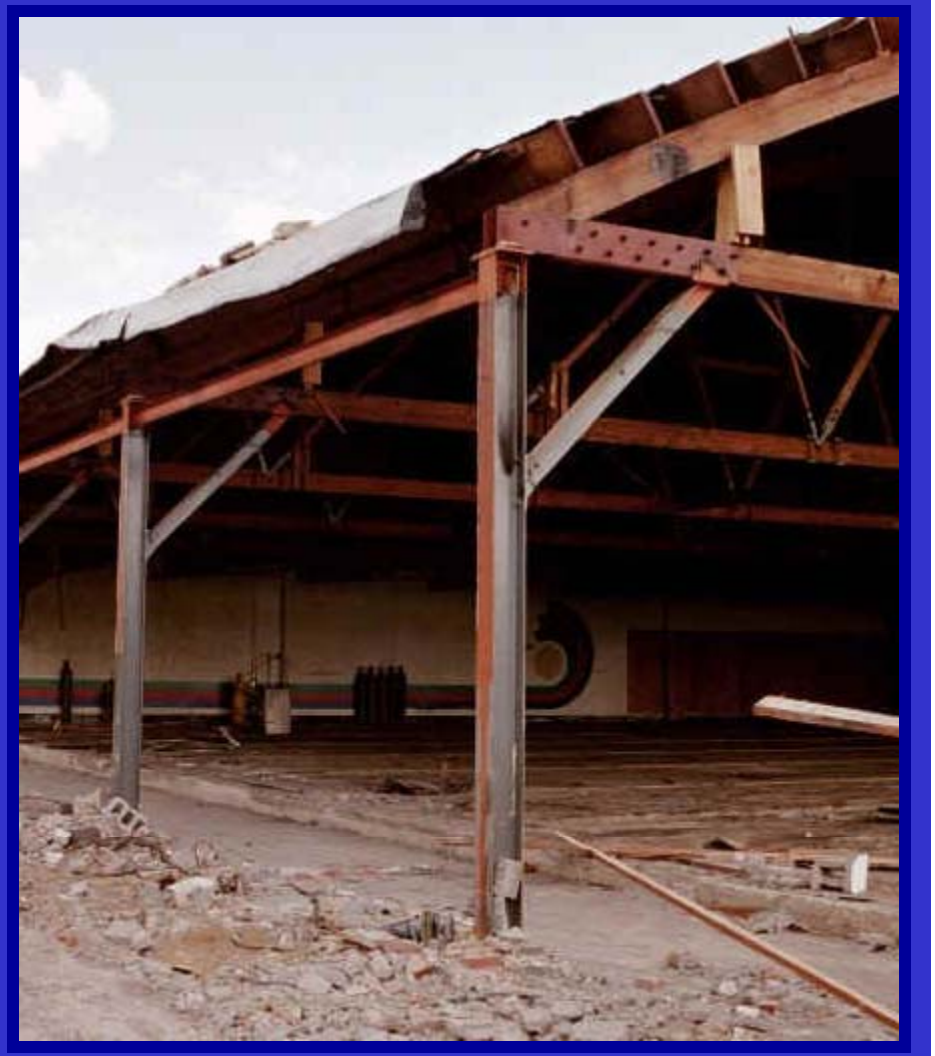
Bowstring Truss Roof Features

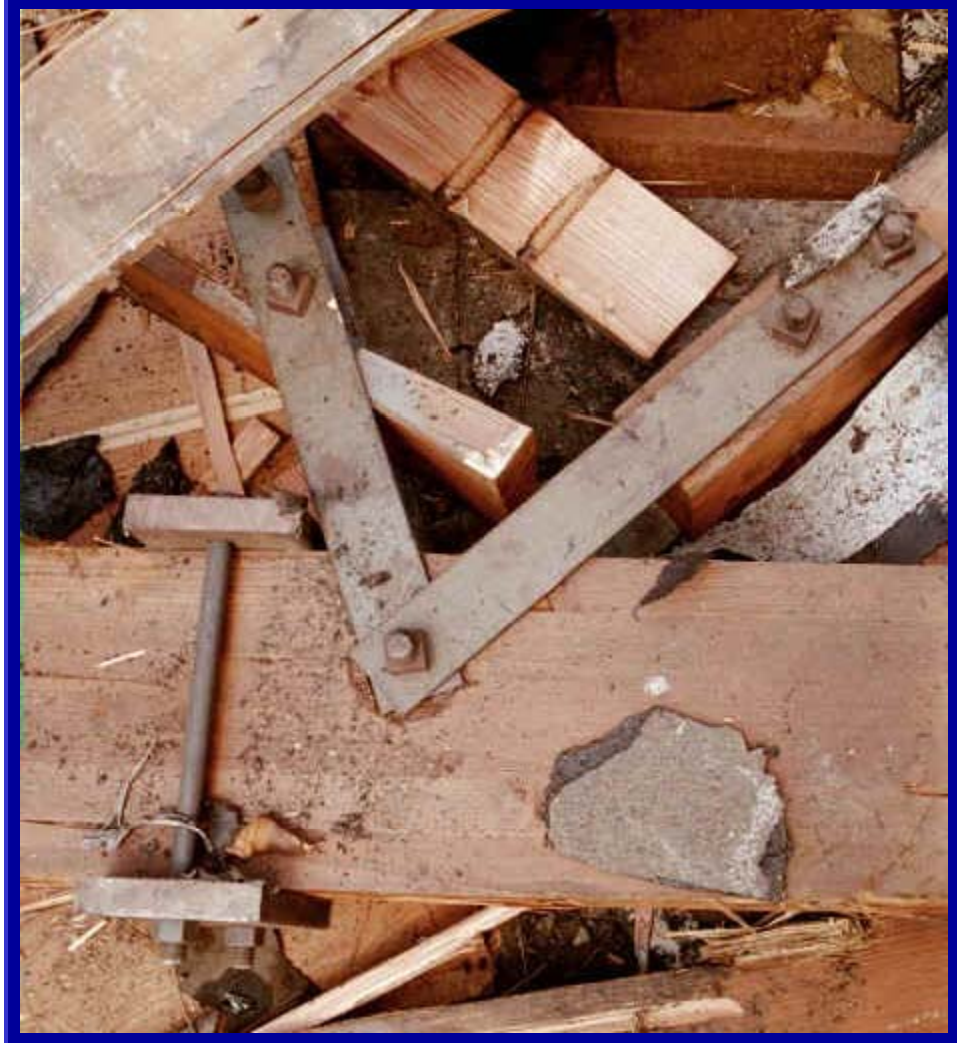

OLYMPIC BOWL

Bowstring Truss Undressed









Heavy Timber/Mill Construction

- N.F.P.A. Class IV Construction Type
- Heavy Timber/Mill Construction Features:
  - The structural members, columns, beams/girders, floor joists, rafters, floor and roof decking are of large cross sectional dimensions, for example:
    - Columns 8" x 8".
    - Beams 8"x 12”.
    - Joists 3"x 10".
    - Floor deck 2" in thickness.

Heavy Timber/Mill Construction …

- Heavy Timber/Mill Construction Features …
  - The buildings are typically 3 to 7 stories high.
  - The building may have a heavy timber truss roof.
  - There are no concealed spaces created by the structure.
  - There will be large open floor areas.

Heavy Timber/Mill Construction …

- Heavy Timber/Mill Construction Features …
  - Buildings or building areas may be separated by fire walls containing fire doors.
  - The buildings where manufacturing facilities and the floors may be soaked with oil from machinery.
  - The building will have a freight elevator.

Heavy Timber/Mill Construction …

- Heavy Timber/Mill Construction Features …
  - The building may have been altered for use by many tenants creating maze like conditions.
  - Conversion to other uses such as, dwelling units may have created concealed combustible spaces and utility chases, these features change the fire spread potential of these buildings.

Heavy Timber/Mill Construction …

- Heavy Timber/Mill Construction Features …
  - Alterations to the buildings may have changed the structural hierarchy of the buildings.
  - Existing automatic sprinkler systems may not be adequate for today's fire loading or may be impaired from lack of maintenance.

Heavy Timber/Mill Construction …

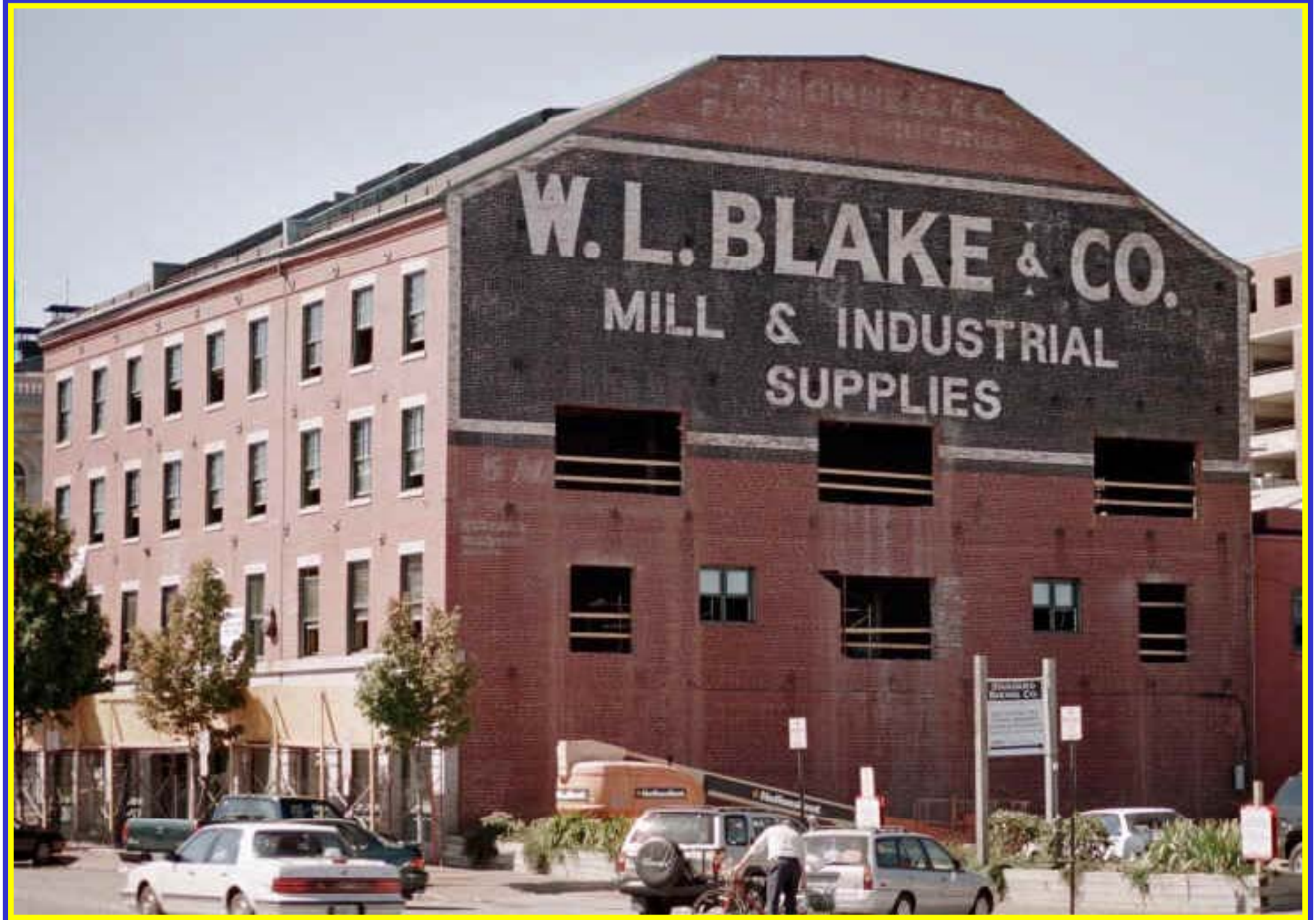
- Heavy Timber/Mill Construction Features …
  - The buildings are slow burning and collapse resistant but release large amounts of radiant heat, watch your exposures!!
  - From the exterior, a heavy timber or mill building may look like an ordinary constructed building, there are many important differences!!

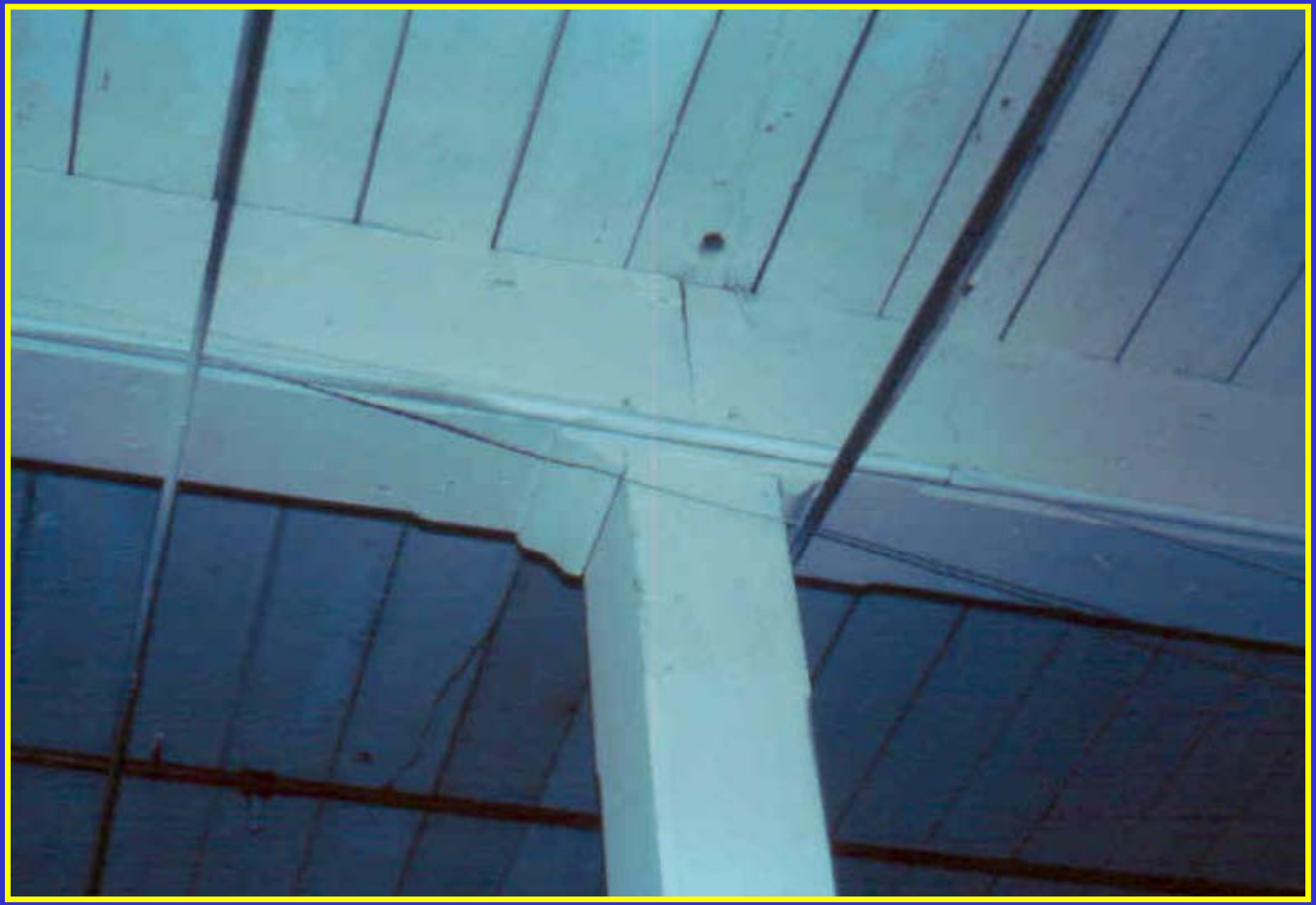
Features Of
Heavy Timber & Mill Construction

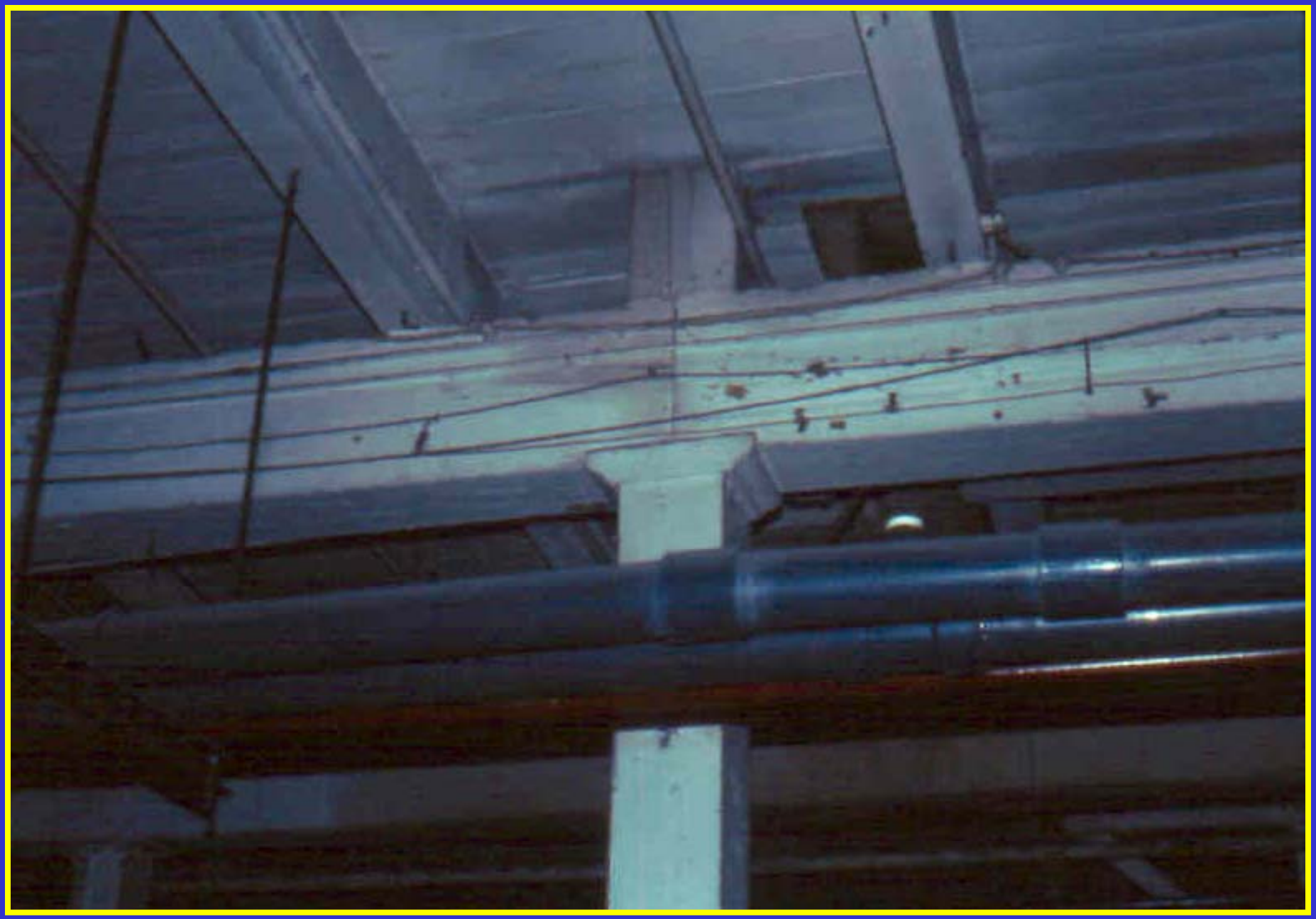

W. L. Blake & Co.
MILL AND PLUMBING SUPPLIES


W. L. BLAKE & CO.
MILL & INDUSTRIAL
SUPPLIES


W. L. BLAKE & CO.
MILL & INDUSTRIAL
SUPPLIES


W. L. BLAKE & CO.
MILL & INDUSTRIAL
SUPPLIES



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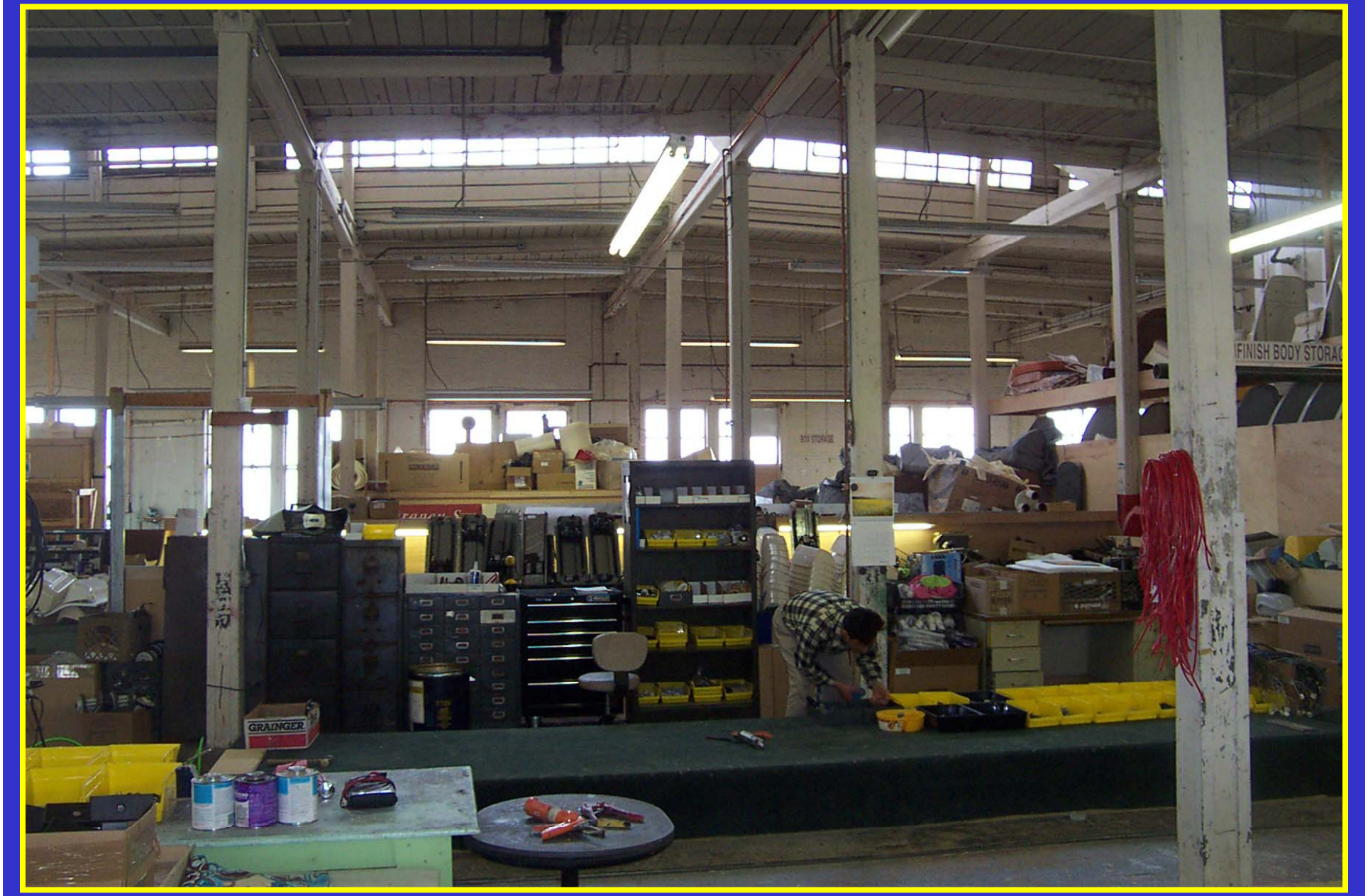
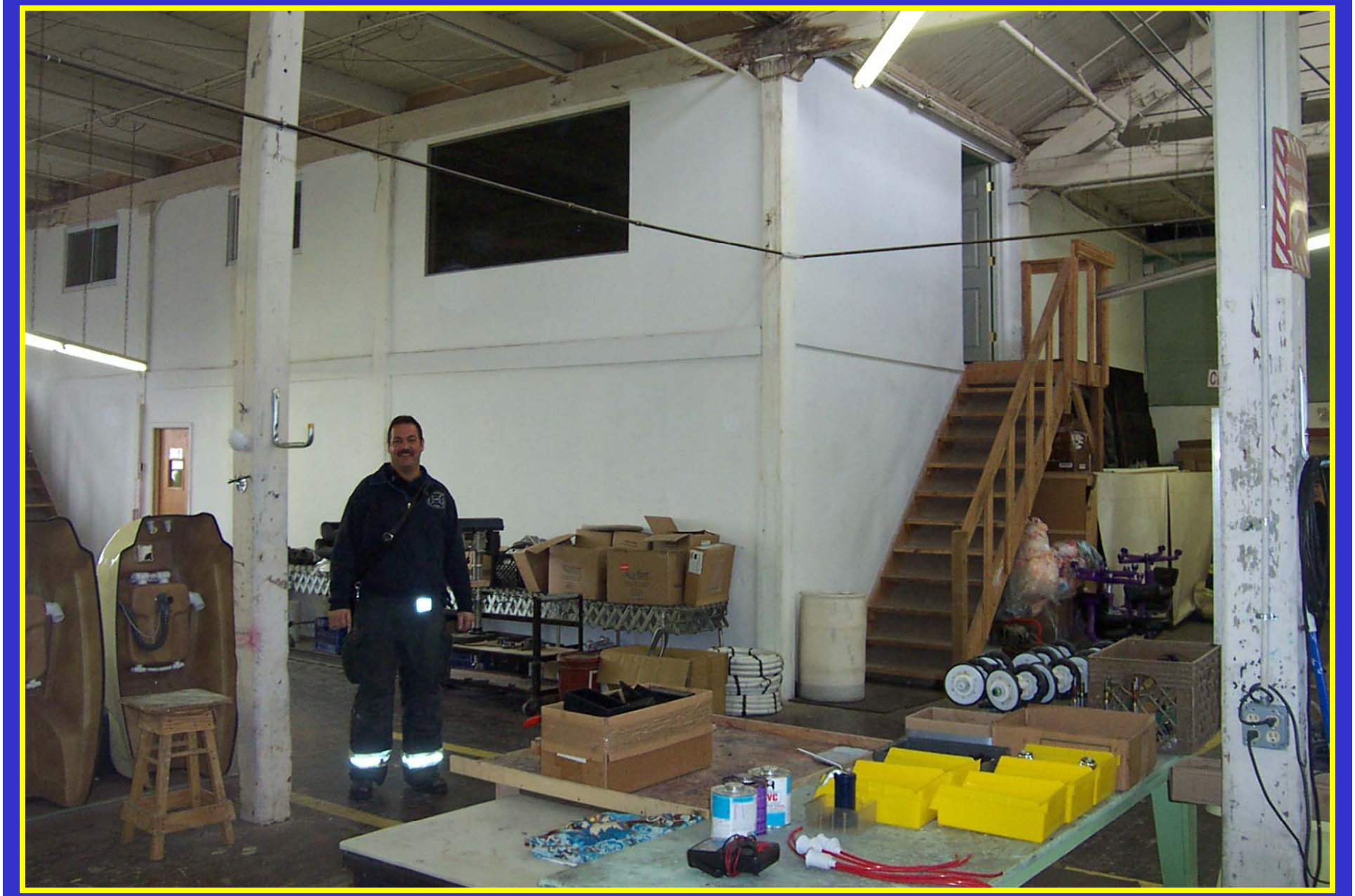

GRAINGER


CHAIR PART
EXIT

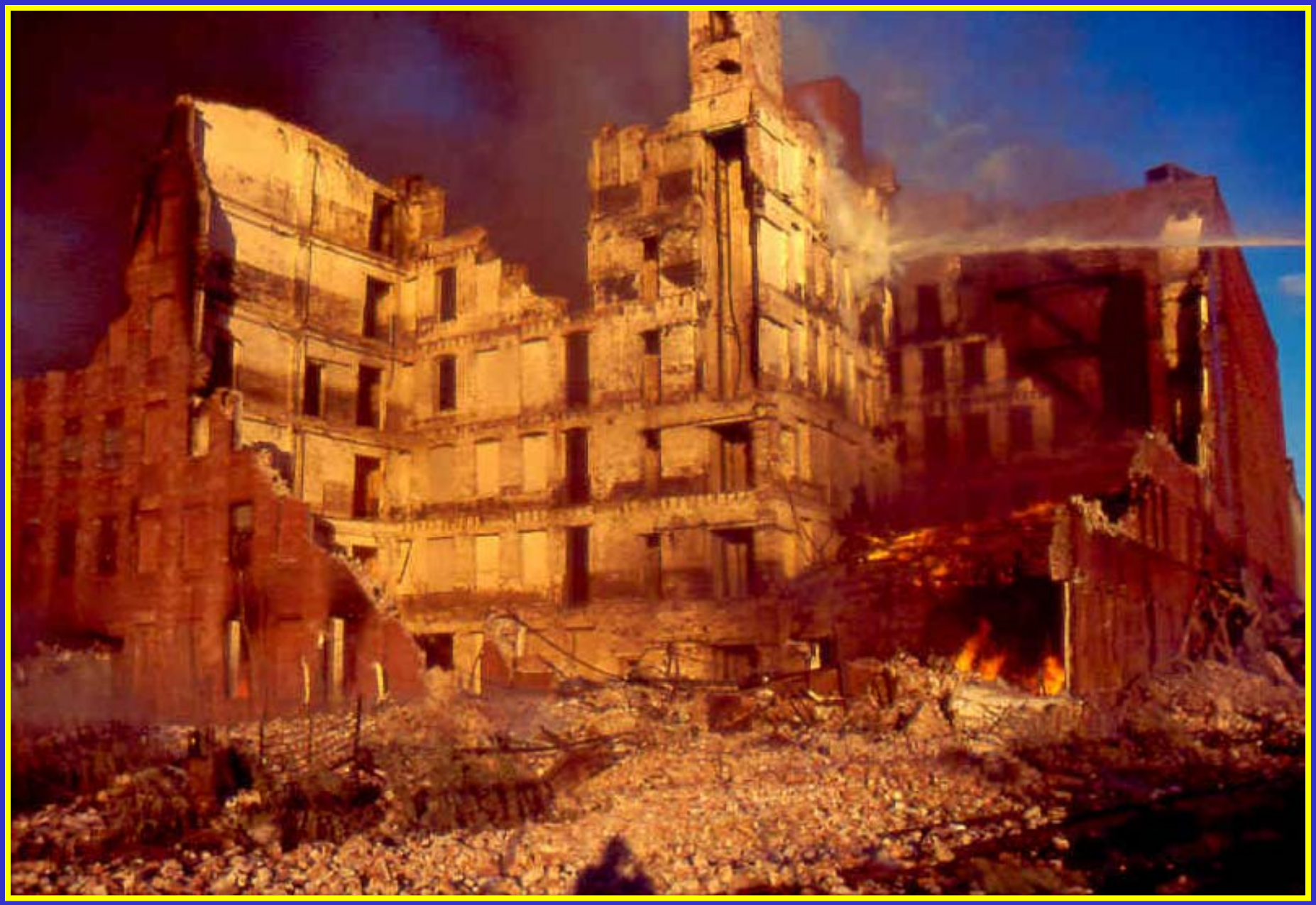



SHIPPING


F.R.P.


Spa
UP
ITEM NO.: 6080P
rapeu Spa
TECH
UP
EST


P&P
Transport In



Wood Frame Construction

- N.F.P.A. Class V Construction Type
- Wood Frame Buildings are typically 1 to 3 stories in height, but may be found as high as 5 stories high.
- The entire structure is combustible, the interior and exterior walls, the floor and roof structure will all burn.

Wood Frame Construction …

- Classifications Of Wood Frame Construction:
  - Post & Beam Construction
  - Balloon Frame Construction
  - Platform Frame Construction
  - Lightweight Frame Construction

Wood Frame Construction …

- Features of Post and Beam Construction:
  - The buildings are typically 2 to 3 stories high.
  - Vertical posts and horizontal beams create the frame for the structure.
  - The load of the building is supported by the vertical and horizontal structural members.
  - Connections between the post and beams are often mortise and tenon connections.
  - These buildings are susceptible to inward/outward collapse, the failure point is the mortise and tenon connection.

Features Of Post & Beam Construction


TRUCK
2

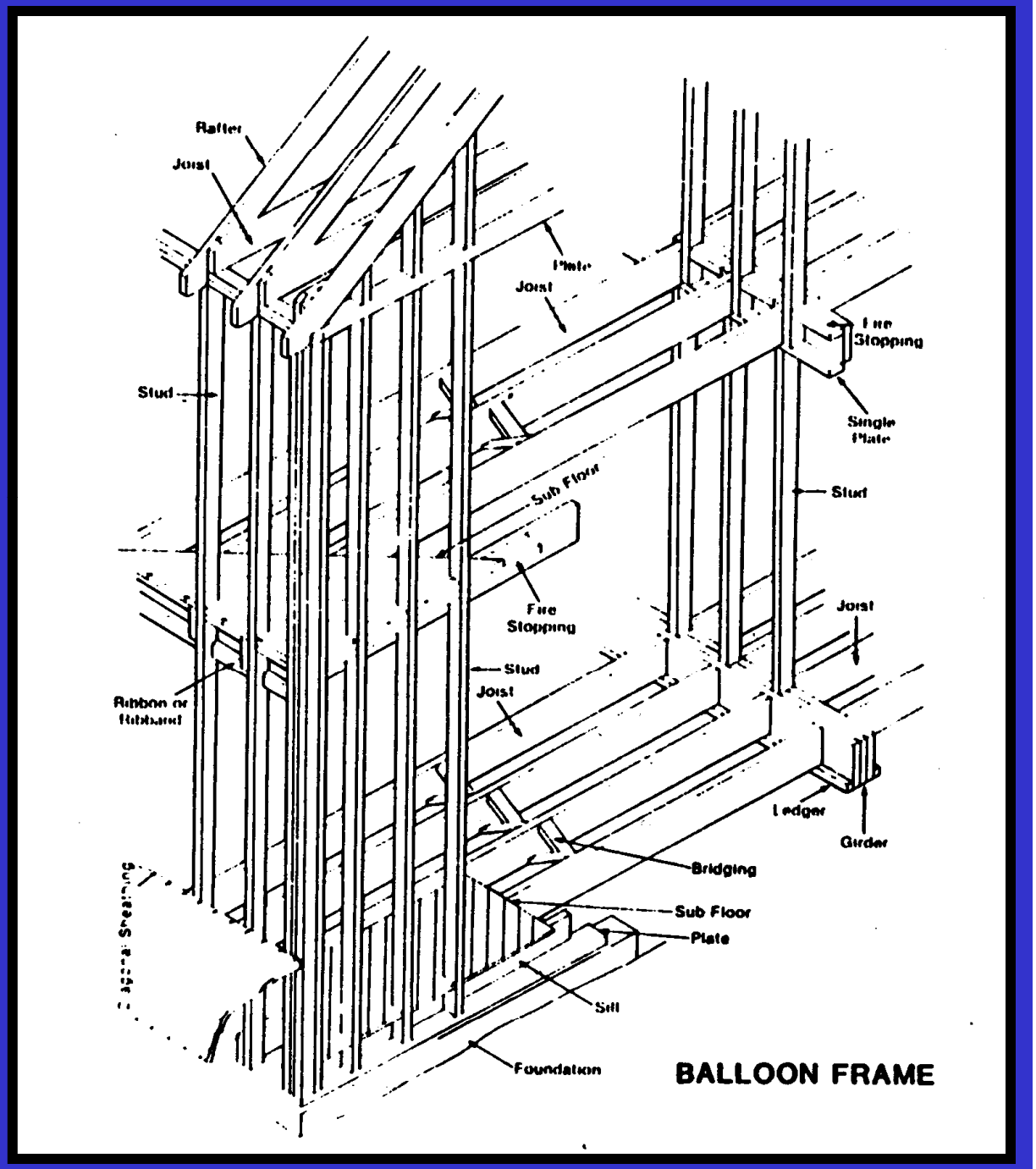
Wood Frame Construction

- Features of balloon frame construction:
  - Construction method used pre-1940's.
  - Un-firestopped stud channels run from the basement to the attic. Exterior and interior walls may be framed in this manner.
  - The floor joist are open to the exterior wall studs, creating another un-firestopped concealed space.
  - The windows line up vertically on the building.

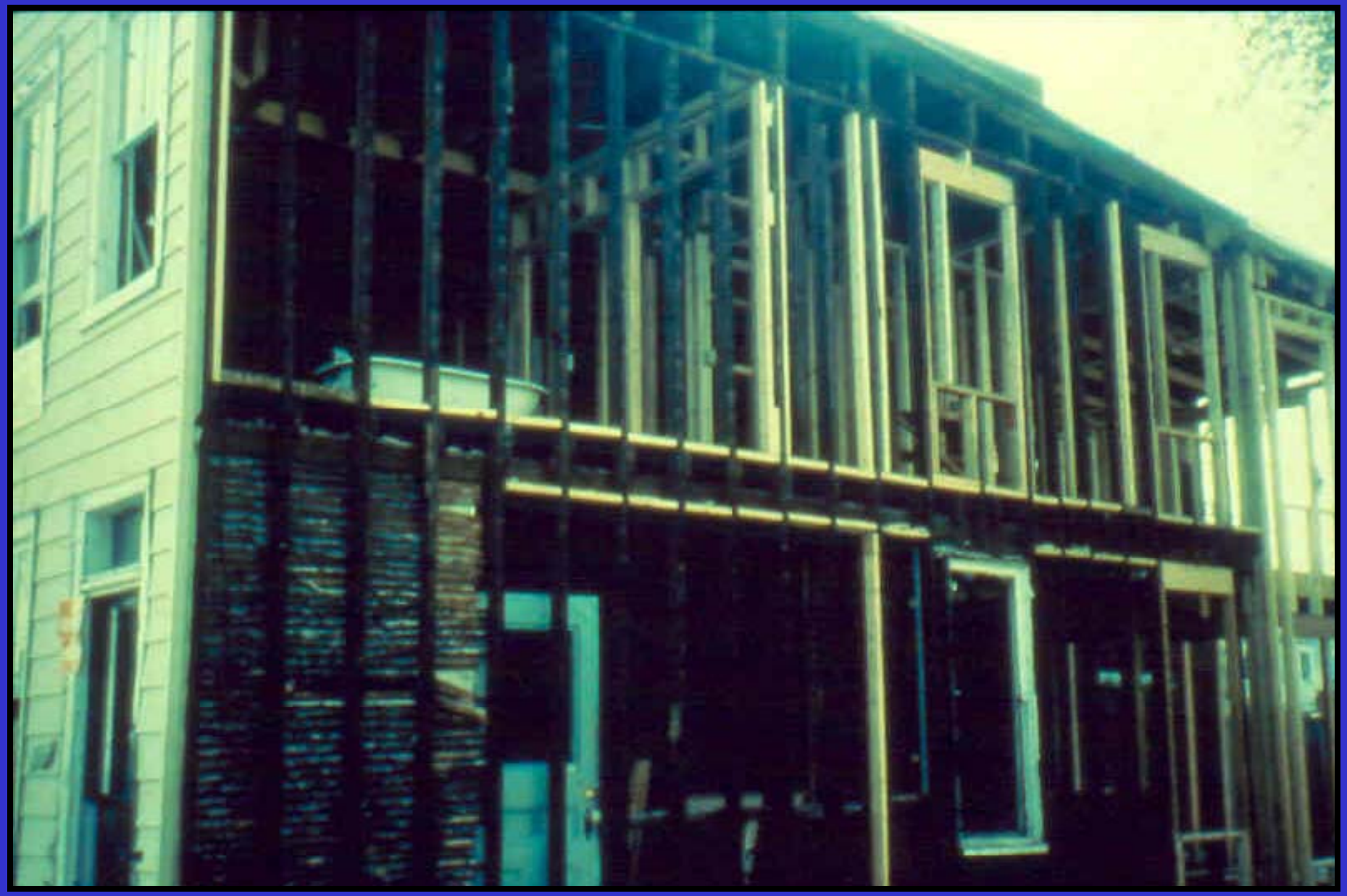
Wood Frame Construction …

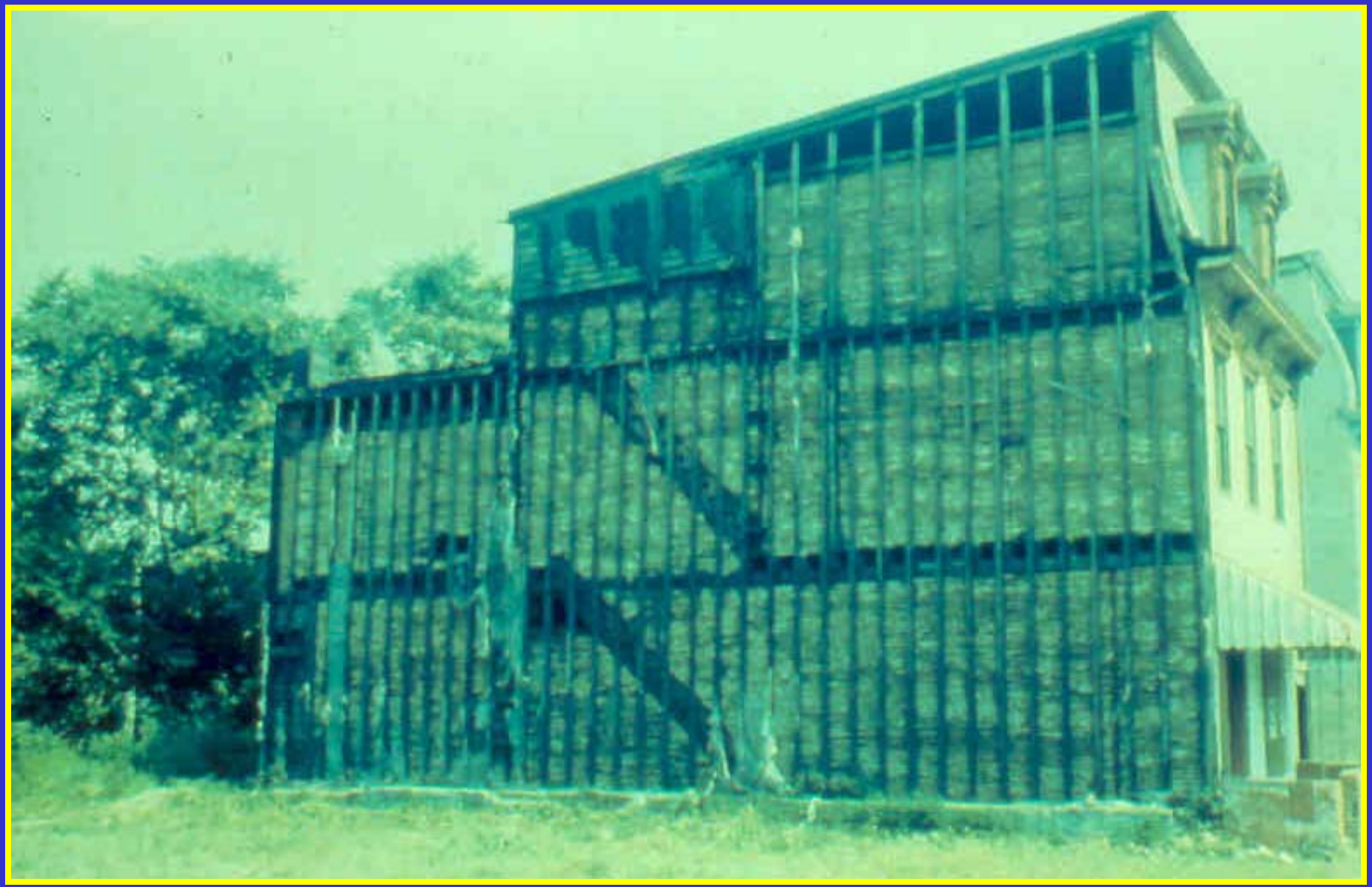
- Features of balloon frame …
  - The building may have been renovated several times through the life of the building, renovations may have created additional concealed spaces such as dropped ceilings.
  - Larger "Queen Anne" or "Victorian" style buildings may be converted into two or more apartments.
  - Buildings may be disguised with brick or stone veneers or stucco finishes.

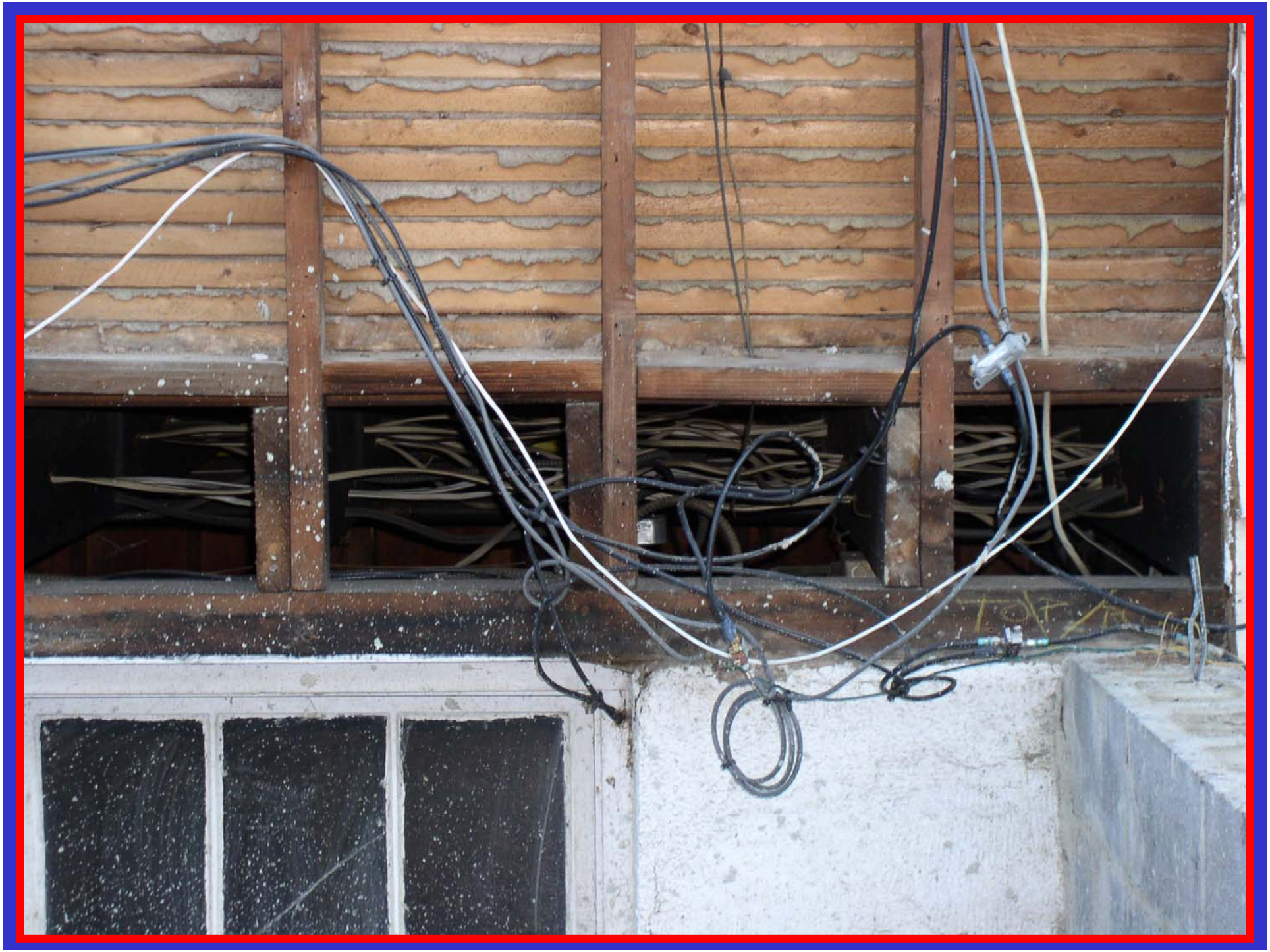
Cross section of a balloon framed structure and typical components.



Features Of Balloon Frame …








CLIFTON FIRE

Balloon Frame Structure Fire Case Study

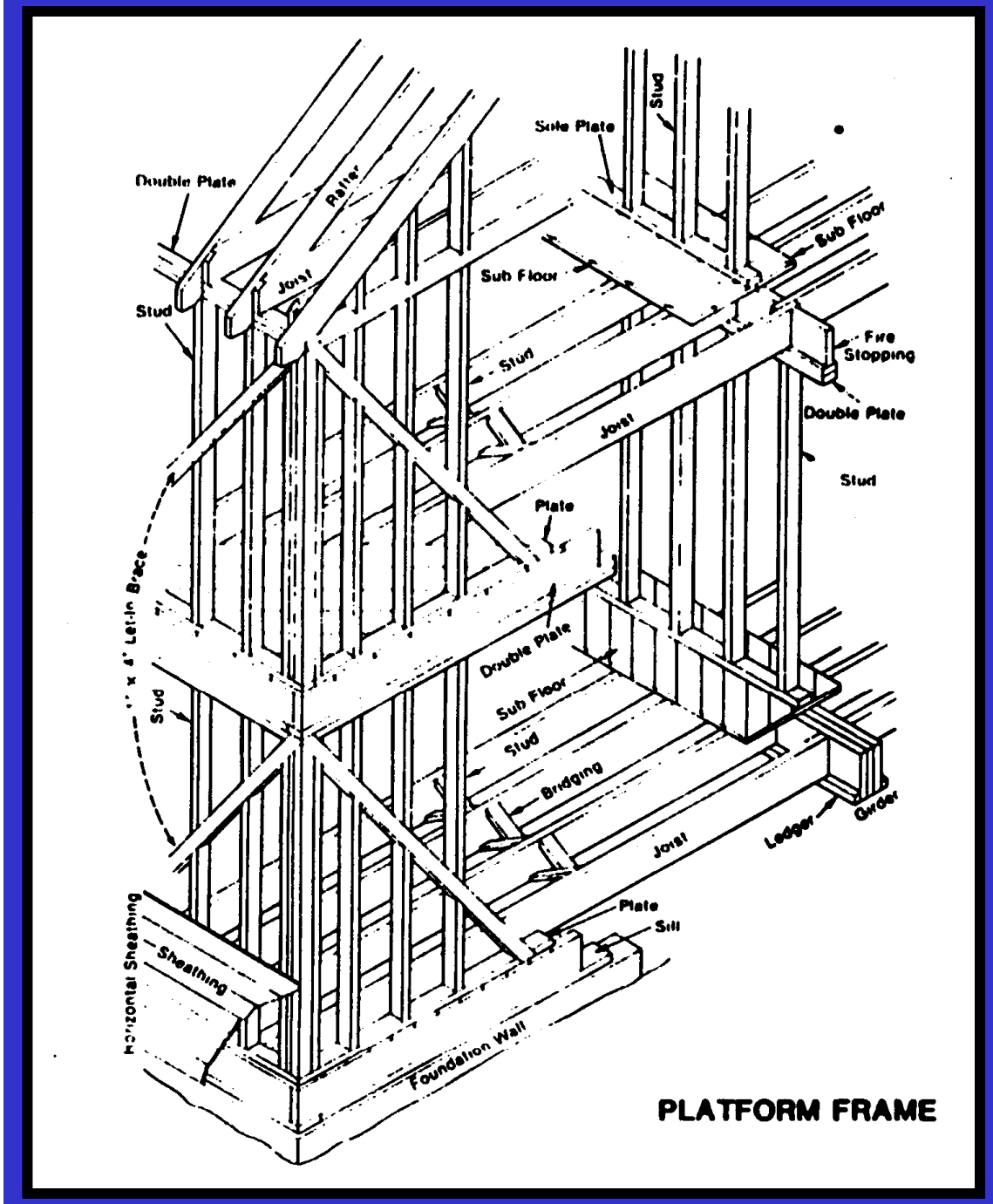

Area of fire origin

Wood Frame Construction

- Features of platform frame construction:
  - Wood frame construction method used since the 1940's up to and including today, but the use of lightweight structural components is more prevalent today.
  - The buildings are constructed one floor at at time or one "platform" at a time.
  - The floors extend to the outer edge of the wood framing so the fire stopping is built in or "inherent" fire stopping.

Wood Frame Construction …

- Features of platform frame …
  - The inherent fire stopping is often cut away or removed to run utilities such as plumbing, HVAC, electric and other wiring.
  - Utility chases may not be fire stopped.
  - The building may be a "hybrid" and contain lightweight floor or roof trusses, TGI joist or steel beams may be used to provide or create large open floor areas.
  - The buildings may be disguised by brick or stone veneers or stucco finishes.



Cross section of a platform framed structure and typical components.

Features Of Platform Frame

Wood Frame Construction

- Features of lightweight frame construction:
  - Lightweight frame construction has been used since the early 70's.
  - The floors and roofs of lightweight frame buildings are constructed with engineered structural components such as:
    - Lightweight floor and roof wood trusses.
    - Wood "I" beams, truss joists or TGI's.

Wood Frame Construction …

- Features of lightweight frame…
  - Lightweight frame buildings are constructed in the same manner as a platform frame, one story at a time, but the concealed space created by floor/ceiling joists provides a much greater potential fire extension in the truss area.
  - The inherent fire stopping can be removed as utilities are installed.

Wood Frame Construction …

- Features of lightweight frame…
  - The building may contain steel beams used to create large open floor areas.
  - The buildings may be disguised by brick or stone veneers or stucco finishes.
  - This type of construction is not limited to residential buildings. This type of construction may be found in buildings such as office buildings and restaurants.

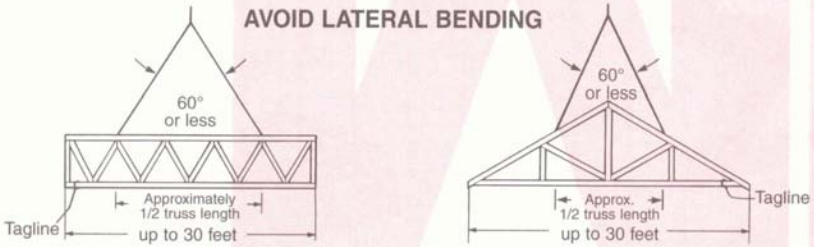
Review Of Lightweight Frame Construction


DO NOT CUT
OR DRILL
ANY MEMBER

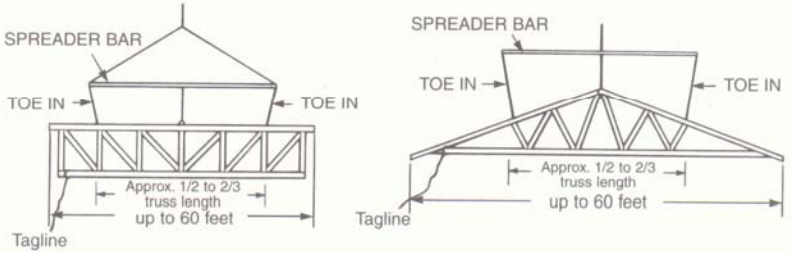
HOISTING

ALL TRUSSES THAT ARE ERECTED ONE AT A TIME SHALL BE HELD SAFELY IN POSITION BY THE ERECTION EQUIPMENT UNTIL SUCH TIME AS ALL NECESSARY BRACING HAS BEEN INSTALLED AND THE ENDS OF THE TRUSSES ARE SECURELY FASTENED TO THE BUILDING.

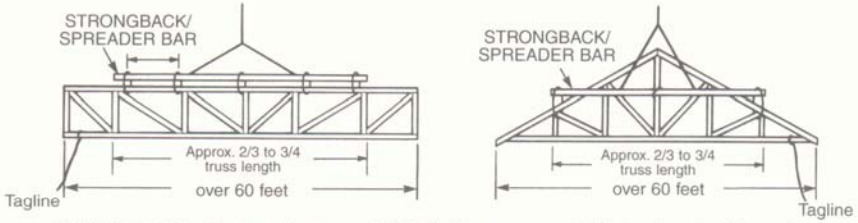
AVOID LATERAL BENDING



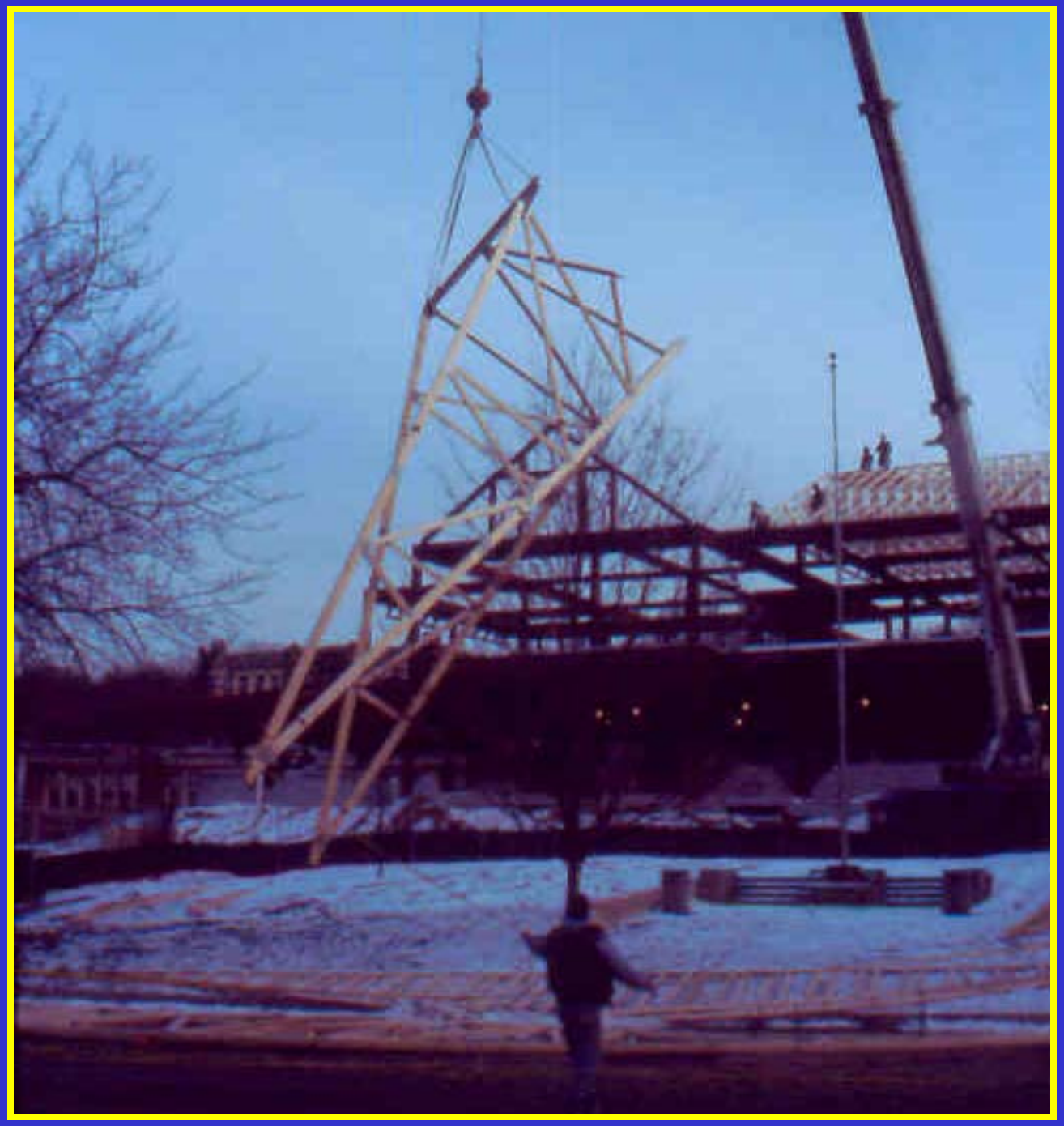
Truss sling is acceptable where these criteria are met.



Use spreader bar in ALL other cases. It should be noted that the lines from the ends of the spreader bar "TOE IN"; if these lines should "TOE OUT" the truss may fold in half.



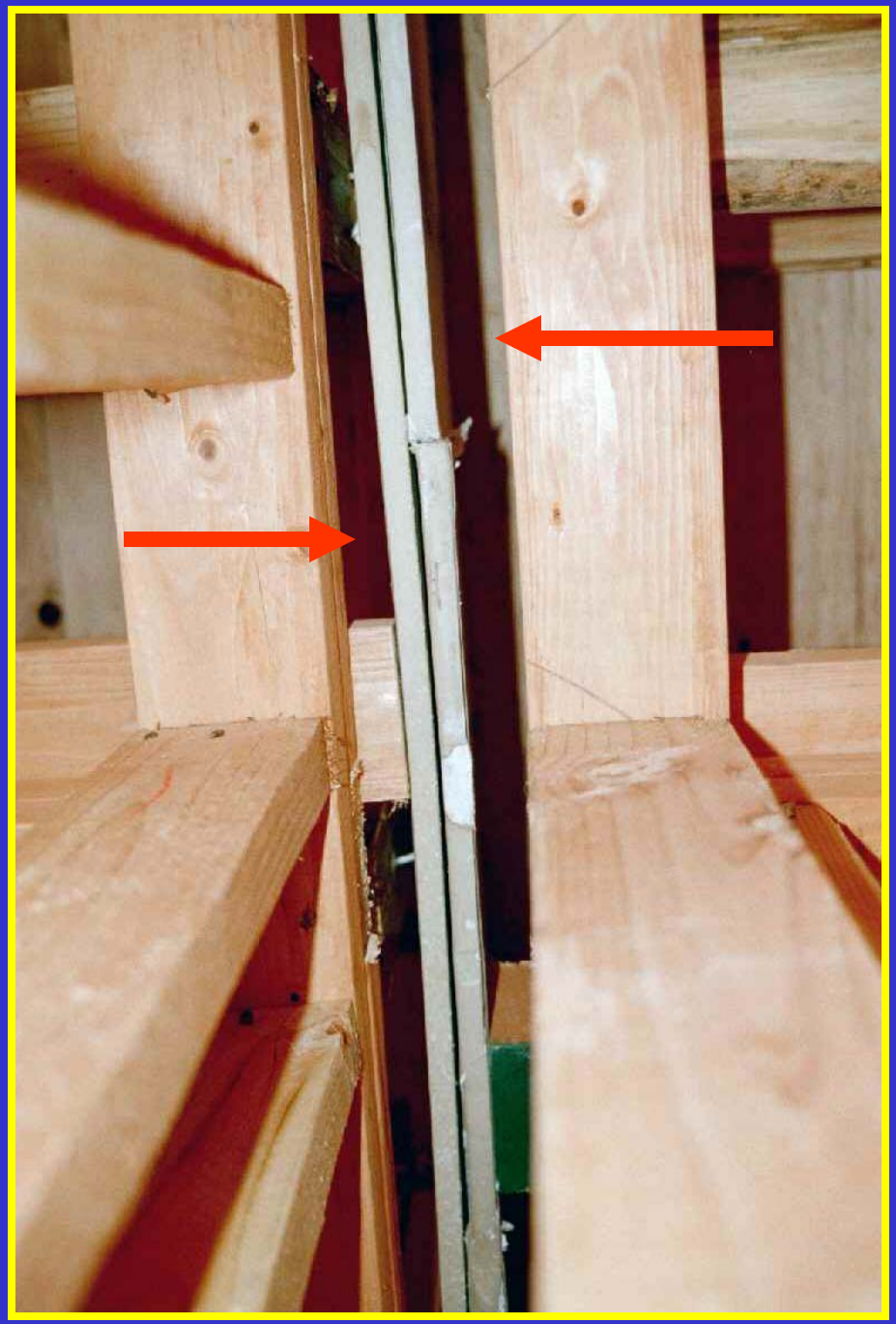
For lifting trusses with spans in excess of 60 feet, it is recommended that a strongback/spreader bar be used as illustrated. The strongback/spreader bar should be attached to the top chord and web members at intervals of approximately 10 feet. Further, the strongback/spreader bar should be at or above the mid-height of the truss to prevent overturning. The strongback/spreader bar can be of any material with sufficient strength to safely carry the weight of the truss and sufficient rigidity to adequately resist bending of the truss.




WINDOWS VENTED USING
EXTENSION LADDER
VICTIM REMOVED THROUGH
THIS WINDOW
POINT OF ENTRY
AND EXIT


BACK BEDROOM
WINDOW
FIRE EXTENSION INTO
TRUSS VOID SPACE
24' - 0"
OUTLINE OF CHIMNEY
FRAMING
FIRE EXTENSION INTO
TRUSS VOID SPACE

This is the view looking up between the double stud walls. Note the gaps in between the gypsum board and the wood framing, additionally the gypsum board is missing entirely from the first floor.



The building utilities provide for another source of vertical and horizontal fire extension.

These utilities include plumbing waste lines, HVAC ducts and dryer vents.


CAUTION

HVAC diffuser fire connected to flexible duct on top floor, duct runs through the truss space under the roof. Note the absence of a fire damper.


WARNING
DO NOT CUT, DRILL, OR ALTER TRUSSES
DO NOT USE DAMAGED TRUSSES
TRUSSES REQUIRE CAREFUL HANDLING DURING INSTALLATION AND WELL DESIGNED TEMPORARY AND PERMANENT BRACING. REFER TO TRUSS PLATE INSTITUTE'S GUIDELINES FOR HANDLING, INSTALLING AND BRACING METAL PLATE CONNECTED WOOD TRUSSES PRIOR TO INSTALLATION AND BEFORE ANY LOADS ARE APPLIED.
CONSULT THE ARCHITECT OR ENGINEER FOR ADVICE ON PROPER BRACING OF THE TRUSSES AND THE ROOF SYSTEM.
ANY PARTY WHO CUTS OR DAMAGES A TRUSS SHALL BE RESPONSIBLE FOR ALL COSTS OF REPAIR AND RELATED LIABILITY. CONSULT THE ARCHITECT, ENGINEER AND COMPONENT TECHNOLOGY IF TRUSSES ARE CUT OR DAMAGED.
COMPONENT TECHNOLOGY, INC.
66 Columbia Rd., Somerville, N.J. 08876

Wood Frame Restaurants Case Study


PVC SEWER PIPE ASTM-D3034


C SEWER PIPE ASTM-D3034 99 X 05 2 1

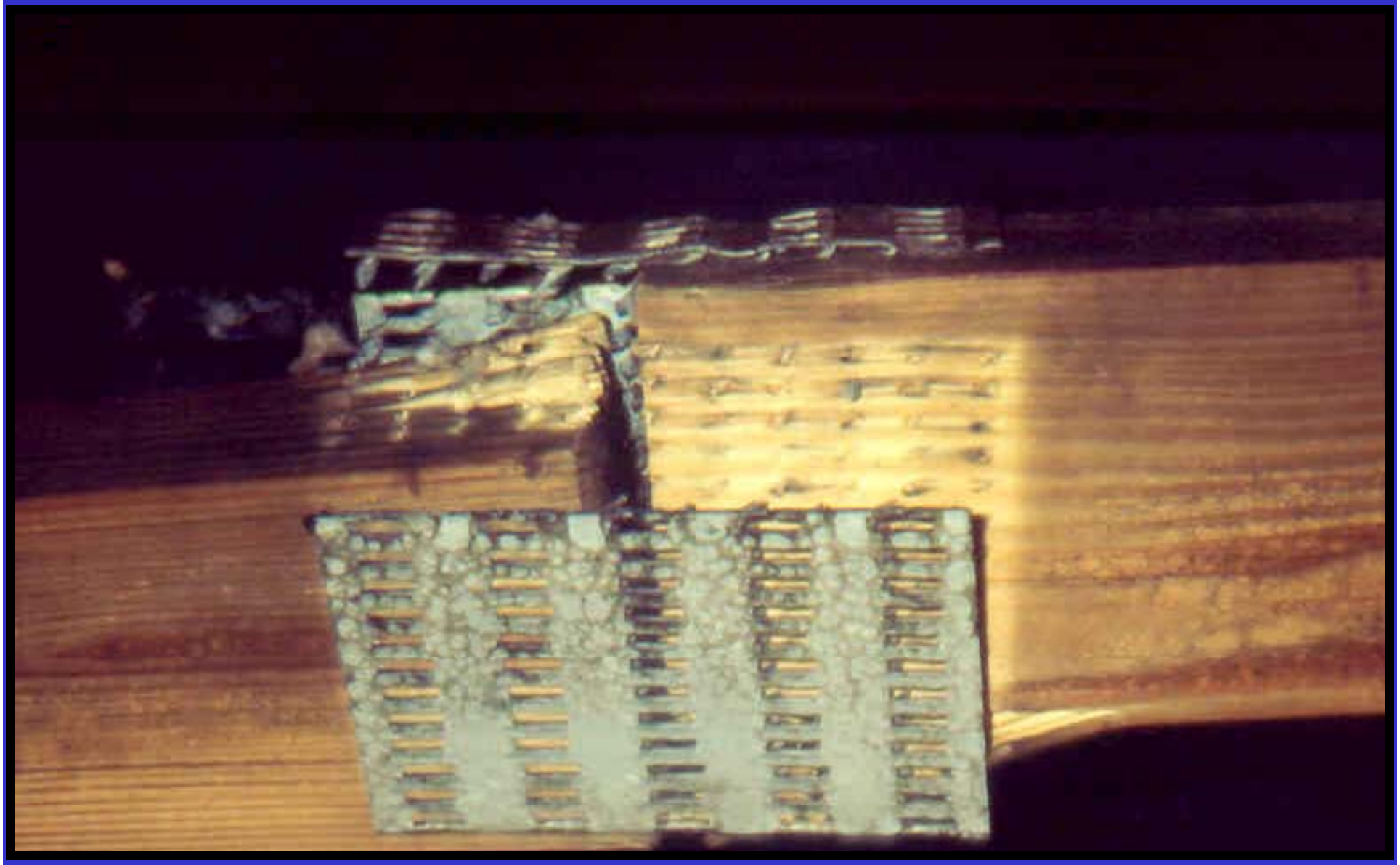

WESTERN


BURGER KING
TG7
(TOP)
TG7
BURGER KING
TG
(TOP)

Lightweight Wood Frame Condominium Fire Case Study


1-1


1-1




Fire origin was in the combustible wall void space.

Pedestal Buildings

- Combine different types of construction
- Typical is one or two stories of fire resistive or reinforced concrete with three to four stories of lightweight wood above
- The sprinklers in these buildings are for occupant evacuation only and are not intended for building protection

New Wrinkles of Concern

- Insulated sandwich panels
- EIFS – Exterior Insulated Finishing Systems
- Combustible wood buildings up to 18 stories in height

That's All Folks

Thank-you …

and remember …

the building is the problem!!!