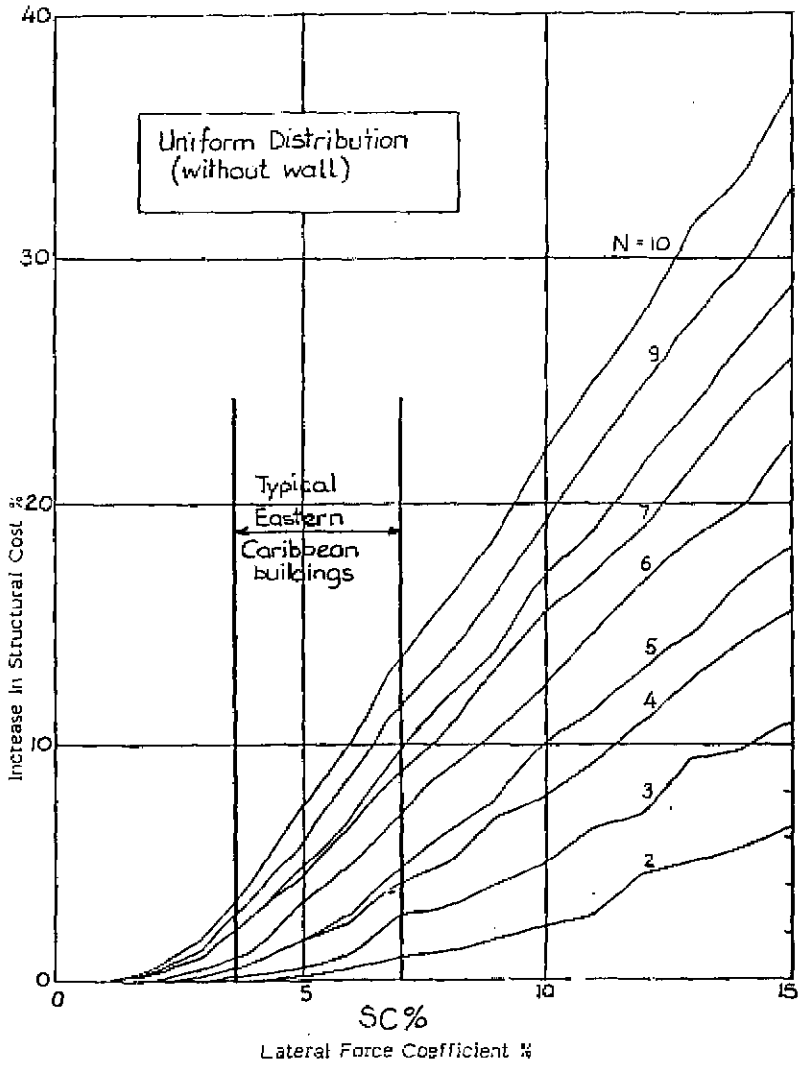
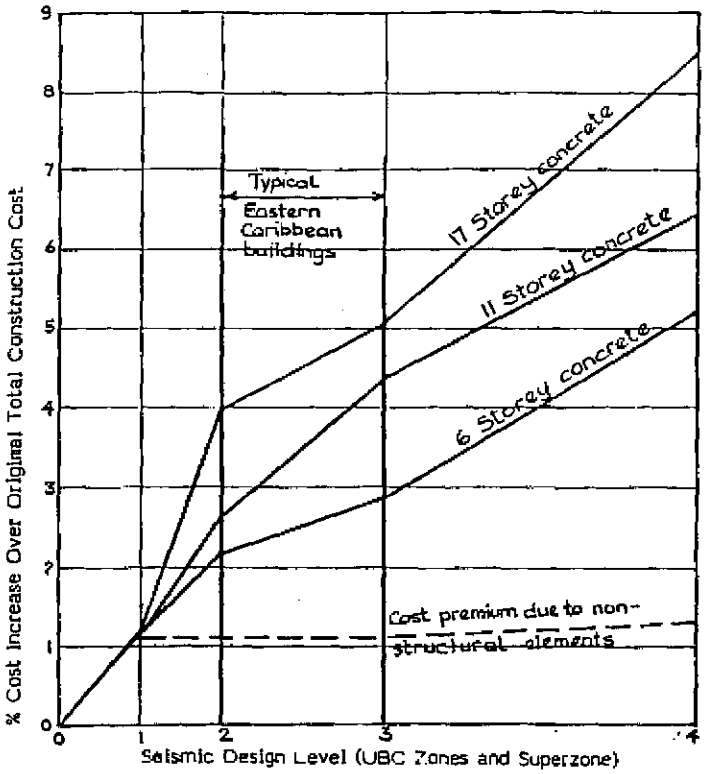
'It is unwise to pay too much, but worse to pay too little; when you pay too much, you lose a little money, that is all.
When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the things it was bought to do.
The common law of business balance prohibits paying a little and getting a lot. It can't be done. If you deal with the lowest bidder, it is as well to add something for the risk you run.
And if you do that, you will have enough to pay for something better.
There is hardly anything in the world that someone can't make a little worse and sell a little cheaper — and people who consider price alone are this man's lawful prey'.
John Ruskin 1819-1900 (plus ça change ...).



Cost Impact of Earthquake-Resistant Design

(Ipek)

Figure 4



Effect on Cost of a Seismic Design
of Typical Concrete Apartment Buildings
(after Whitman et al)
Figure 5

TABLE 2

PERCENTAGE INCREASE * IN CONSTRUCTION COST FOR MODEL DWELLINGS INCORPORATING SEISMIC OR WIND DESIGN RECOMMENDATIONS **

SEISMIC OR WIND LOADING	DWELLING BY MODEL DESIGNATION										
	'A'	'A' 1.5 x O. T.	'A-1' Sliding door	'A-1' Window	'B'	'B-1'	'C'	'C-1'	'C-2'	E	F
Zone 3	0.3 0.24		0.37 0.29	0.37 0.29	0.42 0.33	0.45 0.35	0.81 0.63	0.74 0.58	0.74 0.58	0.48 0.38	1.4 1.1
Zone 2	0.28 0.22		0.36 0.28	0.36 0.28	0.29 0.23	0.29 0.23	0.31 0.24	0.28 0.22	0.27 0.21	0.48 0.38	0.24 0.18
15 psf wind	0.31 0.25	0.57 0.45	0.41 0.32	0.39 0.31	0.44 0.34	0.61 0.47	1.3 0.98	1.2 0.90	1.2 0.95	0.48 0.38	0.24 0.19
25 psf wind	0.59 0.46	1.1 0.85	0.60 0.47	0.59 0.46	0.92 0.72	1.0 0.79				0.48 0.38	0.71 0.55
40 psf wind	2.00 1.57	2.2 1.7	1.6 1.2	1.4 1.1	2.2 1.7	1.9 1.5				1.3 1.0	1.9 1.5

* Estimated upper and lower bounds given.

**Design recommendations as given in the report titled " A Methodology for Seismic Design and Construction of Single-Family Dwellings".

CONTRACT NO. H-2195R

COST IMPACT ANALYSIS

For The Construction Recommendations in The Report Titled

"A METHODOLOGY FOR SEISMIC DESIGN AND CONSTRUCTION
OF SINGLE FAMILY DWELLINGS"

JANUARY 1977

by

Ralph W. Goers & Associates
Structural Engineers

for

Applied Technology Council

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT

OFFICE OF
POLICY DEVELOPMENT AND RESEARCH

Division of Energy, Building Technology and Standards

HUD SEISMIC DESIGN: COST IMPACT ON HIGH-RISE RESIDENTIAL STRUCTURES

Department of Housing and Urban Development
Contract H-2418
September 1977

Severud-Gruzen-Turner
New York, New York 10017

For sale by the Superintendent of Documents, U.S. Government Printing Office
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Figure 3.2

Percentage Increase Over Basic Cost

		Local to MPS	Local to UBC 73	Local to UBC 76
ATLANTA GA	BRICK MASONRY	3.0%	3.0%	
	CONCRETE MASONRY	2.2%	2.2%	
	REINFORCED CONCRETE	3.8%	3.8%	
	STRUCTURAL STEEL	4.7%	4.7%	
BOSTON MA	BRICK MASONRY	13.1%	13.5%	
	CONCRETE MASONRY	12.4%	12.4%	
	REINFORCED CONCRETE	14.4%	14.4%	
	STRUCTURAL STEEL	3.7%	4.2%	
BUFFALO NY	BRICK MASONRY	23.9%	24.3%	
	CONCRETE MASONRY	13.5%	13.5%	
	REINFORCED CONCRETE	16.4%	16.4%	
	STRUCTURAL STEEL	8.2%	8.3%	
CHARLESTON SC	BRICK MASONRY	14.1%	14.5%	
	CONCRETE MASONRY	12.9%	12.9%	
	REINFORCED CONCRETE	8.4%	8.4%	
	STRUCTURAL STEEL	8.0%	9.8%	
CINCINNATI OH	BRICK MASONRY	8.9%	9.0%	
	CONCRETE MASONRY	2.6%	2.6%	
	REINFORCED CONCRETE	2.8%	2.8%	
	STRUCTURAL STEEL	4.6%	4.6%	
INDIANAPOLIS	BRICK MASONRY	2.9%	2.5%	31.2%
	CONCRETE MASONRY	2.2%	2.2%	14.9%
	REINFORCED CONCRETE	3.5%	3.5%	21.5%
	STRUCTURAL STEEL	4.9%	6.8%	9.5%
MANCHESTER NH	BRICK MASONRY	1.2%	1.3%	
	CONCRETE MASONRY	3.0%	3.0%	
	REINFORCED CONCRETE	2.7%	2.7%	
	STRUCTURAL STEEL	1.0%	1.8%	
MEMPHIS TN	BRICK MASONRY	25.0%	25.3%	
	CONCRETE MASONRY	22.0%	22.0%	
	REINFORCED CONCRETE	25.5%	25.5%	
	STRUCTURAL STEEL	10.6%	11.8%	
PHOENIX AZ	BRICK MASONRY	1.1%	1.2%	
	CONCRETE MASONRY	2.8%	2.8%	
	REINFORCED CONCRETE	2.6%	2.6%	
	STRUCTURAL STEEL	1.1%	2.0%	
ST. LOUIS MO	BRICK MASONRY	9.4%	9.5%	
	CONCRETE MASONRY	10.1%	10.1%	
	REINFORCED CONCRETE	10.1%	10.1%	
	STRUCTURAL STEEL	6.4%	7.3%	
SEATTLE WA	BRICK MASONRY	.0%	0%	13.8%
	CONCRETE MASONRY	.0%	.0%	9.8%
	REINFORCED CONCRETE	.0%	.0%	6.7%
	STRUCTURAL STEEL	.0%	.0%	7.0%

Cost Impact-Brick Masonry

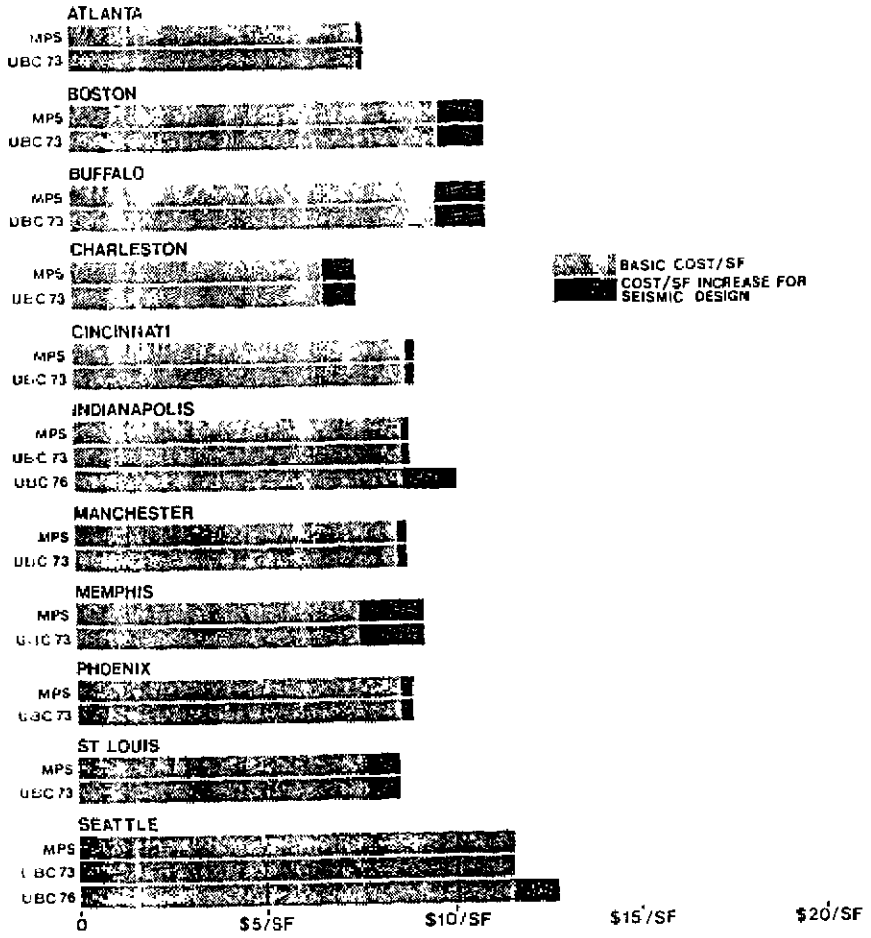
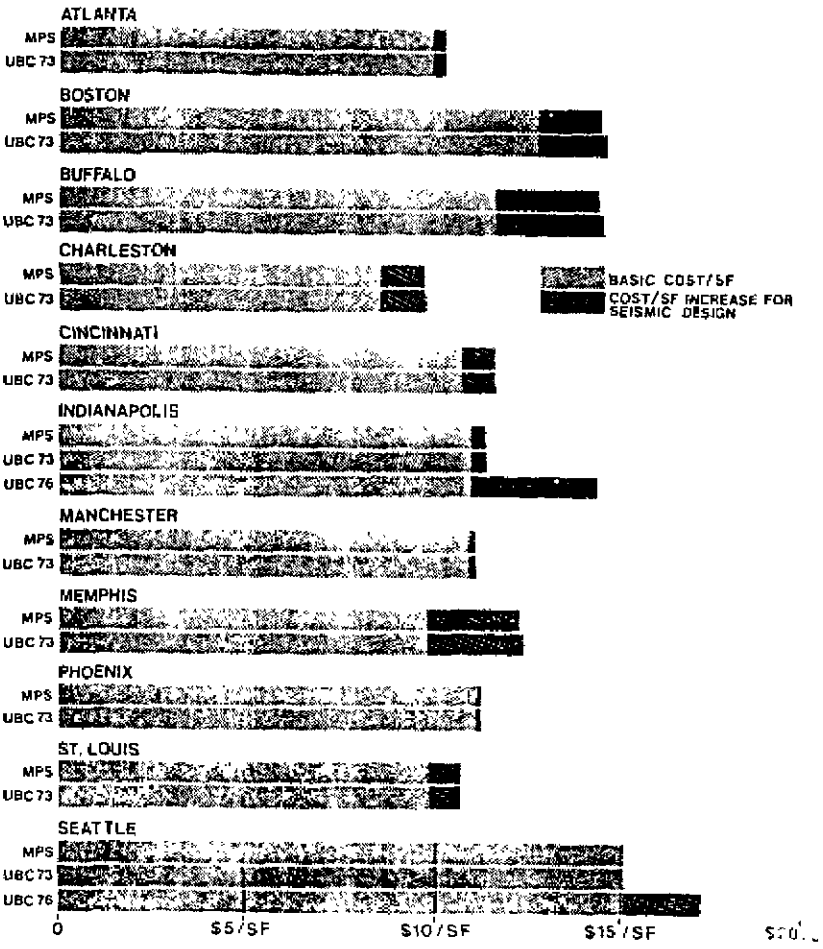


Figure 3.4

Cost Impact - Concrete Masonry



Cost Impact - Reinforced Concrete

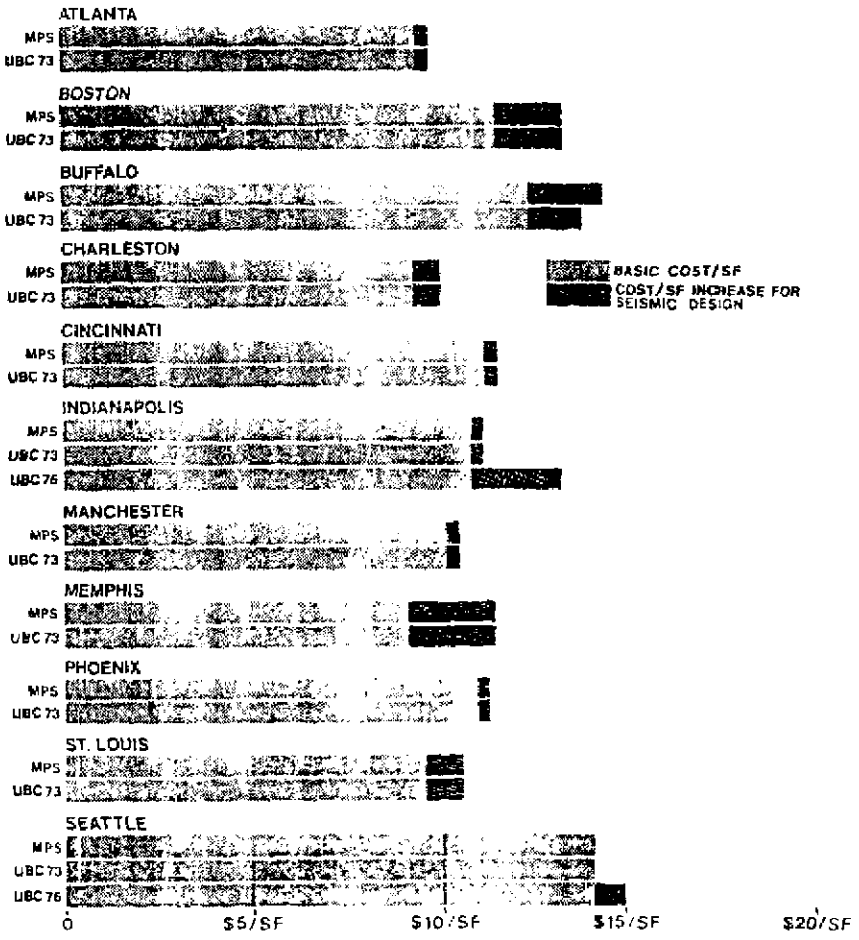
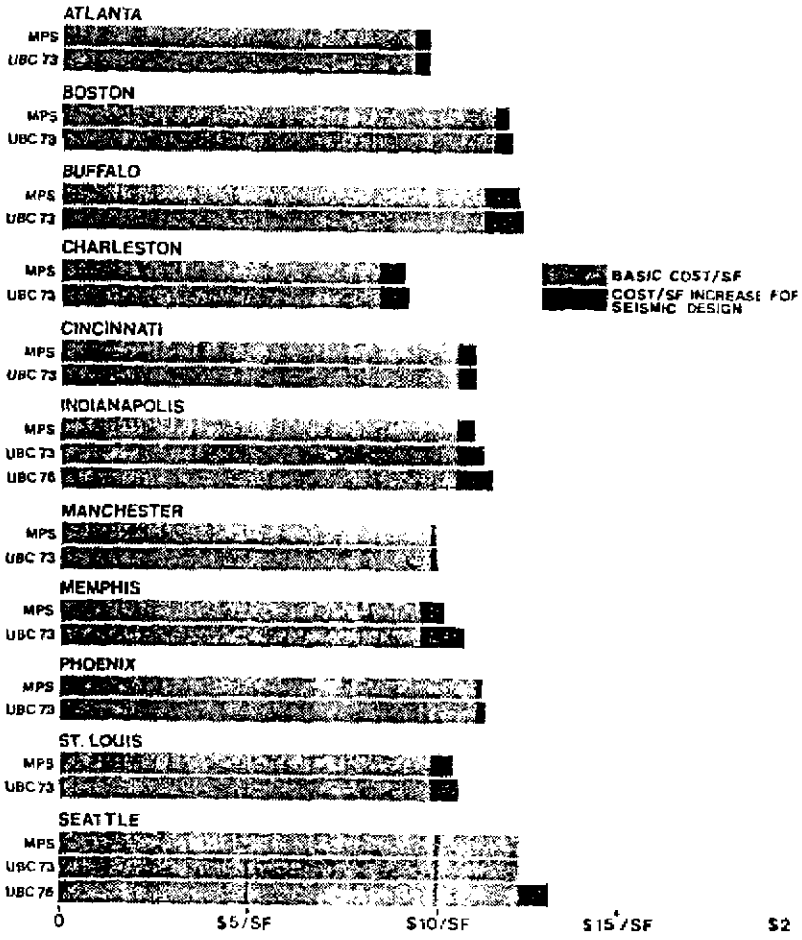


Figure 3.6

Cost Impact - Steel



Services (cont'd)

Item	Qty	Rate($)	Cost($)
6. Connecting 23 internal lines		20.00	460
Total Cost:			148 760

D. Summary of Costs

Materials	130 574.00
Labour	54 823.00
Repairs to Water Tank	5 000.00
Power Lines	30 000.00
Telephone System	113 760.00
	334 157.00
Engineering Supervision	33 400.00
	367 557.00
+ 15% Contingencies	55 000.00
	422 557.00

Say $423 000 00

3.10 Phasing

It is suggested that the work be phased over 3 years as follows:

Immediate - (Funds available)

Item	Cost($)
Improvement of services - water, power and telephone	38 000
Year 1	
Replacement of roof sheets, and improvement of roof fixings	95 297
Year 2	
Storm shutters and protective measures	90 100
Year 3	
Placing telephone cables underground	110 760
	334 157

NOTE: The costs given above do not include for engineering supervision or for contingencies.

3.11 Financing of the Project

The expenditure of $38 000 estimated as the cost of urgent works can be met from USAID funds available. However, the Financial Secretary has indicated that the Government of Dominica would be unable to provide the funds needed to support the program. The Government however is approaching international donors for funds for the reconstruction of damaged public buildings and facilities and it is hoped that such funds would be available to carry out the work proposed.

Hurricane Damage Potential Assessment CEP/20029 17-Jul-93

ICN/Facility	Location Sub-total (BBD)	Replacement cost (BBD)	Barbados-dollar damage figures for civil works only HC3 structure	HC3 envelope	HC4 structure	HC4 envelope	HC5 structure	HC5 envelope
PARK sub-station ing and fence	200,000	200,000	0	8,000	0	8,000	0	8,000
d sub-station ing and fence	100,000	100,000	0	4,000	0	4,000	0	4,000
OHAS sub-station	1,100,000							
ing		900,000	0	18,000	0	18,000	0	18,000
structure		100,000	0	8,000	9,000	10,000	27,000	10,000
structure		100,000	0	8,000	9,000	10,000	27,000	10,000
ES telecom (BL&P fixings only)	100,000	100,000	40,000		80,000		100,000	
US Residences	2,500,000	2,500,000	37,500	175,000	75,000	437,500	112,500	612,500
S	54,600,000	54,600,000	572,000	1,896,500	2,401,500	5,275,500	3,807,000	10,441,500
			HC3 total=2,468,500		HC4 total=7,677,000		HC5 total=14,248,500	
			Percentage	5		14		26

	Building/ Facility		Structure	Non-structure
1	L-Block		$ 60,000	$ 39,000
2.	Baron Wing		$ 30,000	$ 16,000
3.	Paediatrics	*	$ 12,000	$ 20,000
4.	Chest Wing		$ 40,000	$ 20,000
5.	Former Doctor's Residence	*	$ 3,000	$ 4,000
6.	Former Nurses Quarters		$ 80,000	$ 20,000
7.	Boiler House	*	$ 1,000	$ 2,000
8.	Generator Bldg	*	$ 1,000	$ 1,000
9.	Administration		$ 30,000	$ 30,000
10.	Laboratory		$ 15,000	$ 15,000
11.	Kitchen		$ 20,000	$ 3,000
12.	Water Tank		$ 1,000	$ 3,000
13.	Standby Generator		-	NA
14.	Boilers		-	NA
15.	Utility Lines		-	$100,000
16.	Drainage		$ 30,000	-
17.	Telecommunications		-	$140,000
	Sub-Totals		$323,000	$413,000
	Overall Total			EC$736,000

NA = Estimate not available

Table 2

Cost Variables for Existing Facilities

- *Deterioration*—of the structure, foundation, equipment, etc.
- *Alterations*—which have reduced safety or will incumber efforts to retrofit and renovate; lack of flexibility.
- *Inadequate Codes* — in force when the station was built which make the structure and basic components too expensive to retrofit for earthquake safety.
- *Inherently High Cost to Retrofit* — based upon the type of construction and building system, their age, and the practicality of making improvements.
- *Climate* — characteristic local weather conditions influence construction needs, which in turn affect seismic safety approaches and those costs.
- *Down Time for Buildings* — retrofit activity may force building closure for a period of time. Costs for relocation of employees and services will add to the overall cost of modifications.
- *Other Hazards* — needs to increase the resistance of existing buildings to hazards other than earthquakes may significantly increase costs and reduce the practicality of retrofit for earthquakes alone.