

URM Technical Standards committee meeting

Dec. 20th 2016.

Agenda

- 1) Requirements and need for a geotechnical evaluations for URM structures on liquefiable and poor soils.
- 2) Revised definition of URM Buildings as proposed by policy committee.
- 3) Merging current URM class 3 and class 4 into one category
- 4) Specific requirements for an ASCE 41 evaluation.
- 5) Do roof and floor attachments to the wall require continuous ties and sub-ties.
- 6) Discussion, if desired on letter prepared by David Bugni in response to position statement from building owners to URM policy recommendations.



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Geotechnical Evaluation

Current Requirements:

A geotechnical report is required as part of the building assessment (STEP 1) for URM buildings in high liquefaction zones or situated on type E soils (Exception : URM Class 5 buildings are exempt from this requirement.

Rationale :

- The Retrofits Standards Committee concluded that, in order to mitigate the hazards posed by liquefaction or poor soils, ground improvement measures or use of deep foundations would be necessary.
- These measures may not be practical or economically feasible for an existing building
- Evaluation will enable owners to make an informed economic decision as to whether the building should be upgraded or demolished.
- URM buildings in high liquefaction zones may not be susceptible to liquefaction in smaller seismic events but could still pose a danger to occupants and the public. Therefore, seismic upgrades based on their classification are still warranted.



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Geotechnical Evaluation

Question from Policy Committee :

- 1) Since mitigation of liquefaction hazards is not being required, why is a geotechnical report a required element of the evaluation?
- 2) Instead of a mandatory requirement can this be optional since it is only there to provide information to the owner?
- 3) Question from BDS : Instead of requiring a geotechnical report, are there other strategies that can be required to lessen the impact of poor soils liquefaction hazards such as tying isolated footing together with grade beams for URM buildings in high liquefaction zones ?



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URM Definition

Current Definition

Unreinforced Masonry Bearing Wall Building means a building that contains at least one URM bearing wall.



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URM Definition

Proposed revision

Unreinforced Masonry Wall Building means a building that contains **either**

- A. At least one Unreinforced Masonry Bearing Wall, or
- B. ***At least one Unreinforced Masonry Wall that participates in the main lateral force-resisting system.***

Exception: A building is exempt from this definition if both of the following are satisfied:

- 1. All existing lateral load-carrying structural elements have a demand-capacity ratio no more than 10 percent greater when neglecting all Unreinforced Masonry Walls than their demand-capacity ratio including all Unreinforced Masonry Walls, and***
- 2. The demand-capacity ratio, determined by neglecting all Unreinforced Masonry Walls, from the Quick Check Procedures for the appropriate Life Safety Structural Checklist of ASCE 41-13 shall not exceed 2.0. The appropriate Life Safety Structural Checklist shall be determined based on the building type neglecting all Unreinforced Masonry Walls.***

Where the building is exempt per Item 1 and 2 above, the deficiencies in all Unreinforced Masonry Walls meeting Items A or B must still be evaluated and retrofitted.




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Seismic Risk	Classification	Description	Upgrade Level ^{2,3}	Approximate # of Buildings ⁴
Highest 	URM Class 1	Critical Buildings (Risk category ¹ IV buildings, power generating stations serving critical facilities, water facilities, and other public utilities)	Evaluation and Retrofit Level: Tier 3 in accordance with ASCE 41 Performance Objective: BPON for Risk Category IV Structural Performance Objective: Immediate Occupancy for BSE-1N and Life Safety for BSE-2N Non-Structural Performance Objective: Operational for BSE-1N for all non-structural components assigned a component importance factor, $I_p=1.5$ as defined in ASCE 7-10 Chapter 13, as well as URM parapets, cornices, partitions and chimneys and hollow clay tile partitions.	10
	URM Class 2	A. All school buildings B. Risk category ¹ III buildings	Evaluation and Retrofit Level: Tier 3 in accordance with ASCE 41 Performance Objective: BPOE for Risk Category III Structural Performance Objective: Damage Control for BSE-1E and Limited Safety for BSE-2E. Non-Structural Performance Objective: Position Retention for BSE-1E for URM parapets, cornices and chimneys as well as unreinforced masonry or clay tile partitions along major routes of egress.	(88) 46- schools 36- churches 6- community centers/theatres
	URM Class 3	A. Buildings \geq 4 stories or B. Buildings with \geq 300 occupants or C. Residential buildings with \geq 100 units	Evaluation and Retrofit Level: Tier 2 deficiency only in accordance with ASCE 41 (unless Tier 3 required by ASCE 41) Performance Objective: BPOE for Risk Category II Structural Performance Objective: Life Safety for BSE-1E. When Tier 3 is required by ASCE 41, structural performance objective also includes Collapse Prevention for BSE-2E. Non-Structural Performance Objective: Life Safety for BSE-1E for URM parapets, cornices and chimneys.	(221)




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Seismic Risk	Classification	Description	Upgrade Level ^{2,3}	Approximate # of Buildings ⁴
	URM Class 4	All other URMs not categorized as URM Class 1, 2, 3, or 5.	<p>Evaluation and Retrofit Level: Tier 2 deficiency only in accordance with ASCE 41 (unless Tier 3 is required by ASCE 41)</p> <p>Performance Objective : BPOE for Risk Category II</p> <p>Structural Performance Objective: Life Safety for BSE-1E. When Tier 3 is required by ASCE 41, structural performance objective also includes Collapse Prevention for BSE-2E.</p> <p>Non-Structural Performance Objective: Life Safety for BSE-1E for URM parapets, cornices and chimneys.</p> <p>**Exception: If a building conforms to or is brought up to the minimum requirements described in footnote 5 below, then only the following elements are required to be upgraded per ASCE 41 for Life Safety performance under the BSE-1E and Collapse Prevention under the BSE-2E:</p> <ul style="list-style-type: none"> (a) brace URM parapets, cornices and chimneys; (b) anchor URM walls to floors and roofs for out of plane loading; (c) attach diaphragm to vertical elements to transfer in plane shear; and (d) out-of-plane URM wall bracing if h/t ratio exceeds that reqd. by ASCE 41-13 Table 11-5. 	(1136) (1357)
	URM Class 5	1 and 2-story buildings with 0-10 occupants.	<p>Performance Objective: Limited Performance Objective</p> <p>Only the following elements are required to be upgraded per ASCE 41 for Life Safety performance under the BSE-1E and Collapse Prevention under the BSE-2E :</p> <ul style="list-style-type: none"> (a) brace URM parapets, cornices and chimneys; (b) anchor URM walls to floors and roofs for out of plane loading; (c) attach diaphragm to vertical elements to transfer in plane shear; and (d) out-of-plane URM wall bracing for URM walls with h/t ratio greater than 16 for one-story buildings or h/t ratio greater than 18 for the first story of a multi-story building, or h/t ratio greater than 14 for walls in top story of a multi-story building. 	(203)



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Footnotes

(5) Minimum Requirements / Building Configurations when limited upgrade is applicable for URM Class 4 buildings:

- The building does not have vertical irregularity type 5a or 5b (a “weak story”) as defined in ASCE 7-10, Table 12.3-
- The building has a mortar strength (v_t) of 30 psi or more for all masonry at an axial stress of 0 psi.
- The building has diagonally sheathed or plywood diaphragms at all levels above the base of the building.
- The building has or will be provided with a minimum of two lines of vertical elements of the lateral force resisting system parallel to each axis. Masonry walls shall have piers with a height to width ratio that does not exceed 2:1. Wall piers shall occupy not less than 40 percent of the wall’s length for the wall to be considered as providing a line of resistance. Exception: If a design professional registered in Oregon can demonstrate that the flexural, shear and compressive strength Demand/Capacity ratio are equal to 2.0 or less for all walls when evaluated using ASCE 41.



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Time Lines

	<u>STEP 1</u> ASCE 41 Assessment ² and Geotechnical Report ³	<u>STEP 2</u> Parapet, cornice and chimney bracing and wall to roof attachment ⁵	<u>STEP 3</u> All bearing and exterior wall to floor attachments and out-of-plane wall strengthening ^{4,5}	<u>STEP 4</u> Seismic upgrade completed ⁴
URM Class 1	3 years	-	-	10 years
URM Class 2	3 years	10 years	-	20 years
URM Class 3	↪ 5 years	10 years	20 years	25 years with up to an additional 5 years with demonstrable hardship
URM Class 4	↪ 5 years	10 years	20 years	25 years with up to an additional 5 years with demonstrable hardship
URM Class 5	3 years Not. Req'd.	10 years	10 years	-



ASCE 41 Evaluation

Current Requirements in the Retrofit Standards Committee report :

Class 1 : **Evaluation and Retrofit Level:** Tier 3 in accordance with ASCE 41

Class 2: **Evaluation and Retrofit Level:** Tier 3 in accordance with ASCE 41

Class 3: **Evaluation and Retrofit Level:** Tier 2 deficiency only in accordance with ASCE 41 (unless Tier 3 is required by ASCE 41)

Class 4: **Evaluation and Retrofit Level:** Tier 2 deficiency only in accordance with ASCE 41 (unless Tier 3 required by ASCE 41)

Class 5 : No seismic evaluation required if building confirmed to be a class 5 building



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ASCE 41 Evaluation

- Executive summary** for the non-technical reader at the beginning of the evaluation
- Scope and Intent:** A summary of the evaluation procedures used, and level of investigation conducted.
- Site and Building Data:**
 - A) General building description, including number of stories and dimensions,
 - B) Building Occupancy and use.
 - C) Determination of URM Building Class
 - D) Structural system description (framing, seismic-force -resisting system, floor and roof diaphragm construction, basement and foundation system)
 - E) Nonstructural systems description (all nonstructural elements that affect seismic performance of the building or whose failure could cause serious life-threatening injuries to occupants or those near the structure)
 - F) Common Building Type
 - G) Performance Level
 - H) Level of seismicity
 - I) Soil Type



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ASCE 41 Evaluation

- List of assumptions and testing** : material properties, site soil conditions, Level of inspections and testing conducted (if testing was done)

- Findings**: A list of seismic deficiencies identified.

- Appendix**:
 - 1) All necessary Checklists (Basic checklist, Structural checklist for different building types, non-structural checklist)
 - 2) Summary datasheet
 - 3) Building plans
 - 4) Calculations and analysis procedure including demand capacity ratios, quick checks etc.
 - 5) Material test results (if testing was done)
 - 6) Photographs



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ASCE 41 Evaluation

Questions with regards to evaluation

- (1) Do we want to add to or delete any requirements listed above
- (2) Should both a Tier 1 and Tier 2 (Tier 3 for class 1 and 2 and Tier 3 if required by ASCE 41 for class 3 and 4) evaluations be required or just Tier 1.
- (3) Do we want geologic site hazard evaluation as part of the ASCE 41 evaluation?
- (4) How much of non-structural checklist evaluation should be required?



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