

## UNIT 4: BUILDING CONSTRUCTION TYPES



Slide 4-1

## OBJECTIVES

The students will:

- List ways to collect data and manage information.
- Identify and describe the five types of building construction.
- Identify the strengths, weaknesses, characteristics, and collapse potential for each of the five methods of building construction.
- Identify special safety concerns.
- Given a scenario, identify the strengths and weaknesses in different building construction types.

Slide 4-2

## MANAGEMENT OF INFORMATION

Struggle for safety



Slide 4-3

## MANAGEMENT OF INFORMATION (cont'd)

- Code enforcement
- Preincident planning
- Sizeup



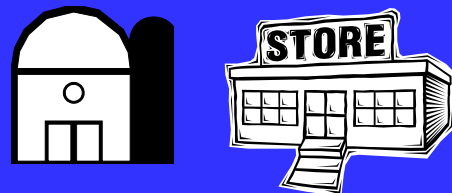
Slide 4-4

## NATIONAL FIRE PROTECTION ASSOCIATION 220, STANDARD ON TYPES OF BUILDING CONSTRUCTION



Slide 4-5

## IDENTIFICATION OF CONSTRUCTION CLASSES



Slide 4-6

## TYPE I--FIRE-RESISTIVE CONSTRUCTION

- What are the characteristics?
- What are the strengths?
- What are the firefighting/safety concerns?

Slide 4-7

## TYPE I--FIRE-RESISTIVE REQUIREMENTS

|  |                  |
|--|------------------|
| • Exterior bearing walls                   | 3 to 4 hours     |
| • Interior bearing walls                   | 2 to 4 hours     |
| • Columns, beams, girders, trusses, arches | 2 to 4 hours     |
| • Floors                                   | 2 to 3 hours     |
| • Roof                                     | 1-1/2 to 2 hours |
| • Exterior nonbearing walls                | 0 hours          |

Slide 4-8

## TYPE I DESIGN--CONCRETE ADDED ROOF LOAD



Slide 4-9

## TYPE I DESIGN--CONCRETE



Slide 4-10

## TYPE I DESIGN-- CONCRETE/STEEL RESIDENTIAL



Slide 4-11

## TYPE I DESIGN--CONCRETE COLUMNS



Concrete  
columns



Slide 4-12

**TYPE I DESIGN--CONCRETE  
FLOOR AND WALLS**



Slide 4-13

**TYPE I DESIGN--STEEL FRAME**



Slide 4-14

**TYPE I DESIGN--SPRAY ON FIRE  
PROTECTION--STEEL TRUSS**



Slide 4-15

**TYPE I DESIGN--SPRAY ON FIRE  
PROTECTION--STEEL JOIST AND CEILING**



Slide 4-16

**TYPE I DESIGN--STAIRS  
ENCLOSED**



Slide 4-17

**TYPE I DESIGN--CURTAIN WALL  
(ALSO CALLED SAFING GAP)**



Slide 4-18



**TYPE I DESIGN--GLASS EXTERIOR WALL  
NONLOAD BEARING**



Slide 4-19

**TYPE II--NONCOMBUSTIBLE/LIMITED  
COMBUSTIBLE CONSTRUCTION**



Slide 4-20

**TYPE II--NONCOMBUSTIBLE/LIMITED  
COMBUSTIBLE CONSTRUCTION  
(cont'd)**

- What are the characteristics?
- What are the strengths?
- What are the firefighting/safety concerns?

Slide 4-21

**TYPE II--NONCOMBUSTIBLE/LIMITED  
COMBUSTIBLE CONSTRUCTION  
(cont'd)**

- |  |              |
|--|--------------|
| • Exterior/Interior bearing walls          | 0 to 2 hours |
| • Columns, beams, girders, trusses, arches | 0 to 2 hours |
| • Floors                                   | 0 to 2 hours |
| • Roof                                     | 0 to 1 hour  |

Slide 4-22

**TYPE II DESIGN--SINGLE STORY  
FLAT ROOF**



Slide 4-23

**TYPE II DESIGN--MULTISTORY  
BOW STRING TRUSS**



Slide 4-24

**TYPE II DESIGN--MULTISTORY  
STEEL FRAMEWORK**



Slide 4-25

**TYPE II DESIGN--METAL RETAIL  
STRUCTURES--HIGH FIRE LOAD**



Slide 4-26

**TYPE II DESIGN--METAL  
INDUSTRIAL STRUCTURES**



Slide 4-27

**TYPE II DESIGN--METAL PEAKED  
ROOF**



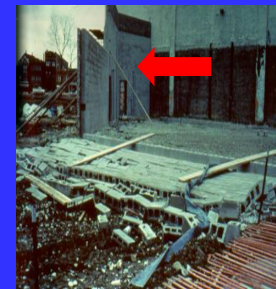
Slide 4-28

**TYPE II DESIGN--CONCRETE  
BLOCK EXTERIOR WALLS**



Slide 4-29

**TYPE II DESIGN--TILT-UP  
CONSTRUCTION**



Slide 4-30

**TYPE II DESIGN--CINDER BLOCK WITH  
METAL FRAME SUPPORT**



Slide 4-31

**TYPE II DESIGN--STEEL WITH  
COLUMNS FOR SUPPORT**



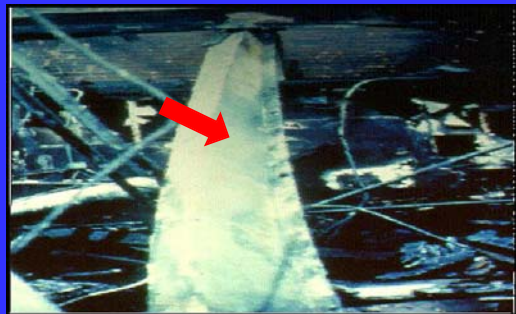
Slide 4-32

**TYPE II DESIGN--UNPROTECTED  
STEEL FRAME WITH TRUSS**



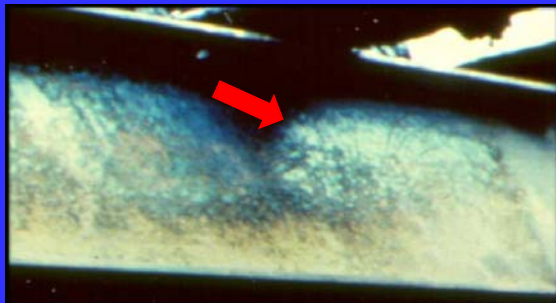
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**TYPE II DESIGN--UNPROTECTED  
STEEL WILL TWIST WHEN HEATED**



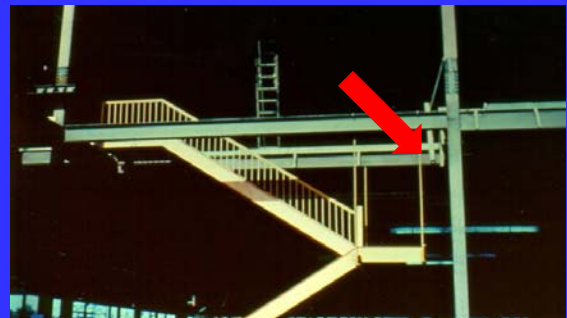
Slide 4-34

**TYPE II DESIGN--UNPROTECTED  
STEEL LOSES STRENGTH WHEN  
HEATED TO 1,100 °F (593 °C)**



Slide 4-35

**TYPE II DESIGN--STAIRS FASTENED TO  
UNPROTECTED STRUCTURAL  
ELEMENTS**



Slide 4-36



**TYPE III--ORDINARY  
CONSTRUCTION**



Slide 4-37

**TYPE III--ORDINARY  
CONSTRUCTION (cont'd)**

- What are the characteristics?
- What are the strengths?
- What are the firefighting/safety concerns?

Slide 4-38

**TYPE III--ORDINARY CONSTRUCTION  
MAIN STREET USA**



Slide 4-39

**TYPE III DESIGN--MASONRY  
EXTERIOR WALLS**



Slide 4-40

**TYPE III DESIGN--CONTAINS  
CONCEALED SPACES**



Slide 4-41

**TYPE III DESIGN--COMMONLY  
FOUND IN STRIP MALLS**



Slide 4-42

**TYPE III DESIGN--WOOD LATH  
OVER PLASTER**



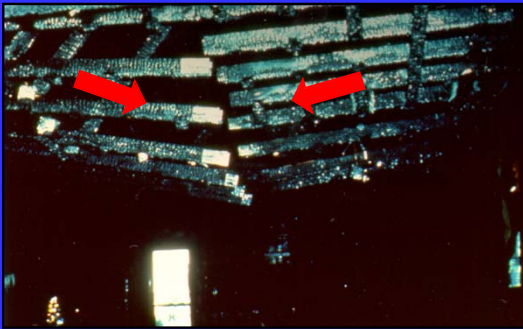
Slide 4-43

**TYPE III DESIGN--WOODEN  
FLOORING**



Slide 4-44

**TYPE III DESIGN--WOODEN JOISTS  
AND RAFTERS**



Slide 4-45

**TYPE III DESIGN--ROOF COVERING  
ADDS TO FUEL LOAD**



Slide 4-46

**TYPE III DESIGN--RIDGE POLE  
SUPPORTS MAIN ROOF**



Slide 4-47

**TYPE III DESIGN--FIRE CUT**



Slide 4-48



**TYPE III DESIGN--TOE-NAILED JOINTS**



Slide 4-49

**TYPE III DESIGN--GANG NAILER AND CLEAT**



Slide 4-50

**TYPE III DESIGN--WOODEN CORNICE**



Slide 4-51

**TYPE III DESIGN--LARGE WINDOW RENOVATIONS**



Slide 4-52

**TYPE III DESIGN--MARQUEE OVERHANG**



Slide 4-53

**TYPE III DESIGN--TRUSS ROOF SUPPORTS**



Slide 4-54

**TYPE IV--HEAVY-TIMBER/MILL  
CONSTRUCTION**



Slide 4-55

**TYPE IV--HEAVY-TIMBER/MILL  
CONSTRUCTION (cont'd)**

- What are the characteristics?
- What are the strengths?
- What are the firefighting/safety concerns?

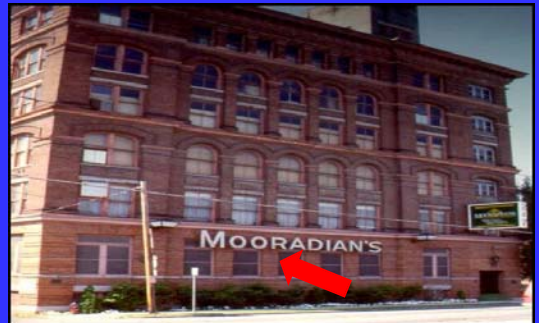
Slide 4-56

**TYPE IV DESIGN--RENOVATED  
STRUCTURES**



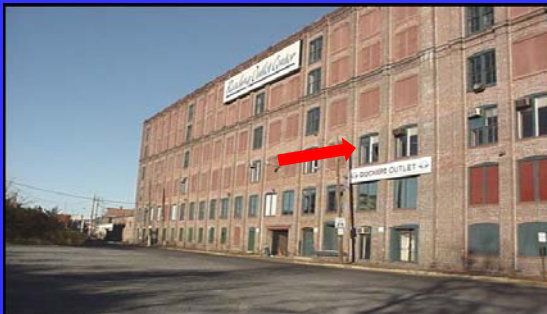
Slide 4-57

**TYPE IV DESIGN--OCCUPANCY  
CHANGE**



Slide 4-58

**TYPE IV DESIGN--SEALED  
WINDOWS**



Slide 4-59

**TYPE IV DESIGN--INTERIOR  
WOODEN COLUMNS**



Slide 4-60

### TYPE IV DESIGN--LARGE WATER SUPPLY REQUIREMENTS



Slide 4-61

### TYPE IV DESIGN--POTENTIAL COLLAPSE ZONE



Slide 4-62

### TYPE IV DESIGN--LARGE DIMENSIONAL LUMBER



Slide 4-63

### TYPE V--WOOD-FRAME CONSTRUCTION



Slide 4-64

### TYPE V--WOOD-FRAME CONSTRUCTION (cont'd)

- What are the characteristics?
- What are the strengths?
- What are the firefighting/safety concerns?

Slide 4-65

### TYPE V COMPARISON

National Fire Protection Association (NFPA) 220 defines Type V construction as the type in which the following materials are made of wood and are less substantial than NFPA Type IV (heavy timber/mill) construction:

- Exterior wall
- Bearing walls
- Columns
- Beams, girders, trusses, arches
- Floors and roofs

Slide 4-66



**TYPE V DESIGN--COMBUSTIBLE  
EXTERIOR**



Slide 4-67

**TYPE V DESIGN--WALL STUDS**



Slide 4-68

**TYPE V DESIGN--PREDICT BURN  
TIME OF RESIDENTIAL PROPERTY**



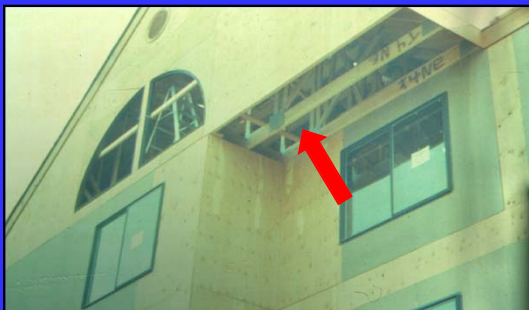
Slide 4-69

**TYPE V DESIGN--PREDICT BURN  
TIME OF COMMERCIAL PROPERTY**



Slide 4-70

**TYPE V DESIGN--SOFFIT  
OVERHANG**



Slide 4-71

**TYPE V DESIGN--BRICK  
VENEER**



Slide 4-72

**TYPE V DESIGN--VINYL SIDING**



Slide 4-73

**TYPE V DESIGN--BALLOON FRAME**



Slide 4-74

**TYPE V DESIGN--BALLOON FRAME (cont'd)**



Slide 4-75

**TYPE V DESIGN--PLATFORM FRAME**



Slide 4-76

**TYPE V DESIGN--POST AND BEAM**



Slide 4-77

**TYPE V DESIGN--LOG CABIN**



Slide 4-78

**TYPE V DESIGN--LOG  
CABIN (cont'd)**



Slide 4-79

**WHAT ARE THE  
FIREFIGHTING SAFETY  
CONCERNS?**

Slide 4-80

**BUILDING UNDER  
CONSTRUCTION**



Slide 4-81

**DEMOLITION PHASE**



Slide 4-82

**OCCUPANCY CHANGES**



Slide 4-83

**MIXED-CONSTRUCTION  
FEATURES**



Slide 4-84



## DECISION MAKING FOR INITIAL COMPANY OPERATIONS

### COMBUSTIBLE OUTER COVERINGS AND BALCONIES



Slide 4-85

### COMBUSTIBLE LINTEL



Slide 4-86

### UNPROTECTED STEEL LINTEL



Slide 4-87

### OVERHANGS



Slide 4-88

### MANSARD ROOF



Slide 4-89

### PARAPET WALL



Slide 4-90

## DECISION MAKING FOR INITIAL COMPANY OPERATIONS

**REINFORCEMENT STAR**



Slide 4-91

**ANGLE IRON SUPPORT**



Slide 4-92

**VOID SPACES**



Slide 4-93

**POKE THROUGH**



Slide 4-94

**MISSING CEILING TILE**



Slide 4-95

**SUSPENDED CEILING**



Slide 4-96

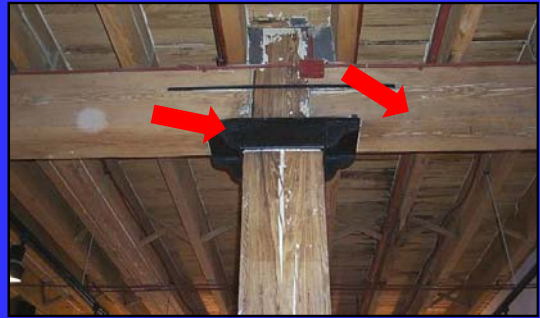
## DECISION MAKING FOR INITIAL COMPANY OPERATIONS

### LARGE OPEN SPACES



Slide 4-97

### STEEL AND WOOD REACTION TO HEAT



Slide 4-98

### DANGERS OF NEW TECHNOLOGY



Slide 4-99

### METHOD OF CONSTRUCTION



Slide 4-100

### METHOD OF CONSTRUCTION (cont'd)



Slide 4-101

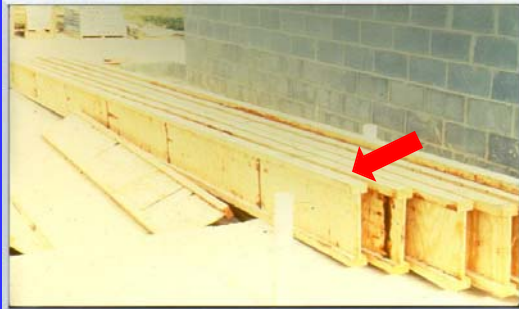
### METHOD OF CONSTRUCTION (cont'd)



Slide 4-102

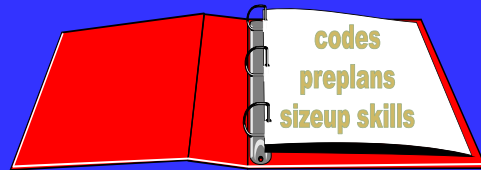


## METHOD OF CONSTRUCTION (cont'd)



Slide 4-103

## RISK/BENEFIT EVALUATION



Slide 4-104

## BRIEF INITIAL REPORT SIZEUP REPORT OF FIREGROUND CONDITIONS

- Initial reporting procedures should be given immediately upon arrival on location.
- Report exact location and conditions as observed:
  - Nothing showing.
  - Size of structure--stories and dimensions--type of construction--occupied or vacant.
  - Smoke/Fire--location and density.
  - Status of occupants--if known.
  - Exposures--Sides A, B, C, D, or other.
  - Engine \_\_\_ is establishing \_\_\_ Street Command.

Slide 4-105

## BRIEF INITIAL REPORT SIZEUP REPORT OF FIREGROUND CONDITIONS (cont'd)

- Subsequent report: Information not immediately reported and/or information developed upon investigation. To be given as soon as possible or within 5 minutes.
- Progress report: Should be given by the IC every 10 minutes until fire is under control.

Slide 4-106

## BRIEF INITIAL REPORT SIZEUP REPORT OF FIREGROUND CONDITIONS (cont'd)

See Student Manual (SM) p. 4-10 for plot plan of the following example. The following slides show fire conditions before arrival.

Slide 4-107



Slide 4-108



## BRIEF INITIAL REPORT SIZEUP REPORT OF FIREGROUND CONDITIONS (cont'd)

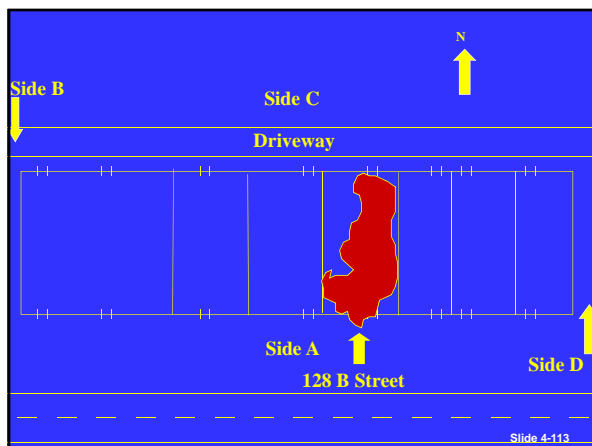
- Engine 1
- Engine 2
- Engine 3
- Ladder 1
- Basic life support (BLS) 1
- Battalion Chief 1
  - All companies staffed with four firefighters
  - Battalion Chief 1: 30-minute response

Slide 4-110

## BRIEF INITIAL REPORT SIZEUP REPORT OF FIREGROUND CONDITIONS (cont'd)

The following slides show fire conditions upon arrival. Refer back to SM p. 4-10 for the plot plan.

Slide 4-111



## BRIEF INITIAL REPORT SIZEUP REPORT OF FIREGROUND CONDITIONS (cont'd)

Sizeup report example:

- On location at 128 B Street, one-story strip store, Type III-ordinary construction, 20'x45', occupied as a furniture store.
- Heavy fire and smoke, Side A.
- All occupants have been removed.
- Exposures B 1 and D 1 similar type stores, medium smoke showing.

Slide 4-114

## **SUMMARY**

If you think building construction has changed, you are right! Now, you must change your thinking and decision making process.

Slide 4-115