



Fire Protection Training

Procedures Handbook 4300

BUILDING CONSTRUCTION

TOPIC: Structural Components

TIME FRAME: 2 Hours

LEVEL OF INSTRUCTION:

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will identify the construction features of buildings which have an influence on forcible entry, fire behavior, ventilation and other firefighting operations.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- IFSTA, Building Construction Related to the Fire Service, 1st Edition, Chapter 3
- NFPA, Fire Protection Handbook, 16th Edition

PREPARATION:

Understanding building construction techniques and how they relate to fire service operations is a basis for making informed decisions in the areas of forcible entry, ventilation, and search and rescue.



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STRUCTURAL COMPONENTS

PRESENTATION	APPLICATION
<p>I. BELOW FLOOR BUILDING COMPONENTS</p> <p>A. Pilings</p> <ol style="list-style-type: none">1. Concrete vertical support members2. Constructed in ground to support footings3. Used in areas of poor soil (i.e. minimal weight bearing capacity) <p>B. Footings</p> <ol style="list-style-type: none">1. Generally made of concrete2. Built below ground/grade3. Support for foundation, bearing walls, piers, posts, etc. <p>C. Foundations</p> <ol style="list-style-type: none">1. Transfer the weight of a structure to the footings2. Types of foundations<ol style="list-style-type: none">a. Concrete<ol style="list-style-type: none">(1) Poured in place(a) Steel reinforced	<p>Information sheets #1, 2 and 3</p> <p>Instructor's Note: This lesson plan will proceed from the bottom to the top in describing construction features</p>



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<ul style="list-style-type: none"><ul style="list-style-type: none">(b) Anchor bolt embedded to attach mudsill(2) Pre-cast<ul style="list-style-type: none">(a) Steel reinforced(b) Pilings for support commonb. Masonry<ul style="list-style-type: none">(1) Weaker than concrete(2) Interlocking components(3) Steel reinforced(4) Labor intensive(5) Block, brick, tile, etc.(6) Anchor bolt embedded to attach mudsillc. Piers<ul style="list-style-type: none">(1) Poured in place concurrent with footing(2) Pre-cast and set in footing while footing wet(3) Wooden cap to which vertical floor support is attached	
<p>D. Floor Support Structural Components</p>	
<p>1. Wood</p>	
<p>a. Girder posts or columns</p>	
<ul style="list-style-type: none">(1) Provides link and support from pier to girder beneath floor	



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<ul style="list-style-type: none">b. Girder<ul style="list-style-type: none">(1) Full dimension supporting member which runs parallel to ground from pier to pierc. Laminated beams or "Glulams"<ul style="list-style-type: none">(1) Pieces of wood glued together and formed into thick beams(2) Lengths of 100' can be unsupportedd. Box beams<ul style="list-style-type: none">(1) Composite beams with vertical plywood webs(2) High strength to weight ratioe. Plywood beams<ul style="list-style-type: none">(1) "I" beam cross section(2) Box beam cross section(3) Fabricated using nails, bolts, glue, etc.f. Trusses<ul style="list-style-type: none">(1) Manufactured off site(2) May consist of wood and steel componentsg. Floor joists<ul style="list-style-type: none">(1) Attached parallel to ground(2) Perpendicular to floor support components	



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<ul style="list-style-type: none">(3) Commonly attached with metal joist hangers2. Steel<ul style="list-style-type: none">a. Girderb. Beamsc. Trussesd. Joists	
<h2>II. FLOOR COMPONENTS</h2> <ul style="list-style-type: none">A. Wood<ul style="list-style-type: none">1. Sub-floor<ul style="list-style-type: none">a. Plywoodb. Compositionc. Sheathing or planks2. Finished floor<ul style="list-style-type: none">a. Hardwoodb. PlanksB. Concrete<ul style="list-style-type: none">1. Poured in place<ul style="list-style-type: none">a. Often simultaneous with footingsb. Reinforced mesh or steel rod2. Pre-cast<ul style="list-style-type: none">a. Transported to site	Information sheet #4



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<ul style="list-style-type: none">b. Reinforced with steel rod <p>III. WALL COMPONENTS</p> <ul style="list-style-type: none">A. Exterior walls<ul style="list-style-type: none">1. Wood frame construction<ul style="list-style-type: none">a. Balloon frame<ul style="list-style-type: none">(1) Studs run from mudsill to the ceiling in unbroken fashion(2) Apparent in two story occupanciesb. Platform frame construction<ul style="list-style-type: none">(1) Studs run from mudsill to double plate on each story(2) Subsequent stories are raised from newly created platformc. Fire blocks used to compartmentalize and minimize fire spread2. Masonry construction<ul style="list-style-type: none">a. Brick<ul style="list-style-type: none">(1) Distinguished from brick veneer which is a facade for aesthetic valueb. Blockc. Stoned. Pre-cast or tilt up	<p>Information sheet #5</p> <p>Information sheet #6</p>



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<ul style="list-style-type: none">3. Steel or aluminum alloy<ul style="list-style-type: none">a. Steel studsb. Glass commonly used as coveringB. Interior Walls<ul style="list-style-type: none">1. Load bearing<ul style="list-style-type: none">a. Support weight of structural components (e.g. roof or higher floors)b. Supports own weight2. Non-load bearing<ul style="list-style-type: none">a. Supports its own weight onlyb. Used to partition occupancy3. Fire walls<ul style="list-style-type: none">a. Divides occupancy into finite areas to restrict fire spread	
<p>IV. CEILINGS</p> <ul style="list-style-type: none">A. Of Little Structural SignificanceB. Support Own Weight and That of Fixtures<ul style="list-style-type: none">1. Exception: may constitute floor of next occupancy levelC. Main Components<ul style="list-style-type: none">1. Ceiling joists<ul style="list-style-type: none">a. Woodb. Steel unit	



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<ul style="list-style-type: none">2. Trusses<ul style="list-style-type: none">a. Woodb. Steelc. Wood and steel3. Drywall<ul style="list-style-type: none">a. Nailed to bottom of joists4. Suspended ceiling<ul style="list-style-type: none">a. Ceiling suspended or hung down into roomb. Opening between floors for vents, electrical, mechanical services	
V. ROOFS	
A. Types of Support Systems	
1. Gable roof	
2. Hip roof	Information sheet #7
3. Metal gusset plate	
4. Open web construction	Information sheet #8
5. Wooden I beams	
6. Open web bar joist	
7. Bridge truss	Information sheet #9



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<ul style="list-style-type: none">8. Flat roof9. Panelized roof10. Ribbed (trussed) arch roof11. Bowstring arch roofB. Roof Coverings<ul style="list-style-type: none">1. Tar and gravel2. Galvanized steel3. Copper4. Aluminum5. Clay tile6. Slate7. FiberglassC. Roof Designs	<p>Information sheet #10</p>
<ul style="list-style-type: none">1. Shed2. Flat3. Pitched4. Hip5. Gambrel6. Mansard7. Arched	<p>Information sheet #11</p>



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8. Butterfly 9. Monitor 10. Sawtooth 11. Bridge truss	



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SUMMARY:

Personnel tasked with attacking structural fires or with making decisions as to how such fires should be attacked must be knowledgeable of construction techniques and structural components.

Armed with this knowledge and effective pre-fire planning large loss fires can be minimized and personnel safety enhanced.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).