

Policy and Financial Feasibility Study for the Concrete Building Safety Program

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ARUP

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Introduction

Financial feasibility is understood as a significant barrier for improving earthquake resilience across San Francisco's seismically vulnerable concrete buildings. Responding to this challenge, this report quantifies earthquake risks and the potential benefits of seismic retrofits, examines the current policy ecosystem and financial feasibility of retrofitting, and reviews precedent retrofit and redevelopment programs to inform near- and long-term policy recommendations to advance seismic risk reduction for concrete buildings.

Seismic Risk and Mitigation in the Bay Area

San Francisco sits along multiple active fault lines, making seismic resilience central to the City's resilience planning. In 2014, the United States Geological Survey (USGS) estimated a 72% probability that a magnitude 6.7 or greater earthquake will occur in the Bay Area by 2044, which could cause widespread injuries, fatalities, and long-term disruptions to housing stability and the economy. These risks are significant, but they are also largely preventable. Retrofitting or redeveloping vulnerable buildings can save lives, limit damage, and speed recovery. However, because earthquakes strike without warning, the only way to realize these benefits is by taking action before a disaster occurs.

In the decades since the 1989 Loma Prieta earthquake – the most damaging in the City's history since the calamitous 1906 San Francisco earthquake – the City has developed policies to proactively retrofit the most seismically vulnerable buildings in its inventory. Building from extensive studies of seismic risk in San Francisco completed under the Community Action Plan for Seismic Safety (CAPSS), the City developed the [Earthquake Safety Implementation Program \(ESIP\)](#) in 2011, providing a 30-year workplan and timeline for implementing a series of community-supported interventions that mitigate risks to safety, housing stability, and long-term economic vitality against a future damaging earthquake.

Since then, the City implemented and completed retrofit programs targeting particularly vulnerable building inventories, including thousands of unreinforced masonry (URM) and five-plus unit soft-story buildings. The Office of Resilience and Capital Planning (ORCP) is responsible for implementing the ESIP and is currently working to identify and improve the older non-ductile concrete and rigid-wall-flexible-diaphragm (or “tilt-up”) buildings¹ through the [Concrete Building Safety Program \(CBSP\)](#). The CAPSS identified non-ductile concrete buildings as having the greatest risk to loss of life.

Vulnerable concrete buildings are more difficult to retrofit than the URM and soft story buildings previously addressed. They typically involve disruptive structural modifications that require owners to relocate their tenants temporarily, adding costs and limiting the building's ability to generate revenue during that time. As a result, concrete building retrofits are very expensive, estimated to cost between \$50 and \$200 per square foot, and current high interest rates make financing them even more costly.² Certain buildings may also have more difficulty financing a retrofit if their ownership structure and use type produce low profit margins, have limited eligibility for financing resources, or face other market headwinds. Many owners may also lack the experience or personnel capacity to finance and implement a project like a seismic retrofit. Together, these barriers will make it difficult for owners to improve their buildings on an inventory-wide scale.

Recognizing these challenges, the City convened a group of stakeholders spanning City staff, building owners, tenants' rights advocates, business advocates, builders and developers, labor unions, and technical experts between 2022 and 2023 to better understand the technical, social, and economic implications of seismically retrofitting concrete buildings. Their findings and recommendations were compiled into the [Concrete Building Safety Program Stakeholder Engagement Report](#).

¹ Rigid-wall-flexible-diaphragm buildings are not considered in this study, as they are relatively easier and less costly to retrofit than non-ductile concrete buildings. Reference to “concrete buildings” throughout indicates only non-ductile concrete buildings.

² Cost estimates were compiled from a survey of 30 concrete building retrofits conducted by the Applied Technology Council (ATC) prior to this study.

Purposes of this Report

Across recommendations for implementing the CBSP, stakeholders have continuously identified financial feasibility as the central barrier to concrete building retrofits, expressing a need for a comprehensive resource that identifies financing options available to different building types and outlines policy interventions and actions that could support retrofits. A nuanced understanding of the barriers to seismic retrofits and alternative opportunities is critical to establishing a successful retrofit program that saves lives and maximizes feasibility while mitigating potential unintended consequences and creating opportunities for economic development.

This **Policy and Financial Feasibility Study for the Concrete Building Safety Program** directly responds to these needs, bringing together an examination of seismic risk, real estate market dynamics, financing approaches, and the current policy ecosystem into a single resource designed to help building owners and policymakers understand and address the barriers to strengthening San Francisco's vulnerable concrete inventory. The analyses included in this report center on privately-owned, non-ductile concrete buildings in San Francisco, which represent the majority of the concrete building inventory based on available information.³

This report is the culmination of analysis, literature reviews, and interviews with City departments and external experts conducted by HR&A Advisors, Inc and Arup between May 2025 and March 2026. Findings are organized into two sections which build an understanding of the scale and types of seismic risk across concrete buildings, the tools available to building owners to mitigate their properties' vulnerability, and policy opportunities to support seismic retrofits.

- **Section 1: Risks and Benefits Analysis** estimates the order of magnitude of seismic risks across the concrete building inventory over a 30-year period and examines the impact seismic retrofits could have on reducing those risks. Analysis studied eight representative archetypes drawn from the City's preliminary inventory of suspected concrete buildings that describe the majority, which are used throughout this report to describe, organize, and extrapolate analytical findings across the concrete inventory.
- **Section 2: Policy Analysis and Recommendations** synthesizes findings from an inventory of existing policies, an illustrative financial feasibility analysis of seismic retrofits across select building types and uses, and case studies of similar retrofit and redevelopment programs to inform a set of policy recommendations for the CBSP that improve the feasibility of retrofit or redevelopment projects, support program implementation, and align outcomes with City priorities.

This report also includes four appendices, provided as additional context to the recommendations and as standalone resources.

- **Appendix A: Glossary and Assumptions** defines key terms and assumptions used in this report.
- **Appendix B: Existing Policies** provides extended descriptions of programs, tools, and legislation introduced in section 2 that are currently available for encouraging the seismic retrofits or redevelopment of vulnerable concrete buildings.
- **Appendix C: Case Studies** examines existing seismic retrofit programs and other informative programs to inform recommendations included in section 2.
- **Appendix D: Existing Financing Strategies for Concrete Buildings** serves as a standalone resource for the City to use when working with building owners to plan a retrofit approach. Written in accessible language, it explains current options for voluntary seismic retrofits, how to plan for a retrofit project, and existing programs available to support seismic retrofits.

³ Analysis uses a preliminary inventory of presumed concrete buildings collected by the City of San Francisco prior to this study. More accurate information is being collected through concrete building screening set to complete in 2027.

Summary of Key Findings

Risks and Benefits Analysis

Analysis in [Section 1: Risks and Benefits Analysis](#) models the seismic performance of representative concrete building structural systems with and without a seismic retrofit across a range of potential earthquake scenarios, which provides a baseline for evaluating the impact seismic retrofits have on reducing building damage, collapse potential, and risks to safety. These reductions are used to derive monetized avoided losses in the event of a future earthquake, producing the following key findings:

- **The potential consequences of earthquake damage across San Francisco's concrete buildings are significant**, with an estimated \$85B in damages over 30 years to building owners, occupants, the City, and the broader San Francisco economy.⁴
- **Seismic retrofits are effective at reducing seismic hazards across building types.** Simulated losses over 30 years are reduced by 77% with a modeled BSE-1E standard ("Level 1") retrofit or by 93% with a modeled BSE-2E standard ("Level 2") retrofit based on standards established by the San Francisco Existing Building Code. Across this study's eight archetypes representing 1220 buildings, cumulative retrofit costs could total between \$2 billion to \$9 billion.⁵ In comparison, a modeled Level 1 retrofit across the entire inventory would yield an estimated \$58 billion in reduced seismic losses over a 30-year time period.
- **Taller buildings and high occupancy uses have greater vulnerability and seismic risk, and therefore derive greater benefits from risk mitigation actions.** Although there are relatively few of these buildings across the suspected concrete building inventory, they collectively represent one of the largest sources of risk to life safety, property, and economic activity during and after a damaging earthquake.

Policy Analysis

[Section 2: Policy Analysis and Recommendations](#) examines the economics affecting a building owner's decision to retrofit and potential impacts on tenants to explain the fundamental dynamics that determine retrofit feasibility. Within this context, it surveys existing policies and models the financial impact of selected tools on the financial feasibility of representative seismic retrofit projects to assess gaps in the current policy ecosystem. This analysis produced the following key findings:

- **Seismic retrofits are financially infeasible for most building owners**, due in large part to the high cost of retrofitting, limited financing capacity for retrofits, inadequate market incentives, and minimal support programs. As a result, modeling suggests that **some mid-rise multifamily buildings may have a pathway to making a seismic retrofit financially feasible, but most properties would require significant public financial support to retrofit.**
- **Because seismic risk is not widely disclosed or understood, it does not have a significant impact on market behavior – limiting an owner's financial incentive to retrofit.** The current market does not easily allow potential buyers or tenants to differentiate seismically strengthened buildings from vulnerable ones, preventing them from placing a value on seismic safety that would make retrofitting financially beneficial.
- **Existing support policies and seismic retrofit triggers are inadequate for motivating seismic retrofits at the scale of San Francisco's concrete building inventory.** Building owners are motivated

⁴ Based on the cumulative, probability-weighted, expected seismic shaking over a 30-year period, multiplied by average expected building damages across the inventory. For further details on the methodology used to produce this estimate, refer to [Section 1: Risks and Benefits Analysis](#).

⁵ Estimates are preliminary and subject to change as new information becomes available. Calculations assume concrete building retrofits cost between \$50 and \$200 per square foot based on a survey conducted by ATC prior to this study of 30 concrete building retrofits, and analyses use the City's suspected concrete building inventory as of April 2026.

to minimize maintenance costs while operating their buildings, limiting potential for proactive seismic retrofits unless underlying market incentives are altered.

Policy Recommendations

To address the challenges currently limiting the financial feasibility of seismic retrofits, the City of San Francisco should consider the following strategies to improve feasibility and support implementation of the CBSP. Detailed policy recommendations are provided in subsection [5. Policy Recommendations](#) under section 2.

- **A mandatory retrofit requirement offers the strongest mechanism to encourage compliance.** Previous City studies and stakeholder engagement have underscored the value of making seismic retrofits mandatory for concrete buildings. To motivate action, mandatory programs provide an overarching structure for both incentives to comply and disincentives for inaction, giving the City greater ability to affect what types of buildings complete a seismic retrofit or are redeveloped. In contrast, a program without a mandate would require the City to provide a much greater level of subsidy to all building types to motivate widespread seismic retrofits.
- **Disclosing seismic risk at the building level is an important part of motivating compliance, enabling the real estate market to place a value on seismic strengthening.** Potential buyers and tenants currently have little ability to compare the seismic safety of individual buildings when evaluating purchase prices or rents, meaning risk does not readily affect their decision-making. The City should implement disclosure requirements to help the real estate market determine a value for seismic safety, in turn increasing the financial incentive to retrofit or redevelop vulnerable properties.
- **Because buildings that are most financially feasible to retrofit are not always the same as those that have the greatest ability to achieve desired outcomes, the City will need to prioritize how it allocates different types of support resources.** The CBSP's stated goals are to protect life and public safety, preserve housing and critical uses, protect the economy, preserve city vitality and character, and speed earthquake recovery, which should be weighed with other needs to identify what types of buildings or areas are most vital to retrofit or redevelop. To maximize the impact of limited staff and financial resources, the City should consider a prioritization framework to inform how compliance periods, technical support, and financial support are allocated across the concrete building inventory to promote outcomes aligned with City priorities.
- **The City should develop new resources tailored to improve the feasibility of retrofits among low-to moderate-income residential buildings with lower financial feasibility.** These resources might include a new allocation of PASS funding to support greater concrete retrofits, a seismic retrofit grant program, and/or a 0% or low-cost loan program. Additional programs should provide process improvements like a permitting accelerator team and expand eligibility for redevelopment incentives like transfer tax abatements to support feasibility for other building types – particularly in downtown areas.
- **Over the long term, the City should pursue State-level legislation and policy initiatives that make concrete buildings more affordable to seismically retrofit.** Some valuable tools like a temporary Prop 13 property value transfer, expanded revenue capture authorization for Enhanced Infrastructure Financing Districts (EIFD), State lending programs and policy changes, or creating new public development capacity may require State legislative changes or be more effective when pursued at the State level. The City should also partner with other municipalities seeking to retrofit their vulnerable buildings to create a coalition to advocate changes with and leverage greater resources.
- **Recommendations should be pursued in parallel over different time scales to accelerate program implementation,** making information and resources available earlier while other studies or processes progress. A detailed roadmap for implementation is included in [5.5 Advance Interventions in Parallel as Implementation Progresses](#) in section 2.

Near-Term Actions

The CBSP is being developed amid constraints on federal funding resources and City capacity. While these factors limit the resources available to the CBSP in the near-term, these limitations are not likely to reflect the context in which the CBSP will be implemented as conditions evolve. Five actions can be advanced immediately to best position the CBSP for future success:

1. **Build Transparency:** similar to the City's previous retrofit programs, establish a near-term transparency requirement for confirmed concrete buildings and launch a public database of concrete buildings that includes information from the concrete building screening program. Where requirements like placarding can be used in the long-term to strengthen tenant awareness and help motivate seismic retrofits, near-term transparency allows the public to begin accounting for seismic risk in decision making within the real estate market.
2. **Announce Mandate Timing while Building Support Resources:** define and announce an anticipated mandate program, including planned compliance deadlines as well as financing and support policies being pursued. Announcing expected elements of the CBSP in the near-term while the City identifies additional supportive resources will give building owners time to prepare for required actions and take advantage of market and building improvement cycles that better accommodate the significant cost of seismic retrofits. Conducting a detailed economic analysis grounded in updated cost estimates for seismic retrofits will allow the City to refine the types and amount of support needed to make seismic retrofits feasible across the concrete building inventory, which will support defining mandate requirements and target inventory segments.
3. **Streamline Processes:** create a seismic retrofit accelerator team, advance technical assistance resources, and establish process incentives. The permitting and approval processes required for seismic retrofits will be significant, particularly for smaller building owners. Dedicated staff resources will reduce impacts on various City departments, while improvements or incentives that speed up the permitting process will help reduce friction as the City coordinates across a large number of seismic retrofit projects.
4. **Advance Financial Incentives:** modify Prop M and create a real estate transfer tax waiver for retrofitted buildings to expand support options for buildings. Changes to Prop M could make redevelopment a more appealing option for commercial office buildings that might struggle to afford a retrofit, while a transfer tax abatement for retrofitted buildings would better enable retrofits when properties change hands, even before a mandate is in place.
5. **Create Partnerships to Advance State Action:** build a coalition of city governments to advocate for State legislative changes and programs. Multiple cities across California are actively pursuing seismic retrofit programs for their concrete buildings and face a similar set of challenges. Partnering with other cities can help innovate policy approaches and advocate for solutions that are only possible or are more effective through State legislation.

Section 1: Risks and Benefits Analysis

1. Introduction

1.1 San Francisco Concrete Building Safety Program

The San Francisco Concrete Building Safety Program (CBSP) is an ongoing initiative led by the City of San Francisco to identify and improve the structural safety of seismically vulnerable concrete buildings throughout the city. The program was formed following a year-long stakeholder engagement process including building owners, policymakers, and seismic experts to identify key goals for the city's seismic inventory and recommend policy approaches. During these discussions, stakeholders identified financing availability as the primary barrier to implementing a large-scale retrofit program. This section reviews the potential scope of risks posed by seismic vulnerability in the concrete building inventory, and the benefits of retrofitting nonductile concrete buildings across stakeholder groups.

The City of San Francisco passed an ordinance in May 2025 implementing an initial mandatory screening program and voluntary retrofit standards for vulnerable concrete buildings. The ordinance requires concrete buildings built or retrofitted before July 1, 1999, to be evaluated by a structural engineer before June 2027, with exemptions for smaller buildings and certain structural systems. The ordinance also outlines an existing and new option for voluntary retrofits, requiring buildings to meet a Structural Collapse Prevention (S-5) performance level under a BSE-1E or BSE-2E earthquake hazard level of ground shaking alongside addressing other specific deficiencies.⁶

This section summarizes findings from an analysis conducted by Arup and HR&A Advisors in 2025 evaluating the seismic performance of unretrofitted and retrofitted concrete buildings and the benefits of concrete building retrofits.

This study modeled the seismic performance of representative buildings for each archetype with and without retrofits. Two levels of retrofits were modeled based on the voluntary retrofit options established in the 2025 concrete building ordinance:

- **Level 1** presents a conservative version of the ordinance Option A BSE-1E performance standard without addressing seismic deficiencies; and
- **Level 2** represents a higher level of collapse prevention at the BSE-2E performance standard (Option B in the 2025 ordinance).

By calculating the avoided losses generated by seismic retrofits, this study provides important insight for the development of financing tools and policies to facilitate retrofits.

The analysis of the concrete building inventory in this report is based on a preliminary database of likely non-ductile concrete buildings. However, the mandatory screening program will allow the City to fully enumerate the inventory, and the extent of its seismic vulnerability. A technical memo was prepared in conjunction with this report which provides assumptions, detailed explanations of the methodology, and more granular results, and should be referenced for additional details on all analyses included within this report.

⁶ These definitions follow the American Society of Civil Engineers' ACSE 41 standards document (Seismic Evaluation and Retrofit of Existing Buildings). A Collapse Prevention (or S-5) structural performance level represents a minimum standard where buildings may sustain damage but do not immediately collapse, improving life safety outcomes. A BSE-1E earthquake represents a severe earthquake with a 225-year return period, while BSE-2E reflects an even higher intensity earthquake with a 975-year return period.

1.2 Overview of Findings

Without retrofits, San Francisco's concrete buildings face considerable risk of severe damage or structural collapse in a future earthquake. To analyze the seismic risk facing concrete buildings, this study segments the inventory, which comprises an estimated 1,476 buildings, into eight archetypes defined by building scale and use. The actual number of concrete buildings represented by these eight archetypes may decrease following the ongoing screening process as building structural systems are verified. However, additional buildings not included in the eight selected archetypes may face comparable risks during an earthquake.

This analysis presents cumulative financial risks in terms of a 30-year expected value, which reflects the losses a property can anticipate over that timeframe, accounting for the probability of earthquakes and the severity of potential impacts. It is not a prediction of a specific loss outcome for a given building, but rather an averaged estimate that combines the following inputs into a single, cumulative dollar figure to support planning:

- 1) Low-probability, high-severity events;
- 2) Higher-probability, low-severity events; and
- 3) The probability of no seismic activity.

Using projected building impacts, this analysis derives monetized costs incurred by several stakeholder groups affected by seismic damage to the buildings studied, including building owners, tenants and occupants, the City of San Francisco, and the broader San Francisco economy. The analysis compares results for unretrofitted buildings and two levels of retrofits, illustrating a significant cost savings in a damaging event. The comparative costs and avoided losses to each group are summarized in Figure 1 below.⁷

Figure 1: Monetized Benefits of Retrofits (30-Year Expected Value)

Benefit Category	Cumulative Loss, Unretrofitted Inventory	Cumulative Loss, Level 1 Retrofit	Cumulative Loss, Level 2 Retrofit	Net Savings, Level 1 Retrofit	Net Savings, Level 2 Retrofit
Life Safety	(\$72,089M)	(\$14,567M)	(\$2,922M)	\$57,522M	\$69,166M
Building Content Loss	(\$1,944M)	(\$810M)	(\$303M)	\$1,134M	\$1,518M
Building Damage	(\$4,898M)	(\$2,076M)	(\$797M)	\$2,822M	\$4,102M
Building Value Loss	(\$3,266M)	(\$1,157M)	(\$697M)	\$2,109M	\$2,570M
Lost Building Owner Income	(\$1,512M)	(\$438M)	(\$269M)	\$1,074M	\$1,243M
Displacement	(\$281M)	(\$133M)	(\$71M)	\$148M	\$210M
Loss of Economic Activity	(\$548M)	(\$154M)	(\$97M)	\$394M	\$451M
Property Tax Revenue	(\$164M)	(\$50M)	(\$16M)	\$115M	\$148M
Disaster Response Costs	(\$49M)	(\$21M)	(\$8M)	\$28M	\$41M
Total	(\$84,750M)	(\$19,410M)	(\$5,180M)	\$65,350M	\$79,570M

⁷ Within low and mid-rise archetypes, some buildings in the inventory have uses that are not easily modeled for economic losses, such as parking garages and non-traditional or non-revenue-generating uses (e.g. houses of worship, masonic lodges, fraternal organizations). As these uses were not modeled, the total number of modeled buildings by use in Figure 1 (1,220) is slightly lower than the assumed building total (1,476).

As outlined in Figure 1, **nearly 90% of the total benefits from Level 1 retrofits are attributable to life safety, which includes both avoided injuries and fatalities.** Benefits accruing directly to building owners, meanwhile, comprise roughly 10% of benefits, while just over 1% of Level 1 benefits accrue to the broader public: household displacement, broader economic activity, property tax revenue, and disaster response costs.

However, **the general public's exposure to seismic risks is likely greater.** The analysis does not quantify San Francisco's exposure to a large-scale, long-term economic disruption following a large seismic event, or long-term neighborhood disinvestment following a large earthquake, as was the experience of Christchurch, New Zealand (See [Appendix C: Case Studies](#) for further information). While this study examines second-order economic consequences of concrete buildings being offline and inactive, it assumes that all jobs, households, and capital will immediately flow back into San Francisco following a seismic event. As a result, this analysis represents a conservative estimate of potential seismic damage and loss to the San Francisco community.

The following subsections detail each category of seismic-related damages, the estimated benefits from building retrofits, and the methodology used to produce these estimates.

1.3 Methodology

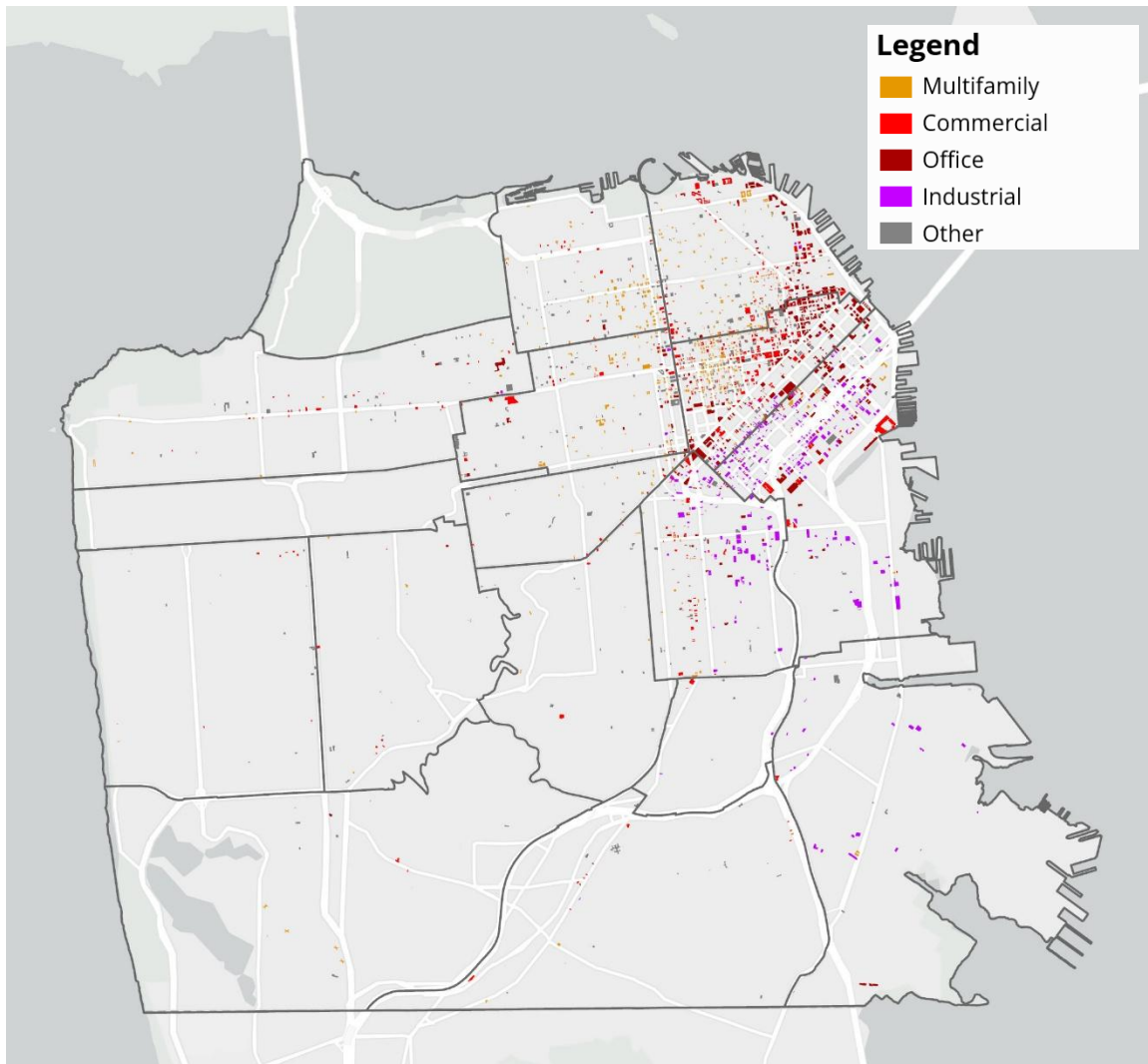
1.3.1 Concrete Building Inventory

The San Francisco ORCP developed an inventory of more than 3,000 potential non-ductile concrete buildings, building on prior versions developed by the Concrete Coalition and the Structural Engineers Association of Northern California. The inventory was developed using information contained in public records to make the best guess at which buildings might be non-ductile concrete buildings built before 1999. The City is using the inventory as a tool to anticipate general trends in the City's non-ductile concrete building stock.

As mapped in Figure 2, the inventory of potential non-ductile concrete buildings is highly concentrated in downtown San Francisco and the South of Market district (SoMa), with a considerable number of buildings distributed throughout the city. As discussed in later subsections of this report, the size and clustering of vulnerable concrete buildings has significant implications for which policy approaches are feasible or useful in different regions of the city, such as leveraging potential for block-scale redevelopment or targeting buildings which pose significant risk to their neighbors.

On May 6, 2025, the San Francisco Board of Supervisors passed legislation that will give the City building-by-building information, vetted by a licensed engineer, on which buildings in San Francisco are concrete construction. The owners of possible non-ductile concrete buildings have until June 2027 to hire an engineer to complete a checklist with some basic building structural information. As a result, the City expects that the concrete inventory will become more accurate once the checklists are completed. The legislation also supports early adopters by publishing voluntary retrofit standards for non-ductile concrete buildings.

Figure 2: Potential Concrete Buildings by Use

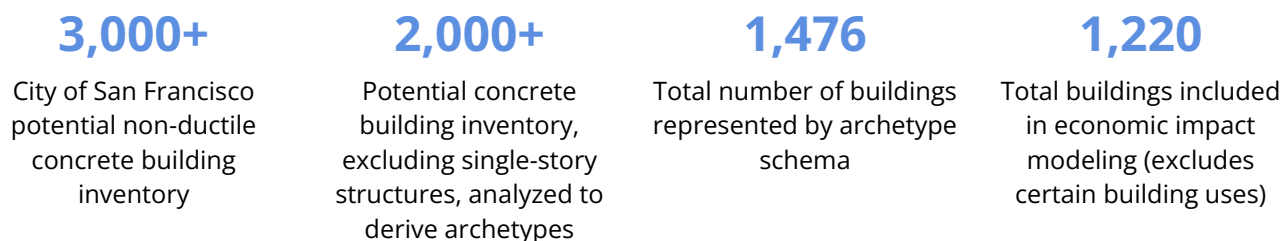


The list of properties in this map remains a draft to be revised as the Concrete Building Safety Program develops. It is the City's very first attempt to understand the location of potential non-ductile concrete buildings in San Francisco constructed prior to 1995. The map is a work in progress and will be refined by adding or removing properties as new information or analyses are made available.

1.3.2 Analysis Archetypes

The more than 3,000 buildings in San Francisco's potential non-ductile concrete building inventory represent diverse uses, scales, construction periods, and structural systems. As such, it is not possible to model all buildings in the inventory. This inventory was cleaned to remove buildings with incomplete height data and single-story structures (the latter of which are generally exempt from the 2025 concrete building ordinance), producing a multi-story inventory of more than 2,000 buildings for analysis. Eight generalized archetypes were developed to represent existing building characteristics across this multi-story inventory, which together include 1,476 buildings (approximately 74% of the non-single story inventory), summarized in Figure 3. These representative archetypes were used both to estimate the aggregate risks and benefits across the full inventory and to compare differences in risk between buildings with varying characteristics. Lastly, economic impacts were only modeled for residential, office, retail, and hotel buildings, excluding approximately 256 buildings from risk and benefit modeling. This process of filtering to the final economic analysis subset of buildings used in analysis summarized in Figure 3 below. **As such, building damage totals can be estimated across the 1,476 buildings in the archetype schema, but risk and benefit impacts can only be estimated for the 1,220 buildings in the archetypes studied.**

Figure 3: Concrete Building Inventory Filtering for Analysis



Of the concrete buildings analyzed, only 430 have complete structural information needed to facilitate detailed seismic risk modeling, 360 of which fell in the eight building archetypes. These buildings were assumed to be unretrofitted or not compliant with modern standards. Data from buildings with complete structural information were therefore extrapolated to other buildings of the same archetypes to enable inventory-scale calculations, embedding substantial but unavoidable imprecision into these broader estimates.

Figure 4: Archetype Schema

Archetype Name	Number of Stories	Structural System	Uses Included	Buildings with complete data	Extrapolated Buildings
Archetype 1: Low-Rise Commercial Moment Frame	2	Moment Frame	- Office - Retail	50	177
Archetype 2: Low-Rise Industrial Moment Frame	2	Moment Frame	Office	42	118
Archetype 3: Mid-Rise Commercial Shear Wall	4	Shear Wall	- Office - Retail - Hotel	36	122
Archetype 4: Mid-Rise Residential Shear Wall	4	Shear Wall	Residential	87	260
Archetype 5: Mid-Rise Commercial Moment Frame	4	Moment Frame	- Office - Retail - Hotel	82	320
Archetype 6: Mid-Rise Residential Moment Frame	4	Moment Frame	Residential	54	161
Archetype 7: High-Rise Commercial Moment Frame	18	Moment Frame	- Office - Hotel	5	43
Archetype 8: Mid-Rise Residential Moment Frame, Built 1980-1999	4	Moment Frame	Residential	4	17
Total	N/A	N/A	N/A	360	1,220

1.3.3 Risks Analyzed and Translation to Benefits

The seismic risks and benefits analysis considers three non-ductile concrete building performance levels: 1) a baseline unretrofitted structure with no seismic deficiency, 2) a Level 1 retrofit, and 3) a Level 2 retrofit.⁸ For each building model and performance scenario, the analysis calculates the probability of structural damage or collapse, estimated building downtime (the period a building needs to be emptied of inhabitants and workers while it is being repaired), and probability of injuries and fatalities for occupants across a range of earthquake shaking intensities for a representative site in San Francisco. In an actual seismic event, the intensity of shaking is

⁸ Seismic risk modeling was also conducted for other for seismic event hazard levels with a return period of 43 years, 72 years, 225 years, 475 years, and 975 years.

expected to vary across the city. Consequently, the results presented in this report are likely to be conservative in nature; however, they still provide valuable insight into the financial implications of seismic retrofit.

Results from the seismic risk assessment of each building archetype and performance level are integrated with market data, tax assessment data, and FEMA Hazus guidance to calculate monetized damages across various categories of risk, summarized in Figure 5 below. The benefits of each retrofit level are derived from reduced or avoided costs from a seismic event in comparison to the unretrofitted baseline. In other words, the impact associated with each risk category presented in Figure 5 become a benefit when the overall risk is reduced by a seismic retrofit.

Figure 5: Risks Analyzed

Risk	Accrued to	Description
Life Safety	Building Occupants, Building Tenants	Seismic damage or building collapse may cause injuries or fatalities. Importantly, this analysis considers building occupants and does not include others in the vicinity who may be harmed by a structural failure.
Displacement	Building Tenants	Building tenants may need to be relocated if a building collapses or requires significant structural repairs, incurring a relocation cost and temporary cost for replacement space or lodging.
Building Content Loss	Building Tenants	Major seismic events damage non-structural building contents, such as personal property, equipment, and supplies.
Building Damage	Building Owners	Building damage from a seismic event directly imposes repair costs on owners, or buildings may need to be fully demolished and rebuilt. <i>For the purposes of this study, all building damage is modeled as the cost of repairing a structure to its current market value.</i>
Building Value Loss	Building Owners	In addition to needing repair, a damaged building has limits on its operations until repairs are complete, which reduces its value to a potential buyer.
Loss of Economic Activity	San Francisco Economy	While a building is emptied and being repaired following a seismic event, it cannot generate economic value, causing secondary economic impacts for its employees and across the broader economy.
Property Tax Revenue	City of San Francisco	Owners of seismically damaged properties can request temporary reassessment under Section 170 of the California Revenue and Taxation Code, reducing the tax revenue generated while the building is being repaired.
Disaster Response Costs	City of San Francisco, other public sector entities	Damaged buildings impose secondary recovery costs on the public sector, including administrative costs for disaster response, debris removal, and emergency and life safety services.

Importantly, while these categories present a diverse range of potential damages and stakeholders affected, they should not be considered inclusive of all the potential impacts of a major seismic event. For example, building and context-specific factors such as historic or cultural significance, amenities, and place-based real estate value are not captured in modeling, which may affect the magnitude of losses experienced by a given building. Further, it is possible building tenants might seek compensation for damages associated with a building's seismic deficiency, for which legal fees and liability has not been estimated. Lastly, this analysis does not account for some of the largest risks associated with widespread seismic damage that could have more complex and long-term consequences for San Francisco and the Bay Area. The analysis does not calculate secondary damage to nearby buildings and infrastructure resulting from a concrete building collapse due to variations in how buildings may collapse or the uses around them.

The potential impacts of fires resulting from damaged infrastructure and utilities (a major cause of damage from the 1906 San Francisco earthquake) were similarly not calculated due to their highly contextual considerations. Extensive earthquake damage could also cause sectoral or district-wide de-population or relocation for multiple

years after an initial seismic event, which could have long-term economic and cultural consequences for the Bay Area. These factors magnify the risks of non-ductile concrete building vulnerability and the subsequent benefit of pursuing retrofits.

2. Estimated Physical Risks and Impacts

2.1 Summarized Key Findings

The physical risks and impacts analysis demonstrate widespread vulnerability across the existing inventory, with the highest degree of vulnerability reflected in specific building archetypes. Both Level 1 and Level 2 retrofits are shown to be effective at substantially reducing seismic risks across the inventory.

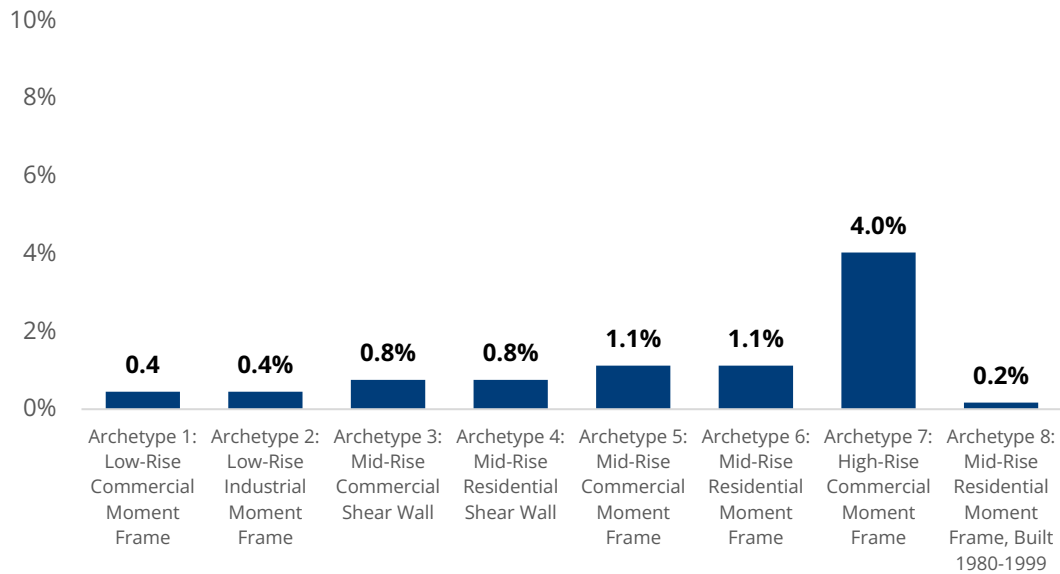
1. **The greatest losses from damages, injuries, and fatalities occur in tall non-ductile concrete buildings**, which both exhibit lower structural performance during seismic events and contain a higher number of occupants. When translating injury and fatality rates to archetypes, archetype 7 buildings (modeled as an 18-story high rise) are responsible for roughly 54% of the fatality risk across the inventory over the next 30 years, despite representing just 1% of the concrete buildings modeled.
2. **Improved structural performance under retrofit scenarios correlates with reduced numbers of injuries and fatalities.** With reduced risk of damage or collapse, a Level 1 retrofit reduces the estimated aggregate injury and fatality risk by approximately 80%, while a Level 2 retrofit reduces modeled injury and fatality risk by 95-97%.
3. **Retrofits reduce downtime** by reducing a building's risk of damage or collapse. As a result, retrofitted buildings are able to resume operation faster after a seismic event, reducing the losses generated by their downtime. It is important to note that a typical seismic retrofit aims to improve life safety outcomes, but does not ensure the building will be usable immediately following an earthquake. Consequently, downtime for a retrofitted structure can still be significant, but in general, will be less than the time needed to demolish and replace a building.
4. **Building use and occupancy do not significantly affect downtime**, since downtime is primarily driven by structural performance and impeding delays which stall when repair work can begin. While tenants may have varying needs to resume normal operations after an earthquake, these are less impactful on the building's overall recovery.
5. **The economic impacts of building downtime are highly variable by building use and occupancy.** Buildings that support higher economic activity experience more costly disruptions. In 2025, residential buildings are generally more profitable than office buildings, so similar downtime durations create greater direct financial losses for residential owners. However, when broader economic effects are considered, the opposite is true: office buildings and hotels typically drive higher local spending on goods and services, meaning their downtime generates larger second- and third-order economic impacts.

2.2 Performance of Unretrofitted Buildings

Estimating collapse probability is notoriously difficult, especially for older concrete buildings. The archetype-based approach used in this analysis indicates trends in behavior, but inherently cannot capture the detail of building-specific risk. For this study, a simplified structural model of each archetype building was developed and subjected to hundreds of earthquake realizations across a range of seismic intensities to estimate lateral displacements at each floor of the structure. If these displacements exceed the thresholds defined in Hazus as typically resulting in collapse, then the building is assumed to have collapsed in the earthquake realization. By summing the total number of simulated realizations that trigger collapse, the collapse probability can be determined for each archetype.

When integrating the probability of earthquakes of any and all magnitudes, unretrofitted buildings in the non-ductile concrete inventory have between a 0.4% and 4.0% annual chance of collapse, as demonstrated in Figure 6.

Figure 6: Expected Annual Probability of Collapse, Representative Unretrofitted Buildings



2.3 Life Safety

When quantifying seismic risks across stakeholder groups, the collective risk of fatalities and injuries represents the single greatest financial cost to the region. The annual collapse probabilities in Figure 6 were adjusted by the casualty rates published in FEMA Hazus to calculate the annual fatality and injury risks to a typical building occupant for each archetype. Casualty rates in Hazus measure the portion of building occupants that are killed or injured across varying levels of structural damage and are based on the ATC-13 method and observational data from different building types in previous earthquakes. However, Hazus' fatality rate parameters are contingent upon collapse probability, and this study's models of nonductile concrete building types in the inventory indicate higher probabilities of collapse than those assumed by Hazus. As a result, this study produces higher fatality estimates—not because it uses different fatality rates, but because its engineering models of nonductile buildings more accurately capture collapse probability than Hazus' default fragilities.

Figure 7 illustrates how the risks of fatalities during an earthquake compare to other fatality risks. Archetype 7 buildings, which represent office and hotel moment frames built pre-1980 with 13+ stories, carry the highest risks of injury or fatality by a considerable margin. This does not imply a fatal event will occur in any given year; rather, the probability-weighted seismic hazard implies an annual individual fatality risk of roughly 1 in 250 under continuous occupancy. If an individual were to occupy an unretrofitted archetype 7 building continuously for a full year, the modeled seismic risk corresponds to approximately a 1-in-250 chance of death due to earthquake shaking. Importantly, a typical individual will not occupy a building 100% of the year, while many other individuals may not occupy and archetype 7 building over the course of a year, therefore, the values in the table below provide an upper bound on earthquake life safety risks.

Figure 7: Understanding Earthquake Fatality Odds Relative to Common Fatality Risks

Risk ⁹	Annual Odds
General Age-Adjusted Mortality, U.S.	1 in 110
Death from Earthquake if Occupying an Unretrofitted Archetype 7 Building	1 in 250
Death Due to Cancer, U.S.	1 in 690
Death from Earthquake if Occupying an Unretrofitted Archetype 5 or 6 Building	1 in 910
Death from Earthquake if Occupying an Unretrofitted Archetype 3 or 4 Building	1 in 1,250
Death from Earthquake if Occupying an Unretrofitted Archetype 1 or 2 Building	1 in 2,500
Death from Earthquake if Occupying a Level 1 Retrofitted Building of Any Archetype	1 in 3,800
Death Due to Automobile Accidents, U.S.	1 in 7,800
Death from Earthquake if Occupying a Level 2 Retrofitted Building of Any Archetype	1 in 20,000

2.4 Building Downtime

Building downtime is a key consequence of buildings' damage sustained during seismic events. Downtime reflects the number of days or years for which a building cannot be occupied after an earthquake while damage is being repaired. As a result, damaged concrete buildings will not be able to function as housing or employment locations during downtime, which displaces residential and commercial tenants, reduces or eliminates property revenue for building owners, decreases building value, reduces payable taxes, and causes a variety of other secondary economic impacts. If a building's post-earthquake repairs represent a direct cost imposed by earthquake damage, building downtime represents an opportunity cost of earthquake damage. Building owners cannot earn income from their buildings, while the building's market value will suffer large declines.

Buildings do not need to be completely destroyed to experience downtimes, while slightly damaged buildings do not necessarily experience downtime. A building sustaining "Slight" damage, as defined by FEMA Hazus methodology, is unlikely to experience downtime. In the event of a catastrophic earthquake, a building may experience multiple years of downtime. If a building experiences 225-year ground shaking forces, it is estimated to experience downtime of up to four years. Over a 30-year period, unretrofitted buildings have an expected cumulative downtime of eight to ten months.

2.5 Implications of Inventory-Scale Seismic Vulnerability

Since unretrofitted older buildings are expected to perform poorly under high-intensity shaking, significant shares of the non-ductile concrete building inventory are likely to sustain damage or collapse in a severe seismic event. In addition to this significant cumulative impact across the inventory, damage to San Francisco's concrete buildings can have a larger effect on the city's future after a major earthquake.

Beyond the direct damage sustained to these structures, the number of buildings damaged will have a significant impact on San Francisco's vitality and recovery efforts, particularly in areas where non-ductile concrete buildings are highly concentrated. In the near term after a major seismic event, taller concrete buildings which do not collapse may trigger a cordon, requiring evacuation from the buildings around them regardless of damage state. Considering that the radius of a building cordon is often equal to about 80% of a building's height, tall concrete buildings in downtown could further contribute to large-scale displacement by requiring cordons spanning

⁹ Age-adjusted mortality sourced from the CDC: <https://www.cdc.gov/nchs/fastats/deaths.htm>; death rates due to cancer sourced from Cancer.gov: <https://www.cancer.gov/about-cancer/understanding/statistics>; deaths due to automobile accidents sources from the CDC: <https://www.cdc.gov/nchs/fastats/injury.htm>.

several blocks. As a result, tall buildings have received particular attention in separate studies by the City of San Francisco to determine an appropriate policy response to the vulnerabilities they create.

Furthermore, as shown in the illustrative Figure 8, potential non-ductile concrete buildings often make up large proportions of city blocks in downtown neighborhoods, increasing potential for collateral damage. If a high enough proportion of these buildings are damaged or collapse, some of these blocks may need to be completely razed, including some surviving buildings. Recent disasters like the Christchurch, New Zealand earthquake in 2011 illustrate that damage at this scale significantly suppresses downtown vitality over a long period while large-scale recovery efforts complete and real estate development slowly begins to rebuild downtown density (Figure 9).

While the widespread damage suffered in downtown Christchurch is an important reference point for the potential consequences of inaction on San Francisco’s non-ductile concrete buildings, it is important to consider that a seismic retrofit mandate implemented without sufficient lead time or financing support could also have significant impacts. If retrofits are not feasible for many building owners, they may elect to defer upgrades to their buildings to maximize the value they can receive from the properties, then demolish them in final years before a mandated compliance deadline. If this occurs at a large scale, this behavior could lead to a surge in demolitions within a condensed period and outstrip market capacity to redevelop these sites and absorb the new units and space delivered. Consequently, concrete building policy will need to create a balance between creating compliance deadlines, supporting retrofits, and phasing any resulting demolitions to avoid shocks to the San Francisco market.

Figure 8: Illustrative Clustering of Potential Concrete Buildings (highlighted) Common in Downtown Neighborhoods

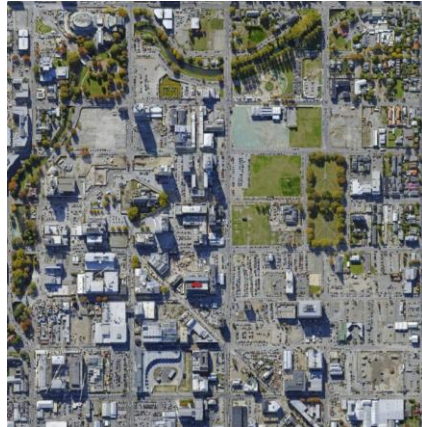


Figure 9: Downtown Christchurch, New Zealand Recovery Over Time



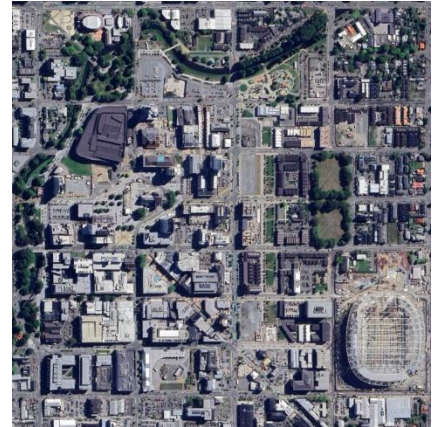
February 7, 2011

Downtown Christchurch, two weeks before the February 22 earthquake. Downtown blocks are substantially built out with few open parcels.



February 9, 2016

After compromised buildings were demolished, much of downtown is used as parking and grass lots.



February 19, 2025

Downtown vitality continues its recovery more than a decade later, with new developments beginning to re-establish a downtown core.

Image source: Google Earth

3. Economic Benefits (Avoided Costs)

3.1 Key Findings

As introduced in subsection [1.3.3 Risks Analyzed and Translation to Benefits](#), the benefits of seismic retrofits in this analysis are derived from avoided losses relative to a “do-nothing” scenario where vulnerable concrete buildings remain largely unchanged from the present day. At a high level, these benefits accrue to building owners, building tenants and occupants, the City of San Francisco, and the broader San Francisco economy. Across the benefits analyzed, the following core trends emerge:

1. **Life safety impacts are the largest category of benefit** when monetized, representing nearly 90% of total avoided costs from retrofits.
2. **Improvements made by Level 1 retrofits have a substantial impact**, realizing about 82% of the total avoided costs achieved through a Level 2 retrofit.
3. **Level 2 retrofits still add significant value over Level 1 retrofits** by increasing building performance and subsequently life safety. Across the inventory modeled, Level 1 retrofits reduce monetized life safety impacts by 80%, whereas Level 2 retrofits almost completely mitigate these impacts at 96% reduction. This increment is also seen in building damage: Level 1 retrofits mitigate 58% of the projected building damage (as estimated by repair costs) from unretrofitted buildings, compared to an 84% reduction at Level 2.
4. **Over the long term, the total benefits of any level of retrofit outweigh the projected upfront cost**, but this varies meaningfully depending on retrofit costs, which were not explicitly developed in this study.
5. **Avoided costs convey significant benefits to all stakeholders but are not accurately reflected in the real estate market or individual behaviors.** While monetized life safety costs represent almost 85% of potential damages in an unretrofitted scenario, this risk is not currently expressed as a cost to building owners which could shift their behavior around retrofits. Similarly, costs directly accrued to building owners like building damage and downtime-related losses are still dependent on an uncertain seismic event. Policy interventions are therefore necessary to actualize these risks and spur near-term action.

As noted, this analysis does not capture all of the potential impacts of inventory-wide seismic vulnerability, such as consequences of long-term depopulation or concentrated building damage. Nevertheless, the benefits observed present a compelling argument for investments addressing seismic vulnerabilities in San Francisco's concrete buildings.

3.2 Benefits to Tenants and Occupants

Cumulative Expected Benefits over a 30-Year Period: \$58.8B (Retrofit Level 1), \$71.1B (Retrofit Level 2)

Any occupants or tenants inside a building during an earthquake might be injured or killed, and property inside the structure may be damaged. As a result, tenants may be displaced following an earthquake as building damage is repaired. However, tenants largely do not recognize or act upon this risk in the current real estate market. Discussions with brokers found no evidence that residential or commercial tenants will pay a premium for seismic safety, which may be indicative of market-scale information failure. Accessing seismic safety assessments also typically requires potential tenants to sign a non-disclosure agreement, limiting tenants knowledge of the options available to them. Many tenants live or rent space from non-ductile concrete buildings because they are older and therefore cheaper, but may prioritize different spaces if the seismic risks were disclosed in building marketing materials or shared in City communications. To illustrate the magnitude of risk tenants and occupants face, the following subsection outlines the potential costs of relocation, content damage, and life safety risk and the relative benefits of seismic retrofits.

3.2.1 Life Safety

While structural characteristics influence a building's risk of collapse – and therefore injury and fatality rates for its occupants – a building's use determines how densely a building is occupied throughout the day. Hotel and residential uses are densely populated and have high occupancy for a large proportion of the day, increasing the potential number of injuries or fatalities when an earthquake occurs. On the other hand, office and retail uses have a lower occupant density and are only heavily occupied for a few hours a day, reducing the expected number of occupants who might be inside when an earthquake occurs, but leaving a possibility for a high-casualty event for high-rise office buildings during standard working hours..

Given the high potential for casualties in unretrofitted buildings and the proven effectiveness of retrofits, the monetized life safety impacts of retrofits¹⁰ represent the largest single category of benefit evaluated in this study. As illustrated in Figure 10, the unretrofitted inventory faces an expected value of \$72 billion in life safety losses over a 30-year timeframe. A Level 1 Retrofit would reduce these damages by an estimated 80%, while a Level 2 Retrofit eliminates an estimated 96% of life safety losses. Archetype 7 represents a high proportion of potential losses despite including just 3.5% of the modeled inventory.

Although current market valuations rarely account for a building's seismic life safety, legal precedents exist where tenants have sought damages from property owners of seismically unsafe buildings. In 2008, *Myrick v. Mastagani* found the owners of a historic unreinforced masonry building liable for damages from the deaths of two women, citing negligent operation and maintenance of the structure. While the owners had until 2018 to complete an unreinforced masonry retrofit of the building, the court viewed this deadline as only the minimum standard of care, finding that a reasonable person would have taken additional steps to address the building's vulnerability earlier. This suggests that liability exposure could become a consideration for property owners based on knowledge of seismic risk and enacted public policy, reinforcing the economic rationale for retrofitting.

¹⁰ To integrate these benefits with other monetary savings, FEMA guidance assigns heuristic values for life safety at \$2,932,000 per injury and \$11,600,000 per fatality.

Figure 10: Monetized Citywide Life Safety Impacts by Archetype (30-Year Cumulative Expected Value)

Archetype	Unretrofitted	Level 1 Retrofit	Level 2 Retrofit
1	\$1,440,000,000	\$830,000,000	\$180,000,000
2	\$240,000,000	\$140,000,000	\$30,000,000
3	\$4,210,000,000	\$1,580,000,000	\$310,000,000
4	\$4,190,000,000	\$1,570,000,000	\$310,000,000
5	\$20,760,000,000	\$5,340,000,000	\$1,070,000,000
6	\$4,610,000,000	\$1,190,000,000	\$240,000,000
7	\$36,130,000,000	\$3,150,000,000	\$620,000,000
8	\$510,000,000	\$770,000,000	\$170,000,000
Total	\$72,090,000,000	\$14,570,000,000	\$2,920,000,000
Retrofit Savings	N/A	-80%	-96%

3.2.2 Relocation Costs

In cases where buildings collapse or are extensively damaged, all residential and commercial tenants need to be temporarily or permanently relocated. This conveys several costs to tenants and building owners, including the initial cost of moving as well as ongoing rent. While insurance may ultimately enable tenants to charge these costs to their building owner or insurer, these findings convey that these costs are initially borne by displaced residents.

The potential non-ductile concrete building inventory includes an estimated 472 multi-family residential buildings containing more than 21,000 apartment units across archetypes 4, 6, and 8 (the only residential archetypes). With a representative building having an expected downtime of 88-308 days, the potential scale and scope of residential displacement, then, could be significant.

Residential displacement cost is estimated as additional temporary housing expenses for households whose units become uninhabitable following a severe earthquake. For each affected building, the number of occupied units is multiplied by an assumed displacement duration (capped under FEMA guidance at 6 months, or 180 days) and a daily temporary housing cost.

Figure 11: Total Relocation Costs for Residential Archetypes (30-Year Cumulative Expected Value, Unretrofitted Inventory)

Archetype	Estimated Buildings in Inventory	Estimated Housing Units in Archetype	Estimated Downtime, in Days	Displacement Expenses per Household	Persons Displaced	Aggregate Costs to Households
4	260	9,377	237	\$15,106	18,942	\$141,653,983
6	161	7,087	308	\$15,106	14,315	\$107,053,214
8	17	4,712	88	\$14,017	9,519	\$32,239,311
Total	438	21,176	--	--	42,776	\$280,946,508

Given that the average renter household in San Francisco contains 2.02 individuals, 42,800 persons across 21,200 housing units are expected, on average, to face displacement from non-ductile concrete buildings (assuming all buildings are unretrofitted). The costs of displacement and relocation are additionally estimated at roughly \$281 million across the inventory, adhering to the 6-month FEMA upper limit.

While retrofits greatly mitigate earthquake damages by reducing building downtimes, **tenant relocation costs are typically high irrespective of whether a building has a downtime of 30 days or 365 days.** In large earthquakes, then, savings to tenants in the form of relocation costs will be limited. Where an unretrofitted inventory imposes \$281 million in displacement costs across the inventory, a Level 1 retrofit across the inventory would still impose \$133 million in displacement costs, while a Level 2 retrofit would impose \$71 million.

Importantly, monetizing relocation costs does not account for the secondary impacts of mass displacement. The sudden need to relocate almost 43,000 people may exceed the local capacity to accommodate residents, affecting displaced residents’ access to employment, services, and community. As discussed in subsection [1.3.3 Risks Analyzed and Translation to Benefits](#), there may also be significant impacts from widespread depopulation on San Francisco’s economy and culture that cause long-term consequences for the City and region.

3.2.3 Building Content Damage

In addition to structural damage, a severe seismic event also damages personal property and other valuable objects inside of buildings. FEMA Hazus guidelines define building contents as furniture, equipment that is not integral to the structure, computers, and supplies, the total cost of which can vary significantly by use and tenant. As standard practice, Hazus recommends estimating building content damage as 50% of building replacement value for residential uses and 100% of building replacement costs for commercial uses. These estimates are summarized in Figure 12 below. The cumulative probability of earthquakes over a 30-year timeframe is estimated to cause an estimated \$1.9 billion of damage to building contents, primarily in commercial buildings. Retrofits demonstrate considerable savings, with Level 2 retrofits reducing content damages by roughly 85%.

Figure 12: Building Content Damages by Retrofit Level (30-Year Cumulative Expected Value)

Building Use	Stakeholder Category	Unretrofitted	Level 1 Retrofit	Level 2 Retrofit
Residential	Households	\$380,000,000	\$210,000,000	\$80,000,000
Office	Businesses	\$950,000,000	\$330,000,000	\$120,000,000
Retail	Businesses	\$330,000,000	\$170,000,000	\$60,000,000
Hotel	Businesses	\$280,000,000	\$110,000,000	\$40,000,000
Total		\$1,940,000,000	\$820,000,000	\$300,000,000
		Retrofit Savings	-58%	-85%

3.3 Benefits to Building Owners

Cumulative Expected Benefits over a 30-Year Period: \$6.01B (Level 1), \$7.91B (Level 2)

“Building owners” as described here may range from small-scale property owners to property management companies and institutional investors. These groups bring different perspectives when considering risk and investment in their buildings. For example, institutional investors and other large owners may seek to flip their buildings within a five-year period in the current real estate market and typically have large portfolios capable of absorbing financial losses from individual buildings. Considering a short-term outlook of 10 years or fewer, these owners may not see the financial upside of undertaking a retrofit when considering the near-term probability of a damaging earthquake. With no current evidence of a rent premium for seismically retrofitted buildings, there are not currently any near-term incentives for these larger-scale owners to consider the long-term resiliency of their buildings.

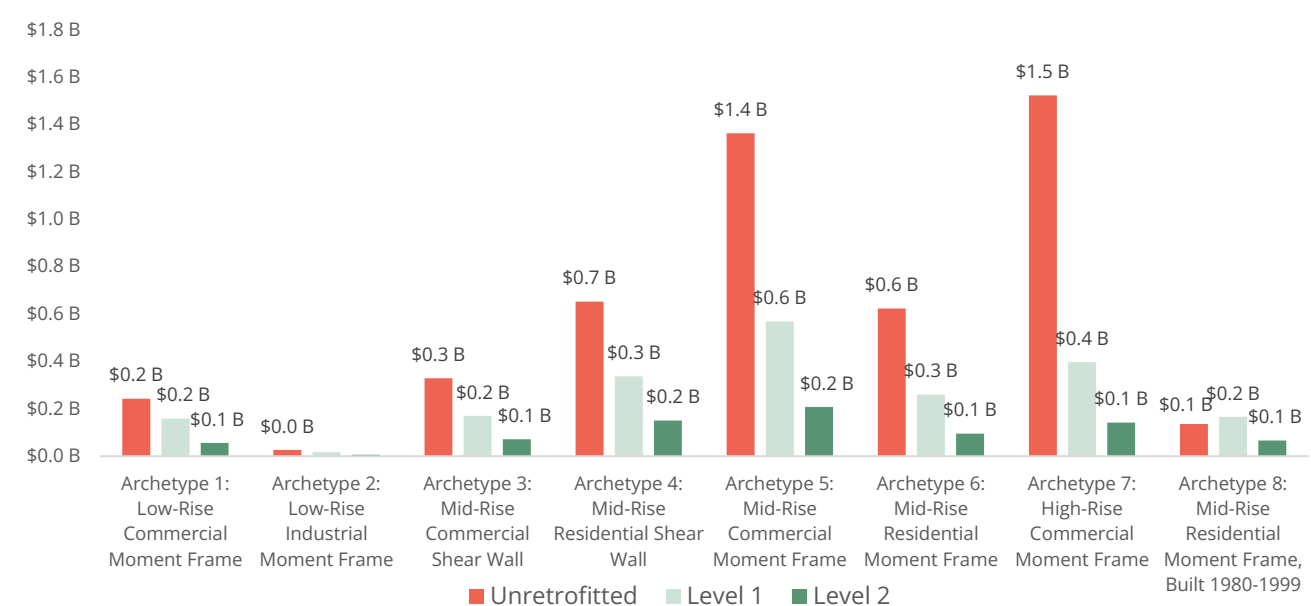
However, this dynamic changes when considering a longer period of 30 or more years, over which the likelihood of a damaging seismic event increases. Small-scale building owners and property managers might have a long-term investment in their buildings and smaller real estate portfolios, making them more sensitive to long-term risk. Over a 30-year planning horizon, the annualized avoided costs from a damaging event begin to outweigh the initial cost of a retrofit, creating a favorable cost-benefit ratio. This tradeoff is illustrated further in subsection [3.7 Cost-Benefit](#).

The following subsections describe different types of costs which directly affect building owners looking to repair or sell their properties in the wake of a damaging seismic event. Results illustrate that both levels of retrofits are able to mitigate a significant share of potential costs relative to an unretrofitted scenario, creating cost savings for owners.

3.3.1 Physical Building Damage

Building damage was calculated based on the estimated cost to restore a building to its current market value (excluding the value of the land the building sits on). The market value for a representative building in each archetype was estimated using the building's income-earning potential, referred to in real estate analysis as an income approach. This is done because data on the repair cost of non-ductile concrete buildings, built across an array of decades and floorplate configurations, are not readily accessible. Using this value, replacement costs were calculated using Hazus building damage tiers and multiplied by the number of buildings to estimate inventory-wide replacement costs for a given earthquake intensity. This is considered a conservative estimate of building's replacement value, as rapidly increasing construction and material costs following the COVID-19 pandemic have likely driven true replacement values above what is modeled. Inventory-wide results are summarized in Figure 13. An unretrofitted inventory would sustain an expected \$4.9 billion of physical damages in a 30-year period, or approximately \$4 million per building. A Level 1 retrofit would reduce physical damages by approximately 58%, while a Level 2 retrofit would reduce physical damages by 84% of their unretrofitted extent.

Figure 13: Cost of Physical Building Damage by Archetype (30-Year Cumulative Expected Value), Inventory-Wide Assessment



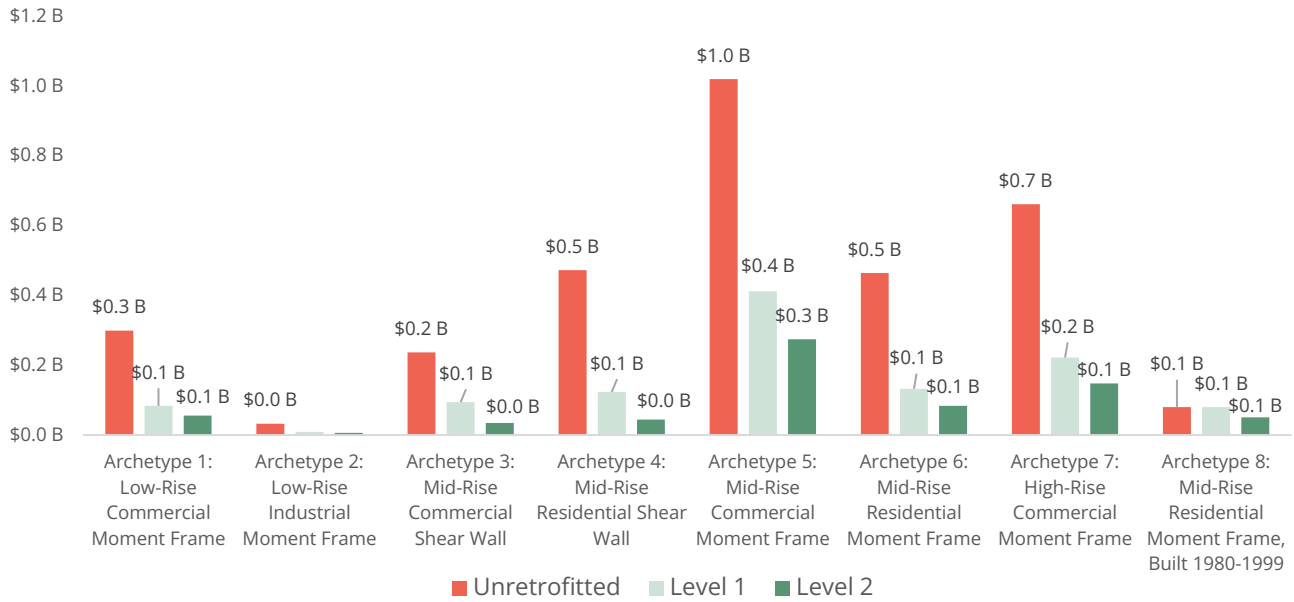
This estimate of building damage also does not factor in the possibility of a building having to retrofit in the process of repairing damage sustained during an earthquake, which could further increase the cost of restoring a building.

3.3.2 Downtime-Induced Building Value Loss

Building owners also lose a portion of their market value when undergoing downtime to conduct repairs. A building that cannot operate for several years is worth less to a potential buyer, which prevents owners from recouping the value of their damaged buildings on the open market. Importantly, this suppressed value is *in addition to* the building damage incurred, which further reduces the amount building owners aiming to sell their properties could expect.

This analysis uses an income approach to estimate a building's post-earthquake market value considering a period of five years after an earthquake, which ensures market value estimates include at least one year of normal operations and up to a maximum modeled four years of downtime. As such, an unretrofitted building that needs four years of downtime could lose an estimated 80% of its market value following an earthquake, whereas a retrofitted building with reduced downtime would begin generating revenue sooner and lose less of its market value. As with other avoided losses, this difference is captured as a benefit for the retrofitted scenarios.

Figure 14: Downtime-Induced Losses to Building Owners (30-Year Cumulative Expected Value), *Inventory-Wide Assessment*



An unretrofitted inventory faces a cumulative expected value of \$3.3 billion of downtime-induced losses over a 30-year period, or approximately \$2.7 million per building. A Level 1 retrofit would reduce downtime-induced losses by approximately 65%, while a Level 2 retrofit would reduce downtime-induced losses by 79% of their unretrofitted extent.

3.4 Macroeconomic Benefits

Cumulative Expected Benefits over a 30-Year Period: \$0.34B (Level 1), \$0.38B (Level 2)

Buildings cannot perform their economic functions during downtime while they are being repaired, which has a ripple effect across the broader San Francisco economy. Cascading impacts, such as loss of rental income, lost wages for building employees and contractors, and reduced spending were modeled using the IMPLAN Input-Output model, which calculates how these disruptions propagate through the San Francisco economy. Operating revenues for each modeled use were combined with IMPLAN data to approximate reduced economic activity stemming from building downtime, summarized in Figure 15.

Figure 15: Inventory-Wide Economic Impacts, by Retrofit Level, 30-Year Cumulative Expected Value

	Unretrofitted	Level 1	Level 2
Direct Impacts: Building Owner & Business Losses	\$1.59B	\$0.46B	\$0.27B
Residential	\$0.29B	\$0.10B	\$0.05B
Office	\$0.56B	\$0.16B	\$0.10B
Hotel	\$0.66B	\$0.19B	\$0.12B
Retail	\$0.08B	\$0.02B	\$0.02B
Indirect Impacts: Reduced Business Spending Throughout San Francisco	\$0.34B	\$0.09B	\$0.06B
Residential	\$0.01B	\$0.00B	\$0.00B
Office	\$0.19B	\$0.05B	\$0.03B
Hotel	\$0.13B	\$0.04B	\$0.02B
Retail	\$0.01B	\$0.00B	\$0.00B

	Unretrofitted	Level 1	Level 2
Induced Impacts: Reduced Household Spending Throughout San Francisco	\$0.13B	\$0.04B	\$0.02B
Residential	\$0.00B	\$0.00B	\$0.00B
Office	\$0.04B	\$0.01B	\$0.01B
Hotel	\$0.08B	\$0.02B	\$0.01B
Retail	\$0.01B	\$0.00B	\$0.00B

3.5 Public Sector Benefits

Cumulative Expected Benefits over a 30-Year Period: \$143M (Level 1), \$189M (Level 2)

The City of San Francisco is impacted by all seismic damage across the city through administrative costs for delivering recovery efforts, followed by several years of reduced tax revenue as buildings are repaired or rebuilt.

3.5.1 Property Tax Revenue

Section 170 of the California Revenue and Taxation Code allows seismically damaged properties to request partial tax abatement for the period while they are being repaired, translating to reduced property tax revenues to the City of San Francisco. To estimate these impacts, the average assessed value was calculated for each archetype using publicly-available data from the San Francisco Assessor's Office. This value was then combined with structural damage estimates to produce an inventory-wide estimate of reduced property taxes, summarized in Figure 16.

Figure 16: Property Tax Impacts (30-Year Cumulative Expected Value)

Archetype	Number of Buildings	Property Tax Losses, Unretrofitted	Property Tax Losses, Level 1 Retrofit	Property Tax Losses, Level 2 Retrofit
1	177	\$1,708,686	\$1,047,526	\$325,975
2	118	\$827,607	\$507,372	\$157,887
3	122	\$7,182,868	\$3,272,540	\$1,050,373
4	260	\$7,862,913	\$3,582,371	\$1,286,629
5	320	\$51,883,660	\$18,915,184	\$5,937,747
6	161	\$7,765,024	\$2,830,888	\$888,656
7	43	\$85,839,953	\$18,035,753	\$5,605,542
8	17	\$1,073,762	\$1,364,039	\$463,457
Total		\$164,144,472	\$49,555,674	\$15,716,265
Retrofit Savings			-70%	-90%

These property tax impacts should be considered a conservative representation of overall fiscal impacts, as increased vacancies and reduced economic activity would have additional effects on sales tax, transfer taxes, and other taxes collected by the City, State, and Federal governments.

3.5.2 Administrative Costs

During an earthquake recovery, the City of San Francisco bears additional administrative costs for disaster response, debris removal from vital public infrastructure (such as roadways), and emergency and life safety services. While data is not readily available on earthquake response costs due to the relative infrequency of major

earthquakes, public sector response costs from the 1987 Whittier Narrows and 1989 Loma Prieta earthquakes were compared to the total value of property damage from those events to inform an appropriate ratio of the City of San Francisco's projected response costs relative to total property damage. An estimated response cost associated with each retrofit scenario is summarized in Figure 17.

Figure 17: Estimated Public Sector Disaster Response Costs (30-Year Cumulative Expected Value)

Damage Type	Whittier Narrows Amount	Loma Prieta Amount	30-Year Cumulative Expected Value, San Francisco Non-Ductile Concrete Building Inventory		
	Source: French (1993)		Unretrofitted	Level 1 Retrofit	Level 2 Retrofit
All Property Damage	\$358M	\$6.0B	\$4.90B	\$2.08B	\$0.80B
Aggregated Public Sector Disaster Response Costs	\$1.05M	\$99.1M	\$49M	\$21M	\$8M
Public Sector Costs as a % of Property Damage	0.3%	1.7%	1.0%		

3.6 Summarized Risks and Benefits

Probabilistic findings for the estimated damages across scenarios and the relative benefits of seismic retrofits are summarized in Figure 18 below.

Figure 18: Summarized Risks and Benefits (30-Year Cumulative Expected Value)

Benefit Category	Cumulative Loss, Unretrofitted Inventory	Cumulative Loss, Level 1 Retrofit	Cumulative Loss, Level 2 Retrofit	Net Savings, Level 1 Retrofit	Net Savings, Level 2 Retrofit
Life Safety	(\$72,090M)	(\$14,570M)	(\$2,920M)	\$57,520M	\$69,170M
Displacement	(\$280M)	(\$130M)	(\$70M)	\$150M	\$210M
Building Content Loss	(\$1,940M)	(\$810M)	(\$300M)	\$1,130M	\$1,520M
Building Damage	(\$4,900M)	(\$2,080M)	(\$800M)	\$2,820M	\$4,100M
Building Value Loss	(\$3,270M)	(\$1,160M)	(\$700M)	\$2,110M	\$2,570M
Lost Building Owner Income	(\$1,510M)	(\$440M)	(\$270M)	\$1,070M	\$1,240M
Loss of Economic Activity	(\$550M)	(\$150M)	(\$100M)	\$390M	\$450M
Property Tax Revenue	(\$160M)	(\$50M)	(\$20M)	\$120M	\$150M
Disaster Response Costs	(\$50M)	(\$20M)	(\$10M)	\$30M	\$40M
Total	(\$84,750M)	(\$19,410M)	(\$5,180M)	\$65,350M	\$79,570M

3.7 Cost-Benefit Ratios

As indicated in Figure 18, the largest single benefit from seismic retrofits is reduced injuries and fatalities in the event of an earthquake, translated into financial terms using FEMA's heuristics surrounding the value of a human life. When included, the benefits of retrofits dramatically outweigh the costs on an expected-value basis. As discussed elsewhere in this report, it is conceivable that building owners could be found liable for casualties.

However, benefit-cost ratios are also presented from the perspective of building owners only (e.g. capturing only benefits directly realized by owners), omitting life safety outcomes.

Retrofits create enormous benefits, but building owners responsible for retrofitting may not realize net benefits unless a) retrofit costs are low, or b) owners are liable for life safety losses. It is imperative to gain an understanding of when and how the probabilistic benefits of retrofits exceed their cost. For a representative archetype 5 building, as shown in Figure 19 below, Level 1 retrofit benefits to the building owner exceed costs up to \$100 per square foot, while Level 2 retrofit benefits exceed costs up to \$125 per square foot.¹¹ When the benefits to all stakeholders are recognized, particularly life safety benefits, benefits exceed costs dramatically. For a more extensive accounting of benefit-cost ratios across archetypes and uses, see the Technical Memo.

Figure 19: Illustrating Benefit-Cost Ratio over 30 Years of Probabilistic Benefits, Example Archetype | Building Owners vs. All Stakeholders

Benefit-Cost Ratio, Building Owners Only: 30 Year Probabilistic Benefits		Costs of Retrofit, per Square Foot						
		\$50	\$75	\$100	\$125	\$150	\$175	\$200
Archetype 5, Mid Rise Moment Frame, Office	Level 1	2.5	1.7	1.2	1.0	0.8	0.7	0.6
	Level 2	3.1	2.1	1.6	1.3	1.0	0.9	0.8

Benefit-Cost Ratio, All Stakeholders: 30 Year Probabilistic Benefits		Costs of Retrofit, per Square Foot						
		\$50	\$75	\$100	\$125	\$150	\$175	\$200
Archetype 5, Mid Rise Moment Frame, Office	Level 1	21.9	14.6	11.0	8.8	7.3	6.3	5.5
	Level 2	28.0	18.7	14.0	11.2	9.3	8.0	7.0

3.8 Additional Stakeholders

In addition to the stakeholders considered as recipients of costs and benefits in this analysis, additional entities and sectors will undoubtedly be affected by the consequences of seismic shaking, therefore creating justification for them to take action in mitigation efforts. For instance, insurance has been a primary means of mandating building improvements to minimize other types of hazards like flooding and wildfires, which in turn creates a financial case for resilience measures through avoided insurance costs. However, such a market does not exist for seismic risk currently. Efforts to strengthen market awareness of the risk are an initial step toward changing this along with improved data. Furthermore, lenders may find value in supporting seismic resiliency efforts, as a damaging event could affect their borrowers' ability to repay long-term loans. The State and Federal governments will also likely be involved in disaster recovery efforts, creating a case for additional resiliency funding. Considering that San Francisco is one of the largest economies in the United States and a significant hub for nationally significant industries, reducing the impact of seismic events in the region has far reaching economic benefits across the state and country.

¹¹ These computations do not discount future benefits against the present; when building owners consider retrofitting, it is reasonable to assume they will value a dollar today more than a dollar tomorrow (e.g. the time value of money principle). The ratios in Figure 19, then, represent an upper bound on the benefit-cost ratio, as retrofit costs will be upfront, while benefits will flow in over the longer term. Analysis undertaken for [Section 2: Policy Analysis and Recommendations](#) does discount future benefits, and shows less gain to Archetype 5 building owners undertaking a Level 1 retrofit at \$100 per square foot.

4. Conclusions on Risks and Benefits

Although their significant upfront cost makes it challenging for building owners to rationalize concrete seismic retrofits when considering the near-term benefits, the inventory-wide expected value of seismic-related damages, across all stakeholder groups, approaches \$85 billion over a 30 year period. An inventory-wide Level 1 retrofit would reduce these costs by 77%, while an inventory-wide Level 2 retrofit would yield a 93% reduction in expected damages.

For building owners that elect to retrofit, they would realize avoided building damages, building downtimes, and lost building value. Potential life safety liability is another key factor, as avoided fatalities and injuries constitute 88% of retrofit benefits; if building owners are held liable for seismic-related fatalities and injuries, the economic case for retrofits becomes much more compelling. Regardless of stakeholder group, the long-term potential to reduce and avoid costs across a multitude of stakeholder groups provides ample justification for the cost of retrofits.

Nevertheless, the value from retrofitting and avoiding these substantial economic losses will not be actualized on its own. The degree of uncertainty surrounding seismic events, short planning horizons for building owners, and the lack of a verifiable, predictable market value gain from a retrofit are all disincentives to near-term interventions regardless of the potential consequences of inaction.

Furthermore, avoided losses from retrofits cannot be directly monetized or service a mortgage taken out to finance a retrofit. [Section 2: Policy Analysis and Recommendations](#) addresses this dilemma in greater detail, while exploring which policy approaches might be implemented to address the underlying challenges of concrete vulnerabilities over both the near and long term to achieve the Concrete Building Safety Program's objectives. [Appendix D: Existing Financing Strategies for Concrete Buildings](#) presents a guide for property owners to understand their risk, potential benefits, and existing tools to build market awareness and begin shifting market behaviors.

Section 2: Policy Analysis and Recommendations

1. Introduction

Seismic vulnerability in concrete buildings carries significant consequences across a broad range of stakeholders. For building owners, seismic vulnerability represents a substantial financial risk encompassing potential losses from structural damage, prolonged vacancy, and legal liability. Tenants and other occupants face direct risks to their safety and property, as well as the prospect of displacement if their building is severely damaged. Considering the number and clustering of suspected concrete buildings across San Francisco, these hazards could also have a cascading impact across the City's neighborhoods and commercial or cultural centers, posing a risk to the City's fiscal stability, earthquake recovery capacity, and vitality following a damaging event. Mitigating seismic vulnerability in concrete buildings is therefore not only a matter of individual building safety, but a prerequisite for citywide resilience which must be addressed across the inventory to be effective.

Broadly, concrete buildings can resolve their seismic vulnerabilities by completing a seismic retrofit in line with City guidance or by demolishing the vulnerable structure and redeveloping the site using modern building code standards. Although both approaches mitigate the underlying risk, they produce materially different outcomes for housing availability and affordability, neighborhood character, displacement, and economic activity in different urban contexts. Either pathway will require policy interventions to shift market behavior away from the current pattern of postponing risk-reducing actions.

To date, City and State seismic retrofit programs have focused on unreinforced masonry (URM) and soft story buildings, which – combined with historic preservation incentives and economic development tools – successfully led to widespread retrofits. Many of the programs used to support these building types remain applicable to concrete buildings, but **the cost of pursuing a seismic retrofit significantly exceeds the support existing tools can provide for most concrete buildings – meaning that far fewer concrete buildings can afford to retrofit without extensive financial support.** Redevelopment is also a challenging option for building owners due to the disproportionately high cost of development in San Francisco, existing debt burdens, and the prevailing financial incentive to continue operating without incurring the burdens of retrofitting.

With limited staff and financial capacity, how the City structures and targets its support resources will directly affect which buildings are retrofitted, demolished and redeveloped, or left vulnerable or vacant, and the ensuing impacts on the residents, businesses, and communities these buildings serve. A coherent framework for the City's Concrete Building Safety Program (CBSP) must be sensitive to this context, guiding owner behavior towards outcomes which reflect the City's objectives around seismic resilience, social equity, and economic development rather than being determined solely by individual owner economic decisions.

This section provides an analysis of San Francisco's current seismic policy ecosystem and real estate market dynamics to recommend new interventions to advance the CBSP, and is divided into the following subsections:

2. Understanding Key Stakeholders provides an overview of the motivations affecting building owners and their decision to retrofit or redevelop their properties and the implications of completing a retrofit for occupants.

3. Policy Scan summarizes existing policy and financial tools for motivating seismic retrofitting or redevelopment of vulnerable concrete buildings, detailed further in [Appendix B: Existing Policies](#). This subsection also analyzes the order of magnitude impact of existing incentive policies on retrofit feasibility for representative buildings and examines gaps in the existing policy ecosystem to inform policy recommendations.

4. Case Studies includes lessons from existing seismic retrofit policies and relevant retrofit and redevelopment support programs to identify key considerations for designing the CBSP. Detailed case studies are included in [Appendix C: Case Studies](#).

5. Policy Recommendations outlines a recommended strategy for shifting market incentives, structuring compliance, and developing support resources to make widespread seismic mitigation more financially feasible and implementable across the concrete building inventory. These recommendations can be pursued in parallel to accelerate program implementation.

2. Understanding Key Stakeholders

2.1 The Concrete Building Inventory

Designing effective seismic retrofit policies for concrete buildings begins with understanding the characteristics of the City's vulnerable concrete building inventory and implications for the types of building owners and tenants they attract. This study defines the most vulnerable concrete buildings as moment frame and shear wall structures constructed before 1980, along with a small number built before 2000; as a result, most buildings in the inventory are approximately 50 years old or older. Buildings of this age are primarily Class B or C properties: older, less desirable buildings which command a lower rent (and subsequently property value) relative to higher quality and amenity-rich modern buildings.¹² Lower costs and property values make these buildings appealing and affordable to specific types of owners and tenants, determining the general populations who will be most affected by concrete seismic retrofit policies.

Still, there is significant variation within the City's concrete building inventory across building height and age, location, use, and owner financials. Concrete buildings range in scale from low-rise buildings which appeal to small businesses with limited office needs to high-rises which provide more affordable office space for large companies seeking a downtown presence. Many mid- to high-rise concrete buildings are in desirable, high-rent areas of downtown and may still command a considerable rent despite their age and condition. Recognizing this, the archetype schema introduced in **1.3.2 Analysis Archetypes** was repurposed to segment and analyze variations across the inventory. As additional information becomes available once the ongoing Concrete Building Screening Program is implemented, the City may be able to develop a more detailed approach to segmenting concrete buildings based on a more nuanced understanding of their economics and potential owner behaviors.

2.2 Property Owners

Concrete building owners vary significantly from local independent or “mom and pop” operators to large national or international institutional investors. While each owner has unique business considerations and financial expectations, all broadly aim to make a profit from their building by balancing costs – such as mortgage payments, operating expenses, and maintenance costs – against the rents their residential or commercial tenants generate. A building's use and size significantly affect many of these factors, shaping the amount of profit they produce after subtracting expenses (referred to as the building's net operating income, or NOI).

Building profitability is central to how building owners plan for and finance larger physical improvements such as lifecycle capital maintenance, modernizing building features, or a seismic retrofit. Most building owners operate on an approximately 30-year capital maintenance cycle for lifecycle renovations, using accumulated savings from NOI and future earning potential to leverage a loan to replace major systems like heating, ventilation, and air conditioning (HVAC) and roofing, or to undertake modernization projects like an energy retrofit or adding premium finishes. Because of the high upfront costs, uncertain returns, and potential tenant disruption these building improvements can involve, owners will often defer this work until prompted to by a triggering event such as a building refinancing, a policy or insurance requirement, or a failure in one of the building's mechanical or structural elements.

The type of building owner influences how they respond to a triggering event: long-term owner-operators may have flexibility to defer work as they plan for their building's long-term profitability, while institutional investors with shorter hold periods may pursue improvements to increase a property's value before a near-term sale. Ownership type also affects the financial resources and capacity available to support these projects, which

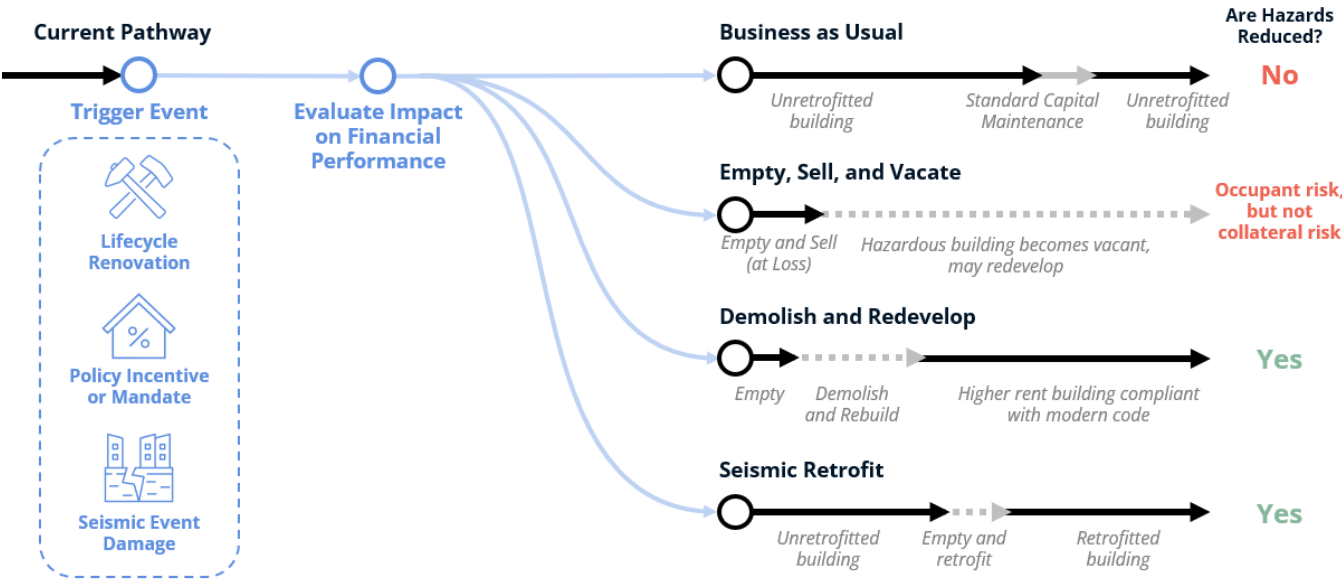
¹² Broker interviews conducted in summer 2025 support this presumption, noting that Class B and C properties typically lack amenities like air conditioning, meaning tenants in these buildings are often making significant compromises in favor of lower rents.

combined with their building’s scale and NOI influence the capital project scale they can finance. If the cost of a required project exceeds what can be financed, owners may either defer the work further or sell the building.

Against this backdrop, budgeting for a seismic retrofit is difficult for a concrete building owner to justify. **Seismic retrofits for concrete buildings are complex, expensive and, unlike many other capital improvements, do not increase a building’s potential rental income on their own under current market conditions.**¹³ In 2019, a review undertaken by the National Development Council for the City of Seattle found that “seismic retrofits do not, in and of themselves, increase the economic value of buildings...we have not found evidence that retrofitted buildings currently command higher rental rates in the rental market.”¹⁴ No empirical studies of commercial building retrofits in North America exist to support this possibility.¹⁵ ¹⁶ Because of this, while section 1 of this report outlines the significant benefits to owners from avoided losses in the event of a damaging earthquake, owners currently have almost no near- to mid-term financial incentive to retrofit their concrete buildings voluntarily.

As Figure 20 illustrates, mitigating seismic hazards for a concrete building can take several alternative pathways depending on owner financial circumstances and business outlook. However, to shift owners from the least expensive scenario of “business as usual” without completing a seismic retrofit, new policy tools will need to be introduced or expanded to make the other pathways legally or financially advantageous.

Figure 20: Seismic Hazard Mitigation Triggers and Outcomes



¹³ Confirmed through conversations with real estate brokers and experts focused on the Bay Area.

¹⁴ National Development Council. Funding URM Retrofits. Seattle Department of Construction and Inspections, 2019.

¹⁵ Filippova, Rehm, and Dibble (2017) found New Zealand’s first empirical instance of seismic strength rent premiums in office buildings in earthquake-prone Wellington, which the authors attributed to an increase in awareness of earthquake risks following 2010-11 earthquakes in the Canterbury/Christchurch region. No such rent premium was found in low-earthquake-risk Auckland.

¹⁶ Commercial buildings, such as those in the concrete building inventory, are distinct from owner-occupied single-family homes, where empirical evidence does suggest a value premium from seismic retrofits.

2.3 Building Occupants

Building occupants do not determine how a building addresses its seismic risk, but tenants, workers, and other occupants are most directly exposed to any seismic hazard. As discussed in section 1, **taller concrete buildings face a meaningful risk of collapse in a damaging earthquake**, which can result in **high numbers of injuries and fatalities**. Building failures can also **destroy personal belongings or business property**, representing significant additional risk to occupants.

Understanding who occupies at-risk concrete buildings also has implications for how seismic vulnerability affects San Francisco neighborhoods and the City's economy. Older Class B and C concrete buildings typically lack significant amenities, which keeps rents lower relative to newer buildings. Older multifamily concrete buildings therefore represent an important source of naturally occurring affordable housing (NOAH) and are likely to be occupied by low- and moderate-income households. On the commercial side, low-rise properties (archetypes 1 and 2) are often occupied by small businesses requiring space for offices, warehouse storage, or light manufacturing, while larger buildings (archetypes 3, 5, and 7) tend to attract office, retail, and hospitality tenants seeking less expensive space than the newer inventory offers.

Residential and commercial tenants in concrete buildings can be displaced either by the work needed to repair earthquake damage or to complete a seismic retrofit, though the potential outcomes of these scenarios are meaningfully different.

- **If a building is severely damaged in an earthquake, tenants may be forced to relocate suddenly and for an extended period**, competing for housing or commercial space simultaneously with thousands of other displaced occupants across the city. This could be particularly challenging for low- and moderate-income residents and smaller businesses who have limited affordable alternatives due to San Francisco's shortage of affordable housing and commercial space – which could be made worse by a damaging earthquake.
- In contrast, **the temporary relocation for a seismic retrofit gives tenants the benefit of advance notice, a less restricted housing market, a potentially shorter relocation period**, and an opportunity to return to a safer building. As a result, while seismic retrofits still cause short-term relocation, they are less disruptive than the impact a damaging earthquake would have on an unretrofitted inventory and less likely to result in long-term displacement out of San Francisco.

Building occupants can play a meaningful role in shaping seismic risk mitigation and market dynamics, as demonstrated by tenant advocacy and organized political pressure that influenced both the pace and scope of San Francisco's Soft-Story Retrofit Program. Residential and commercial tenants also have the power to create or reduce market demand for specific building attributes. **Because seismic vulnerability is not widely known or disclosed, it currently does not have a significant impact on occupant behavior.** Building tenant awareness can therefore be a valuable tool to affect market dynamics and build support to advance the City's seismic resilience goals.

3. Policy Scan

3.1. Existing Policies

A range of existing policies across federal, state, and city governments can be used to influence or compel concrete seismic retrofits, as summarized in Figure 21. This list summarizes current policies with broad applicability across the concrete inventory as of March 2026, and should not be considered exhaustive. Most tools are not mutually exclusive, allowing them to be used individually or in combination to address various common problems.

Figure 21: Existing Policy Tools

Policy Category	Type of Policy Tool	Existing Tools
Market Enablement Tools: <i>Create or improve market conditions for retrofits</i>	- Technical Assistance - Data Transparency - Capacity Building	- SF Tall Buildings Database - U.S. Resiliency Council Building Rating System for Earthquakes - SF Concrete Building Screening - SF Concrete Building Seismic Retrofit Standards (<i>SFBC Appendix A Chapter A6 and AB 113</i>)
Mandates and Requirements: <i>Compel action through legal requirements</i>	- Retrofit Mandates - Inspection Mandates - Disclosure Requirements - Performance Standards	- California State Seismic Inventory Requirement (<i>Assembly Bill 2681</i>) - CA Natural Hazards Disclosure Act (<i>CA Civil Code § 1103.2</i>) - CA Commercial Property Owner's Guide to Earthquake Safety and Homeowner's Guide to Earthquake Safety - SF Seismic Retrofit Triggers for Existing Buildings (<i>SFBC §§ 405.2, 502, 503, and 506</i>)
Penalties: <i>Discourage non-compliance or delay by imposing costs or restrictions</i>	- Fines and Fees - Restrictions - Market-Based Disincentives	- SF Noncompliance Fines - SF Building Placarding - SF Certificate of Occupancy Revocation (<i>SFBC §109A</i>)
Planning and Coordination Tools: <i>Support strategic alignment and long-term resilience planning.</i>	- Resilience Plan - Stakeholder Engagement - Monitoring and Evaluation	- SF Earthquake Safety Implementation Program (ESIP) - SF Concrete Building Safety Program (CBSP) and Working Group - SF Tall Buildings Safety Strategy
Incentives: <i>Encourage voluntary compliance by reducing costs or increasing benefits for building owners</i>	- Direct Financial Support - Tax-Based Incentives - Financing Mechanisms - Process Incentives - Insurance Incentives - Tenant Cost Passthrough	- CA Mills Act - Federal Historic Rehabilitation Tax Credit - CA Seismic Improvement Property Tax Exclusion (<i>CA Revenue and Taxation Code §74.5</i>) - SF Seismic and Solar Transfer Tax Exemption (<i>Business and Tax Regulations Code §1105</i>) - SF Transfer Tax Exemption for Conversion to Residential Use (<i>Business and Tax Regulations Code §1108.7</i>) - SF Downtown Adaptive Reuse Program - SF Tenant Cost Passthrough - SF Preservation and Seismic Safety (PASS) - California Property Assessed Clean Energy (C-PACE) (<i>Streets & Highway Code §5898.12</i>)

More details on these programs are provided in [Appendix B: Existing Policies](#). These policies, along with the financial analysis in the following subsection, are used to identify challenges in the current policy ecosystem in subsection [3.3 Policy Gaps and Limitations](#).

3.2. Financial Modeling Findings

To understand the economics of retrofitting a building, a discounted cash flow analysis was conducted for three representative concrete building archetypes: archetype 4 (mid-rise multifamily shear wall; presumed rent controlled for this analysis), archetype 5 (mid-rise moment frame office), and archetype 7 (high-rise moment frame office).¹⁷ This analysis informs how much capital a typical concrete building can access to finance a retrofit, whether it can absorb the associated costs, whether avoided seismic losses outweigh retrofit costs, and the extent to which available financial tools improve the feasibility of retrofitting.¹⁸

¹⁷ These archetypes were selected to represent some of the most common and potentially vulnerable concrete building types across the preliminary concrete inventory. Refer to Section 1 for detailed archetype descriptions.

¹⁸ Financial modeling relies on preliminary assumptions about attributes of the concrete inventory, retrofit cost per square foot, and available incentives – some of which will be refined by the ongoing screening program. The results provide an order of magnitude feasibility for illustrative buildings and, therefore, does not represent the actual cost or financial gap for every building or typology across the inventory.

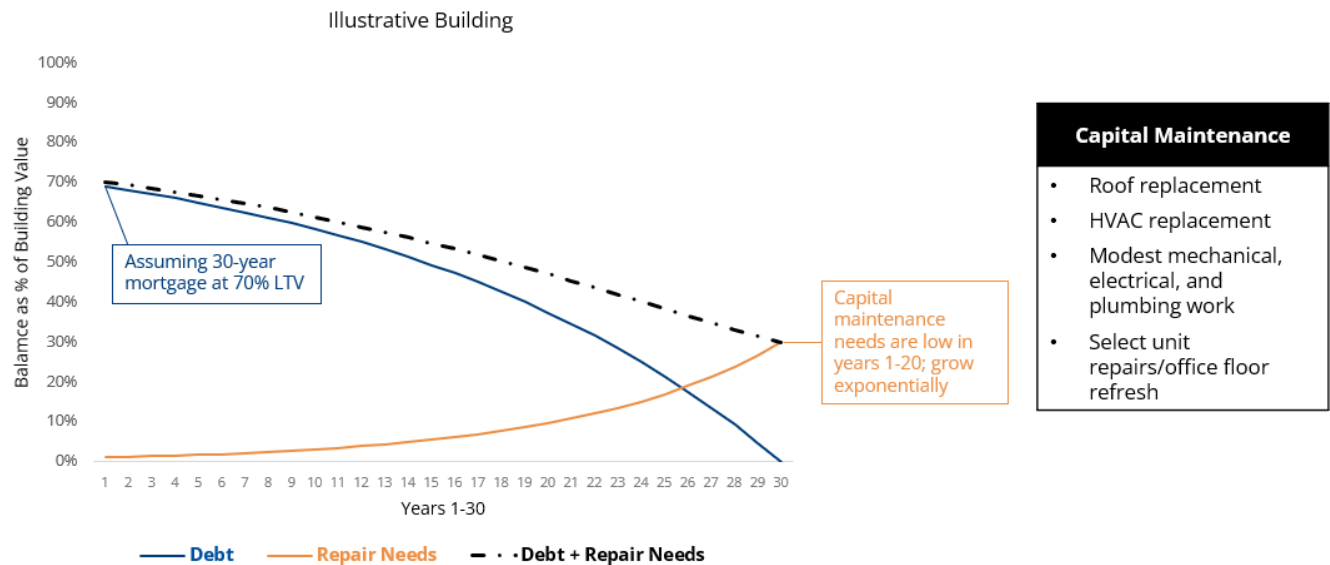
Most financing needed to pay for a seismic retrofit will come from a bank or lending institution. Building owners routinely elect to borrow money, typically to cover building maintenance costs, to consolidate or refinance existing debts, or to access cash from anticipated building value increases. Across an inventory of thousands of buildings, there are countless variations in building-level financial conditions, but a few fundamental conditions hold:

- 1. Buildings need reinvestment every 20-40 years in the form of substantial capital maintenance; and
- 2. From the perspective of a building owner, it is cheaper to use a lender’s money than their own to cover reinvestment, cash reserves, or other working capital.

The financial modeling analysis assumes that there are moments within a typical 30-year capital maintenance cycle where capital maintenance needs require a reinvestment, and that conducting a seismic retrofit at that time is likely most efficient due to tenant disruptions required for both scopes of work and potential construction efficiencies. Absent a triggering event, as described in subsection 2.2 [Property Owners](#), it is not conceivable for a building owner to pursue a retrofit on its own.

Critically, lenders size loans to building owners against the value of their buildings and the revenue streams (NOI) available to pay the loan, not just the cost of the seismic retrofit itself. Furthermore, as Figure 22 illustrates below, the costs of retrofitting are an additional expense to the building’s capital maintenance needs and/or outstanding debt burden.

Figure 22: 30-Year Capital Maintenance Cycle of Debt and Capital Maintenance Needs, Illustrative Building



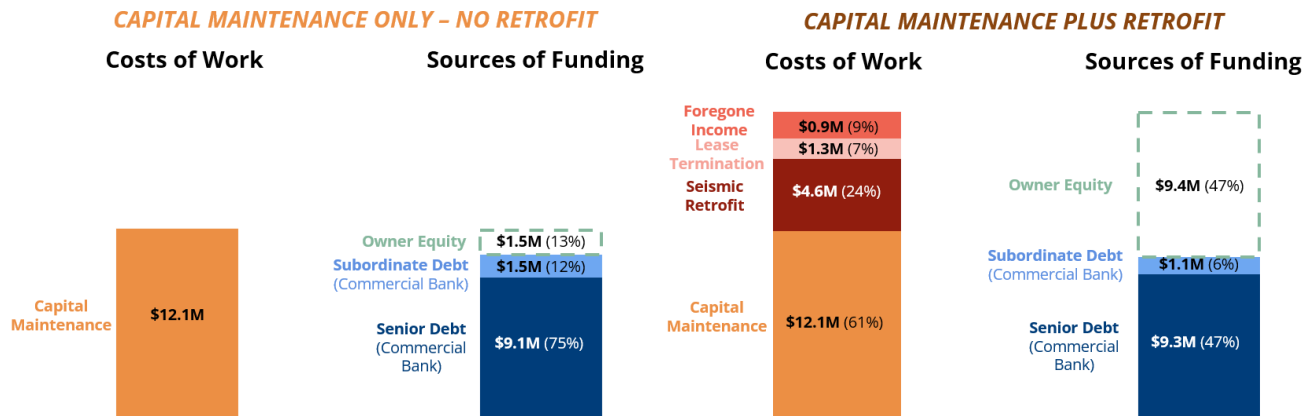
Loan to Value (LTV) is a measure used for examining a building’s debts, measured as the ratio of the outstanding loan amount to a property’s assessed value. LTV is often used by lenders to assess risk when underwriting loans.

Because seismic retrofits do not have a documented impact on a building’s operating income or market value, this analysis presumes that lenders will not extend additional capital to building owners to accommodate retrofits.¹⁹ Because lenders will not extend additional capital, owners will either have to find grant funding, utilize non-conventional debt products, or spend the money themselves (owner equity). This analysis assumes all funding gaps for retrofits will come as a direct equity investment from building owners. To illustrate how retrofit costs complicate the financing picture for a representative building, Figure 23 illustrates the financial calculus for a representative 4-story office building in archetype 5. Between roof and HVAC replacement, mechanical,

¹⁹ If a mandatory disclosure program causes prospective building tenants to choose more seismically safe buildings, or pay a rental premium for seismic safety, this assumption would change, and building owners would have added incentive to retrofit, as well as an increased ability to borrow money for a retrofit.

electrical, and plumbing work, and some improvements to the finishes on office floors themselves, a building in archetype 5 faces a 30-year capital maintenance cost of approximately \$12.1 million, or \$260 per square foot.²⁰

Figure 23: Building-Level Costs of Work and Sources of Funding, With and Without Retrofit: Representative 4-Story Office Building



Layering on a Level 1 retrofit at \$100 per square foot increases the costs of capital maintenance work by 60-65%.^{21 22} Most capital maintenance can be done without emptying the building, but structural engineering work for seismic retrofits requires buildings to be emptied, increasing building owner costs from lease termination and foregone building income.²³ These additional costs of work, as shown in Figure 23 above, have significant implications for the owner’s financial calculus. **Because retrofits do not have a measurable impact on building rents or value, virtually all additional costs must be covered by the building owner’s equity,** as lenders will not finance the gap.²⁴ As a result, the hypothetical office building owner represented in Figure 23 must contribute \$9.4 million of their own money or revenue as a direct equity investment to the project, about 47% of total costs. Without a guaranteed return on investment, this is very difficult for a building owner to justify.

Across archetypes and use patterns, seismic retrofits translate to higher owner equity requirements, which translate to financial losses over a 10-year period as illustrated in Figure 24. When an average building refinances for capital maintenance without a retrofit, the 10-year return profile (“Net Present Value”) is cash flow positive and can navigate upfront financing costs (0-15% owner equity). However, the expected value of seismic building damages and life safety liabilities exceeds the positive cash flows over a 10-year period.

²⁰ This estimate is informed by Cushman and Wakefield’s 2025 estimate of average tenant improvements ([Office Fit Out Cost Guide 2025 | US | Cushman & Wakefield](#)) and a 2024 CoStar study ([News | Here’s What It Costs To Build the Office Tenants Say They Want](#)) of office tenant improvements. This analysis ultimately assumed a \$125 per-square-foot tenant improvement (which is more conservative than Cushman and Wakefield or CoStar’s data suggest), along with a \$75 per-square-foot allowance for roof and HVAC work, and a 30% allowance for soft costs and general contingency. Because the office building is undergoing a light tenant improvement, rents were assumed to increase by 10% following the completion of the work.

²¹ Cost assumptions were informed by a survey of 30 concrete building retrofits conducted by ATC prior to this study that found the costs of concrete building retrofits to range from \$50 to \$200 per square foot.

²² BSE-1E is a standard earthquake hazard level of ground shaking used when designing buildings or seismic retrofits. For more information on how these are used in San Francisco’s seismic retrofit requirements, refer to [1.1 San Francisco Concrete Building Safety Program](#) in section 1.

²³ Most capital maintenance can occur without emptying the building; it is likely that tenant improvements would be reduced if the building were continuously occupied. Because a retrofit requires emptying the building, a rational building owner will take advantage of the opportunity to make repairs across all floors. In the absence of a retrofit, the building may spend less than the assumed \$260 per square foot in a 1–2-year timeframe. For illustrative purposes, however, this example assumes capital maintenance costs are the same with and without the retrofit.

²⁴ Figure 23’s “Sources of Funding” show that senior and subordinate debt amounts change when retrofit costs are added. This is a function of how the office lender is presumed to size its loan products; however, these will vary between lenders in practice. In this example, the senior lender’s presumed loan-to-cost (LTC) terms, at 75% LTV, constrain the “capital maintenance only” loan. When the costs of work increase in the “capital maintenance plus retrofit” scenario, the senior lender can lend more, as costs have increased. In response, subordinate debt shrinks slightly with total debt (senior and subordinate) roughly equal in both scenarios.

Figure 24: Financial Modeling Results: Impacts of Level 1 Retrofit on Financial Feasibility, by archetype

	Mid-Rise Residential 16k square feet	Mid-Rise Office 46k square feet	High-Rise Office 227k square feet
<i>Capital Maintenance Only, No Retrofit</i>			
Owner Equity Required	2%	13%	13%
10-Year Net Present Value	\$3.13M	\$2.78M	\$13.6M
+ net <i>expected</i> seismic building damages	\$2.43M	\$1.45M	(\$0.25M)
+ net <i>expected</i> life safety liabilities	(\$0.46M)	(\$10.3M)	(\$229M)
<i>Capital Maintenance + Level 1 Retrofit at \$100 per square foot</i>			
Owner Equity Required	32%	47%	47%
10-Year Net Present Value	(\$0.18M)	(\$6.60M)	(\$33.3M)
+ net <i>avoided</i> seismic building damages	\$0.33M	(\$5.65M)	(\$23.8M)
+ net <i>avoided</i> life safety liabilities	\$2.46M	\$2.97M	\$142M

A mid-rise residential building conducting capital maintenance without retrofitting is projected to return a net 10-year net present value, or net cash flow, of \$3.13M.²⁵ However, expected seismic building damages within a 10-year period are \$0.7M higher if the building is unretrofitted, while expected life safety liabilities are expected to be \$2.89M higher.²⁶

Without retrofitting, the expected value of building damages and liabilities exceeds the positive cash flows of a representative building. If the building includes a retrofit, the reverse is true; 10-year net present value is negative, while the expected value of avoided building damages and liabilities is overwhelmingly positive and exceeds the magnitude of the negative 10-year cash flow projection. While both scenarios illustrate the benefits of retrofitting and the risks of not retrofitting to building owners, it is worth underscoring that avoided losses from a retrofit cannot be monetized. **The benefits of retrofits are only realized if and when an actual damaging earthquake occurs, which cannot service a mortgage or offset operating losses.**

It should also be noted that residential retrofits are much closer to a positive 10-year cash flow than typical office building retrofits. As modeled in Figure 24, a mid-rise office building finishes with a 10-year net present value of \$6.60 million following a retrofit, meaning the building would need approximately \$6.6 million in an upfront subsidy for the project to break even. In comparison, a representative mid-rise residential building would theoretically require \$0.18 million for the project to eliminate financial losses from a retrofit. While these estimates may not translate to precise dollar amounts needed to incentivize retrofits of each type, the comparison of 10-year net present values provides a helpful sense of scale: the \$6.6 million needed to gap finance a representative office building is more than 30 times the amount of upfront grant that would theoretically be needed to make a residential retrofit break even. The implications for any future assistance programs are meaningful. A high-rise office building may present significant life safety and economic risks to the downtown area, but could require a substantial public investment to make a retrofit feasible. In comparison, that same amount of funding could support seismic retrofits in many more small low-income multifamily buildings to preserve housing, mitigate displacement, and protect disadvantaged residents, though these buildings may not collectively reduce as much risk to life safety or economic activity.

²⁵ This includes a 7% discount rate for future years and models a sale of the property at Year 10.

²⁶ Life safety liability amounts are based on FEMA heuristics for the value of an injury and the value of a human life, which are estimated at \$3.7M and \$11.6M, respectively.

To illustrate the impact of available support programs, Figure 25 summarizes the ability of four existing and widely applicable financial tools to improve cash flow outcomes for building owners. For additional detail on assumptions and limitations surrounding these financial tools, see [Appendix A: Glossary and Assumptions](#).

Figure 25: Impacts of Financial Tools on Projected Cash Flows from Retrofit Work

	Mid-Rise Residential <i>16k square feet</i>	Mid-Rise Office <i>46k square feet</i>	High-Rise Office <i>227k square feet</i>
<i>Capital Maintenance + Level 1 Retrofit at \$100 per square foot</i>			
Baseline, 10-Year Net Present Value	(\$0.18M)	(\$6.60M)	(\$33.3M)
C-PACE, 10-Year Net Present Value	(\$0.08M)	(\$6.10M)	(\$30.8M)
Mills Act, 10-Year Net Present Value	\$0.01M	(\$5.88M)	(\$27.5M)
PASS Funds, 80% AMI building, 10-Year Net Present Value	\$0.28M	N/A	N/A
PASS Funds, 60% AMI building, 10-Year Net Present Value	(\$1.89M)	N/A	N/A
Residential Tenant Cost Passthrough, 10-Year Net Present Value	(\$0.15M)	N/A	N/A

The impact of available financial tools are minimal in comparison to the projected 10-year losses from retrofit work, as shown in Figure 25. This is because the lending system requires borrowing against a building’s ability to generate income, which seismic retrofits have not shown an ability to increase. Seismic retrofit costs, then, have to be absorbed, which only may be feasible for highly profitable buildings. San Francisco’s multifamily market rebounded strongly from the pandemic, with decade-low vacancy and stable rent growth. For this reason, **residential buildings have an easier path to making seismic retrofits financially feasible. In contrast, the office market is struggling, limiting available credit and forcing owners to shoulder more retrofit costs upfront.**

For representative mid- or high-rise office buildings, existing available financial tools are insufficient to close the baseline cash-flow deficit and make retrofit projects financially viable. By contrast, a representative residential building could become cash-flow positive with the right financial tools, though the margin for viability is likely narrow and may vary between actual buildings:

- **PASS funds** offer larger amounts of inexpensive debt than a conventional bank loan, and thus, result in a projected 10-year net present value of \$0.28M if the building is renting at 80% AMI levels. However, PASS funds cannot accommodate retrofits at deeper levels of affordability; if the building is capped at 60% AMI rents, the 10-year net present value becomes a loss of nearly \$2 million.
- The **Mills Act** improves a building’s cash flow, enabling a larger bank loan, and for a representative residential building, can take the 10-year net present value to effectively \$0, but it is worth noting that a) not all residential buildings will be eligible for the Mills Act, and b) the effective abatement amount will vary from building to building; this example assumes a 60% property tax abatement.

The buildings with the greatest seismic benefits from retrofits (namely high-rise office buildings) are also the least financially feasible to retrofit, a reality exacerbated by the struggles of the office market in recent years. Office buildings are harder to retrofit because banks perceive lending to them as fundamentally riskier than apartments, given their lower profitability under current market conditions. This means owners have to come up with more upfront equity than they do for apartment buildings, making retrofits less likely. Given that high-rise office buildings are often hundreds of thousands of square feet, the sheer upfront liquidity needed to commence a retrofit on these buildings is immense. Without a readily available source of existing financing for retrofits, it is critical to understand the financial disparities between residential and office buildings. It would require millions of dollars in free or very low-cost capital to offset the financing of retrofit costs for market-typical office buildings in the inventory looking to retrofit. As an example, an average four-story office building would require approximately \$6.60M in grants to eliminate financial losses from a retrofit, compared to \$0.2M for a similarly sized residential building – meaning **the same amount of public funding to support one office**

building might fund more than 30 comparably sized residential retrofits.²⁷ The City will therefore need to make explicit tradeoffs between the building uses and the number of retrofits it can support when allocating its finite financial resources.

3.3 Policy Gaps and Limitations

Although there are existing tools and clear standards for seismic retrofits and incentives for redevelopment, they have not led to widespread seismic retrofits or redevelopment of vulnerable concrete buildings. Interviews with real estate professionals and a review of the literature indicate an **information failure** where limited market awareness of seismic risk prevents seismic retrofits from increasing building values, meaning there is no rent or value premium that can be used to offset a portion of seismic retrofit costs. In addition, available **financial incentives for retrofits or redevelopment are insufficient** relative to the high upfront cost of retrofits and capital constraints many owners face. At the same time, some policies make redevelopment difficult or less appealing, further narrowing the possible pathways for risk reduction. **Process and capacity limitations** also make it difficult to initiate retrofit projects and slow their implementation. As a result of these barriers, most owners are unlikely to pursue seismic retrofits or redevelopment without a legal or financial trigger, but **additional retrofit triggers are needed**. Existing retrofit requirements in the San Francisco Existing Building Code (SFEBC) are largely reactive or situational and are therefore not structured to drive compliance across the vulnerable concrete inventory. **Without changes to address these structural barriers or until the market differentiates the value of seismically safe buildings, each building owner is likely to operate their property until it reaches the end of its useful life without pursuing a seismic retrofit.** As a result, seismic vulnerability could persist across much of the concrete building inventory for many decades to come.

3.3.1 Information Failure

Because seismic risk is not consistently disclosed or understood in San Francisco's real estate market, prospective buyers or tenants have little reason to demand lower prices or rents for seismically vulnerable concrete buildings relative to comparable structures built to modern code. As detailed in subsection **3.1. Existing Policies**, California law requires owners of older buildings to disclose whether a property lies within designated fault or seismic hazard zones through a Natural Hazard Disclosure Statement (NHDS) and to provide information on known structural risks in a Homeowner's or Commercial Property Owner's Guide to Earthquake Safety before a sale is finalized. However, because these disclosures are only triggered when a sale is underway and only provide information to the prospective buyer, seismic hazards have little opportunity to influence a property's market value. Disclosures are also only required for building owners, leaving tenants with limited access to information about a building's seismic safety. In addition, the Owner's Guide requirement applies only to buildings constructed before 1980, meaning some seismically vulnerable concrete buildings may not be subject to a clear disclosure requirement. **As a result, neither buyers nor tenants can easily compare seismic risk across buildings when evaluating purchase prices or rents. This prevents the real estate market from developing a meaningful value premium for seismic safety, giving owners little financial incentive to retrofit and limiting their ability to recover retrofit costs through higher rents or property values.**

The City has invested in several studies to gather information on seismic risk including the 2019 Tall Buildings Study and ongoing concrete building screening program to inform future policies. Since this information is not widely available or understood, most tenants in or prospective buyers of concrete buildings will not be aware of this information or have the expertise to interpret it, meaning that building information will not have a meaningful impact on market behavior without a City outreach program. While there are national standards for communicating seismic safety (such as the U.S. Resiliency Council Building Rating System for Earthquakes), they are not widely employed or required by any policies in San Francisco, which limits their usefulness as a tool for differentiating between buildings.

The secondary impacts of an earthquake such as tenant displacement and relocation are also not widely understood, which may be suppressing support for seismic retrofits. Residential tenant displacement is a key concern for many residents, particularly due to San Francisco's severe housing affordability challenges. Because

²⁷ Based on the results of 10-year net present value modeling.

seismically retrofitting a concrete building requires temporary tenant relocation, residents may have reasonable concerns around displacement that create apprehension and affect program implementation. However, the displacement caused by a damaging earthquake could have longer lasting and more severe impacts for residents that can be mitigated by proactive seismic retrofits. Without stronger public awareness around this tradeoff and a clear approach to minimizing displacement, a seismic retrofit program may struggle to gather public support and momentum.

3.3.2 Insufficient Scale of Financial Tools

While existing financing and incentive programs can be deployed to support retrofits, they are highly unlikely to make retrofits feasible for most buildings. The high cost of a seismic retrofit for a concrete building will require most property owners to make a significant capital contribution to leverage a loan. Building owners can secure bank loans to help pay for retrofits, but lenders need to be repaid, and loans are constrained by how much cash flow a building generates. Below-market loans or C-PACE can slightly lower the cost of borrowing or expand the loan amount owners can leverage, but are unlikely to cover the scale of the remaining gap. Furthermore, as of 2026, the PASS program is fully obligated and cannot support more projects without an additional bond approval. **Ultimately, the subsidy and low-cost loan programs available to concrete buildings are insufficient to fill their anticipated financial feasibility gaps.**

When considering redevelopment, many buildings may be eligible for policies like expedited permitting and requirement waivers through the City's Downtown Adaptive Reuse Program or other development incentives, but the impacts these tools have on project feasibility are generally not large enough to close financial gaps. Many suspected concrete buildings take up entire blocks or are clustered with other concrete buildings on small parcels, creating opportunities for redevelopment which range in scale from small assemblages to entire blocks. However, **the City currently lacks tools to create and position development opportunities or coordinate them to minimize social harm.**

Furthermore, existing permitting and approvals processes pose an additional hurdle to development and source of uncertainty for building owners navigating the retrofit process. San Francisco has recently made substantial modifications to its permitting processes, with the early results indicating reduced permitting times. **In other U.S. cities that have pursued large scale retrofit or renovation programs, creating a dedicated permitting and approval unit that is able to navigate building owners through required processes has been a key to success.** San Francisco should create a dedicated permitting and approval program designed to accelerate seismic retrofits. Without this focused support, retrofit and redevelopment projects will be slower to deliver seismic resilience improvements and other community benefits.

These challenges are especially impactful for the office market, which is slowly adapting to new market demands following the COVID-19 pandemic's acceleration of a shift toward remote office work. While San Francisco's downtown vacancy is down from its pandemic peak and leasing activity has increased, many older properties have distressed loans and are struggling to finance routine capital maintenance. **Financial modeling results suggest that a seismic retrofit requirement will be infeasible for most downtown office properties, which could hamper downtown's recovery if these buildings cannot access support resources to retrofit or redevelop.**

3.3.3 Process and Capacity Limitations

San Francisco is currently implementing permitting reforms that will ease administrative burdens and reduce the carrying costs that building owners incur while permits are processed and approved, including improved inter-departmental coordination, streamlined review processes, and expanded online services. Still, a mandatory program will generate significant new demands on several City departments. With an influx of complex retrofit projects seeking compliance, offices like DBI, Planning, OEWD, and ORCP will need sufficient staff capacity and capabilities to effectively monitor progress, provide technical assistance, and enforce compliance.

While seismic retrofit projects will benefit from process improvements, they do not address the full range of City support services that many building owners will need to successfully complete a retrofit. Many owners will require assistance navigating available financing sources, identifying and procuring qualified contractors, and managing any required tenant relocation. These needs are likely to be highest among small building owners with limited

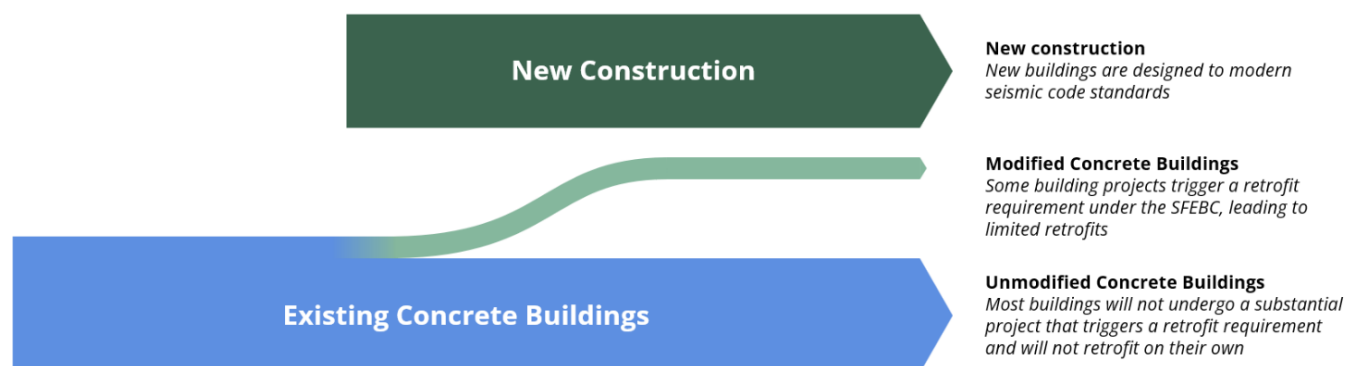
experience undertaking large capital projects, who will therefore have greater difficulty completing a retrofit if dedicated technical support is not available. **Without expanding the City's support capacity, the CBSP could fall short of its intended outcomes regardless of how comprehensive its underlying policy framework is.**

3.3.4 Narrow Impact of Existing Retrofit Triggers

Seismic retrofits often involve significant upfront costs, uncertain financial returns, and potential tenant disruption, which can lead owners to postpone these investments. In practice, upgrades are frequently delayed until a triggering event – such as refinancing, regulatory requirements, or building system failures – forces action. **Given the choice to pursue a costly retrofit which generates little to no value, many property owners are likely to avoid retrofitting until legally or financially compelled to do so.**

There are currently three triggers in the San Francisco Existing Building Code that can create this requirement: (1) extensive building alterations (Sections 502 and 503), (2) change in use (Section 506), or (3) building repairs following substantial seismic damage (Section 405.2 and Administrative Bulletin AB-099). However, these triggers only apply when a building pursues a significant project and does not encourage proactive seismic retrofits across existing concrete buildings. Some building retrofit triggers can also be avoided by careful planning, meaning at-risk buildings can receive improvements which extend their lifespan without addressing underlying vulnerabilities. **As a result, existing trigger mechanisms will not require or encourage seismic retrofits at the pace or scale San Francisco needs to safeguard its vulnerable concrete inventory.**

Figure 26: Illustrative Impact of Reactive Retrofit Triggers



Because concrete building retrofits are voluntary in San Francisco, the only returns building owners will realize for retrofitting are the potential avoided losses from seismic building damages and life safety avoided losses as outlined in section 1, which cannot be monetized in the present day. There are also no near-term disincentives from continuing to operate a building without retrofitting. **Without a near-term financial incentive or disincentive to trigger action, it is difficult for owners to justify proactively undertaking a seismic retrofit or a redevelopment project.**

As noted in prior subsections, property owners typically plan for major capital improvements and maintenance projects on a roughly 30-year cycle. Even with greater awareness of their potential losses from a damaging earthquake, they may be inclined to discount this risk due to the perceived low probability of a major earthquake over this period.²⁸ This tendency to discount risk can be even more pronounced among investors, who commonly have hold periods for as few as five years in the current market. As a result, **awareness of potential avoided losses will also not trigger retrofits.**

Other policies that promote major building improvements such as flood resilience retrofits or wildfire mitigation measures often use insurance requirements and discounts as trigger mechanisms or motivators. Unfortunately, seismic insurance is typically an optional add-on or specialty insurance policy. After the 1994 Northridge earthquake demonstrated significant seismic risk exposure across California, most insurers pulled back from

²⁸ See [Appendix D: Existing Financing Strategies for Concrete Buildings](#) for additional information on property owner capital improvement planning.

offering seismic insurance or greatly increased both their rates and deductibles.²⁹ **Earthquake insurance is not likely to be a useful retrofit trigger given its limited uptake for both commercial and residential buildings.** Without an external requirement or incentive for seismic insurance, such as making it a prerequisite to underwrite mortgages for vulnerable buildings or requiring it for building owners that do not comply with City retrofit policies, any changes to seismic insurance policies will not have an impact on most building owners.

4. Case Studies

Concrete building seismic retrofit programs are a relatively new policy area in the United States, beginning with Los Angeles' landmark Concrete Retrofit Program in 2015. While the efficacy of these programs is still being explored given their recent implementation, a broader exploration of similar large-scale seismic and energy retrofit programs and building conversion support tools provides valuable insight into factors that can shape the success of the CBSP. In addition to review of existing seismic retrofit programs within the United States as illustrated in Figure 27 below, case studies were conducted on the following programs to inform recommendations for San Francisco and are included in [Appendix C: Case Studies](#).

- [Ongoing Mandatory Concrete Retrofit Programs in California](#): Profiles of concrete retrofit requirements implemented by Los Angeles, West Hollywood, and Santa Monica enacted between 2015 and 2017. These policies vary by their number of buildings targeted, support resources available, and approach to deadlines, providing insights for any requirements contemplated in San Francisco.
- [New Zealand Earthquake-Prone Building System](#): Nationwide seismic retrofit requirement created in 2017 in response to vulnerabilities revealed by the Canterbury earthquake sequence from 2010 to 2011. The program was refocused in 2025 in response to significant feasibility barriers.
- [Seattle Unreinforced Masonry Retrofits](#): Forthcoming mandatory unreinforced masonry building retrofit program which will go into effect once the City can establish support programs, especially for disadvantaged communities and tax-exempt entities. The program design process has been accompanied by transparent messaging and building owner outreach to prepare them for the future requirement.
- [New York City Local Law 97](#): Landmark emissions reduction legislation, which creates increasingly strict building emissions caps to spur energy retrofits and building efficiency upgrades. However, the current net cost of compliance relative to penalties and availability of alternate compliance methods have undercut the policy's effectiveness at encouraging retrofits.
- [Pittsburgh Downtown Conversion Program](#): Downtown revitalization program designed to increase the mix of uses in Pittsburgh's distressed office-centric downtown to improve the city's fiscal stability and downtown vitality. The program provides significant 0% loan funding for high-impact office conversion and mixed-income housing projects to kickstart this transformation.
- [New York City Office Conversion Accelerator](#): A single point of entry with dedicated support staff for supporting office conversion projects, coordinates requirements across multiple departments to significantly reduce the administrative burden on property owners and developers and minimize compliance-related delays.

4.1 Key Takeaways

The case studies underscore the following observations, informing a potential CBRP program structure, support opportunities, and approaches to ensuring compliance:

- **Financial feasibility ultimately determines whether building owners can pursue capital projects.** Even with public support and understanding of potential financial losses, building owners still need to be able to make a long-term profit from their buildings to justify making an investment in them. Previous

²⁹ Insurance Information Institute, "[Background on: Earthquake insurance and risk](#)"

seismic retrofit requirements and comparable programs like New York's Local Law 97 have struggled to achieve widespread compliance due to the high cost of required work relative to its unknown financial return, and available incentives are too limited to meaningfully offset them.³⁰

- **Interim deadlines and phased milestones help sustain momentum over a long program period.** Prior seismic retrofit requirements routinely provide a compliance period of up to 25 years, often including interim deadlines for submitting a work plan or evidence of permit approval. This can help to monitor progress and anticipate compliance issues, creating opportunities to adjust support programs based on their performance. Overly compressed timelines risk low compliance rates and can overwhelm local permitting, engineering resources, and construction capacity, especially as deadlines approach. Differentiating compliance timelines by risk level as proposed for New Zealand's updated Earthquake Prone Building system and Seattle's unreinforced masonry retrofit program can also help distribute demand and match urgency to actual hazard exposure.
- **Upfront evaluation requirements create a foundation for compliance, disclosure, and support prioritization.** Requiring building owners to evaluate and disclose structural deficiencies early in a program creates lead time for the market to respond to new information, structures compliance planning for building owners, and helps the City anticipate demand for and allocate support resources.
- **Mandatory policies require disincentives strong enough to affect owner economics.** Disclosure requirements and reputational risk can spur action among a subset of owners, but meaningful financial penalties are the core mechanism for driving broad compliance. Progressively costly penalty structures that escalate over time can encourage early action, generate ongoing revenue for other policy programs, and communicate that deferral is not a viable long-term strategy.
- **Policy signaling and process improvements help support program buy-in and compliance.** While administrative improvements like expedited permitting save a relatively small amount relative to total project costs, they communicate City commitment and priorities to streamline the implementation process. Seattle's advance messaging around its planned requirements and support programs for unreinforced masonry buildings has given building owners time to plan, reducing the shock of compliance requirements and building goodwill with stakeholders.
- **Repositioning distressed asset classes can enable seismic policy to serve broader housing and economic goals.** Pittsburgh's experience converting vacant office buildings illustrates that offering seismic support resources to high impact conversion or redevelopment projects can address oversupply, generate housing units, and attract additional public financing – generating additional benefits while reducing seismic vulnerability. However, these projects may require a more significant public investment to be feasible, which will compete with other public priorities for resources and limit the number of projects that can be pursued in the near future.
- **Alternate compliance mechanisms can advance broader policy goals but risk becoming a permanent off-ramp.** New York's Local Law 97 illustrates that fee-in-lieu options can provide relief for building owners navigating particularly challenging retrofits and capture funding for support programs which advance other City policy objectives. However, the program's current difficulties around spurring retrofits suggests that if alternative or less strict compliance options are readily available and preferable to actual compliance, they often delay action from buildings and undermine the policy's core intent.
- **Public resources should be used to reinforce desired outcomes, requiring tradeoffs where resources are limited.** Both the New York City Office Conversion Accelerator and Pittsburgh Downtown Conversion Program concentrate their support resources on mid-sized and larger buildings to maximize the impact of their public funding and staff capacity, but at the cost of reaching smaller building owners who may face proportionally higher costs and fewer financing options. In comparison, Seattle's proposed unreinforced masonry program is actively pursuing grant funding for underserved residents and

³⁰ Center for Urban Future, "[New York City's Green Economy Opportunity](#)" (2025)

alternative financing mechanisms for tax-exempt owners to reduce social harm from the proposed compliance requirements. San Francisco will need to calibrate how resources and staff capacity are allocated to ensure public investment aligns with the CBSP's core goals.

4.2 Comparing Existing Seismic Retrofit Programs

Mandatory seismic retrofit programs implemented over the last decade have defined a similar set of timelines, with 1-3 years for initial screening and assessment and up to 25 years for full compliance. Several also include interim deadlines for submitting plans to retrofit or demolish and for acquiring relevant permits to help track compliance and progress. Figure 27 illustrates comparative approaches across the precedent concrete building seismic retrofit mandates studied to inform an approach for San Francisco.

Figure 27: Precedent Concrete Retrofit Program Timelines

Policy	Factors Prioritized	Screening	Interim Deadlines	Compliance Deadline
Los Angeles Concrete Retrofit Program <i>Enacted 2015</i>	- Concrete buildings prior to 1976 Uniform Building Code - Excludes detached single family or duplexes <i>Soft story buildings (retrofit under a separate program) were notified on a rolling basis based on height and number of units</i>	Assessment checklist within 3 years <i>(62% compliance as of 2024)</i>	Proof of prior retrofit or work plan submittal within 10 years <i>(12% compliance as of 2024)</i>	Completion within 25 years <i>(6% compliance as of 2024)</i>
West Hollywood Seismic Retrofit Program (Concrete) <i>Enacted 2017</i>	- Concrete buildings prior to 1976 Uniform Building Code - Height over 2 stories (with exceptions)	Engineering report within 3 years	From initial notice: Phase 1 retrofit plans within 5 years , permit within 7 years Phase 2 retrofit plans within 13 years , permit within 15 years	Phase 1 completion within 10 years , option to extend to 13 years if completing both phase 1 and 2 requirements simultaneously Phase 2 completion within 20 years
Santa Monica Seismic Retrofit Ordinance <i>Enacted 2017</i>	Concrete buildings prior to 1977 Building Code	Evaluation report within 3 years	Work plan submittal within 4.5 years	Completion within 10 years
New Zealand Earthquake-Prone Building (EPB) System <i>Enacted 2016, revisions proposed in 2025</i>	- Height over 3 stories - URM which could fall onto high-traffic area - May impede major road or emergency response route - Geographic seismic hazard zone	Engineering Assessment within 1 year of receiving notice of possible risk; leads to EPB notice	N/A	From receiving EPB notice: Priority buildings: 7.5 years in high seismic zones, 12.5 in medium seismic zones All others: 15 years in high seismic zones, 25 in medium seismic zones

Importantly, **deadlines cannot spur widespread retrofits if the underlying cost of compliance remains infeasible to most property owners.** Based on building demolition and vacancy increases after New Zealand's EPB system and low proactive compliance rates for Los Angeles' mandatory concrete retrofit program, an infeasible requirement can cause significant demolition, leave non-compliant buildings vacant, or lead owners to widely ignore deadlines. These outcomes create other negative impacts for tenants, business owners, and local governments which erode the long-term benefits of a seismic retrofit program. Therefore, deadlines need to be backed by sufficient penalties and enforcement capacity to motivate compliance but must also include policies offering flexibility and support to make more retrofits feasible and minimize negative impacts.

5. Policy Recommendations

Based on the foregoing analysis of the policy landscape, insights from interviews with key stakeholders and policymakers, and survey of comparable markets, there are several opportunities for new policies that can be pursued to drive seismic retrofit implementation and building redevelopment among concrete buildings in San Francisco. These are organized under the following overarching recommendations:

- 1. Create a Phased Mandate Program with Public Disclosure Requirements
- 2. Align Program Design with Broader Policy Priorities
- 3. Use Support Resources to Deliver Priority Outcomes
- 4. Advocate for Larger Changes at the State Level
- 5. Advance Interventions in Parallel as Implementation Progresses

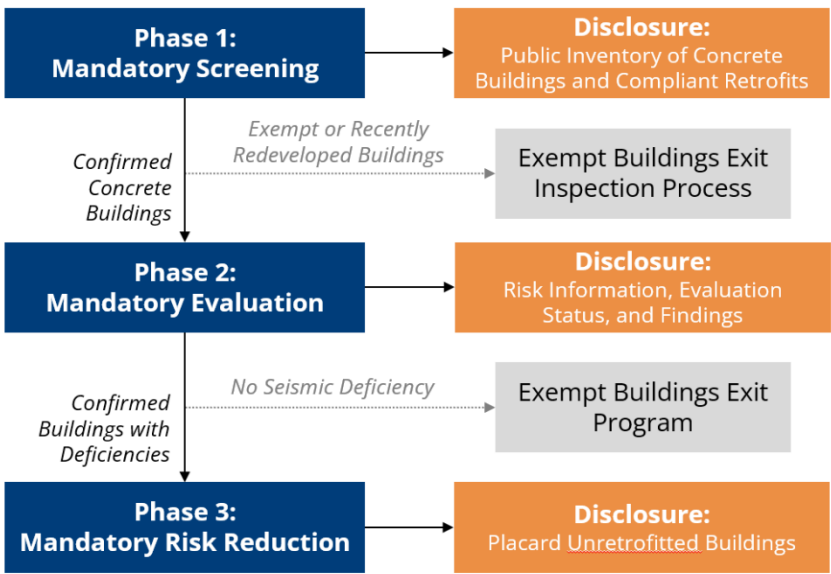
5.1 Create a Phased Mandate Program with Public Disclosure Requirements

Given the financial challenges retrofits face and limited reach of current retrofit triggers, the only viable option for motivating inventory-wide seismic retrofits is a phased mandate. This approach aligns with previous City planning documents such as the Earthquake Safety Implementation Program and CBSP Stakeholder Engagement Report, as well as previous mandatory programs implemented for unreinforced masonry and soft story buildings in San Francisco and its peer cities. A retrofit mandate provides clear requirements and deadlines for mitigating seismic hazards, incentivizing compliance to avoid legal and financial penalties.

A mandate also affects the cost of motivating compliance. Under a mandatory retrofit program where compliance is legally enforced, incentive and support programs can minimize the financial barriers to seismic retrofits by reducing the feasibility gap and enable compliance. However, without a mandate, the public sector would need to heavily subsidize seismic retrofits to make them financially advantageous to spur building owners to retrofit on a voluntarily basis. This approach would require more public funding to deliver the same number of retrofits as a mandate, leading to greater tradeoffs with other public priorities.

A potential three-phase mandatory retrofit program is illustrated in Figure 28. During ongoing concrete building screening (shown as Phase 1), owners of suspected concrete buildings will work with a licensed civil or structural engineer or architect to confirm their building’s structural typology and provide additional information about their use, height, and previous seismic retrofits. In Phase 2, confirmed concrete buildings would be required to conduct a seismic evaluation to confirm seismic risk and applicable retrofit requirements and could have 2-3 years to conduct the evaluation based on precedent programs. Once evaluated, buildings under the scope of the retrofit mandate would enter mandatory risk reduction in Phase 3, which may include interim deadlines for providing hazard mitigation plans or proof of progress, leading to a comply-by date for completing retrofit work.

Figure 28: Conceptual Phased Mandate Program



The CBSP Stakeholder Engagement Report advises that the City create comprehensive communications plans for legislative updates and tenant notification. Expanding upon these recommendations, public disclosures should be required at multiple points throughout the phased program to communicate seismic hazards and allow the real estate market to recognize a value to seismic risk reduction. The following communications strategies can be introduced across a phased mandate program to achieve these outcomes:

- **Phase 1: Mandatory Screening:** Mirroring San Francisco's soft-story retrofit program and Seattle's proposed unreinforced masonry program, the City should publish a public database of confirmed concrete buildings that includes basic building information and a tag indicating whether a building has completed a seismic retrofit meeting SFEBC voluntary standards. This database will provide a useful tool for tracking compliance throughout the program and creates an early opportunity for the market to begin valuing seismic risk. Disclosing retrofit status also increases the incentive to pursue a proactive retrofit by publicly differentiating seismically upgraded buildings from their peers. Providing information on confirmed seismic vulnerabilities prior to a retrofit requirement also allows time for the market to recalibrate, which could introduce a premium for retrofitting that improves feasibility for building owners.
- **Mandatory Evaluation:** For all buildings which proceed into the mandatory evaluation phase, city press releases, disclosure notices, flyers at building entrances, the database of confirmed concrete buildings, and other resources should be used to notify tenants, and occupants, and potential buyers that an evaluation is required and explain what findings may mean for its seismic vulnerability or a future retrofit requirement. Once the evaluation deadline passes, these methods should be used again to provide updates on evaluation results, whether each building evaluated is subject to a retrofit requirement, and timelines. Requiring buildings to post an easy-to-understand indicator of their seismic strength at entrances (such as the U.S. Resiliency Council Building Rating System for Earthquakes or similar) could also help build a broader understanding of seismic risk throughout the city.
- **Mandatory Compliance:** As buildings enter the mandatory compliance period and deadlines approach, vulnerable buildings should be required to display a hazard placard at entrances to further increase visibility. As with preceding phases, using multiple communication methods like a public database can ensure disclosures reach a wider audience and have the greatest potential to affect market behavior.

For any mandatory policy to be effective, it must be supported by sufficient penalties and enforcement capacity. Viable policy options depend on the City's capacity to monitor compliance across the applicable inventory and assign penalties where applicable.

- **As interim permitting and work plan deadlines pass,** the City should consider imposing cautionary penalties such as non-compliance fines issued by the Department of Building Inspections, restrictions on occupancy (ranging from an occupancy cap to a complete ban), and seismic hazard placarding to build pressure on building owners to prioritize completing a retrofit and demonstrate potential consequences for noncompliance.
- **After the comply-by date,** noncompliant building owners might face steep fines, occupancy bans, and/or legal consequences.

Importantly, however, if buildings do not have a feasible path to compliance, a large number of owners may ignore requirements or be forced to vacate, sell, or demolish their properties. To anticipate these challenges, the City should **consider completing an updated feasibility study** prior to the mandatory compliance phase using updated inventory and cost information and determine an enforcement strategy. **Communicating anticipated program design and support policies** in advance of any formal requirements can also help identify and adapt to any challenges stakeholders express.

It will also be vital for the City to **study potential displacement impacts** from seismically retrofitting or redeveloping vulnerable buildings. This will inform whether existing anti-displacement policies will be effective considering the number of projects pursued and the duration of work involved under a mandate. For example, tenants may not exercise their right to return if they are relocated for a long period. Findings from this should be used to define an anti-displacement strategy for the CBSP, which should inform tenant messaging throughout the Mandatory Evaluation and Compliance periods.

5.2 Align Program Design with Broader Policy Priorities

With finite financial resources and staff capacity, the CBSP's approach to allocating support resources will need to balance tradeoffs between different building types and uses to achieve priority outcomes. For example, a vulnerable large, high-occupancy office building downtown may present significant life safety and economic risks to the downtown area, but could require a substantial public investment to make a retrofit feasible. In comparison, that same amount of funding could support seismic retrofits in many more small low-income multifamily buildings to preserve housing, mitigate displacement, and protect disadvantaged residents, though these buildings may not collectively reduce as much risk to life safety or economic activity. To help with this prioritization, this subsection outlines a proposed prioritization framework and outcomes of an unfunded mandate across archetypes to understand where support may be most needed or impactful.

5.2.1 Prioritization Framework

The CBSP's stated goals are to protect life and public safety, preserve housing and critical uses, protect the economy, preserve city vitality and character, and speed earthquake recovery. To help begin prioritizing deployment of limited financial resources and staff capacity around these goals, HR&A and City staff developed six measurable outcomes for the retrofit program which can be assessed using analytical results and information currently available, summarized in Figure 29.

Figure 29: Prioritization Framework Considerations

Outcome	Potential Approach for Retrofit Prioritization
Reduce life safety risk to occupants	• Support buildings with the highest occupancy and risk of injury and fatality
Reduce collateral damage	• Support buildings located along vital corridors, transit service, or infrastructure • Prioritize support to taller buildings which could impact nearby buildings and infrastructure
Prioritize equitable investment	• Inform eligibility for support resources using vulnerability metrics, building affordability, and neighborhood context
Protect housing opportunities	• Prioritize retrofit incentives to residential buildings • Prioritize commercial buildings over residential ones for demolition and redevelopment incentives and outcomes
Maximize the total number of retrofits	• Support the buildings with the greatest feasibility to maximize the number of retrofits completed across the inventory
Minimize fiscal risks to the City and State	• Provide support to buildings with strongest economic value or potential avoided loss of fiscal revenue

5.2.2 Implications of a Mandate

The archetypes used in this study to analyze a subset of the City's preliminary concrete building inventory can provide an initial framework to illustrate how these prioritization criteria apply across different types of buildings and uses.³¹ Figure 30 illustrates that while several archetypes can have a significant benefit across multiple outcomes if they receive support to retrofit, a singular group of buildings will not deliver all desired outcomes. The City will ultimately need to make tradeoffs between the level of support given to different archetypes and the outcomes that achieves.

³¹ The total and color schema used in Figure 30 are illustrative based on the archetype schema, which represents a subset of uses and building types in the concrete building inventory based on data currently available. Results and typology classifications should therefore be reviewed using data collected by the concrete building screening program to inform a final prioritization approach.

Figure 30: Retrofit Impacts by Building Archetype

Legend

	High Benefit from Retrofitting Archetype
	Medium Benefit from Retrofitting Archetype
	Low Benefit from Retrofitting Archetype
	Minimum Benefit from Retrofitting Archetype

Archetype	Reduce Life Safety Risk to Occupants ³²	Reduce Collateral Damage	Prioritize Equitable Investment	Protect Housing Opportunities	Maximize the Total Number of Retrofits	Minimize Fiscal Risks to the City and State ³³
1. Low-Rise Commercial Moment Frame	~\$1,437M	Dispersed Properties	Small Business Tenants	Commercial	177 buildings <i>limited feasibility</i>	~\$4.0M
2. Low-Rise Industrial Moment Frame	~\$242M	High Clustering	Small Business Tenants	Commercial	118 buildings <i>limited feasibility</i>	~\$1.0M
3. Mid-Rise Commercial Shear Wall	~\$4,213M	Adjacent Building Damage	Mid-Size Commercial	Commercial / Mixed-use	122 buildings <i>limited feasibility</i>	~\$10.5M
4. Mid-Rise Residential Shear Wall	~\$4,186M	Adjacent Building Damage	Low/Moderate-Income Tenants	Multifamily	260 buildings <i>narrow feasibility</i>	~\$14.5M
5. Mid-Rise Commercial Moment Frame	~\$21,762M	Adjacent Building Damage	Mid-Size Commercial	Commercial / Mixed-use	320 buildings <i>limited feasibility</i>	~\$65.5M
6. Mid-Rise Residential Moment Frame	~\$4,613M	Adjacent Building Damage	Low/Moderate-Income Tenants	Multifamily	161 buildings <i>narrow feasibility</i>	~\$14.0M
7. High-Rise Commercial Moment Frame	~\$36,128M	Risk of Falling onto Others	Larger Commercial	Commercial	43 buildings <i>no feasibility</i>	~\$101.0M
8. Mid-Rise Residential Moment Frame (Built 1980-1999)	~\$508M	Adjacent Building Damage	Moderate-Income Tenants	Multifamily	17 buildings <i>narrow feasibility</i>	~\$2.5M

Without support resources, a seismic retrofit will not be feasible for most building owners. New Zealand's experience following its initial Earthquake Prone Building system in 2016 illustrated that mandatory retrofit programs can produce a range of unintended outcomes when building owners cannot afford the work required: owners may elect to sell or demolish their buildings, leave structures vacant to comply with occupancy restrictions, or ignore mandates entirely. Based on building attributes in the City's initial concrete building inventory, the following outcomes may occur across common building typologies with an unfunded mandate:

- **Low Rise Commercial and Industrial:** Archetypes 1 and 2 represent smaller buildings under two stories, which often occupy smaller parcels and make up large portions of blocks in industrial areas like SoMa, the Mission District, and Potrero Hill. Without financial support to retrofit, these buildings may experience

³² Monetized value of probabilistic injuries and fatalities over 30 years

³³ Estimated probabilistic fiscal losses from a 225-year return period

high rates of demolition and redevelopment, and developers may create assemblages of multiple small properties to redevelop into higher density typologies. This outcome would accelerate the transformation of post-industrial neighborhoods and reduce the affordable space options available to small commercial and industrial businesses.

- **Mid-Rise Commercial:** Archetypes 3 and 5 represent a range of lower-scale mid-rise buildings of around four stories occupied by office, hotel, and retail uses, generally located near downtown in areas like Union Square, Market Street, and other commercial nodes. Archetype-based financial modeling suggests these buildings have low feasibility for seismic retrofits, meaning a mandate without support could increase vacancy in commercial centers if unretrofitted buildings have their certificate of occupancy revoked after the compliance deadline. Where redevelopment is feasible, a mandate without support could trigger a wave of redevelopment activity, causing short-term disruption to downtown economic activity near the compliance deadline.
- **Mid-Rise Residential (Pre-1980):** Archetypes 4 and 6 reflect low mid-rise residential buildings around four stories, some of which are likely to be affordable to low- or moderate-income households. The current concrete building inventory suggests many of these buildings are clustered in neighborhoods west of Union Square and offset from Van Ness Avenue, though other individual buildings and small clusters are distributed across the city in neighborhoods at various income levels. Preliminary financial modeling suggests some of these buildings may have a narrow path to feasibility using existing support programs, potentially making retrofits feasible but causing short-term displacement during construction. However, many buildings will face a feasibility gap without additional support, leading to higher rates of demolition and redevelopment, significant residential displacement, and accelerated transformation of transitional neighborhoods.
- **Mid-Rise Residential (1980 – 1999):** Archetype 8 captures a small number of concrete residential buildings around four stories which were built between 1980 and 1999, many of which already perform near a Level 1 retrofit level based on seismic modeling. As a result, these buildings may have less to gain from retrofitting; it is assumed that any building owner in this archetype that wishes to retrofit will need to pursue a Level 2 retrofit. Some owners may be able to afford retrofitting without public support, though cost passthroughs and temporary displacement during construction could lead to resident turnover.
- **High-Rise Commercial:** Archetype 7 captures high-rise hotel and office buildings concentrated near the downtown core, using a representative height of 18 stories. Financial modeling suggests most of these properties will face a significant feasibility gap, requiring substantial public support to retrofit. Broker interviews noted that many of these properties already carry upside down loans given shifting market needs (meaning the property's outstanding loan exceeds its current market value), and many owners may opt to sell at a loss or vacate their buildings in response to a retrofit mandate. This could increase downtown vacancy and potentially trigger significant demolition and redevelopment activity over a short timeframe, disrupting downtown activity.

Beyond typology-specific impacts, the City can expect several broader outcomes depending on how the program allocates financial and process support resources and program deadlines:

- Some precedent mandatory programs make noncompliant buildings illegal to occupy, forcing owners to vacate them or sell at a loss. Over time, these noncompliant buildings are demolished and redeveloped to modern code, which addresses the underlying safety challenge but carries significant collateral consequences for building owners and neighborhood vitality.
- Smaller building owners who cannot afford to retrofit can be disproportionately harmed by strict enforcement: for many, their building is their most valuable asset and primary source of income, and being unable to comply would require them to sell it at a loss.

- Areas with clusters of vulnerable buildings may also see increased vacancy leading up to and beyond the compliance deadline, suppressing their area's economic vitality. Redevelopment can also accelerate neighborhood transformation, displacing lower-income residents if replacement housing is not affordable or does not serve the same population. In other cases where there is no market for redevelopment, buildings may remain empty, causing blight and potentially creating greater seismic hazards if they become derelict.
- A mandate without sufficient support also risks widespread noncompliance. If a large share of owners cannot or do not comply, the City faces a difficult choice: enforce penalties strictly, which could damage the local economy and cause economic harm to low-income owners, or offer alternative compliance pathways that generate program revenue or provide relief but leave some seismic vulnerability in place. In all scenarios, owners are likely to delay retrofitting until as close to the compliance deadline as possible to maximize the value they receive from their building and the chances that additional support resources or relief become available. Policy solutions will therefore need to be designed to help distribute retrofits over time with mechanisms like incentives and compliance deadlines to avoid creating shocks to the City's real estate market and economic vitality.

5.2.3 Policy Support Approaches

Deadlines, financial support, and process improvements are the main levers that the City can use in an overarching mandate program to move buildings towards a seismic retrofit or redevelopment project.

- **Deadlines** can be used to influence buildings to retrofit or redevelop sooner, or can provide support for less feasible or seismically hazardous typologies to assemble funding. Deadlines can also help adjust the pace of retrofits or redevelopment to reduce market shocks.
- **Financial support** such as grants, 0% or below-market-rate loans, and development incentives provide direct financial support to improve project feasibility, which can be structured to increase both the number and pace of seismic retrofits. In contrast, not providing financial support or incentives can also influence owners to pursue demolition and redevelopment instead.
- **Process improvements** like technical support and expedited permitting will reduce friction as the program is implemented and can make compliance easier and less expensive. While some improvements will be broadly beneficial across all buildings, dedicated support resources like a technical support or accelerator team may have limited capacity relative to demand and need to be reserved for higher impact projects.

While all concrete buildings would benefit from some form of support to improve their feasibility, given limited financial resources, the level and types of support available can vary based on how the building's scale, use, and context align with City priorities. The City's prioritization framework could take several approaches to segmenting the concrete inventory when allocating support, including but not limited to an assessment of each building's impact on life safety, a weighted cost/benefit analysis of different building types, or selection of key geographies that contain concentrated hazards to life safety or emergency response efforts. To inform this, the City should advance additional feasibility studies, cost estimate analysis, and economic modeling using more precise building information as it becomes available.

Based on potential implications of an unfunded mandate, Figure 31 recommends a preliminary approach to prioritizing City technical support, deadlines, and financial incentives by building size and use, based on policy objectives expressed during interviews with City stakeholders and an understanding that resources to support seismic retrofits may be limited. This proposed allocation of resources is subject to shift if the City's priority outcomes change, new information, or new resources become available as the CBSP evolves.

Figure 31: Preliminary Recommendations for Prioritizing Support Resources

Archetype	Recommendations for Support
Low-Rise Commercial and Industrial	• Consider excluding from a comprehensive seismic retrofit mandate due to lower risk and low occupancy; communicate liability precedents and avoided losses to encourage action. • Provide funding and technical support to culturally significant buildings.
Mid-Rise Commercial	• Offer technical support for redevelopment. • Consider offering a longer compliance period for buildings with social vulnerability and/or lower hazards.
Mid-Rise Residential	• Provide funding and technical support to multifamily buildings. • Incentivize early action to distribute retrofits and associated temporary tenant relocation over time.
Mid-Rise Residential (Built 1980-1999)	• Consider excluding from a comprehensive seismic retrofit mandate or offering a longer compliance period due to the structural systems used in this period often achieving a near BSE-1E collapse prevention seismic performance; require evaluation to confirm seismic performance level.
High-Rise Commercial	• Phase deadline across high-rise inventory to avoid a wave of redevelopment. • Offer commercial to residential conversion tools and explore reducing redevelopment costs through zoning/process changes.

Within this approach, it will also be important to provide additional flexibility and resources to high-need buildings, such as nonprofit-run housing, senior housing, condos, or culturally significant uses. Specific recommendations are not included at this stage due to current information availability on the concrete inventory.

5.3 Use Support Resources to Deliver Priority Outcomes

Recognizing the feasibility gaps identified in subsection [3.3 Policy Gaps and Limitations](#), the retrofit mandate will need accompanying policies that directly improve financial feasibility to deliver the CBSP's desired outcomes.

5.3.1 Grants and Low-Cost Loans

In concurrence with the findings of the CBSP Stakeholder Engagement Report, **funding sources like grants which do not need to be repaid will have the greatest impact on owners with limited financial resources, followed by 0% interest or below market rate loans**. Without these resources, many building owners will be unable to afford retrofitting and be forced to sell or redevelop their properties if the mandate is strictly enforced. Consequently, one of the most important near-term actions the City can take is to begin seeking and advocating for a funding source to deliver a grant or low-cost loan program for seismic retrofits.

In alignment with the goals of the CBSP, **financial support resources should be prioritized to low- to moderate-income residential buildings with lower financial feasibility** to avoid placing disproportionate economic impacts on small building owners and to reduce the risk of residential displacement. When implementing a support program, the City may consider making the amount of (or eligibility for) resources decrease over time to encourage early action and distribute when retrofit projects (and the temporary tenant relocation involved) occur.

Low- and moderate-income residential and mixed-use buildings would also benefit from **renewed funding to the Preservation and Seismic Safety Program (PASS) program**, which previously leveraged \$260.7 million in general obligation bond funding to support the preservation of more than 1,000 residential units, including seismic retrofit projects. PASS funds have been fully subscribed to projects as of 2026, and an additional allocation of general obligation bond funding could provide meaningful funding to advance retrofits for low- to moderate-income housing. Because PASS funds are finite, the program structurally encourages projects to apply earlier to maximize their chances of receiving funding.

5.3.2 Process Incentives

Process incentives which make retrofitting or redeveloping concrete buildings easier will also be impactful. Streamlining improvements that shorten the City's approval processes have a noteworthy impact on project costs for retrofit and redevelopment projects by reducing "carrying costs" (such as insurance, property taxes, mortgage payments, and other expenses) incurred by permit seekers while their projects await approval. Although these cost savings are generally not large enough to shift overall financial feasibility, process incentives can help move projects that are near feasibility towards implementation. Process incentives can also support program implementation by making it easier to track each property's progress and reduce administrative burdens on the City. Several specific improvements could be useful for the CBSP:

- **Dedicated support staff or an "accelerator team" for the CBSP**, as recommended in the CBSP Stakeholder Engagement Report, can help speed up permitting for retrofit projects, reduce logistical inefficiencies when helping a large number of less experienced building owners navigate program and permitting requirements, ensure the City has the staff capacity to keep up with the CBSP's compliance deadlines, and mitigate the program's impact on other City departments' operations.
- **For buildings pursuing redevelopment, a "cookie cutter" approval pathway may be useful in certain neighborhoods** to enable certain projects which meet city-approved form, scale, and use requirements to bypass certain approval steps and reduce their timeline to construction. A similar approach was used in areas of Los Angeles recovering from the 2025 Palisades wildfire, offering pre-approved home designs to homeowners seeking to rebuild.

The City should market its existing resources for redevelopment to make redevelopment more feasible in different contexts. Under the Downtown Adaptive Reuse program, redevelopment and conversion projects may be eligible for modified or waived planning code requirements and various financial incentives. Conversion or redevelopment opportunities may be particularly compelling for high-rise office buildings in the inventory that face a difficult financial path towards achieving compliance, as discussed in [3.2. Financial Modeling Findings](#). The Downtown Adaptive Reuse Program already provides support for redevelopment; and proactively marketing the program to eligible commercial properties downtown, along Market Street, and on the City's northeastern waterfront could increase the uptake of redevelopment as pathway to mitigating seismic risk.

The City should consider **revisions to Prop M** (1986) – the City's limit on the amount of office space which can be built each year – as a process incentive to provide more flexibility for office redevelopment or conversion projects. For example, office buildings could be permitted to demolish and rebuild additional office square footage without altering or needing to reapply for their Prop M office space allocations, and could potentially have an increased allocation up to a capped limit (e.g. 10-15%).

Providing exemptions to fees and process requirements can also help to lower financial barriers to seismic retrofit or redevelopment projects:

- The city could **waive certain requirements or impact fees** for redeveloping vulnerable concrete buildings or office to residential conversions, providing a modest improvement to their financial feasibility. Importantly, exemptions should ensure that buildings remain subject to CEQA.
- The City could also explore a **real estate transfer tax waiver for concrete buildings that complete a seismic retrofit**. San Francisco already provides a one-time transfer tax waiver for up to five million square feet of space converted to residential use via retrofit or redevelopment, which is available to some concrete buildings. To make this policy more impactful, the City could expand eligibility for a waiver to vulnerable concrete buildings that complete a seismic retrofit and increase their maximum exemption to up to 100% of eligible retrofit costs. Because real estate transfer taxes are typically paid by the current building owner, this would encourage owners to retrofit their buildings before selling them.
- Importantly, any incentives or waivers should be weighed against their fiscal impacts on the City to ensure that they do not have an undue impact on the City's resources used to provide other services.

5.4 Advocate for Larger Changes at the State Level

Seismic vulnerability is a statewide issue in California, and other cities like Los Angeles, Santa Monica, and West Hollywood are facing similar feasibility issues as San Francisco as they seek to retrofit their seismically vulnerable concrete buildings. Working with peer cities to pursue solutions at the State level can help San Francisco access greater resources and create new mechanisms to help make retrofitting and redeveloping the concrete inventory more feasible. Because State policy changes may require several years to fund, approve, and implement, the following should be pursued in parallel with local policy recommendations:

- **Transfer Prop 13 Property Value for Select Redevelopment Projects:** California Revenue and Taxation Code Section 74.5 provides an exemption from property value reassessment for seismic retrofit work, which reduces property owners' retrofit resistance to retrofitting to avoid an assessable event. However, a similar incentive is not available for property owners who cannot justify retrofitting and need to pursue redevelopment instead. The City can advocate to create a provision which temporarily transfers a property's current Prop 13 tax basis to a new structure if it is demolished and rebuilt to similar standards to address seismic deficiencies, gradually phasing in the new building's assessed value over several years to make redevelopment a more viable pathway.
- **Create Capacity for Capturing State Tax Increment:** California law enables Enhanced Infrastructure Financing Districts (EIFD) to capture incremental property tax value increases over a set base year value to support eligible projects. To capture additional value from parcels within downtown, the City could pursue State legislation to allow EIFDs or the existing Downtown Revitalization Financing District to capture additional revenues such as sales tax, hotels tax, gross receipts tax, parking tax, and utility user's tax. This would capture significant additional revenue to fund retrofit or redevelopment support programs, though it would slow the growth of the City's general fund by repurposing incremental tax revenue.
- **State Loan Program:** Recognizing the statewide challenges facing concrete building retrofits, a State level loan program that can provide below-market rate financing could have broad support and expand options in San Francisco. This may involve expanding eligibility for existing state infrastructure loan programs or creating new programs to include seismic retrofits or the redevelopment of infeasible buildings. The State could also partner with private lenders to provide lower interest loans to buildings proactively addressing their seismic risk.
- **Recognize Seismic Risk in Lending:** A vulnerable building may not be able to service its loans for several years and may need to borrow more if it is severely damaged during an earthquake, yet private lenders do not currently account for building-specific seismic risk when underwriting loans. The State could work with private lenders to establish best practices that internalize this risk, creating additional financial incentives for owners to retrofit. This could take two forms. Lenders could incorporate seismic risk into long-term loan underwriting, offering less favorable terms to unretrofitted buildings. Alternatively, lenders could require seismic insurance for unretrofitted concrete buildings, making the ongoing cost of insurance a direct disincentive for owners.
- **Build Public Redevelopment Capacity:** After California's redevelopment agencies were dissolved in 2012, city governments have lacked a similar mechanism to build housing and infrastructure or position development opportunities for private partners. Because redevelopment may be the only feasible pathway for some seismically vulnerable concrete buildings under a retrofit mandate, re-establishing an entity with similar capacities could be advantageous for advancing the CBSP. For example, the City could manage buyouts over a block with several adjacent vulnerable concrete buildings, demolishing the properties and combining parcels to form an opportunity site while retaining control to require higher levels of mixed-income housing or other community benefits. This approach pairs seismic hazard mitigation with economic development, possibly making additional funding available and advancing other City priorities. To build this capacity, the City might consider advocating for a revised statute reintroducing a similar capacity. As a less scalable or effective alternative, the City could establish additional EIFDs in areas with large numbers of vulnerable concrete buildings to finance redevelopment and infrastructure projects, but may need to expand EIFD authorization to do so.

5.5 Advance Interventions in Parallel as Implementation Progresses

An effective mandate program will take multiple years to develop, requiring additional information gathering, State and local policy approvals, and expanded capacity to support and oversee compliance. While several items are contingent on information gathered or procedural steps under the CBSP, many items can be pursued immediately and in parallel to accelerate program development. Developing program elements and supportive studies early also positions the City to have the resources to accelerate retrofit projects if a significant earthquake occurs and makes seismic mitigation a higher public priority. Potential actions can be considered and undertaken under the following time scales and are illustrated in Figure 32:

- **Near-term:** Today – mandate announcement and launch (2026 – 2030)
- **Medium-term:** Mandate announcement – mandatory evaluation deadline (2030 –2032)
- **Long-term:** Mandatory evaluation deadline – compliance deadline (2032 – 2055)

Figure 32: Implementation Roadmap

Category	Recommended Action
Near-Term	
Disclosures	1. Establish a requirement to disclose data collected by concrete building screening, including basic building information, structure type (such as NDC, RWFD, or non-concrete), and if a past retrofit was completed in line with concrete seismic retrofit standards in the SFEBC. 2. Create separate communications strategies for building owners and tenants, detailing comprehensive approaches for explaining seismic risk and the benefits of retrofitting, potential retrofit impacts, evaluation requirements and results, and seismic retrofit requirements across all stages of the mandate program. As recommended by the CBSP Stakeholder Engagement Report, the communications strategy for tenants should include an approach for notifying occupants of requirements, upcoming construction, timelines, and tenant resources in advance of any construction work. 3. Develop a framework for disseminating findings from concrete building screening through press releases, outreach, and other media to maximize awareness. 4. Develop materials for informational outreach, communicating evaluation requirements, and publicizing findings throughout the Mandatory Evaluation phase. 5. Once concrete building screening is completed, create and launch a public database of confirmed concrete buildings on the DataSF open data page that includes information outlined in the disclosure requirement. This should include a framework for regularly updating the database to incorporate information provided by owners as the CBSP progresses. 6. Communicate details of intended requirements, policy solutions, and timelines before they are implemented, as well as the support resources being pursued.
Prioritization	1. Coordinate City decisionmakers to define intended City support resources and prioritization framework. 2. Confirm compliance deadlines for a mandate and define a support strategy using the chosen support prioritization framework, incorporating findings from feasibility analyses and screening program results. Engage City legal counsel to assess potential implications of any proposed programs to mitigate future legal challenges.
Local Support Resources	1. Commission a study to develop more accurate cost estimates for seismic retrofits by concrete building typology and BSE performance level. 2. Conduct detailed financial modeling of mandate implications with cost estimates to inform feasibility and development of new local policy tools and support State-level advocacy efforts. This should include deeper analysis of the residential concrete inventory exploring tenure, affordability, displacement risk, and social vulnerability to better understand potential impacts on tenants and the broader housing inventory if properties cannot afford mandatory retrofits.

	Assess and create technical assistance, process supports, and redevelopment resources to be launched prior to or in tandem with a mandate. Specifically, coordinate with OEWD and San Francisco Downtown Development Corporation on supports for buildings within downtown. Identify a funding source for and design a grant or low cost loan program, which should be launched in tandem with a mandate. Advance general process incentives for general permitting, seismic retrofits, and redevelopment projects. Create an accelerator team of dedicated staff to support seismic retrofit and redevelopment projects through permitting and approvals. - Draft and introduce a ballot measure to modify Prop M to further support office conversion and redevelopment projects. - Enable a real estate transfer tax waiver for concrete buildings that complete seismic retrofits.
State Policy Changes	Coordinate with other cities pursuing concrete building retrofits to align on useful State-level actions, policy changes, and support programs, including those outlined in 5.4 Advocate for Larger Changes at the State Level. Once confirmed, develop a strategy to advocate for these changes.
Medium-Term	
Mandate	Enact mandatory evaluation and retrofit requirements
Disclosures	Notify owners and tenants of evaluation requirements and timelines. After the mandatory evaluation deadline, notify tenants of evaluation results and mandate requirements as applicable.
Prioritization	Refine a penalty and/or enforcement strategy informed by precedent seismic retrofit programs to ensure there are sufficient enforcement resources and disincentives to ensure compliance with a seismic retrofit mandate.
Local Support Resources	Consider pre-approving “cookie-cutter” standard redevelopment projects in certain neighborhoods to facilitate streamlined permitting.
State Policy Changes	Introduce legislation for recommended State policy interventions, such as enabling a Prop 13 property value transfer mechanism, expanding funds captured via EIFDs, establishing or expanding eligibility for State loan programs, and advocating for statute reimplementing redevelopment agencies.
Long-Term	
Disclosures	Require seismic hazard placarding for vulnerable buildings as compliance deadline(s) approach.
State Policy Changes	Explore approaches with private lenders to acknowledge seismic risk in loan underwriting.

Appendix A: Glossary and Assumptions

Real Estate Terminology

Capital Maintenance: buildings routinely need significant repairs every 20 to 40 years over their lifecycle, assumed as 30 years for modeling purposes. This work commonly includes replacing the roof and HVAC systems, modest mechanical, electrical, and plumbing (MEP) work, and is often accompanied by more disruptive tenant improvements like larger unit repairs or upgraded finishes to increase achievable rents.

Expected Value: The adjusted value of an asset or investment accounting for future variability or uncertainty. The expected value is calculated by multiplying the value of future outcomes by the probability of that outcome occurring. For example, if a building valued at \$500,000 has a 20% chance of losing \$100,000, the building's expected value is calculated as $\$500,000 + (-\$100,000 * 0.2) = \$480,000$.

Hold Period: The length of time an investor intends to own a building from purchase to sale.

Loan to Value (LTV): a measure used for examining a building's debts, calculated by dividing a property's outstanding loan amount by its appraised value. LTV is often used by lenders to assess risk when underwriting loans.

Net Operating Income (NOI): the profit a building produces in a given period of time, calculated by subtracting expenses such as utilities and maintenance costs from revenues like rent and parking fees.

Net Present Value (NPV): A measure of the financial return of an investment over a given period. NPV is calculated by applying an interest rate to future cash inflows and outflows associated with the investment to determine its equivalent value in the present day. The net present value is calculated as $NPV = \sum \frac{cash\ flow_t}{(1 + discount\ rate)^t}$, where t is the years the net present value is calculated over.

Owner Equity: Money contributed upfront from property owners' personal savings or reserve funds to help pay for a building investment. An owner equity contribution is typically required to receive financing support from a private lender.

Trigger Event: A trigger event refers to a policy requirement or financing event which requires a building owner to consider making a major capital investment in their property. These events can be convenient or financially advantageous opportunities for owners to make other investments like improved finishes, energy efficiency upgrades, or seismic retrofits, and are therefore useful to consider when designing building retrofit policies.

Analytical Assumptions

Building Heights: Definitions of high, medium, and low-rise buildings can vary. For the purposes of this study, the following definitions were used:

- **Low-Rise:** 1 to 2 story buildings, represented in modeling by a 2-story building.
- **Mid-Rise:** medium density buildings between 3 and 12 stories, represented in modeling by a 4-story building.
- **High-Rise:** taller buildings across the inventory over 13 stories, represented in modeling by an 18-story building.

Archetypes: Eight representative groups of building typologies and uses developed for section 1 of this report to facilitate seismic modeling and benefit calculations. The archetypes represent a subset of the preliminary concrete building inventory. General archetype definitions are included in the table below.

Archetype Name	Number of Stories	Structural System	Uses Included	Buildings with complete data	Extrapolated Buildings
Archetype 1: Low-Rise Commercial Moment Frame	2	Moment Frame	- Office - Retail	50	177
Archetype 2: Low-Rise Industrial Moment Frame	2	Moment Frame	Office	42	118
Archetype 3: Mid-Rise Commercial Shear Wall	4	Shear Wall	- Office - Retail - Hotel	36	122
Archetype 4: Mid-Rise Residential Shear Wall	4	Shear Wall	Residential	87	260
Archetype 5: Mid-Rise Commercial Moment Frame	4	Moment Frame	- Office - Retail - Hotel	82	320
Archetype 6: Mid-Rise Residential Moment Frame	4	Moment Frame	Residential	54	161
Archetype 7: High-Rise Commercial Moment Frame	18	Moment Frame	- Office - Hotel	5	43
Archetype 8: Mid-Rise Residential Moment Frame, Built 1980-1999	4	Moment Frame	Residential	4	17
Total	N/A	N/A	N/A	360	1,220

Tools Analyzed in Financial Modeling:

Tool	Description	Limitations
Tenant Cost Passthrough	Property owners can pass up to 100% of mandatory seismic improvements on to tenants. <i>100% passthrough only available to concrete buildings in the event of a mandate, otherwise capped at 50%.</i>	- Passing through all of the costs of seismic retrofits would bring an average building's rent to significantly above-market. - When assuming that tenants will move out rather than accept significantly above-market rents on their units, the impact of passthroughs is small.
PASS Funding	Long-term, low-interest loans for preserving and retrofitting low- and middle-income properties. Eligible to apartments renting at an average of 80% AMI or below.	- Impact of PASS funds are highly contingent on property affordability. Properties at 80% AMI can potentially accommodate retrofits; 60% AMI cannot. <i>Largely subscribed as of 2026, limiting financing availability.</i>
C-PACE	Financing of seismic or sustainability capital improvements with a voluntary property tax assessment.	- Size of loan is still bound by property cash flow and overall value; cannot be stretched based on retrofit costs. - PACE loans have been shown to have vulnerability to bad actors; modeling for this exercise assumes good-faith actors executing loans.
Mills Act	Properties can be re-valued using the income approach instead of their purchase price, typically reducing property taxes by about 40-60%.	Only available to listed historic properties.

Appendix B: Existing Policies

Market Enablement Tools

Market enablement tools increase information availability and transparency to inform local policies and stakeholder decision making, allowing seismic vulnerability to have a greater role in shaping outcomes for the concrete building inventory.

San Francisco Tall Buildings Study and Database: In 2019, the San Francisco Office of Resilience and Capital Planning published a study examining the seismic hazards in buildings over 240 feet tall (approximately 20 or more stories) and their implications for post-earthquake recovery. The study compiled a complete inventory of these buildings and select buildings over 160 feet, including information on structural and architectural attributes, use, safety features, prior retrofits, and ground or bedrock conditions. This inventory is publicly accessible on the [DataSF](#) open data portal and is used to inform disaster and recovery planning.

Concrete Building Screening: San Francisco [Ordinance 250211](#), passed in 2025, introduced a screening program to catalog a detailed inventory of seismically vulnerable Rigid-Wall-Flexible-Diaphragm (RWFD) and concrete buildings. The Department of Building Inspection (DBI) screening form is designed to collect information on each building's structure and design, prior seismic retrofits, number of stories, and occupant uses, as well as supporting documentation. Owners of suspected RWFD or concrete buildings received notices in 2025 to complete the screening form and have until June 9, 2027 to submit information. This information will allow the City to better understand seismic vulnerabilities across the inventory and tailor future support programs to key needs.

Concrete Building Seismic Retrofit Standards: [Ordinance 250211](#) also added [Appendix A Chapter 6](#) and [Administrative Bulletin 113](#) to the City's Building Code, providing guidelines for concrete building retrofits. Concrete building owners who elect to pursue a voluntary seismic retrofit or trigger one as part of another project (as detailed under **Mandates and Requirements**) are provided two options for compliance: Option A requires buildings to meet an ASCE 41 structural collapse prevention performance standard under a BSE-1E hazard level event and address any key seismic deficiencies, while Option B requires buildings to meet an ASCE 41 structural collapse prevention performance standard under a BSE-2E hazard level event (a more significant level of ground shaking). In addition to these requirements, buildings must also secure any unreinforced masonry. Buildings which meet these guidelines will be exempt from future local mandatory seismic retrofit requirements until May 9, 2045, giving building owners who invest in a retrofit a clear path for compliance and confidence that they will not face additional requirements in the near-term.

U.S. Resiliency Council Building Rating System for Earthquakes: Akin to Energy Star energy efficiency ratings, the U.S. Resiliency Council has developed a standard performance rating and certification system for buildings to communicate their seismic safety. Buildings receive 3 ratings for safety (loss of life, injury, and egress), damage (estimated cost to repair the structure), and recovery (estimated downtime until the building can be occupied and used) ranging from one to five stars, with an accompanying rating and certification threshold. This information can then be used to help market the building to buyers or tenants or advocate for better lending or insurance terms.

Mandates and Requirements

Mandates and requirements require specific actions such as disclosing information or retrofitting a building, providing an overarching structure for support programs, incentives, and penalties to build from.

California State Seismic Inventory Requirement (AB 2681): Enacted in 2018, Assembly Bill 2681 requires cities and counties within seismic zone 4 (encompassing most of coastal California, including San Francisco) to identify, inventory, and establish a program to mitigate buildings which pose a potential seismic hazard. The law defines potentially vulnerable buildings as URM, nonductile concrete, or soft story buildings approved before the 1976 uniform building code, or steel moment frame buildings, concrete or masonry buildings with flexible diaphragms, or certain other concrete buildings approved under the 1995 or earlier California Building Code. The local program requirement is contingent upon the California Office of Emergency Services (OES) identifying a funding source for these programs. San Francisco's 1992 URM and 2013 soft story retrofit programs have already accomplished several of these required actions, and the CBSP is positioned to address many of the remaining requirements.

Natural Hazards Disclosure Act (CA Civil Code § 1103.2): Enacted in 1998, this State law requires property owners to provide a Natural Hazards Disclosure (NHD) report to their prospective buyers. These reports are formatted as a checklist which identifies if a property is in a geography designated as a seismic hazard zone, earthquake fault zone, special flood hazard area, dam failure inundation area, high fire severity area, or wildland fire hazard area, allowing buyers to make informed decisions about their geographic hazard exposure.

Commercial Property Owner's Guide to Earthquake Safety and Homeowner's Guide to Earthquake Safety: California law requires that property owners provide a copy of the relevant version of these guide documents to their purchaser before a property transaction is finalized for commercial buildings with certain structural characteristics built before 1975 or 1-4 unit homes built before 1960. These guides are prepared by the California Seismic Safety Commission and provide important information for understanding and mitigating seismic risk, outline required retrofit actions, and include a mandatory disclosure report checklist for documenting common seismic deficiencies and any mitigation actions completed.

Seismic Retrofit Triggers for Existing Buildings: The SFEBC currently outlines several conditions which trigger a seismic retrofit in existing buildings. Under [§ 502](#) (additions) and [§ 503](#) (alterations), projects which significantly alter a building such as horizontal additions, major structural alterations, or extensive changes to major building elements can require the entire building to complete a seismic retrofit. A change in occupancy or use ([§ 506](#)) which increases occupant load by more than 100 persons constituting a 10% increase over a building's original permitted use also triggers a full-building retrofit. Lastly, buildings which suffer seismic damage above a certain evaluated threshold are required to retrofit as part of their repairs under [§ 405](#), with further interpretative guidance for concrete buildings provided in [Administrative Bulletin 099](#).

Penalties

Penalties help to spur desired actions by creating financial, legal, or other disincentives for not complying.

SF Noncompliance Fines: The San Francisco DBI imposes daily fines for code violations and charges additional fees to reimburse the City for any costs and inspection fees it incurs while compelling a building owner to achieve compliance. Fines vary by the type of violation and can exceed several thousand dollars per day per violation. Noncompliance fines have been used to help enforce the Mandatory Soft Story retrofit program as a penalty for noncompliant buildings.

SF Seismic Risk Placarding: Under the City's 2013 Mandatory Soft Story Retrofit Program, buildings in violation of the program's requirements are required to display a placard notifying the public of the building's risk. This may affect buildings' ability to attract tenants or their achievable rent, affecting owner

economics. Placards remain until the building has reached compliance and carry fines and legal penalties if they are not displayed.

SF Certificate of Occupancy Revocation (San Francisco Building Code §109A): Buildings cannot be legally inhabited or used without a Certificate of Occupancy, which can be revoked for buildings which are not code compliant. This removes most of a building's ability to generate revenue, and building owners which continue to lease non-compliant buildings are liable for civil and legal penalties.

Planning and Coordination Tools

The City of San Francisco has assembled groups of experts and developed guidance documents as resources to inform its ongoing policy design and implementation efforts. These mechanisms provide expert insight and a clear, long-term vision for improving the city's seismic resilience.

SF Earthquake Safety Implementation Program (ESIP): San Francisco's 2011 ESIP provides a workplan for enacting recommendations from the Community Action Plan for Seismic Safety (CAPSS) study of the City's seismic risk and vulnerabilities conducted between 1998 and 2010. The ESIP has helped phase and structure the City's other seismic safety initiatives such as the 2013 Mandatory Soft-Story Retrofit Program, 2019 Tall Buildings Study, and ongoing Concrete Building Safety Program.

SF Concrete Building Safety Program (CBSP) and Working Group: The CBSP is an initiative developing policies to identify and strengthen vulnerable concrete buildings across the City, prioritizing buildings built before 2000 and particularly before 1980 due to the less stringent structural code requirements prior to those years. The CBSP convened a stakeholder working group and conducted interviews between 2022 and 2023 to understand stakeholder priorities and challenges for seismically retrofitting concrete buildings. A [Stakeholder Engagement Report](#) summarizing findings from these meetings is published on the CBSP website.

San Francisco Tall Buildings Safety Strategy: As an output of the 2019 Tall Buildings Study, the City published a targeted strategy for managing seismic risk in tall buildings, which present disproportionate hazard due to their height, occupancy, and concentration in high-density areas. The report includes recommendations for proactively reducing risk in new and existing buildings, actions for reducing risk after earthquakes, and information and planning efforts to support the City's understanding of its tall buildings.

Incentives

Incentives lower financial and administrative barriers to make it more feasible for property owners to address their buildings' seismic vulnerabilities.

CA Mills Act: California's 1972 Mills Act provides a structure for cities to enter contracts with owners of officially designated historic properties to rehabilitate and maintain these buildings. In exchange, the property taxes for these buildings are recalculated using an income approach rather than their market value, which typically leads to a 40% to 60% reduction in annual property taxes. As older concrete buildings may be eligible for historic status, this can be a valuable tool for supporting their retrofit needs.

Federal Historic Rehabilitation Tax Credit: The IRS provides a 20% income tax credit to offset qualifying expenses for rehabilitating historic buildings. To be eligible, buildings must have an income-producing use and be listed either individually or as a contributor to a historic district in the National Register of Historic Places.

CA Seismic Improvement Property Tax Exclusion (CA Revenue and Taxation Code § 74.5): Under California law, seismic retrofitting improvements do not trigger a property reassessment that other significant renovation projects might. Without this exemption, building owners would be more reticent to undertake a retrofit, as a building-wide reassessment could result in increased annual property taxes

would disincentivize seismic retrofits, regardless of whether increased assessed value was driven by the retrofit itself.

SF Seismic and Solar Transfer Tax Exemption (SF Business and Tax Regulations Code §1105): San Francisco provides an exemption for up to one third of any imposed transfer tax if the owner has made seismic retrofitting improvements or installed an active solar system. The eligible amount of transfer tax exempted cannot exceed the transferor's cost of making these improvements.

SF Transfer Tax Exemption for Conversion to Residential Use (SF Business and Tax Regulations Code §1108.7): San Francisco voters approved Proposition C in 2024, providing a one-time transfer tax waiver for up to five million square feet of nonresidential space converted to residential use through building alterations or redevelopment. The exemption is available for conversion projects which receive final approval between 2024 and 2030.

SF Downtown Adaptive Reuse Program: Created in 2023, this City program provides density bonuses and waives or modifies various site requirements and administrative processes for office to residential conversion projects, including demolition and redevelopment of office buildings as housing. These projects may also receive support from the Downtown Revitalization and Economic Recovery Financing District, created in 2025, which reinvests increased property tax revenues from residential conversions to help offset conversion costs. Office to residential projects trigger seismic retrofit requirements, making them a useful tool for mitigating vulnerable concrete office buildings.

SF Tenant Cost Passthrough: San Francisco allows property owners to pass 100% of any seismic retrofit capital improvement costs required by law on to multifamily tenants through rent increases, capped annually at the greater of \$30 or 10% of a tenant's base rent. Mixed-use buildings with multifamily units are also eligible, provided they distribute a portion of the capital cost to their commercial tenants.

SF Preservation and Seismic Safety (PASS): The PASS program was created through a 2016 general obligation bond providing new and reallocated funding to provide long-term, low-interest loans to preserve affordable housing, acquire and rehabilitate at-risk properties to create affordable housing, and fund seismic retrofits in low- and moderate-income multifamily buildings. *While existing funding has been almost completely utilized, additional funding to the program could help support seismic retrofits in eligible concrete buildings.*

California Property Assessed Clean Energy (C-PACE) (Streets & Highway Code §5898.12, et seq.): California statute enables residential and commercial property owners to finance energy efficiency and seismic safety improvements through a long-term, fixed-cost loan repaid through a voluntary assessment on the building's property taxes. These terms often offer lower interest rates and longer loan terms than those available through private lenders, conveying a long-term cost saving. However, C-PACE financing is still constrained by what a building's cash flow can repay, as well as a building's senior lender consenting to C-PACE terms. The program has also received scrutiny over the last decade for its vulnerability to predatory lending practices.

Appendix C: Case Studies

Ongoing Mandatory Concrete Retrofit Programs in California

Several cities in California have implemented non-ductile and RWFD concrete building retrofit mandates over the last decade, offering insight into approaches for phasing and achieving compliance. The programs highlighted below feature noteworthy or unique elements and are not intended to represent an exhaustive list of existing concrete retrofit ordinances.

1. **Los Angeles Concrete Retrofit Program (2015):** Los Angeles addressed both soft story and non-ductile buildings within the same ordinance, providing concrete buildings a significantly longer timeline for compliance. Buildings were notified in phases from 2016 to 2017 and were given 3 years to complete a checklist verifying their non-ductile concrete status, 10 years to submit proof of a prior retrofit or provide plans for retrofit or demolition, and 25 years to complete any planned work. The ordinance charges building owners with a misdemeanor if they continue to rent or allow people to occupy non-compliant buildings after the specified compliance period. To offset the costs of retrofits, the City allows for a 50% tenant cost pass-through with a maximum rent increase of \$38 per month. However, compliance rates have still struggled: as of 2024, just 62% of buildings had met the 3-year checklist deadline, 12% had met the upcoming plan submittal deadline, and only 6% had achieved compliance.
2. **West Hollywood Seismic Retrofit Program (2017):** West Hollywood enacted separate ordinances for soft story buildings and concrete or pre-Northridge steel buildings, with notices sent to building owners in 2019. The concrete and steel program takes a two-stage compliance approach with numerous interim deadlines for submitting plans and permits to structure each building's progress. Buildings were required to submit an engineering report and documentation of all deficiencies within 3 years of receiving notice, after which they were given 5 years to submit plans, 7 years to acquire permits, and 10 years to complete a retrofit of key deficiencies, and 20 years to complete a retrofit of all deficiencies. Notably, building owners could also submit intention to complete all retrofits simultaneously within 13-year period. Concrete and steel building owners are eligible for grants of up to \$5,000 for design and \$20,000 for construction, capped at 75% of incurred costs.
3. **Santa Monica Seismic Retrofit Ordinance (2017):** Whereas many municipalities have addressed vulnerable building typologies through separate ordinances, Santa Monica elected to regulate all typologies under a single ordinance with varying compliance deadlines. The City collected and published a database of approximately 2,000 vulnerable buildings, almost 85% of which are soft story. Approximately 30 buildings are concrete tilt-up and 70 are non-ductile concrete, which limited the number of more complicated and expensive retrofits the City would need to oversee. Compliance deadlines vary by typology and cost, with work completion deadlines ranging from 3 years for concrete tilt-up buildings to 10 years for non-ductile concrete buildings. The longest deadline provided was 20 years for older steel moment frame buildings.

Program Structural Lessons

- Concrete buildings have conventionally been given at least 10 years from receiving notice to achieve compliance, though most programs acknowledge that a longer period of up to 25 years may be required.

Key Takeaways

- Requiring upfront evaluation of deficiencies helps building owners confirm what hazards they need to mitigate and provide information that can be used to offer different pathways for compliance.
- Over longer compliance periods, interim deadlines can help ensure progress and create opportunities to phase in penalties.
- Mechanisms like tenant cost passthroughs have been insufficient on their own considering the high costs involved in concrete retrofits.

New Zealand Earthquake-Prone Building System

The Canterbury earthquake sequence from 2010 to 2011 caused widespread damage throughout New Zealand over the span of four major seismic events and thousands of smaller earthquakes, revealing or creating new seismic vulnerabilities throughout the nation's building stock. Some of the most notable damage occurred during the 2011 Christchurch Earthquake, where the city's high proportion of unreinforced masonry and multi-story concrete significantly contributed to life safety impacts and complicated recovery efforts. In total, the total economic losses of the Canterbury earthquake sequence exceeded NZ\$40 billion (approximately \$24 billion USD as of March 2026).

In response to these quakes, the New Zealand government created the [Earthquake-Prone Building \(EPB\) system](#) in 2016 for managing buildings identified as having seismic deficiencies. The 2016 law leveraged the preexisting definition for EPBs, labeling buildings as deficient if a professional engineering assessment identifies them to have less than one third (calculated 34%) of the required code strength for new construction in an area.³⁴ EPBs were given placards based their performance relative to code strength, which must be displayed at all main entrances. The EPB system initially identified more than 8,000 EPBs, causing approximately 1,500 buildings to be strengthened or destroyed by September 2025. However, the remaining EPBs would have been a more significant challenge to retrofit due to the high financial burden of achieving compliance, particularly in comparison to the actual risk many of these buildings face considering their regional seismic risk, structural system, and local population density. Additional barriers to compliance included complications navigating historic heritage status, limited capacity among New Zealand's territorial authorities to oversee compliance and enforcement, and costly fire safety and accessibility modifications required alongside mandated retrofits. Many owners found that it was not financially feasible to retrofit their buildings, which led to a notable increase in building vacancies that caused economic harm to small building owners, removed cultural and economic resources from many communities, and created concerns that empty buildings might become dilapidated and pose a greater risk during a future earthquake.

Incorporating this feedback, New Zealand began [refocusing the EPB system](#) in 2025 to prioritize buildings with the highest actual risk. The revisions propose removing buildings in geographies with low seismic risk from the labeling system, reducing the total number of EPBs. Recommendations also include replacing the structural performance requirements with construction typology, focusing the EPB label to only concrete buildings with three or more stories or unreinforced masonry buildings of any height. More specific retrofit requirements were also defined for these typologies based on height, deficiencies, and local population density to align requirements with the building's actual risk. The readjusted program requirements are expected to save public and private building owners more than NZ\$8.2 billion (about \$4.9 billion USD) in retrofit costs.³⁵

The revised program sets compliance deadlines based on a building's seismic hazard zone and priority building type. Priority buildings are defined as 1) unreinforced masonry structures which could fall onto major pedestrian or vehicle routes or 2) any EPB which could impede emergency services routes if it were to collapse. Within high-risk zones, priority buildings must comply within 7.5 years and all others within 15 years; in medium-risk zones, priority buildings have 12.5 years to comply and all others have 25 years. These deadlines and other requirements are designed to be enforced through strict fines issued by territorial authorities. The territorial authorities can initially issue a NZ\$1,000 infringement fee (about \$590 USD). If convicted of a violation, building owners may be fined up to NZ\$50,000 (\$29,600 USD) for failing to display placarding, NZ\$300,000 or NZ\$1.5 million (\$177,800 USD to \$889,000 USD) for failure to complete retrofits within the given timeline, and NZ\$200,000 plus NZ\$20,000 per day (\$118,000 USD plus \$12,000 daily) for allowing occupancy of structures which have entry restrictions.³⁶

³⁴ The Earthquake Prone Building designation utilizes a standard originally introduced by Building Act 2004, predating the Canterbury earthquake sequence. EPB assessment is based on the building's current state, factoring in any structural damage.

³⁵ Chris Penk, Cabinet Paper: "[Focusing the earthquake-prone building system](#)" (2025)

³⁶ [Compliance and enforcement of the earthquake-prone building system](#), Building Performance

The initial EPB system was accompanied by some limited support programs. A pilot program was created in 2020 providing free case management, legal, mediation, and wellbeing support to 10 residential EPB owners, which has since been discontinued. The government also offered a Residential Earthquake-prone Building Financial Assistance loan program for up to NZ\$250,000. Both programs were retired in 2024, preceding the reevaluation of the EPB system.

Program Structural Lessons:

- The priority building designation is based on risk to occupants and the public, considering a combination of typology-based risk, hazards to highly populated areas, and impacts on emergency response.
- Structural remediation deadlines are set starting from the day a building is notified of its EPB status and consider both geographic seismic risk and priority building status. Priority buildings have 7.5 years to remediate in high-risk zones or 12.5 years in medium-risk zones, while other EPBs have 15 years in high-risk zones or 25 years in medium-risk zones. Owners may negotiate an extension for up to 15 years with their local councils.
- Compliance with labeling requirements or remediation deadlines is enforced using court summons, which can lead to significant fines if the owner is convicted. For noncompliance with retrofits, territorial authorities may seek authorization to retrofit the building themselves and charge the owner for costs incurred.

Key Takeaways

- A retrofit mandate without addressing underlying financial feasibility challenges leads owners to vacate or abandon buildings, causing economic and cultural damage without meaningfully mitigating building hazards.
- Even with public support and understanding of risk, financial feasibility ultimately determines if a building owner can afford to pursue a retrofit.

Seattle Unreinforced Masonry Retrofits

Seattle began investigating its unreinforced masonry (URM) buildings as a major vulnerability after URM structures accounted for a large share of buildings deemed unsafe following the 2001 Nisqually earthquake. Over the last two decades, the city has undertaken extensive efforts to study, catalog, and develop financing solutions to address these risks. The City inventoried its URM buildings in 2012, convened a policy working group in 2017, and conducted a funding and financing study in 2019 that investigated the available resources and policies necessary to implement a feasible and equitable URM retrofit requirement.

The City of Seattle is now advancing policies to encourage near-term voluntary retrofits, alongside clear public messaging that mandatory retrofits will be required once sufficient support mechanisms are in place. Building on the URM inventory, each structure is assigned a vulnerability classification – critical (emergency facilities and schools), high (buildings over 3 stories with poor soil or large assembly spaces), or medium (all others) – with anticipated compliance timelines of 7, 10, or 13 years, respectively, following enactment of a mandatory retrofit ordinance. The full URM database is publicly available on [Seattle GeoData](#), including building information, retrofit status, seismic risk information, and vulnerability classification.

To incentivize voluntary action, the City amended the Seattle Existing Building Code (SEBC) to create a [new URM retrofit category](#) that establishes minimum standards for voluntary retrofits and provides a pathway for recognizing prior retrofits. Buildings that meet these standards are designated as “retrofitted” in the public URM database and will be exempt from the future mandatory retrofit program. Because approximately 11% of URM buildings may qualify based on prior work, this provision could substantially reduce the scope of a future mandate. Owners may also petition to remove an incorrect URM designation by submitting documentation from a structural engineer. The new code standard also allows voluntary retrofits to avoid triggering “substantial alteration” requirements to comply with current life safety codes, although roughly 25% of buildings may qualify for a lower-cost alternative standard that does not provide this exemption.

The [Seattle Department of Construction & Inspections' website](#) also outlines several enabling policies the City is pursuing to help the future mandatory retrofit program balance equity and feasibility for building owners while reducing critical seismic hazards. The City is actively looking to identify additional funds to support retrofits in underserved communities and is also exploring a transfer of development rights (TDR) program to allow URM buildings to sell any development potential under their zoned maximum to fund URM retrofits.³⁷ However, many Seattle developments are already eligible for existing TDR programs designed to protect farms, forests, and historic buildings, which may constrain demand for additional TDR sales. In parallel with these local efforts, the State of Washington is currently studying tax incentives and exploring alternative incentives for tax-exempt entities. These programs would complement existing protections such as Seattle's Tenant Relocation Assistance Ordinance (TRAO), which supports eligible renters displaced by major projects.

Program Structural Lessons

- The city provides a public vulnerability database detailing risk and retrofit status, communicating the need for retrofits and existing risks to public stakeholders.
- Compliance periods are differentiated by risk, which could help distribute when retrofits occur to avoid overloading local capacity.

Key Takeaways

- Clear advance messaging of intent to pursue a mandatory program, anticipated compliance requirements, and support programs that are in development may help building owners plan for future requirements, even if the program is not ready for immediate implementation.
- Transfer of Development Rights is a contextually viable tool, depending heavily on market demand and existing development incentives.

New York City Local Law 97

Under the 2015 OneNYC long-term strategic plan, New York City set a goal of achieving carbon neutrality by 2050, requiring an 80% reduction in citywide emissions. While statewide investments in renewable energy and lower-emission power sources will contribute to this effort, the city's largest emissions challenge lies in its buildings. As of 2016, more than 68% of New York City's emissions came from the energy used to heat, cool, and power buildings – either directly through oil or natural gas heating or through the city's power grid.³⁸ Much of the city's building stock is also aging, with inadequate insulation and inefficient systems. Addressing these deficiencies requires substantial upfront investment and long payback periods, making it unlikely that building owners would voluntarily undertake major energy efficiency upgrades without external financial pressure or incentives.

[Local Law 97](#) (LL97) was enacted in 2019 to address this challenge by introducing a series of 5-year compliance periods for building owners with increasingly strict carbon emissions limits. Buildings are charged a fine for each ton of CO₂ equivalent emissions they produce over their specified energy usage and emissions limits, initially set at \$268 per ton for the 2024-2029 compliance period. As caps become more stringent over time, noncompliance fees will grow and apply to more buildings, creating disincentives to shift the economics of operating an inefficient building and encourage energy retrofits. As an alternative compliance pathway, building owners may purchase renewable energy credits (RECs) that support clean energy investments in upstate New York or acquire offset certificates for up to 10% of building emissions, which fund decarbonization and electrification projects in low-income buildings that might otherwise be unable to afford upgrades. These mechanisms reduce a building's assessed emissions, allowing noncompliant buildings to mitigate annual penalties.

Alongside the financial penalties established under LL97, New York developed a broad ecosystem of energy retrofit support programs that improve the feasibility of compliance. The free [NYC Accelerator](#) program provides technical assistance for building owners to refine retrofit projects, navigate financing sources and legal compliance, and connect with vetted service providers. At the State level, the New York State Research and

³⁷ In 2024, the City applied for FEMA grant funding to support retrofits in underserved communities, although review of this proposal is still pending.

³⁸ [New York City's Roadmap to 80 X 50](#) (2016)

Development Authority (NYSEREDA) offers technical assistance and incentives for energy upgrades in multifamily buildings. Tax abatements are available by right for multifamily building retrofits in exchange for rent stabilization under J-51 Tax Incentive program and commercial and industrial buildings can offset retrofit costs through tax abatements available under the Industrial & Commercial Abatement Program (ICAP). In addition, local utilities such as Con Edison offer rebates and incentives for efficiency improvements that reduce energy consumption. Financing mechanisms, including PACE and low-interest loans from lenders such as the New York City Energy Efficiency Corporation, further support compliance by spreading retrofit costs over time. Together, these programs provide multiple pathways to reduce or distribute retrofit costs, making compliance more affordable.

However, the high number of individual support programs can be overwhelming to small building owners and could require a significant administrative burden to navigate and acquire support. While these programs reduce the cost of retrofits, they do not completely solve the underlying issue that retrofits are expensive: the Center for an Urban Future estimates a retrofit project for a 50-unit apartment building might range from \$1 million to \$3 million, while a 150,000 square foot office building might cost from \$2 million to upwards of \$3.5 million.³⁹ As a result, the cost of retrofits required for compliance can far exceed the fines imposed under LL97, with some industry professionals estimating that the cost to retrofit might be 15 to 20 times the annual penalties – and will remain higher after significantly stricter emissions limits take effect in the next compliance period. The current option to purchase RECs in lieu of undertaking a retrofit has raised concerns from various stakeholders, as it allows buildings to achieve a degree of compliance without addressing the underlying efficiency and emissions issues that Local Law 97 was intended to resolve. There is therefore uncertainty about how effective Local Law 97 will be at encouraging widespread retrofits in its current form.

Still, LL97 and accompanying legislation may also have more difficult to quantify impacts that may make building owners more likely to retrofit in the future. Local Law 33 passed in 2018 requires buildings over 25,000 square feet to publicly post their Energy Star efficiency scores and associated letter grades, which are updated and disclosed annually through a public database and a printout displayed at the building's entrance. This creates reputational risk for businesses and institutions with public sustainability commitments, which may compel them to undertake retrofits. It is possible this may affect certain tenants' willingness to pay a higher rent for more efficient buildings and affect building values. Furthermore, as many buildings may be sold during the next five-year compliance period, noncompliant buildings could experience reduced resale values due to higher future fines, influencing current owners' capital investment decisions.

Program Structural Lessons

- Phased penalties which increase over time can generate revenue from noncompliant buildings over time, encouraging early action while generating funds for larger policy goals and programs.
- Alternate fee options for non-compliant buildings add flexibility to the program while providing funding for larger initiatives or supports for low- and moderate-income buildings that are unable to finance a retrofit on their own. However, this mechanism may delay or prevent buildings providing these funds via non-compliance fees or RECs from retrofitting themselves.

Key Takeaways

- To be an effective trigger for seismic retrofits, mandatory policies need to have sufficient disincentives to affect owner economics.
- A broader network of support programs for both residential and commercial buildings is useful for reducing the cost of retrofits but must be accompanied by a meaningful trigger to make owners pursue a retrofit.
- Public disclosure of compliance can create reputational risk for a segment of owners that spurs action.
- Future fines may affect the market price of a noncompliant building, although the exact impact may only be confirmed once more severe penalties go into effect.

³⁹ Center for Urban Future, "[New York City's Green Economy Opportunity](#)" (2025)

Pittsburgh Downtown Conversion Program

Over the last 70 years, Pittsburgh has experienced sustained population loss and industrial decline that ultimately led the city into State receivership between 2003 and 2017. Downtown in particular has an oversupply of office space relative to current demand and the reassessment of office values following the COVID-19 pandemic resulted in a nearly 10% decline in downtown property tax revenue in 2023. Office vacancy rates remain elevated at over 15% as of March 2026, up from just 8% in 2016.

Despite these challenges, downtown Pittsburgh remains a compelling district, containing major historic resources, multiple riverfronts, cultural destinations, educational institutions, and key regional employers. Downtown's assets and regional significance have created strong pressure to reposition it with a greater mix of residential and other uses to attract new residents and improve the city's long-term fiscal stability.

The Urban Redevelopment Authority of Pittsburgh (URA) has led this transformation through its flagship [Pittsburgh Downtown Conversion Program](#) (PDCP), a 0% interest loan program designed to support the conversion of high-vacancy office buildings into mixed-income housing. Participating projects must dedicate at least 20% of units to households earning 80% of area median income or below for a minimum of 40 years. In return, PDCP loans provide between \$1 million and \$3 million per project – covering up to 40% of total project costs, depending on the level of affordability achieved. To date, seven major projects have received nearly \$12 million in PDCP financing, leveraging an additional \$48.3 million in Low-Income Housing Tax Credits (LIHTC) and \$22 million in state grants. Once completed, these projects are expected to deliver nearly 1,000 housing units – approximately one-third of which will be affordable to low- and moderate-income households – and expand the downtown housing supply by nearly 20%. Because PDCP funds are structured as loans, repaid funds will be recycled to support future conversion projects.

The PDCP was initially capitalized with a \$5.1 million allocation of American Rescue Plan Act (ARPA) funds in 2023 and expanded in 2024 with more than \$10 million in additional URA funding. Its success in a high-cost development environment has depended heavily on coordination with local, state, and federal tax credit and grant programs to achieve its desired impacts. The PDCP also joins a State-led public-private partnership initiative that is channeling almost \$600 million in investment toward revitalizing downtown Pittsburgh. The PDCP illustrates how targeted public financing can close capital gaps and enable complex, high-cost retrofit and reuse projects that would otherwise remain infeasible. The program has accelerated the pace of downtown transformation and will continue to as the city advances its long-term goals for revitalizing downtown.

Program Structural Lessons

- Low-cost or 0% loans may only convey a small cost savings to developers relative to a total project budget, but can be a useful complement to other financing tools to “unstick” priority projects.
- Repositioning distressed asset classes like office simultaneously addresses oversupply while creating opportunities for additional multifamily units.

Key Takeaways

- Federal ARPA funds were initially used to establish the loan pool, but additional State and regional funding was required to enable more projects to move forward in the near term as the first project loans are repaid.
- The program focuses on closing feasibility gaps for higher-impact projects that accomplish city policy objectives (diversifying uses, reducing oversupply of office space, and increasing housing opportunities), enabling stronger support for a smaller number of conversions.

New York City Office Conversion Accelerator

Office to residential conversion projects in New York City require incredibly complicated engagement across multiple government offices located in different buildings, which creates a significant barrier to entry for building owners and developers who have limited conversion experience or personnel capacity. In 2023, the City created a dedicated [Office Conversion Accelerator](#) team to provide a single point of contact for conversion projects

expected to deliver 50 or more residential units. Instead of each project identifying the distinct offices and contacts they needed to achieve compliance, dedicated City personnel help to navigate zoning and permitting, streamlining project delivery and mitigating compliance-related delays. Having a specialized focus, these staff can also build repeat experience to help identify and troubleshoot common barriers for conversion projects. Within the first five months of the team's operation, at least 46 projects were enrolled in the accelerator program, and four had moved into the conversion process. Taken together, these initial projects are expected to deliver around 2,100 new multifamily units.

Program Structural Lessons

- Reserving support for larger buildings helps to triage city resources for higher impact projects, but may exclude smaller building owners who have less capacity or experience.

Key Takeaways

- Complicated projects like retrofits benefit from dedicated coordination staff to help ensure compliance and minimize administrative delays.
- While an accelerated permitting process is a small cost reduction relative to overall project costs, it signals city priorities and commitment to specific project types.

Appendix D: Existing Financing Strategies for Concrete Buildings

Introduction

Located along the San Andreas Fault to its west and the Hayward Fault to its east, San Francisco faces a high risk of major earthquakes. Experts consider the Bay Area overdue for an earthquake exceeding 8.0 mW, which could produce ground shaking 4 to 20 times stronger than what the city experienced during the 1989 Loma Prieta earthquake, which produced the most severe ground shaking San Francisco has seen in the past century. Although many of the city's older buildings designed to less stringent historic seismic safety standards survived the Loma Prieta earthquake with minor damage, the earthquake's epicenter was more than 60 miles outside the city. A stronger earthquake with an epicenter closer to downtown could therefore cause much more significant damage to the city, making it vital to strengthen seismically vulnerable building types before one occurs.

Mindful of these buildings' potential vulnerabilities in a major seismic event, the City is carrying out its [Earthquake Safety Implementation Program \(ESIP\)](#) to reduce risks to safety, housing stability, and long-term economic resilience from a damaging earthquake in the future. Under the ESIP and previous resilience planning, San Francisco implemented widespread retrofit programs for vulnerable building types including unreinforced masonry (1992-2004) and soft-story (2013-2021) buildings. The Office of Resilience and Capital Planning (ORCP) is currently working to strengthen vulnerable concrete buildings under the [Concrete Building Safety Program \(CBSP\)](#), focusing on those that pose the greatest risk to life safety, housing, and the city's recovery following an earthquake. Some of the concrete buildings constructed before 2000 were not designed to withstand the shaking expected during a major future event. This structural vulnerability presents significant risks for building owners and occupants ranging from high probabilities of damage or collapse to potential legal liability, long repair timelines, lost income earning potential, and reduced property value after an earthquake. Given this, proactive seismic retrofits are a critical strategy for protecting occupant safety and building owners' long-term investments against future earthquakes.

Seismic retrofits for concrete buildings are costly and financially complex, and many property owners face significant barriers to pursuing them. To better understand these challenges and how to make retrofits more feasible to finance and implement, the City convened a stakeholder working group between 2022 and 2023, summarizing their findings and recommendations in the [Concrete Building Safety Program Stakeholder Engagement Report](#). This report recommended generation of a detailed and accurate inventory of concrete buildings as a starting point for improving seismic safety. To develop this, the Board of Supervisors passed legislation in 2025 requiring property owners to complete a survey to understand the number and potential vulnerabilities of concrete buildings across the city.

This companion resource for the **Policy and Financial Feasibility Study for the Concrete Building Safety Program** serves as a guide for concrete building owners to plan for and seismically upgrade their properties. The following subsections present an overview of current guidelines for voluntary seismic retrofits, strategies for planning for a retrofit, and a guide for navigating the resources currently available to support seismic retrofit projects.

Current Pathways

While conducting a seismic retrofit is voluntary for concrete buildings, the City is encouraging owners to take proactive steps to protect lives and property, reduce liability, and preserve the long-term value of their investments. Toward that end, the City passed [ordinance 250211](#) in May 2025 to support voluntary concrete retrofits, outlining two performance standards for voluntary building retrofits. Buildings that are retrofitted to one of these standards will be exempt from future local mandatory seismic retrofit requirements until May 9, 2045.

- **Option A** is a lower performance standard expected to be less expensive for building owners. Retrofitted buildings must meet an ASCE 41 structural collapse prevention performance standard under a BSE-1E hazard level event, a minimum seismic design level which approximately corresponds to an earthquake intensity that has a 20% chance of being met or exceeded over the next 50 years. The retrofitted building must also address any key seismic deficiencies present out of a list of common, high-risk structural features which compromise life safety.
- **Option B** requires retrofitted buildings to meet an ASCE 41 structural collapse prevention performance standard under a BSE-2E hazard level event, a more significant seismic hazard level which approximately corresponds to an earthquake intensity that has a 5% chance of being met or exceeded over the next 50 years. Buildings that pursue Option B do not have additional requirements to address specific deficiencies.

For additional information, refer to the full voluntary retrofit standards established in Appendix A Chapter A6 of the San Francisco Existing Building Code (SFEBC) and clarifying detail provided in the accompanying [Administrative Bulletin 113](#).

How to Plan for a Retrofit

Though seismic retrofits are vital to the long-term safety and viability of vulnerable older concrete buildings, they require an expensive upfront investment. A retrofit project can cost anywhere from \$50 to \$250 per building square foot depending on building characteristics and the extent of retrofit work needed.⁴⁰ Most seismic retrofits for concrete buildings also require tenants to vacate the building for potentially a year or longer. This temporarily reduces how much revenue the building produces through rent. Despite these costs, the high probability of damage or destruction to older concrete buildings in a major earthquake means that cumulative avoided losses (such as to life safety, property value, and building revenue) typically outweigh the upfront retrofit cost over a 20 to 30-year horizon, even with the low probability of such an earthquake occurring in a given year. However, because these avoided losses are based on future probability, they cannot be used to service a loan or secure additional debt in the current market.

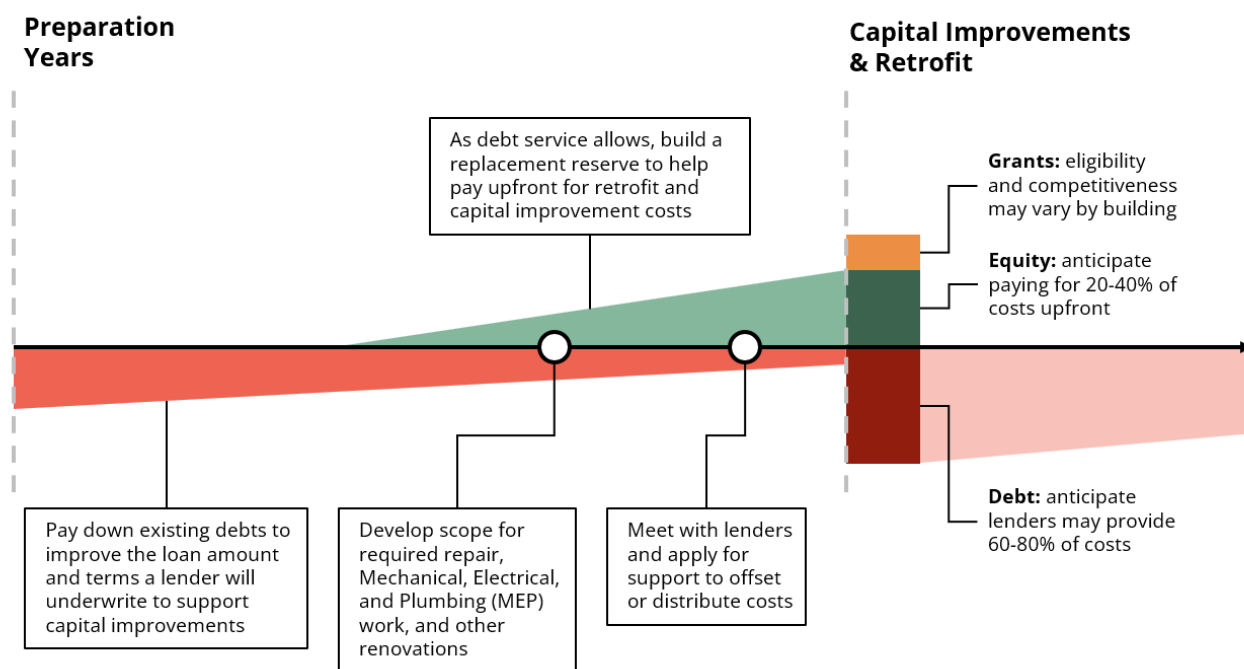
It is advantageous for concrete building owners to consider completing a seismic retrofit alongside their next major capital improvement project given the financial resources and disruptions to building operations needed. Seismic retrofit requirements in the SFEBC are triggered by the size of the area being renovated or changes in occupancy or use, meaning extensive renovation or conversion in concrete buildings may already require a seismic retrofit. Seismic retrofit work, which typically requires the building to be vacated, could be coordinated with similarly disruptive work such as energy efficiency retrofits, tenant improvements, or modernizing amenities and utilities to lessen the financial impact on operating revenues while also offering cost savings and efficiencies.

Most buildings require a major capital investment approximately every 30 years to replace HVAC systems, roofing, and other major building components, and some owners may use this opportunity to pursue modernization projects to improve the energy efficiency of their building or attract higher rents. Any seismic retrofit work included alongside these improvements will increase the overall project cost. Building owners should therefore first identify a scope of planned improvements and prepare a comprehensive budget that accounts for

⁴⁰ The estimate is based on a selection of precedent retrofit projects between 2015 and 2020 compiled by Applied Technology Council for the City of San Francisco in 2025. This cost does not include other non-structural upgrades that may be included in an overall project scope.

construction and repair costs, permitting fees, financing costs, and any multifamily tenant relocation or commercial lease termination requirements to determine what project elements they can afford to pursue.⁴¹

Considering the substantial upfront cost needed to make capital improvements, owners typically rely on financing from private lenders for about 60% to 80% of total project costs. Loan amounts are underwritten based on the building's ability to repay debt over an amortization period of 10 to 30 years. Because lending terms are influenced by existing debt obligations, owners considering a major capital project are encouraged to pay off any preexisting loans to the extent possible to maximize loan eligibility and secure more favorable terms. Lenders specify a required minimum equity contribution as part of the underwriting process, but building owners are recommended to set aside revenue for a replacement reserve of between 20% and 40% of overall project costs to reduce their financing needs and overall borrowing costs. The following figure outlines these considerations within an illustrative capital maintenance and improvement cycle:



Importantly, seismic retrofits of existing structures such as structural strengthening or life safety improvements can claim an exemption from reassessment under California State law. Further guidance on applying for a reassessment exclusion is available at <https://www.sf.gov/apply-tax-savings-earthquake-retrofit>. Seismic retrofits also typically do not trigger other San Francisco Building Code retrofit requirements on their own. However, these exemptions do not apply to other work pursued alongside a seismic retrofit, which should be studied separately to understand their potential impact on property reassessment and other required upgrades.

Existing Resources

Once a capital project with a seismic retrofit has been defined, several programs exist to help offset or distribute the costs of retrofitting.

California Property Assessed Clean Energy (C-PACE): This California statute enables residential and commercial property owners to finance energy efficiency and seismic safety improvements through a long-term, fixed-cost loan repaid through a voluntary assessment on the building's property taxes. These terms often offer lower interest rates and longer loan terms than those available through private lenders, conveying a long-term cost

⁴¹ The San Francisco Rent Board publishes [rate guidelines](#) for tenant compensation in the event of a relocation, which gives maximums of approximately \$25k to \$30k per household depending on household composition as of 2026.

saving. However, PACE applicants should assess the impact on their annual property taxes to ensure the terms of their loan are affordable over the duration of the assessment.

- Since PACE contracts are tied to the specific property improved, they can span multiple building owner transitions – though an active PACE contract may affect the sale value of a property.
- Energy efficiency retrofits also increase property values and lower operating costs, conveying additional benefits if pursued alongside retrofit work.
- Property owners should contact a [PACE solicitor](#) enrolled with a licensed California PACE Program Administrator that offers seismic retrofit financing to understand available options and the projected impacts on their building's annual property taxes. A list of solicitors is available on the State [Department of Financial Protection and Innovation website](#).

Mills Act: The Mills Act allows owners of historic properties to contract with the City, committing owners to the preservation, restoration, and maintenance of their property in exchange for preferential property tax treatment.

- Under a Mills Act contract, buildings are assessed based on their ability to produce income rather than the purchase price of the property, which typically reduces property taxes by 40% to 60%.
- To be eligible, properties must be listed individually or as a contributor to a historic district by the City of San Francisco, State of California, or National Register of Historic Places. Properties not currently listed may work with the City Historic Preservation Commission to explore eligibility for landmark designation.
- Applications for new Mills Act contracts are available through the [Department of Planning website](#), and applications are accepted through May 1st of each year.

Tenant Cost Passthrough: The San Francisco Rent Board allows property owners to pass through capital improvement costs of up to 50% of certified capital improvements (such as replacing a building's roof, windows, or utilities) or up to 100% of any seismic retrofit capital improvement costs required by law on to multifamily tenants through rent increases. The passthrough amount is capped annually at the greater of \$30 or 10% of a tenant's base rent over any 12-month period, with an amortization period between 10 and 20 years depending on the work performed. Mixed-use buildings with commercial units are also eligible to use passthroughs, provided they distribute a portion of the capital cost to commercial tenants who benefit from the work completed.

- Improvement work must be completed before costs can be passed through to tenants.
- Building owners seeking to pass through costs may submit a [Capital Improvement petition](#) for any work completed within the past five years. The petition form requirements vary based on the number of units in a building — a special petition form is required for mandatory seismic retrofit projects.
- Building owners voluntarily pursuing seismic retrofits which are not mandated by the SFEBBC should consult the Rent Board to confirm the eligible pass-through amount for their specific building.

Preservation and Seismic Safety (PASS) Program: San Francisco's PASS program provides long-term, low-interest loans to preserve affordable housing, acquire and rehabilitate at-risk properties to create affordable housing, and fund seismic retrofits in low- and moderate-income multifamily buildings.

- Multifamily buildings with commercial units are also eligible.
- PASS was funded through new and reallocated City general obligation bond funding in 2016 and is currently almost completely subscribed, limiting near-term funding opportunities.
- As of February 2026, the PASS program is not actively inviting new applications. Projects interested in pursuing PASS financing should contact the [Mayor's Office of Housing and Community Development \(MOHCD\)](#).

Additional Resources

The City of San Francisco [Concrete Building Safety Program](#) website provides additional information on seismic risk research, City resilience planning, and other guidance. For more information on the ongoing concrete building screening program, please visit the [Department of Building Inspection \(DBI\) program website](#).