**BSESC—Disaster Resistance and Resiliency**

## Proficiency Level 3: Apply

### Learning Objective 3.1

* Identify and explain the role of 3 building-related stakeholders that are affected in a natural disaster.

### Lecture Notes 3.1

At the specific building level and from planning through construction, immediate stakeholders include the property owner or renter, designer, mechanical engineer, energy engineer, architect, building scientist, builder, specific licensed contractors (electrician, plumber, and carpenter), inspector, and code official.

At the community level, stakeholders are identified by FEMA to include the following with some of their responsibilities listed (not a comprehensive list)

* Local, state, and federal government
	+ Governor
		- Requests post-disaster power
		- Requests federal disaster declarations
		- Mobilizes the National Guard
		- Requires evacuations
	+ State Legislature
		- Orders a state-wide hazards assessment
		- Creates a disaster trust fund
		- Evaluates recovery and mitigation programs
		- Establishes a State Emergency Response Team
	+ Federal Emergency Management Agency
		- Implements a Federal response plan related to transportation, communications, public works and engineering, firefighting, information and planning, mass care, health and medical, urban search and rescue, food, energy, etc.
	+ Local emergency manager
	+ Local elected officials
		- Represent constituents
		- Publicize community needs
		- Approve or deny proposed policy changes
	+ State emergency management
		- Establish and maintain an emergency management program
		- Coordinate state-wide training
		- Advise the Governor
		- Coordinate post-disaster assistance
		- Act as an intermediary between local and federal government
	+ City manager
		- Hires contractors
		- Reports status
		- Makes policy changes
	+ Finance
		- Documents disaster expenditures
		- Tracks reimbursable costs
		- Tracks grant applications
	+ Public works
		- Conducts post-disaster damage assessment
		- Restores public water and sewer service
		- Works on restoration of damaged infrastructure
	+ Planning
		- Develops a disaster recovery plan
		- Develops pre-and post-disaster grant applications
		- Disseminates disaster assistance information
		- Identifies suitable sites for post-disaster reconstruction
	+ Police
		- Assist individuals as needed
		- Protect public and private property
	+ Fire
		- Conduct initial search and rescue
		- Suppress fires
		- Assist with damage assessment
	+ Building inspector
		- Conducts damage assessment
		- Determines the habitability and extent of damage to buildings
	+ Local floodplain administrator
		- Assesses the type of flood damages sustained
		- Assesses accuracy of flood insurance rate maps
		- Notifies homeowners of options
* Impacted citizens
	+ May include homeowners, renters, homeless populations, business owners, employees, students, vacationers, and local government officials
* Media
	+ Disseminate information to prepare, recovery and mitigate
	+ Supply directions to the public
	+ Stimulate volunteerism and donations
* Businesses and corporations
	+ Identify alternative sites for operations
	+ Purchase alternative energy sources
	+ Identify alternative suppliers and transportation routes
	+ Work through business interruption
	+ Become post-disaster operational
* Universities and research institutions
	+ Provide policy advice to practitioners
	+ Conduct research and post-disaster data collection and analysis
	+ Train and mentor future professionals
* Non-profit agencies and emergency community organizations, including Red Cross and Salvation Army
	+ Provide food and water
	+ Provide clothing
	+ Provide medical assistance
	+ Provide crises intervention
* Contractors
	+ Repair damaged or destroyed housing, infrastructure and public buildings
	+ Provide post-disaster training
	+ Provide debris management
* Associations and collaborative partnerships
	+ Identify specific and local problems
	+ Identify improved actions and processes

A few characteristics of stakeholders in disaster planning and resolution include the following:

* A core group usually participates.
* The group changes over time.
* Roles can change in a disaster.
* Differing viewpoints, personal needs, and professional needs may lead to conflict.
* Stakeholders may increase cooperation across groups.
* Roles and responsibilities can be formal and informal.
* Groups may emerge as needed by the disaster.
* The role of the stakeholders is shaped by power, formal authority, informal authority, and the control of scarce resources.

### Learning Objective 3.2

* Applying relevant building codes, demonstrate in writing how a residential building meets resistance and resiliency specifications for one type of natural disaster for your climate zone and local area.

### Lecture Notes 3.2

Some nationally applicable references for disaster resistance and resiliency include:

[*“Catalog of FEMA Building Science Branch Publications and Training Courses”*](https://www.fema.gov/media-library-data/1476460097383-a315a523cd7a30a1c737b7dd6388400d/FEMA_P787_2016-508.pdf)

[FEMA Building Science Resources](https://www.fema.gov/building-science);

[Insurance Institute for Business and Home Safety](https://disastersafety.org/fortified/); see [disaster safety resources](https://disastersafety.org/);

[University of California Wildfire Resources](http://ucanr.edu/sites/cfro/Resources/)

[NIBS WBDG Natural Hazards Mitigation](http://wbdg.org/design-objectives/secure-safe/natural-hazards-mitigation);

Search “[Building Design Best Practices](https://search.usa.gov/search?utf8=%E2%9C%93&affiliate=fema&query=building+design+best+practices&commit=GO)” under FEMA Building Science page Search Engine.

[NIST SPECIAL PUBLICATION 1117: DISASTER RESILIENCE: A GUIDE TO THE LITERATURE](http://wbdg.org/ffc/nist/criteria/nist-spec-pub-1117-dis-res-guide-lit)

For a more local perspective:

Apply a Google search starting with the following overall codes (numbered below) to identify and then narrow down specific relevant codes for your climate zone and local area.

Building codes are essential to the success of disaster resistance and resiliency.

Building codes are sets of regulations that address structural integrity, fire resistance, safe exits, lighting, ventilation, and construction materials. They specify the minimum requirements to safeguard the health, safety, and general welfare of building occupants.

The International Code Council (ICC) ([www.iccsafe.org](file:///C%3A%5CUsers%5Cmetz285%5CAppData%5CLocal%5CMicrosoft%5CWindows%5CTemporary%20Internet%20Files%5CContent.Outlook%5CNN7YEA8R%5Cwww.iccsafe.org)) family of codes covers all aspects of construction and includes (but is not limited to):

1. International Building Code (IBC): Applies to new and existing buildings, except those residential buildings covered under the International Residential Code.
2. International Residential Code (IRC): Applies to new and existing one- and two-family dwellings and townhouses of not more than three stories in height.
3. International Property Maintenance Code (IPMC): Applies to all existing buildings and addresses maintenance issues for continued safe use of buildings.
4. International Existing Building Code (IEBC): Applies to the alteration, repair, addition, or change in occupancy of existing structures.

The International Code Council (ICC) ([www.iccsafe.org](file:///C%3A%5CUsers%5Cmetz285%5CAppData%5CLocal%5CMicrosoft%5CWindows%5CTemporary%20Internet%20Files%5CContent.Outlook%5CNN7YEA8R%5Cwww.iccsafe.org)) publishes updated codes every three years.

In partnership with the ICC, the Federal Emergency Management Agency(FEMA) supports the development of building codes by continuously monitoring, strengthening, and championing disaster-resistant provisions of national model codes and standards. Over the past 30 years, FEMA and other government organizations have worked with national model codes and standards groups as well as engineering and construction industry groups to propose and gain adoption of numerous disaster-resistant provisions for earthquake, wind, and flood hazards in the Nation’s model building codes and standards.

The development and widespread adoption of building codes is beneficial in that it has created a uniform regulatory environment in which design professionals and contractors are held to a set of standards adopted by and applicable to the jurisdiction in which they work. More importantly, building codes provide individuals, their families, and the community protection in the event of a natural disaster.

It is the responsibility of state and local jurisdictions to adopt and enforce building codes. Today, most U.S. communities formally adopt a building code and have a system in place for building regulation. However, some rural areas in America still have not adopted a building code and in these areas it is legal to design and construct structures using any standards deemed appropriate by the designers and builders.

Many communities, depending on their geographic location, are at significant risk of experiencing severe damage from earthquakes, hurricanes, floods, tornados, wildland fires and other natural events. Adoption and effective enforcement of up to date building codes is the best line of defense against such severe events. (Codes can also help ensure that the history of a building is preserved if that is applicable. Guidance on this topic is available here: <https://www1.eere.energy.gov/buildings/publications/pdfs/building_america/historic_homes_guide.pdf>.) Owners and local communities can also take effective steps in protecting themselves by strengthening or building tornado safe rooms and storm shelters, and taking other effective steps to protect lives, property and community.

It is critical that property owners, planners, designers, contractors, elected officials, emergency managers, and other decision makers understand the building code and its value as well as support the adoption, use and enforcement of codes, incorporating codes into local resilience efforts and allowing builders to construct structures to higher standards are important steps to becoming more disaster-resilient.

Having an understanding of local building code requirements is critical prior to executing any construction projects. Locally adopted building codes define the details necessary for permitting, inspection, and rebuilding techniques. Most remodeling projects and all new construction require one or more building permits before work can begin.

Building permits are generally required for any alteration that changes the structure, size, safety, or use of living space. They are usually not required for projects considered to be normal maintenance such as painting or wallpapering.

Visit your local building department before you start construction to find out the type of permits that are necessary for your project. Ask if inspections are necessary and at what stage of construction. Once the work begins, an inspector should visit the site to be sure that the project is code compliant. If a building permit is not obtained for a project that requires one, the property owner may be subject to legal action. If the project is completed without a building permit and does not meet building code standards, the building department may require that additional work be done at the owner’s expense. After construction is completed, any additional work to bring a building up to code will in most cases be much more expensive than if the building was originally designed and built code compliant. Designing and building to the code not only help save lives and property; in many cases it can save time, money and potential legal action.

The code information above is from the Department of Homeland Security website. Federal Emergency Management Agency. February 5, 2013. “FEMA Building Codes Toolkit Factsheet.” Available at <https://www.fema.gov/media-library/assets/documents/30423>

**Industry Standards**

The information below, which focuses more on industry standards and code adoption, is from theNational Institute of Building Sciences Building Seismic Safety Council. December 2010. *Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*. Prepared for the Federal Emergency Management Agency of the U. S. Department of Homeland Security By the National Institute of Building Sciences Building Seismic Safety Council. Available at <https://www.fema.gov/media-library-data/20130726-1759-25045-5477/fema_p_749.pdf>

**Consensus Standards**

As the model building codes were evolving, various industries (e.g., concrete, masonry, steel, wood) established professional associations to develop technical criteria for the design and construction of structures using each industry’s specialized materials and systems. Eventually, the industry associations began issuing their guidance documents in the form of industry standards developed following rigorous consensus procedures promulgated by the American National Standards Institute (ANSI) and the model code organizations began adopting those documents into their codes by reference. The industry consensus standards typically are revised and updated every five years.

Among the more important consensus standards presently referenced by the building codes are the following:

* + - *Minimum Design Loads for Buildings and Other Structures,* ASCE/SEI 7, published by the Structural Engineering Institute of the American Society of Civil Engineers;
			* *Building Code Requirements for Reinforced Concrete,* ACI 318, published by the American Concrete Institute;
			* *National Design Specification,* NDS, published by the American Forest and Paper Association;
			* *Specification for Steel Buildings,* AISC 360, published by the American Institute of Steel Construction;
			* *North American Specification for the Design of Cold Formed Steel Structural Members,* AISI S100, published by the American Iron and Steel Institute; and
			* *Building Code Requirements and Specification for Masonry Structures,* TMS 402/ACI 530/ASCE 5 and TMS 602/ACI 530.1/ASCE 6, jointly published by the Masonry Society, the American Concrete Institute, and the American Society of Civil Engineers.

**Code Adoption and Enforcement**

Building codes are adopted by state and local governments to protect the health, safety, and welfare of the public by establishing minimum acceptable design and construction requirements intended to provide safe and reliable buildings and structures. These codes affect all aspects of building construction including structural stability, fire resistance, means of egress, ventilation, plumbing and electrical systems, and even energy efficiency. Once adopted by a state or local government, the building code becomes law and is typically enforced by a government official. This official generally is identified as the Chief Building Official but he or she may have another title such as Fire Marshall or Clerk. Collectively, the people empowered to enforce the requirements of a building code are identified in the codes as the Authority Having Jurisdiction (AHJ).

In communities that have adopted a building code, it is illegal to construct a structure unless the AHJ issues a building permit. Before issuing the permit, the AHJ typically will review the design documents to ensure that they were prepared by an appropriately qualified and licensed (generally by the state) professional and that they conform, in a general sense, to the technical requirements of the building code. Once the AHJ is satisfied that a design conforms to the applicable requirements and appropriate fees are paid, the AHJ issues a permit for construction, a document commonly referred to as the “building permit” that generally is posted at the construction site.

During the construction period, the AHJ requires a series of inspections to ensure that the design is being properly executed by the builders. These inspections may be directly performed by the AHJ or the AHJ’s staff, by private individuals or firms with the appropriate qualifications, or by a combination of the two. When an inspection is performed, the conformance of the construction with the design and code requirements is documented by a series of reports and/or by the inspector’s signature on the building permit. If an inspector finds that the construction does not conform in some way to the code requirements, the builder must correct this situation before a sign-off is given. Upon completion of construction and submittal of documentation by the builder of evidence that the building has passed all required inspections, the AHJ will issue an “occupancy permit” that allows the structure to be open to the public. If a building is occupied without this permit, the AHJ can require that other law enforcement officials vacate the premises and lock it. Even after an occupancy permit has been issued for a structure, the AHJ can revoke the permit if there is reason to believe that the structure has become unsafe in some way. It is not uncommon for this to occur after a fire, earthquake, hurricane, or other event that causes extreme damage to buildings and structures. This also can occur if a building’s occupants allow its various systems to deteriorate to a point at which the structure is no longer safe for use.