

# Seismic Risk Assessment Demonstration Project

City of Seattle All-Hazards Mitigation Plan  
2014 Plan Update

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March 17, 2015

# Seismic Risk Assessment Demonstration Project

## Presentation Goals

- Present the process used to prioritize and assess facilities in our portfolio
- Introduce assessment methodology and terminology
- Brief overview of how information is being used for planning efforts



# Seismic Risk Assessment Demonstration Project

- FAS responsible for over 100 facilities
- Facilities vary greatly in use
- Facilities vary in age and construction type



# Critical Facilities Index (CFI)

- Index is calculated on a scale of 1 to 5 (5 is the most critical)
- Based on (5) weighted emergency management categories

	<b>I. Life Safety Index</b>	<b>II. Lifeline Systems Index</b>	<b>III. Time Dependency Index</b>	<b>IV. FFD Business Function Index</b>	<b>V. High Risk Index</b>
	<b>Life Saving Operations</b>	<b>Utilities</b>	<b>Emergency Response Function</b>	<b>Continuity of Operations</b>	<b>Damage &amp; Power Loss Potential</b>
	25%	25%	20%	15%	15%
5	Facilities essential to maintain life safety after disaster	Main component of critical lifeline system infrastructure	Immediate emergency response function <8hrs	FFD COOP designated Fatal (F) city impact if function fails	High damage potential and no generator for emergency power backup
	EOC, police precincts, fire stations, DOCs	pump house, power generation facility, communication towers, 911, FAC, EOC call centers, DOIT server	Life safety operations, EOC, all of the department DOCs	Life safety vehicle repairs, fuel, parts, EOC, DOC	High seismic hazard from past assessment or two or more bldg risks (building age, site hazard, etc.)



# Critical Facilities Index (CFI)

Score	Criticality Class
3.5 – 5.0	Critical
2.5 – 3.4	Essential
1.5 – 2.4	Important
1.0 – 1.4	Non-Essential

FACILITY NAME	CFI	YEAR BUILT	PRIMARY USE
South Precinct	4.15	1981	Police precinct
Haller Lake Vehicle Maintenance	3.85	1957	Vehicle maintenance shop
Airport Way Center – Building E	3.7	1985	Laboratory
Charles Street SDOT Engineering	3.5	1971	Office
Sunny Jim SDOT Sign Shop	3.45	1963	Sign shop, warehouse and office
Charles Street Vehicle Maintenance	3.4	1949	Vehicle maintenance shop
Charles Street Tire Shop	3.4	1966	Vehicle maintenance shop
Airport Way Center – Building B	3.25	1985	Office and shop
Fire Headquarters	2.8	1928	Office
Charles Street Traffic Meter Shop	2.8	1966	Equipment maintenance shop
Harbor Patrol Office	2.8	1928	Office
Charles Street Fire Garage	2.65	1973	Vehicle maintenance shop



# Consultant Scope of Work

## Phase 1

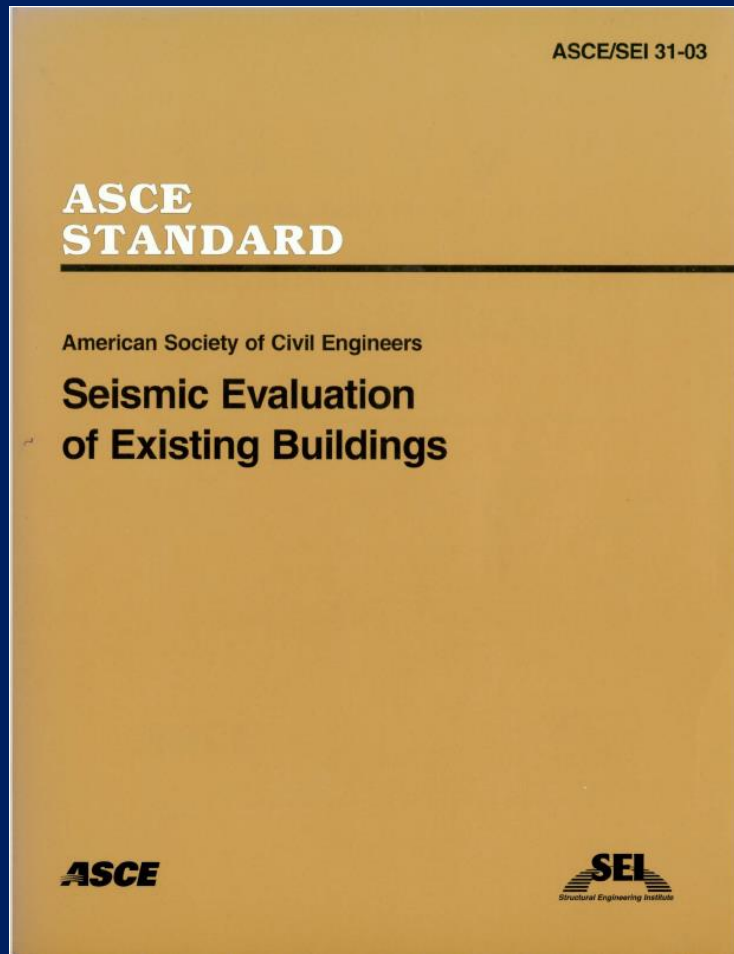
- Evaluation of (12) facilities
- Rough order of magnitude (ROM) costs for retrofit

## Phase 2

- Further evaluation and analysis of (2) selected facilities based on results of Phase 1
- Designed plans and details of retrofit
- Refined cost estimate



# ASCE 31-03 Methodology



- More detailed look than FEMA 154
- Industry accepted standard
- Evaluation must be performed by an engineer



# ASCE 31-03 Methodology

- Performance objectives
- Benchmark buildings
- Tier 1 checklists
  - Structural and Non-Structural
  - Identify compliant and non-compliant systems and components

**Table C1-2 Damage Control and Building Performance Levels**

	Target Building Performance Levels			
	Collapse Prevention Level (5-E)	Life Safety Level (3-C)	Immediate Occupancy Level (1-B)	Operational Level (1-A)
<b>Overall Damage</b>	Severe	Moderate	Light	Very Light
General	Little residual stiffness and strength, but load-bearing columns and walls function. Large permanent drifts. Some exits blocked. Infills and unbraced parapets failed or at incipient failure. Building is near collapse.	Some residual strength and stiffness left in all stories. Gravity-load-bearing elements function. No out-of-plane failure of walls or tipping of parapets. Some permanent drift. Damage to partitions. Building may be beyond economical repair.	No permanent drift. Structure substantially retains original strength and stiffness. Minor cracking of facades, partitions, and ceilings as well as structural elements. Elevators can be restarted. Fire protection operable.	No permanent drift. Structure substantially retains original strength and stiffness. Minor cracking of facades, partitions, and ceilings as well as structural elements. All systems important to normal operation are functional.
Nonstructural components	Extensive damage.	Falling hazards mitigated but many architectural, mechanical, and electrical systems are damaged.	Equipment and contents are generally secure, but may not operate due to mechanical failure or lack of utilities.	Negligible damage occurs. Power and other utilities are available, possibly from standby sources.
Comparison with performance intended for buildings designed under the <i>NEHRP Provisions</i> , for the Design Earthquake	Significantly more damage and greater risk.	Somewhat more damage and slightly higher risk.	Less damage and lower risk.	Much less damage and lower risk.

Source: FEMA 356 – Prestandard and Commentary for the Seismic Rehabilitation of Buildings





# ASCE 41-06 Methodology



- More information on HOW to seismically improve your facilities
  - Gives engineers information on analysis options
- Structural System
- Non-Structural Systems



# Next Steps?

## ASSET PLANNING PROGRAM

- Catalog retrofit information into our facilities database
- Information combined with known deficiencies, energy conservation and ADA items
- Look for opportunities to combine work in a smart and strategic way
- Use existing funding to execute more assessments



# LESSONS LEARNED

- Work to further advance the dialogue between us (owner) and consultant
  - Reevaluate performance objectives selected for facilities against business operation needs
  - Closer evaluation of non-structural systems could add costs to a retrofit project

Life Safety Level (3-C)	Immediate Occupancy Level (1-B)
<p>Moderate</p> <p>Some residual strength and stiffness left in all stories. Gravity-load-bearing elements function. No out-of-plane failure of walls or tipping of parapets. Some permanent drift. Damage to partitions. Building may be beyond economical repair.</p>	<p>Light</p> <p>No permanent drift. Structure substantially retains original strength and stiffness. Minor cracking of facades, partitions, and ceilings as well as structural elements. Elevators can be restarted. Fire protection operable.</p>
<p>Falling hazards mitigated but many architectural, mechanical, and electrical systems are damaged.</p>	<p>Equipment and contents are generally secure, but may not operate due to mechanical failure or lack of utilities.</p>
<p>Somewhat more damage and slightly higher risk.</p>	<p>Less damage and lower risk.</p>



# Questions?

