Unreinforced Masonry (URM) Building Policy Committee Report

- DECEMBER 2017 -

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Executive Summary

An unreinforced masonry (URM) building is a structure with at least one wall made of brick or blocks joined by mortar with no steel reinforcing bars.

URM buildings were constructed in Portland between about 1870 and 1960. Many have aged handsomely. They include historic churches, schools, and theaters, as well as restaurants, breweries, dance halls, and other landmarks that Portlanders know and love. URM buildings define the character of many Portland neighborhoods and business districts.

Unfortunately, Portland has a significant earthquake risk, both from a subduction zone off the Oregon coast and crustal faults beneath the city. URM buildings are highly vulnerable to seismic damage. When the ground shakes, they pose a major risk for death or injury, property damage, and loss of economic use.

Requirements to strengthen URM buildings were put in place in Portland in 1995. They apply only when a URM building owner seeks permission from the City to increase occupancy, change the use, or make a significant renovation to their building. Since 1995, about 8% of Portland URM buildings have been demolished. Of those that remain, about 5% have been fully retrofitted, and about 9% have been at least partially upgraded. An estimated 85% of existing URM buildings have had no retrofits at all.

The average Portland URM building is 88 years old. Portland's stock of URM buildings includes about 44 schools, 38 churches, and 248 multifamily structures with over 7,000 residential units. More than 500 URM buildings are on the National Register of Historic Places or are contributing structures in a designated National Historic District or Conservation District. A complete URM building inventory is available at www.portlandoregon.gov/bds/urms.

In 2014, Portland City Council directed the Portland Bureau of Emergency Management, the Portland Development Commission (now known as Prosper Portland), and the Bureau of Development Services to work together with community stakeholders and subject matter experts to develop recommendations to reduce Portland's risk from URM buildings. Two technical committees composed of outside experts were created to advise on engineering and finance. They met from January to November 2015. From December 2015 to November 2017, a Policy Committee composed of members of both technical committees, along with advocates for historic preservation, affordable housing, schools, churches, and other owners-stakeholders, met to synthesize the technical recommendations and data into a complete policy recommendation. This report represents the culmination of their work.

Based on the risks Portland faces, the need to ensure public safety, the lack of progress under current codes, the effectiveness of mandatory seismic retrofit policies in other locations, and the results of an independent cost-benefit analysis, it is recommended that the city of Portland adopt a limited, mandatory seismic strengthening program.

The Policy Committee proposes a tiered approach, requiring URM building upgrades to critical buildings sooner and to a standard that will enable their use after an earthquake, and lower-risk buildings later, to a cost-effective standard that will still reduce the danger they pose to the public. The details of the proposed building classification system, upgrade standards, and proposed timelines are summarized on page 18 of this report.

The Committee recognizes the potentially significant impacts that mandatory URM building retrofits will have on building owners, including small businesses and individuals who rely on building rents as their primary income. The Committee proposes that the City develop a program of property tax exemptions to help offset the costs of retrofitting, as authorized under recent state legislation. The Committee also supports increased state funding for school retrofits, and an extended timeline, if necessary, for affordable housing retrofits. For tax-exempt public assembly spaces, such as churches and synagogues, which are ineligible for public subsidy and do not benefit from tax exemptions, the Committee recommends a program of minimal upgrades plus warning placards.

The Committee further recommends that the City support a public education campaign for building owners and tenants, a voluntary building placarding program to mark retrofitted URM buildings, and an earthquake navigator to assist building owners in navigating the permitting, financing, and design of seismic retrofits.

Introduction

An unreinforced masonry (URM) building is a structure with at least one wall made of brick or blocks joined by mortar with no steel reinforcing bars.

URM buildings were constructed in Portland between about 1870 and 1960. Many have aged handsomely. They include historic churches, schools, and theaters, breweries, dance halls, and other landmarks that Portlanders know and love. URM buildings define the character of many Portland neighborhoods and business districts. More than 7,000 Portland households reside in multi-family URM buildings.

URM Building Risks

In an earthquake, URM buildings pose a life-safety risk to building occupants and people nearby. According to the Federal Emergency Management Agency (FEMA), "More than any other kind of construction, they can be singled out as being seismically vulnerable." [1]

Masonry walls are heavy and brittle. When the ground shakes, the roof and floors pull away from URM building walls, which crack and crumble. Typical earthquake damage to URM buildings includes the collapse of the walls, roofs, and upper floors. Mortar weakens with age, so the risks increase in older

1 Federal Emergency Management Agency Publication #774: Unreinforced Masonry Buildings and Earthquakes. October, 2009.

buildings. With even light shaking, chimneys, parapets, and architectural ornaments may break off and fall. It is for all these reasons that URM buildings pose a great risk for human injury, property damage, and loss of economic use after an earthquake.

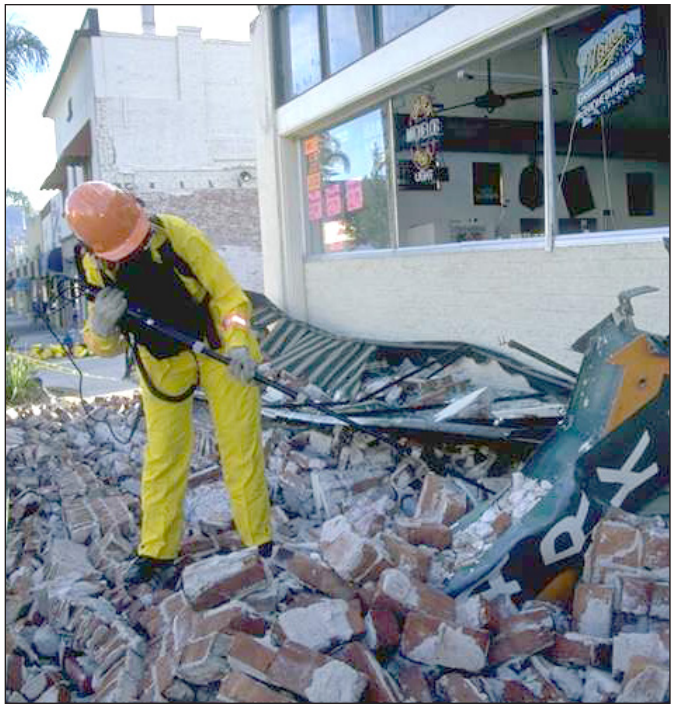
Examples from across the world, including earthquakes in Washington, California, New Zealand, and Chile, illustrate potentially tragic outcomes for URM building occupants and others nearby during an earthquake.

Fortunately, URM buildings can be retrofitted using a variety of strategies: walls can be braced; roofs, floors, chimneys, and parapets can be more strongly anchored to the walls; and building diaphragms (floors) can be strengthened. Evidence from earthquakes in other states and countries shows that URM building retrofits work. Seismically strengthened URM buildings have survived in earthquakes while adjacent un-retrofitted structures were lost.

Existing City Code

Earthquake risk in the Pacific Northwest was not well-understood by scientists until the late 1980s. In 1995, the City of Portland updated City Code (Title 24.85) to partially address the specific seismic risks of URM buildings. This code was updated again in 2004.

Current code requires building owners to seismically retrofit their buildings when at least 1/3 of the building is changed to a more intensive use, the occupancy increases by 150 or more people, or the owner spends more than about $43 (FY 2016) per square foot on other improvements. A partial upgrade, to brace the parapets and tie the walls to the roof, is required when more than half of the building is re-roofed. In all cases, seismic improvements are required only when the building owner approaches the City to make other changes; structures that continue in the same use without major upgrades will never be required to be retrofitted under the current code.

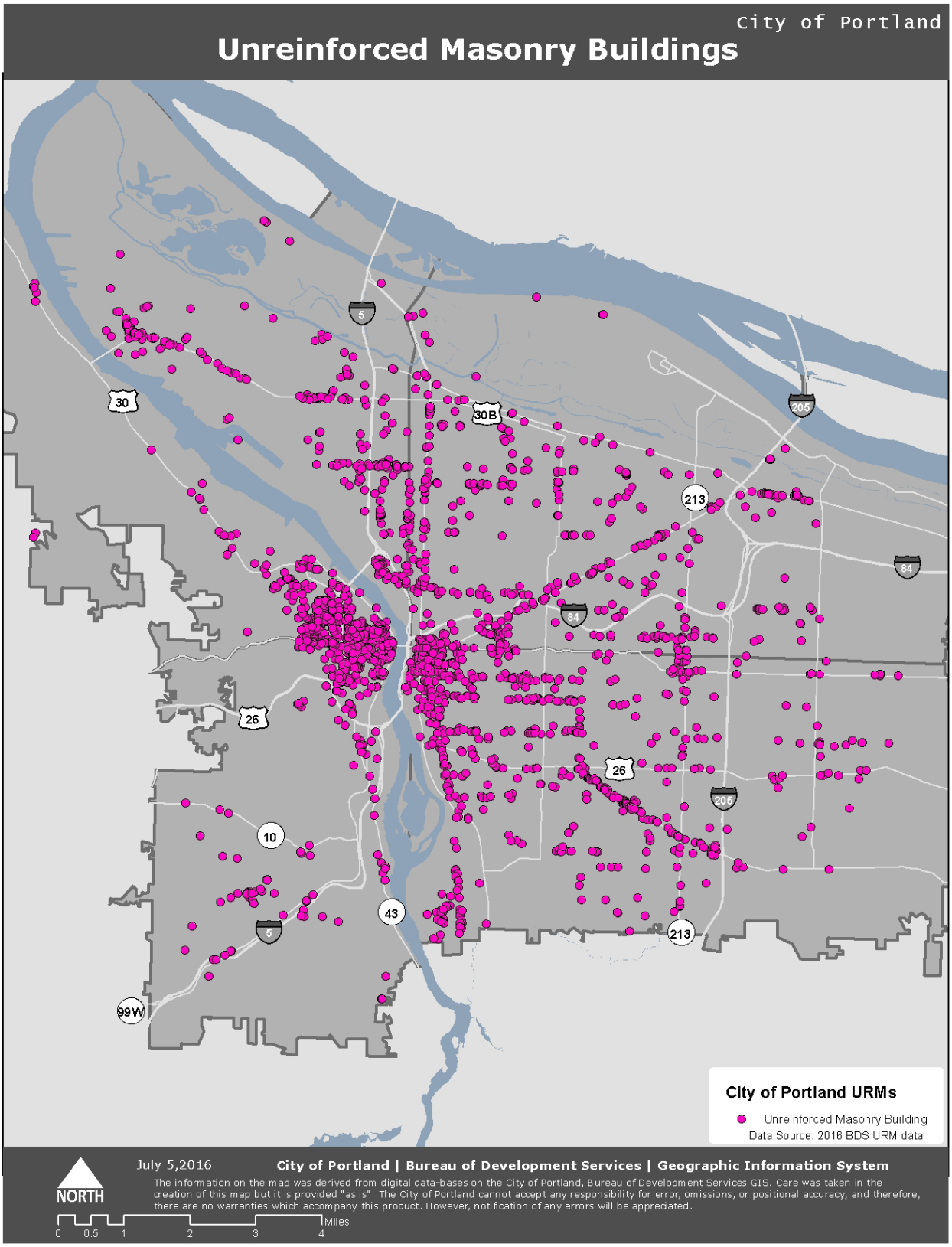


Code Effectiveness Concerns

Since the City's requirement to retrofit URM buildings was put in place in 1995, about 8% of Portland URM buildings have been demolished. Of those that remain, about 5% have been fully retrofitted, and about 9% have been at least partially upgraded. An estimated 85% of existing URM buildings have had no retrofits at all. The current regulations have not proven to be as effective in reducing the risk posed by URM buildings as had been hoped.

In June 2014, the Portland City Council held a work session on Portland's URM building risk. Based on information presented at the session, Council directed the Portland Bureau of Emergency Management (PBEM), Bureau of Development Services (BDS) and Prosper Portland to work together to propose a strategy to reduce Portland's URM building risk. This report represents the work of these bureaus and the advisory body of engineering experts, building owners, and community stakeholders they assembled to support the effort.

MAP 1 | Portland URM Buildings



URM Buildings by the Numbers

Portland conducted a URM building inventory in 1994-1996, when the first retrofit requirements for URM buildings were adopted, and updated the inventory in 2015-2016 as part of its current effort. Altogether, this work identified 1,884 URM buildings. Of those, 154 were demolished and 90 were fully upgraded after the first inventory was completed. The average remaining URM building is 88 years old.

Portland's URM buildings include about 44 schools, 38 churches, and 248 multifamily structures, with more than 7,000 residential units. Of the residential units, at least 1,800 are publicly-financed affordable housing.

The URM building inventory includes approximately 30 individual properties on the National Register of Historic Places, 36 local Portland Historic Landmarks, and an additional 204 buildings that are contributing structures within a recognized historic or conservation district. And all URM buildings are more than 50 years old, and thus at least potentially eligible for consideration as historic structures according to the National Trust and Oregon's State Historic Preservation Office.

FIGURE 1 | All URM Buildings by General Use

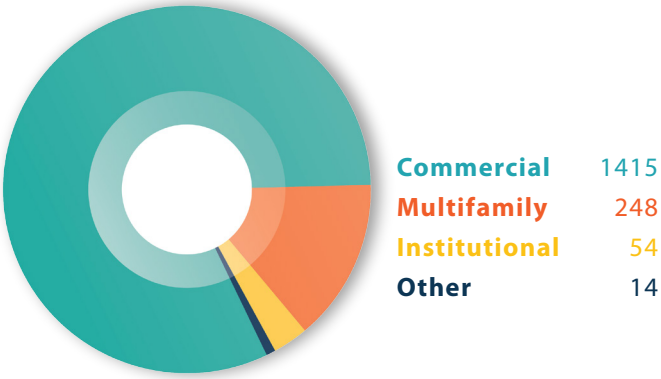


FIGURE 2 | All URM Buildings by Height

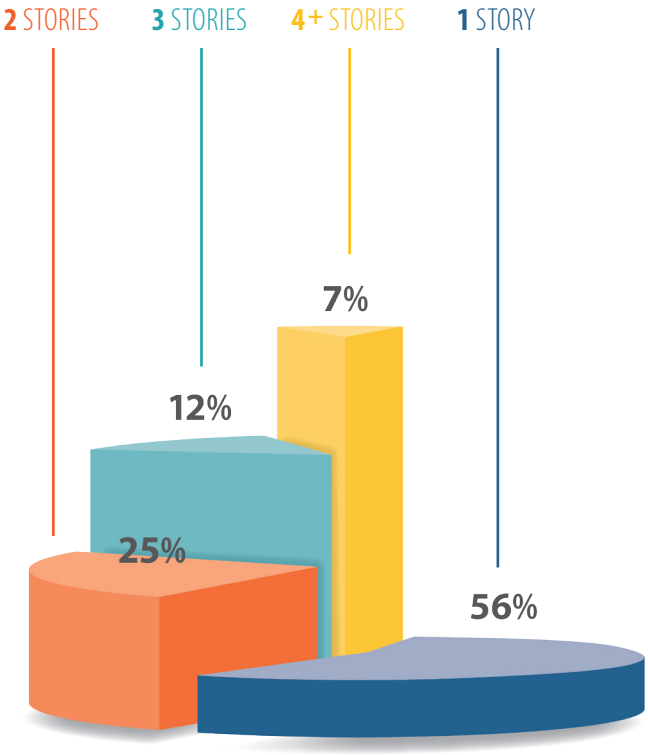


FIGURE 3 | All URM Buildings by Construction Date

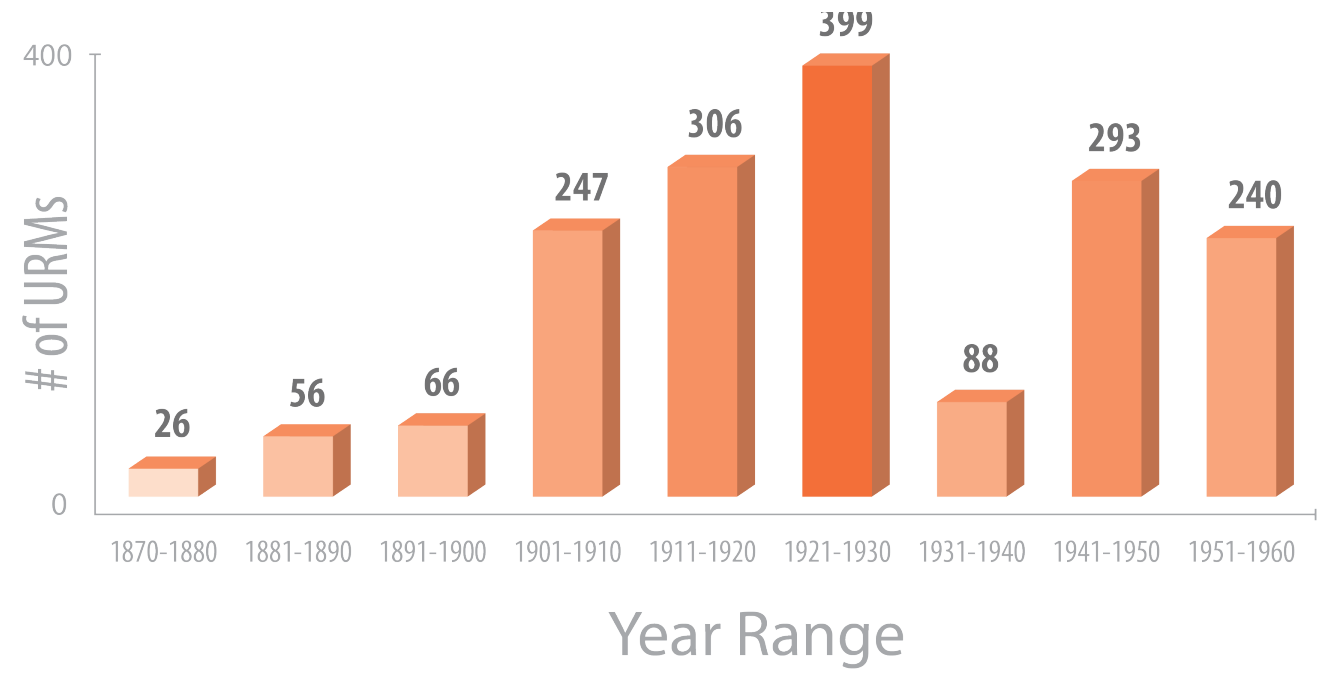
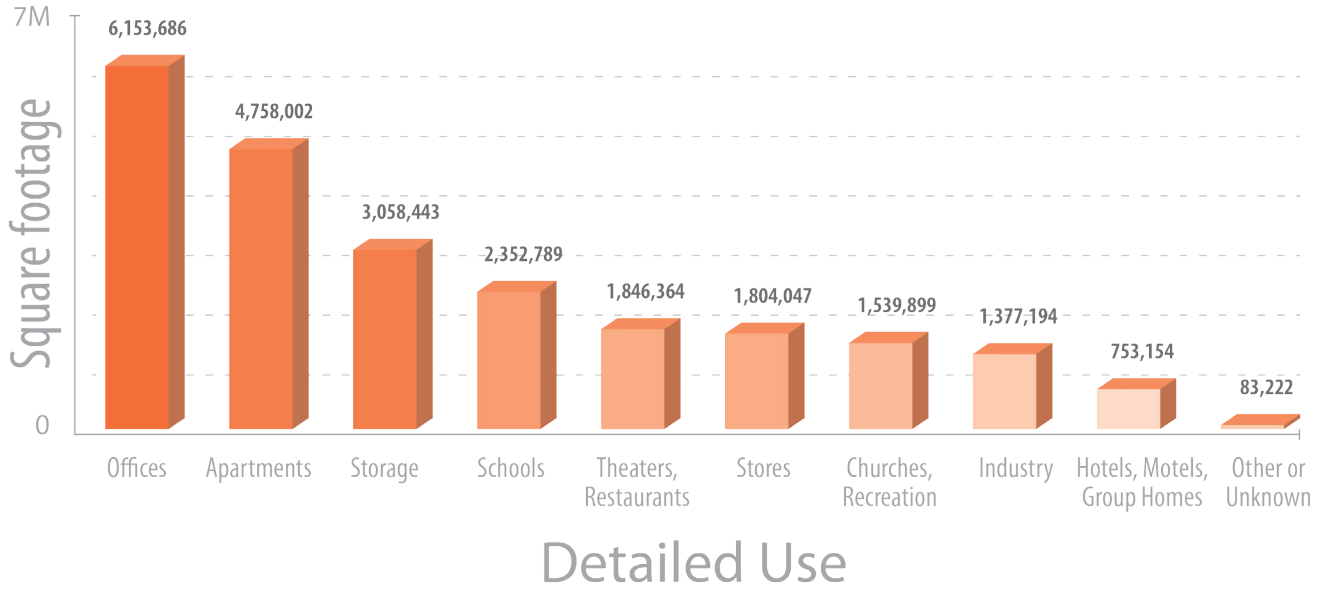


FIGURE 4 | All URM Buildings by Area by Detailed Use



The complete URM building inventory is available on the BDS website. Information about Portland's stock of URM buildings, by age, use, size, and value, was calculated from this inventory as of December 2017.

The following page shows a map of URM buildings with the underlying land-use. This illustrates how many URM buildings are located in commercial, residential, industrial, and other areas. As the map shows, the majority of URM buildings are clustered in the downtown employment and commercial areas, or are located in mixed-use areas along main commercial streets.

FIGURE 5 | Historic URM Buildings

567 HISTORIC PORTLAND URM BUILDINGS[2]

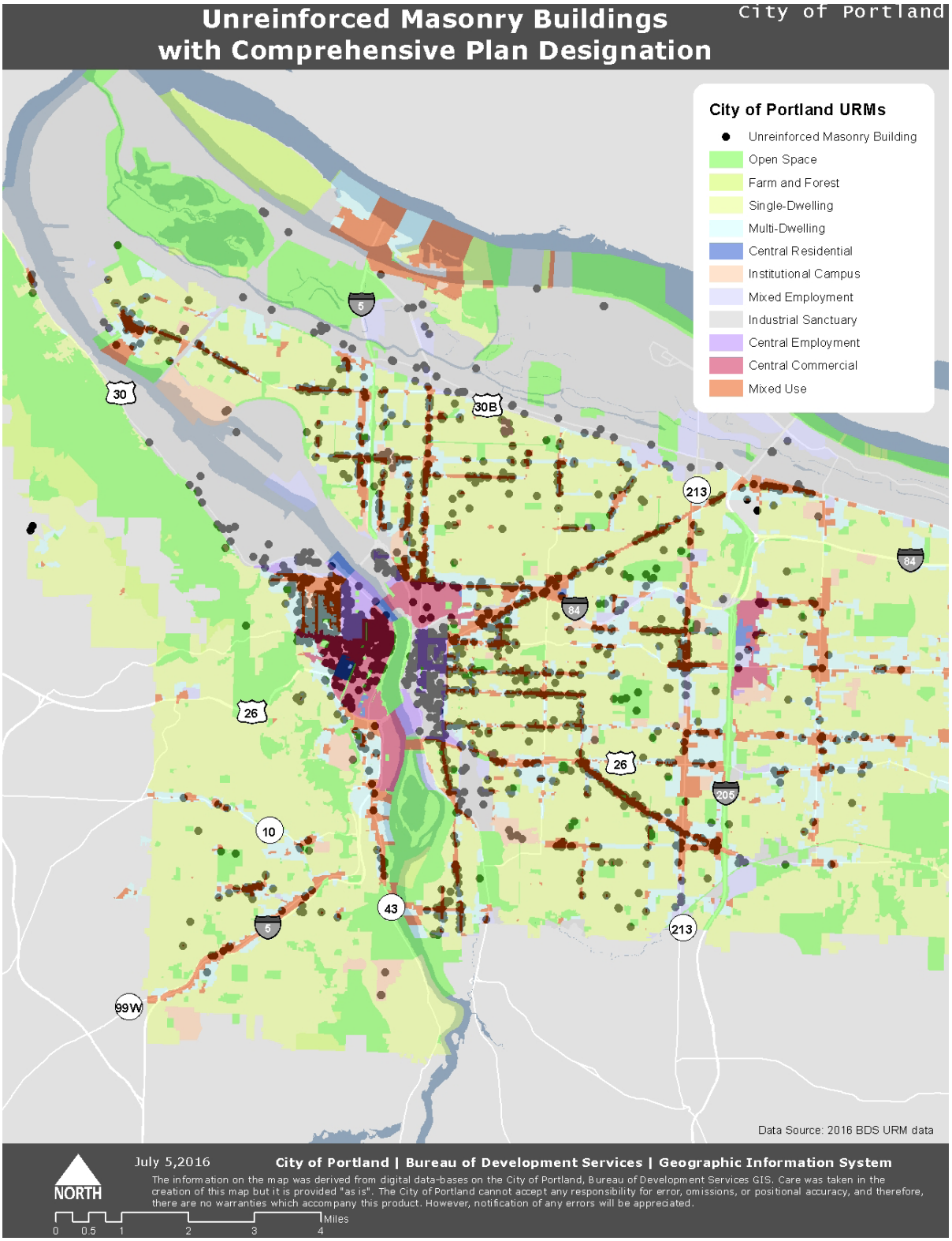
National Registry	**124**
Local Landmarks	**154**
In Historic District	**270**
In Conservation District	**49**

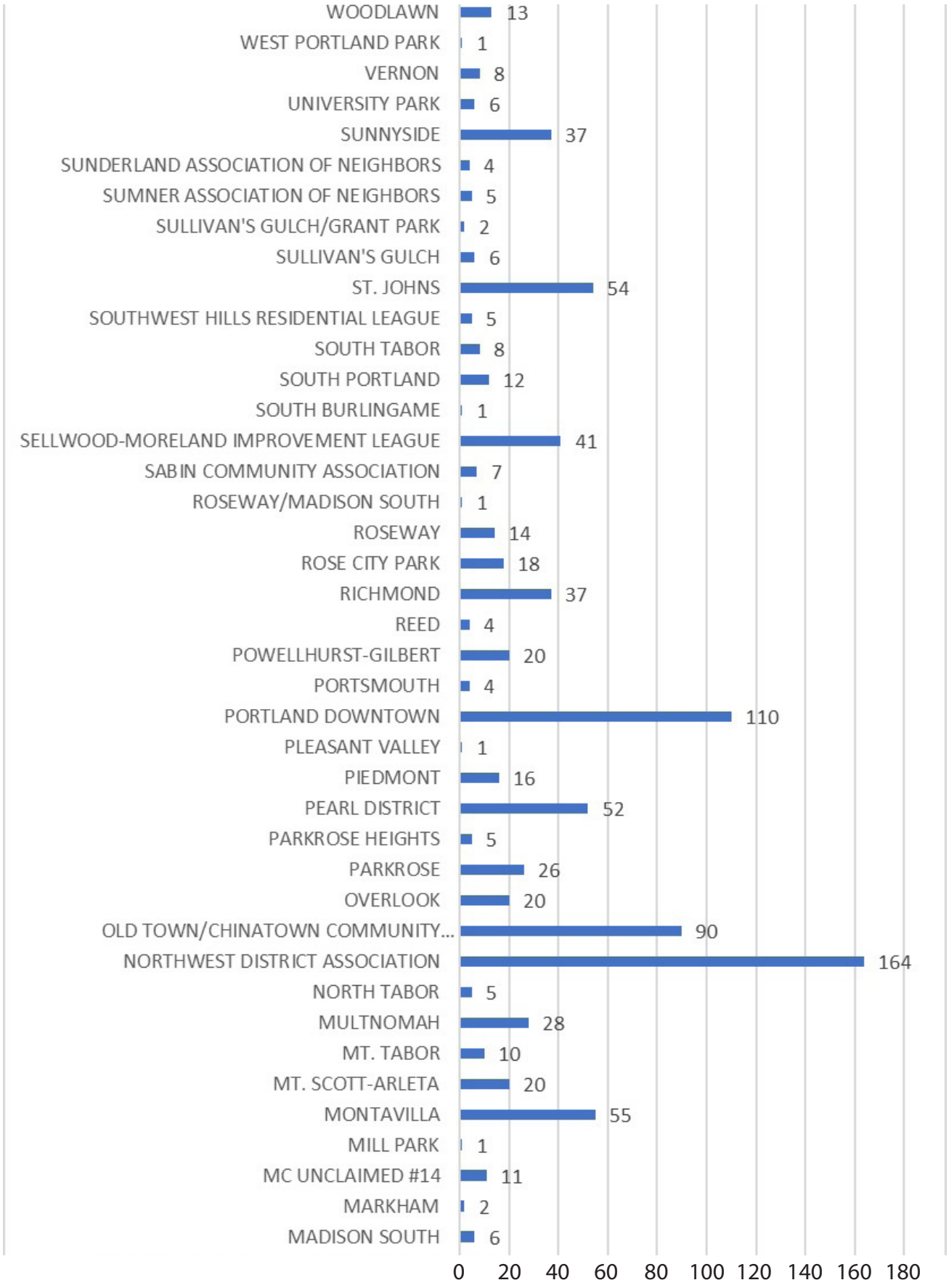
FIGURE 6 | Area (Square feet) in each URM Building class, by use

USE	CRITICAL	SCHOOLS, PUBLIC ASSEMBLY	GENERAL	SMALL/LOW-RISK	TOTAL
Commercial	33,518	1,107,578	13,735,882	541,369	15,420,347
Institutional		2,145,845	194,218		2,340,063
Multi Family	8,811		4,741,111	4,670	4,754,592
Other	5,000		69,020	9,202	83,222
TOTAL	**49,329**	**3,253,423**	**18,740,231**	**555,241**	**22,598,224**

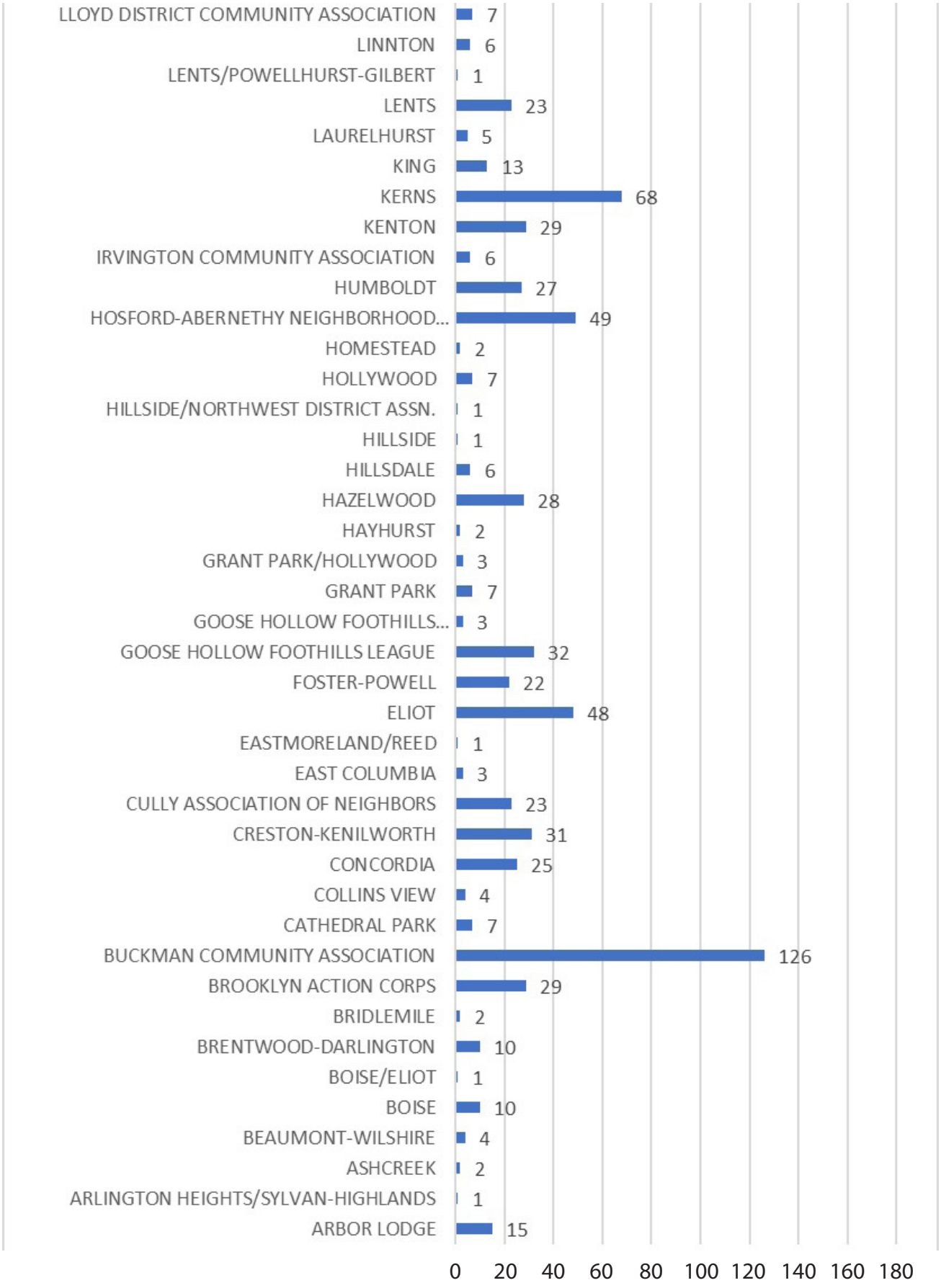
2 Includes only buildings listed on a historic registry, not buildings potentially eligible for inclusion. Buildings may fit into more than category.

MAP 2 | URM Building with Comprehensive Plan Designation





Unreinforced Masonry Buildings by Neighborhood



Unreinforced Masonry Buildings by Neighborhood

Policy Development Process

Portland City Council directed PBEM, BDS, and Prosper Portland to work together on the URM building project. Together, the three bureaus devised a process intended to incorporate scientific, financial, and social considerations.

A Retrofit Standards Committee, composed of engineers, architects, and geologists, met from January to April 2015 to develop proposed upgrade standards with a sound technical and scientific basis. Their work is summarized in a final report.

A Seismic Retrofit Support Committee made up of building owners, developers, retired City staff, and lenders, met from May to December 2015. They researched the cost and possible financial support available to URM building owners to carry out seismic retrofits. Their findings and recommendations were also presented in a final report.

URM Building Policy Committee

The URM Policy Committee was first convened in January 2016 and charged with reviewing the work of the technical committees and developing a balanced set of recommendations. This committee included some members of both the Retrofit Standards and Seismic Retrofit Support Committees, as well as stakeholders representing school, church, historic preservation, local business, and affordable housing interests. The Portland Housing Bureau, Bureau of Planning and Sustainability, and City Risk contributed to these discussions as well. This report is the culmination of the Policy Committee's work.

Public Engagement

In addition to assembling the three advisory committees, Portland City staff working on the URM project sought broad public engagement on the committee's work and recommendations. BDS and PBEM pursued media coverage of the effort; PBEM developed a video tour of Portland URM buildings; the Policy Committee hosted three public forums and solicited comments on the draft policy on their website, via email, and via telephone. All URM building owners and all residential tenants in URM buildings received an invitation to a public forum. All the comments received and the minutes and materials from the meetings are available on the project website.

In addition to the committee meetings, public meetings, and written comments, City staff also sought opportunities to address other public bodies throughout the policy development process; staff presented interim work products to the Development Review Advisory Committee (DRAC), Downtown Neighborhood Association, Portland Business Alliance (PBA), Building Owners and Managers Association (BOMA), Portland Public Schools, Structural Engineers Association of Oregon (SEAO), and others.

Recommendation | Mandatory URM Building Retrofits

Based on the seismic risks Portland faces, the need to ensure public safety, and the lack of progress under current codes, the Policy Committee recommends a mandatory seismic strengthening program for Portland URM buildings. Because of the costs and disruptions involved in retrofitting a URM building to current building code, most private buildings should be expected to retrofit only to the level of collapse risk reduction. Critical facilities, schools, and large assembly spaces that belong to the public or for-profit companies, should be retrofitted to a higher standard.

The Policy Committee agreed unanimously that if resources were available to support retrofit work for all URM buildings, it would be desirable to bring all URM buildings up to Life Safety standards or better.

The group struggled to find the right level of retrofit, given the costs and limited resources available to support seismic retrofit work. In the end, the Committee did not reach a unanimous agreement, but there was a consensus to place buildings into four classes and set standards for each class based on the buildings' function, the risks posed to the public, and the resources that would realistically be available to support the retrofit work.

The proposed standards are described below in general terms, and then presented in a table that includes engineering specifics.

DEFINITION OF A URM BUILDING:

In simple terms, a URM building is a building with one or more walls that are made of adobe, clay, brick or blocks, with no steel reinforcement inside. Unreinforced concrete is not considered URM.

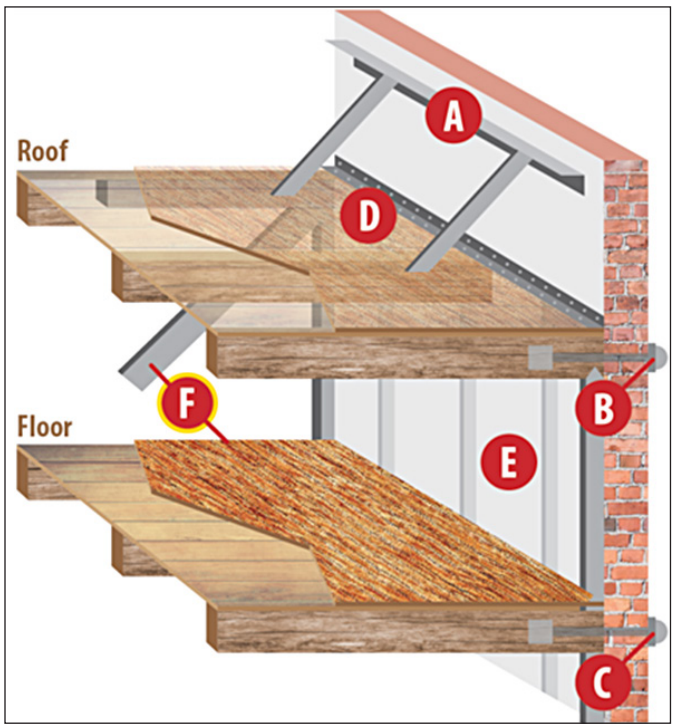
Precise definitions of terms like "reinforced" and "unreinforced" are necessary to understand how the proposed standards would apply to a specific building's structural system. Likewise, terms like "immediate occupancy" and "life safety" already have meaning, but must be defined precisely to be applied as a technical standard. The technical definitions are provided in the appended Glossary.

All the engineering definitions are based on standard 41 of the American Society of Civil Engineers (ASCE-41). ASCE-41 also provides a standard approach for assessing the seismic risk of URM buildings.

Recommendations by Building Class

CLASS 1 | CRITICAL BUILDINGS AND ESSENTIAL FACILITIES. *This category is for critical structures such as hospitals, police and fire stations, power generating stations, and water treatment plants.*

Class 1 URM buildings are structures essential to emergency response. Therefore, they must meet the highest proposed performance objective; they would be expected to remain operational after a Design Earthquake (the "expected" earthquake) and provide for Life Safety in a Maximum Considered Earthquake (the strongest earthquake engineers anticipate).



Life Safety Upgrade to a URM Building

a. Brace parapets

b. Attach wall to roof

c. Attach wall to floor

d. In plane shear attachments and roof sheathing, ties and cross ties

e. Out of plane wall bracing

f. Other upgrades as needed, including vertical bracing and floor sheathing

These buildings are also expected to meet the shortest retrofit timelines, achieving all retrofits within ten years. The URM building database has identified six Class 1 URM buildings. Five are owned by the City, and one by a private utility.

CLASS 2 | SCHOOLS AND HIGH-OCCUPANCY STRUCTURES. *This category addresses buildings listed as Risk Category III buildings in the Oregon Structural Specialty Code and generally includes schools and other structures with many occupants, such as churches and theaters.*

Due to the substantial life safety risk posed by buildings in this class, it is expected that they would be retrofitted to provide greater resistance to collapse or major structural damage than a typical building, a performance standard called "Damage Control." A Damage Control standard makes it more likely the building could be repaired and used again after an earthquake. Buildings retrofitted to this standard are expected to suffer damage that may be repairable; they are expected to be usable with minor repairs immediately after an earthquake.

For Class 2 URM buildings, an ASCE-41 evaluation report is required to be submitted at the time of application for the first permit to retrofit the building under the mandatory retrofit program. The bracing of parapets, cornices, chimneys and other ornamentation, and attachment of the roof to walls is required to be completed within ten years. The remainder of the retrofit, including roof sheathing, floor sheathing, floor-wall ties, out-of-plane lateral bracing, a vertical lateral force resisting system, and other improvements necessary to strengthen the building to a

damage control standard, is required to be completed within 20 years.

However, the committee recommends that Class 2 buildings owned by non-profits, such as churches and other places of worship, that lack access to tax benefits or state grants for financing, only be required to meet the standard for Class 3 buildings. It is also recommended that these structures be required to post a warning that they pose a potential risk in an earthquake if they only retrofit to a Class 3 standard.

There are an estimated 92 Class 2 URM buildings in Portland: about 44 schools, 38 churches and ten other public assembly uses (theaters, community centers).

CLASS 3 | AVERAGE URM BUILDINGS. *This category includes all buildings not classified as URM Class 1, 2 or 4 buildings – most non-critical buildings with more than ten occupants. These buildings pose somewhat less risk because they have no critical uses or large assembly areas. However, they still pose a potentially significant life safety risk to people inside, and to people outside near the building during an earthquake.*

This is by far the largest group of URM buildings, and it includes a variety of private offices, apartments, restaurants, retail, and storage. The retrofit standard recommended for Class 3 is best described as "Collapse Risk Reduction." It requires property owners to perform and submit an ASCE-41 evaluation, brace the parapets, cornices, chimneys and other ornamentation , attachment of the roof to the walls and roof sheathing within ten years, attach the floors to walls within fifteen years.

Parapet bracing and wall-floor/roof ties are the retrofit activities that generally provide the greatest benefit for the cost. These interventions will reduce the likelihood of collapse for many URM buildings, at a much lower cost than a full retrofit. However, this standard will not require owners to address other known deficiencies or meet any set structural performance standard, so some buildings retrofitted to this level could still collapse in an earthquake. The majority of the Committee felt this was an acceptable trade-off; some supported lesser standards with lower costs.

The Committee supports some flexibility in the timeline for retrofit of Class 3 buildings: owners should be able to enter into a phased seismic agreement and extend the deadline if a building has significant life left in an existing roof at the end of the implementation period. The Committee also accepts that subsidized housing may need extra time to complete retrofits. Their recommendation is that within a year of City Council approval of policy recommendations, the Portland Housing Bureau develop a retrofit timeline for their portfolio, and present it to Council for approval if an extension will be required.

Portland has an estimated 1,332 Class 3 URM buildings, making this the largest class, with two-thirds of all existing Portland URM buildings.

CLASS 4 | LOW OCCUPANCY URM BUILDINGS. *This category includes one and two-story URM buildings with relatively low number of occupants, generally 0-10. Buildings in this category include single-story auto garages, etc. These are relatively low-risk, low-occupancy structures.*

Class 4 URM buildings are proposed to meet an upgrade standard that mostly protects nearby structures and people outside near the building: to mitigate falling hazards by bracing parapets, cornices, and chimneys and attaching walls to the roof within ten years.

The Policy Committee does not recommend that these building owners be required to complete an ASCE-41 assessment. They should complete the retrofit work within ten years. There are an estimated 201 class 4 URM buildings in Portland.

The table on the next page provides technical details of the Committee's recommendations with respect to URM building classification and retrofit standards, and summarize the proposed timelines.

TABLE 1 | Technical Summary of Proposed Engineering Standards

Building Classification & Description	Approx. # of Buildings[4]	Upgrade Level[2,3]
Class 1: Critical Buildings (Risk category[1] IV buildings, power stations serving critical facilities, water facilities, other public utilities)	**6**	• **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, Ip=1.5 as defined in ASCE 7-10 Chapter 13, as well as URM parapets, cornices, partitions, chimneys, and hollow clay tile partitions.
Class 2: **A.** All school buildings **B.** Risk category[1] III buildings	**92, including** 44 schools 38 churches 10 other 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.
Class 3: All URM buildings with more than ten occupants that are not critical facilities, schools, or Risk Category III or IV buildings (everything not in class 1, 2, or 4).	**1,332** Plus 35 churches and other buildings owned by non-profits (but not schools) may elect to meet this standard and post a placard noting earthquake risk	• **Evaluation and Retrofit Level:** Tier 2 deficiency only in accordance with ASCE 41 • **Performance Objective:** Limited Performance Objective. • 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: 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; d. New roof sheathing as required for diaphragm functions.
Class 4 : 1 and 2-story buildings with 0-10 occupants.	**201**	**Performance Objective:** Limited Performance Objective. 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: a. brace URM parapets, cornices and chimneys; b. anchor URM walls to roofs for out of plane loading.

NOTES FROM TABLE:

1. Risk category as defined in Oregon Structural Specialty Code, 2014 Table 1604.5. (See Appendix B.)
2. ASCE 41 refers to latest edition of American Society of Civil Engineers standard ASCE 41. As of this writing, the reference standard is ASCE 41-13.
3. Refer to the glossary for definition of BPOE, BPON, BSE-1, and BSE-2 etc. Note that BSE-1E and BSE- 2E are defined differently in this report than in ASCE 41.
4. The number of URM buildings was obtained from inventory referenced in this report.

Recommendation | Support URM Building Owners

Many URM building owners face significant financial hurdles to retrofitting. Cost estimating for retrofits is difficult because construction types can vary so greatly. An older building often requires invasive testing just to determine existing conditions. Work in old buildings may also disturb lead or asbestos, adding to construction cost. Additionally, the standards for Class 3 and Class 4 retrofits proposed here is novel and there are no case studies to show costs. When the work is completed, retrofitted buildings do not currently command much higher rents than non-retrofitted ones.

The Policy Committee heard from a number of building owners who stated they would be unable to carry out a retrofit without financial assistance. The Committee recognized the legitimacy of these concerns and modified the proposed retrofit standards for class 2, 3, and 4 buildings to at least partly address them. The current proposed standards are much less stringent than what was originally suggested by the Retrofit Standards Committee. The Committee also sought avenues to subsidize retrofits.

The most promising avenues for financial support to building owners were tax credits or tax exemptions. The Committee did not believe that the City or its residents would support a general obligation bond to pay for seismic retrofits of privately-owned buildings. Oregon state law precludes the City from extending credit to privately-owned firms.

Seismic Retrofit Tax Exemption

A local seismic retrofit property tax exemption is expected to be one of the most important supports available to URM building owners in Portland. Senate Bill 311, adopted in Oregon's 2017 legislative session, permits local jurisdictions to create a property tax exemption program for seismic retrofits. This will allow local jurisdictions to exempt a building owner from taxes on real property improvements (buildings) for up to 15 years, up to the total cost of the retrofit. This would be a significant direct financial support to the owner. Several Policy Committee members lobbied in favor of SB 311.

The Committee urges the City to work with Multnomah County and other taxing jurisdictions to implement a local program as authorized under this legislation. It is the position of the committee that the City should not move forward with a mandatory seismic retrofit program until this support is in place. When it is adopted, it should be available to support retrofit work only when that work exceeds the requirements of the City's current (2017) building code for URMs, Title 24.85; that is, for connecting floors to the walls on buildings of more than story. Depending on program design, support might also be made available for improvements beyond the minimum standards proposed here.

It should be noted that SB 311 will reduce the amount of money available to schools by the amount of the unpaid local option levy (currently $1.99/$1,000 of assessed value). So, a $10,000/year property tax exemption will reduce income to schools by $19.90/year. The state school fund will fill the gap for regular

operations levy ($5.2781/$1,000 assessed value), and the debt service levy ($1.0623/$1,000 assessed value) will be offset by a slight increase to other taxpayers in the school district. The implementation program for SB 311 must consider this effect on schools.

Federal Rehabilitation Tax Credits

At the federal level, a rehabilitation tax credit permits the owner of a certified historic structure to claim 20% of the costs of a building rehabilitation project as a credit on their federal income tax. A similar program provides a credit for 10% of the costs of the rehabilitation of any other commercial building constructed before 1936. These programs are administrated through the National Park Service. A seismic retrofit that meets National Park Service standards is eligible for this credit.

URM property owners may freeze their property taxes for up to 20 years while performing seismic rehabilitation on historic URM buildings. This is possible under the state's Special Assessment Program, an existing incentive program to encourage the preservation and rehabilitation of National Register properties. In the program, a property is specially assessed for a period of ten years to allow the owner to restore or improve the property and not pay additional taxes on the resulting increase in the property's value. Seismic retrofits are an allowed improvement under this program, and the ten-year benefit period may be renewed for an additional ten years for seismic work.

Seismic Rehabilitation Grant

An existing program funded by the state legislature for fiscal year 2016-2017 is the Seismic Rehabilitation Grant Program (SRGP). This competitive grant program provides funds to schools and emergency service facilities for structural seismic improvements. In FY 2016-17, $125 million is available for schools and $30 million for emergency services buildings. This program provides critical funds to move seismic retrofits of schools forward.

The SRGP is distributed throughout the whole state. The cap was recently raised to $2.5 million per project; however many school retrofits will still require significant additional funding to be completed. The City should advocate for continued and increased dollars for this program in future fiscal years.

Seismic Commercial Property Assessed Clean Energy (C-PACE) Program

The Seismic Commercial Property Assessed Clean Energy (C-PACE) program, which was authorized under Senate Bill 85, provides another potential avenue of financing. It is advantageous to some owners because C-PACE debt is accounted for differently than mortgage debt, and it transfers with building ownership.

C-PACE requires the investment in the retrofit to generate savings or revenue to support the payoff of the loan over time. The Seismic Retrofit Tax Exemption could provide one way to pay off the debt. In the future, when more consumers are aware of the risk of URM buildings, retrofitted structures may also predictably command higher rents than

non-retrofitted ones. C-PACE could then leverage this income stream. This is also a longer-term strategy, but still potentially helpful within the proposed time frame of the retrofits.

Urban Renewal Area (URA) Funds

The Committee identified one local source of available capital funds for direct subsidy. Prosper Portland committed to making $5 million available for URM buildings in the Old Town – Chinatown Urban Renewal Area (URA). Prosper Portland is seeking opportunities that could provide a financial model that would apply outside of URAs. However, Prosper Portland's funding can only be spent within the geographic boundaries of the URA; much of the funding in these districts has been expended, as the districts are expiring. Therefore, URA funds are not a viable mechanism to finance additional URM building retrofits.

Floor Area Ratio (FAR) Transfer

In Portland, historic structures are currently able to sell any unused development rights (floor-area-ratio or FAR) to another site, and use funds from the sale to finance a retrofit. In the Central City, historic URM buildings can sell their FAR to any other Central City property. Outside the Central City, they can sell their FAR to another site within two miles.

Proposed State Historic Tax Credit

A state historic tax credit is another promising approach with fairly broad support. It is a longer-term strategy because statewide tax credits are difficult to advance in constrained budget years, including this year. However, many other states do have credits that complement the federal historic preservation tax incentives. In Oregon, Senate Bill 565 was introduced in the 2015 session to create a new State Historic Tax Credit program. It would have authorized the Department of Revenue to conduct an auction for tax credits to generate up to $12 million annually to provide rebates to property owners for eligible rehabilitation expenses. The legislation did not pass. The Committee recommends reintroducing this legislation in a more favorable budget year, and advocating for its passage.

State Seismic Tax Credit

URMs and other seismically unsound construction types pose a risk to people across Oregon. The Committee recommends that the City advocate for a State Seismic Retrofit Tax Credit to promote greater resilience in the built environment. This tax credit would not require historic designation of the building to qualify, making it accessible to virtually all private owners of URMs.

Proposed Revolving Loan Fund

The Committee recommends that the City explore a revolving loan fund for URM property owners. Prosper Portland would be well-positioned to administer this fund.

Business License Tax Exemption

The Committee recommends that the City explore waiving business license taxes for URM property owners for a period of years, to offset building retrofit costs.

Technical Assistance:

Earthquake Navigator

The Committee recommends that the City create a staff position to serve as an ombudsman to help URM building owners navigate the retrofit process, including design, permitting, and financing. This need was highlighted by both the Support and Retrofit Standards Committees, and by the Historic Preservation Subcommittee of the Policy Committee.

Mandatory URM building retrofits have the potential to disproportionately impact neighborhoods and community groups with fewer resources. The navigator position is expected to be of particular benefit to non-profits and small business owners, who are more likely to struggle in navigating the permitting and financing processes. The work of the navigator should prioritize historically underserved neighborhoods. This strategy is important from an equity standpoint.

Other Incentives

Relatedly, building permit, plan review and fire life safety review fees for structural work related to seismic strengthening are already waived when such fees total less than $2,500, and reduced by 50% when such fees would total $2,500 or more. The Policy Committee recommends that this **fee waiver continue**.

The Committee also recommends that **seismic upgrades to URM buildings be allowed without triggering any valuation-based requirements to address other non-conformities, or incurring fees to bureaus other than BDS,** similar to the way ADA upgrades are presently treated.

Seismic retrofits may require tenants to vacate a unit while work is performed. In this case, the committee recommends that **landlords be exempted from any City tenant relocation fee** they would otherwise be required to pay.

Public Education Campaign

The Committee recommends that the City conduct a comprehensive outreach and awareness campaign about URM buildings. An information campaign will help URM building owners and managers and design and construction professionals understand and plan for proposed changes. Outreach to others who use URM buildings can also help encourage market demand for retrofits and over time make private financing of the retrofits more feasible.

Recommendation | Special Hardships

All URM building owners may face challenges in upgrading their structures. Building owners outside the city, with generally lower property values, face more barriers to financing than those with high-value properties. The Policy Committee focused on developing strategies to help as many building owners as possible. However, it also recognized that some building owners, especially non-profits, face special hardships. They sought to understand the unique issues of these owners, and recommended special considerations for a few groups.

Affordable Housing

Affordable housing providers are legally bound to provide residential units at below-market rents to qualified residents. Much affordable housing is provided by non-profits that do not benefit from tax exemptions, tax credits, or C-PACE. Affordable housing is not eligible for SRGP grants, and providers have no or limited ability to increase rents to cover the costs of retrofitting.

Affordable housing faces challenges beyond the financial: the tenants that must be relocated while seismic work is done are often vulnerable. A handful of providers also own the bulk of the affordable URM buildings; some indicated that they would struggle to update all structures on the same timeline given the low number of units available for relocating tenants, and their own limited capacity to manage major construction projects.

In consideration of these issues, and of the city's current housing crisis, the Policy Committee recommends that affordable housing be permitted to request timeline extensions for seismic upgrades beyond roof and parapet bracing. The Portland Housing Bureau is expected to present an affordable housing retrofit strategy and timeline to the City Council within a year of the adoption of a new URM building retrofit standard. At that time, they may also request a timeline extension if necessary.

Private owners of residential buildings may also secure an extension if they enter into an agreement with the Portland Housing Bureau to make and keep their units affordable long term. The same agreement would include milestones and timelines for achieving seismic upgrades. Affordable housing would still be required to provide structural assessment and parapet and roof upgrades on the same timeline as other structures. And affordable housing would still be required to meet the same standards as other structures, simply on a modified timeline.

Schools

The Policy Committee also gave special consideration to schools. Schools play a critical role in the community. Many school buildings have multiple issues that impact the safety of the learning environment. Portland Public Schools is the second-largest building owner in Portland, and their buildings in particular are old. Many public schools urgently require modernization to meet students' needs. They have unmet fire life safety and environmental health and

safety needs, building systems that require replacement, and a long backlog of deferred maintenance. Many schools also have a critical need for ADA improvements, modern security systems, and opportunities to access instructional technology in classrooms; all of these needs may be seen as competing with seismic retrofits.

Additionally, the school year presents special challenges for scheduling retrofit projects. Efforts that take more than two months may require the school to be relocated, which is a hardship to families and staff, and an additional project expense to the school district.

Public schools rely on voter-approved bonds and, to a lesser extent, state grants, to make necessary improvements. Most schools in Oregon are perpetually underfunded. And even when funds are available, Portland Public Schools has had difficulty finding enough contractors and sub-contractors to bid on their contracts. In a competitive construction market, it is hard for public-sector clients with public contracting requirements, limited budgets, and strict construction timelines to compete with other jobs. A requirement for URM retrofitting has the potential to exacerbate this dynamic.

At the same time, families are required to send children to school, and young people are a vulnerable population. Without a mandate, URM retrofits may not be prioritized. SRGP, while limited, is also available to schools. Therefore, the committee does not recommend modifications to the standards or timelines for schools. It does recommend that the City continue to advocate for continuing and increasing the SRG program.

Religious and Non-profit Uses

Downtown Portland and its inner neighborhoods offer one of the largest concentrations of religious properties of any West Coast city. Downtown churches especially are landmarks, and many have regional or national architectural significance.

Beyond their contribution to the urban landscape, downtown churches also provide important social benefits for a wide range of residents. In addition to religious services, they host soup kitchens and food banks, children's day care, support group meetings, concerts, lectures, community events, and inexpensive space for other non-profits.

Outside the downtown, neighborhood churches also serve an important role. Nearly half of the churches in the URM building inventory primarily serve ethnic communities (Latino, African-American, Chinese, Samoan) in NE and SE Portland. A survey of the websites available suggests they serve as community centers for historically underserved, immigrant, and refugee populations, with distinctive cultural and social service programs, childcare, and emergency assistance.

Churches and community centers often rely on volunteer committees to manage their financial affairs. They struggle with little access to capital and a limited ability to navigate complex legal or financial transactions. Churches often find it difficult to secure commercial loans. And church membership has declined for decades, while the demand for the social services they provide is growing.

Church buildings themselves also present unique challenges. Special technical treatment is involved for musical instruments (pipe organs), artwork, sculpture, stained glass, and special furnishings like pews and alters. Many of these items have to be removed, stored, and then re-installed following the retrofit construction.

Finally, temporarily moving church functions to another location is challenging; the Catholic Archdiocese estimates that a 10-month absence from a congregational structure results in a 30% membership and donation loss. Some congregants never return.

Like schools, many churches serve vulnerable populations. However, participation in activities in a church is more optional than in a public school. Given the tremendous hardships facing churches and non-profits, the fact that no grants or public subsidies have been identified to support their retrofit, and tax exemptions do not benefit them (since they do not pay taxes), and that people can choose not to enter these private buildings, the Committee recommends that Class 2 tax-exempt buildings be allowed to comply with the standards for Class 3 buildings. They should be required to post a placard at public entrances stating that the building is a URM and may be dangerous in an earthquake.

Historic Structures

Historic structures add beauty, variety, and dignity to the built environment. Most are still in full use; they may be churches, schools, or community centers. When historic structures are retrofitted, they must meet design standards for historic buildings that are set by the National Parks Service; these standards are usually inflexible and can make the design and review of seismic improvements even more complex and costly than they would otherwise be. Often, modifications to historic buildings are also subject to review by the City's Historic Landmarks Commission and by the State Office of Historic Preservation. These reviews also add time and cost to the development process.

Historic structures do have two special benefits available to them; they are eligible for a federal historic tax credit, and they can sell their unused FAR to another site, and use funds from the sale to finance a retrofit. With these benefits in place, the committee does not recommend modifications to the standards or timelines for historic buildings.

Recommendation | Building Code Elements

The Policy Committee also considered some logistical elements of the building code, and made recommendations regarding implementation. These should be codified at the same time as any new retrofit requirements.

Notice

If new rules are adopted for URM buildings, the owners of all known or suspected URM buildings must be notified in writing of their building's status. The letter should explain the new rules that apply to URM buildings, how to access the information that led to the building's classification as a URM building, and how to appeal this classification if they believe it is incorrect. The timeline for retrofit requirements can start only after a property owner is notified.

Appeals

Some building owners may consider their building incorrectly classified as URM; they must be provided with an opportunity to appeal this status. If an owner demonstrates that their building is a single-family home, has already been upgraded or demolished, or is not a URM, it should be removed from the inventory. A qualified professional, such as a registered professional engineer, needs to certify that a building is not a URM.

Enforcement

The committee acknowledged the need for some enforcement mechanism. These should be developed in the code implementation phase to accord with penalties imposed for comparable building code violations.

Existing Code Improvements

The City's current code requires that when more than 50% of a URM building is re-roofed in a five-year period, the building's structural roof system, anchorage, and parapet be repaired or rehabilitated such that parapet bracing and the wall anchorage for both in-plane and out-of-plane forces at the roof conform to ASCE 41 standards. The committee supports changing the five-year window to fifteen years. Similarly, the code now requires that when costs associated with building alteration or repair exceed a monetary threshold in a two-year period (adjusted annually, currently $57.57 for single story buildings and $43.18 for two or more stories or with special structural deficiencies), the owner improve the entire building to ASCE 41 standards. The committee supports changing the two-year window to five years. In addition, the committee recommends adding an upper cap when the costs of alteration or repair in a fifteen-year period are more than twice the five-year costs. In this case, the owners would be required to upgrade their buildings. This will not require any retrofits to a higher standard than is already proposed, but it will require some owners to move forward with those improvements somewhat sooner, if they are already doing work on their buildings.

Future Code Improvements

The City's proposed seismic retrofit policy is new for the City of Portland, and novel even among other cities with mandatory programs. Every impact cannot yet be anticipated, and implementation will also be influenced by market forces and other factors that cannot be predicted. Therefore, the Committee urges the City to review the effects of the mandatory policy after five years, and consider modifications that could streamline implementation or improve effectiveness or fairness. Staff should track program implementation quantitatively and qualitatively, and report back to Council at the end of this time.

Benefit-Cost Analysis (BCA)

At the request of the Policy Committee, the City commissioned a benefit-cost analysis (BCA) by an independent consultant experienced in economic analysis of seismic retrofitting. The goal was to understand the economic impacts of seismic retrofits[3] as objectively and quantitatively as possible.

The costs of retrofitting used in the BCA included estimated construction costs, soft costs such as architectural and engineering fees, and relocation-costs. Benefits factored into the BCA included avoided property damage, avoided injuries and deaths, and avoided displacement (moving) costs.

URM retrofits can also help protect cultural heritage and the economic vitality of neighborhoods after an earthquake; these are tangible benefits that deserve consideration in the context of financial support to URM owners. However, the economic value of qualities like "neighborhood character" are difficult to calculate. For this reason, public benefits such as character were omitted from the BCA.

The study found a range of benefit-cost ratios depending on the building and the level of upgrades. Generally, the report showed that for a defined "typical" building, the benefits of retrofitting exceed costs.

3 Goettel, Kenneth. Benefit-Cost Analysis of the Proposed Seismic Retrofit Ordinance City of Portland. November 23, 2016. Available online: www.portlandoregon.gov/pbem/article/596311

The standards that were evaluated in the BCA were modified by the committee after the BCA was completed; the committee ultimately recommended a less-rigorous standard for most commercial buildings. In general, lower-cost retrofits to lower performance standards increase the benefit-cost ratio. Therefore, although the precise ratios in the study do not apply to the standards presented in this report, it is reasonable to assume that the benefit-cost ratio has increased, and the benefits exceed the costs by more than was reported in the original study.

For reference, the ratios in the original study can be found on the following table.

URM Building Type	Est. Cost per SF	Benefit-Cost Ratio
Schools & public assembly uses	$82.62	**1.474**
Most commercial URM buildings	$51.00- $69.00	**1.661 – 1.967**
Small URM buildings, > 10 occupants	$20.00	**1.940**

Who Benefits, Who Pays

The BCA looked at the overall costs and benefits for the community. However, cost, risk, and benefit are not shared equally. The ultimate distribution of cost depends on the financial supports provided.

In general, the costs of retrofits are borne primarily by the building owner. The City and/or the State and its taxpayers may contribute, depending on the financial credits or incentives owners utilize. In rental buildings, costs may ultimately be borne partly or mostly by tenants in the form of higher rents.

The benefit of avoided property loss clearly accrues to the property owner. The distribution of life-safety benefits is a question of perspective; if a building owner is seen as responsible for protecting tenants and passers-by from their building, life-safety improvements are also benefits to the owner. If members of the public are viewed as responsible for informing and protecting themselves, the life-safety benefits accrue to them.

BCA: Conclusion

Overall, the benefit-cost results indicate that the benefits of URM building retrofits exceed the retrofit costs in all cases, and likely by a greater ratio than is reflected in the 2016 study. However, both the benefits and costs can vary significantly from building to building.

Risk of Demolition

Also in response to Policy Committee concerns, City staff developed a summary of the impacts of retrofit requirements in California, where mandatory programs were adopted beginning in the 1980s.

In California cities, demolition rates ranged from just 1% in Berkeley, which gave owners up to ten years to retrofit and provided tax rebates to support the work[3], to 5% in Santa Monica, which also gave owners up to ten years and waived permit fees for the work, and 7% in Oakland, which allowed up to seven years but provided no incentives. The demolition rate in San Francisco, which gave owners up to eight years and offered low-interest loans was 8%; it is also worth noting that very few owners took advantage of the loans due to the complex loan qualification requirements. Los Angeles saw a much higher demolition rate of 19%; this city gave building owners only a year to obtain a building permit, and provided no financial supports. The highest demolition rate, 25%, was in San Diego, which gave building owners up to five years and provided no financial incentives. These results seem to indicate that program design matters, particularly timelines, and that subsidies may help. Berkeley was the only City to provide direct subsidies, and it also had a very low demolition rate.

The timelines proposed by the Policy Committee reflect this research.

3 All the demolition rates and program descriptions given here come from interviews and research conducted by PBEM. The work was reviewed by the Policy Committee and is available on the project website at www.portlandoregon.gov/pbem/article/632729

Next Steps

This report describes a suite of recommendations for implementing a mandatory URM building retrofit policy in the city of Portland. These recommendations seek to balance life safety concerns with the very real financial hardships that seismic retrofits impose on building owners and tenants. Full retrofits, including invasive interior work, cannot be completed for all buildings without additional financial supports in place. However, much can be done to improve life safety in a cost-effective way.

Making a commitment to eventually upgrade all URM buildings, notifying property owners of their building's status, and taking the first step towards retrofit—completing building assessments—are important commitments.

The Policy Committee proposes the following next steps in the implementation of a mandatory URM policy:

- Codify proposed building regulations and return to Council for adoption (BDS lead).
- Continue to update the URM building inventory, and to prepare to send a notice to URM building owners of their status and new requirements (BDS).
- Develop a proposal to implement the Seismic Retrofit Tax Exemption in Portland (Prosper Portland).
- Prepare an analysis and recommendations on the impact of exempting all or part of a commercial business license tax when seismic improvements are undertaken (OMF).
- Develop legislative concepts for the additional incentives proposed by the committee that will require state legislative action and include these in the council's legislative agenda in the next full session (2019) (OGR + PBEM).

Glossary

ASCE 41 EVALUATION: the process of evaluating an existing building for potential earthquake-related risk to life posed by the building, performed and documented according to the ASCE 41 standard.

BASIC PERFORMANCE OBJECTIVE FOR EXISTING BUILDINGS (BPOE): a series of defined performance objectives based on a building's risk category; shown in Table 2-1 of ASCE 41.

BASIC SAFETY EARTHQUAKE 1E (BSE-1E): taken as a seismic hazard with a 20% probability of exceedance in 50 years in accordance with ASCE 41, except that the design spectral response acceleration parameters, SXS and SX1, shall not be taken less than 75 percent of the respective design spectral response acceleration parameters for the BSE-1N seismic hazard level and need not be taken greater than those for the BSE-1N.

BASIC SAFETY EARTHQUAKE 1N (BSE-1N): taken as two-thirds of the BSE-2N in accordance with ASCE 41.

BASIC SAFETY EARTHQUAKE 2E (BSE-2E): taken as a seismic hazard with a 5% probability of exceedance in 50 years in accordance with ASCE 41, except that the design spectral response acceleration parameters of, SXS and SX1, shall not be taken less than 75 percent of the respective design spectral response acceleration parameters for the BSE-2N seismic hazard level and need not be taken greater than the BSE-2N.

BASIC SAFETY EARTHQUAKE 2N (BSE-2N): taken as a seismic hazard corresponding to the risk-targeted maximum considered earthquake (MCER) in accordance with ASCE 41.

COLLAPSE PREVENTION: the post-earthquake damage state in which a structure has damaged components and continues to support gravity loads but retains no margin against collapse. *A structure retrofitted to "collapse prevention" is not expected to collapse during the initial earthquake but will be left in a very vulnerable state. The structure will likely not be practical to repair and is not safe to reoccupy. Significant risk of injury caused by falling hazards from structural debris will likely also exist.*

DAMAGE CONTROL: a post-earthquake damage state between the Life Safety and the Immediate Occupancy structural performance level. *A structure retrofitted to "Damage Control" is not expected to be usable immediately after an earthquake. The damage is controlled to permit return to function more quickly than "Life Safety," but not as quickly as "Immediate Occupancy."*

IMMEDIATE OCCUPANCY: the post-earthquake damage state in which a structure remains safe to occupy and essentially retains its pre-earthquake strength and stiffness. *A structure retrofitted to "Immediate Occupancy" is expected to suffer limited structural damage. The risk of life threatening injury as a result of structural damage is very low. Although some minor structural repairs might be appropriate, these repairs would generally not be required before re-occupancy.*

LIFE SAFETY: the post-earthquake damage state in which a structure has damaged components but retains a margin against the onset of partial or total collapse. *A structure retrofitted to "Life Safety" will have some structural elements and components that are severely damaged, but this damage has not resulted in large falling debris hazards, either inside or outside the building. Injuries might occur during the earthquake; however, the overall risk of life-threatening injury as a result of structural damage is expected to be low.*

LIMITED SAFETY: the post-earthquake damage state between the Life Safety and the Collapse Prevention structural performance objective. *Limited Safety is intended to provide a structure with a greater reliability of resisting collapse than collapse prevention, but not to the full level that "Life Safety" would imply.*

MAXIMUM CONSIDERED EARTHQUAKE: an extreme seismic hazard used for the evaluation or retrofit of a building.

REINFORCED MASONRY: is defined in ASCE 41-13 Section 1.2 as masonry with the following minimum amounts of vertical and horizontal reinforcement: vertical reinforcement of at least 0.20 in 2 in cross-section at each corner or end, at each side of each opening, and at a maximum spacing of 4 feet throughout. Horizontal reinforcement of at least 0.20 in2 in cross-section at the top of the wall, at the top and bottom of wall openings, at structurally connected roof and floor openings, and at a maximum spacing of 10 feet.

UNREINFORCED MASONRY (URM): means adobe, burned clay, concrete or sand-lime brick, hollow clay or concrete block, hollow clay tile, rubble and cut stone, or unburned clay masonry that does not satisfy the definition of Reinforced Masonry. Plain unreinforced concrete is not considered URM.

UNREINFORCED MASONRY BEARING WALL: is defined in ASCE 41-13 Section 1.2 as an Unreinforced Masonry Wall that provides vertical support for a floor or roof for which the total superimposed vertical load exceeds 100 pounds per foot of wall. An Unreinforced Masonry Bearing Wall shall also be considered an Unreinforced Masonry Wall.

UNREINFORCED MASONRY WALL: is defined in ASCE 41-13 Section 1.2 as a masonry wall containing

less than the minimum amounts of reinforcement as defined for Reinforced Masonry; assumed to resist gravity and lateral loads solely through resistance of the masonry materials.

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 from the proposed standards 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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