

Appendix C

Task 2, Technical Memorandum Prototypical Buildings

Memorandum

Date: December 29, 2010
To: David Tremont, Municipality of Anchorage Planning Department
From: Donald Ballantyne, MMI Engineering
Subject: Downtown Anchorage Seismic Risk Assessment –
Task 2, Proposed Prototypical Buildings

This memorandum identifies prototypical buildings that are proposed for use in evaluation of the downtown Anchorage seismic risk. These prototypical buildings were selected based on review of the Anchorage Downtown Comprehensive Plan. A list of ten prototypical buildings is shown in Table 1

The Occupancy Categories in Table 1 are derived from the Anchorage Downtown Comprehensive Plan. The Occupancy Description/Size and HAZUS Occupancy Class are derived from HAZUS (see Tables 3.1 and 3.2 from the HAZUS Technical Manual, attached).

Each of the ten prototypical buildings will be evaluated estimating casualties and damage, with two possible foundation types and three possible structural systems (for a total of 60 [10 x 3 x 2]) for each of the 5 hazard zones.

Analysis is currently underway to identify the likely foundation types that would be used for the various categories of prototypical buildings. It is understood that these will generally include distributed foundations and mat foundations. Deep foundations projecting into the Bootlegger clays are generally not used in Anchorage.

Analysis is currently underway to identify the likely structural system types that would be used for the various categories of prototypical buildings. Table 3.1 from HAZUS (attached) shows the possible structural systems.

The ten prototypical building types, each with three possible structural systems, will be evaluated in HAZUS to estimate losses due to shaking.

The ten prototypical building types, each with two possible foundations types and three possible structural systems, will be evaluated outside of HAZUS using a spreadsheet model to estimate losses due to permanent ground deformation. Families of fragilities will be developed for each of these prototypical buildings, foundations types, and building structural systems that will be used in that model.

Table 1. Proposed Prototypical Buildings

No.	Occupancy Category	Occupancy Description/ Size	HAZUS Occupancy Class	Example R.S. Means Model Description (Means Model Number)
1	Multi-family Residential (small)	Low-Rise (1-3 stories)	RES3D (MFR - 10-19 units)	Apt., 1-3 stories, 12,000 SF (M.010)
2	Multi-family Residential (medium)	Mid-Rise (4-7 stories)	RES3E (MFR, 20-49 units)	Apt., 4-7 stories, 40,000 SF (M.020)
3	Multi-family Residential (large)	High-rise (8+ stories)	RES3F (MFR, 50+ units)	Apt., 8-24 stories, 145,000SF (M.030)
4	Offices (small)	Low rise (1-3 stories)	COM4 (Office)	Office, 2-4 stories, 20,000 SF (M.460)
5	Offices (medium)	Mid-rise (4-7 stories)	COM4 (Office)	Office, 5-10 stories, 80,000 SF (M.470)
6	Offices (large)	High-rise (8+ stories)	COM4 (Office)	Office, 11-20 stories, 260,000 SF (M.480)
7	Hotel (medium)	Mid-rise (4-7 stories)	RES4 (Hotel/Motel)	Hotel, 4-7 stories, 135,000 SF (M.350)
8	Hotel (large)	High-rise (8+ stories)	RES4 (Hotel/Motel)	Hotel, 8-24 Stories 450,000 SF (M.360)
9	Multi-use (medium)	Mid-rise (4-7 stories)	COM1/COM4/RES3	Assumed to be 6 stories, 60,000 SF. 1st floor = Store/retail, 2nd & 3rd floor = Offices; 4th floor & above = Apartments
10	Parking Structure	Mid-rise (4-7 stories)	COM10	Garage, Pkg, 5 st., 145,000 SF (M.270)

Table 3.1: Building Structure (Model Building) Types
(from HAZUS Technical Manual)

No.	Label	Description	Height			
			Range		Typical	
			Name	Stories	Stories	Feet
1	W1	Wood, Light Frame ($\leq 5,000$ sq. ft.)		1 - 2	1	14
2	W2	Wood, Commercial and Industrial ($> 5,000$ sq. ft.)		All	2	24
3	S1L	Steel Moment Frame	Low-Rise	1 - 3	2	24
4	S1M		Mid-Rise	4 - 7	5	60
5	S1H		High-Rise	8+	13	156
6	S2L	Steel Braced Frame	Low-Rise	1 - 3	2	24
7	S2M		Mid-Rise	4 - 7	5	60
8	S2H		High-Rise	8+	13	156
9	S3	Steel Light Frame		All	1	15
10	S4L	Steel Frame with Cast-in-Place Concrete Shear Walls	Low-Rise	1 - 3	2	24
11	S4M		Mid-Rise	4 - 7	5	60
12	S4H		High-Rise	8+	13	156
13	S5L	Steel Frame with Unreinforced Masonry Infill Walls	Low-Rise	1 - 3	2	24
14	S5M		Mid-Rise	4 - 7	5	60
15	S5H		High-Rise	8+	13	156
16	C1L	Concrete Moment Frame	Low-Rise	1 - 3	2	20
17	C1M		Mid-Rise	4 - 7	5	50
18	C1H		High-Rise	8+	12	120
19	C2L	Concrete Shear Walls	Low-Rise	1 - 3	2	20
20	C2M		Mid-Rise	4 - 7	5	50
21	C2H		High-Rise	8+	12	120
22	C3L	Concrete Frame with Unreinforced Masonry Infill Walls	Low-Rise	1 - 3	2	20
23	C3M		Mid-Rise	4 - 7	5	50
24	C3H		High-Rise	8+	12	120
25	PC1	Precast Concrete Tilt-Up Walls		All	1	15
26	PC2L	Precast Concrete Frames with Concrete Shear Walls	Low-Rise	1 - 3	2	20
27	PC2M		Mid-Rise	4 - 7	5	50
28	PC2H		High-Rise	8+	12	120
29	RM1L	Reinforced Masonry Bearing Walls with Wood or Metal Deck Diaphragms	Low-Rise	1-3	2	20
30	RM2M		Mid-Rise	4+	5	50
31	RM2L	Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms	Low-Rise	1 - 3	2	20
32	RM2M		Mid-Rise	4 - 7	5	50
33	RM2H		High-Rise	8+	12	120
34	URML	Unreinforced Masonry Bearing Walls	Low-Rise	1 - 2	1	15
35	URM M		Mid-Rise	3+	3	35
36	MH	Mobile Homes		All	1	10

Table 3.2: Building Occupancy Classes
(from HAZUS Technical Manual)

Label	Occupancy Class	Example Descriptions
	Residential	
RES1	Single Family Dwelling	House
RES2	Mobile Home	Mobile Home
RES3	Multi Family Dwelling RES3A Duplex RES3B 3-4 Units RES3C 5-9 Units RES3D 10-19 Units RES3E 20-49 Units RES3F 50+ Units	Apartment/Condominium
RES4	Temporary Lodging	Hotel/Motel
RES5	Institutional Dormitory	Group Housing (military, college), Jails
RES6	Nursing Home	
	Commercial	
COM1	Retail Trade	Store
COM2	Wholesale Trade	Warehouse
COM3	Personal and Repair Services	Service Station/Shop
COM4	Professional/Technical Services	Offices
COM5	Banks	
COM6	Hospital	
COM7	Medical Office/Clinic	
COM8	Entertainment & Recreation	Restaurants/Bars
COM9	Theaters	Theaters
COM10	Parking	Garages
	Industrial	
IND1	Heavy	Factory
IND2	Light	Factory
IND3	Food/Drugs/Chemicals	Factory
IND4	Metals/Minerals Processing	Factory
IND5	High Technology	Factory
IND6	Construction	Office
	Agriculture	
AGR1	Agriculture	
	Religion/Non/Profit	
REL1	Church/Non-Profit	
	Government	
GOV1	General Services	Office
GOV2	Emergency Response	Police/Fire Station/EOC
	Education	
EDU1	Grade Schools	
EDU2	Colleges/Universities	Does not include group housing