

# Voluntary Seismic Strengthening of Soft-story, Wood-frame Buildings: Economic Impact Report

Controller's Office of Economic Analysis  
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# Introduction

- The proposed legislation is intended to encourage voluntary seismic retrofit upgrades for soft-story, wood-frame buildings through specified permit fee waivers, permit expediting, and exemption from future mandatory seismic upgrades for 15 years.
- Department of Building Inspection (DBI), Planning and Fire Department plan review fees, and Department of Public Works (DPW) sidewalk encroachment fees would be waived for work relating to seismic strengthening.



# Past Volume of Voluntary Seismic Retrofits

<u>Year</u>	<u># of Retrofits</u>
1989	3
1990	42
1991	63
1992	43
1993	16
1994	26
1995	20
1996	19
1997	7
1998	15
1999	46
2000	30
2001	32
2002	51
2003	43
2004	53
2005	48
2006	70
2007	143
2008	19
2009	24
Average	40

Note: Includes only voluntary seismic retrofits for all building types; retrofits done in conjunction with other work are excluded.  
 Source: DBI MIS Department.

- The number of voluntary seismic retrofits performed each year has been low, ranging from 3 to 143 building permit applications per year, with a 20-year average of about 40 per year, per DBI.
- The relatively few voluntary seismic retrofits suggests a low cost-benefit perception among private property owners.
- The legislation seeks to increase this voluntary retrofit volume through limited incentives.



## Economic Impact Factors

- Potential increase in the number of seismic retrofits, which could result in:
  - More construction activity in the near-term (though less in the long-term)
  - Reduced damage to structures, leading to reduced casualties and property savings in the long-term.
- City cost of lost fee revenue to affected departments.

# Estimating Number of Retrofits: Average Seismic Retrofit Cost

Building Type	Soft-Story Building Inventory (1)	Average Total Retrofit Cost per Unit (2)	Average Units per Building (3)	Average Retrofit Cost per Building (5)
Single Family	51,000	\$26,000	1.0	\$26,000
Multifamily	27,000	\$21,600	5.1	\$111,105
Weighted Average (4)	78,000			<b>\$55,500</b>

*Footnotes located at the end of the document.*



## Estimating Number of Retrofits: Pass-through to Tenants

- The Residential Rent Ordinance (Administrative Code Section 37.7 (c)(4) and (5)) stipulates how *voluntary* capital improvement costs are passed-through to residential tenants:
  - For buildings with 5 or fewer units, a landlord is allowed to pass-through 100% of capital costs, including interest, based on a 20-year amortization schedule. The maximum annual rental increase to tenants in these buildings is 5% of base rent or \$30, whichever is greater.
  - For buildings with 6 or more units, 50% of capital costs (plus interest) may be passed-through, based on amortizing the costs over 10 years, with a maximum annual rent increase of 10% of base rent or \$30, whichever is greater.
- Under current law, 100% of mandatory capital improvement costs may be passed on to tenants.
- For purposes of this analysis, it is assumed that on average 50% of multifamily retrofit costs are passed-through.

# Estimating Number of Retrofits: Average Owner Benefits Equal 48% of Costs

	Average for all Building
<u>Retrofit Benefit - Average Dollar Loss Avoided per Building</u>	
Retrofit Benefit per Building - Damage Avoided (14)	\$126,600
x Adjustment for Annual Earthquake Probability (15)	0.74%
= Annual Benefit per Building	\$938
Discounted Benefit per Building - Loss Avoided (16)	\$13,387
<u>Retrofit Benefit - Rental Income Foregone/Relocation Cost for Red-Tagged Buildings</u>	
+ Average discounted income loss/displacement cost per building (17)	\$3,707
= Combined structural damage avoided and rental income/relocation cost (total benefit)	\$17,094
Average Retrofit Cost Per Building (net of fee waiver and 50% passthrough on multifamily) (18)	\$35,504
Discounted Benefit as % of Retrofit Costs	<b>48%</b>



# Estimating Number of Retrofits: Fee Waiver as Percent of Cost

Building Type/Fee Component	Direct Retrofit Cost per Building (6)	Estimated Fees per Building (7)	Estimated % of Retrofits Requiring Fee (8)	Estimated Average Fee per Building
<u>Single Family</u>	\$ 19,000			
DBI - Plan Review Fees		\$ 528	100%	\$ 528
Planning - Permit Review Fees		\$ 600	0%	\$ -
Fire - Plan Review Fees		\$ 279	0%	\$ -
DPW - Sidewalk Encroachment Fee		\$ 180	35%	\$ 63
Estimated Average Fees Waived per Building				\$ 591
<i>Fee as % of Total Cost</i>				<b>2.3%</b>
<u>Multifamily</u>	\$ 82,000			
DBI - Plan Review Fees		\$ 1,486	100%	\$ 1,486
Planning - Permit Review Fees		\$ 2,613	10%	\$ 261
Fire - Plan Review Fees		\$ 685	5%	\$ 34
DPW - Sidewalk Encroachment Fee		\$ 359	50%	\$ 180
Estimated Average Fees Waived per Building				\$ 1,961
<i>Fee as % of Total Landlord Cost</i>				<b>3.5%</b>
Average Fee Discount as % of Costs (9)				<b>2.7%</b>





# Estimating Number of Retrofits: Impact of Fee Waiver on Retrofit Demand

Retrofit Cost Discount Due to Fee Waiver (10)	2.7%
x Elasticity of Demand (11)	0.45
= Estimated Increase in retrofits	1.2%
x Average Annual Voluntary Seismic Retrofits (12)	40
= Estimated Increase in # of Buildings Retrofitted	0.5
x Average Cost per Retrofit (13)	\$55,500
= Total Retrofit Spending per Year	\$27,000

- Elasticity measures change in demand resulting from a change in cost.
  - The OEA utilized the REMI model to estimate the price elasticity of demand by calculating the percent change in construction industry demand resulting from a percent change in construction cost.
  - The resulting elasticity of demand is approximately .45, meaning that for each 2.7% decline in construction costs, demand will increase by about 1.2%, as shown.
  - This elasticity factor is used in the analysis to estimate the increase in retrofits resulting from the 2.7% price discount associated with the legislation.



# Economic Impact: Loss of Fee Revenue to Affected Departments

Fee Component	Estimated Retrofit Spending per Year (19)	Estimated Fees (7)	Estimated % of Retrofits Requiring Fee (8)	Estimated Average Fee per Year
	\$ 27,000			
DBI - Plan Review Fees		\$ 857	100%	\$ 857
Planning - Permit Review Fees		\$ 855	5%	\$ 43
Fire - Plan Review Fees		\$ 415	3%	\$ 10
DPW - Sidewalk Encroachment Fee		\$ 359	50%	\$ 180
Estimated Average Fees Waived per Year				<b>\$ 1,090</b>



## Conclusions

- A broad set of interests – property owners, tenants, and the City itself – are affected by the soft-story retrofit issue.
- This legislation attempts to stimulate retrofitting by influencing the property owner’s private interest.
- During the last 20 years, there have been relatively few voluntary seismic retrofits—about 40 per year.
- The proposed fee waiver is a small incentive, amounting to 2.7% of total cost.
- This is not expected to significantly increase the number of voluntary retrofits.
- Because property owner costs outweigh their private benefits from retrofitting - even when a significant pass-through of costs to tenants is factored in – a more comprehensive approach may be necessary to accelerate retrofitting.

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# Appendix A - Estimated Relocation Cost/Foregone Income Calculation- Buildings Red Tagged in Earthquake

## Multifamily

Average Contract Rent/Unit/Month (20)	\$1,262
x Average Units per Multifamily Building	5.14
= Potential Gross Income per Building (per month)	\$6,491
- Operating Expenses (35%)	<u>(\$2,272)</u>
= Annual Net Income Loss per Red-Tagged Building	\$50,633
x Annual probability of quake (15)	0.74%
= Annual potential loss based on probability of quake	\$375
Discounted Loss per Building per Year (21)	\$5,354
x Average Downtime (years) (22)	<u>1.4</u>
= Average discounted income loss per building impacted	\$7,585
x % Buildings Impacted (23)	<u>55%</u>
= Average discounted income loss per building	<b>\$4,172</b>

## Single-Family

Average displacement cost per year (24)	\$42,000
x Annual probability of quake (15)	<u>0.74%</u>
= Annual potential loss based on probability of quake	\$311
Discounted Loss per Year (21)	\$4,441
x Average Downtime (years) (22)	<u>1.4</u>
= Average discounted displacement loss per building impacted	\$6,292
x % Buildings Impacted (23)	<u>55%</u>
= Average discounted relocation cost per building	<b>\$3,460</b>

Weighted Average Relocation/Income Loss - All Buildings

**\$3,707**



## Appendix B - Footnotes

- (1) Source: Applied Technology Council (ATC), the lead consultant on the Community Action Plan for Seismic Safety (CAPSS) team. Inventory is based on ATC field survey and review of Assessor's parcel data. Soft story generally means significant ground floor openings (i.e., doors, windows) on one or more sides of the building. See Department of Building Inspection (DBI) Administrative Bulletin AB-094, May 2009 for complete definition.
- (2) Based on Retrofit Scheme 3 in CAPSS "Here Today-Here Tomorrow" report dated February 19, 2009. This retrofit scenario consists of installing plywood shear panels and cantilevered steel columns. Includes direct costs plus indirect costs (such as for architecture and engineering, financing, etc.), estimated at 35% of direct costs.
- (3) Cost per multifamily building adjusted from figures in CAPSS report because the study focused on buildings with 5+ units (with an average density of 10.4 units per building), whereas the legislation includes all multifamily buildings. Multifamily per-building retrofit cost is based on average of 5.1 units per building, per Assessor's Office data and review of building survey data from ATC.
- (4) Weighted average based on soft story building inventory.
- (5) Costs for multifamily retrofits will be split between landlords and tenants. This analysis assumes 50% of costs are passed through to tenants, on average.
- (6) Average direct retrofit costs (excluding 35% indirect costs), the basis the City uses to calculate fees, are estimated at \$16,000 per unit for multifamily, and \$19,000 for single-family.
- (7) Based on each department's fee schedule and calculations from DBI's help desk. DPW sidewalk fee based on minimum fee for a 1 month permit with 25' of frontage for single-family, and 2 months for multifamily.
- (8) Estimated percent of retrofits requiring specified fee, based on discussion with DBI, Planning, and DPW staff. Fire Department plan check only applies to buildings with 3 or more units, therefore no fee is assumed for single family uses. Further, DBI staff indicated that Fire plan review is rarely triggered for seismic work by itself, thus only 5% of multifamily buildings are assumed to require Fire Department plan review. Planning staff indicated that Planning review would only be triggered if changes are made to the exterior of a building or if the building is a historic landmark. The Planning Department estimated that no single family units would require plan review, and that 5-10% of multifamily units could require Planning review.

## Appendix B – Footnotes (continued)

- (9) Fee discount weighted by the number of soft story buildings by property type. Multifamily fee discount assumes 50% of costs are passed through to tenants; percentage discount calculated only on building owners cost (50%).
- (10) See Slide 7.
- (11) Estimated based on REMI (Regional Economic Models Inc.) model run of the impact on construction demand resulting from changes in construction costs.
- (12) Average annual voluntary retrofits during past 20 years, per DBI. See Slide 3.
- (13) See Slide 5.
- (14) Based on dollar loss avoided under retrofit scenario 3 compared with no retrofit. Estimates based on 1/12/2009 SPA Risk LLC technical report Table 5, the results of which are summarized in the 2/19/09 CAPSS report, Table 5. Loss estimates of damage were made by SPA Risk utilizing an adaptation of FEMA's HAZUS model. Estimates based on 7.2 magnitude earthquake on the San Andreas Fault. The damage loss estimate for a 6.5 magnitude earthquake on the San Andreas produced similar cost savings on a per unit basis between the as-is and retrofit scheme 3. Figure shown represents weighted average benefit per building, based on soft story inventory by building type.
- (15) The USGS estimates there is a 9.4% probability of a 7.2 or greater magnitude earthquake on the San Andreas Fault in the next 30 years. Further, there is an approximately 20% chance of a 6.7 magnitude quake impacting San Francisco in the next 30 years. Per USGS information and discussions with CAPSS team members, a 6.7 or larger quake is the threshold of shaking resulting in more significant building damage. Figure shown is annual probability based on the 30-year projection of a 6.7 magnitude quake. Source: USGS, based upon Working Group on California Earthquake Probabilities, 2008, The Uniform California Earthquake Rupture Forecast, v2 (UCERF 2).
- (16) Present value of annual benefit after adjusting for annual probability of earthquake, discounted at 7.0%.
- (17) Average discounted income loss/relocation cost per building, considering red-tag building losses avoided by retrofitting compared to as-is, adjusted for earthquake probability. See Appendix A.
- (18) See Slide 5 for cost estimates. Estimates are net of permit review fee waiver under proposed legislation. In addition, it is assumed that 50% of multifamily costs are passed-through to tenants. The retrofit cost shown reflect only those costs borne by the landlord.

## Appendix B – Footnotes (continued)

- (19) Estimated increase in retrofit spending resulting from legislation. See Slide 9.
- (20) Average 2008 contract rent per US Census, American Community Survey.
- (21) Net present value (at 7% discount rate) of potential monthly loss during 100 year projection period.
- (22) Average down time before building is repaired or replaced. The average was calculated based on the difference in the damage state (red vs. yellow tag) of buildings after a seismic event in the as-is compared with retrofit Scenario 3, per CAPSS 2/09 report, Table 2.
- (23) Per CAPSS 2/09 report, Table 2, the % of red-tagged buildings projected in the as-is scenario. Loss calculated only on these buildings.
- (24) Based on combination of average market rents per RealFacts for larger (2+ bedroom) units, and average Northern California hotel daily rates. No adjustment to price of lodging due to potential diminished supply post-quake is considered in the analysis.