

# Building Construction

## ODA COURSE SYLLABUS

<b>COURSE INFORMATION</b>	
<b>Course</b>	<b>Building Construction: Considerations for Informed Fireground Decisions</b> (Possible FS-102 Reciprocity)
<b>Course Overview</b>	<p>Building design and construction are important considerations when completing pre-incident surveys and inspecting buildings; building construction is a crucial consideration for fireground size-up, incident action planning, determining the appropriate operational mode, and the deployment of resources.</p> <p>This course will provide a comprehensive overview of the engineering principles of building construction, building classifications and their related characteristics, load bearing and non- load bearing structural components, fire and life safety assemblies, fire resistance, flame spread, and fire loading.</p> <p>Significant differences between the various methods, techniques, and materials of building construction and their performance when subjected to fire conditions will be explored. Special attention will be focused on a strategic comparison of <i>legacy</i> (conventional) and <i>contemporary</i> (lightweight) building construction.</p> <p>In addition, UL/NIST fire behavior and ventilation research findings will be explored, in particular how flow paths, building geometry, and petrochemical-based fireload combine to create challenging fire control situations.</p>
<b>Class Dates</b>	18–20 September 2019
<b>Class Hours</b>	0830-1630
<b>Location</b>	Woodinville Fire & Rescue 17718 Woodinville-Snohomish Rd NE Woodinville, WA 98072
<b>Prerequisite</b>	<ol style="list-style-type: none"> <li>1. Fire Department/Fire District affiliation</li> <li>2. IFSAC <i>Firefighter I and II</i> Certification (or equivalent)</li> </ol>
<b>INSTRUCTOR INFORMATION</b>	
<b>Mark Emery</b>	<p>Mark began teaching fire service building construction in 1986. Mark developed the curriculum for the FCA-152, the <i>Fire Command and Administration</i> college course in Washington State for many years. Mark is co-developer of the <i>Integrated Tactical Accountability System</i> (ITAC) and developed the popular <i>ITAC Command Competency Clinic</i>. Mark co-developed the original IFSAC Accredited <i>Fire Service</i></p>

	<p><i>Instructor I</i> curriculum for the State of Washington. Mark also designs ITAC incident management status boards which are manufactured and sold by <i>IMS Alliance</i>. In 2005 Mark conceived of, guided the creation of, and hosted the first <i>King County Officer Development Academy</i> in King County, WA.</p> <p>Mark continues to provide Building Construction programs for numerous fire departments throughout North America, including Phoenix, Las Vegas, Anchorage, and Toronto.</p> <p>Mark has been a Contributing Editor for <i>Firehouse</i> magazine, serves as the Region X Director for the <i>National Fire Academy Alumni Association</i> (NFAAA), and recently served as <i>Western Director</i> for ISFSI (2014 to 2016).</p> <p>In addition, Mark developed and teaches <i>The Essentials of Honorable Leadership</i>.</p> <p>Mark was selected as the ISFSI 2013 <i>George D. Post Instructor of the Year</i>, awarded each year at FDIC International.</p> <p>After retiring as an Operations Battalion Chief in 2010, Mark served five years as a Fire Commissioner, and currently serves as Fire Chief with <i>East Valley Fire District 4</i> in Yakima County.</p>
<b>Instructor Phone</b>	(425) 753-6924
<b>Instructor Email</b>	fci@usa.com
<b>COURSE INFORMATION</b>	
<b>Required Text</b>	<p><i>Brannigan's Building Construction for the Fire Service (5<sup>rd</sup> edition)</i>, Jones and Bartlett Learning, 2016.</p> <p>\$73.70 Amazon Prime  <a href="https://www.amazon.com/gp/offer-listing/1284136132/ref=olp_f_usedAcceptable?ie=UTF8&amp;f_all=true&amp;f_new=true&amp;f_usedLikeNew=true">https://www.amazon.com/gp/offer-listing/1284136132/ref=olp_f_usedAcceptable?ie=UTF8&amp;f_all=true&amp;f_new=true&amp;f_usedLikeNew=true</a></p>
<b>Recommended Student Workbook</b>	<p><i>Brannigan's Building Construction for the Fire Service Student Workbook (5<sup>rd</sup> edition)</i>, Jones and Bartlett Learning, 2014.</p> <p>\$59.89 Amazon Prime  <a href="http://www.amazon.com/gp/offer-listing/1449688373/ref=olp_f_usedGood?ie=UTF8&amp;f_all=true&amp;f_new=true&amp;f_usedLikeNew=true&amp;f_usedVeryGood=true">www.amazon.com/gp/offer-listing/1449688373/ref=olp_f_usedGood?ie=UTF8&amp;f_all=true&amp;f_new=true&amp;f_usedLikeNew=true&amp;f_usedVeryGood=true</a></p>
<b>Pre-Assignment</b>	Read (and complete study guides) for chapters 1, 2, 3, 5, 7, 8, 9, 10 11, 13, and 14.
<b>Recommended (not required)</b>	<i>Knowing Your Buildings: A Firefighter's Reference Guide (1<sup>st</sup> edition)</i> , by Craig Schwinge; Cengage (Delmar) Learning, 5 Maxwell Drive, Clifton Park, NY, 12065.
<b>FESHE Equivalency</b>	This course addresses the course objectives and outcomes identified by the <i>Fire and Emergency Service Higher Education (FESHE) National Fire Academy Model Curriculum</i> , Associates Degree Core, February 2011 edition.

<p style="text-align: center;"><b>Objectives</b></p>	<p>To meet and exceed citations within NFPA 1021, <i>Fire Officer I</i>, <i>Fire Officer II</i>, and NFPA 1521, <i>Incident Safety Officer</i>, students will:</p> <ol style="list-style-type: none"> <li>1. Describe building construction as it relates to firefighter safety, building codes, pre-incident surveys, and the development of fireground strategy.</li> <li>2. Identify <i>strategic</i> characteristics of the five basic classifications of building construction.</li> <li>3. Identify principles of building design and the significance of each to safe fire suppression efforts.</li> <li>4. Differentiate between various loads, stresses, and strains that are placed on buildings and the interrelationship of each.</li> <li>5. Identify various structural components and building materials and their performance under fire conditions</li> <li>6. Identify and/or describe fire resistance, fire resistive assemblies, fire resistance and flame spread ratings, fire load, and construction features which may contribute to the spread of fire.</li> <li>7. Recognize significant differences between contemporary (lightweight) and legacy (conventional) construction.</li> <li>8. Identify how walls, roofs and floors can fail when exposed to fire conditions.</li> <li>9. Recognize safety hazards created by various building construction methods and techniques than can injure or kill fire fighters.</li> <li>10. Identify strategic and tactical considerations associated with building construction types, methods and techniques.</li> <li>11. Identify how fire may extend within various structures and identify appropriate options for controlling fire spread and ensure the safety of personnel.</li> <li>12. Appreciate the need to for the fire service to continuously seek <i>contemporary</i> methods and techniques that will achieve <i>traditional</i> strategically beneficial outcomes.</li> </ol> <p><b>EVIDENCE:</b> Passing grade according to grading criteria identified below.</p>	
<p style="text-align: center;"><b>Attendance</b></p>	<p><b>One-half class</b> will lower student’s final evaluation one letter grade.</p> <p><b>One (or more) classes</b> and the student will be dropped without credit.</p> <p><b>Only</b> incredible and entertaining) excuses will be considered and judged by the Instructor.</p>	
<p style="text-align: center;"><b>Scoring &amp; Grading</b></p>	<p>Attendance &amp; Participation</p>	<p>500 points</p>
	<p>NIOSH Case Studies (2)</p>	<p>300 points</p>
	<p>Mid-Term Exam</p>	<p>300 points</p>
	<p>Final Exam</p>	<p>900 points</p>

	Total		2,000 points	
	Student Points	Grade Points	Grade	You will know your scores and final grade before the course is complete.
	2000-1980	4.0—3.9	A	
	1979-1900	3.8—3.5	A-	
	1899-1840	3.4—3.2	B+	
	1839-1780	3.1—2.9	B	
	1779-1700	2.8—2.5	B-	
	1699-1640	2.4—2.2	C+	
	1639-1580	2.1—1.9	C	
	1579-1500	1.8—1.5	C-	
	1499-1440	1.4—1.2	D+	
	1399-1380	1.1—0.9	D	
	1379-1300	0.8—0.7	D-	
1299-0000	0.6—0.0	F		
<b>Exams &amp; Case Studies</b>	<ul style="list-style-type: none"> <li>• <u>Pre-Exam Exercise</u>: not scored</li> <li>• <u>Case Studies</u>: 150-points each</li> <li>• <u>Mid-Term</u>: 75 questions (4-points per test item)</li> <li>• <u>Final Exam</u>: 150 questions (6-points per test item)</li> </ul>			
<b>G R E A T   E X P E C T A T I O N S</b>				
<b>Instructor Will</b>	<ul style="list-style-type: none"> <li>• Arrive prepared each day</li> <li>• Respect <i>your</i> time</li> <li>• Keep things moving</li> <li>• Provide ‘nuggets’</li> <li>• Challenge the way it’s always been done</li> <li>• Make learning fun</li> <li>• Help you be successful on the mid-term and final exams</li> <li>• Help you leave more knowledgeable than when you got here</li> </ul>			
<b>Student Will</b>	<ul style="list-style-type: none"> <li>• Complete pre-course reading assignment and study guides</li> <li>• Arrive prepared each day (including required text)</li> <li>• Respect <i>our</i> time</li> <li>• Ask questions</li> <li>• Gather ‘nuggets’</li> <li>• Challenge Instructor’s challenges</li> <li>• Have fun learning</li> <li>• Strive to leave more knowledgeable than when you got here</li> </ul>			

<b>COLLEGE CREDIT</b>	
<b>Contact preferred college for FS-102 &amp; FESHE reciprocity</b>	<p>To determine the current status of local college reciprocity:</p> <ul style="list-style-type: none"> <li>• Everett Community College <a href="https://www.everettcc.edu/programs/health-safety/public-safety/fire-science/course-information/">https://www.everettcc.edu/programs/health-safety/public-safety/fire-science/course-information/</a></li> <li>• Lower Columbia College (in Longview) <a href="http://lowercolumbia.edu/publications/catalog-15-16/programs/Vocational-AAS-Fire-Science-Technology.php">http://lowercolumbia.edu/publications/catalog-15-16/programs/Vocational-AAS-Fire-Science-Technology.php</a></li> </ul>
<b>W A C 2 9 6 - 3 0 5</b>	
<b>Applicable Citations</b>	<p><b>-05000 Incident Management</b></p> <p>(4) At all emergency incidents, the incident commander shall have the responsibility to:</p> <p style="padding-left: 40px;">(b) Perform situation evaluation that includes risk assessment.</p> <p>(6) The fire department shall establish an accountability system: Written procedures and guidelines for tracking all members operating at emergency incidents.</p> <p><b>-05002 Fire Suppression</b></p> <p>(1) Before beginning interior structural firefighting operations, the incident commander must evaluate the situation and risks to operating teams.</p> <p>(12) Prior to overhaul, buildings shall be surveyed for possible safety and health hazards. Firefighters shall be informed of hazards observed during the survey and measures shall be taken to protect firefighters from these hazards.</p>
<b>N F P A S T A N D A R D S A D D R E S S E D</b>	
<b>NFPA 1021 Fire Officer I</b>	<p>4.2.1 Assign tasks or responsibilities to unit members, given an assignment at an emergency incident, so that the instructions are complete, clear, and concise; <b><u>safety considerations are addressed</u></b>; and the desired outcomes are conveyed.</p> <p>4.5.2 <b><u>Identify construction, alarm, detection, and suppression features</u></b> that contribute to or prevent the spread of fire, heat, and smoke throughout the building or from one building to another, given an occupancy, and the policies and forms of the AHJ so that a pre-incident plan for any of the following occupancies is developed:</p> <ol style="list-style-type: none"> <li>1) Public assembly</li> <li>2) Educational</li> <li>3) Institutional</li> </ol>

	<p>4) Residential</p> <p>5) Business</p> <p>6) Industrial</p> <p>7) Manufacturing</p> <p>8) Storage</p> <p>9) Mercantile</p> <p>10) Special properties</p> <p>(A) Requisite Knowledge. <b><u>Fire behavior; building construction</u></b>; inspection and incident reports; detection, alarm, and suppression systems; and applicable codes, ordinances, and standards.</p> <p>4.6 Emergency Service Delivery. This duty involves supervising emergency operations, <b><u>conducting pre-incident planning</u></b>, and deploying assigned resources in accordance with the local emergency plan and according to the following job performance requirements.</p> <p>4.6.1 Develop an initial action plan, given size-up information for an incident and assigned emergency response resources, so that resources are deployed to control the emergency.</p> <p>(A) Requisite Knowledge. <b><u>Elements of a size-up</u></b>, standard operating procedures for emergency operations, and <b><u>fire behavior</u></b>.</p> <p>(B) Requisite Skills. The <b><u>ability to analyze emergency scene conditions</u></b>; to activate the local emergency plan, including localized evacuation procedures; to allocate resources; and to communicate orally.</p> <p>4.6.3 Develop and conduct a post-incident analysis, given a single unit incident and post-incident analysis policies, procedures, and forms, <b><u>so that all required critical elements are identified and communicated</u></b>, and the approved forms are completed and processed in accordance with policies and procedures.</p> <p>(A) Requisite Knowledge. Elements of a post-incident analysis, <b><u>basic building construction</u></b>, <b><u>basic fire protection systems and features</u></b>, <b><u>basic water supply</u></b>, <b><u>basic fuel loading</u></b>, <b><u>fire growth and development</u></b>, and departmental procedures relating to dispatch response tactics and operations and customer service.</p>
<p><b>NFPA 1021</b></p> <p><b>Fire Officer II</b></p>	<p>5.6.2 Develop and conduct a post-incident analysis, given multi-unit incident and post-incident analysis policies, procedures, and forms, so that all required critical elements are identified and communicated and the approved forms are completed and processed.</p>

	<p>(A) Requisite Knowledge. Elements of a post-incident analysis, <b><u>basic building construction</u></b>, basic fire protection systems and features, basic water supply, <b><u>basic fuel loading, fire growth and development</u></b>, and departmental procedures relating to dispatch response, strategy tactics and operations, and customer service.</p> <p>5.7.1 <u>Analyze a member’s accident, injury, or health exposure history, given a case study, so that a report including action taken and recommendations made is prepared for a supervisor.</u></p> <p>(A) Requisite Knowledge. <u>The causes of unsafe acts, health exposures, or conditions that result in accidents, injuries, occupational illnesses, or deaths.</u></p>
<p><b>NFPA 1500</b> <b>Occupational Safety &amp; Health</b></p>	<p>8.1.1 Emergency operations and other situations that pose similar hazards, including but not limited to training exercises, <b><u>shall be conducted in a manner that recognizes hazards and prevents accidents and injuries.</u></b></p> <p>8.1.5 At an emergency incident, the incident commander shall be responsible for the overall management of the incident <u>and the safety of all members involved at the scene.</u></p> <p>8.1.8 <u>At an emergency incident, the incident commander shall have the responsibility for the following:</u></p> <p><b><u>(3) Perform situation evaluation that includes risk assessment.</u></b></p> <p>8.3.3 <b><u>The incident commander shall evaluate the risk to members</u></b> with respect to the purpose and potential results of their actions in each situation.</p> <p>ANNEX C, Building Hazard Assessment</p> <p>C.1 Fire fighters are being exposed to increased risks on the fireground. Buildings are being occupied in a manner different from that for which they were originally designed. <b><u>The design of some buildings has changed so that the roofs and floors can and do fail at a faster rate.</u></b> Mezzanines over the floor area have created <u>hazards during fire-fighting operations. These changes have created safety hazards, which have increased the risks to fire fighters.</u></p> <p>Fire departments should take appropriate measures <b><u>to identify buildings that can cause hazardous conditions during emergency operations.</u></b> A method that could be used is to add a letter or letters to the bottom white “specific hazard” area on existing placards as specified in NFPA 704, <i>Standard System for the Identification of the Hazards of Materials for Emergency Response</i>. Some buildings are constructed utilizing several types of roof construction. The local fire department should determine which identifier is used based upon the construction feature or hazard that creates the greatest risk to fire fighters.</p>

	<p>The identifier letter or letters that could be used are as follows:</p> <ul style="list-style-type: none"> <li>(1) A — Artisans living in a commercial building</li> <li>(2) LT — Lightweight trusses used in roof or floor construction (e.g., roofs-open web, wooden I-beams)</li> <li>(3) AT — Arch trusses used in roof construction</li> <li>(4) P — Panelized roof construction</li> <li>(5) M — Mezzanines above floor area</li> </ul> <p>The NFPA 704 marking system could prove beneficial for first-responding companies and move-up companies, including companies used during mutual and automatic aid.</p> <p>It is recommended that fire departments develop tactical plans to address safety concerns for fire fighters confronted with buildings placarded with specific hazards.</p>
<p><b>NFPA 1521 Incident Safety Officer</b></p>	<p>6.1.5 The incident safety officer shall monitor the incident action plan, conditions, activities, and operations to determine whether they fall within the criteria as defined in the fire department’s risk management plan.</p> <p>6.1.7 <u>The incident safety officer shall monitor the incident scene and report to the incident commander the status of conditions, hazards, and risks.</u></p> <p>6.2.3 <b><u>Where fire has involved a building(s) the incident safety officer shall advise the incident commander of hazards, collapse potential, and any fire extension in such building(s).</u></b></p> <p>6.2.4 The incident safety officer shall <b><u>evaluate visible smoke and fire conditions</u></b> and advise the incident commander, tactical level management component’s (TLMC) officers, and company officers on the <b><u>potential for flashover, backdraft, blow-up, or other events</u></b> that could pose a threat to operating teams.</p>
<p><b>Accommodation Not a Problem</b></p>	<p>Should you require a special accommodation please contact ODA staff or the Instructor prior to the course.</p>

# SCHEDULE AND ASSIGNMENTS

<b>DAY 1</b>	Roster and Student Profile	0.5
	Introduction and Syllabus Review	0.5
	Diagnostic Pre-Exam and Review	1.5
	Engineering Principles of Building Construction	4.5
	<b>Homework: Review chapters 2, 3, 4, 5, 7, 8, 10, 11, 12, 14; Case Studies:</b> <a href="https://www.cdc.gov/niosh/fire/pdfs/face9807.pdf">https://www.cdc.gov/niosh/fire/pdfs/face9807.pdf</a> <a href="https://www.cdc.gov/niosh/fire/pdfs/face201316.pdf">https://www.cdc.gov/niosh/fire/pdfs/face201316.pdf</a>	

<b>DAY 2</b>	Strategic classification of Building Construction:	5.0
	Type I: Fire Resistive (high rise)	
	Type II: Non-Combustible (concrete and steel)	
	Type IV: Heavy Timber (including 'Mill' construction)	
	Type III: Ordinary Construction (unreinforced versus reinforced)	
	Type V: Wood Frame Construction (balloon versus platform)	
	Fire protection and occupancy details	1.0
Overview of UL/NIST fire dynamics research methods and findings.	1.0	
<b>Homework: Prepare for Final Exam; Case Studies (cont.)</b>		

<b>DAY 3</b>	Fire Resistance versus Flame Spread: What is the difference?	0.5
	Truss anatomy and truss behavior analysis	1.0
	NIOSH/ USFA Case Study Discussion (how to not be there and not do that)	1.5
	Strategic and Tactical Considerations and Alternatives	1.0
	Final Exam (150 questions)	1.5
	Grade and Review Final Exam	0.5
	Course/Instructor Evaluation; Closure	0.5

thank you for investing your time, attention, and effort  
 enjoy a safe, healthy, & rewarding career