WASAFE
BUILDING SAFETY ASSESSMENT

[VANCOUVER, OCTOBER 16, 2019]

PRESENTED BY:

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PROGRAM FOCUS

Reoccupy safe buildings

Postearthquake Safety Evaluation of Buildings

ATC-20

Original ATC-20 Document Developed by:

APPLIED TECHNOLOGY COUNCIL

With Funding From:

FEDERAL EMERGENCY MANAGEMENT AGENCY

OFFICE OF EMERGENCY SERVICES, STATE OF CALIFORNIA

OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT, STATE OF CALIFORNIA

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This PowerPoint® Presentation Is Based on Original ATC-20 Training Materials Developed by:

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Principal-in-Charge: Ronald P. Gallagher

Original ATC-20 & WAsafe Presentation Modified by:

[name, position, organization]

MORE RESOURCE DOCUMENTS

WASAFE BUILDING SAFETY ASSESSMENT (BSA) TRAINING

Restrooms

Breaks and Lunch

Pagers and cell phones to silent mode

Registration, forms, photos
(don't leave early)

WASAFE BSA TRAINING OUTLINE

Seismic Hazard Overview
Field Safety
Posting System
Politics of Response
WAsafe
Evaluation Procedures

OUTLINE (CONT.)

Structural Basics

Wood-Frame Structures

Masonry Structures

Concrete Structures

Steel-Frame Structures

OUTLINE (CONT.)

Nonstructural Elements

Geotechnical Elements

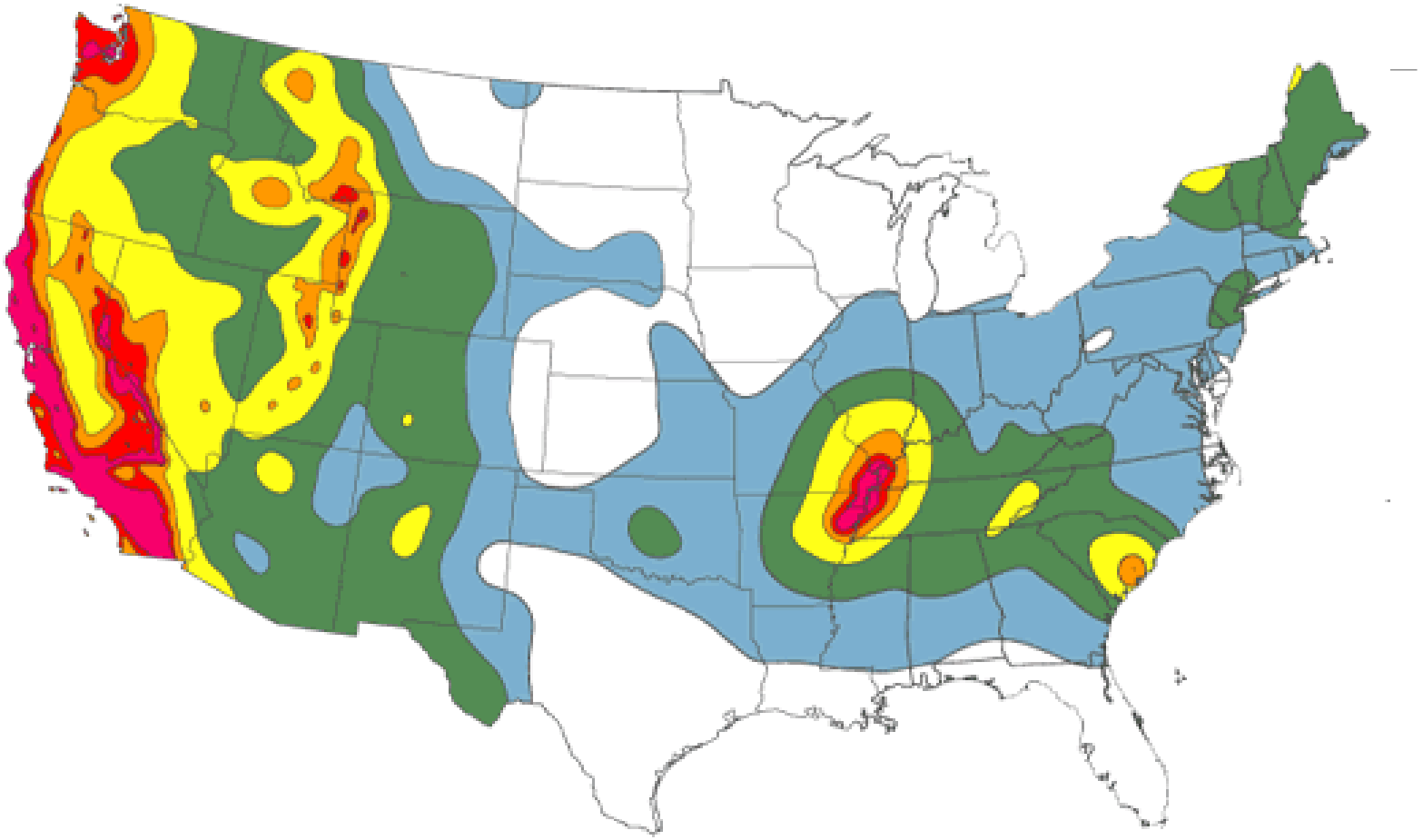
Hazardous Materials

Non-seismic Hazards

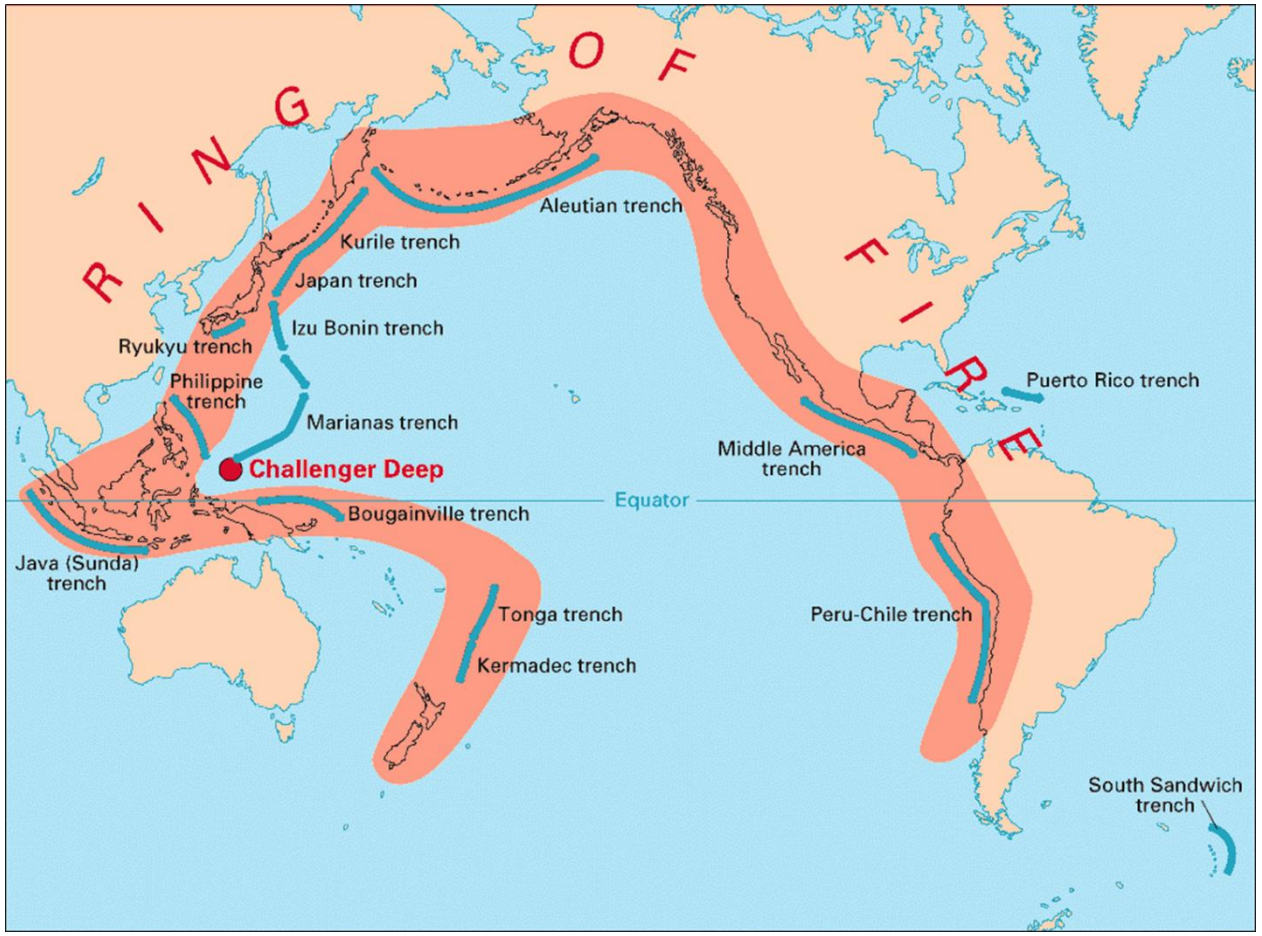
Politics of Recovery

SEISMIC HAZARD OVERVIEW

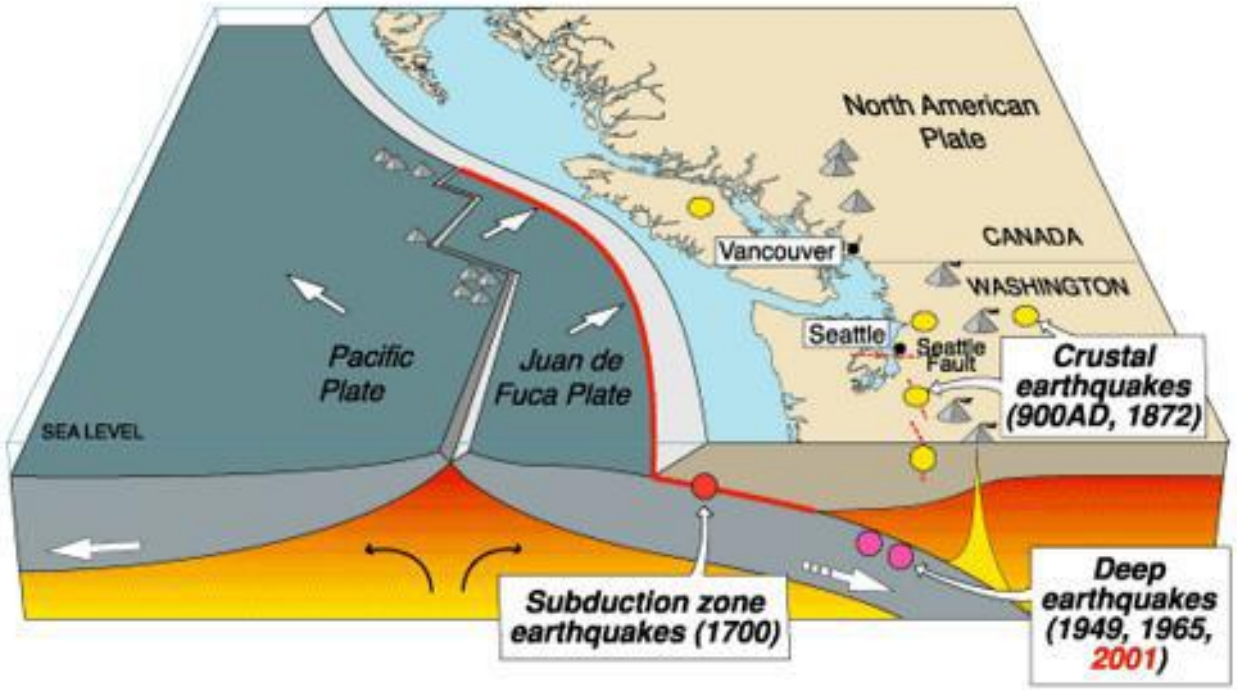
USGS SEISMIC HAZARD MAP



PACIFIC RIM – RING OF FIRE

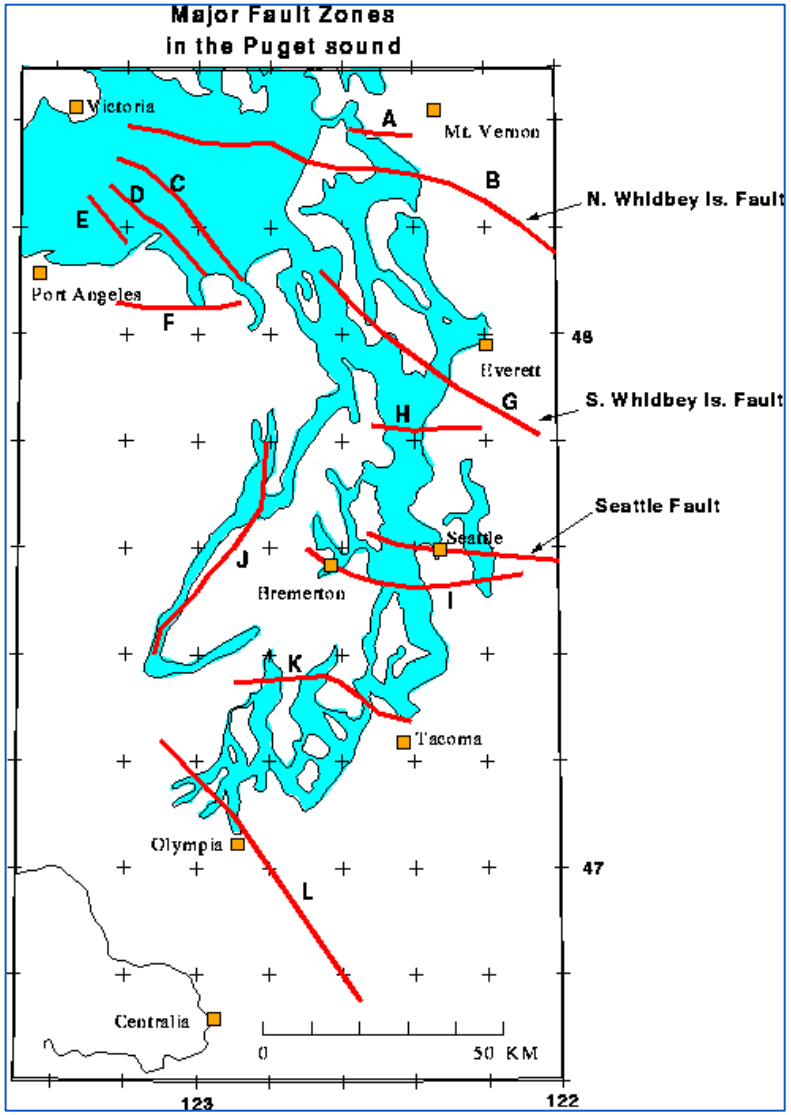


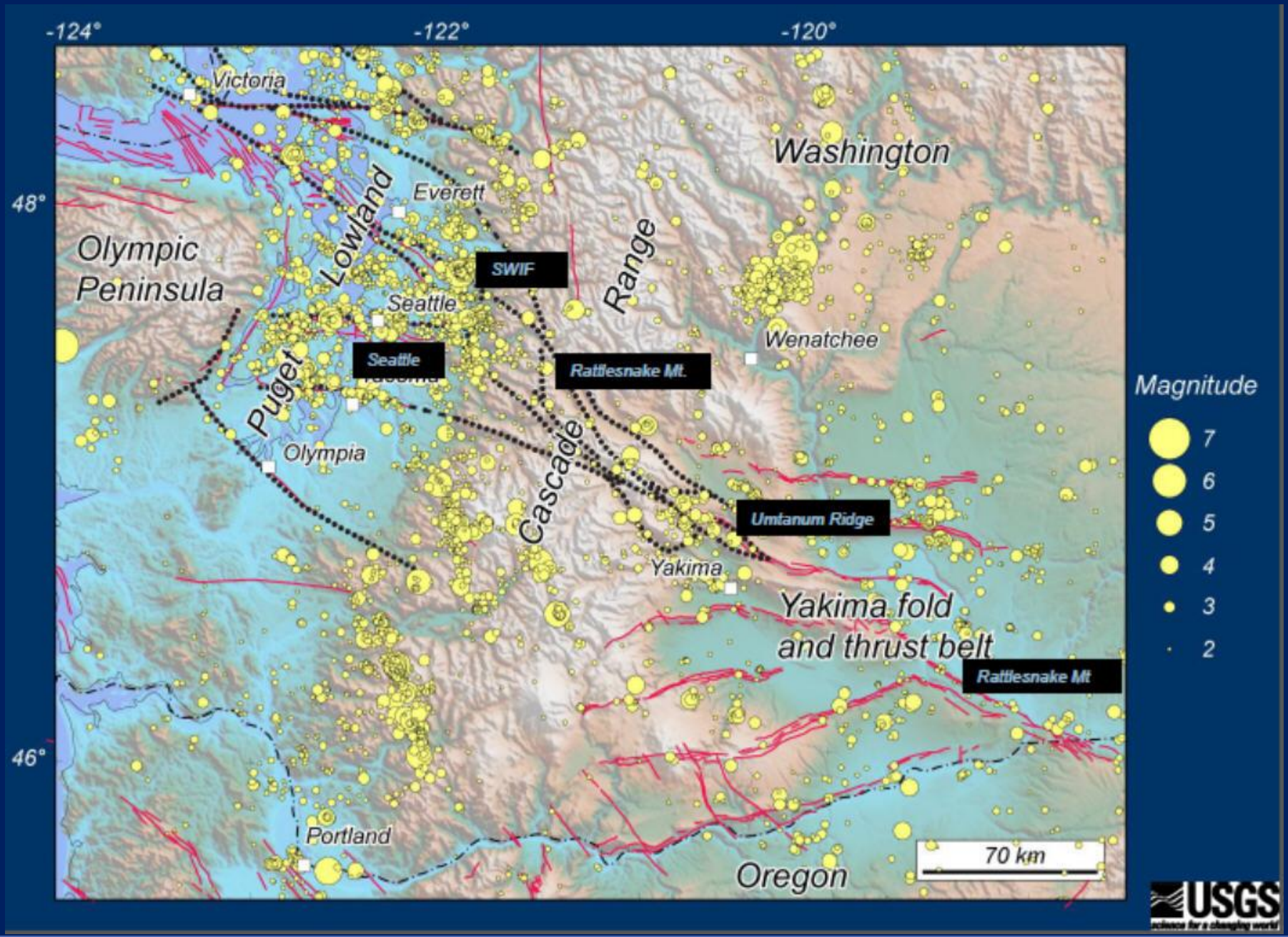
Cascadia earthquake sources



Source	Affected area	Max. Size	Recurrence
Subduction Zone	W.WA, OR, CA	M 9	500-600 yr
Deep Juan de Fuca plate	W.WA, OR,	M 7+	30-50 yr
Crustal faults	WA, OR, CA	M 7+	Hundreds of yr?

PUGET SOUND FAULT ZONES




-124°
-122°
-120°
48°
46°
Victoria
Everett
Seattle
Seattle
Olympia
Portland
Wenatchee
Yakima
Washington
Oregon
Olympic Peninsula
Puget Lowland
Cascade Range
SWIF
Rattlesnake Mt.
Umtanum Ridge
Yakima fold and thrust belt
Rattlesnake Mt
70 km
Magnitude
7
6
5
4
3
2
USGS

RICHTER SCALE

Richter Magnitude (M_L)	4	→	6	→	8
Energy Increase Ratio		1,000		1,000	

Moment Magnitude (M_W) more commonly used today

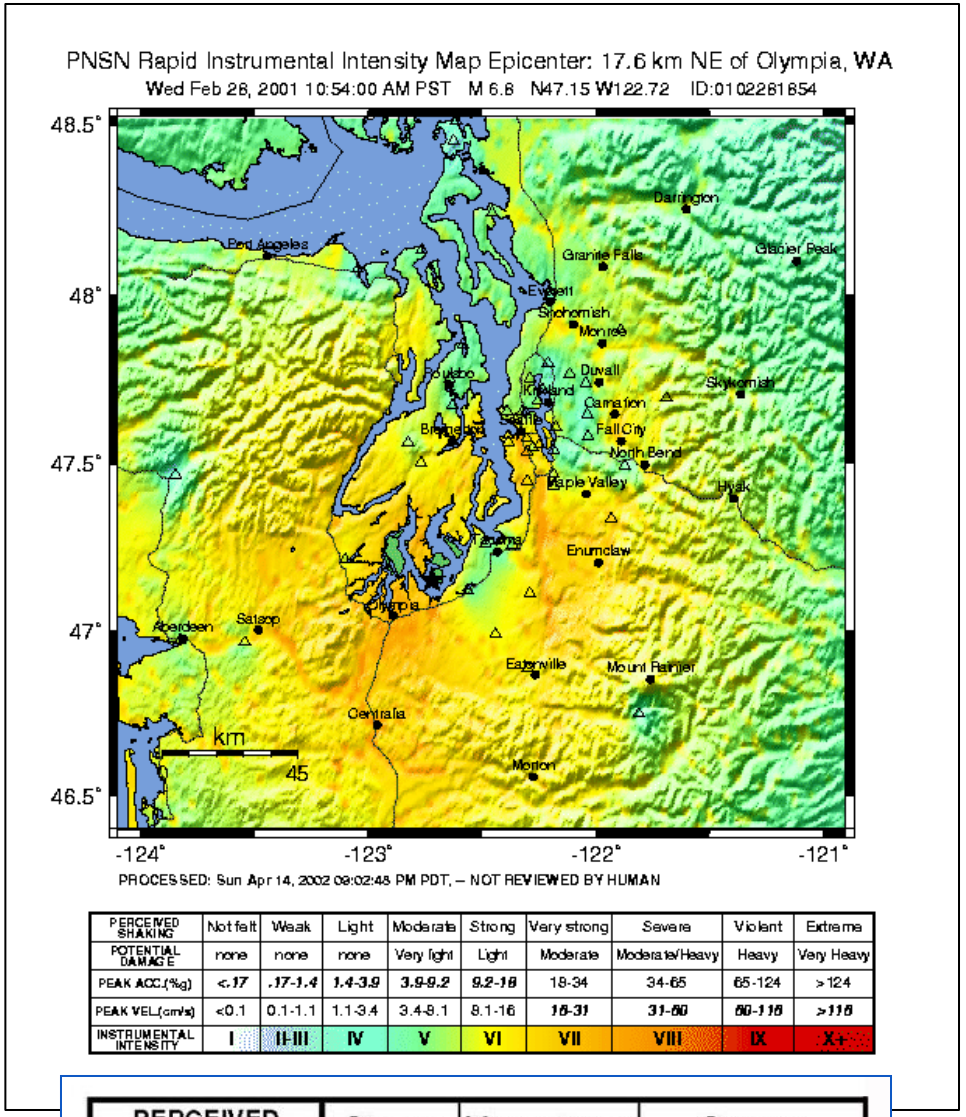
MODIFIED MERCALLI INTENSITY SCALE

MMI VI Windows broken. Books off shelves. Weak plaster cracked.

MMI VII Damage to weakest masonry. Weak chimneys broken. Fall of plaster, loose bricks, tiles, unbraced parapets.

MMI VIII Damage to weak masonry, partial collapse. Frame houses moved on foundations.

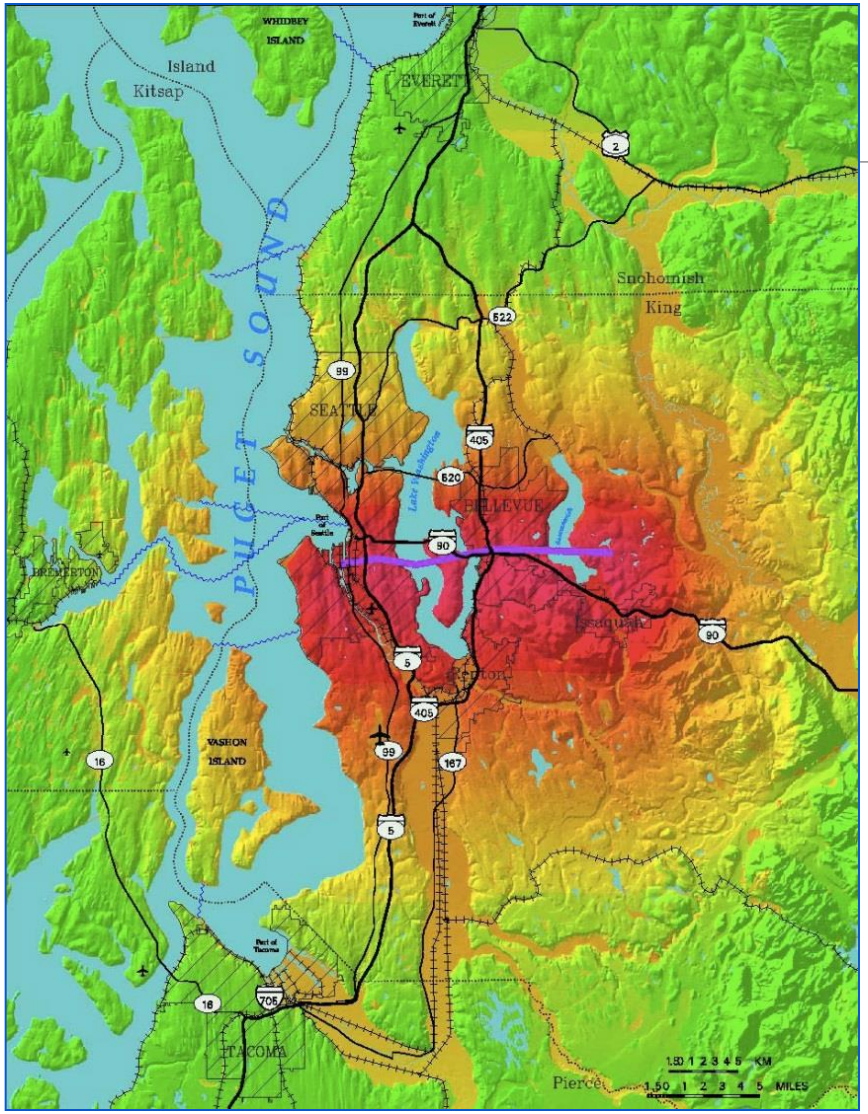
2001 NISQUALLY EQ

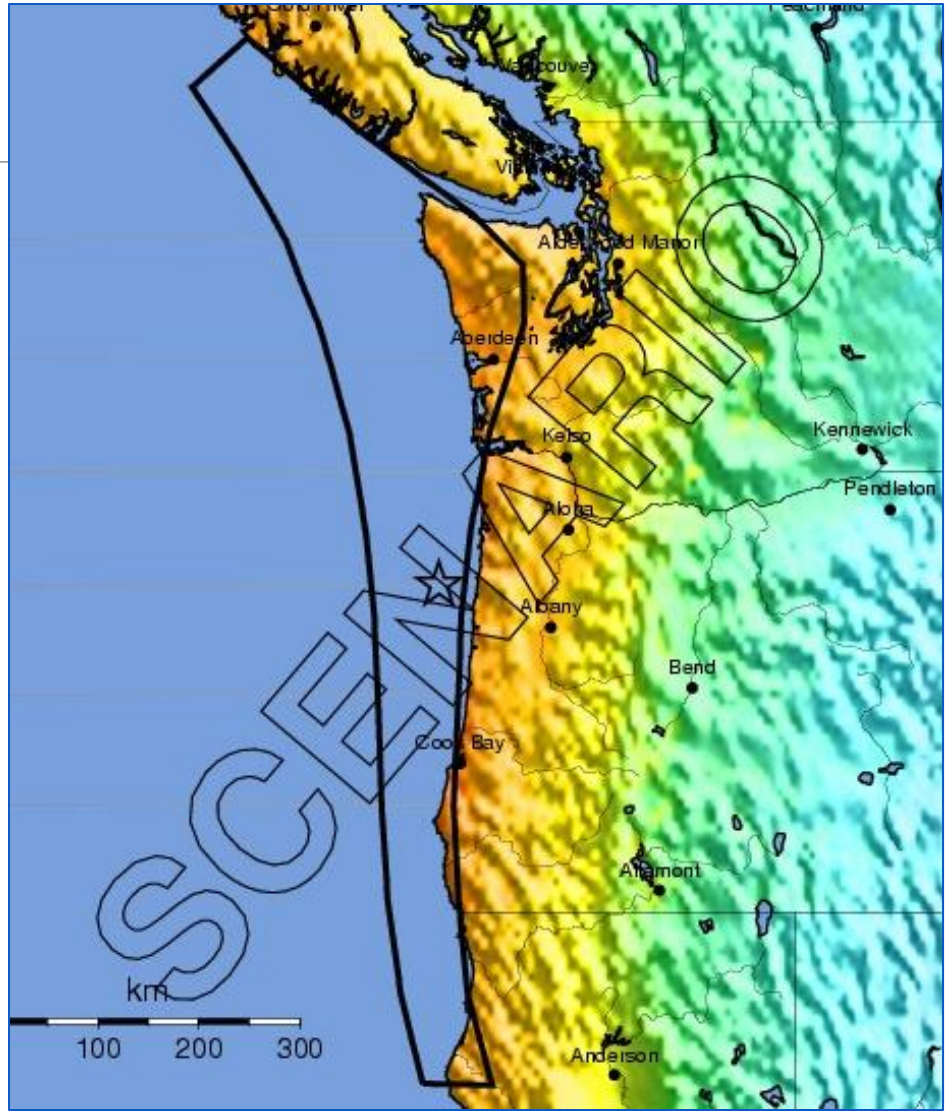


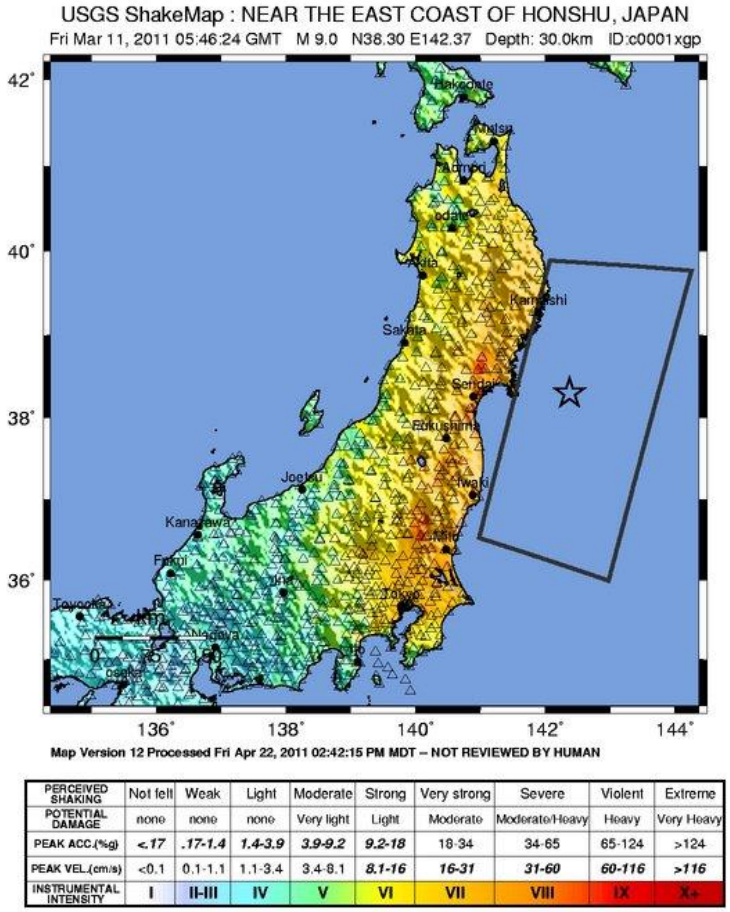
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

PERCEIVED SHAKING	Strong	Very strong	Severe
POTENTIAL DAMAGE	Light	Moderate	Moderate/Heavy
PEAK ACC.(%g)	***9.2-18***	18-34	34-65
PEAK VEL.(cm/s)	8.1-16	***16-31***	***31-60***
INSTRUMENTAL INTENSITY	**VI**	**VII**	**VIII**

LOCAL EARTHQUAKE SCENARIOS







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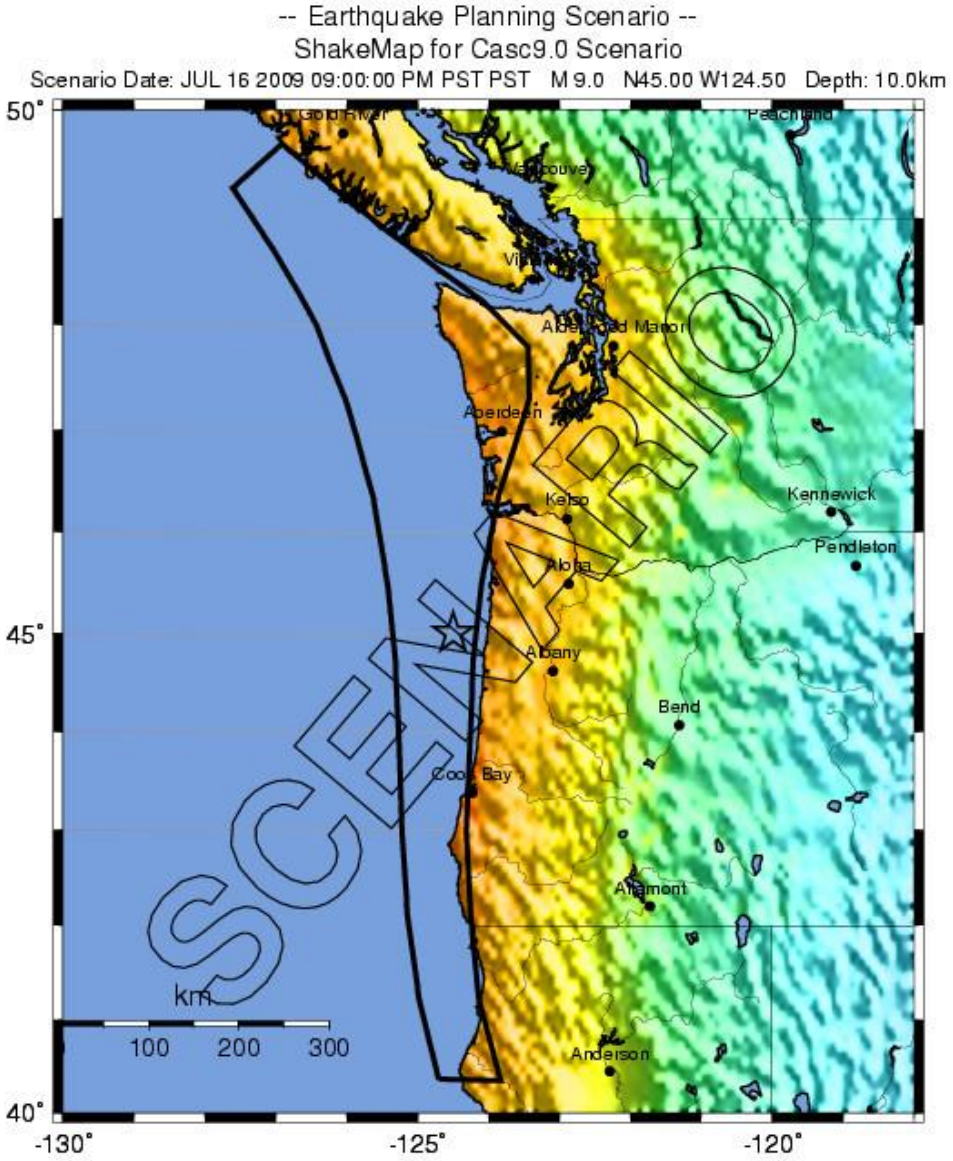
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Table 1. Closest Distance (in km) for Various Cities to Fault Rupture

Japan City	Distance to Fault Rupture (km)	Washington City	Distance to Expected CSZ Fault Rupture (km)
Tokyo	150	Bellingham	153
Chiba	138	Seattle	112
Utsunomiya	111	Tacoma	104
Fukushima	90	Vancouver	91
Morioka	87	Olympia	71
Sendai	75	Port Angeles	56
Iwaki	50	Aberdeen	20



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INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

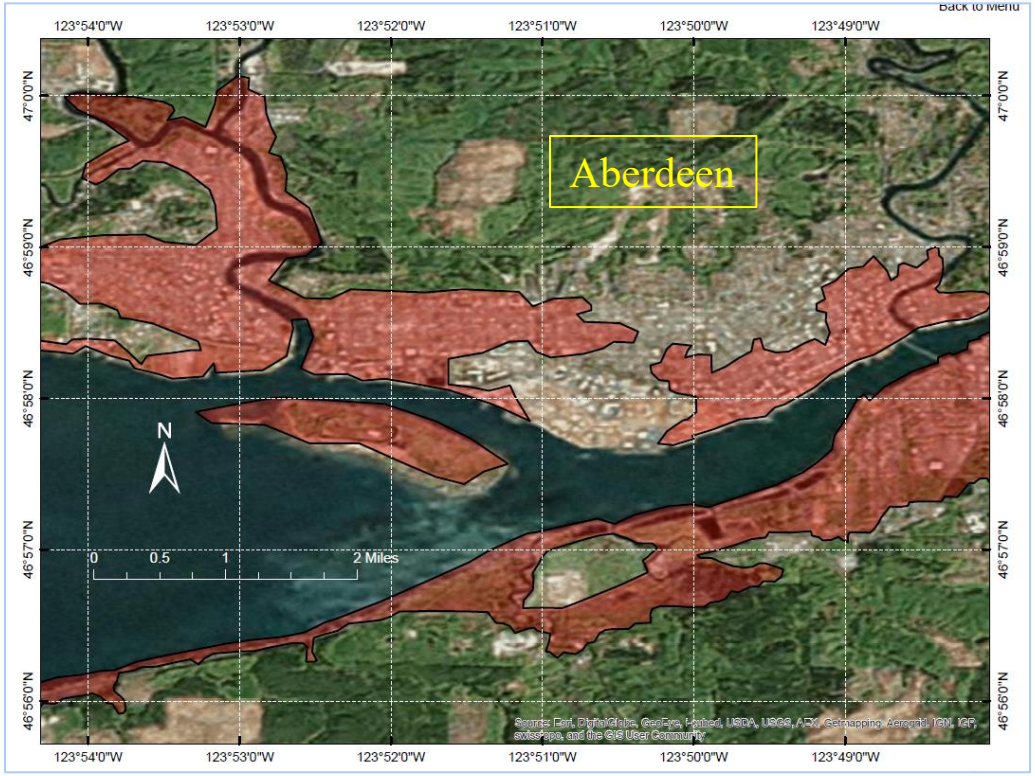
TSUNAMIS

Possibly an issue for southern Puget Sound in Tacoma or Seattle Fault event

Major issue on coast, northern Puget Sound in Cascadia subduction event

TSUNAMIS

Optional tsunami-resistant design provisions in ASCE 7-16 (2018 IBC)



FIELD SAFETY

FIELD SAFETY

- Travel in teams of two
  - Watch for stress symptoms
- Wear a hard hat
- Survey building before entering
- Enter only if safe
- Avoid hazardous materials

FIELD SAFETY (CONT.)

Use safety equipment

Be alert for falling objects

In case of fire, evacuate area and alert fire department

Avoid downed power lines

Report gas leaks

Take care of yourself (eat, sleep, take breaks, pace yourself)

US&R MARKING SYSTEM

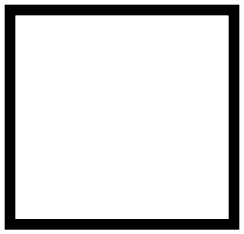
US&R/USAR teams generally on site before BSA teams

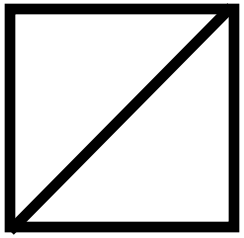
BSA Evaluators may encounter markings on buildings

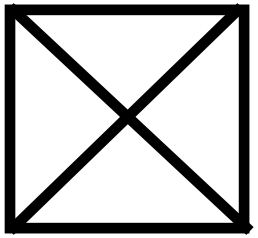
Understanding the markings

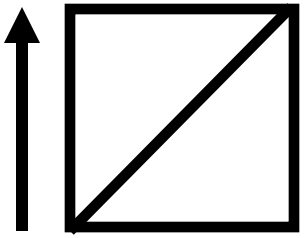
BSA Evaluators are not to mark the buildings

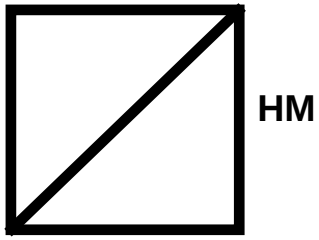
STRUCTURE/HAZARDS MARKS

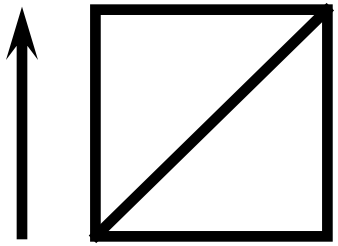






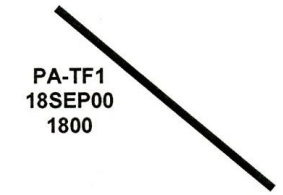




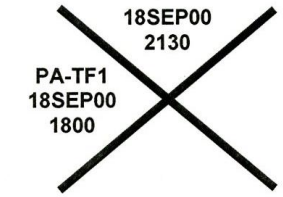


15JUN92
HM NATURAL GAS
OR-1

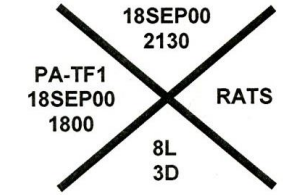
FEMA SEARCH ASSESSMENT MARKING



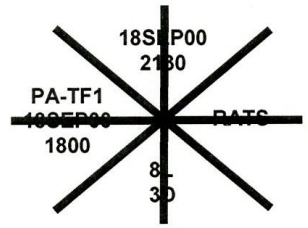
- Single slash upon entry into structure
- TF ID, date & entry time noted
- Indicates ongoing search



- Crossing slash upon exit
- Upon exit, date and time noted in top field
- Additional information placed in open areas of "X"

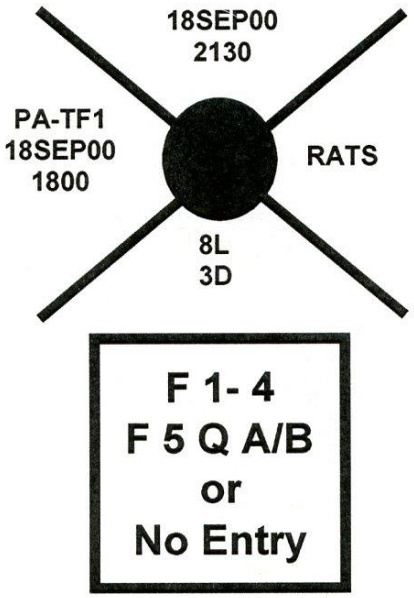


- Right - hazards
- Bottom - # of victims



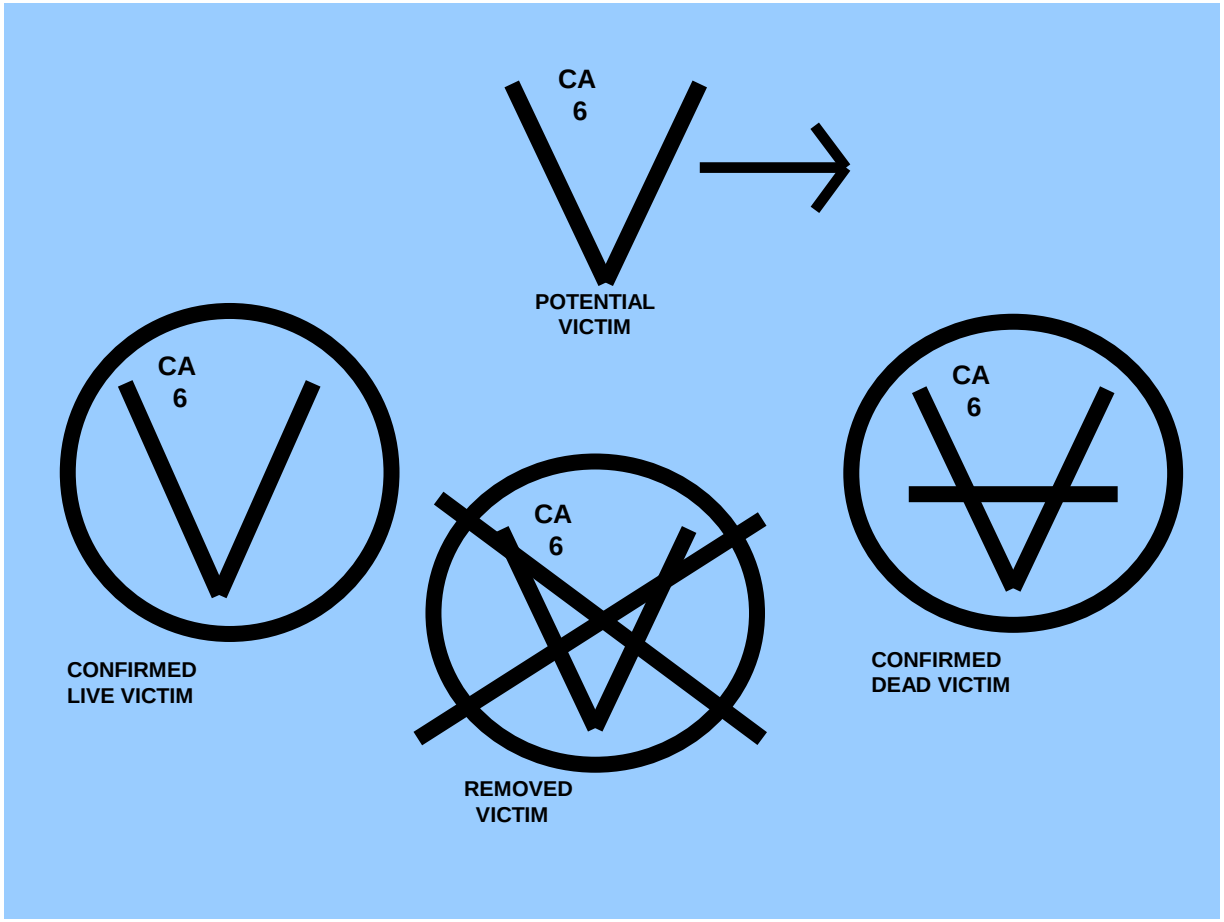
- When new search completed, cross out previous, and complete new search assessment marking

FEMA SEARCH ASSESSMENT MARKING (INCOMPLETE SEARCH)



- When search terminated prior to completion:
  - Place filled circle at center of slash
  - Add date & time search terminated in top field
  - Note hazards to right
  - Note victims beneath
  - Place box below slash, & Note areas searched
    - Use "F" to ID floors searched
    - Use "Q" to ID quadrants searched
  - If only searched Exterior, as in Hurricane, write "No Entry" in box

VICTIM LOCATION MARKING



POSTING SYSTEM

PRINCIPAL SAFETY CONCERNS

Collapse

Falling hazards

Other hazards

BASIC APPROACH

Right to evaluate

Observe expected damage

Quickly assess unexpected damage

Methodically evaluate structure

- Assume that significant aftershocks will occur, depending on EQ mechanism (if known)

Utilize checklists and safety criteria

Exercise judgment in assessing risks from damage

Communicate risks to public with posting system

Collect and report damage data to jurisdiction

JUDGMENT IN ASSESSING RISK FROM OBSERVED DAMAGE

Amount of risk is not always proportional to amount of damage

Structural aspects of assessing risk from damage

- Redundancy
- Brittleness and Ductility

EVALUATION PROCEDURES

1. Survey of the building exterior.
2. Examine the site for geotechnical hazards.
3. Evaluate structural system from inside building.
4. Evaluate for nonstructural hazards.
5. Evaluate for other hazards.
6. Complete forms and post building.

    Optional (check with jurisdiction): Make notes for possession retrieval access (exits, corridors, stairways)

POSTING SHOULD

Be timely

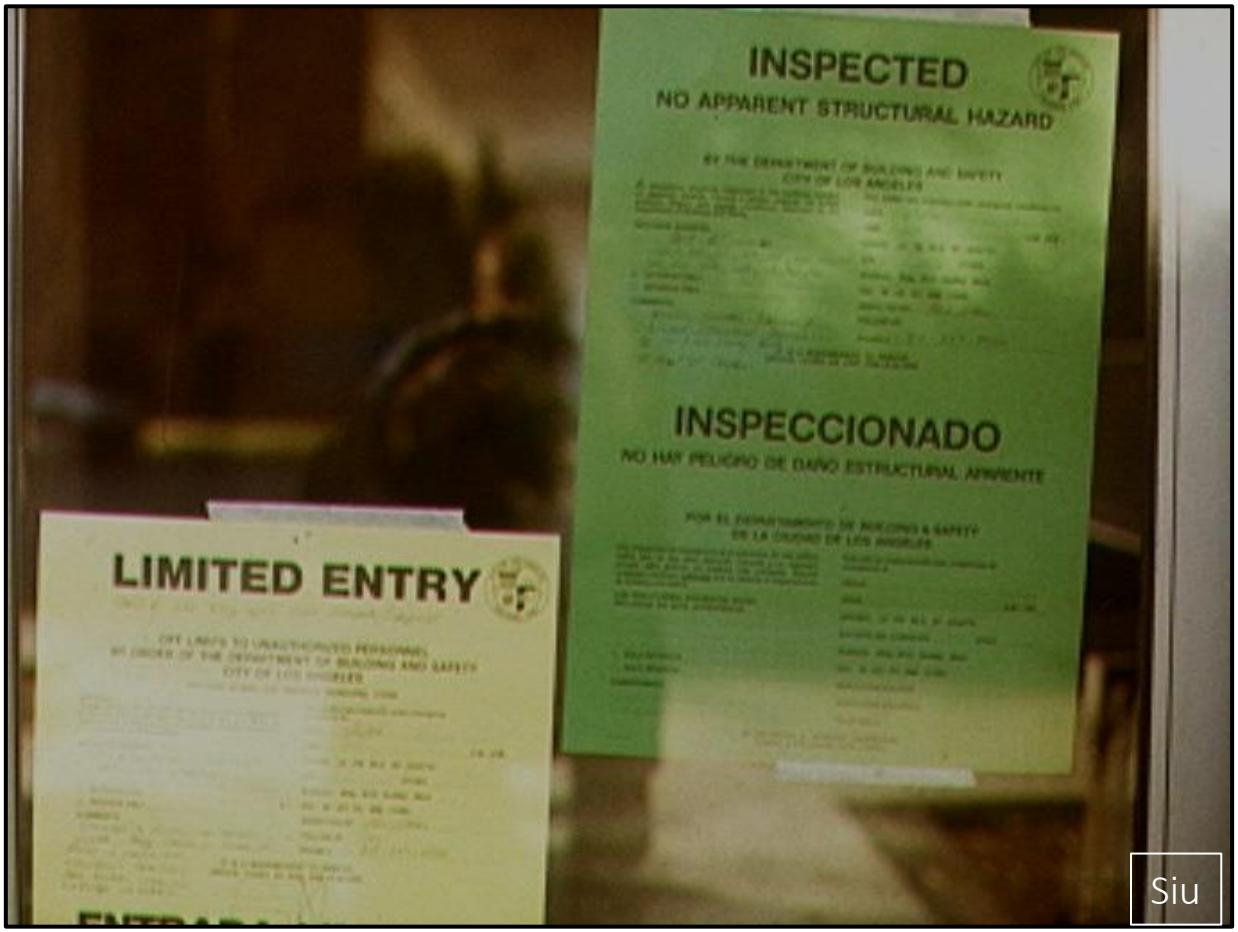
Be consistent

Be visible

Be clear

- Who's the audience?

IS THIS CLEAR?



POSTING SYSTEM

INSPECTED/NO APPARENT HAZARD (Green): Appears safe for occupancy, unrestricted use or entry allowed

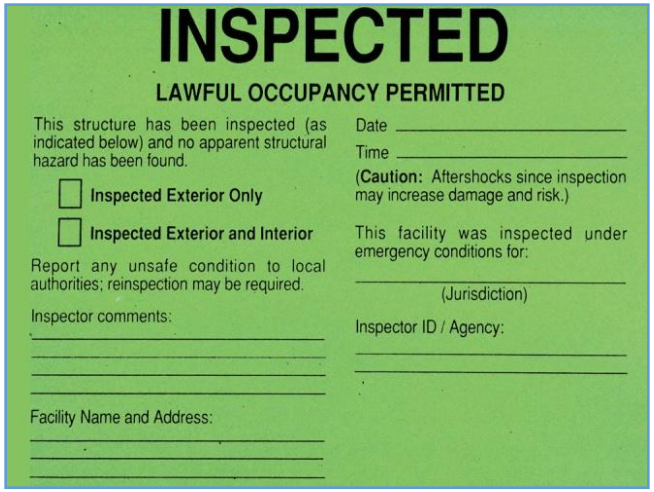
RESTRICTED USE/LIMITED ENTRY (Yellow): Some restriction/limitation on use or entry

UNSAFE (Red): Entry not allowed

INSPECTED/NO APPARENT HAZARD

Observed damage, if any, does not appear to pose a safety risk

Unlimited entry, occupancy, and use permitted



INSPECTED

LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

☐ **Inspected Exterior Only**

☐ **Inspected Exterior and Interior**

Report any unsafe condition to local authorities; reinspection may be required.

Inspector comments:

Facility Name and Address:

Date

Time

(**Caution:** Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

(Jurisdiction)

Inspector ID / Agency:

INSPECTED/NO APPARENT HAZARD

- Original vertical-load or lateral-load carrying capacity not significantly decreased, no potential instabilities
- No falling or other life-safety risks
- No evidence of significant foundation damage, uplifiting, erosion, or ground displacement
- Main exits operable and accessible
- No other apparent unsafe condition

INSPECTED

LIMITED ENTRY/RESTRICTED USE

Some risk from damage in all or part of building

Restricted

- duration of occupancy
- areas of occupancy
- usage

Restrictions enforced by owner / manager

LIMITED ENTRY/RESTRICTED USE

Safety issues can only be resolved by removal of architectural elements or by an Engineering Evaluation

Cladding damage may result in further damage

Interior finishes or ceilings…may lead to falling hazards or air quality issues

LIMITED ENTRY/RESTRICTED USE

- Possibility of further damage due to foundation conditions & occupant load
- Possible presence of other risks (toxic materials release, etc.)
- Portion of the building cannot be safely occupied

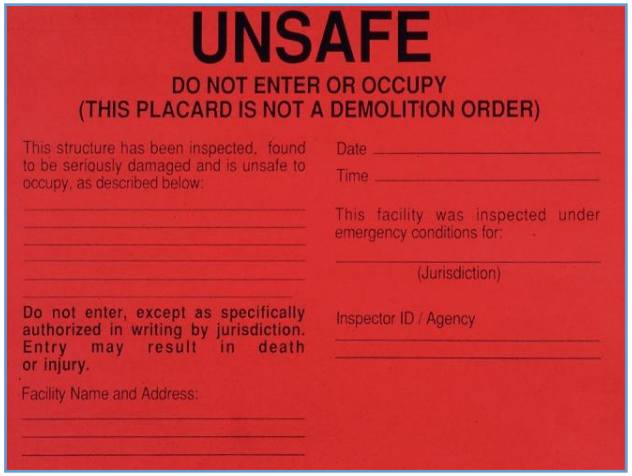
LIMITED ENTRY/RESTRICTED USE

UNSAFE

Falling, collapse, or other hazard

Does not necessarily indicate that demolition is required

Owner must mitigate hazards to satisfaction of jurisdiction to gain entry



UNSAFE

Obvious safety risks are present

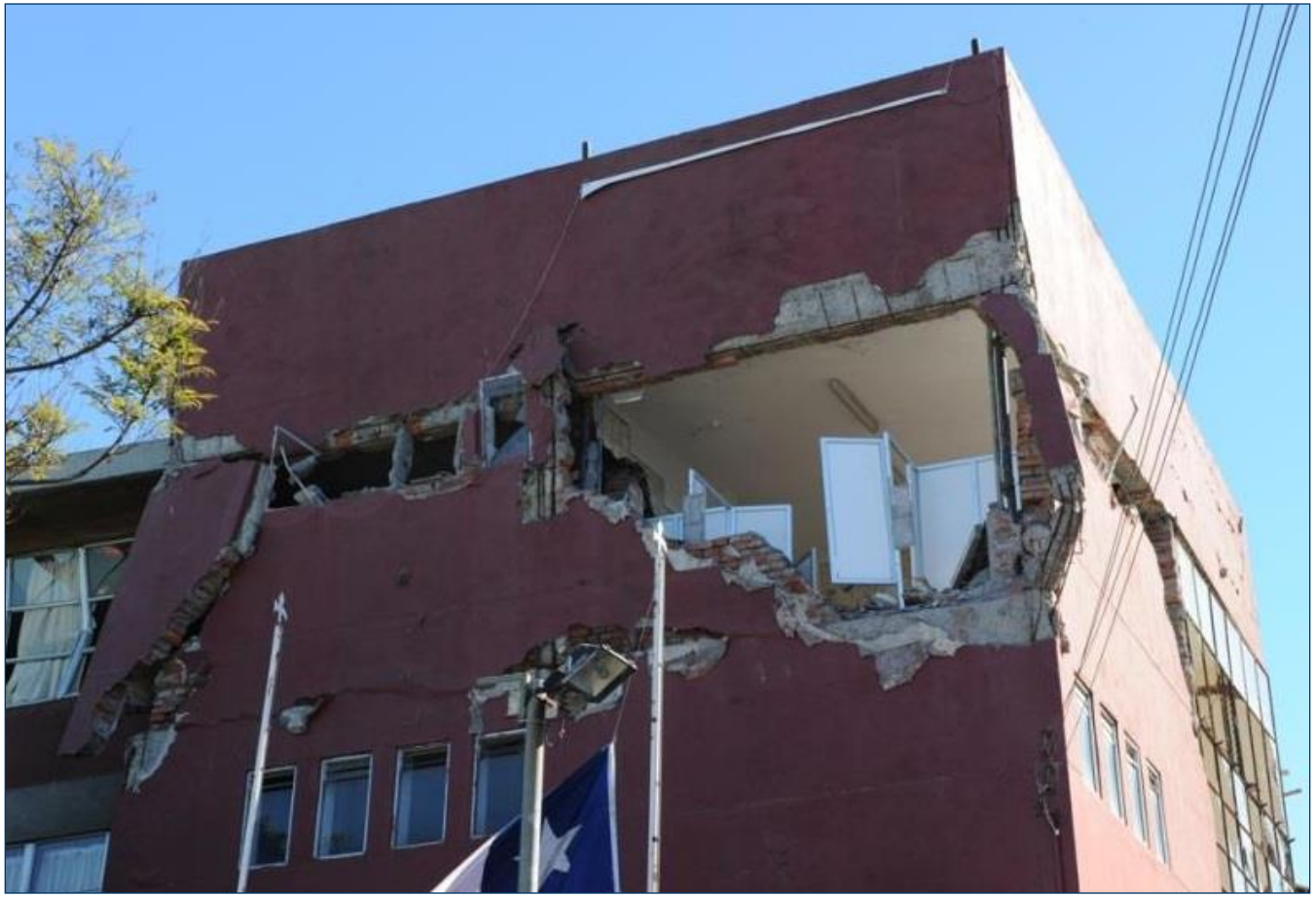
Structure is believed to be in danger of collapse from static conditions, subsequent events, or addition of occupant loads

Another unsafe condition is present

UNSAFE

UNSAFE

UNSAFE



NOTES ON POSTING

Consider earthquake mechanism

- Large aftershocks very unlikely in deep event (i.e. Nisqually)
- Aftershocks likely in subduction or shallow fault events (i.e. Cascadia & Seattle Fault)

Consider if other hazards or political issues are greater

NOTES ON POSTING (fr. ATC-45)

"There is a benefit to the community if a building can safely be posted Restricted Use instead of Unsafe."

"It is important that posting decisions be carefully considered, particularly those that will displace individuals and businesses."

"Unnecessarily conservative postings must be avoided"

CHANGING A POSTING

Correct oversight or mistake in judgment

Significant aftershock

Engineered reevaluation and repair

POLITICS OF RESPONSE

“THE LOMA PRIETA QUAKE: WHAT ONE CITY LEARNED”

Richard C. Wilson
City Manager
Santa Cruz,
California

Published by
International City/County Management Association

"THE LOMA PRIETA QUAKE: WHAT ONE CITY LEARNED"

"The city was … under enormous pressure to provide access to damaged buildings."

"Residents wanted to remove … valued personal belongings … cash and essential documents."

"Business owners wanted to remove inventory … computers … files."

"At each afternoon's city council meeting they pleaded for access."

"We had to decide whether to err on the side of access or safety. The needs for access were urgent and compelling, but the dangers were real and manifest."

"THE LOMA PRIETA QUAKE: WHAT ONE CITY LEARNED"

"Many of the occupants of even the three most seriously damaged buildings were more than prepared to risk their lives to remove contents."

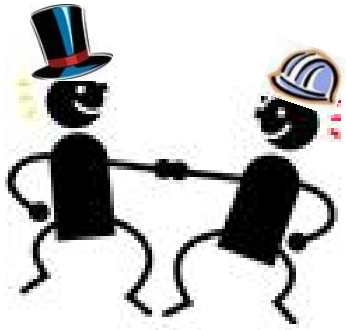
"Final decisions about access of course fell to me."

WABO/SEAW WHITE PAPER 5-2009

WABO/SEAW Liaison Committee Washington Association of Building Officials & Structural Engineers Association of Washington	**WHITE PAPER 5-2009**

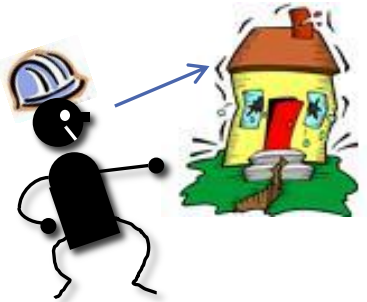
Title: Guideline –Post-Disaster Contract Safety Evaluations	**Date: March 10, 2011**
Abstract: In the event of a natural disaster, this white paper is intended to establish standard processes by which engineering firms may provide building safety evaluations under contract to a building owner, and would provide notification to the local building official of the results.	**Committee Members:** *Mark D'Amato (SEAW, co-chair)* *Chris Ricketts (WABO, co-chair)* *Jerry Barbera (WABO/SEAW)* *Rick Fine (SEAW)* *Charlie Griffes (SEAW)* *Larry Lindell (SEAW)* *Jon Siu (WABO)* *Dan Sully (WABO)*

WABO/SEAW WHITE PAPER 5-2009

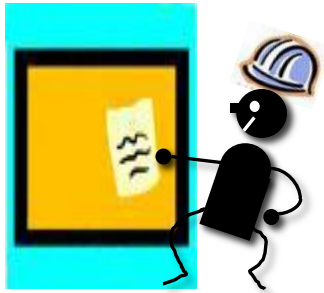


1. Contract (Owner/Professional) /agreement (Owner/Jurisdiction)

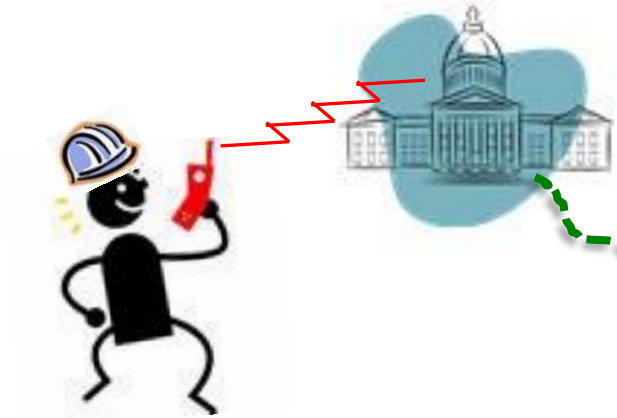
2. Event



3. Professional ATC-20 eval



4. Professional Posts Advisory Placard



5. Professional Notifies Jurisdiction

6. Jurisdiction Posts Official Placard

WASAFE AND VOLUNTEER DEPLOYMENT

WAsafe and Volunteer Deployment

WAsafe Overview

Concept of Operations in WA

- Incident Command System (ICS)
- Activation and Deployment of WAsafe Volunteers
- Roles of WAsafe Volunteers and Local Government

Washington Law – Emergency Management Worker Program, Good Samaritan Law, Workman's Comp

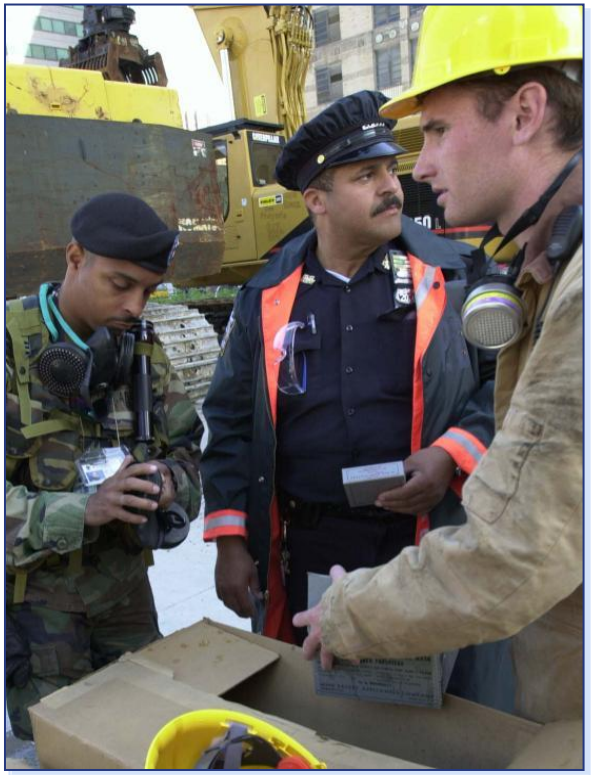
Enrolling in WAsafe (WAserv)

Interstate Operations - EMAC

Overview: What is WAsafe?

WASAFE

Washington State Safety Assessment Facility Evaluators



Washington State Department of Health

WABO

aia seattle

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

SEA STRUCTURAL ENGINEERS ASSOCIATION WASHINGTON DISASTER RESPONSE

Who is WAsafe?

Coalition formed in 2015

- Washington Chapter, American Institute of Architects (AIA Washington)
- Structural Engineers Association of Washington (SEAW)
- Washington Association of Building Officials (WABO)
- American Society of Civil Engineers (ASCE) Seattle Section (2019)

With key assistance from the Washington State Department of Health (DOH) – providing the WAserv registry

WAsafe Objectives

- Assist building officials with building safety assessments following a disaster (earthquake, flood, storm, etc.)
- Develop a group of qualified volunteers
  - Provide WAsafe BSA training
  - Include information on authority, liability & field safety
  - Maintain registry of volunteers
- Assist WA State EMD in calling up and dispatching volunteers to where they are needed in large events
  - Share resources

WAsafe Program Focus

Reoccupy safe buildings

Guidance Documents

ATC-20-1 (2005): Earthquakes

ATC-45 (2004): Floods, Windstorms

WAsafe Capabilities

Volunteer enrollment managed by WAsafe member orgs

Response/deployment managed by WA State Emergency Management Division (EMD)

Multi-Hazard

WAsafe Volunteers – Desired Qualifications

- General knowledge of construction
- Professional experience
- Broad building review capability
- Good judgment

WAsafe Resources - Types and Qualifications

Type	Duties/Limitations	Minimum Qualifications
1	• Structural evaluation only: All buildings, including: Multi-family and commercial structures over 5 stories and complex structures	• Registered civil or structural engineer with structural specialty • WAsafe BSA or CalOES SAP training with WAsafe-specific module
2	a. Non-structural evaluation: all single family residential, multi-family and commercial buildings b. Structural evaluation: single family residential, multi-family and commercial buildings up to 5 stories with non-complex structural systems	• Certified Building Plans Examiner, Commercial Building Inspector, Building Inspector, Certified Building Official, or Registered Architect • WAsafe BSA or CalOES SAP training with WAsafe-specific module

WAsafe Resources – Types and Qualifications (cont.)

Type	Duties/Limitations	Minimum Qualifications
3	• Wood-framed, multi-family and commercial structures up to 3 stories	• Certified Residential Building Plans Examiner or Residential Building Inspector • WAsafe BSA or CalOES SAP training with WAsafe-specific module
4	• Single family residences and associated accessory structures	• Any ICC Certification • WAsafe BSA or CalOES SAP training with WAsafe-specific module
5	• As assigned by IC	• EITs, Unlicensed Architects, Permit Technicians • Relevant Experience • WAsafe BSA or CalOES SAP training with WAsafe-specific module

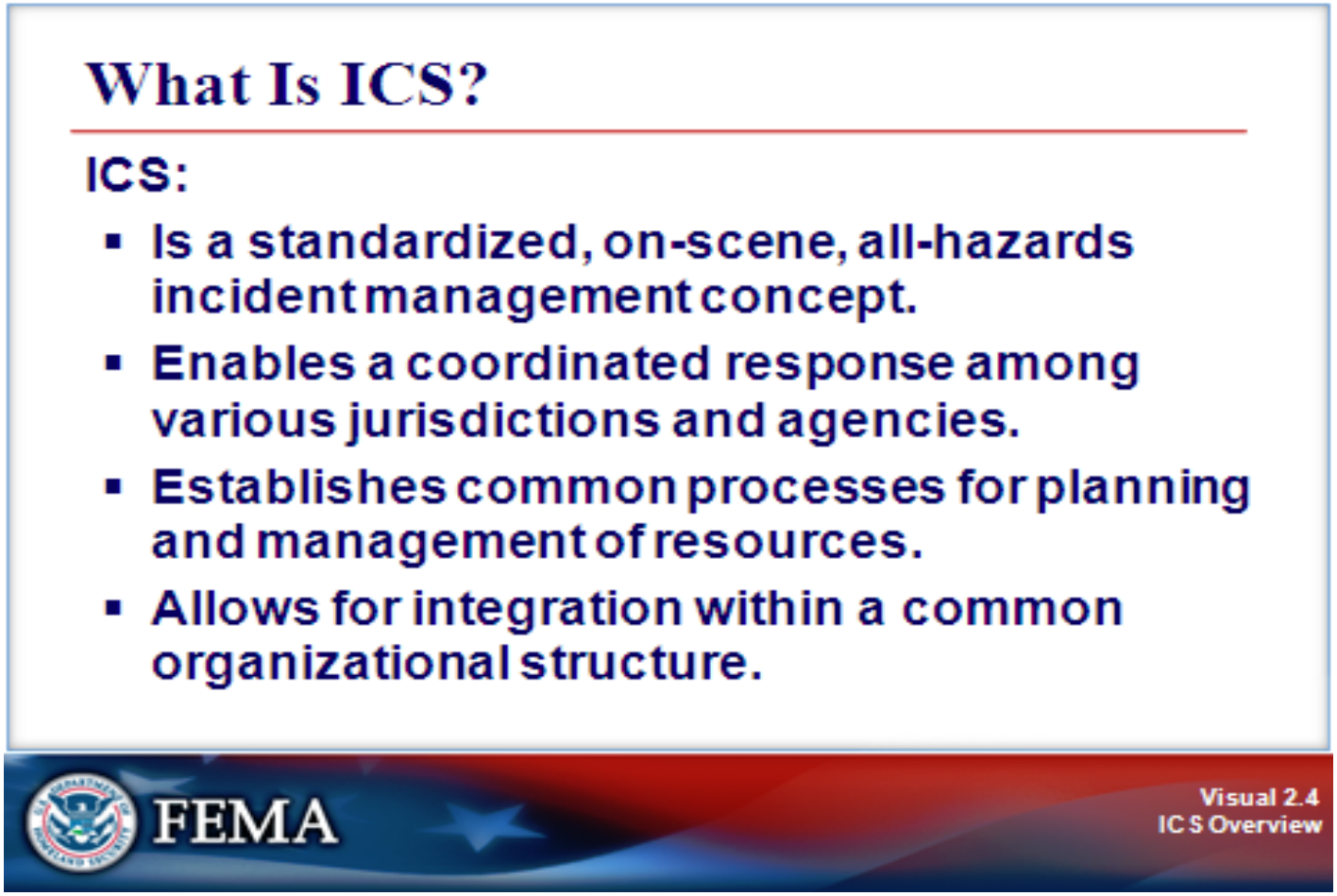
Concept of Operations

Emergency Response Hierarchy

Local Government is always in charge in emergency response.

- Upper levels supply aid to local level
- Hierarchy established by the ***Incident Command System (ICS)*****, *a standardized, all-hazards incident management concept.***

WAsafe – part of a larger system

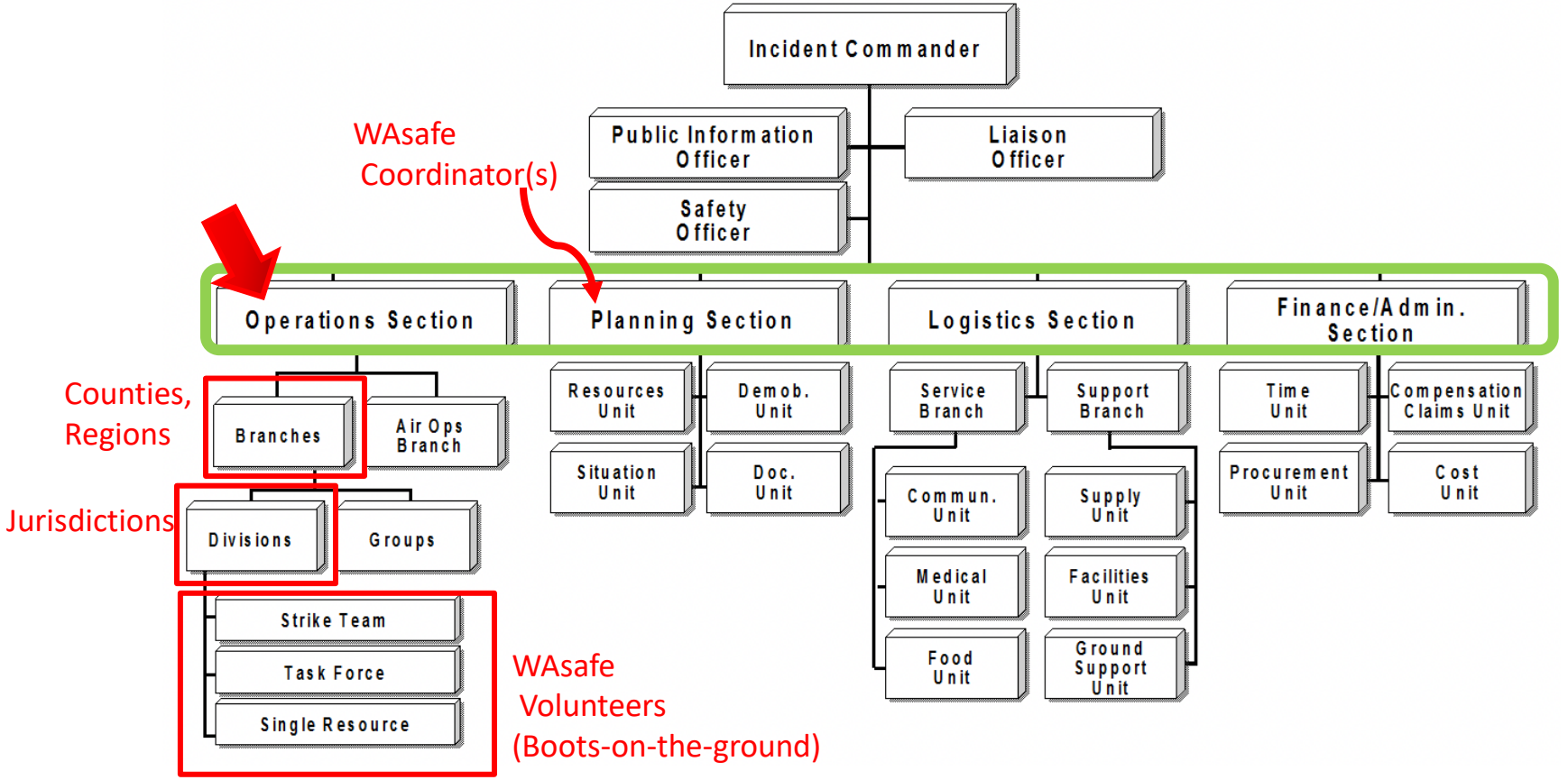


WAsafe – part of a larger system

Other responders:

- Red Cross
- Insurance companies
- Media
- FEMA
- Small Business Administration
- Fire Fighters
- Medical personnel
- Haz Mat teams
- Law Enforcement
- Utility workers

ICS Organization Chart



FEMA IS-Trainings

Independent Study (IS), Online, Free https://training.fema.gov/is/

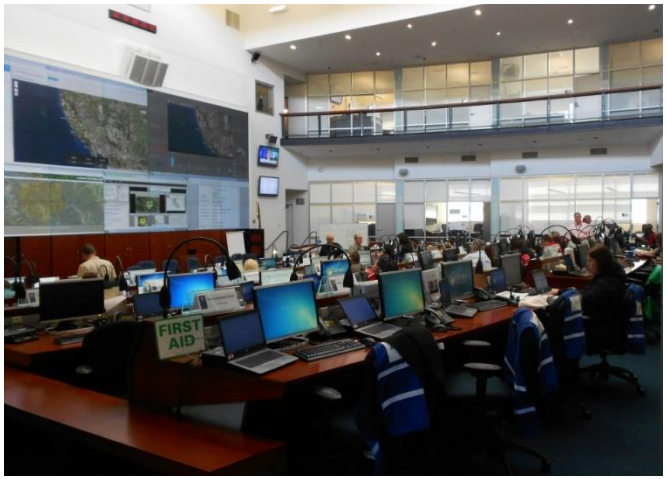
Recommended in for WAsafe Volunteers (Boots-on-the-Ground); Required for NIMS "Post-Disaster Building Safety Evaluator"

X	X	IS-100	Introduction to the Incident Command System (2 hours)
X		IS-200	ICS for Single Resources and Initial Action Incidents (3 hours)
	X	IS-230	Fundamentals of Emergency Management (6 hours)
X	X	IS-700	An Introduction to the National Incident Management System (NIMS) (3.5 hours)
X		IS-800	National Response Framework, An Introduction (3 hours)

Required for WAsafe Coordinators

WAsafe Activation

1. Event triggers local response
   a. Includes mutual aid agreements
2. Local building official requests additional resources through local EOC
3. Local EOC sends request to County
4. County cannot fulfill request => forward request to State
5. A Mission Number is assigned by the State
6. State initiates contact with WAsafe Coordinators



WAsafe Regions in Washington

WAsafe Volunteer Expectations

State EOC asks WAsafe volunteers to report to staging area

On first day:

- Report to staging area (local EOC or building department)
- Register as Temporary Emergency Worker
- Receive briefing instructions and refresher
- Deputized by building official

WAsafe Volunteer Expectations

Each day (until assignment is done):

- Report to staging area (local EOC or building department)
- Sign in
- Receive assignments
- Follow guidance of jurisdiction while in field
- At the end of the day
  - Report to staging area to review assessment forms with jurisdiction
  - Sign out

WAsafe – Deputizing

- Non-jurisdiction personnel cannot post official jurisdiction placards unless deputized

WAsafe Volunteer's Role

Provide Rapid Evaluation of Buildings

Provide Detailed Evaluations as directed by the local jurisdiction

WAsafe Volunteer's Role

Do NOT provide COST estimates

- DO provide % DAMAGE estimates, if required by jurisdiction

Do NOT evaluate compliance of grandfathered conditions to current code

Do NOT provide escort or property retrieval services

Do NOT leave business cards

Local Government Role

Provide jurisdictional contact

Issue local placards

Deputize WAsafe volunteers

Coordinate WAsafe volunteer activities

Local Government Role

Briefing information

- Key contact information for Building Official, law enforcement, fire, haz mat, utilities, and animal control
- Relevant local policies

Lodging & Meals information

Ensure necessary authorization exists to allow WAsafe work

Provide EMD with Disaster Data if requested

WA State Law

WA Emergency Worker Program

Is an emergency management program established and regulated by state law.

State coverage:

- Immunity from liability (“Good Samaritan”), and
- Injury/Damage to Individual (Workman’s Comp)

Must be a **registered** Emergency Worker.

Emergency Worker training and employment must be approved by the WA EMD.

WA Emergency Worker Program

Legal Foundation

- RCW 38.52 – Emergency Management Act (Authority)
- WAC 118-04 – Emergency Worker Program (Rules)

  http://www.leg.wa.gov/CodeReviser

WA Emergency Management Department (EMD) directed to establish the Emergency Worker Program (RCW 38.52.310)

Liability Protection by the State (RCW 38.52.180) aka "Good Samaritan Law"

WA Emergency Worker Registration (WAC 118-04-080)

Government employees – Covered!

Considered as registered with local OEM if within own jurisdiction;

Outside their jurisdiction:

- Acting under a Mutual Aid agreement; or
- Deployed by State EMD (through WAsafe)

WA Emergency Worker Registration (WAC 118-04-080)

Volunteers

Temporary registration under a Mission Number issued by the WA EMD

Commandeered / Impressment as citizens after Governor's proclamation of disaster

"Permanent" registration may be possible through local Emergency Operations Center (EOC)

- City, County
- Each jurisdiction is different. (Evolving.)

WA Emergency Worker Registration and Building Safety Assessment

Members of a Community Emergency Response Team (CERT) or any other volunteer group which is not registered with a City, County or State emergency management organization are NOT emergency workers as defined in RCW 38.52.010(7)

WAsafe – Reimbursements

Housing, Meals, Travel, and other necessary expenses may or may not be reimbursed by requesting agency.

Volunteers must be on their own time (e.g., vacation).

Mutual Aid requires NO Expectation of Pay for the Providing Resources.

WAsafe – Reimbursements

Public employees may be reimbursed by the requesting jurisdictions

Safety assessment activities are currently eligible for state & federal disaster grants; damage assessment is not.

Signing up with WAsafe

WAsafe – Enrollment

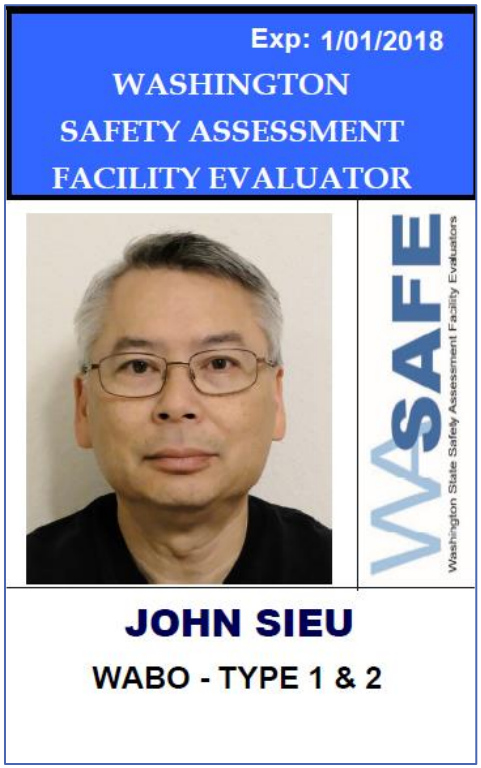
Associated with a Professional Organization (WABO, SEAW, AIA, ASCE or “Other”); and

Meet minimum qualifications

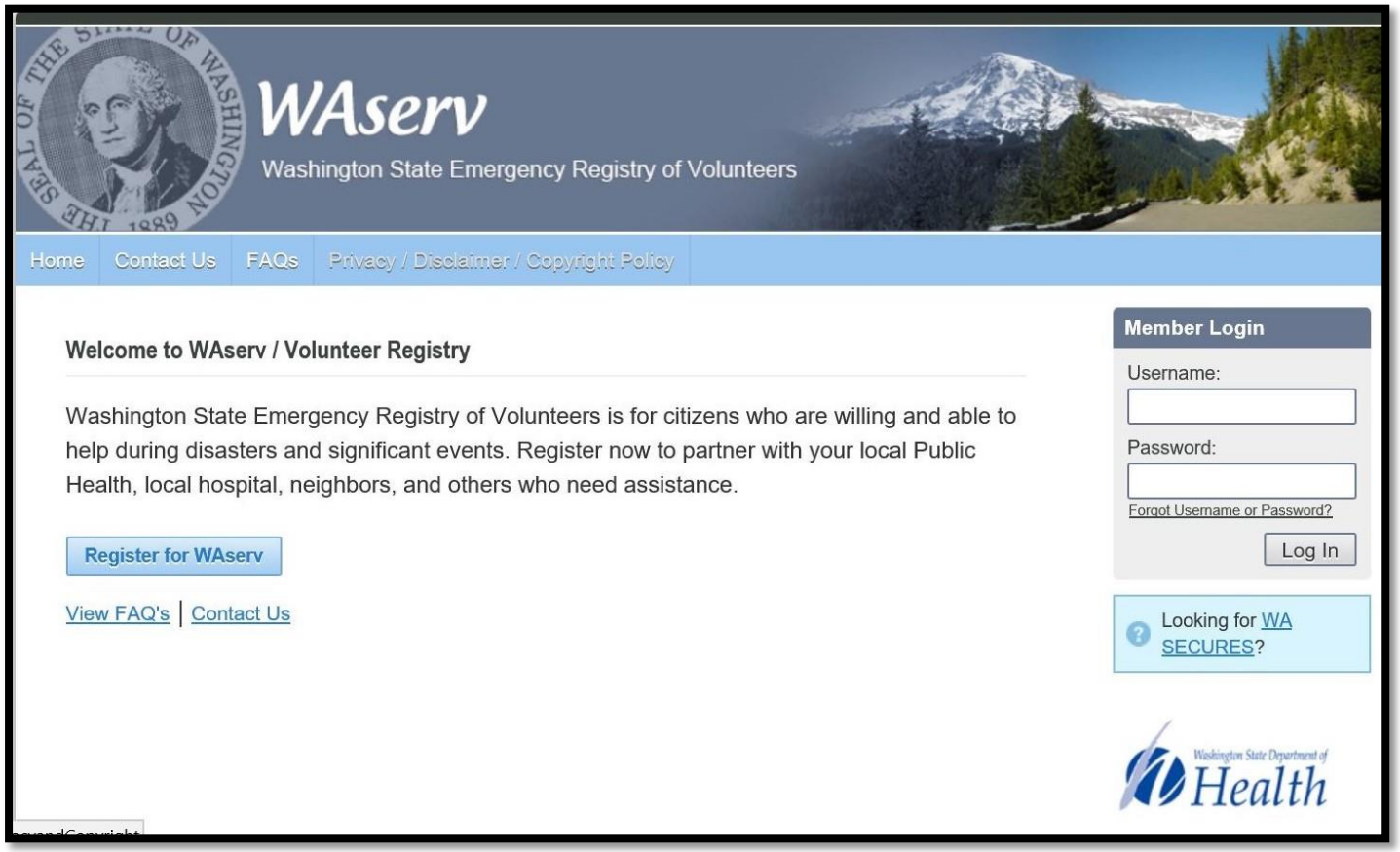
Approved one-day standardized training by a WAsafe certified trainer

Digital picture & documentation

Enroll through WAserv



Join WAsafe at https://www.waserv.org/



WAsafe – Enrollment

- Validation and notification process
  - Non-affiliated volunteers by WABO
- Photo ID Badge
- ID number may be issued when registered as a volunteer with the **local jurisdiction** (ID number is for placards)
- Interactions with WA State EMD (EOC)
- Renewal process
  - Note: WAsafe will require refresher training every 5 years
- Refresher training

Interstate Emergency Management

(EMAC)

Emergency Management Assistance Compact (EMAC)

- State-to-state mutual aid agreement through which states can assist one another directly
- Most States are signatories to EMAC and can provide or receive aid
- Workers comp and immunity coverage is carried forward through EMAC, along with licenses

EMAC – Hurricane Katrina (2005)

Recap - WAsafe and Volunteer Deployment

WAsafe Overview

Concept of Operations in WA

- Incident Command System (ICS)
- Activation and Deployment of WAsafe Volunteers
- Roles of WAsafe Volunteers and Local Government

Washington Law – Emergency Management Worker Program, Good Samaritan Law, Workman's Comp

Enrolling in WAsafe (WAserv)

Interstate Operations - EMAC


WASAFE
Washington State Safety Assessment Facility Evaluators

Questions?

EVALUATION PROCEDURES

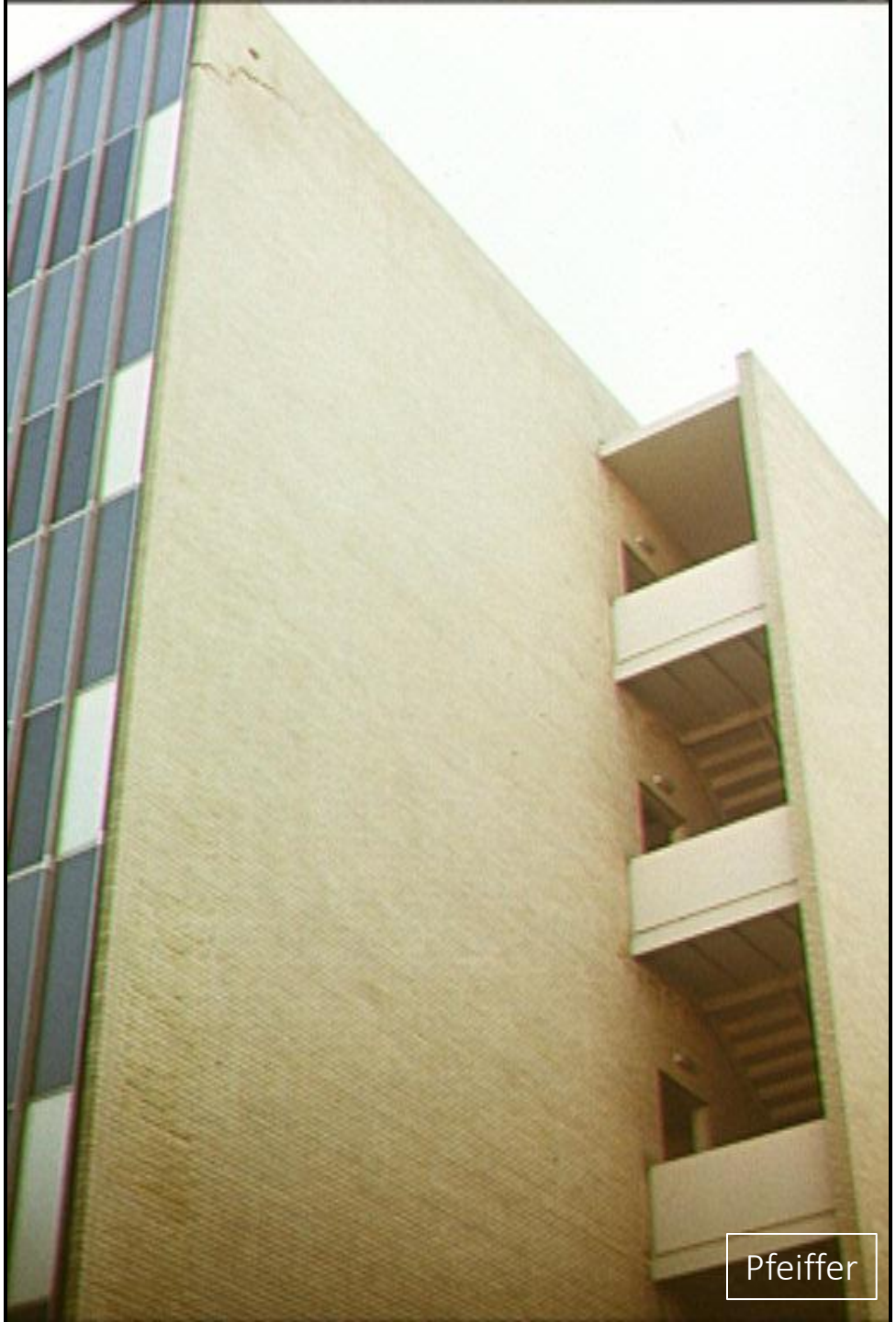
EVALUATION LEVELS

Windshield	–	Overall scope of damage
Rapid	**–**	**Assessment sufficient for most buildings**
Detailed	–	Closer assessment of difficult and essential buildings
Engineering	–	Consultant engaged by owner

EVALUATION STEPS

1. Examine entire outside of building
2. Examine ground for distress
3. Enter if safe and continue inspection
4. Discuss observations; evaluate by criteria
5. Tape off hazardous areas
6. Post building at all entrances
7. Inform occupants and management of hazards


Pfeiffer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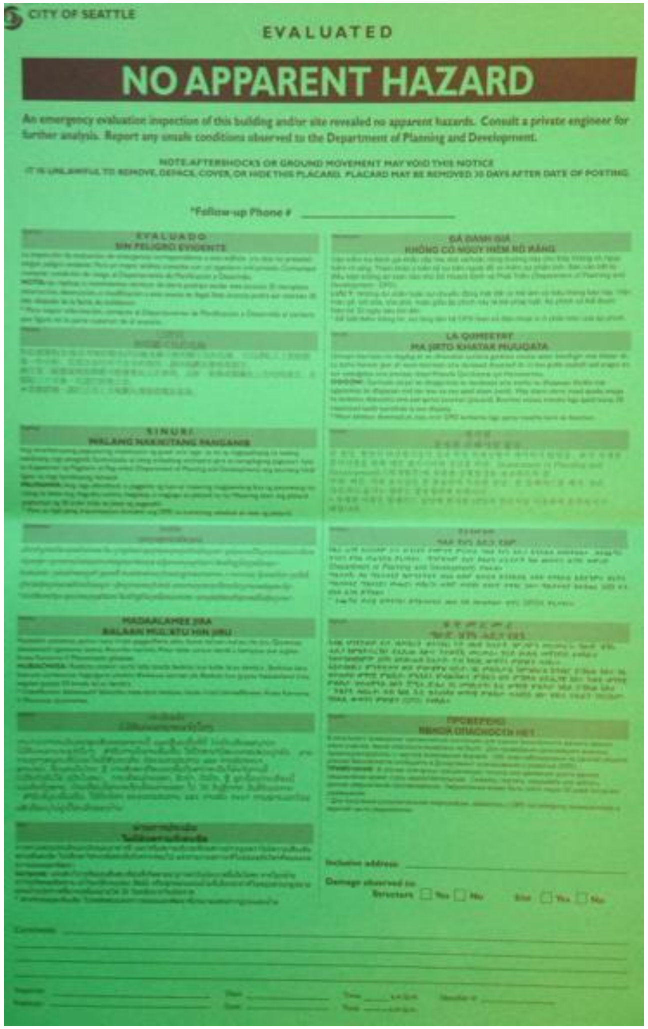
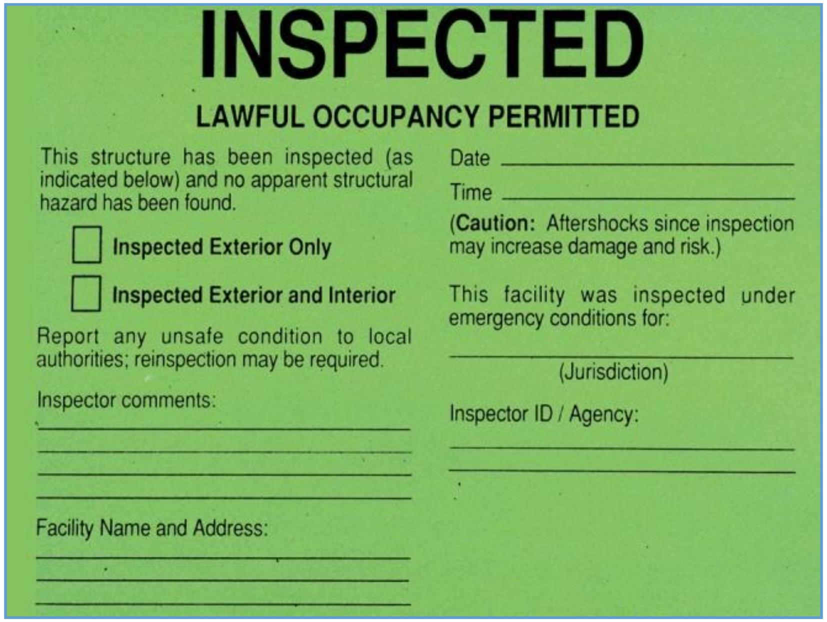




INSPECTED

LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

☐ **Inspected Exterior Only**

☐ **Inspected Exterior and Interior**

Report any unsafe condition to local authorities; reinspection may be required.

Inspector comments: ____________________

Facility Name and Address: ____________________

Date ____________________

Time ____________________

(**Caution:** Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

____
(Jurisdiction)

Inspector ID / Agency: ____________________

NO APPARENT HAZARD

OCCUPANCY PERMITTED

This structure has been evaluated (as indicated below) and no apparent structural hazard has been found.

☐ **Evaluated Exterior Only**
☐ **Evaluated Exterior and Interior**

Report any unsafe condition to local authorities; re-evaluation may be required.

Inspector Comments: ____________________

Facility Name and Address: ____________________

Owner contact information: ____________________

Evaluating firm contact information: ____________________

Date ___________ Time ___________

This facility was evaluated under emergency conditions for damage assessment.

This ADVISORY BUILDING EVALUATION TAG may be superseded by the placard of the authority having jurisdiction

DO NOT REMOVE, ALTER, OR COVER THIS PLACARD

CAUTION: AFTERSHOCKS AFTER THIS EVALUATION MAY INCREASE DAMAGE AND RISK.

INSPECTED

LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

☐ **Inspected Exterior Only**

☐ **Inspected Exterior and Interior**

Report any unsafe condition to local authorities; reinspection may be required.

Inspector comments:

_____

_____

_____

_____

Facility Name and Address:

_____

_____

_____

Date _____

Time _____

(**Caution:** Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

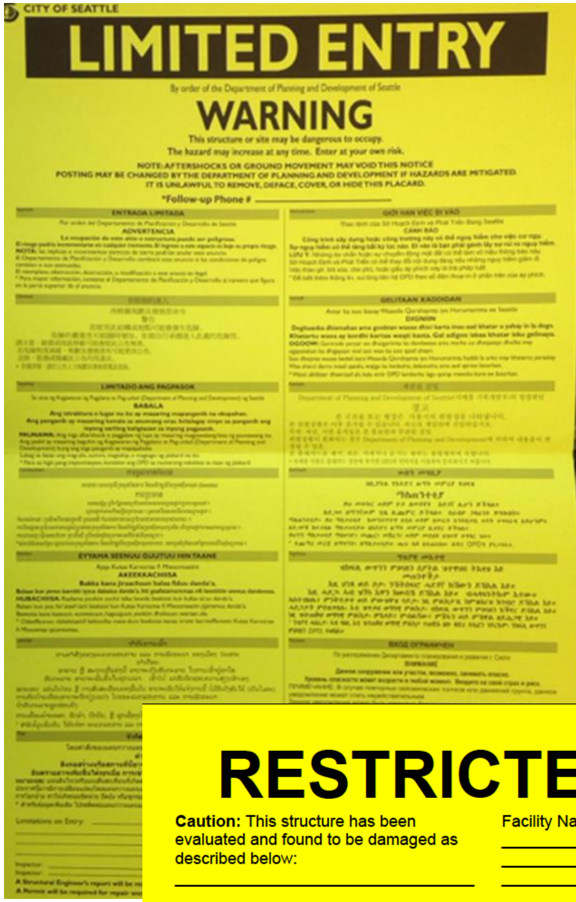
_____

(Jurisdiction)

Inspector ID / Agency:

_____

_____


CITY OF SEATTLE
LIMITED ENTRY
By order of the Department of Planning and Development of Seattle
WARNING
This structure or site may be dangerous to occupy.
The hazard may increase at any time. Enter at your own risk.
NOTE: AFTERSHOCKS OR GROUND MOVEMENT MAY VOID THIS NOTICE
POSTING MAY BE CHANGED BY THE DEPARTMENT OF PLANNING AND DEVELOPMENT IF HAZARDS ARE MITIGATED.
IT IS UNLAWFUL TO REMOVE, DEFACE, COVER, OR HIDE THIS PLACARD.
*Follow-up Phone #


RESTRICTED USE
Caution: This structure has been inspected and found to be damaged as described below:
Entry, occupancy, and lawful use are restricted as indicated below:
Do not enter the following areas:
Brief entry allowed for access to contents:
Other restrictions:
Facility name and address:
Date
Time
(Caution: Aftershocks since inspection may increase damage and risk.)
This facility was inspected under emergency conditions for:
(Jurisdiction)
Inspector ID / Agency
Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority


RESTRICTED USE
Caution: This structure has been evaluated and found to be damaged as described below:
Entry, occupancy, and use are restricted as indicated below, except as specifically authorized by the owner:
Do not enter the following areas:
Brief entry allowed for access to contents:
Other restrictions:
Facility Name and Address:
Owner contact information:
Evaluating firm contact information:
Date
Time
This facility was evaluated under emergency conditions for damage assessment.
This ADVISORY BUILDING EVALUATION TAG may be superseded by the placard of the authority having jurisdiction
DO NOT REMOVE, ALTER, OR COVER THIS PLACARD
CAUTION: AFTERSHOCKS AFTER THIS EVALUATION MAY INCREASE DAMAGE AND RISK.


LIMITED ENTRY
OFF LIMITS TO UNAUTHORIZED PERSONNEL
Warning:
This structure has been damaged and its safety is questionable. Enter only at own risk. Aftershocks or other events may result in death or injury.
Restrictions on use:
Entry for emergency purposes only
Other
Facility Name and Address
Date
Time
This facility was inspected under emergency conditions for
(Jurisdiction)
on the date and time noted
Inspector ID/Agency
Do Not Remove this Placard until Authorized by Governing Authority.

RESTRICTED USE

Caution: This structure has been inspected and found to be damaged as described below:

_____

_____

_____

_____

Entry, occupancy, and lawful use are restricted as indicated below:

☐ Do not enter the following areas: _____

_____

☐ Brief entry allowed for access to contents: _____

_____

☐ Other restrictions: _____

_____

Facility name and address:

_____

_____

_____

Date _____

Time _____

(**Caution:** Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for:

_____

(Jurisdiction)

Inspector ID / Agency

_____

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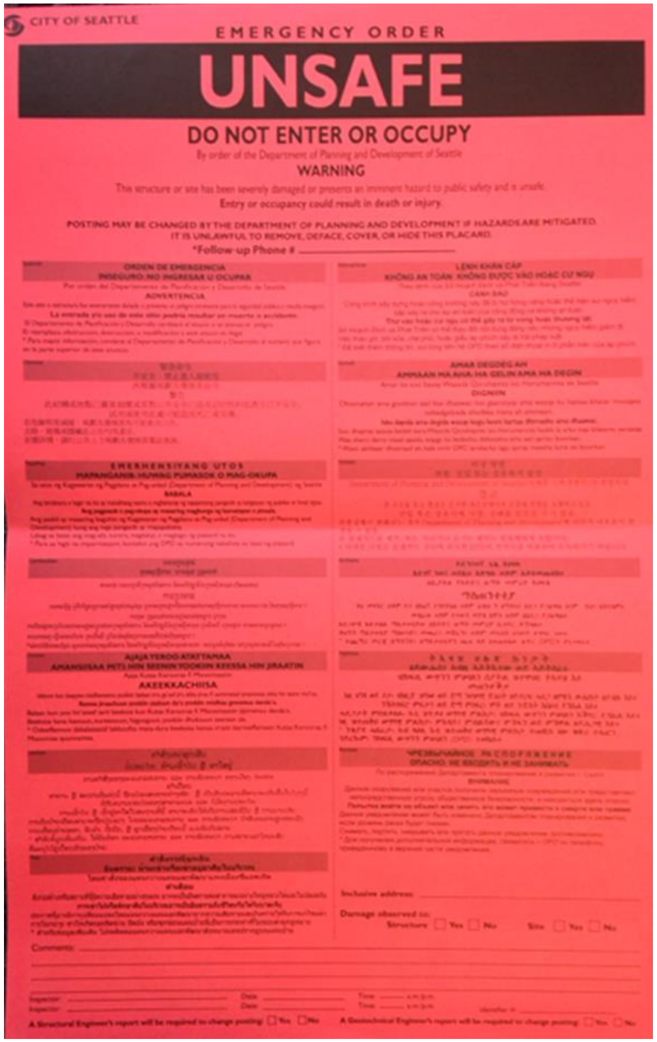
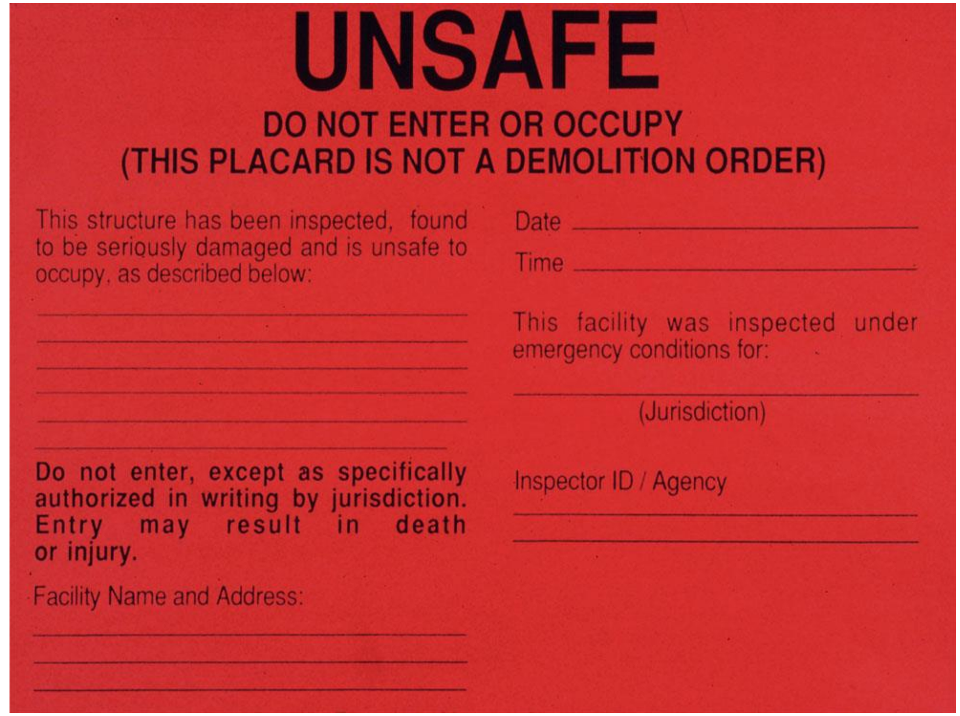
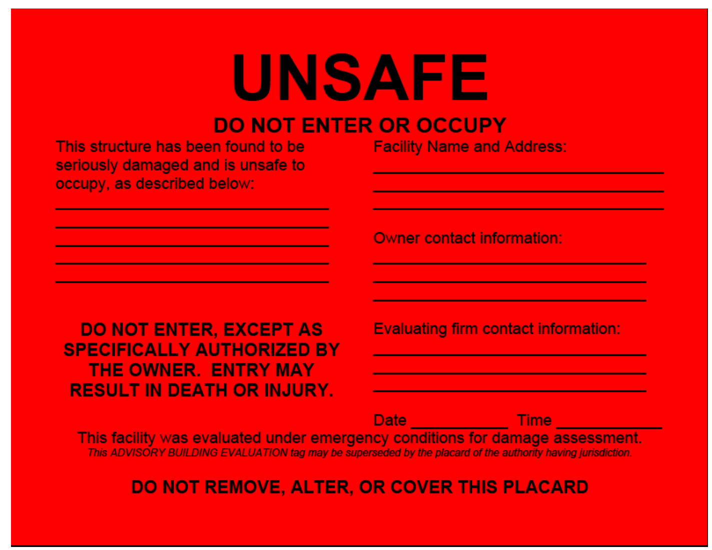
Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority


CITY OF SEATTLE
EMERGENCY ORDER
UNSAFE
DO NOT ENTER OR OCCUPY
By order of the Department of Planning and Development of Seattle
WARNING
This structure or site has been severely damaged or presents an imminent hazard to public safety and is unsafe.
Entry or occupancy could result in death or injury.
POSTING MAY BE CHANGED BY THE DEPARTMENT OF PLANNING AND DEVELOPMENT IF HAZARDS ARE MITIGATED.
IT IS UNLAWFUL TO REMOVE, DEFACE, COVER, OR HIDE THIS PLACARD.
*Follow-up Phone #


UNSAFE
DO NOT ENTER OR OCCUPY
(THIS PLACARD IS NOT A DEMOLITION ORDER)
This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:
Date
Time
This facility was inspected under emergency conditions for:
(Jurisdiction)
Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.
Inspector ID / Agency
Facility Name and Address:


UNSAFE
DO NOT ENTER OR OCCUPY
This structure has been found to be seriously damaged and is unsafe to occupy, as described below:
Facility Name and Address:
Owner contact information:
DO NOT ENTER, EXCEPT AS SPECIFICALLY AUTHORIZED BY THE OWNER. ENTRY MAY RESULT IN DEATH OR INJURY.
Evaluating firm contact information:
Date
Time
This facility was evaluated under emergency conditions for damage assessment.
This ADVISORY BUILDING EVALUATION tag may be superseded by the placard of the authority having jurisdiction.
DO NOT REMOVE, ALTER, OR COVER THIS PLACARD

UNSAFE

DO NOT ENTER OR OCCUPY
(THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:

_____

_____

_____

_____

_____

_____

Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.

Facility Name and Address:

_____

_____

_____

Date _____

Time _____

This facility was inspected under emergency conditions for:

_____

(Jurisdiction)

Inspector ID / Agency

_____

_____

RAPID EVALUATION

Cursory evaluation (~20-30 minutes), focus on big-picture structural damage

Sufficient to evaluate and post most buildings

Recommend detailed evaluation for questionable buildings

RAPID EVALUATION CRITERIA

Collapse, partial collapse

Building or story noticeably leaning

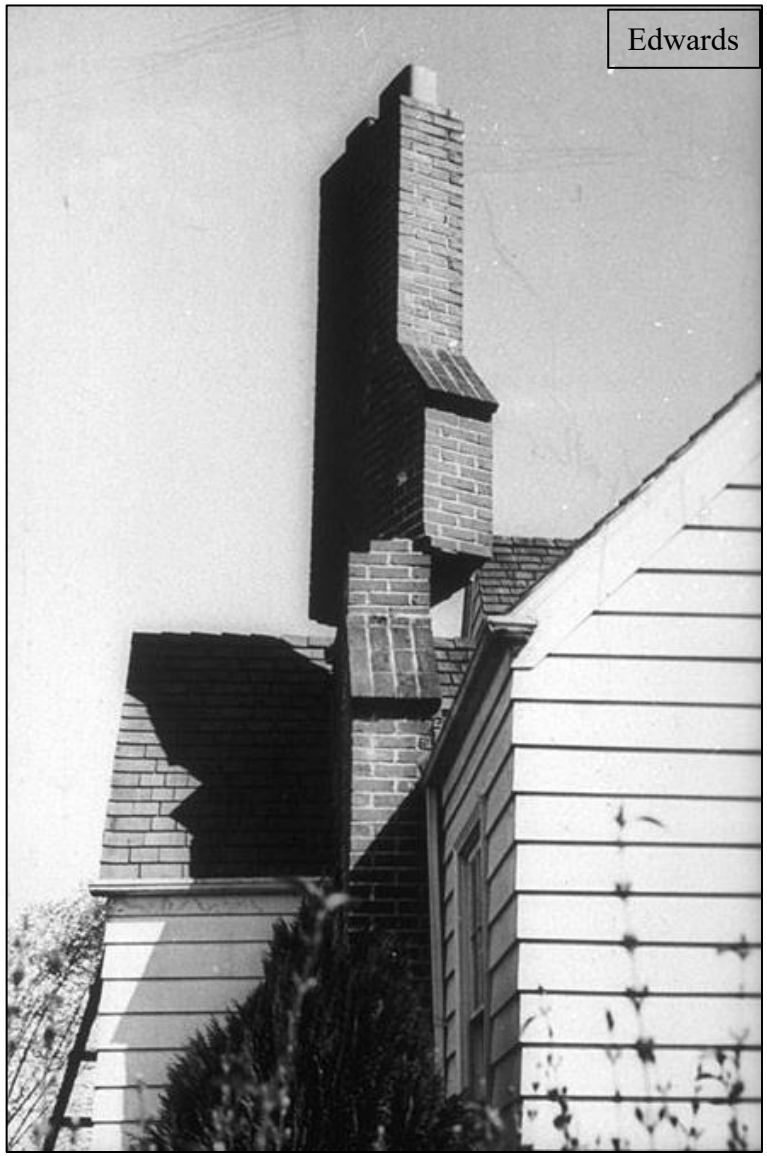
Severe racking of walls, obvious severe damage

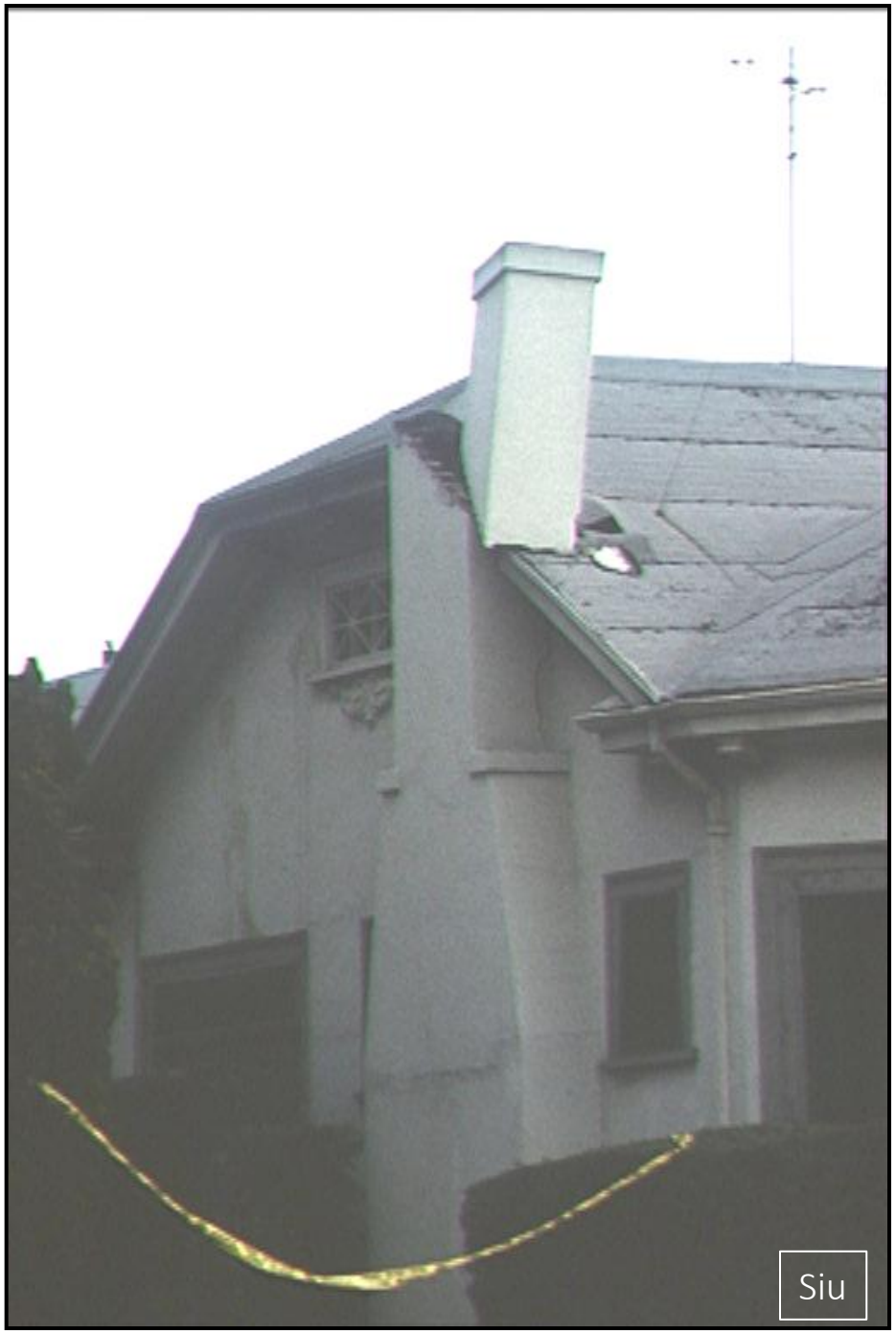
Chimney, parapet, or other falling hazard

Severe ground displacement or foundation damage

Other hazard present

EXAMPLE – CHIMNEY, PARAPET, OR OTHER FALLING HAZARD






EXAMPLE – SEVERE GROUND DISPLACEMENT OR FOUNDATION DAMAGE
Tohoku University, Sendai, Japan

EXAMPLE – PARTIAL COLLAPSE

ATC-20 Rapid Evaluation Safety Assessment Form

Inspection

Inspector ID: _____ Inspection date and time: _____ ☐ AM ☐ PM

Affiliation: _____ Areas inspected: ☐ Exterior only ☐ Exterior and interior

Building Description

Building name: _____

Address: _____

_____

Building contact/phone: _____

Number of stories above ground: ____ below ground: ____

Approx. "Footprint area" (square feet): _____

Number of residential units: _____

Number of residential units not habitable: _____

Type of Construction

☐ Wood frame
☐ Steel frame
☐ Tilt-up concrete
☐ Concrete frame
☐ Concrete shear wall
☐ Unreinforced masonry
☐ Reinforced masonry
☐ Other: _____

Primary Occupancy

☐ Dwelling
☐ Other residential
☐ Public assembly
☐ Emergency services
☐ Commercial
☐ Offices
☐ Industrial
☐ Other: _____
☐ Government
☐ Historic
☐ School

Evaluation

Investigate the building for the conditions below and check the appropriate column.

Observed Conditions:	Minor/None	Moderate	Severe
Collapse, partial collapse, or building off foundation	☐	☐	☐
Building or story leaning	☐	☐	☐
Racking damage to walls, other structural damage	☐	☐	☐
Chimney, parapet, or other falling hazard	☐	☐	☐
Ground slope movement or cracking	☐	☐	☐
Other (specify) _____	☐	☐	☐

Estimated Building Damage (excluding contents)

☐ None
☐ 0–1%
☐ 1–10%
☐ 10–30%
☐ 30–60%
☐ 60–100%
☐ 100%

Comments: _____

_____

Posting

Choose a posting based on the evaluation and team judgment. *Severe* conditions endangering the overall building are grounds for an Unsafe posting. Localized *Severe* and overall *Moderate* conditions may allow a Restricted Use posting. Post INSPECTED placard at main entrance. Post RESTRICTED USE and UNSAFE placards at all entrances.

☐ **INSPECTED** (Green placard) ☐ **RESTRICTED USE** (Yellow placard) ☐ **UNSAFE** (Red placard)

Record any use and entry restrictions exactly as written on placard: _____

_____

_____

Further Actions

Check the boxes below only if further actions are needed.

☐ Barricades needed in the following areas: _____

_____

☐ Detailed Evaluation recommended: ☐ Structural ☐ Geotechnical ☐ Other: _____

☐ Other recommendations: _____

Comments: _____

_____

DETAILED EVALUATION

Careful exterior and interior visual examination by more qualified team

Follows rapid evaluation when required

Important for essential facilities

DETAILED EVALUATION OF ESSENTIAL FACILITIES

Health care facilities

Police and fire stations

Jails and detention centers

Emergency operations centers

High-occupancy shelters (schools, community centers)

DETAILED EVALUATION CRITERIA

Vertical load capacity not significantly decreased
Lateral load capacity not significantly decreased
No falling or other hazards present
No evidence of foundation damage or ground displacement
Main exits are usable
No other unsafe condition

EXAMPLE – VERTICAL LOAD CAPACITY SIGNIFICANTLY DECREASED

EXAMPLE – EXIT NOT USABLE

ATC-20 Detailed Evaluation Safety Assessment Form

Inspection

Inspector ID: _____

Affiliation: _____

Inspection date and time: _____ ☐ AM ☐ PM

Final Posting

from page 2

- ☐ Inspected
- ☐ Restricted Use
- ☐ Unsafe

Building Description

Building name: _____

Address: _____

_____

Building contact/phone: _____

Number of stories above ground: ____ below ground: ____

Approx. "Footprint area" (square feet): _____

Number of residential units: _____

Number of residential units not habitable: _____

Type of Construction

- ☐ Wood frame
- ☐ Steel frame
- ☐ Tilt-up concrete
- ☐ Concrete frame
- ☐ Concrete shear wall
- ☐ Unreinforced masonry
- ☐ Reinforced masonry
- ☐ Other: _____

Primary Occupancy

- ☐ Dwelling
- ☐ Other residential
- ☐ Public assembly
- ☐ Emergency services
- ☐ Commercial
- ☐ Offices
- ☐ Industrial
- ☐ Other: _____
- ☐ Government
- ☐ Historic
- ☐ School

Evaluation

Investigate the building for the conditions below and check the appropriate column. There is room on the second page for a sketch.

	Minor/None	Moderate	Severe	Comments
Overall hazards:				
Collapse or partial collapse	☐	☐	☐	_____
Building or story leaning	☐	☐	☐	_____
Other_____	☐	☐	☐	_____
Structural hazards:				
Foundations	☐	☐	☐	_____
Roofs, floors (vertical loads)	☐	☐	☐	_____
Columns, pilasters, corbels	☐	☐	☐	_____
Diaphragms, horizontal bracing	☐	☐	☐	_____
Walls, vertical bracing	☐	☐	☐	_____
Precast connections	☐	☐	☐	_____
Other_____	☐	☐	☐	_____
Nonstructural hazards:				
Parapets, ornamentation	☐	☐	☐	_____
Cladding, glazing	☐	☐	☐	_____
Ceilings, light fixtures	☐	☐	☐	_____
Interior walls, partitions	☐	☐	☐	_____
Elevators	☐	☐	☐	_____
Stairs, exits	☐	☐	☐	_____
Electric, gas	☐	☐	☐	_____
Other_____	☐	☐	☐	_____
Geotechnical hazards:				
Slope failure, debris	☐	☐	☐	_____
Ground movement, fissures	☐	☐	☐	_____
Other_____	☐	☐	☐	_____

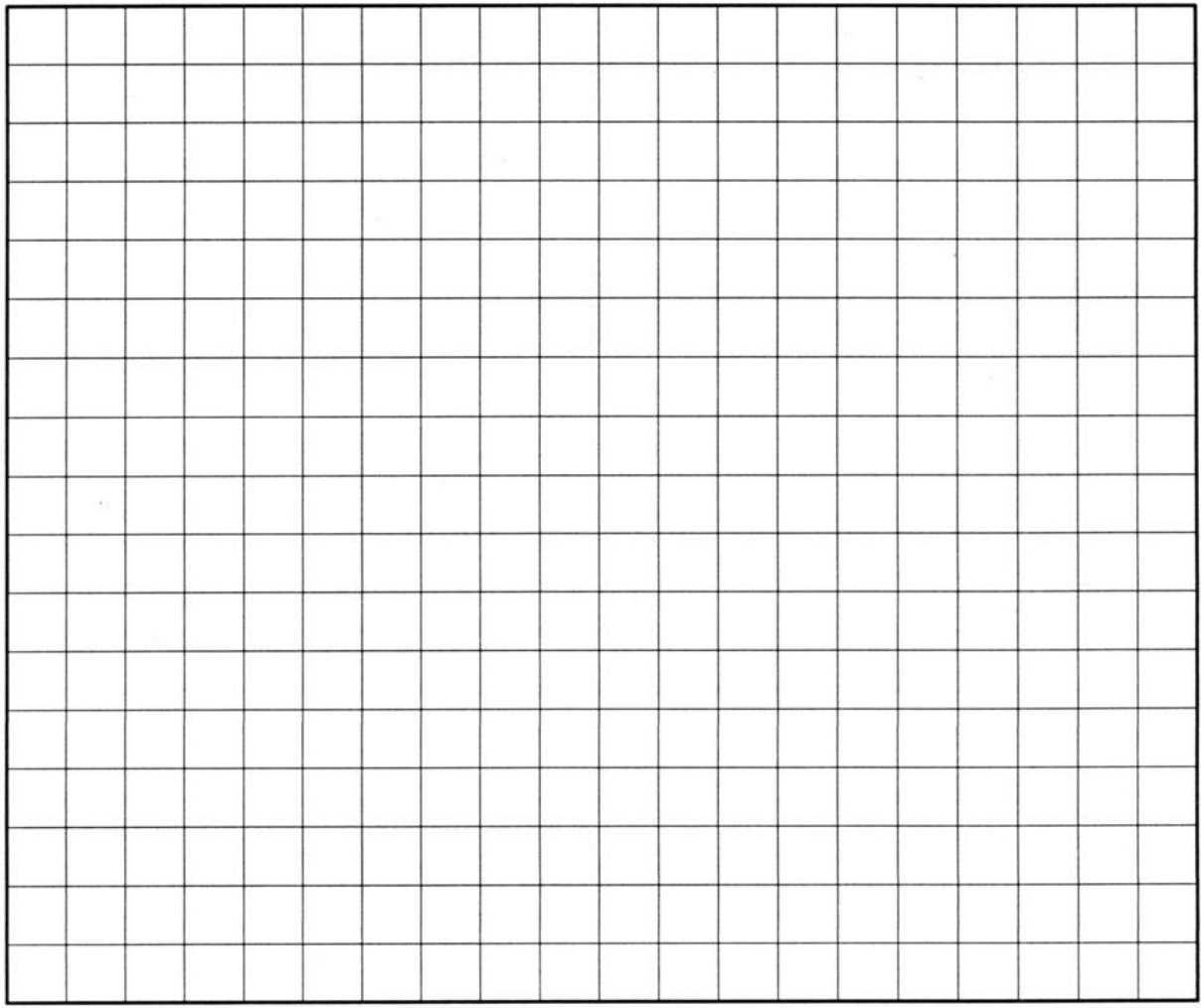
General Comments: _____

_____

Building name: _____ Inspector ID: _____

Sketch (optional)

Provide a sketch of the building or damaged portions. Indicate damage points.



Estimated Building Damage

If requested by the jurisdiction, estimate building damage (repair cost ÷ replacement cost, excluding contents).

- ☐ None
- ☐ 0–1%
- ☐ 1–10%
- ☐ 10–30%
- ☐ 30–60%
- ☐ 60–100%
- ☐ 100%

Posting

If there is an existing posting from a previous evaluation, check the appropriate box.

Previous posting: ☐ INSPECTED ☐ RESTRICTED USE ☐ UNSAFE Inspector ID: _____ Date:_____

If necessary, revise the posting based on the new evaluation and team judgment. *Severe* conditions endangering the overall building are grounds for an Unsafe posting. Local *Severe* and overall *Moderate* conditions may allow a Restricted Use posting. Indicate the current posting below and at the top of page one.

☐ **INSPECTED** (Green placard) ☐ **RESTRICTED USE** (Yellow placard) ☐ **UNSAFE** (Red placard)

Record any use and entry restrictions exactly as written on placard: _____

_____

_____

Further Actions

Check the boxes below only if further actions are needed.

☐ Barricades needed in the following areas: _____

_____

☐ Engineering Evaluation recommended: ☐ Structural ☐ Geotechnical ☐ Other: _____

☐ Other recommendations: _____

_____

_____

Comments: _____

_____

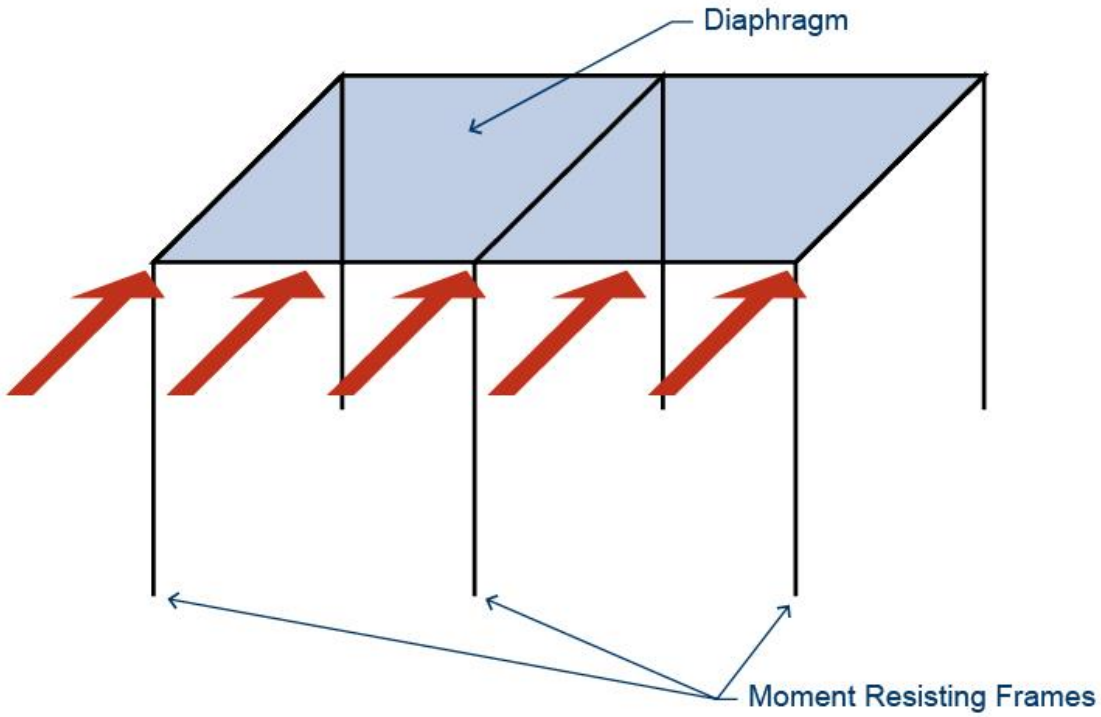
STRUCTURAL BASICS

STRUCTURAL BASICS

- Walls and frames
- Redundancy
- Brittleness/ductility
- Dynamic behavior
- Degradation of structural
  - Strength
  - Stiffness
  - Stability

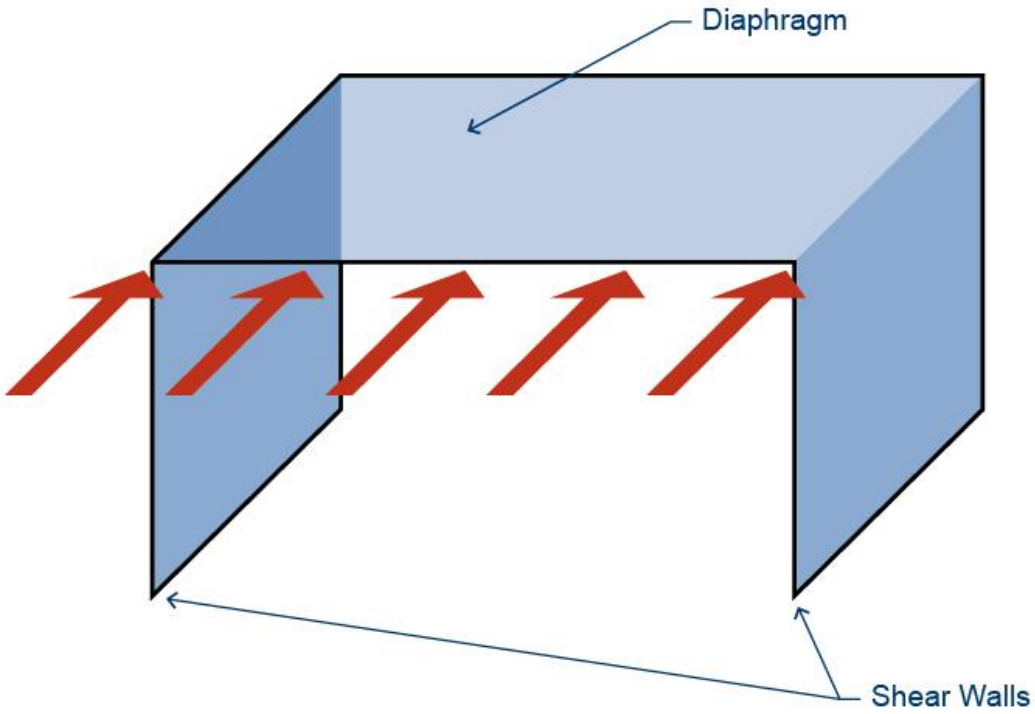
STRUCTURAL SYSTEMS

Moment Frames



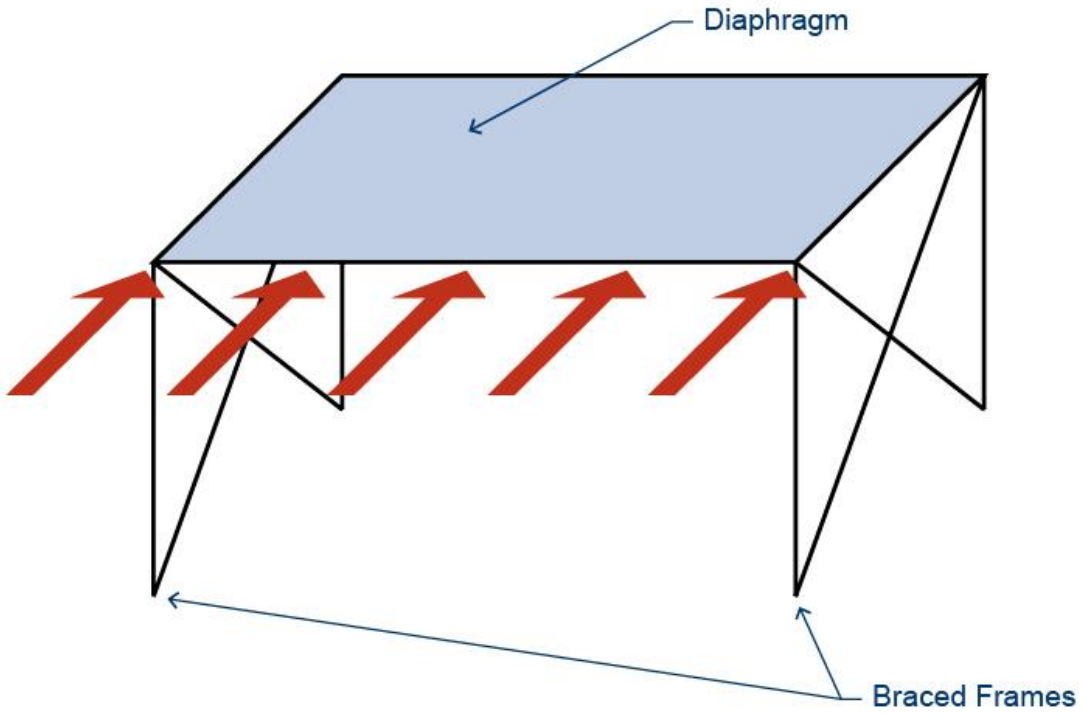
STRUCTURAL SYSTEMS

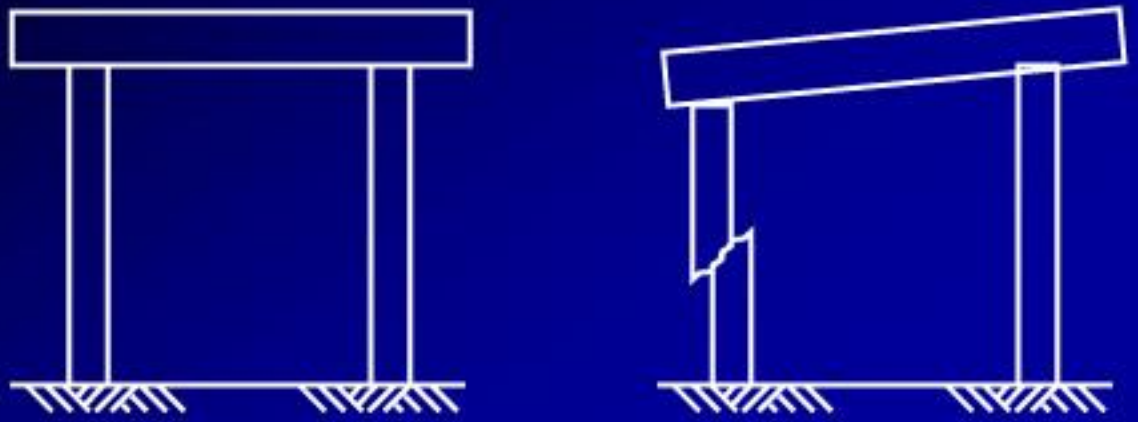
Shear Walls



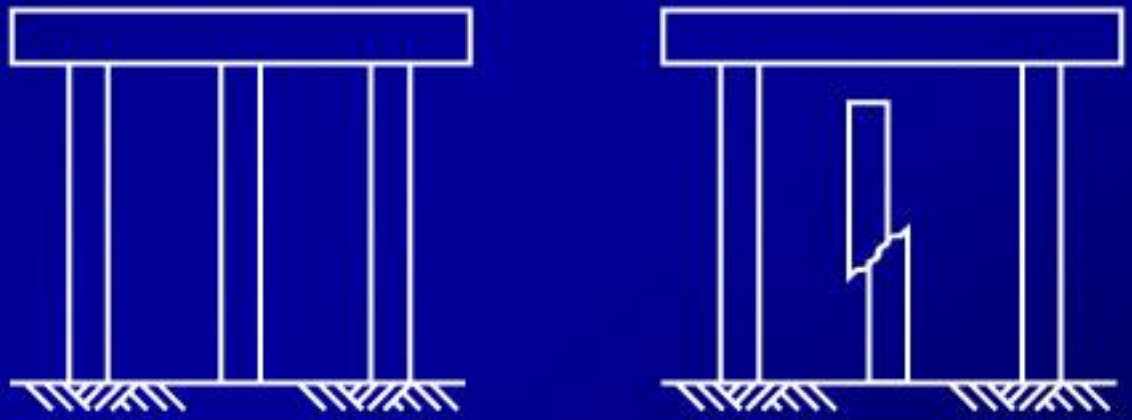
STRUCTURAL SYSTEMS

Braced Frames





DETERMINATE

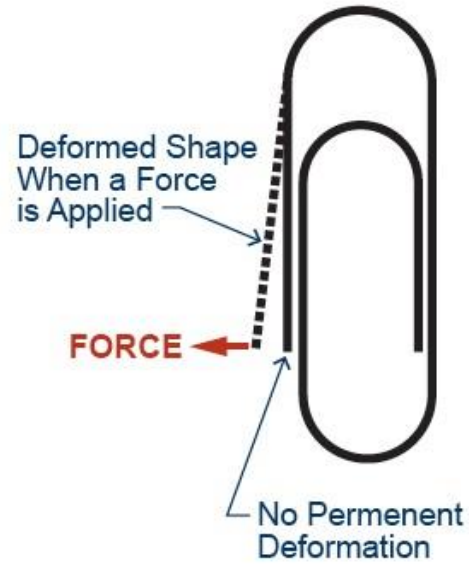


REDUNDANT

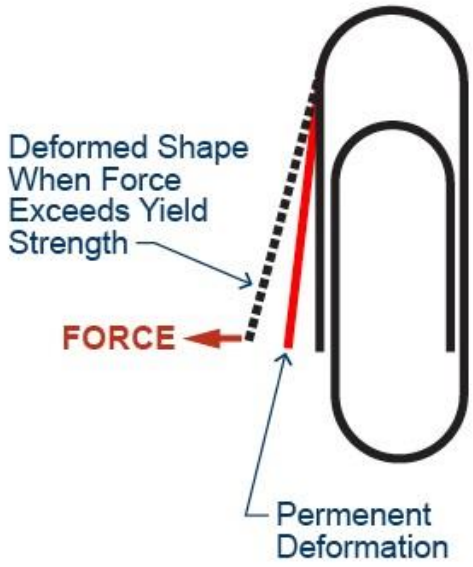
REDUNDANCY

DUCTILE BEHAVIOR

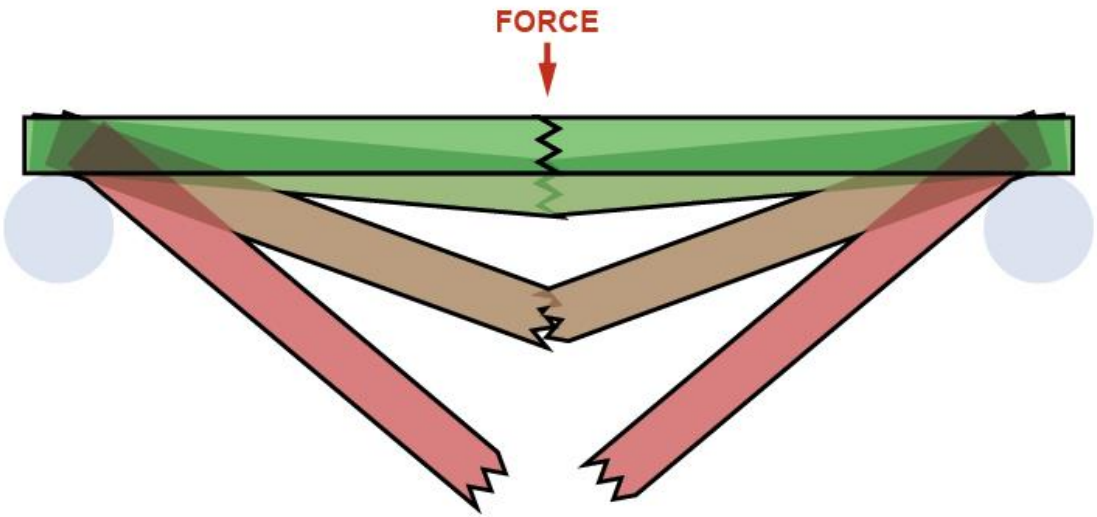
FORCE < YIELD STRENGTH



FORCE > YIELD STRENGTH

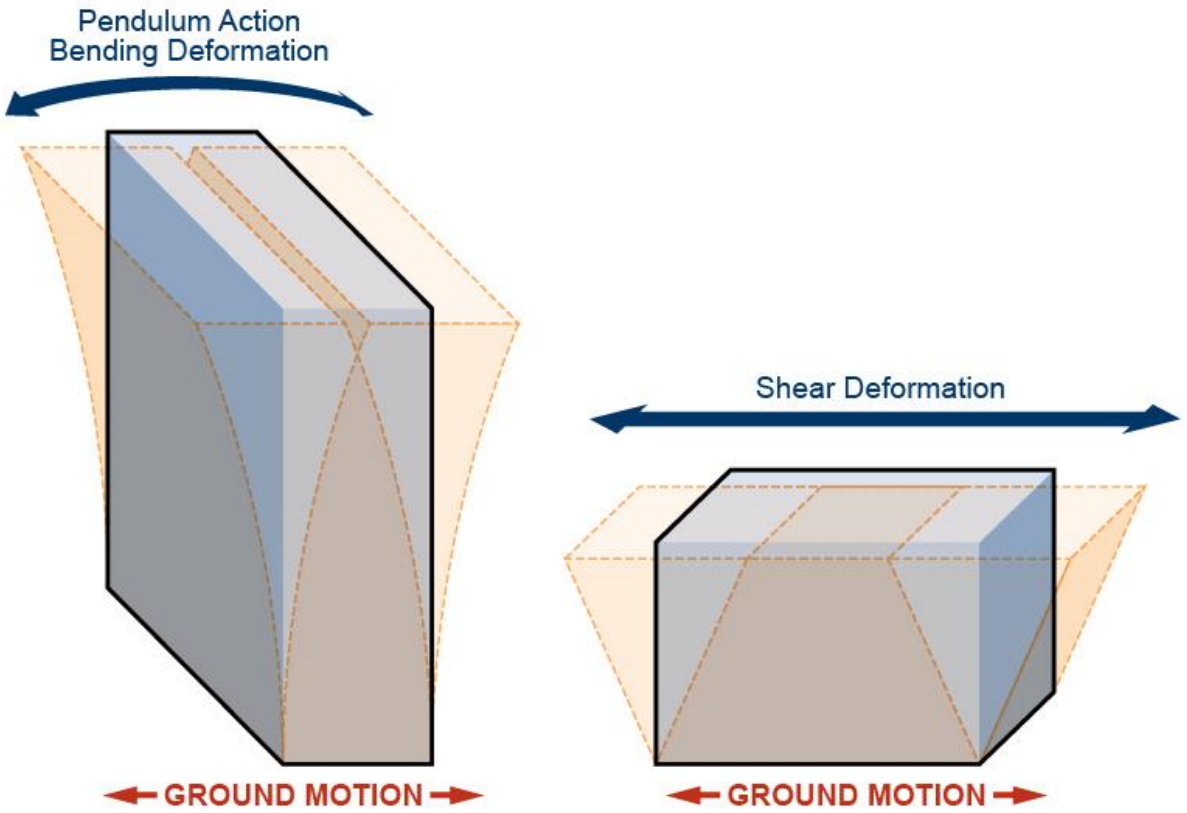


BRITTLE BEHAVIOR



BRITTLE VS DUCTILE BEHAVIOR

BUILDING DYNAMIC BEHAVIOR

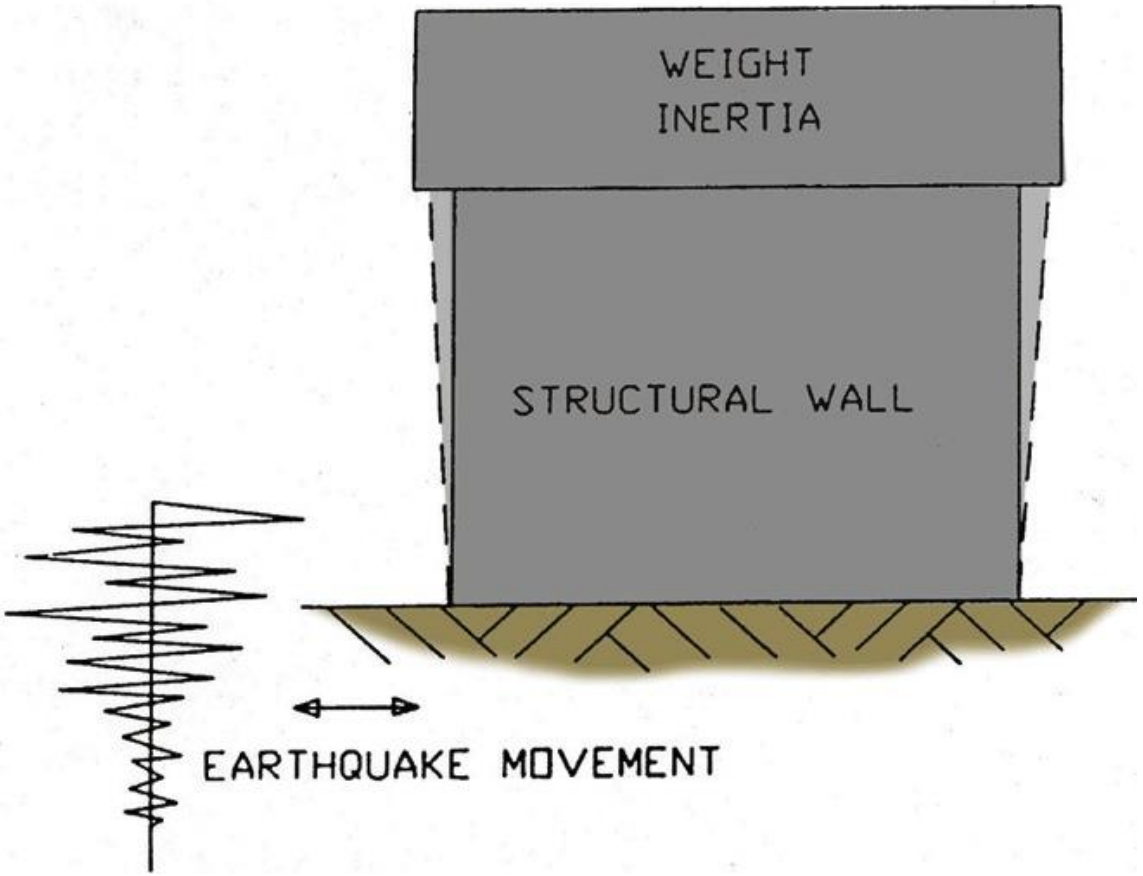


RESONANCE

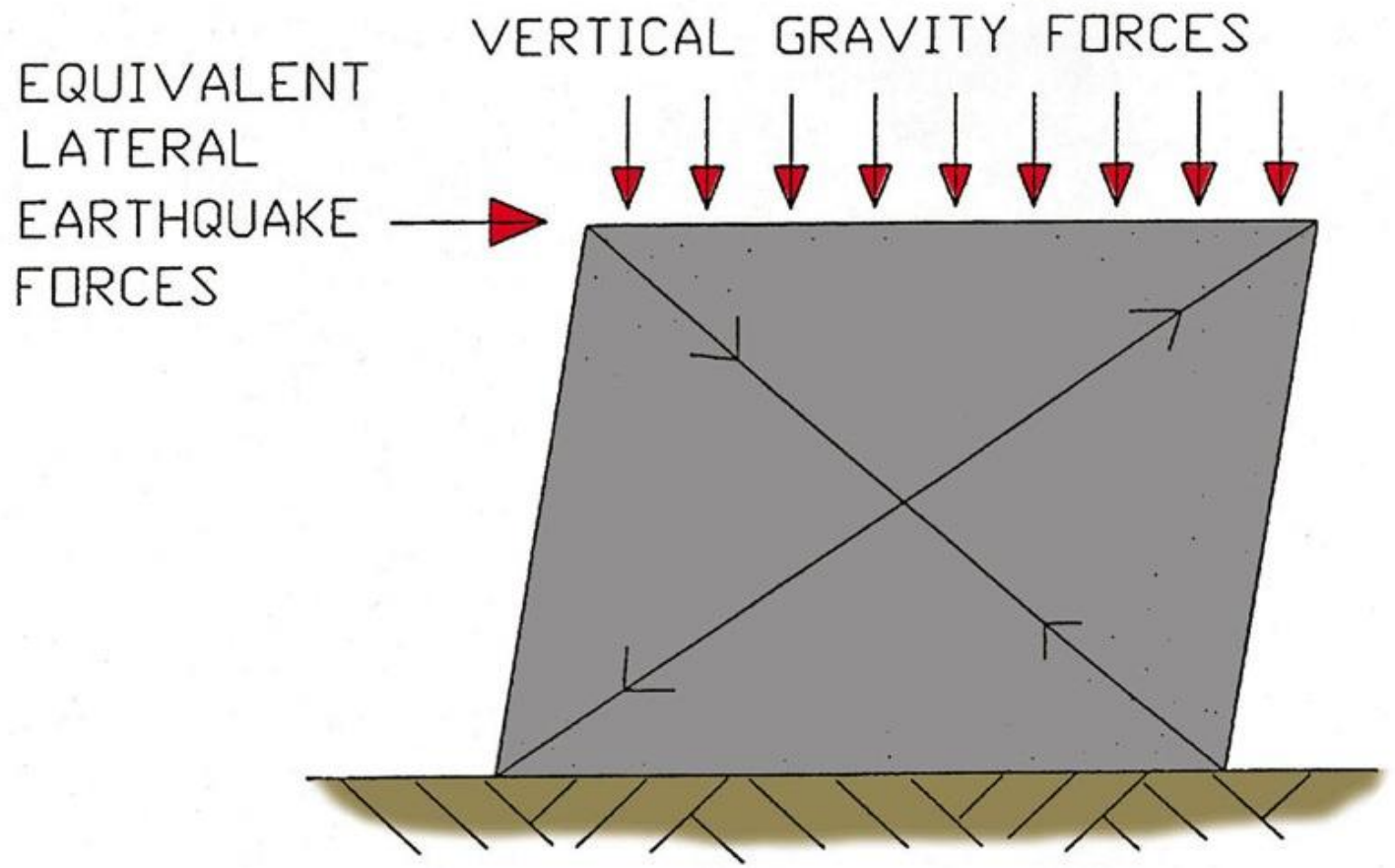
RESONANCE

BUILDING RESPONSE

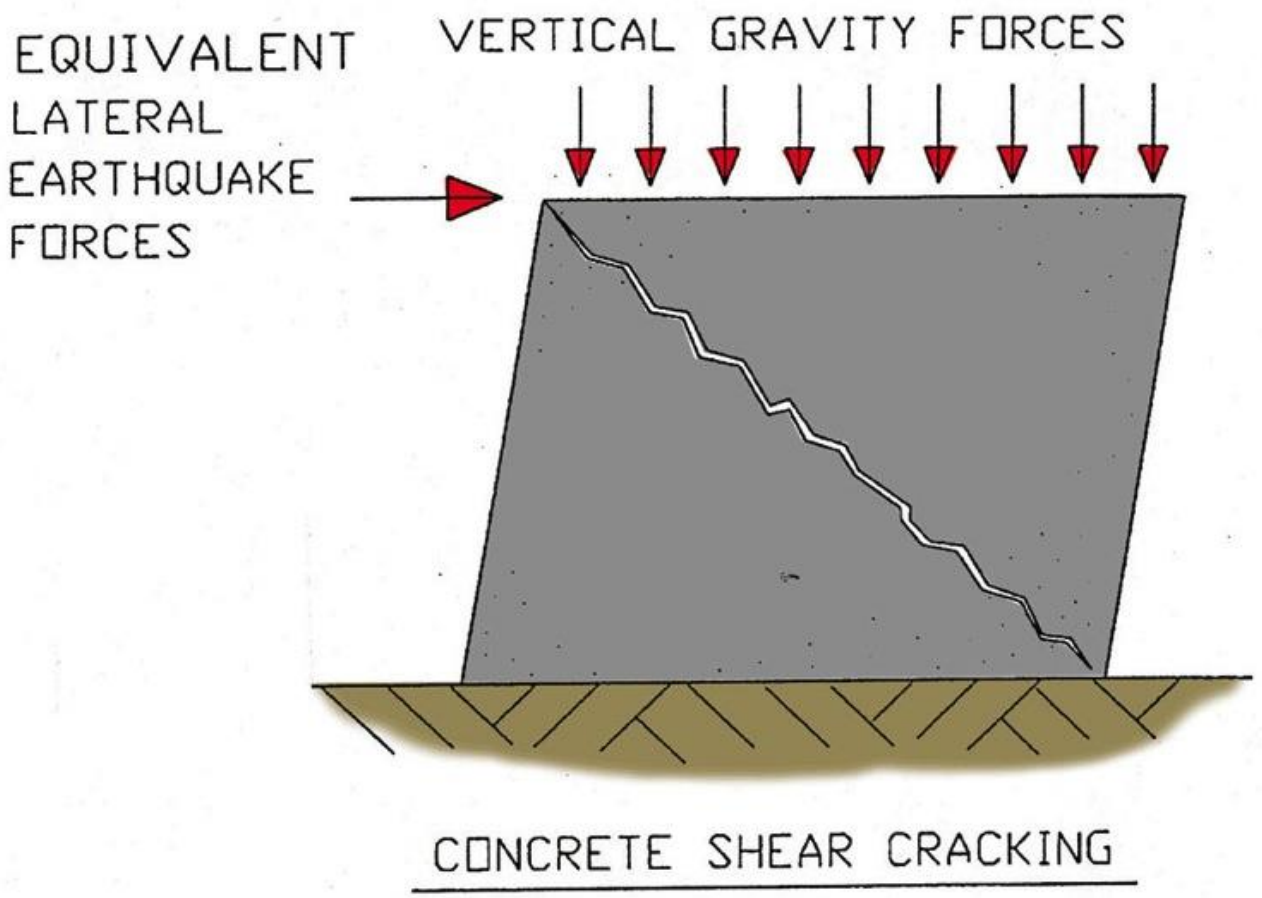
EARTHQUAKE FORCES

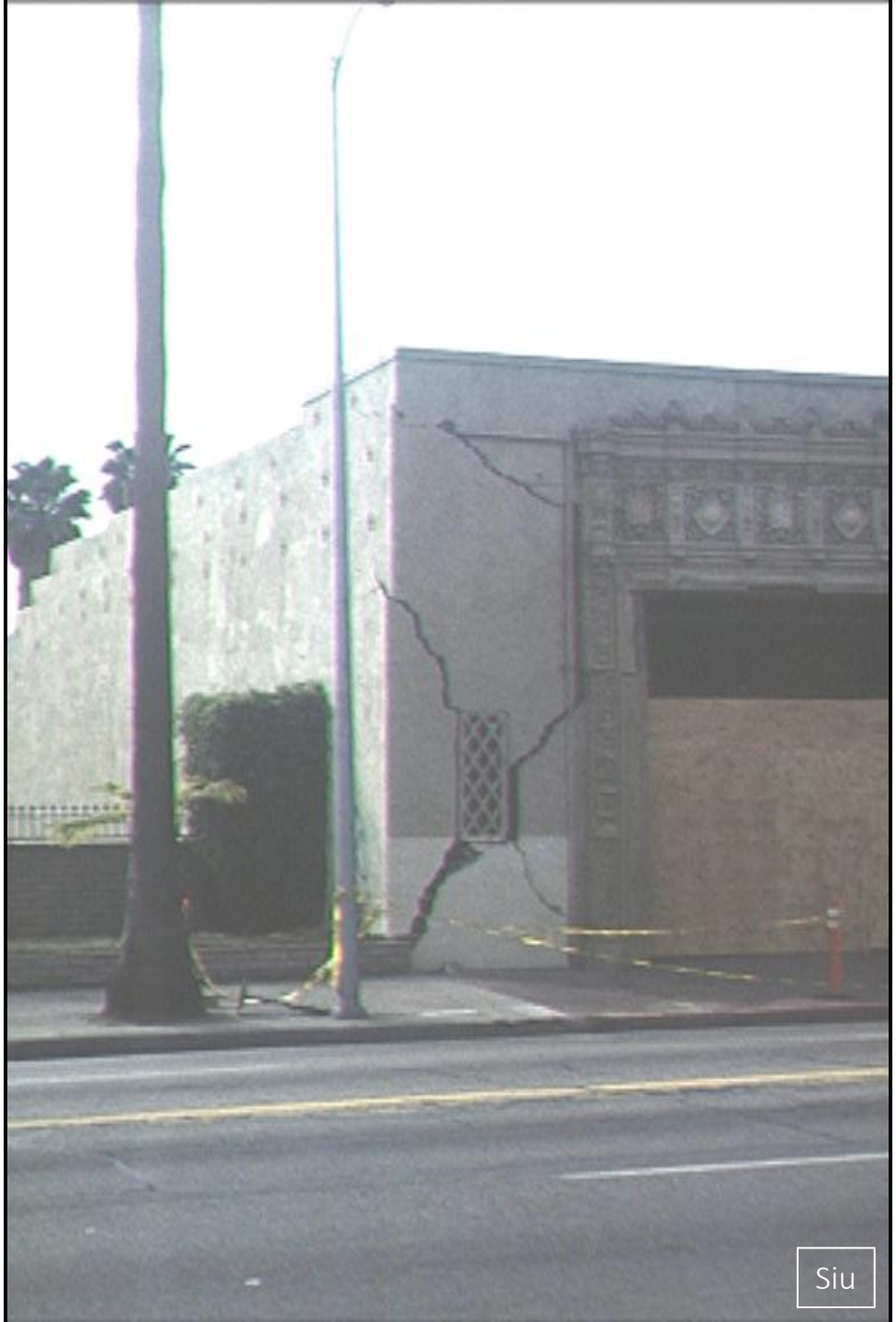


EARTHQUAKE FORCES - WALL

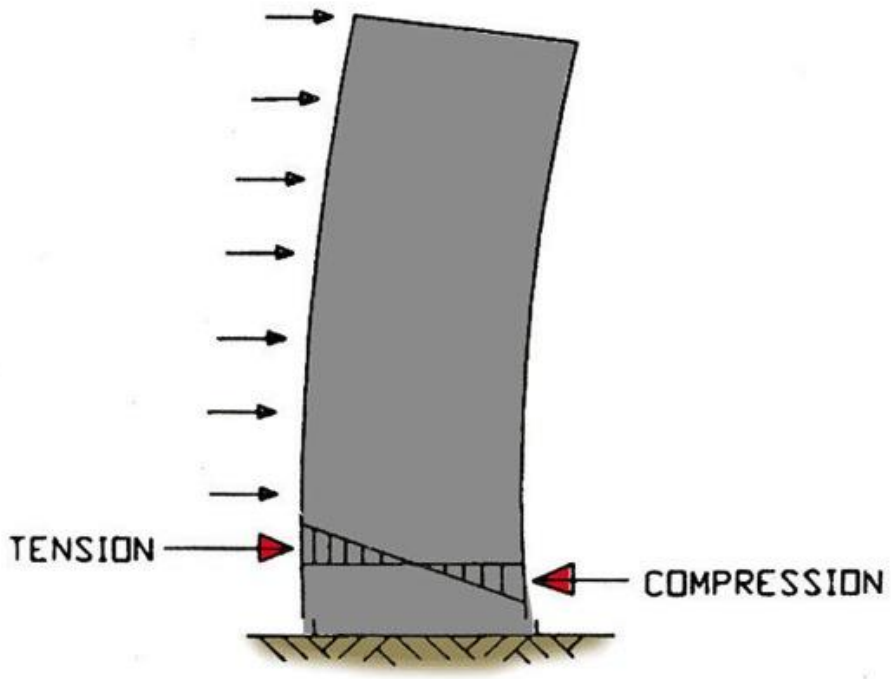


EARTHQUAKE FORCES - WALL

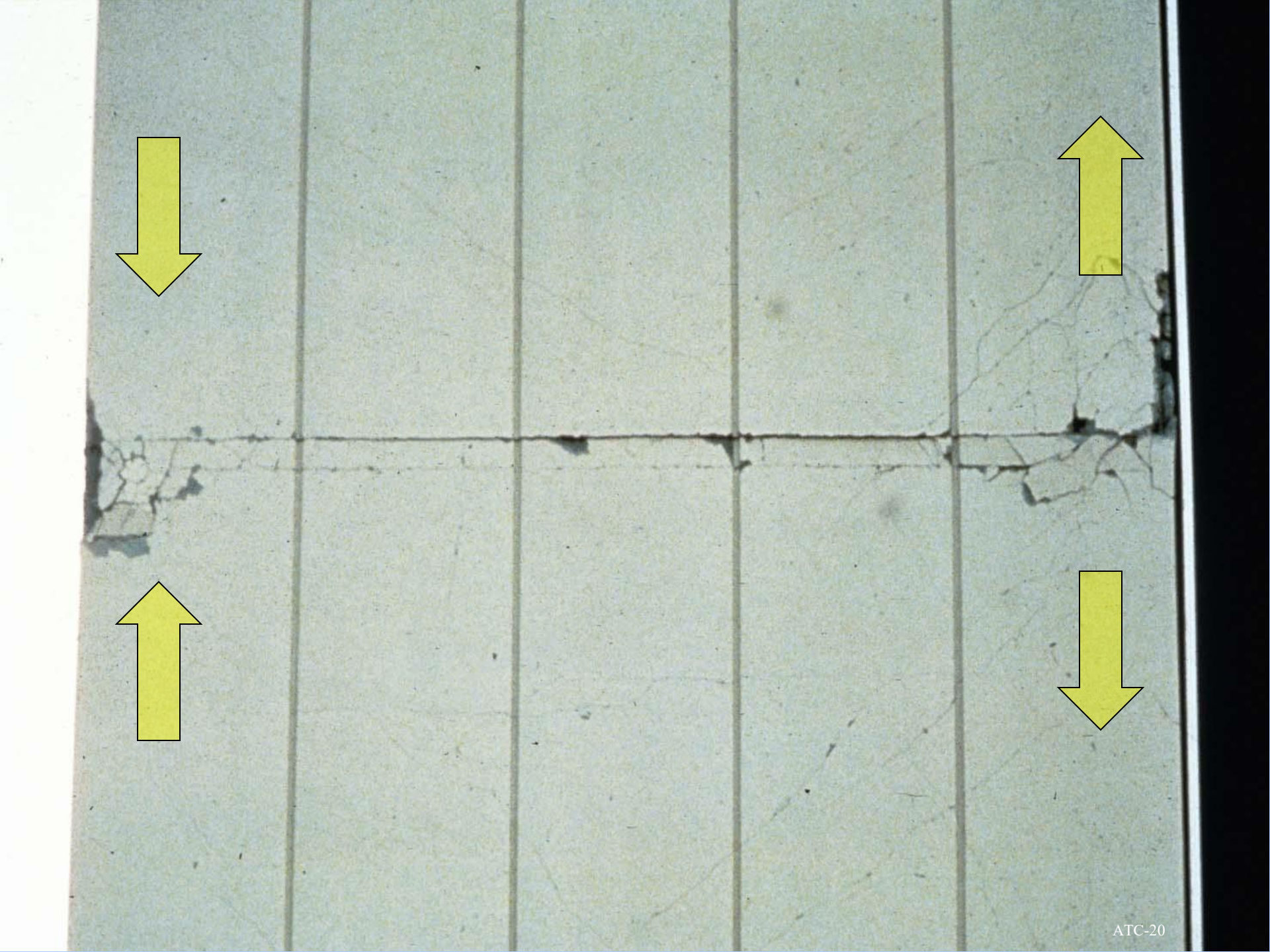



Siu

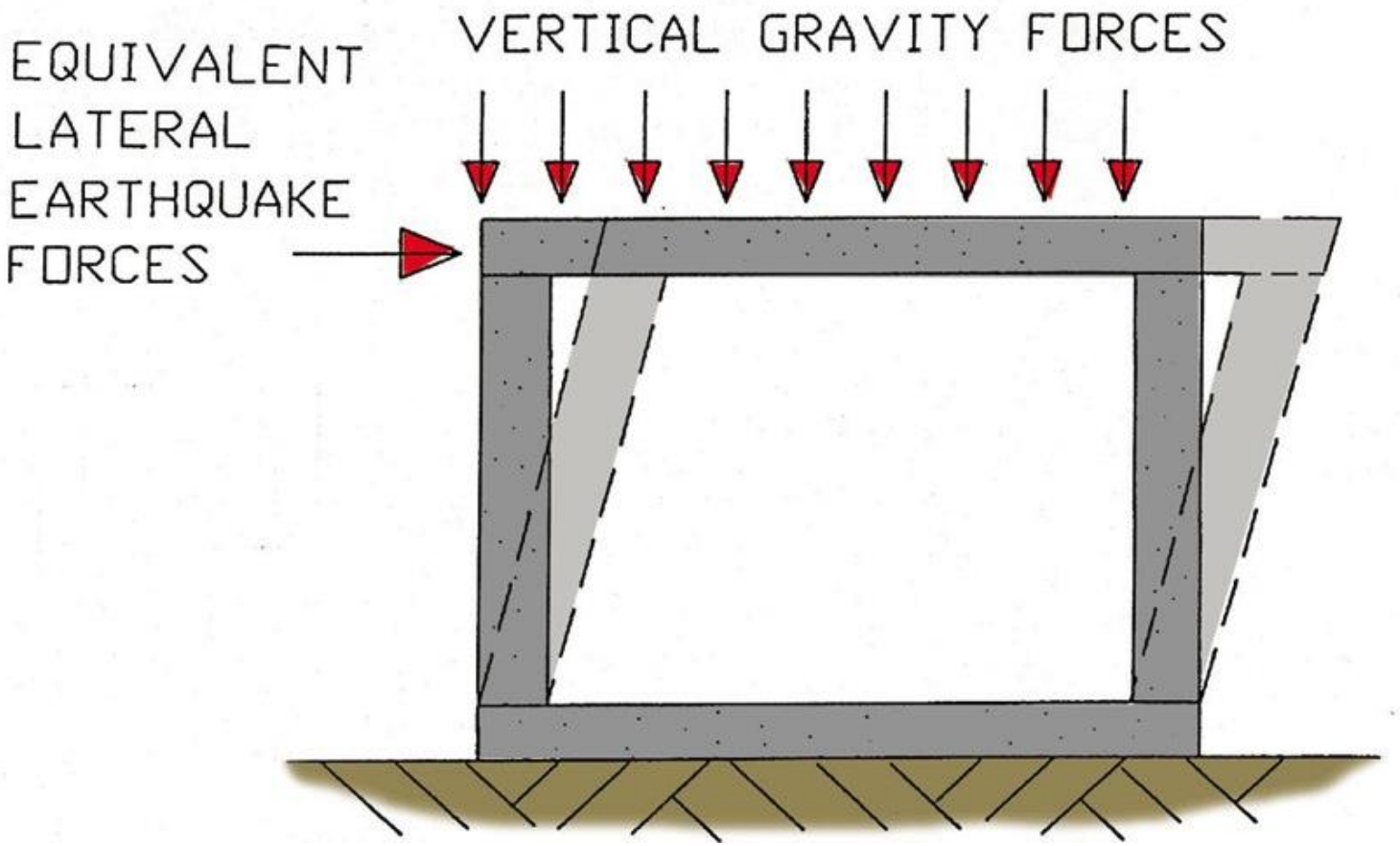
EARTHQUAKE FORCES - HIGHRISE



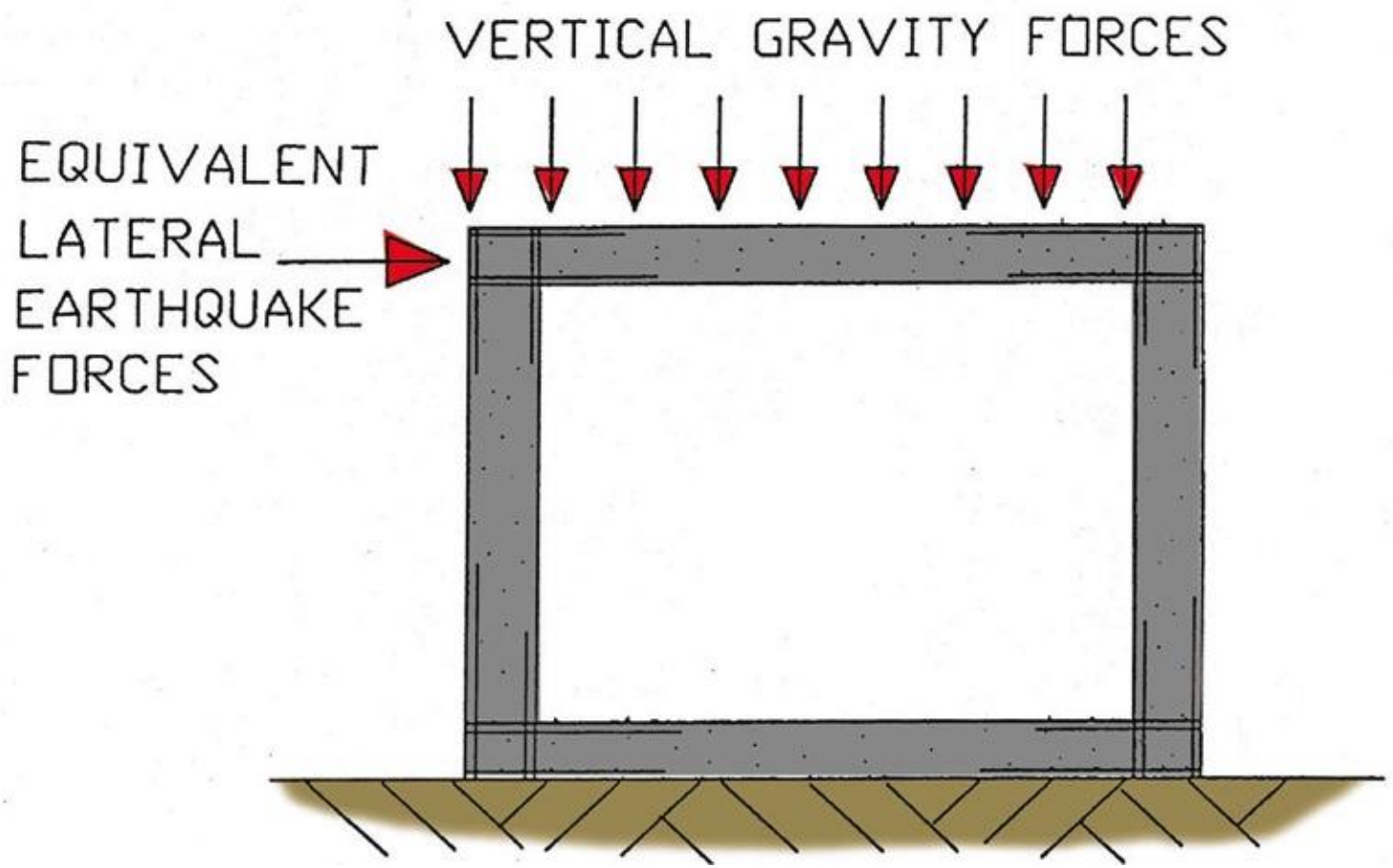
FLEXURAL STRESSES IN A TALL SHEAR WALL


ATC-20

EARTHQUAKE FORCES - FRAME

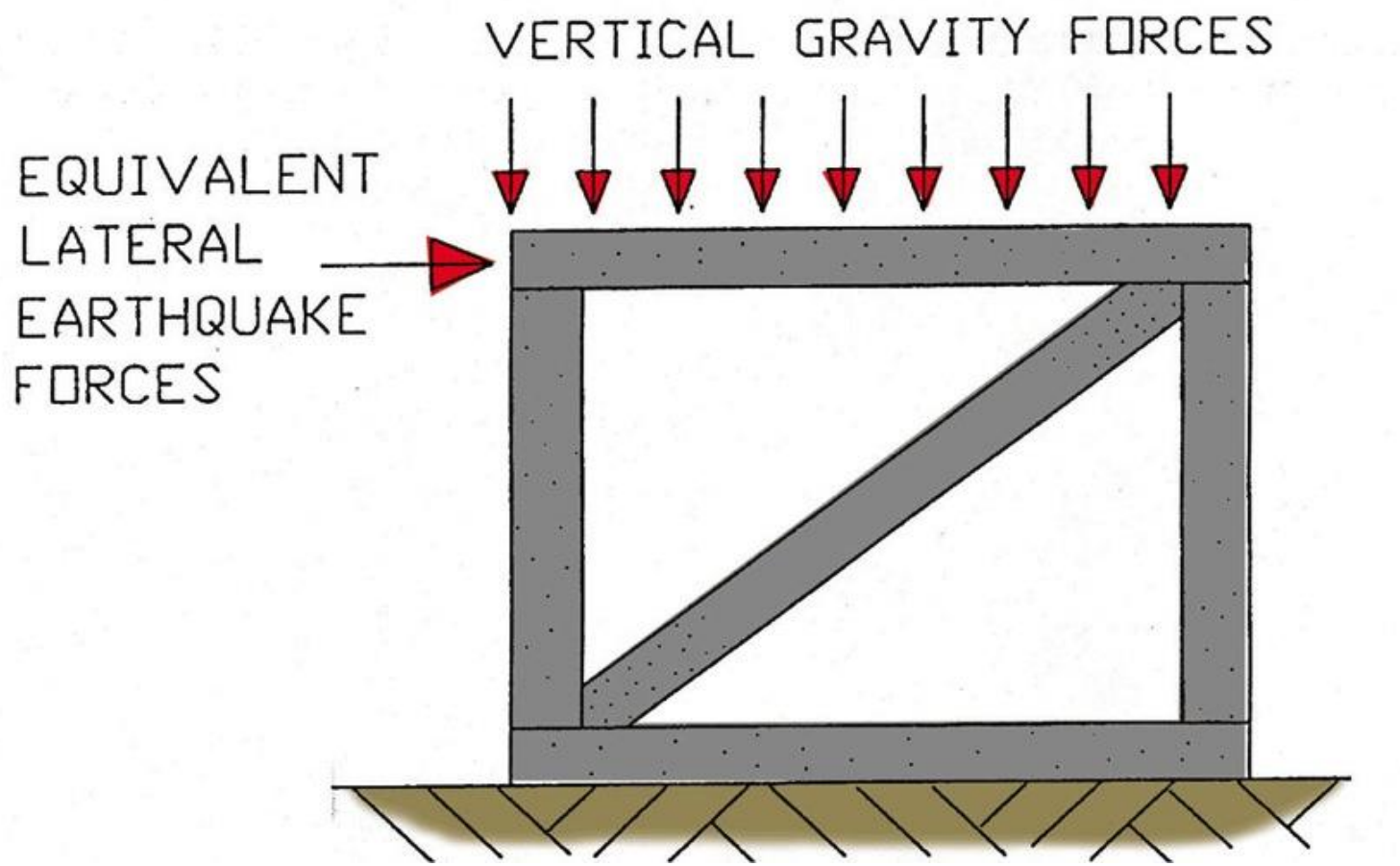


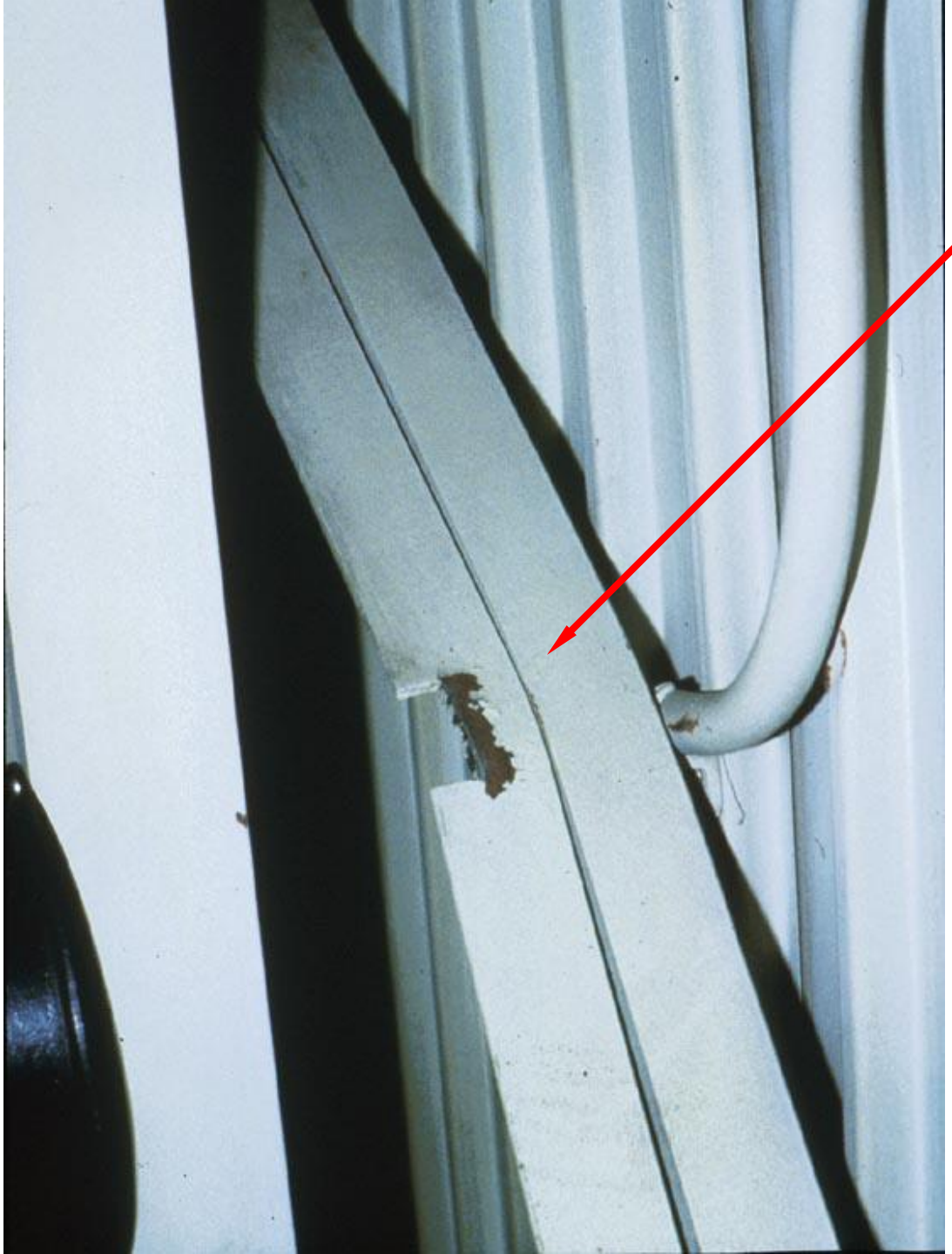
EARTHQUAKE FORCES – CONCRETE FRAME



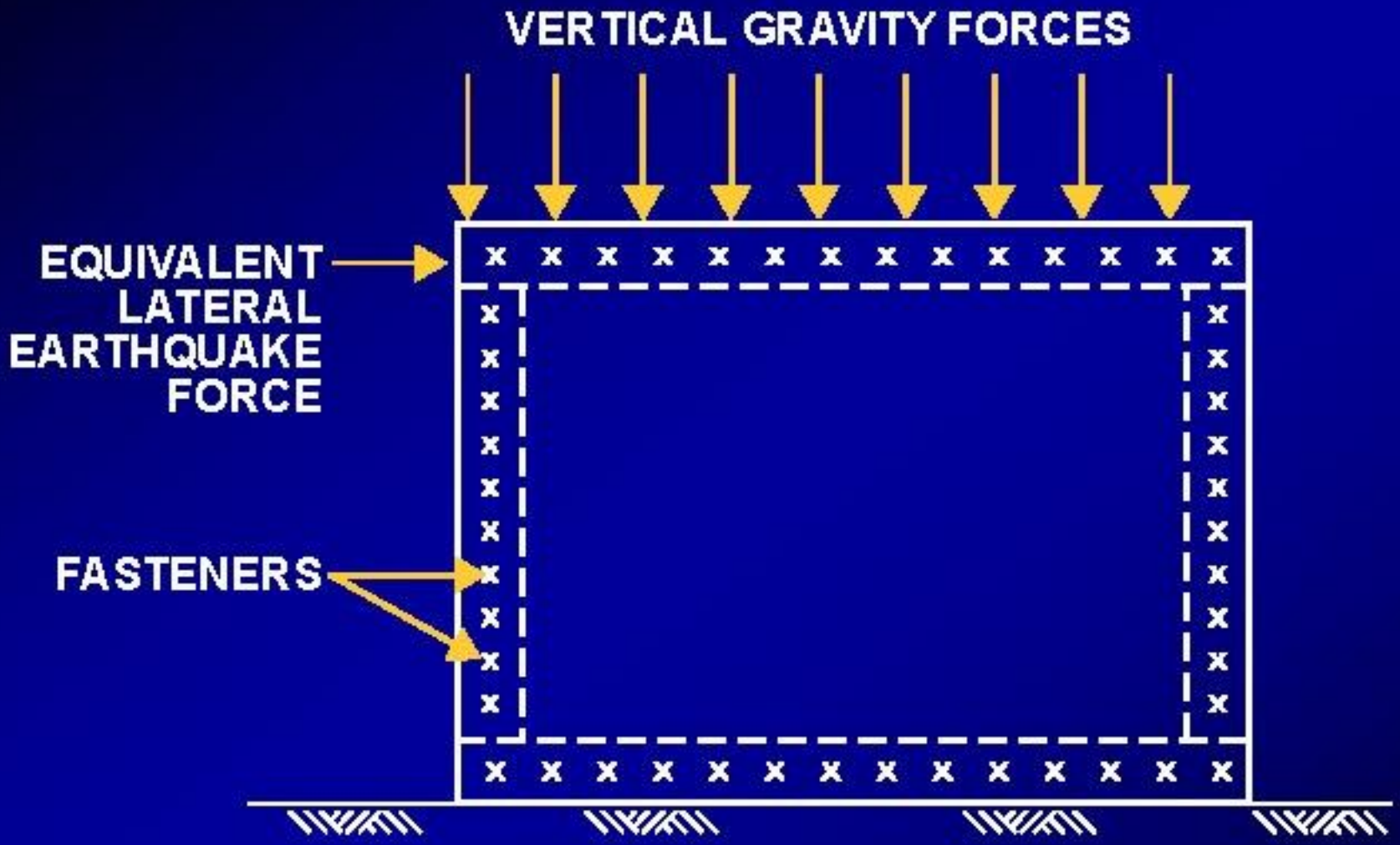

CRACKING AT
GIRDER-COLUMN
CONNECTION

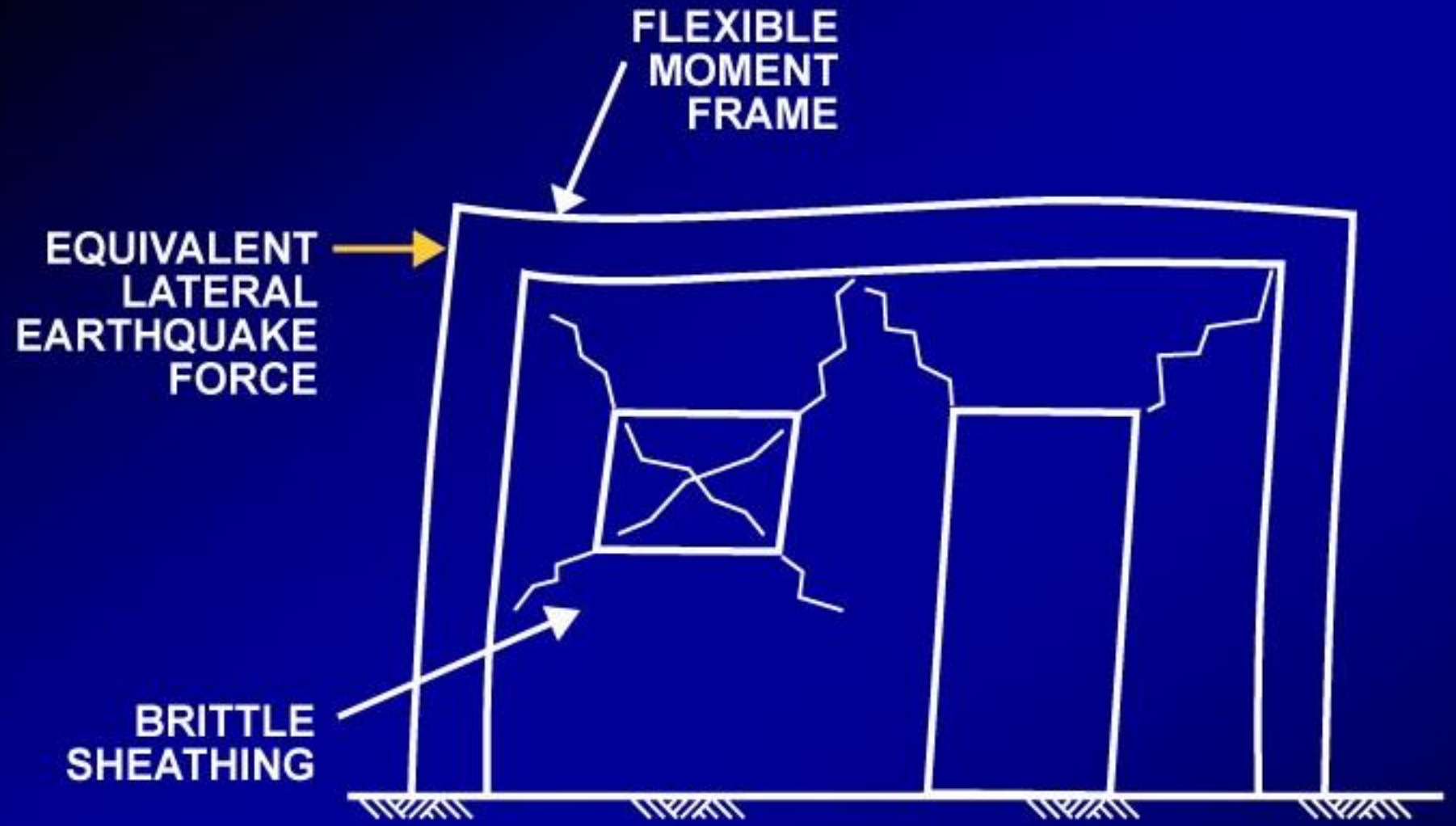
EARTHQUAKE FORCES – BRACED FRAME



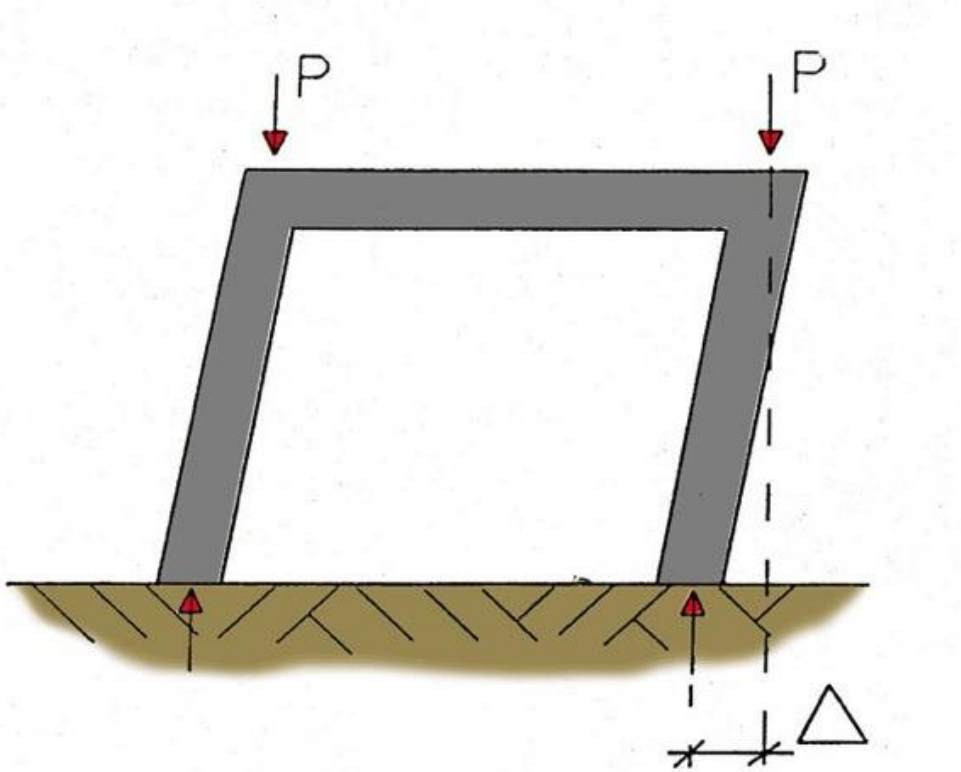


BUCKLED STEEL DIAGONAL MEMBER


VERTICAL GRAVITY FORCES
EQUIVALENT LATERAL EARTHQUAKE FORCE
FASTENERS

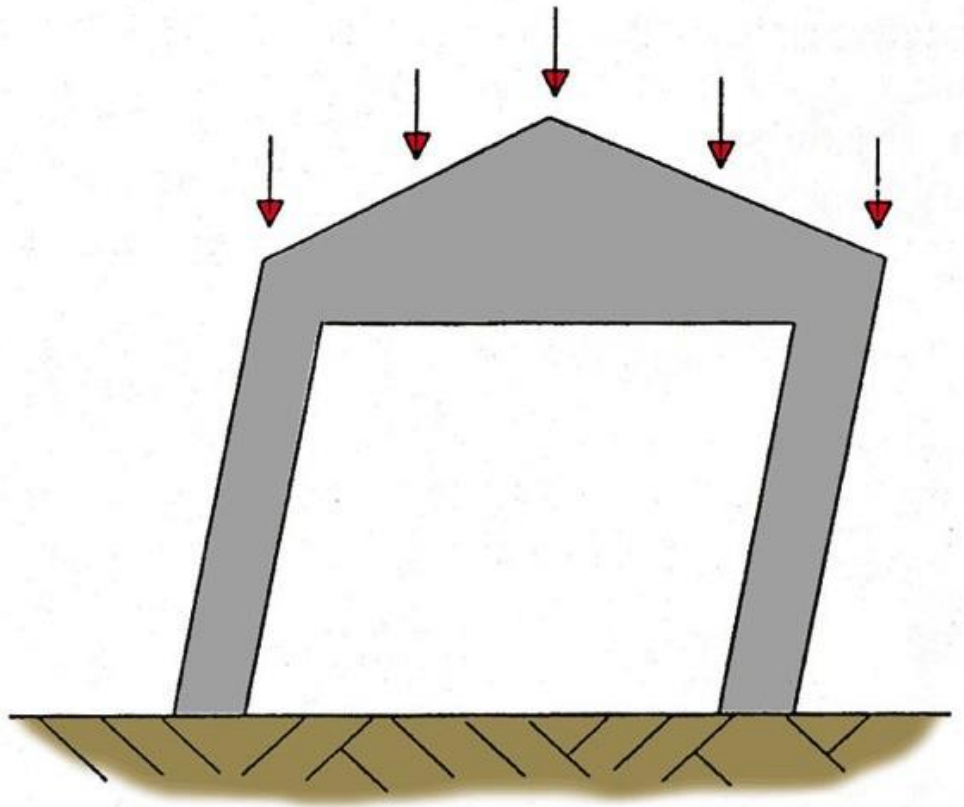

FLEXIBLE
MOMENT
FRAME
EQUIVALENT
LATERAL
EARTHQUAKE
FORCE
BRITTLE
SHEATHING

STRUCTURAL STABILITY



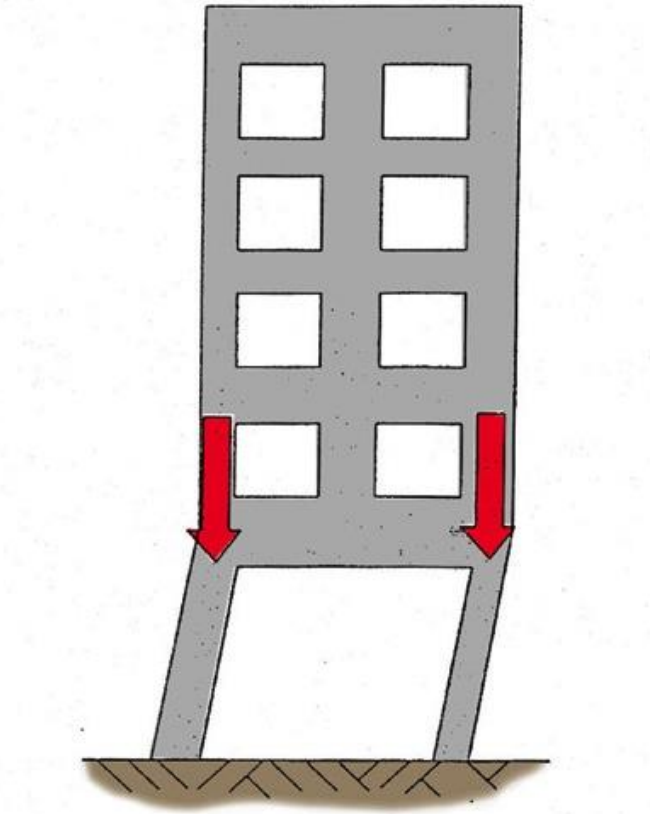
P-DELTA EFFECT ON RECTANGULAR FRAME

STRUCTURAL STABILITY



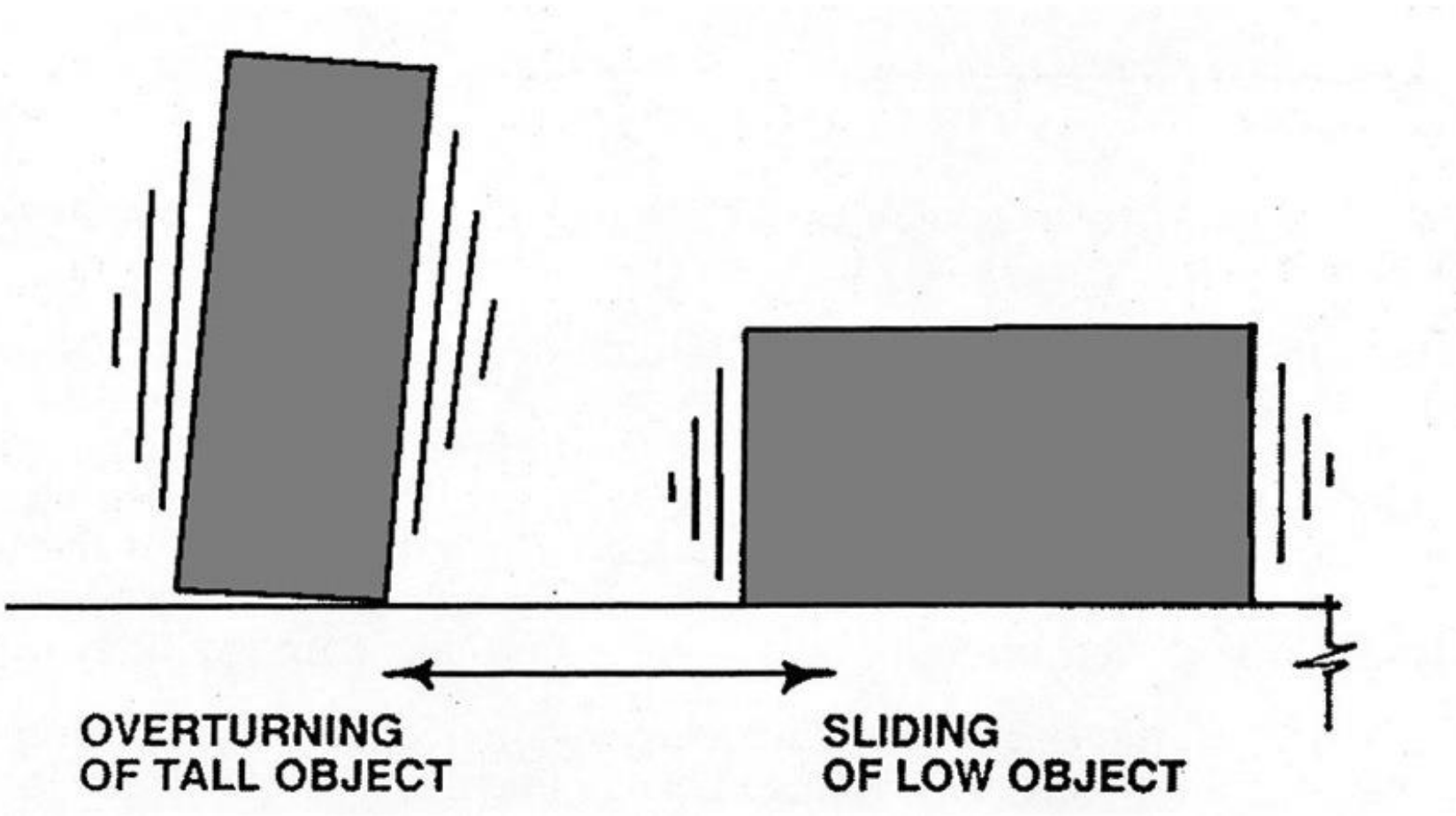
SMALL P-DELTA LOADS IN A GARAGE

STRUCTURAL STABILITY

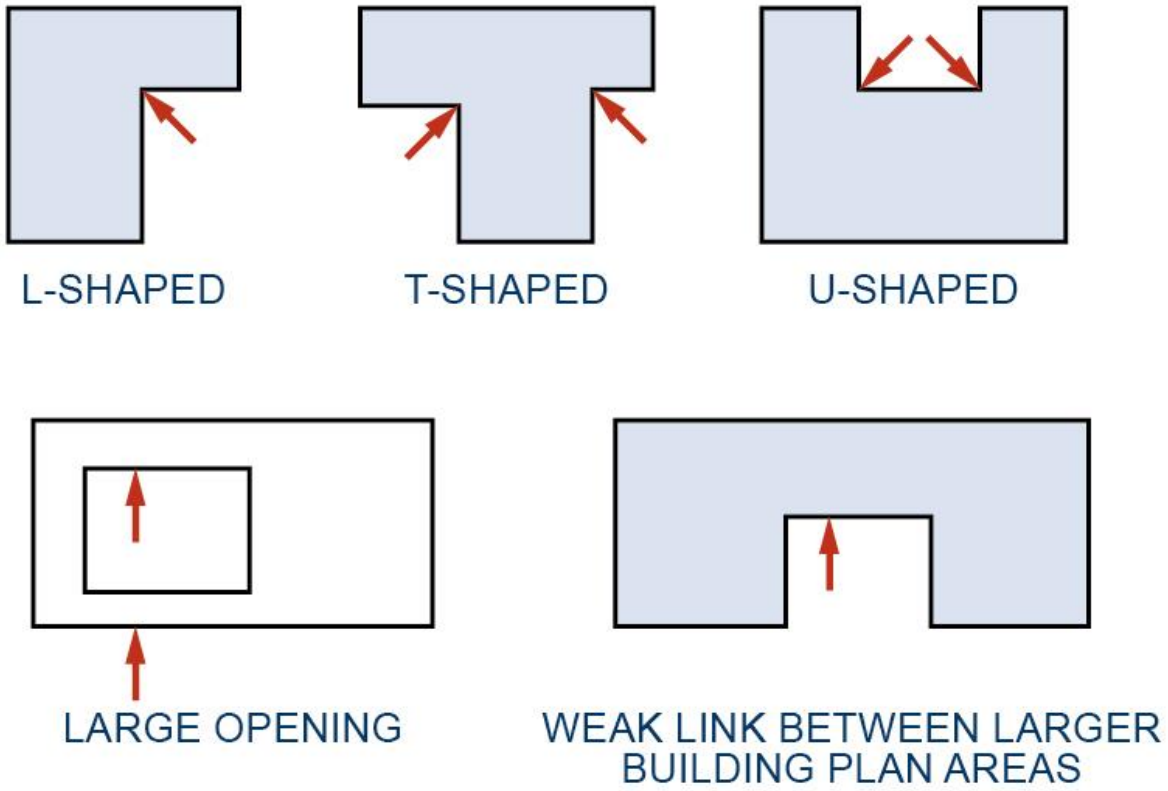


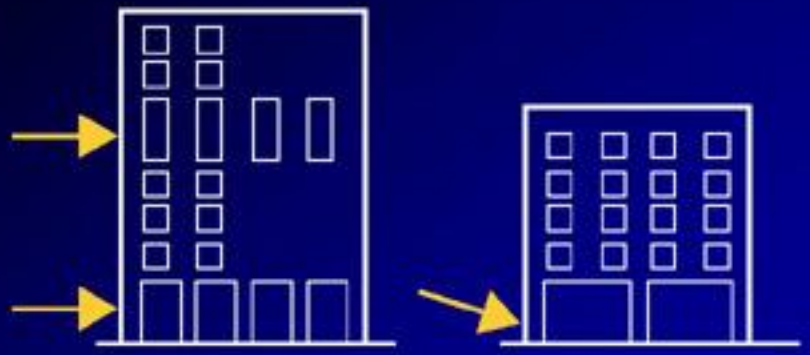
LARGE P-DELTA LOADS IN MULTI-STORY BUILDING

NONSTRUCTUAL - CONTENTS

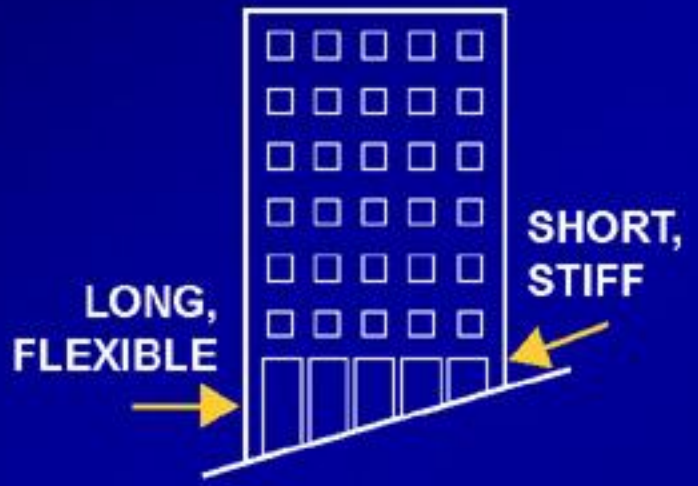


PLAN IRREGULARITY

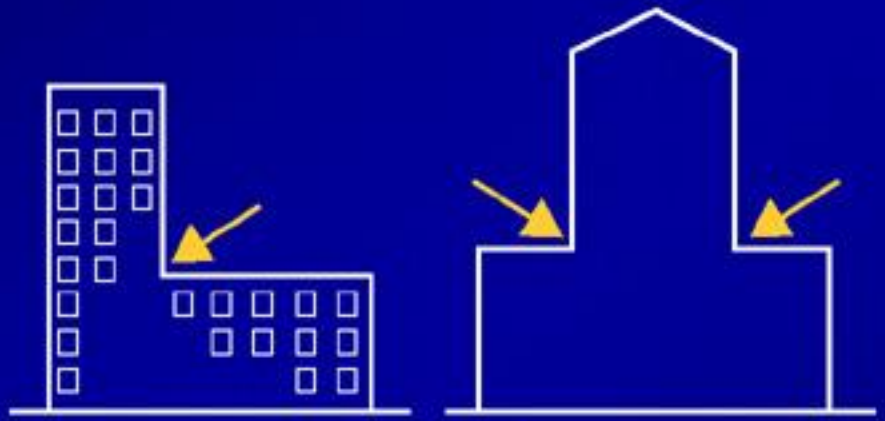




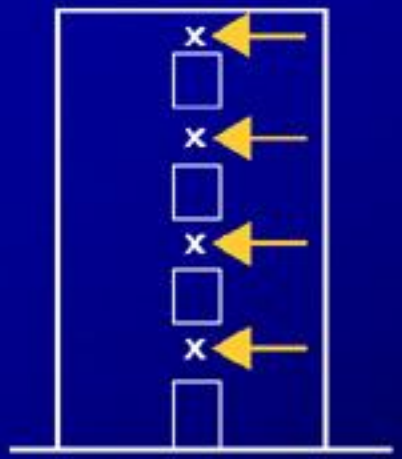
SOFT STORIES



HILSIDE BUILDINGS



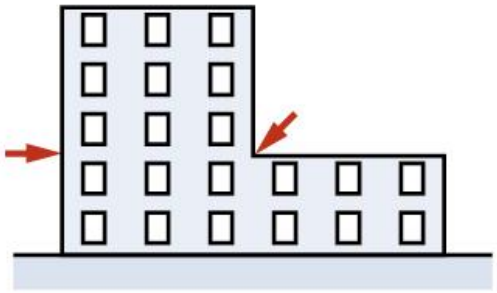
SETBACKS



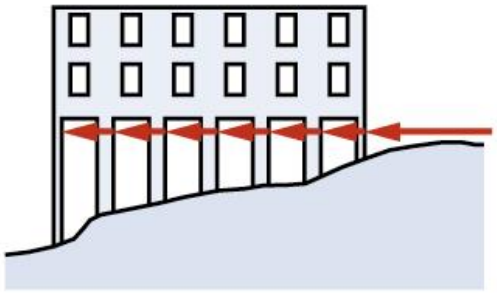
COUPLED SHEAR WALL

AREAS OF PARTICULAR CONCERN

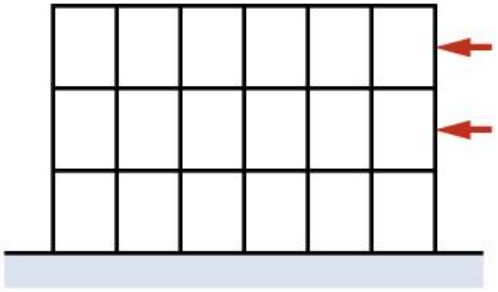
VERTICAL IRREGULARITY



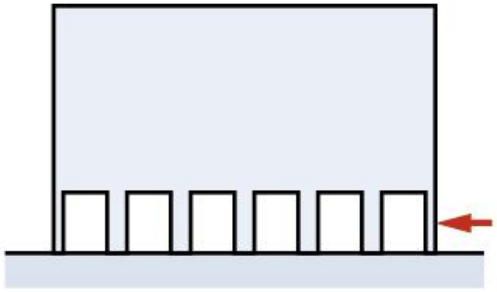
SETBACKS



HILLSIDE



SHORT COLUMN

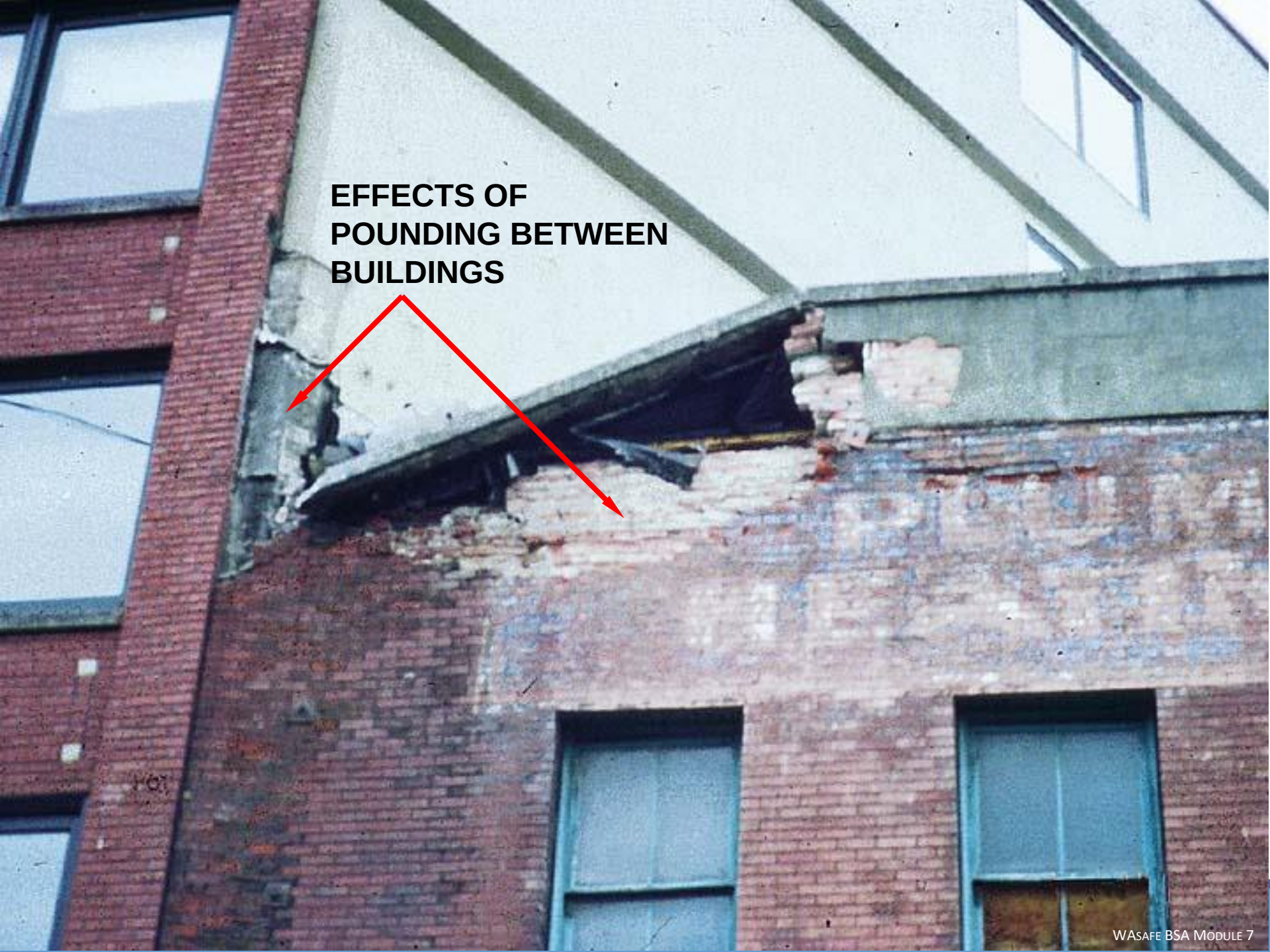


SOFT STORY

VERTICAL IRREGULARITY

VERTICAL IRREGULARITY

COUPLED SHEAR WALL


EFFECTS OF
POUNDING BETWEEN
BUILDINGS


Motosaka


Motosaka