Appendices

Appendix A. Classification Systems

Table A.1 Site Classes
(from the 1997 *NEHRP Provisions*)

Site Class	Site Class Description	Shear Wave Velocity (m/sec)	
		Minimum	Maximum
A	HARD ROCK Eastern United States sites only	1500	
B	ROCK	760	1500
C	VERY DENSE SOIL AND SOFT ROCK Untrained shear strength $u_s \geq 2000$ psf ($u_s \geq 100$ kPa) or $N \geq 50$ blows/ft	360	760
D	STIFF SOILS Stiff soil with undrained shear strength 1000 psf $\leq u_s \leq$ 2000 psf (50 kPa $\leq u_s \leq$ 100 kPa) or $15 \leq N \leq 50$ blows/ft	180	360
E	SOFT SOILS Profile with more than 10 ft (3 m) of soft clay defined as soil with plasticity index PI > 20, moisture content w > 40% and undrained shear strength u_s < 1000 psf (50 kPa) (N < 15 blows/ft)		180
F	SOILS REQUIRING SITE SPECIFIC EVALUATIONS 1. Soils vulnerable to potential failure or collapse under seismic loading: e.g. liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays (10 ft (3 m) or thicker layer) 3. Very high plasticity clays: (25 ft (8 m) or thicker layer with plasticity index >75) 4. Very thick soft/medium stiff clays: (120 ft (36 m) or thicker layer)		

Table A.2 Structural Building Classifications (Model Building Types)

No.	Label	Description	Height			
			Range		Typical	
			Name	Stories	Stories	Feet
1	W1	Wood, Light Frame (≤ 5,000 sq. ft.)		1 - 2	1	14
2	W2	Wood, Greater than 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 Wall s with Wood or Metal Deck Diaphragms	Low-Rise	1-3	2	20
30	RM2M		Mid-Rise	4+	5	50
31	RM2L	Reinforced Masonry Bearing Wall s 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	URMM		Mid-Rise	3+	3	35
36	MH	Mobile Homes		All	1	10

Table A.3 Building Occupancy Classes

No.	Label	Occupancy Class	Description
		Residential	
1	RES1	Single Family Dwelling	House
2	RES2	Mobile Home	Mobile Home
3	RES3	Multi Family Dwelling	Apartment/Condominium
4	RES4	Temporary Lodging	Hotel/Motel
5	RES5	Institutional Dormitory	Group Housing (military, college), Jails
6	RES6	Nursing Home	
		Commercial	
7	COM1	Retail Trade	Store
8	COM2	Wholesale Trade	Warehouse
9	COM3	Personal and Repair Services	Service Station/Shop
10	COM4	Financial/Professional/Technical Services	Offices
11	COM5	Banks	
12	COM6	Hospital	
13	COM7	Medical Office/Clinic	
14	COM8	Entertainment & Recreation	Restaurants/Bars
15	COM9	Theaters	Theaters
16	COM10	Parking	Garages
		Industrial	
17	IND1	Heavy	Factory
18	IND2	Light	Factory
19	IND3	Food/Drugs/Chemicals	Factory
20	IND4	Metals/Minerals Processing	Factory
21	IND5	High Technology	Factory
22	IND6	Construction	Office
		Agriculture	
23	AGR1	Agriculture	
		Religion/Non-Profit	
24	REL1	Church	
		Government	
25	GOV1	General Services	Office
26	GOV2	Emergency Response	Police/Fire Station
		Education	
27	EDU1	Schools	
28	EDU2	Colleges/Universities	does not include group housing

Table A.4 Essential Facilities Classification

No.	Label	Occupancy Class	Description
		Medical Care Facilities	
1	EFHS	Small Hospital	Hospital with less than 50 Beds
2	EFHM	Medium Hospital	Hospital with beds between 50 & 150
3	EFHL	Large Hospital	Hospital with greater than 150 Beds
4	EFMC	Medical Clinics	Clinics, Labs, Blood Banks
		Emergency Response	
5	EFFS	Fire Station	
6	EFPS	Police Station	
7	EFEO	Emergency Operation Centers	
		Schools	
8	EFS1	Grade Schools	Primary/ High Schools
9	EFS2	Colleges/Universities	

Table A.5 High Potential Loss Facilities Classification

No.	Class	Description
		Dams
1	HPDE	Earth
2	HPDR	Rockfill
3	HPDG	Concrete Gravity
4	HPDB	Concrete Buttress
5	HPDA	Concrete Arch
6	HPDM	Concrete Multi-Arch
7	HPDC	Concrete Arch-Gravity
8	HPDM	Masonry Gravity
9	HPDD	Masonry Arch
10	HPDS	Stone
11	HPDT	TimberCrib
12	HPDZ	Miscellaneous
		Nuclear Power Facilities
12	HPNP	Nuclear Power Facilities
		Military Installations
13	HPMI	Military Installations

Table A.6 Highway System Classification

bel	escription
	Highway Roads
HRD1	Major Roads
HRD2	Urban Roads
	Highway Bridges
HWB1	Major Bridge - Length > 150m (Conventional Design)
HWB2	Major Bridge - Length > 150m (Seismic Design)
HWB3	Single Span – (Not HWB1 or HWB2) (Conventional Design)
HWB4	Single Span – (Not HWB1 or HWB2) (Seismic Design)
HWB5	Concrete, Multi-Column Bent, Simple Support (Conventional Design), Non-California (Non-CA)
HWB6	Concrete, Multi-Column Bent, Simple Support (Conventional Design), California (CA)
HWB7	Concrete, Multi-Column Bent, Simple Support (Seismic Design)
HWB8	Continuous Concrete, Single Column, Box Girder (Conventional Design)
HWB9	Continuous Concrete, Single Column, Box Girder (Seismic Design)
HWB10	Continuous Concrete, (Not HWB8 or HWB9) (Conventional Design)
HWB11	Continuous Concrete, (Not HWB8 or HWB9) (Seismic Design)
HWB12	Steel, Multi-Column Bent, Simple Support (Conventional Design), Non-California (Non-CA)
HWB13	Steel, Multi-Column Bent, Simple Support (Conventional Design), California (CA)
HWB14	Steel, Multi-Column Bent, Simple Support (Seismic Design)
HWB15	Continuous Steel (Conventional Design)
HWB16	Continuous Steel (Seismic Design)
HWB17	PS Concrete Multi-Column Bent, Simple Support - (Conventional Design), Non-California
HWB18	PS Concrete, Multi-Column Bent, Simple Support (Conventional Design), California (CA)
HWB19	PS Concrete, Multi-Column Bent, Simple Support (Seismic Design)
HWB20	PS Concrete, Single Column, Box Girder (Conventional Design)
HWB21	PS Concrete, Single Column, Box Girder (Seismic Design)
HWB22	Continuous Concrete, (Not HWB20/HWB21) (Conventional Design)
HWB23	Continuous Concrete, (Not HWB20/HWB21) (Seismic Design)
HWB24	Same definition as HWB12 except that the bridge length is less than 20 meters
HWB25	Same definition as HWB13 except that the bridge length is less than 20 meters
HWB26	Same definition as HWB15 except that the bridge length is less than 20 meters and Non-CA
HWB27	Same definition as HWB15 except that the bridge length is less than 20 meters and in CA
HWB28	All other bridges that are not classified (including wooden bridges)
	Highway Tunnels
HTU1	Highway Bored/Drilled Tunnel
HTU2	Highway Cut and Cover Tunnel

Table A.7 Railway System Classification

No.	Label[1]	Description
		Railway Tracks
1	RTR1	Railway Tracks
		Railway Bridges
2	RBR1	Rail Bridge - Seismically Designed/Retrofitted
3	RBR2	Rail Bridge - Conventionally Designed
		Railway Tunnels
4	RTU1	Rail Bored/Drilled Tunnel
5	RTU2	Rail Cut and Cover Tunnel
		Railway Urban Station
6	RST1L	Rail Urban Station, RC Shear Walls
7	RST2L	Rail Urban Station, Braced Steel Frame
8	RST3L	Rail Urban Station, MR Steel Frame
9	RST4L	Rail Urban Station, Steel Frame & URM
10	RST5L	Rail Urban Station, Tilt-Up
11	RST6L	Rail Urban Station, Concrete Frame & URM
12	RST7L	Rail Urban Station, Wood
13	RST1M	Rail Urban Station, RC Shear Walls
14	RST2M	Rail Urban Station, Braced Steel Frame
15	RST3M	Rail Urban Station, MR Steel Frame
16	RST4M	Rail Urban Station, Steel Frame & URM
17	RST5M	Rail Urban Station, Tilt-Up
18	RST6M	Rail Urban Station, Concrete Frame & URM
19	RST7M	Rail Urban Station, Wood
20	RST1H	Rail Urban Station, RC Shear Walls
21	RST2H	Rail Urban Station, Braced Steel Frame
22	RST3H	Rail Urban Station, MR Steel Frame
23	RST4H	Rail Urban Station, Steel Frame & URM
24	RST5H	Rail Urban Station, Tilt-Up

[1] H = high, M = moderate, L = low seismic design level

Table A.7 Cont. Railway System Classification

No.	Label	Description
25	RST6H	Rail Urban Station, Concrete Frame & URM
26	RST7H	Rail Urban Station, Wood
		Railway Fuel Facility
27	RFF1	Rail Fuel Facility w/ Anchored Tanks, w/ Back-Up (BU) Power
28	RFF2	Rail Fuel Facility w/ Anchored Tanks, w/o BU Power
29	RFF3	Rail Fuel Facility w/ Unanchored Tanks, w/ BU Power
30	RFF4	Rail Fuel Facility w/ Unanchored Tanks, w/o BU Power
31	RFF5	Rail Fuel Facility w/ Buried Tanks
		Railway Dispatch Facility
32	RDF1	Rail Dispatch Facility w/ Anchored Sub-Component, w/ BU Power
33	RDF2	Rail Dispatch Facility w/ Anchored Sub-Comp., w/o BU Power
34	RDF3	Rail Dispatch Facility w/ Unanchored Sub-Comp., w/ BU Power
35	RDF4	Rail Dispatch Facility w/ Unanchored Sub-Comp., w/o BU Power
		Railway Maintenance Facility
36	RMF1L	Rail Maintenance Facility, RC Shear Walls
37	RMF2L	Rail Maintenance Facililty, Braced Steel Frame
38	RMF3L	Rail Maintenance Facility, MR Steel Frame
39	RMF4L	Rail Maintenance Facility, Steel Frame & URM
40	RMF5L	Rail Maintenance Facility, Tilt-Up
41	RMF6L	Rail Maintenance Facility, Concrete Frame & URM
42	RMF7L	Rail Maintenance Facility, Wood
43	RMF1M	Rail Maintenance Facility, RC Shear Walls
44	RMF2M	Rail Maintenance Facililty, Braced Steel Frame
45	RMF3M	Rail Maintenance Facility, MR Steel Frame
46	RMF4M	Rail Maintenance Facility, Steel Frame & URM
47	RMF5M	Rail Maintenance Facility, Tilt-Up
48	RMF6M	Rail Maintenance Facility, Concrete Frame & URM
49	RMF7M	Rail Maintenance Facility, Wood
50	RMF1H	Rail Maintenance Facility, RC Shear Walls
51	RMF2H	Rail Maintenance Facililty, Braced Steel Frame
52	RMF3H	Rail Maintenance Facility, MR Steel Frame
53	RMF4H	Rail Maintenance Facility, Steel Frame & URM
54	RMF5H	Rail Maintenance Facility, Tilt-Up
55	RMF6H	Rail Maintenance Facility, Concrete Frame & URM
56	RMF7H	Rail Maintenance Facility, Wood

Table A.8 Light Rail System Classification

No.	Label[2]	Description
		Light Rail Tracks
1	LTR1	Light Rail Track
		Light Rail Bridges
2	LBR1	Light Rail Bridge - Seismically Designed/Retrofitted
3	LBR2	Light Rail Bridge - Conventionally Designed
		Light Rail Tunnels
4	LTU1	Light Rail Bored/Drilled Tunnel
5	LTU2	Light Rail Cut and Cover Tunnel
		DC Substation
6	LDC1	Light Rail DC Substation w/ Anchored Sub-Components
7	LDC2	Light Rail DC Substation w/ Unanchored Sub-Components
		Dispatch Facility
8	LDF1	Light Rail Dispatch Facility w/ Anchored Sub-Comp., w/ Back-Up (BU) Power
9	LDF2	Light Rail Dispatch Facility w/ Anchored Sub-Comp., w/o BU Power
10	LDF3	Light Rail Dispatch Facility w/ Unanchored Sub-Comp., w/ BU Power
11	LDF4	Light Rail Dispatch Facility w/ Unanchored Sub-Comp., w/o BU Power
		Maintenance Facility
12	LMF1L	Maintenance Facility, RC Shear Walls (C2L)
13	LMF2L	Maintenance Facility, Braced Steel Frame (S2L)
14	LMF3L	Maintenance Facility, MR Steel Frame (S1L)
15	LMF4L	Maintenance Facility, Steel Frame & URM (S5L)
16	LMF5L	Maintenance Facility, Tilt-Up (PC1)
17	LMF6L	Maintenance Facility, C3L (Concrete Frame & URM)
18	LMF7L	Maintenance Facility, W1 (Wood)
19	LMF1M	Maintenance Facility, RC Shear Walls (C2L)
20	LMF2M	Maintenance Facility, Braced Steel Frame (S2L)
21	LMF3M	Maintenance Facility, MR Steel Frame (S1L)

[2] H = high, M = moderate, L = low seismic design level

Table A.8 Cont. Light Rail System Classification

No.	Label	Description
22	LMF4M	Maintenance Facility, Steel Frame & URM (S5L)
23	LMF5M	Maintenance Facility, Tilt-Up (PC1)
24	LMF6M	Maintenance Facility, C3L (Concrete Frame & URM)
25	LMF7M	Maintenance Facility, W1 (Wood)
26	LMF1H	Maintenance Facility, RC Shear Walls (C2L)
27	LMF2H	Maintenance Facility, Braced Steel Frame (S2L)
28	LMF3H	Maintenance Facility, MR Steel Frame (S1L)
29	LMF4H	Maintenance Facility, Steel Frame & URM (S5L)
30	LMF5H	Maintenance Facility, Tilt-Up (PC1)
31	LMF6H	Maintenance Facility, C3L (Concrete Frame & URM)
32	LMF7H	Maintenance Facility, W1 (Wood)

Table A.9 Bus System Classification

No.	Label[3]	Description
		Bus Urban Station
1	BPT1L	Bus Urban Station, RC Shear Walls (C2L)
2	BPT2L	Bus Urban Station, Braced Steel Frame (S2L)
3	BPT3L	Bus Urban Station, MR Steel Frame (S1L)
4	BPT4L	Bus Urban Station, Steel Frame & URM (S5L)
5	BPT5L	Bus Urban Station, Tilt-Up (PC1)
6	BPT6L	Bus Urban Station, C3L (Concrete Frame & URM)
7	BPT7L	Bus Urban Station, W1 (Wood)
8	BPT1M	Bus Urban Station, RC Shear Walls (C2L)
9	BPT2M	Bus Urban Station, Braced Steel Frame (S2L)
10	BPT3M	Bus Urban Station, MR Steel Frame (S1L)
11	BPT4M	Bus Urban Station, Steel Frame & URM (S5L)
12	BPT5M	Bus Urban Station, Tilt-Up (PC1)
13	BPT6M	Bus Urban Station, C3L (Concrete Frame & URM)
14	BPT7M	Bus Urban Station, W1 (Wood)
15	BPT1H	Bus Urban Station, RC Shear Walls (C2L)
16	BPT2H	Bus Urban Station, Braced Steel Frame (S2L)
17	BPT3H	Bus Urban Station, MR Steel Frame (S1L)
18	BPT4H	Bus Urban Station, Steel Frame & URM (S5L)
19	BPT5H	Bus Urban Station, Tilt-Up (PC1)
20	BPT6H	Bus Urban Station, C3L (Concrete Frame & URM)
21	BPT7H	Bus Urban Station, W1 (Wood)
		Bus Fuel Facility
22	BFF1	Bus Fuel Facility w/ Anchored Tanks, w/ Back-Up (BU) Power
23	BFF2	Bus Fuel Facility w/ Anchored Tanks, w/o BU Power
24	BFF3	Bus Fuel Facility w/ Unanchored Tanks, w/ BU Power
25	BFF4	Bus Fuel Facility w/ Unanchored Tanks, w/o BU Power
26	BFF5	Bus Fuel Facility w/ Buried Tanks

[3] Note: H = high, M = moderate, L = low seismic design level.

Table A.9 Cont. Bus System Classification

No.	Name	Description
		Bus Dispatch Facility
27	BDF1	Bus Dispatch Facility w/ Anchored Sub-Comp., w/ BU Power
28	BDF2	Bus Dispatch Facility w/ Anchored Sub-Comp., w/o BU Power
29	BDF3	Bus Dispatch Facility w/ Unanchored Sub-Comp., w/ BU Power
30	BDF4	Bus Dispatch Facility w/ Unanchored Sub-Comp., w/o BU Power
		Bus Maintenance Facility
31	BMF1L	Bus Maintenance Facilities, RC Shear Walls (C2L)
32	BMF2L	Bus Maintenance Facilities, Braced Steel Frame (S2L)
33	BMF3L	Bus Maintenance Facilities, MR Steel Frame (S1L)
34	BMF4L	Bus Maintenance Facilities, Steel Frame & URM (S5L)
35	BMF5L	Bus Maintenance Facilities, Tilt-Up (PC1)
36	BMF6L	Bus Maintenance Facilities, C3L (Concrete Frame & URM)
37	BMF7L	Bus Maintenance Facilities, W1 (Wood)
38	BMF1M	Bus Maintenance Facilities, RC Shear Walls (C2L)
39	BMF2M	Bus Maintenance Facilities, Braced Steel Frame (S2L)
40	BMF3M	Bus Maintenance Facilities, MR Steel Frame (S1L)
41	BMF4M	Bus Maintenance Facilities, Steel Frame & URM (S5L)
42	BMF5M	Bus Maintenance Facilities, Tilt-Up (PC1)
43	BMF6M	Bus Maintenance Facilities, C3L (Concrete Frame & URM)
44	BMF7M	Bus Maintenance Facilities, W1 (Wood)
45	BMF1H	Bus Maintenance Facilities, RC Shear Walls (C2L)
46	BMF2H	Bus Maintenance Facilities, Braced Steel Frame (S2L)
47	BMF3H	Bus Maintenance Facilities, MR Steel Frame (S1L)
48	BMF4H	Bus Maintenance Facilities, Steel Frame & URM (S5L)
49	BMF5H	Bus Maintenance Facilities, Tilt-Up (PC1)
50	BMF6H	Bus Maintenance Facilities, C3L (Concrete Frame & URM)
51	BMF7H	Bus Maintenance Facilities, W1 (Wood)

Note: H = high, M = moderate, L = low seismic design level

Table A.10 Port and Harbor System Classification

No.	Label	Description
		Waterfront Structures
1	PWS1	Waterfront Structures
		Cranes/Cargo Handling Equipment
2	PEQ1	Stationary Port Handling Equipment
3	PEQ2	Rail Mounted Port Handling Equipment
		Warehouses
4	PWH1L	Port Warehouses, RC Shear Walls (C2L)
5	PWH2L	Port Warehouses, Braced Steel Frame (S2L)
6	PWH3L	Port Warehouses, MR Steel Frame (S1L)
7	PWH4L	Port Warehouses, Steel Frame & URM (S5L)
8	PWH5L	Port Warehouses, Tilt-Up (PC1)
9	PWH6L	Port Warehouses, C3L (Concrete Frame & URM)
10	PWH7L	Port Warehouses, W1 (Wood)
11	PWH1M	Port Warehouses, RC Shear Walls (C2L)
12	PWH2M	Port Warehouses, Braced Steel Frame (S2L)
13	PWH3M	Port Warehouses, MR Steel Frame (S1L)
14	PWH4M	Port Warehouses, Steel Frame & URM (S5L)
15	PWH5M	Port Warehouses, Tilt-Up (PC1)
16	PWH6M	Port Warehouses, C3L (Concrete Frame & URM)
17	PWH7M	Port Warehouses, W1 (Wood)
18	PWH1H	Port Warehouses, RC Shear Walls (C2L)
19	PWH2H	Port Warehouses, Braced Steel Frame (S2L)
20	PWH3H	Port Warehouses, MR Steel Frame (S1L)
21	PWH4H	Port Warehouses, Steel Frame & URM (S5L)
22	PWH5H	Port Warehouses, Tilt-Up (PC1)
23	PWH6H	Port Warehouses, C3L (Concrete Frame & URM)
24	PWH7H	Port Warehouses, W1 (Wood)
		Fuel Facility
25	PFF1	Port Fuel Facility w/ Anchored Tanks, w/ Back-Up (BU) Power
26	PFF2	Port Fuel Facility w/ Anchored Tanks, w/o BU Power
27	PFF3	Port Fuel Facility w/ Unanchored Tanks, w/ BU Power
28	PFF4	Port Fuel Facility w/ Unanchored Tanks, w/o BU Power
29	PFF5	Port Fuel Facility w/ Buried Tanks

Note: H = high, M = moderate, L = low seismic design level.

Table A.11 Ferry System Classification

No.	Label	Description
		Water Front Structures
1	FWS1	Ferry Waterfront Structures
		Ferry Passenger Terminals
2	FPT1L	Passenger Terminals, RC Shear Walls (C2L)
3	FPT2L	Passenger Terminals, Braced Steel Frame (S2L)
4	FPT3L	Passenger Terminals, MR Steel Frame (S1L)
5	FPT4L	Passenger Terminals, Steel Frame & URM (S5L)
6	FPT5L	Passenger Terminals, Tilt-Up (PC1)
7	FPT6L	Passenger Terminals, C3L (Concrete Frame & URM)
8	FPT7L	Passenger Terminals, W1 (Wood)
9	FPT1M	Passenger Terminals, RC Shear Walls (C2L)
10	FPT2M	Passenger Terminals, Braced Steel Frame (S2L)
11	FPT3M	Passenger Terminals, MR Steel Frame (S1L)
12	FPT4M	Passenger Terminals, Steel Frame & URM (S5L)
13	FPT5M	Passenger Terminals, Tilt-Up (PC1)
14	FPT6M	Passenger Terminals, C3L (Concrete Frame & URM)
15	FPT7M	Passenger Terminals, W1 (Wood)
16	FPT1H	Passenger Terminals, RC Shear Walls (C2L)
17	FPT2H	Passenger Terminals, Braced Steel Frame (S2L)
18	FPT3H	Passenger Terminals, MR Steel Frame (S1L)
19	FPT4H	Passenger Terminals, Steel Frame & URM (S5L)
20	FPT5H	Passenger Terminals, Tilt-Up (PC1)
21	FPT6H	Passenger Terminals, C3L (Concrete Frame & URM)
22	FPT7H	Passenger Terminals, W1 (Wood)
		Ferry Fuel Facility
23	FFF1	Ferry Fuel Facility w/ Anchored Tanks, w/ Back-Up (BU) Power
24	FFF2	Ferry Fuel Facility w/ Anchored Tanks, w/o BU Power
25	FFF3	Ferry Fuel Facility w/ Unanchored Tanks, w/ BU Power
26	FFF4	Ferry Fuel Facility w/ Unanchored Tanks, w/o BU Power
27	FFF5	Ferry Fuel Facility w/ Buried Tanks

Note: H = high, M = moderate, L = low seismic design level.

Table A.11 Cont. Ferry System Classification

No.	Label	Description
		Ferry Dispatch Facility
28	FDF1	Ferry Dispatch Facility w/ Anchored Sub-Comp., w/ BU Power
29	FDF2	Ferry Dispatch Facility w/ Anchored Sub-Comp., w/o BU Power
30	FDF3	Ferry Dispatch Facility w/ Unanchored Sub-Comp., w/ BU Power
31	FDF4	Ferry Dispatch Facility w/ Unanchored Sub-Comp., w/o BU Power
		Ferry Maintenance Facility
32	FMF1L	Piers and Dock Facilities, RC Shear Walls (C2L)
33	FMF2L	Piers and Dock Facilities, Braced Steel Frame (S2L)
34	FMF3L	Piers and Dock Facilities, MR Steel Frame (S1L)
35	FMF4L	Piers and Dock Facilities, Steel Frame & URM (S5L)
36	FMF5L	Piers and Dock Facilities, Tilt-Up (PC1)
37	FMF6L	Piers and Dock Facilities, C3L (Concrete Frame & URM)
38	FMF7L	Piers and Dock Facilities, W1 (Wood)
39	FMF1M	Piers and Dock Facilities, RC Shear Walls (C2L)
40	FMF2M	Piers and Dock Facilities, Braced Steel Frame (S2L)
41	FMF3M	Piers and Dock Facilities, MR Steel Frame (S1L)
42	FMF4M	Piers and Dock Facilities, Steel Frame & URM (S5L)
43	FMF5M	Piers and Dock Facilities, Tilt-Up (PC1)
44	FMF6M	Piers and Dock Facilities, C3L (Concrete Frame & URM)
45	FMF7M	Piers and Dock Facilities, W1 (Wood)
46	FMF1H	Piers and Dock Facilities, RC Shear Walls (C2L)
47	FMF2H	Piers and Dock Facilities, Braced Steel Frame (S2L)
48	FMF3H	Piers and Dock Facilities, MR Steel Frame (S1L)
49	FMF4H	Piers and Dock Facilities, Steel Frame & URM (S5L)
50	FMF5H	Piers and Dock Facilities, Tilt-Up (PC1)
51	FMF6H	Piers and Dock Facilities, C3L (Concrete Frame & URM)
52	FMF7H	Piers and Dock Facilities, W1 (Wood)

Note: H = high, M = moderate, L = low seismic design level.

Table A.12 Airport System Classification

No.	Label	Description
		Airport Control Towers
1	ACT1L	Airport Control Tower, RC Shear Walls (C2L)
2	ACT2L	Airport Control Tower, Braced Steel Frame (S2L)
3	ACT3L	Airport Control Tower, MR Steel Frame (S1L)
4	ACT4L	Airport Control Tower, Steel Frame & URM (S5L)
5	ACT5L	Airport Control Tower, Tilt-Up (PC1)
6	ACT6L	Airport Control Tower, C3L (Concrete Frame & URM)
7	ACT7L	Airport Control Tower, W1 (Wood)
8	ACT1M	Airport Control Tower, RC Shear Walls (C2L)
9	ACT2M	Airport Control Tower, Braced Steel Frame (S2L)
10	ACT3M	Airport Control Tower, MR Steel Frame (S1L)
11	ACT4M	Airport Control Tower, Steel Frame & URM (S5L)
12	ACT5M	Airport Control Tower, Tilt-Up (PC1)
13	ACT6M	Airport Control Tower, C3L (Concrete Frame & URM)
14	ACT7M	Airport Control Tower, W1 (Wood)
15	ACT1H	Airport Control Tower, RC Shear Walls (C2L)
16	ACT2H	Airport Control Tower, Braced Steel Frame (S2L)
17	ACT3H	Airport Control Tower, MR Steel Frame (S1L)
18	ACT4H	Airport Control Tower, Steel Frame & URM (S5L)
19	ACT5H	Airport Control Tower, Tilt-Up (PC1)
20	ACT6H	Airport Control Tower, C3L (Concrete Frame & URM)
21	ACT7H	Airport Control Tower, W1 (Wood)
		Airport Runways
22	ARW1	Airport Runway
		Airport Terminal Buildings
23	ATB1L	Airport Terminal Building, RC Shear Walls (C2L)
24	ATB2L	Airport Terminal Building, Braced Steel Frame (S2L)
25	ATB3L	Airport Terminal Building, MR Steel Frame (S1L)
26	ATB4L	Airport Terminal Building, Steel Frame & URM (S5L)
27	ATB5L	Airport Terminal Building, Tilt-Up (PC1)

Note: H = high, M = moderate, L = low seismic design level.

Table A.12 Cont. Airort System Classification

No.	Label	Description
28	ATB6L	Airport Terminal Building, W1 (Wood)
29	ATB1M	Airport Terminal Building, RC Shear Walls (C2L)
30	ATB2M	Airport Terminal Building, Braced Steel Frame (S2L)
31	ATB3M	Airport Terminal Building, MR Steel Frame (S1L)
32	ATB4M	Airport Terminal Building, Steel Frame & URM (S5L)
33	ATB5M	Airport Terminal Building, Tilt-Up (PC1)
34	ATB6M	Airport Terminal Building, W1 (Wood)
35	ATB1H	Airport Terminal Building, RC Shear Walls (C2L)
36	ATB2H	Airport Terminal Building, Braced Steel Frame (S2L)
37	ATB3H	Airport Terminal Building, MR Steel Frame (S1L)
38	ATB4H	Airport Terminal Building, Steel Frame & URM (S5L)
39	ATB5H	Airport Terminal Building, Tilt-Up (PC1)
40	ATB6H	Airport Terminal Building, W1 (Wood)
41	ATBU1	Airport Terminal Building w/Unknown Structure Type
		Airport Parking Structures
42	APS1L	Airport Parking Structure, RC Shear Walls (C2L)
43	APS2L	Airport Parking Structure, Braced Steel Frame (S2L)
44	APS3L	Airport Parking Structure, MR Steel Frame (S1L)
45	APS4L	Airport Parking Structure, Steel Frame & URM (S5L)
46	APS5L	Airport Parking Structure, Tilt-Up (PC1)
47	APS6L	Airport Parking Structure, W1 (Wood)
48	APS1M	Airport Parking Structure, RC Shear Walls (C2L)
49	APS2M	Airport Parking Structure, Braced Steel Frame (S2L)
50	APS3M	Airport Parking Structure, MR Steel Frame (S1L)
51	APS4M	Airport Parking Structure, Steel Frame & URM (S5L)
52	APS5M	Airport Parking Structure, Tilt-Up (PC1)
53	APS6M	Airport Parking Structure, W1 (Wood)
54	APS1H	Airport Parking Structure, RC Shear Walls (C2L)
55	APS2H	Airport Parking Structure, Braced Steel Frame (S2L)
56	APS3H	Airport Parking Structure, MR Steel Frame (S1L)
57	APS4H	Airport Parking Structure, Steel Frame & URM (S5L)
58	APS5H	Airport Parking Structure, Tilt-Up (PC1)
59	APS6H	Airport Parking Structure, W1 (Wood)

Note: H = high, M = moderate, L = low seismic design level.

Table A.12 Cont. Airport ystem Classification

No.	Label	Description
		Fuel Facilities
60	AFF1	Airport Fuel Facility w/ Anchored Tanks, w/ Back-Up (BU) Power
61	AFF2	Airport Fuel Facility w/ Anchored Tanks, w/o BU Power
62	AFF3	Airport Fuel Facility w/ Unanchored Tanks, w/ BU Power
63	AFF4	Airport Fuel Facility w/ Unanchored Tanks, w/o BU Power
64	AFF5	Airport Fuel Facility w/ Buried Tanks
		Airport Maintenance & Hangar Facility
65	AMF1L	Airport Maintenance & Hangar Facility, RC Shear Walls (C2L)
66	AMF2L	Airport Maintenance & Hangar Facility, Braced Steel Frame (S2L)
67	AMF3L	Airport Maintenance & Hangar Facility, MR Steel Frame (S1L)
68	AMF4L	Airport Maintenance & Hangar Facility, Steel Frame & URM (S5L)
69	AMF5L	Airport Maintenance & Hangar Facility, Tilt-Up (PC1)
70	AMF6L	Airport Maintenance & Hangar Facility, C3L (Concrete Frame & URM)
71	AMF7L	Airport Maintenance & Hangar Facility, W1 (Wood)
72	AMF1M	Airport Maintenance & Hangar Facility, RC Shear Walls (C2L)
73	AMF2M	Airport Maintenance & Hangar Facility, Braced Steel Frame (S2L)
74	AMF3M	Airport Maintenance & Hangar Facility, MR Steel Frame (S1L)
75	AMF4M	Airport Maintenance & Hangar Facility, Steel Frame & URM (S5L)
76	AMF5M	Airport Maintenance & Hangar Facility, Tilt-Up (PC1)
77	AMF6M	Airport Maintenance & Hangar Facility, C3L (Concrete Frame & URM)
78	AMF7M	Airport Maintenance & Hangar Facility, W1 (Wood)
79	AMF1H	Airport Maintenance & Hangar Facility, RC Shear Walls (C2L)
80	AMF2H	Airport Maintenance & Hangar Facility, Braced Steel Frame (S2L)
81	AMF3H	Airport Maintenance & Hangar Facility, MR Steel Frame (S1L)
82	AMF4H	Airport Maintenance & Hangar Facility, Steel Frame & URM (S5L)
83	AMF5H	Airport Maintenance & Hangar Facility, Tilt-Up (PC1)
84	AMF6H	Airport Maintenance & Hangar Facility, C3L (Concrete Frame & URM)
85	AMF7H	Airport Maintenance & Hangar Facility, W1 (Wood)
		Airport Facilities - Others
86	AFO1	Gliderport, Seaport, Stolport, Ultralight or Baloonport Facilities
87	AFH1	Heliport Facilities

Note: H = high, M = moderate, L = low seismic design level.

Table A.13 Potable Water System Classification

No.	Label	Description
		Pipelines
1	PWP1	Brittle Pipe
2	PWP2	Ductile Pipe
		Water Treatment Plants
3	PWT1	Small WTP with Anchored Components < 50 MGD
4	PWT2	Small WTP with Unanchored Components < 50 MGD
5	PWT3	Medium WTP with Anchored Components 50-200 MGD
6	PWT4	Medium WTP with Unanchored Components 50-200 MGD
7	PWT5	Large WTP with Anchored Components > 200 MGD
8	PWT6	Large WTP with Unanchored Components > 200 MGD
		Wells
9	PWE1	Wells
		Water Storage Tanks (Typically, 0.5 MGD to 2 MGD)
10	PST1	On Ground Anchored Concrete Tank
11	PST2	On Ground Unanchored Concrete Tank
12	PST3	On Ground Anchored Steel Tank
13	PST4	On Ground Unanchored Steel Tank
14	PST5	Above Ground Steel Tank
15	PST6	On Ground Wood Tank
16	PST7	Buried Concrete Tank
		Pumping Plants
17	PPP1	Small Pumping Plant with Anchored Equipment < 10 MGD
18	PPP2	Small Pumping Plant with Unanchored Equipment < 10 MGD
19	PPP3	Medium/Large Pumping Plant with Anchored Equipment ≥ 10 MGD
20	PPP4	Medium/Large Pumping Plant with Unanchored Equipment ≥10 MGD

Table A.14 Waste Water System Classification

No.	Label	Description
		Buried Pipelines
1	WWP1	Brittle Pipe
2	WWP2	Ductile Pipe
		Waste Water Treatment Plants
3	WWT1	Small WWTP with Anchored Components < 50 MGD
4	WWT2	Small WWTP with Unanchored Components < 50 MGD
5	WWT3	Medium WWTP with Anchored Components 50-200 MGD
6	WWT4	Medium WWTP with Unanchored Components 50-200 MGD
7	WWT5	Large WWTP with Anchored Components > 200 MGD
8	WWT6	Large WWTP with Unanchored Components > 200 MGD
		Lift Stations
9	WLS1	Small Lift Stations with Anchored Components < 10 MGD
10	WLS2	Small Lift Stations with Unanchored Components < 10 MGD
11	WLS3	Medium/Large Lift Stations with Anchored Components ≥ 10 MGD
12	WLS4	Medium/Large Lift Stations with Unanchored Components ≥ 10 MGD

Table A.5 Oil System Classification

No.	Label	Description
		Pipelines
1	OIP1	Welded Steel Pipe with Gas Welded Joints
2	OIP2	Welded Steel Pipe with Arc Welded Joints
		Refineries
3	ORF1	Small Refinery with Anchored Equipment < 100,000 bl/day
4	ORF2	Small Refinery with Unanchored Equipment < 100,000 bl/day
5	ORF3	Medium/Large Refinery with Anchored Equipment ≥ 100,000 bl/day
6	ORF4	Medium/Large Refinery with Unanchored Equipment ≥100,000 bl/day
		Pumping Plants
7	OPP1	Pumping Plant with Anchored Equipment
8	OPP2	Pumping Plant with Unanchored Equipment
		Tank Farms
9	OTF1	Tank Farms with Anchored Tanks
10	OTF2	Tank Farms with Unanchored Tanks

Table A.16 Natural Gas System Classification

No.,	Name	Description
		Buried Pipelines
1	NGP1	Welded Steel Pipe with Gas Welded Joints
2	NGP2	Welded Steel Pipe with Arc Welded Joints
		Compressor Stations
3	NGC1	Compressor Stations with Anchored Components
4	NGC2	Compressor Stations with Unanchored Components

Table A.17 Electric Power System Classification

No.	Name	Description
		Transmission Substations
1	ESS1	Low Voltage (115 KV) Substation with Anchored Components
2	ESS2	Low Voltage (115 KV) Substation with Unanchored Components
3	ESS3	Medium Voltage (230 KV) Substation with Anchored Components
4	ESS4	Medium Voltage (230 KV) Substation with Unanchored Components
5	ESS5	High Voltage (500 KV) Substation with Anchored Components
6	ESS6	High Voltage (500 KV) Substation with Unanchored Components
		Distribution Circuits
7	EDC1	Distribution Circuits with Seismically Designed Components
8	EDC2	Distribution Circuits with Standard Components
		Generation Plants
9	EPP1	Small Power Plants with Anchored Components < 100 MW
10	EPP2	Small Power Plants with Unanchored Components < 100 MW
11	EPP3	Medium/Large Power Plants with Anchored Components ≥ 100 MW
12	EPP4	Medium/Large Power Plants with Unanchored Components ≥100 MW

Table A.18 Communication Classification

No.	Name	Description
		Central Offices
1	CCO1	Central Offices with Anchored Components , w/ Back-Up (BU) Power
2	CCO2	Central Offices with Anchored Components , w/o BU Power
3	CCO3	Central Offices with Unanchored Components , w/ BU Power
4	CCO4	Central Offices with Unanchored Components , w/o BU Power
		Stations or Transmitters
5	CBR1	AM or FM radio stations or transmitters
6	CBT1	TV stations or transmitters
7	CBW1	Weather stations or transmitters
8	CBO1	Other stations or transmitters

Table A.19 Mapping of Standard Industrial Codes to NIBS Occupancy Classes

Label	Occupancy Class	Standard Industrial Codes (SIC)
	Residential	
RES1	Single Family Dwelling	
RES2	Mobile Home	
RES3	Multi Family Dwelling	
RES4	Temporary Lodging	70
RES5	Institutional Dormitory	
RES6	Nursing Home	8051, 8052, 8059
	Commercial	
COM1	Retail Trade	52, 53, 54, 55, 56, 57, 59
COM2	Wholesale Trade	42, 50, 51
COM3	Personal and Repair Services	72, 75, 76, 83, 88
COM4	Business/Professional/Technical Services	40, 41, 44, 45, 46, 47, 49, 61, 62, 63, 64, 65, 67, 73, 78 (except 7832), 81, 87, 89
COM5	Depository Institutions	60
COM6	Hospital	8062, 8063, 8069
COM7	Medical Office/Clinic	80 (except 8051, 8052, 8059, 8062, 8063, 8069)
COM8	Entertainment & Recreation	48, 58, 79 (except 7911), 84
COM9	Theaters	7832, 7911
COM10	Parking	
	Industrial	
IND1	Heavy	22, 24, 26, 32, 34, 35 (except 3571, 3572), 37
IND2	Light	23, 25, 27, 30, 31, 36 (except 3671, 3672, 3674), 38, 39
IND3	Food/Drugs/Chemicals	20, 21, 28, 29
IND4	Metals/Minerals Processing	10, 12, 13, 14, 33
IND5	High Technology	3571, 3572, 3671, 3672, 3674
IND6	Construction	15, 16, 17
	Agriculture	
AGR1	Agriculture	01, 02, 07, 08, 09
	Religion/Non-Profit	
REL1	Church/Membership Organizations	86
	Government	
GOV1	General Services	43, 91, 92 (except 9221, 9224) , 93, 94, 95, 96, 97
GOV2	Emergency Response	9221, 9224
	Education	
EDU1	Schools/Libraries	82 (except 8221, 8222)
EDU2	Colleges/Universities	8221, 8222

Appendix B. Descriptions of Model Building Types

Table B.1 lists 36 model building types which have been defined for the methodology. The classification system is based on the classification system of FEMA-178 (1992). By reviewing the table it can be seen that there are 16 basic building types (shown in bold) with some building types being subdivided with respect to height. Each basic building class is defined by a short description of its structural system. These descriptions are based on FEMA-178 and follow Table B.1.

Table B.1 Structural Building Classifications (Model Building Types)

No.	Label	Description	Height
1	W1	Wood, Light Frame (W1)	ALL
2	W2	Wood, Commercial and Industrial (W2)	ALL
		Steel Moment Frame (S1)	
3	S1L	Low-Rise	1-3
4	S1M	Mid-Rise	4-7
5	S1H	High-Rise	8+
		Steel Braced Frame (S2)	
6	S2L	Low-Rise	1-3
7	S2M	Mid-Rise	4-7
8	S2H	High-Rise	8+
9	S3	Steel Light Frame (S3)	
		Steel Frame w/ Cast-in-Place Concrete Shear Walls (S4)	
10	S4L	Low-Rise	1-3
11	S4M	Mid-Rise	4-7
12	S4H	High-Rise	8+
		Steel Frame w/ Unreinforced Masonry Infill Walls (S5)	
13	S5L	Low-Rise	1-3
14	S5M	Mid-Rise	4-7
15	S5H	High-Rise	8+
		Reinforced Concrete Moment Resisting Frame (C1)	
16	C1L	Low-Rise	1-3
17	C1M	Mid-Rise	4-7
18	C1H	High-Rise	8+
		Concrete Shear Walls (C2)	
19	C2L	Low-Rise	1-3
20	C2M	Mid-Rise	4-7
21	C2H	High-Rise	8+
		Concrete Frame Buildings w/ Unreinforced Masonry Infill Walls (C3)	
22	C3L	Low-Rise	1-3
23	C3M	Mid-Rise	4-7
24	C3H	High-Rise	8+

Table B.1 Cont. Structural Building Classifications (Model Building Types)

No.	Label	Description	Height
		Precast-Concrete Tilt-Up Walls (PC1)	
25	PC1	Low-Rise	ALL
		Precast Concrete Frames w/ Concrete Shear Walls (PC2)	
26	PC2L	Low-Rise	1-3
27	PC2M	Mid-Rise	4-7
28	PC2H	High-Rise	8+
		Reinforced Masonry Bearing Walls w/ Wood or Metal Deck Diaphragms (RM1)	
29	RM1L	Low-Rise	1-3
30	RM1M	Mid-Rise	4+
		Reinforced Masonry Bearing Walls w/ Precast Concrete Diaphragms (RM2)	
31	RM2L	Low-Rise	1-3
32	RM2M	Mid-Rise	4-7
33	RM2H	High-Rise	8+
		Unreinforced Masonry Bearing Walls (URM)	
34	URML	Low-Rise	1-2
35	URMM	Mid-Rise	3+
36	MH	Mobile Home (MH)	

B.1 Wood, Light Frame (W1):

These are typically single- or multiple-family dwellings. The essential structural feature of these buildings is repetitive framing by wood rafters or joists on wood stud walls. Loads are light and spans are small. These buildings may have relatively heavy masonry chimneys and may be partially or fully covered with masonry veneer. Most of these buildings, especially the single-family residences, are not engineered but constructed in accordance with "conventional construction" provisions of building codes. Hence, they usually have the components of a lateral-force-resisting system even though it may be incomplete. Lateral loads are transferred by diaphragms to shear walls. The diaphragms are roof panels and floors which may be sheathed with wood, plywood or fiberboard sheathing. Shear walls are exterior walls sheathed with boards, stucco, plaster, plywood, gypsum board, particle board, or fiberboard, or interior partition walls sheathed with plaster or gypsum board.

B.2 Wood, Commercial and Industrial (W2):

These buildings usually are commercial or industrial buildings with a floor area of 5,000 square feet or more and with few, if any, interior walls. The essential structural character of these buildings is framing by beams or major horizontally spanning members over columns. These horizontal members may be glued-laminated (glu-lam) wood, solid-sawn wood beams, or wood trusses, or steel beams, or trusses. Lateral loads usually are resisted by wood diaphragms and exterior walls sheathed with plywood, stucco, plaster, or other paneling. The walls may have diagonal rod bracing. Large openings for storefronts and garages often require post-and-beam framing. Lateral load resistance on those lines may be achieved with steel rigid frames (moment frames) or diagonal bracing.

B.3 Steel Moment Frame (S1):

These buildings have a frame of steel columns and beams. In some cases, the beam-column connections have very small moment resisting capacity but, in other cases, some of the beams and columns are fully developed as moment frames to resist lateral forces. Usually the structure is concealed on the outside by exterior walls, which can be of almost any material (curtain walls, brick masonry, or precast concrete panels), and on the inside by ceilings and column furring. Lateral loads are transferred by diaphragms to moment resisting frames. The diaphragms can be almost any material. The frames develop their stiffness by full or partial moment connections. The frames can be located almost anywhere in the building. Usually the columns have their strong directions oriented so that some columns act primarily in one direction while the others act in the other direction. Steel moment frame buildings are typically more flexible than shear wall buildings. This low stiffness can result in large interstory drifts that may lead to relatively greater nonstructural damage.

B.4 Steel Braced Frame (S2):

These buildings are similar to steel moment frame buildings except that the vertical components of the lateral-force-resisting system are braced frames rather than moment frames.

B.5 Steel Light Frame (S3):

These buildings are pre-engineered and prefabricated with transverse rigid frames. The roof and walls consist of lightweight panels, usually corrugated metal. The frames are designed for maximum efficiency, often with tapered beam and column sections built up of light steel plates. The frames are built in segments and assembled in the field with bolted joints. Lateral loads in the transverse direction are resisted by the rigid frames with loads distributed to them by diaphragm elements, typically rod-braced steel roof framing bays. Loads in the longitudinal direction are resisted entirely by shear elements which can be either the roof and wall sheathing panels, an independent system of tension-only rod bracing, or a combination of panels and bracing.

B.6 Steel Frame with Cast-In-Place Concrete Shear Walls (S4):

The shear walls in these buildings are cast-in-place concrete and may be bearing walls. The steel frame is designed for vertical loads only. Lateral loads are transferred by diaphragms of almost any material to the shear walls. The steel frame may provide a secondary lateral-force-resisting system depending on the stiffness of the frame and the moment capacity of the beam-column connections. In modern “dual” systems, the steel moment frames are designed to work together with the concrete shear walls in proportion to their relative rigidities.

B.7 Steel Frame with Unreinforced Masonry Infill Walls (S5):

This is one of the older types of buildings. The infill walls usually are offset from the exterior frame members, wrap around them, and present a smooth masonry exterior with no indication of the frame. Solidly infilled masonry panels, when they fully engage the surrounding frame members (i.e. lie in the same plane), provide stiffness and lateral load resistance to the structure.

B.8 Reinforced Concrete Moment Resisting Frames (C1):

These buildings are similar to steel moment frame buildings except that the frames are reinforced concrete. There is a large variety of frame systems. Some older concrete frames may be proportioned and detailed such that brittle failure of the frame members can occur in earthquakes, leading to partial or full collapse of the buildings. Modern frames in zones of high seismicity are proportioned and detailed for ductile behavior and are likely to undergo large deformations during an earthquake without brittle failure of frame members and collapse.

B.9 Concrete Shear Walls (C2):

The vertical components of the lateral-force-resisting system in these buildings are concrete shear walls that are usually bearing walls. In older buildings, the walls often are quite extensive and the wall stresses are low but reinforcing is light. In newer buildings, the shear walls often are limited in extent, thus generation concerns about boundary members and overturning forces.

B.10 Concrete Frame Buildings with Unreinforced Masonry Infill Walls (C3):

These buildings are similar to steel frame buildings with unreinforced masonry infill walls except that the frame is of reinforced concrete. In these buildings, the shear strength of the columns, after cracking of the infill, may limit the semiductile behavior of the system.

B.11 Precast Concrete Tilt-Up Walls (PC1):

These buildings have a wood or metal deck roof diaphragm, which often is very large, that distributes lateral forces to precast concrete shear walls. The walls are thin but relatively heavy while the roofs are relatively light. Older buildings often have inadequate connections for anchorage of the walls to the roof for out-of-plane forces, and the panel connections often are brittle. Tilt-up buildings usually are one or two stories in height. Walls can have numerous openings for doors and windows of such size that the wall looks more like a frame than a shear wall.

B.12 Precast Concrete Frames with Concrete Shear Walls (PC2):

These buildings contain floor and roof diaphragms typically composed of precast concrete elements with or without cast-in-place concrete topping slabs. The diaphragms are supported by precast concrete girders and columns. The girders often bear on column corbels. Closure strips between precast floor elements and beam-column joints usually are cast-in-place concrete. Welded steel inserts often are used to interconnect precast elements. Lateral loads are resisted by precast or cast-in-place concrete shear walls. For buildings with precast frames and concrete shear walls to perform well, the details used to connect the structural elements must have sufficient strength and displacement capacity; however, in some cases, the connection details between the precast elements have negligible ductility.

B.13 Reinforced Masonry Bearing Walls with Wood or Metal Deck Diaphragms (RM1):

These buildings have perimeter bearing walls of reinforced brick or concrete-block masonry. These walls are the vertical elements in the lateral-force-resisting system. The floors and roofs are framed either with wood joists and beams with plywood or straight or diagonal sheathing, or with steel beams with metal deck with or without a concrete fill. Wood floor framing is supported by interior wood posts or steel columns; steel beams are supported by steel columns.

B.14 Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms (RM2):

These buildings have bearing walls similar to those of reinforced masonry bearing wall structures with wood or metal deck diaphragms, but the roof and floors are composed of precast concrete elements such as planks or tee-beams and the precast roof and floor elements are supported on interior beams and columns of steel or concrete (cast-in-place or precast). The precast horizontal elements often have a cast-in-place topping.

B.15 Unreinforced Masonry Bearing Walls (URM):

These buildings include structural elements that vary depending on the building's age and, to a lesser extent, its geographic location. In buildings built before 1900, the majority of floor and roof construction consists of wood sheathing supported by wood subframing. In large multistory buildings, the floors are cast-in-place concrete supported by the unreinforced masonry walls and/or steel or concrete interior framing. In unreinforced masonry constructed after 1950 wood floors usually have plywood rather than board sheathing. In regions of lower seismicity, buildings of this type constructed more recently can include floor and roof framing that consists of metal deck and concrete fill supported by steel framing elements. The perimeter walls, and possibly some interior walls, are unreinforced masonry. The walls may or may not be anchored to the diaphragms. Ties between the walls and diaphragms are more common for the bearing walls than for walls that are parallel to the floor framing. Roof ties usually are less common and more erratically spaced than those at the floor levels. Interior partitions that interconnect the floors and roof can have the effect of reducing diaphragm displacements.

B.16 Mobile Homes (MH):

These are prefabricated housing units that are trucked to the site and then placed on isolated piers, jackstands, or masonry block foundations (usually without any positive anchorage). Floors and roofs of mobile homes usually are constructed with plywood and outside surfaces are covered with sheet metal.

Appendix C. Description of Lifeline Componenets

C.1 Highway Transportation System

Below is a list of highway components which have been defined for the methodology. The list indicates the 3 basic components of the transportation system. Some of these components are subdivided further.

- Highway Roads
- Highway Bridges
- Highway Tunnels

C.1.1 Highway Roads

Highway roads are classified as major roads and urban roads. Major roads include interstate and state highways and other roads with four lanes or more. Parkways are also classified as major roads. Urban roads include inter-city roads and other roads with two lanes.

C.1.2 Bridges

Bridges are classified based on the following structural characteristics:

- Seismic Design
- Number of spans: single vs. multiple span bridges
- Structure type: concrete, steel, others
- Pier type: multiple column bents, single column bents and pier walls
- Abutment type and bearing type: monolithic vs. non-monolithic; high rocker bearings, low steel bearings and neoprene rubber bearings
- Span continuity: continuous, discontinuous (in-span hinges), simply supported.
- The seismic design of a bridge is taken into account in terms of the (*i*) spectrum modification factor, (*ii*) strength reduction factor due to cyclic motion, (*iii*) drift limits, and (*iv*) the longitudinal reinforcement ratio.

This classification scheme incorporates various parameters that affect damage into fragility analysis and provides a means to obtain better fragility curves when data become available.

C.1.3 Tunnels

Tunnels are classified as:

- Bored/Drilled
- Cut & Cover

C.2 Railway Transportation System

Below is a list of railway components which have been defined for the methodology. By reviewing the list it can be seen that there are 7 basic components (shown in bold) with some being subdivided. Each component is defined by a short description below.

- Railway Tracks
- Railway Bridges
- Railway Tunnels
- Railway Urban Station
- Railway Fuel Facility
- Railway Dispatch Facility
- Railway Maintenance Facility

C.2.1 Tracks

The class Railway Tracks refers to the assembly of rails, ties, and fastenings, and the ground on which they rest. Only one classification is adopted for these components.

C.2.2 Bridges

The classes of railway bridges are considered analogous to those of major bridges in highway systems. That is they are considered to have at least one span greater than 500 feet. Railway bridges are classified based on the design criteria adopted in the design of these bridges.

- • Seismically designed/retrofitted bridges
- These bridges are either designed with seismic considerations or were retrofitted to comply with the seismic provisions.
- • Conventionally designed bridges
- These bridges are designed without taking seismic considerations into account.

C.2.3 Tunnels

Tunnels are classified as

- Bored/Drilled
- Cut & Cover

C.2.4 Railway System Facilities

- Railway system facilities include urban and suburban stations, maintenance facilities, fuel facilities, and dispatch facilities.
- **Urban and Suburban stations** are generally key connecting hubs that are important for system functionality. In the western U.S., these buildings are mostly made of reinforced concrete shear walls or moment resisting steel frames, while in

the eastern U.S., the small stations are mostly wood and the large ones are mostly masonry or braced steel frames.

- **Fuel facilities** include buildings, tanks (anchored, unanchored, or buried), backup power systems (if available, anchored or unanchored diesel generators), pumps, and other equipment (anchored or unanchored). It should be mentioned that anchored equipment in general refers to equipment designed with special seismic tiedowns or tiebacks, while unanchored equipment refers to equipment designed with no special considerations other than the manufacturer's normal requirements. Above ground tanks are typically made of steel with roofs also made of steel. Buried tanks are typically concrete wall construction with concrete roofs. In total, five types of fuel facilities are considered. These are: fuel facilities with or without anchored equipment and with or without backup power (all combinations), and fuel facilities with buried tanks.
- **Dispatch facilities** consist of buildings, backup power supplies (if available, anchored or unanchored diesel generators), and electrical equipment (anchored or unanchored). In total, four types of dispatch facilities are considered. These are dispatch facilities with or without anchored equipment and with or without backup power (all combinations).
- **Maintenance facilities** are housed in large structures that are not usually critical for system functionality as maintenance activities can be delayed or performed elsewhere. These building structures are often low-rise steel braced frames.

C.3 Light Railway Transportation System

A light rail system consists mainly of six components: tracks, bridges, tunnels, maintenance facilities, dispatch facilities, and DC power substations. These components are listed below.

- Light Rail Tracks
- Light Rail Bridges
- Light Rail Tunnels
- DC Substation
- Dispatch Facility
- Maintenance Facility

C.3.1 Tracks

The class Light Rail Tracks refers to the assembly of rails, ties, and fastenings, and the ground on which they rest. Only one classification is adopted for these components.

C.3.2 Bridges

The classes of light rail bridges are considered analogous to those of bridges in highway systems. Light rail bridges are classified based on the design criteria adopted in the design of these bridges.

- • Seismically designed/retrofitted bridges

These bridges are either designed with seismic considerations or were retrofitted to comply with the seismic provisions.

- • Conventionally designed bridges

These bridges are designed without taking seismic considerations into account.

C.3.3 Tunnels

Tunnels are classified as

- Bored/Drilled
- Cut & Cover

C.3.4 Railway System Facilities

Railway system facilities include DC power substations, dispatch facilities, and maintenance facilities.

- **DC Power Substations** provide DC power used by the light rail electrical distribution system. Light rail systems have low voltage DC power which consists of electrical equipment that converts the local electric utility AC power to DC power. Two types of DC power stations are considered. These are DC power stations with anchored components and DC power stations with unanchored components.
- **Dispatch facilities** consist of buildings, backup power supplies (if available, anchored or unanchored diesel generators), and electrical equipment (anchored or unanchored). In total, four types of dispatch facilities are considered. These are dispatch facilities with or without anchored equipment and with or without backup power (all combinations).
- **Maintenance facilities** are housed in large structures that are not usually critical for system functionality as maintenance activities can be delayed or performed elsewhere. These building structures are often low-rise steel braced frames.

C.4 Bus Transportation System

A bus system consists mainly of four basic components: urban stations, fuel facilities, dispatch facilities, and maintenance facilities. These components are listed below.

- Bus Urban Station
- Bus Fuel Facility
- Bus Dispatch Facility
- Bus Maintenance Facility

C.4.1 Urban and Suburban Stations

Urban and suburban stations are generally key connecting hubs that are important for system functionality. In the western U.S., these buildings are mostly made of reinforced concrete shear walls or moment resisting steel frames, while in the eastern U.S., the small stations are mostly wood and the large ones are mostly masonry or braced steel frames.

C.4.2 Bus System Fuel Facilities

A fuel facility includes buildings, tanks (anchored, unanchored, or buried), backup power systems (if available, anchored or unanchored diesel generators), pumps, and other equipment (anchored or unanchored). It should be mentioned that anchored equipment in general refers to equipment designed with special seismic tiedowns or tiebacks, while unanchored equipment refers to equipment designed with no special considerations other than the manufacturer's normal requirements. Above ground tanks are typically made of steel with roofs also made of steel. Buried tanks are typically concrete wall construction with concrete roofs. In total, five types of fuel facilities are considered. These are: fuel facilities with or without anchored equipment and with or without backup power (all combinations), and fuel facilities with buried tanks.

C.4.3 Bus System Dispatch Facilities

Dispatch facilities consist of buildings, backup power supplies (if available, anchored or unanchored diesel generators), and electrical equipment (anchored or unanchored). In total, four types of dispatch facilities are considered. These are dispatch facilities with or without anchored equipment and with or without backup power (all combinations).

C.4.4 Bus System Maintenance Facilities

Maintenance facilities for bus systems are housed in large structures that are not usually critical for system functionality as maintenance activities can be delayed or performed elsewhere. These building structures are mostly low-rise steel braced frames.

C.5 Port Transportation Systems

A port system consists of four basic components: waterfront structures, cranes/cargo handling equipment, warehouses and fuel facilities as listed below. This section provides a brief description of each.

- Waterfront Structures
- Cranes/Cargo Handling Equipment
- Warehouses
- Fuel Facility

C.5.1 Waterfront Structures

This component includes the wharf, seawalls, and piers that exist in the port system. Waterfront structures typically are supported by wood, steel or concrete piles. Many also have batter piles to resist lateral loads from wave action and impact of vessels. Seawalls are caisson walls retaining earth fill material.

C.5.2 Cranes and Cargo Handling Equipment

These are large equipment items used to load and unload freight from vessels. These can be stationary or mounted on rails.

C.5.3 Port Fuel Facilities

Fuel facilities include buildings, tanks (anchored, unanchored, or buried), backup power systems (if available, anchored or unanchored diesel generators), pumps, and other equipment (anchored or unanchored). It should be mentioned that anchored equipment in general refers to equipment designed with special seismic tiedowns or tiebacks, while unanchored equipment refers to equipment designed with no special considerations other than the manufacturer's normal requirements. Above ground tanks are typically made of steel with roofs also made of steel. Buried tanks are typically concrete wall construction with concrete roofs. In total, five types of fuel facilities are considered. These are: fuel facilities with or without anchored equipment and with or without backup power (all combinations), and fuel facilities with buried tanks.

C.5.4 Warehouses

Warehouses are large buildings usually constructed of structural steel. In some cases, warehouses may be several hundred feet from the shoreline, while in other instances, they may be located on the wharf itself.

C.6 Ferry Transportation System

A ferry system consists of five components: waterfront structures, passenger terminals, fuel facilities, dispatch facilities, and maintenance facilities. This section provides a brief description of each.

- Water Front Structures
- Ferry Passenger Terminals
- Ferry Fuel Facility
- Ferry Dispatch Facility
- Ferry Maintenance Facility

C.6.1 Waterfront Structures

The waterfront structures are located at the points of disembarkation, and they are similar to, although not as extensive as, those of the port transportation system. In some cases the ferry system may be located within the boundary of the port transportation system. The points of disembarkation are located some distance apart from one another, usually on opposite shorelines. The waterfront structures include hydraulic sandfill placement poles and/or piled dock structures.

C.6.2 Passenger Terminals

C.6.3 Fuel and Maintenance Facilities

Fuel and maintenance facilities are usually located at one of the two points of disembarkation. The size of the fuel facility is smaller than that of the port facility. Maintenance facilities are mainly steel braced frame structures.

C.6.4 Dispatch Facilities

In many cases, the dispatch facility is located in the maintenance facility or one of the passenger terminals.

C.7 Airport Transportation System

An airport system consists of six components: control tower, runways, terminal buildings, parking structures, fuel facilities, and maintenance facilities. This section provides a brief description of each.

- Airport Control Towers
- Airport Runways
- Airport Terminal Buildings
- Airport Parking Structures
- Fuel Facilities
- Airport Maintenance & Hangar Facility

C.7.1 Control Tower

The control tower consists of a building and the necessary equipment for air control and monitoring.

C.7.2 Runways

This component consists of well paved "flat and wide surfaces".

C.7.3 Terminal Buildings

These are similar to railway urban stations in that many of the functions performed and services provided to passengers are similar. These are usually constructed of structural steel or reinforced concrete.

C.7.4 Fuel Facilities

A fuel facility includes buildings, tanks (anchored, unanchored, or buried), backup power systems (if available, anchored or unanchored diesel generators), pumps, and other equipment (anchored or unanchored). It should be mentioned that anchored equipment in general refers to equipment designed with special seismic tiedowns or tiebacks, while unanchored equipment refers to equipment designed with no special considerations other than the manufacturer's normal requirements. Above ground tanks are typically made of steel with roofs also made of steel. Buried tanks are typically concrete wall construction with concrete roofs. In total, five types of fuel facilities are considered. These are: fuel facilities with or without anchored equipment and with or without backup power (all combinations), and fuel facilities with buried tanks.

C.7.5 Maintenance Facilities, Hangar Facilities, and Parking Structures

Maintenance facilities are housed in large structures that are not usually critical for system functionality as maintenance activities can be delayed or performed elsewhere. These building structures are mostly low-rise steel braced frames. Hangar facilities and parking structures are usually constructed of structural steel or reinforced concrete.

C.8 Potable Water System

A potable water system typically consists of transmission and distribution pipelines, water treatment plants, wells, storage tanks pumping plants, as listed below. In addition the system consists of terminal reservoirs. In this subsection, a brief description of each of these components is presented.

- Pipelines
- Water Treatment Plants
- Wells
- Water Storage Tanks (Typically, 0.5 MGD to 2 MGD)
- Pumping Plants

C.8.1 Pipelines

- **Transmission Aqueducts:** These transmission conduits are typically large size pipes more than 20 inches in diameter or channels (canals) that convey water from the source such as a reservoir, lake, river to the treatment plant. Transmission pipelines are commonly made of concrete, ductile iron, cast iron, or steel. These could be elevated, at-grade or buried. Elevated or at-grade pipes are typically made of steel (welded or riveted), and they can run in single or multiple lines. Canals are typically lined with concrete, mainly to avoid excessive loss of water by seepage and to control erosion. In addition to concrete lining, expansion joints are usually used to account for swelling and shrinkage under varying temperature and moisture conditions. Damageability of channels is not considered in the loss estimation methodology.
- **Distribution Facilities and Distribution Pipes:** Distribution of water can be accomplished by gravity, or by pumps in conjunction with on-line storage. Except for storage reservoirs located at a much higher elevation than the area being served, distribution of water would necessitate, at least, some pumping along the way. Typically, water is pumped at a relatively constant rate, with flow in excess of consumption being stored in elevated storage tanks. The stored water provides a reserve for fire flow and may be used for general-purpose flow should the electric power fail, or in case of pumping capacity loss.

Distribution pipelines are commonly made of concrete (prestressed or reinforced), asbestos cement, ductile iron, cast iron, steel, or plastic. The selection of material type and pipe size are based on the desired carrying capacity, availability of material, durability, and cost. Distribution pipes represent the network that delivers water to consumption areas. Distribution pipes may be further subdivided into primary lines, secondary lines, and small distribution mains. The primary or arterial mains carry flow from the pumping station to and from elevated storage tanks, and to the consumption areas, whether residential, industrial, commercial, or public. These lines are typically laid out in interlocking loops, and all smaller lines connecting to them are typically valved so that failure in smaller lines does not require shutting off the larger. Primary lines can be up to 36 inches in diameter. Secondary lines are smaller loops within the primary mains and run from one primary line to another. They serve to provide a large amount of water for fire fighting without excessive pressure loss. Small distribution lines represent the mains that supply water to the user and to the fire hydrants.

In this earthquake loss estimation study, the simplified method for water system network performance evaluation applies to a distribution pipe network digitized at the primary level.

C.8.2 Supply Facilities- Water Treatment Plants (WTP)

Water treatment plants are generally composed of a number of physical and chemical unit processes connected in series, for the purpose of improving the water quality. A conventional WTP consists of a coagulation process, followed by a sedimentation process, and finally a filtration process. Alternately, a WTP can be regarded as a system of interconnected pipes, basins, and channels through which the water moves, and where the flow is governed by hydraulic principles. WTP are categorized as follows:

- ***Small water treatment plants***, with capacity ranging from 10 mgd to 50 mgd, are assumed to consist of a filter gallery with flocculation tanks (composed of paddles and baffles) and settling (or sedimentation) basins as main components, chemical tanks (needed in the coagulation and other destabilization processes), a chlorination tank, electrical and mechanical equipment, and elevated pipes.
- ***Medium water treatment plants***, with capacity ranging from 50 mgd to 200 mgd, are also assumed to consist of a filter gallery with flocculation tanks (composed of paddles and baffles) and settling (or sedimentation) basins as main components, chemical tanks (needed in the coagulation and other destabilization processes), a chlorination tank, electrical and mechanical equipment, and elevated pipes.
- ***Large water treatment plants***, with capacity above 200 mgd, are simulated by adding even more redundancy to small treatment plants (i.e., three times as many flocculation, sedimentation, chemical and chlorination tanks/basins).

Water treatment plants are also classified based on whether the subcomponents (equipment and backup power) are anchored or not.

C.8.3 Wells (WE)

Wells typically have a capacity between 1 and 5 mgd. Wells are used in many cities as a primary or supplementary source of water supply. Wells include a shaft from the surface down to the aquifer, a pump to bring the water up to the surface, equipment used to treat the water, and sometimes a building which encloses the well and equipment.

C.8.4 Water Storage Tanks (ST)

Water storage tanks can be elevated steel, on-ground steel (anchored/unanchored), on-ground concrete (anchored/unanchored), buried concrete, or on-ground wood tanks. Typical capacity of storage tanks is in the range of 0.5 mgd to 2 mgd.

C.8.5 Pumping Plants (PP)

Pumping plants are usually composed of a building, one or more pumps, electrical equipment, and in some cases, backup power systems. Pumping plants are classified as either small PP with less than 10 mgd capacity or medium/large PP with more than 10 mgd capacity. Pumping plants are also classified with respect to whether or not the subcomponents (equipment and backup power) are anchored.

C.8.6 Terminal Reservoirs

Terminal reservoirs are typically lakes (man made or natural) and are usually located nearby and upstream of the water treatment plant. Vulnerability of terminal reservoirs and associated dams is marginally assessed in the loss estimation methodology. Therefore, even though reservoirs are an essential part of a potable water system, it is assumed in the analysis of water systems that the amount of water flowing into water treatment plants from reservoirs right after an earthquake is essentially the same as before the earthquake.

C.9 Waste Water System

A waste water system typically consists of collection sewers, interceptors, waste water treatment plants and lift stations as listed below. In this section, a brief description of each of these components is given.

- Buried Pipelines
- Waste Water Treatment Plants
- Lift Stations

C.9.1 Collection Sewers

Collection sewers are generally closed conduits that carry sewage normally with a partial flow. Collection sewers could be sanitary sewers, storm sewers, or combined sewers. Pipe materials that are used for potable water transportation may also be used for wastewater collection. The most commonly used sewer material is clay pipe manufactured with integral bell and spigot ends. These pipes range in size from 4 to 42 inch in diameter. Concrete pipes are mostly used for storm drains and for sanitary sewers carrying noncorrosive sewage (i.e. with organic materials). For the smaller diameter range, plastic pipes are also used.

C.9.2 Interceptors

Interceptors are large diameter sewer mains. They are usually located at the lowest elevation areas. Pipe materials that are used for interceptor sewers are similar to those used for collection sewers.

C.9.3 Lift Stations (LS)

Lift stations are important parts of the waste water system. Lift stations serve to raise sewage over topographical rises. If the lift station is out of service for more than a short time, untreated sewage will either spill out near the lift station, or back up into the collection sewer system.

In this study, lift stations are classified as either small LS (capacity less than 10 mgd) or medium/large LS (capacity greater than 10 mgd). Cases of lift stations with anchored versus unanchored subcomponents are also investigated.

C.9.4 Waste Water Treatment Plants (WWTP)

Three sizes of waste water treatment plants are considered: small (capacity less than 50 mgd), medium (capacity between 50 and 200 mgd), and large (capacity greater than 200 mgd). A WWTP has the same processes existing in a WTP with the addition of secondary treatment subcomponents.

C.10 Oil System

An oil system typically consists of refineries, pumping plants, tank farms, and pipelines as listed below. In this section, a brief description of each of these components is given.

- Pipelines
- Refineries
- Pumping Plants
- Tank Farms

C.10.1 Refineries (RF)

Refineries are an important part of an oil system. They are used for processing crude oil before it can be used. Two sizes of refineries are considered: small, and medium/large.

- ***Small refineries*** have a capacity of less than 100,000 barrels per day. These usually consist of steel tanks on grade, stacks, other electrical and mechanical equipment, and elevated pipes. Stacks are essentially tall cylindrical chimneys.
- ***Medium/Large refineries*** have a capacity of more than 100,000 barrels per day. These also consist of steel tanks on grade, stacks, other electrical and mechanical equipment, and elevated pipes.

C.10.2 Oil Pipelines

Oil pipelines are used for the transportation of oil over long distances. About seventy-five percent of the crude oil is transported throughout the United States by pipelines. A large segment of industry and millions of people could be severely affected by disruption of crude oil supplies. Rupture of crude oil pipelines could lead to a large scale environmental disaster due to pollution of land and rivers. Pipelines are typically made of mild steel with submerged arc welded joints, although older gas welded steel pipe may be present in some systems.

C.10.3 Pumping Plants (PP)

Pumping plants serve to maintain the flow of oil in cross country pipelines. Pumping plants usually use two or more pumps. Pumps can be of either centrifugal or reciprocating type. However, no differentiation is made between these two types of pumps in the analysis of oil systems. There are pumping plants with anchored as well as unanchored subcomponents.

C.10.4 Tank Farms (TF)

Tank farms are facilities which store fuel products. They include tanks, pipes and electric components. There are tank farms with anchored as well as unanchored subcomponents.

C.11 Natural Gas System

A natural gas system typically consists of compressor stations and pipelines as listed below. In this section, a brief description of each of these components is given.

- Buried Pipelines
- Compressor Stations

C.11.1 Compressor Stations

Compressor stations serve to maintain the flow of gas in cross country pipelines. Compressor stations consist of either centrifugal or reciprocating compressors. However, no differentiation is made between these two types of compressors in the analysis of natural gas systems. Cases of compressor stations with anchored versus unanchored subcomponents are also investigated.

C.11.2 Natural Gas Pipelines

Pipelines are typically made of mild steel with submerged arc welded joints, although older lines may have gas welded joints. These are used for the transportation of natural gas over long distances. Many industries and millions of people could be severely affected should disruption of natural gas supplies occur.

C.12 Electric Power System

The only components of an electric power system considered in the loss estimation methodology are substations, distribution circuits, and generation plantsm as listed below. In this section a brief description of each of these components is presented.

- Transmission Substations
- Distribution Circuits
- Generation Plants

C.12.1 Substations

An electric substation is a facility that serves as a source of energy supply for the local distribution area in which it is located, and has the following main functions:

- - Change or switch voltage from one level to another.
- - Provide points where safety devices such as disconnect switches, circuit breakers, and other equipment can be installed.
- - Regulate voltage to compensate for system voltage changes.
- - Eliminate lightning and switching surges from the system.
- - Convert AC to DC and DC to AC, as needed.
- - Change frequency, as needed.

Substations can be entirely enclosed in buildings where all the equipment is assembled into one metal clad unit. Other substations have step-down transformers, high voltage switches, oil circuit breakers, and lightning arrestors located outside the substation building. In the current loss estimation methodology, only transmission (138 kV to 765 kV or higher) and subtransmission (34.5 kV to 161 kV) substations are considered. Substations are also classified based on whether they have anchored or unanchored subcomponents. The substations are classified as:

- High Voltage: he line voltage at these substations is 350 kV or more. These are referred to as 500 kV substations.
- Medium Voltage: The line voltage at these substations is between 150 kV and 350 kV. These are referred to as 230 kV substations.
- Low Voltage: The line voltage at these substations is between 34.5 kV and 150 kV. These are referred to as 115 kV substations.

C.12.2 Distribution Circuits

The distribution system is divided into a number of circuits. A distribution circuit includes poles, wires, in-line equipment and utility-owned equipment at customer sites. A distribution circuit also includes above ground and underground conductors. Distribution circuits either consist of seismically designed components or standard components.

C.12.3 Generation Plants

Power generation plants are facilities where the coal, oil, natural gas, or atom are transformed into electrical energy. These plants produce alternating current (AC) and may be any of the following types:

- - Hydroelectric
- - Steam turbine (fossil fired or nuclear)
- - Combustion turbine
- - Geothermal
- - Solar
- - Wind
- - Compressed air

Generation plant subcomponents include diesel generators, turbines, racks and panels, boilers and pressure vessels, and the building in which these are housed. The size of the generation plant is determined from the number of Megawatts of electric power that the plant can produce under normal operations. Small generation plants have a generation capacity of less than 200 Megawatts. Medium/Large generation plants have a capacity greater than 200 Megawatts. Fragility curves for generation plants with anchored versus unanchored subcomponents are presented.

C.13 Communication System

Only central offices are considered for the loss estimation of the communication systems as listed below. A central office consists of a building, central switching equipment (i.e., digital switches, anchored or unanchored), and back-up power supply (i.e. diesel generators or battery generators, anchored or unanchored) that may be needed to supply the requisite power to the center in case of loss of off-site power.

- Central Offices

Appendix D. Summary of Inventory Databases

Database	File Name	Source
General Building Stock		
Occupancy Square Footage	-	United States Census Bureau (1996) Dun and Bradstreet
Building Type- Occupancy	-	ATC-13 (1985)
Essential Facilities		
Medical Care Facilities	EFCARE.DBF	AHA Database (1999)
Emergency Operation Centers	EFEMERG.DBF	FEMA (1996)
Schools	EFSCHOOL.DBF	Yellow Pages (1996)
High Potential Loss Facilities		
Dams	HPDAMS.DBF	National Dams Inspection Program (NATDAM-1996)
Nuclear Power Facilities	HPNPF.DBF	FEMA Database (1992)
Military Installations	HPMI.DBF	None
Transportation System		
Highway Segments	HRD.DBF	US Census TIGER Street Files (1990)
Highway Bridges	HBR.DBF	National Bridge Inventory (1997)
Highway Tunnels	HTU.DBF	None
Railway Track Segments	RTR.DBF	US Census TIGER Street Files (1990)
Railway Bridges	RBR.DBF	None
Railway Tunnels	RTU.DBF	None
Railway Facilities	RFA.DBF	None
Light Rail Track Segments	LTR.DBF	None
Light Rail Bridges	LBR.DBF	None
Light Rail Tunnels	LTU.DBF	None
Light Rail Facilities	LFA.DBF	None
Bus Facilities	BFA.DBF	None
Ports and Harbors Facilities	PFA.DBF	FEMA Database (1992)
Ferry Facilities	FFA.DBF	None
Airports Facilities	AFA.DBF	FEMA Database (1992)
Airports Runways	ARW.DBF	FEMA Database (1992)

Database	File Name	Source
Utility System		
Potable Water Pipeline Segments	PPL.DBF	ATC-25 (1991)
Potable Water Facilities	PWF.DBF	ATC-25 (1991)
Potable Water Distribution Lines	PDL.DBF	US TIGER Street Proxy
Waste Water Pipeline Segments	WPL.DBF	None
Waste Water Facilities	WFA.DBF	None
Waste Water Distribution Lines	WDL.DBF	US TIGER Street Proxy
Oil Pipelines Segments	CRP.DBF	ATC-25 (1991)
Oil Systems Facilities	CRF.DBF	FEMA Database (1990)
Natural Gas Pipelines Segments	NPL.DBF	ATC-25 (1991)
Natural Gas Facilities	NFA.DBF	ATC-25 (1991)
Natural Gas Distribution Lines	NDL.DBF	US TIGER Street Proxy
Electric Power Facilities	EFA.DBF	FEMA Database (1992)
Electric Power Distribution Lines	EDL.DBF	Population Proxy
Communication Facilities	CFA.DBF	FEMA Database (1991&1990)
Communication Distribution Cables	CDL.DBF	US TIGER Street Proxy
Hazardous Materials Facilities	HAZMAT.DBF	Environmental Protection Agency (1998)
Population Inventory	POPHSNG.DBF	United States Census Bureau (1990)
Agriculture Product Inventory	AGP.DBF	None
Vehicle Inventory	VEH.DBF	None

Appendix E. HAZUS Database Dictionary

This database dictionary provides information for each inventory database in two ways:

- Database Information table.
- Field Information table.

The Database Information and Field Information tables are provided for each inventory database. The tables are given exactly in the order shown above.

Database Information:

- File: name of the database.
- Location1: initial location of the database. It could be either the subdirectory DATA, or (SRDIR) meaning the study region subdirectory as specified by the user. All directories are relative to the main directory (default is \HAZUS).
- Location2: usually if the database is a template database, then it is copied to a different directory at some time during the life of the program. "Location2" is the final location for the file.
- Mappable: Yes if the database has geographic information tied to it.
- Editable: Yes if the user can edit the data.
- # Fields: number of fields in the database. This is constant across the life of the file.
- # Records1: the number of original records when the database is in "Location1".
- # Records2: the number of records when the database is in "Location2".

Field Information:

For any given database, the plus symbol (✚) indicates the minimum fields required by HAZUS for a record to be added into the database and thus used in the analyses.

For any given database, the triangle symbol (▲) indicates all the fields that will be populated by the software -using default values- if no data was supplied by the user and thus used in the analyses.

A star symbol (*) at the end of the description column indicates that an important comment relative to that particular field is noted at right after Field Information table.

Table key fields are shown in ***bold italic*** font. These fields are upon which the .dbf tables are indexed. All indices are ascending order. The index tag is named using the field name. The index file has the .mdx extension and uses the Dbase IV format. If a compound key is used, a description is given.

The databases are listed according to their type, which could be any of the following:

Database Type	Description	Naming convention	Location/Path:
Internal	Used internally by the program (HAZUS).	Anything.	DATA subdirectory. Initial subdirectory could be TEMPLATE
Inventory	Data storing all the inventory information..	Follows chapter numbering convention as listed in the technical manual.	Study region subdirectory if editable. DATA subdirectory if not (for example, the classification databases are not currently editable). Initial subdirectory could be TEMPLATE

E.1 Inventory Databases

E.1.1 General Building Stock

E.1.1.1 Square Footage

The square footage files for all the US census tract by occupancy type are provided by the software as part of the default inventory and could be modified by the user if necessary.

File:	SOSQFT.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
RES1▲	N	10,1	Building Area (SQFT) in Res1*
RES2▲	N	10,1	Building Area (SQFT) in Res2*
RES3▲	N	10,1	Building Area (SQFT) in Res3*
RES4▲	N	10,1	Building Area (SQFT) in Res4*
RES5▲	N	10,1	Building Area (SQFT) in Res5*
RES6▲	N	10,1	Building Area (SQFT) in Res6*
COM1▲	N	10,1	Building Area (SQFT) in Com1*
COM2▲	N	10,1	Building Area (SQFT) in Com2*
COM3▲	N	10,1	Building Area (SQFT) in Com3*
COM4▲	N	10,1	Building Area (SQFT) in Com4*
COM5▲	N	10,1	Building Area (SQFT) in Com5*
COM6▲	N	10,1	Building Area (SQFT) in Com6*
COM7▲	N	10,1	Building Area (SQFT) in Com7*
COM8▲	N	10,1	Building Area (SQFT) in Com8*
COM9▲	N	10,1	Building Area (SQFT) in Com9*
COM10▲	N	10,1	Building Area (SQFT) in Com10*
IND1▲	N	10,1	Building Area (SQFT) in Ind1*
IND2▲	N	10,1	Building Area (SQFT) in Ind2*
IND3▲	N	10,1	Building Area (SQFT) in Ind3*
IND4▲	N	10,1	Building Area (SQFT) in Ind4*
IND5▲	N	10,1	Building Area (SQFT) in Ind5*
IND6▲	N	10,1	Building Area (SQFT) in Ind6*
AGR1▲	N	10,1	Building Area (SQFT) in Agr1*
REL1▲	N	10,1	Building Area (SQFT) in Rel1*
GOV1▲	N	10,1	Building Area (SQFT) in Gov1*
GOV2▲	N	10,1	Building Area (SQFT) in Gov2*
EDU1▲	N	10,1	Building Area (SQFT) in Edu1*
EDU2▲	N	10,1	Building Area (SQFT) in Edu2*
TOTAL▲	N	10,1	Total Building Area (SQFT) per Census Tract

* Note: Refer to Table A.3 of Appendix A for more detailed descriptions of the occupancy types.

E.1.1.2 Building Count

♦ **Number of Buildings per Specific Occupancy**

File:	BLDCNTSO.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
RES1▲	N	20,0	Building Count in Res1*
RES2▲	N	20,0	Building Count in Res2*
RES3▲	N	20,0	Building Count in Res3*
RES4▲	N	20,0	Building Count in Res4*
RES5▲	N	20,0	Building Count in Res5*
RES6▲	N	20,0	Building Count in Res6*
COM1▲	N	20,0	Building Count in Com1*
COM2▲	N	20,0	Building Count in Com2*
COM3▲	N	20,0	Building Count in Com3*
COM4▲	N	20,0	Building Count in Com4*
COM5▲	N	20,0	Building Count in Com5*
COM6▲	N	20,0	Building Count in Com6*
COM7▲	N	20,0	Building Count in Com7*
COM8▲	N	20,0	Building Count in Com8*
COM9▲	N	20,0	Building Count in Com9*
COM10▲	N	20,0	Building Count in Com10*
IND1▲	N	20,0	Building Count in Ind1*
IND2▲	N	20,0	Building Count in Ind2*
IND3▲	N	20,0	Building Count in Ind3*
IND4▲	N	20,0	Building Count in Ind4*
IND5▲	N	20,0	Building Count in Ind5*
IND6▲	N	20,0	Building Count in Ind6*
AGR1▲	N	20,0	Building Count in Agr1*
REL1▲	N	20,0	Building Count in Rel1*
GOV1▲	N	20,0	Building Count in Gov1*
GOV2▲	N	20,0	Building Count in Gov2*
EDU1▲	N	20,0	Building Count in Edu1*
EDU2▲	N	20,0	Building Count in Edu2*
TOTAL▲	N	20,0	Total Building Count per Census Tract

* Note: Refer to Table A.3 of Appendix A for more detailed descriptions of the occupancy types.

♦ Number of Buildings per General Occupancy

File:	BLDCNTGO.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
RES▲	N	20,0	Total Residential Building Count
COM▲	N	20,0	Total Commercial Building Count
IND▲	N	20,0	Total Industrial Building Count
AGR▲	N	20,0	Total Agricultural Building Count
REL▲	N	20,0	Total Religious Institutions Building Count
GOV▲	N	20,0	Total Governmental Building Count
EDU▲	N	20,0	Total Educational Building Count
TOTAL▲	N	20,0	Total Building Count per Census Tract

♦ Number of Buildings by Building Type per Specific Occupancy

File:	BIDCNTMB.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
W1▲	N	20,0	Building Count in W1*
W2▲	N	20,0	Building Count in W2*
S1L▲	N	20,0	Building Count in S1L*
S1M▲	N	20,0	Building Count in S1M*
S1H▲	N	20,0	Building Count in S1H*
S2L▲	N	20,0	Building Count in S2L*
S2M▲	N	20,0	Building Count in S2M*
S2H▲	N	20,0	Building Count in S2H*
S3▲	N	20,0	Building Count inS3*
S4L▲	N	20,0	Building Count in S4L*
S4M▲	N	20,0	Building Count in S4M*
S4H▲	N	20,0	Building Count in S4H*
S5L▲	N	20,0	Building Count in S5L*
S5M▲	N	20,0	Building Count in S5M*
S5H▲	N	20,0	Building Count in S5H*
C1L▲	N	20,0	Building Count in C1L*
C1M▲	N	20,0	Building Count in C1M*
C1H▲	N	20,0	Building Count in c1H*
C2L▲	N	20,0	Building Count in C2L*
C2M▲	N	20,0	Building Count in C2M*
C2H▲	N	20,0	Building Count in C2H*
C3L▲	N	20,0	Building Count in C3L*
C3M▲	N	20,0	Building Count in C3M*
C3H▲	N	20,0	Building Count in C3H*
PC1▲	N	20,0	Building Count in PC1*
PC2L▲	N	20,0	Building Count in PC2L*
PC2M▲	N	20,0	Building Count in PC2M*
PC2H▲	N	20,0	Building Count in PC2H*
RM1L▲	N	20,0	Building Count in RM1L*
RM1M▲	N	20,0	Building Count in RM1M*
RM2L▲	N	20,0	Building Count in RM2L*
RM2M▲	N	20,0	Building Count in CM2M*
RM2H▲	N	20,0	Building Count in CM2H*
URML▲	N	20,0	Building Count in URML*
URMM▲	N	20,0	Building Count in URMM*
MH▲	N	20,0	Building Count in MH*
TOTAL▲	N	20,0	Total Building Count per Census Tract*

* Note: Refer to Table A.2 of Appendix A for more detailed descriptions of the occupancy types.

♦ Number of Buildings by Building Type per General Occupancy

File:	BLDCNTGB.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
WOOD▲	N	20,0	Total Wood Building Count
STEEL▲	N	20,0	Total Steel Building Count
CONCRETE▲	N	20,0	Total Concrete Building Count
PRECAST▲	N	20,0	Total Precast Building Count
RMASONRY▲	N	20,0	Total Reinforced Masonry Building Count
URMASONRY▲	N	20,0	Total Unreinforced Masonry Building Count
MOBILE▲	N	20,0	Total Mobil Homes Building Count
TOTAL▲	N	20,0	Total Building Count per Census Tract*

E.1.1.3 Occupancy Mapping Inventory

♦ **Specific Occupancy to Building Type Mapping**

File:	dflt.** where * = lgb, mgb, hgb (1 for each design level for GBS Module) * = lef, mef, hef (1 for each design level for essential facility module)
Mappable:	No

Name	Type	Length	Description
NO✚	N	2,0	Sequence #. Could be > 28 in future versions.
OCCUP✚	C	5	Specific occupancy label
TOTAL✚	N	3,0	Sum % for all Building type for given occupancy
W1✚	N	3,0	% of building stock of model building type W1 for given occupancy
W2✚	N	3,0	% of building stock of model building type W2 for given occupancy
S1L✚	N	3,0	% of building stock of model building type S1L for given occupancy
S1M✚	N	3,0	% of building stock of model building type S1M for given occupancy
S1H✚	N	3,0	% of building stock of model building type S1H for given occupancy
S2L✚	N	3,0	% of building stock of model building type S2L for given occupancy
S2M✚	N	3,0	% of building stock of model building type S2M for given occupancy
S2H✚	N	3,0	% of building stock of model building type S2H for given occupancy
S3✚	N	3,0	% of building stock of model building type S3 for given occupancy
S4L✚	N	3,0	% of building stock of model building type S4L for given occupancy
S4M✚	N	3,0	% of building stock of model building type S4M for given occupancy
S4H✚	N	3,0	% of building stock of model building type S4H for given occupancy
S5L✚	N	3,0	% of building stock of model building type S5L for given occupancy
S5M✚	N	3,0	% of building stock of model building type S5M for given occupancy
S5H✚	N	3,0	% of building stock of model building type S5H for given occupancy
C1L✚	N	3,0	% of building stock of model building type C1L for given occupancy
C1M✚	N	3,0	% of building stock of model building type C1M for given occupancy
C1H✚	N	3,0	% of building stock of model building type C1H for given occupancy
C2L✚	N	3,0	% of building stock of model building type C2L for given occupancy
C2M✚	N	3,0	% of building stock of model building type C2M for given occupancy
C2H✚	N	3,0	% of building stock of model building type C2H for given occupancy
C3L✚	N	3,0	% of building stock of model building type C3L for given occupancy
C3M✚	N	3,0	% of building stock of model building type C3M for given occupancy
C3H✚	N	3,0	% of building stock of model building type C3H for given occupancy
PC1✚	N	3,0	% of building stock of model building type PC1 for given occupancy
PC2L✚	N	3,0	% of building stock of model building type PC2L for given occupancy
PC2M✚	N	3,0	% of building stock of model building type PC2M for given occupancy
PC2H✚	N	3,0	% of building stock of model building type PC2H for given occupancy
RM1L✚	N	3,0	% of building stock of model building type RM1L for given occupancy
RM1M✚	N	3,0	% of building stock of model building type RM1M for given occupancy
RM2L✚	N	3,0	% of building stock of model building type RM2L for given occupancy
RM2M✚	N	3,0	% of building stock of model building type RM2M for given occupancy
RM2H✚	N	3,0	% of building stock of model building type RM2H for given occupancy
URML✚	N	3,0	% of building stock of model building type URML for given occupancy
URMM✚	N	3,0	% of building stock of model building type URMM for given occupancy
MH✚	N	3,0	% of building stock of model building type MH for given occupancy

♦ Occupancy Scheme to Census Tract Mapping Scheme

File:	SOCTMAP.DBF
Mappable:	No

Name	Type	Length	Description
TRACT	C	11	11-digit census tract number
MAP_SCHEME	C	12	12-char filename of previously defined mapping scheme4 *

[4] All the mapping scheme files are stored in the study region folder

E.1.1.4 Dollar Exposure

♦ **Dollar Exposure per Specific Occupancy:**

File:	SOEXP.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
RES1▲	N	20,0	Dollar Exposure in Res1*
RES2▲	N	20,0	Dollar Exposure in Res2*
RES3▲	N	20,0	Dollar Exposure in Res3*
RES4▲	N	20,0	Dollar Exposure in Res4*
RES5▲	N	20,0	Dollar Exposure in Res5*
RES6▲	N	20,0	Dollar Exposure in Res6*
COM1▲	N	20,0	Dollar Exposure in Com1*
COM2▲	N	20,0	Dollar Exposure in Com2*
COM3▲	N	20,0	Dollar Exposure in Com3*
COM4▲	N	20,0	Dollar Exposure in Com4*
COM5▲	N	20,0	Dollar Exposure in Com5*
COM6▲	N	20,0	Dollar Exposure in Com6*
COM7▲	N	20,0	Dollar Exposure in Com7*
COM8▲	N	20,0	Dollar Exposure in Com8*
COM9▲	N	20,0	Dollar Exposure in Com9*
COM10▲	N	20,0	Dollar Exposure in Com10*
IND1▲	N	20,0	Dollar Exposure in Ind1*
IND2▲	N	20,0	Dollar Exposure in Ind2*
IND3▲	N	20,0	Dollar Exposure in Ind3*
IND4▲	N	20,0	Dollar Exposure in Ind4*
IND5▲	N	20,0	Dollar Exposure in Ind5*
IND6▲	N	20,0	Dollar Exposure in Ind6*
AGR1▲	N	20,0	Dollar Exposure in Agr1*
REL1▲	N	20,0	Dollar Exposure in Rel1*
GOV1▲	N	20,0	Dollar Exposure in Gov1*
GOV2▲	N	20,0	Dollar Exposure in Gov2*
EDU1▲	N	20,0	Dollar Exposure in Edu1*
EDU2▲	N	20,0	Dollar Exposure in Edu2*
TOTAL▲	N	20,0	Total Dollar Exposure per Census Tract

Note: Refer to Table A.3 of Appendix A for more detailed descriptions of the occupancy types.

♦ Dollar Exposure per General Occupancy

File:	GOEXP.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
RES▲	N	20,0	Total Residential Dollar Exposure
COM▲	N	20,0	Total Commercial Dollar Exposure
IND▲	N	20,0	Total Industrial Dollar Exposure
AGR▲	N	20,0	Total Agricultural Dollar Exposure
REL▲	N	20,0	Total Religious Institutions Dollar Exposure
GOV▲	N	20,0	Total Governmental Dollar Exposure
EDU▲	N	20,0	Total Educational Dollar Exposure
TOTAL▲	N	20,0	Total Dollar Exposure per Census Tract

♦ Dollar Exposure by Building Type per Specific Occupancy

File:	SBTEXP.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
W1▲	N	20,0	Dollar Exposure for W1*
W2▲	N	20,0	Dollar Exposure for W2*
S1L▲	N	20,0	Dollar Exposure for S1L*
S1M▲	N	20,0	Dollar Exposure for S1M*
S1H▲	N	20,0	Dollar Exposure for S1H*
S2L▲	N	20,0	Dollar Exposure for S2L*
S2M▲	N	20,0	Dollar Exposure for S2M*
S2H▲	N	20,0	Dollar Exposure for S2H*
S3▲	N	20,0	Dollar Exposure forS3*
S4L▲	N	20,0	Dollar Exposure for S4L*
S4M▲	N	20,0	Dollar Exposure for S4M*
S4H▲	N	20,0	Dollar Exposure for S4H*
S5L▲	N	20,0	Dollar Exposure for S5L*
S5M▲	N	20,0	Dollar Exposure for S5M*
S5H▲	N	20,0	Dollar Exposure for S5H*
C1L▲	N	20,0	Dollar Exposure for C1L*
C1M▲	N	20,0	Dollar Exposure for C1M*
C1H▲	N	20,0	Dollar Exposure for c1H*
C2L▲	N	20,0	Dollar Exposure for C2L*
C2M▲	N	20,0	Dollar Exposure for C2M*
C2H▲	N	20,0	Dollar Exposure for C2H*
C3L▲	N	20,0	Dollar Exposure for C3L*
C3M▲	N	20,0	Dollar Exposure for C3M*
C3H▲	N	20,0	Dollar Exposure for C3H*
PC1▲	N	20,0	Dollar Exposure for PC1*
PC2L▲	N	20,0	Dollar Exposure for PC2L*
PC2M▲	N	20,0	Dollar Exposure for PC2M*
PC2H▲	N	20,0	Dollar Exposure for PC2H*
RM1L▲	N	20,0	Dollar Exposure for RM1L*
RM1M▲	N	20,0	Dollar Exposure for RM1M*
RM2L▲	N	20,0	Dollar Exposure for RM2L*
RM2M▲	N	20,0	Dollar Exposure for CM2M*
RM2H▲	N	20,0	Dollar Exposure for CM2H*
URML▲	N	20,0	Dollar Exposure for URML*
URMM▲	N	20,0	Dollar Exposure for URMM*
MH▲	N	20,0	Dollar Exposure for MH*
TOTAL▲	N	20,0	Total Dollar Exposure per Census Tract*

Note: Refer to Table A.2 of Appendix A for more detailed descriptions of the occupancy types.

♦ Dollar Exposure by Building Type per General Occupancy

File:	GBTEXP.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
WOOD▲	N	20,0	Total Dollar Exposure for Wood Buildings
STEEL▲	N	20,0	Total Dollar Exposure for Steel Buildings
CONCRETE▲	N	20,0	Total Dollar Exposure for Concrete Buildings
PRECAST▲	N	20,0	Total Dollar Exposure for Precast Buildings
RMASONRY▲	N	20,0	Total Dollar Exposure for Reinforced Buildings
URMASONRY▲	N	20,0	Total Dollar Exposure for Unreinforced Buildings
MOBILE▲	N	20,0	Total Dollar Exposure for Mobil Homes
TOTAL▲	N	20,0	Total Dollar Exposure per Census Tract*

E.1.2 Essential Facilities Inventory

E.1.2.1 Medical Care Facilities

File:	EFCARE.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Occupancy Class
MAPPING▲	C	30	Mapping Scheme[5]
BLDG_TYPE▲	C	4	Model Building Type[6]
DESIGNLVL▲	C	1	Seismic Design Level:
BIAS▲	C	1	Construction Quality Flag:
FOUNDATION	N	1,0	Foundation Type
YEAR_B	N	4,0	Year Built
COST▲	N	10,0	Replacement Cost (thous. $)
BU_PWR	C	1	Back-up Power: Y = Yes
FUNCTION	C	10	Primary Function
NUM_BEDS	N	4,0	Number of Beds
AHA_ID	C	7	AHA ID Number
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

[5] The user does not have to specify both the "MAPPING" and the "BLDG_TYPE" fields. Only one is required (the mapping is assigned the "DEFAULT" mapping scheme by default). If both fields were assigned, the software will use the BLDG_TYPE field.

[6] See footnote above.

E.1.2.2 Emergency Response Facilities

File:	EFEMERG.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Occupancy Class
MAPPING▲	C	30	Mapping Scheme*
BLDG_TYPE▲	C	4	Model Building Type[7]
DESIGNLVL▲	C	1	Seismic Design Level:
BIAS▲	C	1	Construction Quality Flag:
FOUNDATION	N	1,0	Foundation Type
YEAR_B	N	4,0	Year Built
COST▲	N	10,0	Replacement Cost (thous. $)
BU_PWR	C	1	Back-up Power: Y = Yes
STORIES	N	2,0	Number of Stories
NUM_TRUCKS	N	2,0	Number of Fire Trucks8
AREA	N	6,0	Facility Area (sq.ft)
CAPACITY	N	6,0	Facility Sleeping Capacity
KITCHEN	C	1	Kitchen Available: Y = Yes
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	***C***	***8***	***HAZUS Internal ID***

[7] The user does not have to specify both the "MAPPING" and the "BLDG_TYPE" fields. Only one is required (the mapping is assigned the "DEFAULT" mapping scheme by default).
8 Since Essential Facilities databases consists of Fire Station, Police Stations and Emergency Operating Centers, this field only gets occupied in the Fire Station database and stays empty in Police Stations and Emergency Operating Centers databases

E.1.2.3 Schools

File:	EFSCHOOL.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
DISTRICT	C	30	School District
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Occupancy Class
MAPPING▲	C	30	Mapping Scheme[9]
BLDG_TYPE▲	C	4	Model Building Type[10]
DESIGNLVL▲	C	1	Seismic Design Level: L = Low, M = Moderate, H = High
BIAS▲	C	1	Construction Quality Flag: = "P" for poor, = "T" for typical, = "S" for superior
FOUNDATION	N	1,0	Foundation Type
YEAR_B	N	4,0	Year Built
COST▲	N	10,0	Replacement Cost (thous. $)
BU_PWR	C	1	Back-up Power: Y = Yes, N= No
FUNCTION	C	10	Function of School
NUM_STUDNT	N	4,0	Number of Students
AREA	N	6,0	Facility Area (sq.ft.)
SHLT_CAP	N	6,0	Facility Shelter Capacity (# people)
KITCHEN	C	1	Kitchen Available: Y = Yes, N= No
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

[9] The user does not have to specify both the "MAPPING" and the "BLDG_TYPE" fields. Only one is required (the mapping is assigned the "DEFAULT" mapping scheme by default). If both are specified, the BLDG_TYPE is used since it is more accurate.
[10] See footnote above.

E.1.3 High Potential Loss Facilities

E.1.3.1 Dams Inventory

File:	HPDAMS.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
DAM_NAME	C	40	Name of Dam
OWNER	C	25	Owner of the Dam
CLASS	C	5	Type of Dam
COUNTYNAME	C	30	County Name
RIVER	C	30	Name of River
NEAR_CITY	C	30	Nearest City to Dam
DIST_CITY	N	10,0	Distance to Nearest City (mile)
PURPOSE	C	10	Purpose of the Dam:
YEAR_COMPL	N	4,0	Year Dam was Built
DAM_LENGTH	N	10,0	Length of Dam (ft)
DAM_HEIGHT	N	10,0	Height of the Dam (ft)
STRUCT_HGT	N	10,0	Structural Height of Dam (ft)
HYDR_HGT	N	10,0	Hydraulic Height of Dam (ft)
MAX_DISCH	N	10,0	Maximum Discharge Rate (ft3/sec)
MAX_STOR	N	10,0	Maximum Storage Area (acre-ft)
NORM_STOR	N	10,0	Normal Storage Area (acre-ft)
SURF_AREA	N	10,0	Surface Area of Water (acres)
DRAIN_AREA	N	10,0	Drainage Area of Dam (sq. miles)
HAZARD	C	1	Relative Hazard Rating (L = Low, S = Significant, H = High)
EAP	C	2	Emergency Action Plan (Y = Yes, N = No, NR = Not Required)
SPILL_TYPE	C	1	Spillway Type on Dam: C = Controlled, U = Uncontrolled, N =
SPILL_WDTH	N	10,0	Spillway Width (ft)
VOLUME	N	10,0	Spillway Volume (yards3)
COST	N	10,0	Cost of Dam Construction
PRIMARY_SR	C	8	Primary Source Agency
LAT✚	N	12,8	Latitude of the Dam
LONG✚	N	13,8	Longitude of the Dam
COUNTY✚	C	5	County FIPS Code
NAT_ID	C	7	NATDAM ID Number
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.3.2 Levees Inventory

File:	HPLEVEE.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
LEV_NAME	C	40	Name of Levee Segment
OWNER	C	25	Owner of the Levee Segment
CLASS	C	5	Type of Levee (not currently defined)
COUNTYNAME	C	30	County Name
RIVER	C	30	Name of River
NEAR_CITY	C	30	Nearest City to Levee Segment
DIST_CITY	N	10,0	Distance to Nearest City (mile)
YEAR_COMPL	N	4,0	Year Levee Segment was Built
LEV_WIDTH	N	10,0	Width of Levee Segment (ft)
LEV_HEIGHT	N	10,0	Height of the Levee Segment (ft)
LEV_CREST	N	10,0	Elevation of Levee Crest (ft)
NORM_HEIGHT	N	10,0	Normal Height of Water During Most of Year (ft)
DESIGN_BASIS	C	20	Design Basis for Dam (i.e. 100 year flood)
HAZARD	C	1	Relative Hazard Rating (L = Low, S = Significant, H = High)
EAP	C	2	Emergency Action Plan (Y = Yes, N = No, NR = Not Required)
LAT1✚	N	10,6	Latitude of Endpoint 1 of Levee Segment
LONG1✚	N	11,6	Longitude of Endpoint 1 of Levee Segment
LAT2✚	N	10,6	Latitude of Endpoint 2 of Levee Segment
LONG2✚	N	11,6	Longitude of Endpoint 2 of Levee Segment
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.3.3 Nuclear Power Facilities Inventory

File:	HPNPF.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS	C	5	Occupancy Class
BLDG_TYPE	C	4	Model Building Type
DESIGNLVL	C	1	Seismic Design Level: L = Low M = Moderate H = High
BIAS	C	1	Construction Quality Flag: = "P" for poor = "T" for typical = "S" for superior
FOUNDATION	N	1,0	Foundation Type
YEAR_B	N	4,0	Year Built
CAPACITY	N	6,0	Capacity (MWatts)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.3.4 Military Installation Inventory

File:	HPMI.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Occupancy Class
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level:
BIAS▲	C	1	Construction Quality Flag:
FOUNDATION	N	1,0	Foundation Type
COST▲	N	10,0	Replacement Cost (thous. $)
YEAR_B	N	4,0	Year Built
FUNCTION	C	10	Function of Facility
SHLT_CAP	N	5,0	Shelter Capacity (# people)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.4 User-Defined Structures

File:	UDSINV.DBF
Mappable:	Yes

Name	Type	Length	Description
ID	C	7	Identifier
NAME	C	30	Name
ADDRESS	C	40	Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS	C	5	Occupancy Class
MAPPING	C	30	Mapping Scheme
BLDG_TYPE	C	4	Model Building Type
DESIGNLVL	C	1	Seismic Design Level: L = Low M = Moderate H = High
BIAS	C	1	Construction Quality Flag: = "P" for poor = "T" for typical = "S" for superior
FOUNDATION	N	1,0	Foundation Type
YEAR_B	N	4,0	Year Built
COST	N	10,0	Replacement Cost (thous. $)
BU_PWR	C	1	Back-up Power: Y = Yes N = No
STORIES	N	2,0	Number of Stories
AREA	N	6,0	Building Area (ft2)
CAPACITY	N	6,0	Capacity
ELEVAT	N	7,1	Elevation (ft)
LAT	N	12,8	Latitude of Facility
LONG	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5 Transportation Systems Inventory

E.1.5.1 Inventory Data for Highway

♦ **Highway Segments**

File:	HRD.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Road Segment Name
OWNER	C	25	Road Segment Owner
CLASS▲	C	5	Analysis Class
NUM_LAN	N	2,0	Number of Lanes
PVMNT	C	10	Pavement Type
WIDTH	N	6,1	Road Width (ft)
LENGTH▲	N	6,2	Section Length (km)
TRAFFIC	N	10,0	Daily Traffic (cars/day)
CAPACITY	N	10,0	Daily Capacity (cars/day)
COST▲	N	10,0	Unit Repair Cost (thous. $/km)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Highway Bridges

File:	HBR.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Bridge Name
OWNER	C	25	Bridge Owner
CLASS▲	C	5	Analysis Class
TYPE	C	8	Structure Type (see table 1 below)*
WIDTH	N	6,1	Bridge Width (ft)
LENMAXSPAN	N	6,0	Maximum Span Length (ft)
LENGTH	N	6,0	Total Bridge Length (ft)
NUM_SP	N	2,0	Number of Spans
ANGLE	N	2,0	Skew Angle (degrees)
SEAT_L	N	5,1	Seat Length (ft)
SEAT_W	N	5,1	Seat Width (ft)
YEAR_B	N	4,0	Year Bridge Was Built
YEAR_R	N	4,0	Year Bridge Remodeled
PIER	C	10	Pier Type (see table 2 below)**
FOUNDATION▲	N	1,0	Foundation Type
SCOUR	C	1	Scour Index
TRAFFIC	N	10,0	Daily Traffic (cars/day)
TRAF_INDEX	C	2	Traffic Index
CONDITION	C	3	General Condition Rating (see table 3 below)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Bridge (ft)
LAT✚	N	12,8	Latitude of Bridge
LONG✚	N	13,8	Longitude of Bridge
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

Table 1: **Structure Types are Described are Specified as Follows:**

Digit	Digit General Description	Code	Code Description
1	For Main Structure Type Kind of Material and/ or Design	1	Concrete
		2	Concrete Continuous
		3	Steel
		4	Steel Continuous
		5	Prestressed Concrete
		6	Prestressed Concrete Continuous
		7	Timber
		8	Masonry
		9	Aluminum, Wrought Iron or Cast Iron
		0	Other
2,3	For Main Structure Type: Type of Design and Construction	01	Slab
		02	Stringer / Multi-Bean or Girder
		03	Girder and Floor Beam System
		04	Tee Beam
		05	Box Beam or Girder - Multiple
		06	Box Beam or Girder - Single or Spread
		07	Frame
		08	Orthotropic
		09	Truss - Deck
		10	Truss - Thru
		11	Arch - Deck
		12	Arch - Thru
		13	Suspension
		14	Stayed Girder
		15	Movable - Lift
		16	Movable - Bascule
		17	Movable - Swing
		18	Tunnel
		18	Culvert
		20	Mixed Types
		21	Segmental Box Girder
		22	Channel Beam
		00	Other
4	For Approach Spans Structure Type: Kind of Material and/ or Design	1	Concrete
		2	Concrete Continuous
		3	Steel
		4	Steel Continuous
		5	Prestressed Concrete
		6	Prestressed Concrete Continuous
		7	Timber
		8	Masonry
		9	Aluminum, Wrought Iron or Cast Iron
		0	Other
5,6	For Approach Spans Structure Type: Type of Design and Construction	01	Slab
		02	Stringer / Multi-Bean or Girder
		03	Girder and Floor Beam System
		04	Tee Beam

Digit	Digit General Description	Code	Code Description
	For Approach Spans Structure Type of Design and	05	Box Beam or Girder - Multiple
		06	Box Beam or Girder - Single or Spread
	:	07	Frame
		08	Orthotropic
		09	Truss - Deck
		10	Truss - Thru
		11	Arch - Deck
		12	Arch - Thru
		13	Suspension
		14	Stayed Girder
		15	Movable - Lift
		16	Movable - Bascule
		17	Movable - Swing
		18	Tunnel
		18	Culvert
		20	Mixed Types
		21	Segmental Box Girder
		22	Channel Beam
		00	Other
7,8	Functional Classification of Code for Rural or Urban		
	Rural	01	Principal Arterial - Interstate
		02	Principal Arterial - Other
		06	Minor Arterial
		07	Major Collector
		08	Minor Collector
		09	Local
	Urban	11	Principal Arterial - Interstate
		12	Principal Arterial - Other Freeway or
		14	Other Principal Arterial
		16	Minor Arterial
		17	Collector
		19	Local

Table 2: Pier Types are Described are Specified as Follows:

Digit	Digit General Description	Code	Code Description
1	Reference Feature	H	Highway Beneath Structure
		R	Railroad Beneath Structure
		N	Feature not a Highway or Railroad
2 ,3, 4 and 5	Four Digit Number that Indicates the Minimum Vertical Underclearance		
6, 7, 8 ,9 and 10	Five Digit User-Defined Information		

Table 3: Condition Ratings are Specified as Follows:

Digit	Digit General Description	Code	Code Description
1	Condition Rating of Deck		
2	Condition Rating of Superstructure		
3	Condition Rating of Substructure		
		N	Not Applicable
		9	Excellent Condition
		8	Very Good Condition – No problem noted.
		7	Good Condition – Some minor problems.
		6	Satisfactory Condition - Structural elements show some minor deterioration.
		5	Fair Condition – All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
		4	Poor Condition – Advanced section loss, deterioration, spalling or scour.
		3	Serous Condition – Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
		2	Critical Condition – advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may closely monitored it may be necessary to close thee bridge until corrective action is taken.
		1	"Imminent" Failure Condition – major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
		0	Failed Condition – Out of service (beyond corrective action.

♦ **Highway Tunnels**

File:	HTU.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Name of Tunnel
OWNER	C	25	Owner of Tunnel
CLASS▲	C	5	Analysis Class
TYPE	C	12	Type of Tunnel
WIDTH	N	6,1	Tunnel Width (ft)
LENGTH	N	6,0	Tunnel Length (ft)
YEAR_B	N	4,0	Year Tunnel Was Built
TRAFFIC	N	10,0	Daily Traffic (cars/day)
CAPACITY	N	10,0	Daily Capacity (cars/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Tunnel (ft)
LAT✚	N	12,8	Latitude of Tunnel
LONG✚	N	13,8	Longitude of Tunnel
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.2 Inventory Data for Railway

♦ **Railway Track Segments**

File:	RTR.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Track Segment Name
OWNER	C	25	Owner of Track Segment
CLASS▲	C	5	Analysis Class
NUM_TRA	N	2,0	Number of Tracks
TRAFFIC	N	10	Daily Traffic (trains/day)
LENGTH▲	N	6,2	Section Length (km)
COST▲	N	10,0	Unit Repair Cost (thous. $/km)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Railway Bridges

File:	RBR.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Bridge Name
OWNER	C	25	Bridge Owner
CLASS▲	C	5	Analysis Class
TYPE	C	12	Structure Type
WIDTH	N	6,1	Bridge Width (ft)
LENMAXSPAN	N	6,0	Maximum Span Length (ft)
LENGTH	N	6,0	Total Bridge Length (ft)
NUM_SP	N	2,0	Number of Spans
ANGLE	N	2,0	Skew Angle (degrees)
SEAT_L	N	5,1	Seat Length (ft)
SEAT_W	N	5,1	Seat Width (ft)
YEAR_B	N	4,0	Year Bridge Was Built
YEAR_R	N	4,0	Year Bridge Remodeled
PIER	C	10	Pier Type
FOUNDATION▲	N	1,0	Foundation Type
SCOUR	C	1	Scour Index
TRAFFIC	N	10,0	Daily Traffic (trains/day)
TRAF_INDEX	C	2	Traffic Index
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Bridge (ft)
LAT✚	N	12,8	Latitude of Bridge
LONG✚	N	13,8	Longitude of Bridge
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Railway Tunnels

File:	RTU.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Name of Tunnel
OWNER	C	25	Tunnel Owner
CLASS▲	C	5	Analysis Class
TYPE	C	12	Type of Tunnel
WIDTH	N	6,1	Tunnel Width (ft)
LENGTH	N	6,0	Tunnel Length (ft)
YEAR_B	N	4,0	Year Tunnel Was Built
TRAFFIC	N	10,0	Daily Traffic (trains/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Tunnel (ft)
LAT✚	N	12,8	Latitude of Tunnel
LONG✚	N	13,8	Longitude of Tunnel
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Railway Facilities

File:	RFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Year Facility Was Built
TRAFFIC	N	10,0	Daily Traffic (trains/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7.1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.3 Inventory Data for Light Rail

♦ **Light Rail Track Segments**

File:	LTR.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Track Segment Name
OWNER	C	25	Owner of Track Segment
CLASS▲	C	5	Analysis Class
NUM_TRA	N	2,0	Number of Tracks
TRAFFIC	N	10	Daily Traffic (trains/day)
LENGTH▲	N	6.2	Section Length (km)
COST▲	N	10,0	Replacement. Cost (thous. $/km)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Light Rail Bridges

File:	LBR.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Bridge Name
OWNER	C	25	Bridge Owner
CLASS▲	C	5	Analysis Class
TYPE	C	12	Structure Type
WIDTH	N	6,1	Bridge Width (ft)
LENMAXSPAN	N	6,0	Maximum Span Length (ft)
LENGTH	N	6,0	Total Bridge Length (ft)
NUM_SP	N	2,0	Number of Spans
ANGLE	N	2,0	Skew Angle (degrees)
SEAT_L	N	5,1	Seat Length (ft)
SEAT_W	N	5,1	Seat Width (ft)
YEAR_B	N	4,0	Year Bridge Was Built
YEAR_R	N	4,0	Year Bridge Remodeled
PIER	C	10	Pier Type
FOUNDATION▲	N	1,0	Foundation Type
SCOUR	C	1	Crosses a River: Y = Yes N= No
TRAFFIC	N	10,0	Daily Traffic (trains/day)
TRAF_INDEX	C	2	Traffic Index
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Bridge (ft)
LAT✚	N	12,8	Latitude of Bridge
LONG✚	N	13,8	Longitude of Bridge
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Light Rail Tunnels

File:	LTU.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Name of Tunnel
OWNER	C	25	Tunnel Owner
CLASS▲	C	5	Analysis Class
TYPE	C	12	Type of Tunnel
WIDTH	N	6,1	Tunnel Width (ft)
LENGTH	N	6,0	Tunnel Length (ft)
YEAR_B	N	4,0	Year Tunnel Was Built
TRAFFIC	N	10,0	Daily Traffic (trains/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Tunnel (ft)
LAT✚	N	12,8	Latitude of Tunnel
LONG✚	N	13,8	Longitude of Tunnel
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Light Rail Facilities

File:	LFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N = No
ANCHOR	C	1	Equipment Anchored: Y = Yes N = No
YEAR_B	N	4,0	Year Facility Was Built
TRAFFIC	N	10,0	Daily Traffic (trains/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.4 Inventory Data for Bus Facilities

File:	BFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power Y = Yes N = No
ANCHOR	C	1	Equipment Anchored: Y = Yes N = No
YEAR_B	N	4,0	Year Facility Was Built
TRAFFIC	N	10,0	Daily Traffic (buses/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.5 Inventory Data for Ports Facilities

File:	PFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
PORT_ID	C	5	Port Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low, M = Moderate, H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes, N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes, N= No
YEAR_B	N	4,0	Year Facility Was Built
CAPACITY	N	10,0	Capacity (tons/day)
BERTHS	N	3,0	Number of Berths
CRANE	N	2,0	Number of Cranes
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.6 Inventory Data for Ferry Facilities

File:	FFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low, M = Moderate, H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes, N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes, N= No
YEAR_B	N	4,0	Year Facility Was Built
TRAFFIC	N	10,0	Traffic (Ferris/Day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.7 Inventory Data Airport

♦ Airport Facilities

File:	AFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
ARPT_ID	C	5	Airport Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low, M = Moderate, H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes, N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes, N= No
YEAR_B	N	4,0	Year Facility Was Built
FLIGHTS	N	10,0	Capacity (flights/day)
PASSENGERS	N	10,0	Capacity (passengers/day)
CARGO	N	10,0	Capacity (tons/day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIPS Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Airport Runways

File:	ARW.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Runway Identifier
NAME	C	30	Runway Name
A_NAME	C	30	Airport Name
ARPT_ID	C	5	Airport Identifier
CLASS▲	C	5	Analysis Class
RNWY_L	N	6,0	Runway Length (ft)
CAPACITY	N	5,0	Capacity (Flights/day)
PAVMNT	C	5	Pavement Type
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Minimum Elevation (ft)
LAT✚	N	12,8	Latitude of Airport
LONG✚	N	13,8	Longitude of Airport
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.5.8 Transportation System Dollar Exposure

File:	EXPTR.DBF
Mappable:	No

Name	Type	Length	Description
COUNTY	C	30	County Name
HWROAD	N	15,0	Dollar Value of Highway Segments (thous. $)
HWBRIDGE	N	15,0	Dollar Value of Highway Bridges (thous. $)
HWTUNNEL	N	15,0	Dollar Value of Highway Tunnels (thous. $)
RWTRACK	N	15,0	Dollar Value of Railway Segments (thous. $)
RWBRIDGE	N	15,0	Dollar Value of Railway Bridges (thous. $)
RWFACILITY	N	15,0	Dollar Value of Railway Facilities (thous. $)
RWTUNNEL	N	15,0	Dollar Value of Railway Tunnels (thous. $)
LRTRACK	N	15,0	Dollar Value of Light Rail Tracks (thous. $)
LRBRIDGE	N	15,0	Dollar Value of Light Rail Bridges (thous. $)
LRFACILITY	N	15,0	Dollar Value of Light Rail Facilities (thous. $)
LRTUNNEL	N	15,0	Dollar Value of Light Rail Tunnels (thous. $)
BSFACILITY	N	15,0	Dollar Value of Bus Facilities (thous. $)
PHFACILITY	N	15,0	Dollar Value of Port Facilities (thous. $)
FSFACILITY	N	15,0	Dollar Value of Ferry Facilities (thous. $)
ATFACILITY	N	15,0	Dollar Value of Airport Facilities (thous. $)
ATRUNWAY	N	15,0	Dollar Value of Airport Runways (thous. $)
CNTY_FIPS	C	5	County Fips

E.1.6 Utility Systems Inventory

E.1.6.1 Inventory Data for Potable Water

♦ Potable Water Pipeline Segments

File:	PPL.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Pipeline Name
OWNER	C	25	Pipeline Owner
CLASS▲	C	5	Analysis Class
MATRL	C	10	Material Type
DIAMETER	N	6,1	Nominal Pipe Diameter (inches)
LENGTH	N	6,2	Section Length (km)
JOINT	C	10	Joint Type
YEAR_B	N	4,0	Year Pipe Installed
COST▲	N	10,0	Unit Repair Cost (thous. $/segment)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Potable Water Facilities

File:	PWF.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BDLG_TYPE	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Facility Year Built
CAPACITY	N	10,0	Capacity (Million Gallons/Day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Potable Water Distribution Pipes

File:	PDL.DBF
Mappable:	Yes

Name	Type	Length	Description
TRACT	C	11	Census Tract
PW_DUCT	N	9,1	Potable Water Ductile Distribution Pipes (km)
PW_BRIT	N	9,1	Potable Water Brittle Distribution Pipes (km)
PW_TOTL	N	9,1	Total Potable Water Distribution Pipes (km)

♦ Potable Water Network System Hydrant

File:	G_HYDR.DBF
Mappable:	No

Name	Type	Length	Description
ID	C	7	Identifier
SYSTEMID	C	5	Potable Water Network System ID
STATUS	N	1,0	Operational Status: 0 = Open, 2 = Closed
DIAMETER	N	6,1	Nominal Diameter (inches)
MIN_PES	N	8,2	Minimum Operational Pressure (psi)

♦ Potable Water Network System Tanks

File:	G_TANK.DBF
Mappable:	No

Name	Type	Length	Description
ID	C	7	Identifier
SYSTEMID	C	5	Potable Water Network System ID
STATUS	N	1,0	Operational Status: 0 = Open, 2 = Closed
INIT_LEV	N	7,1	Initial Hydraulic Grade (ft)
MIN_LEV	N	7,1	Minimum Hydraulic Grade (ft)
MAX_LEV	N	7,1	Maximum Hydraulic Grade (ft)
MIN_VOL	N	7,1	Volume of water below minimum level (ft3)
IS_CIRC	C	1	Is tank Circular: Y = Yes, N = No
DIAMTER	N	6,1	Nominal Diameter (feet)
X_AREA	N	7,1	Cross Sectional Area (sq.ft)

♦ Potable Water Network System Reservoirss

File:	G_RSVR.DBF
Mappable:	No

Name	Type	Length	Description
ID	C	7	Identifier
SYSTEMID	C	5	Potable Water Network System ID
STATUS	N	1,0	Operational Status: 0 = Open, 2 = Closed
GRADE	N	7,1	Hydraulic Head (ft.)

♦ Potable Water Network System Valve

File:	G_VALVES.DBF
Mappable:	No

Name	Type	Length	Description
ID	C	7	Identifier
SYSTEMID	C	5	Potable Water Network System ID
NODEID	C	5	Potable Water Network System Node ID
VLV_TYPE	N	1,0	Valve Type: 0 = open, 1 = check, 2 = gate, 3 = PRV
PRV_GRDE	N	7,1	Hydraulic head which the PRV is set to maintain downstream

♦ Potable Water Network System Pumps

File:	G_PUMP.DBF
Mappable:	No

Name	Type	Length	Description
ID	C	7	Identifier
SYSTEMID	C	5	Potable Water Network System ID
NODEID	C	5	Potable Water Network System Node ID
STATUS	N	1,0	Operational Status: 0 = Open, 2 = Closed
TYPE	N	1,0	Type (=0 constant power, =1 for 3 point-curve)
IS_BOAT	C	1	Is Pump used as a Fireboat: Y = Yes, N = No
POWER	N	8,2	Power Rating (HP)
L_HEAD	N	8,2	Head at Lowest Admissible Flow (ft)
L_FLOW	N	8,2	Lower Admissible Flow (gpm)
M_HEAD	N	8,2	Design or Intermediate Head (ft)
M_FLOW	N	8,2	Design or Intermediate Flow (gpm)
H_HEAD	N	8,2	Head corresponding to highest flow (ft)
H_FLOW	N	8,2	Highest Flow (gpm)

E.1.6.2 Inventory Data for Waste Water

♦ Waste Water Pipeline Segments

File:	WPL.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Pipeline Name
OWNER	C	25	Pipeline Owner
CLASS▲	C	5	Analysis Class
MATRL	C	10	Material Type
diameter	N	6,1	Nominal Pipe Diameter (inches)
JOINT	C	10	Joint Type
LENGTH	N	6,2	Section Length (km)
YEAR_B	N	4,0	Year Pipe Installed
COST▲	N	10,0	Unit Repair Cost (thous. $/segment)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Waste Water Facilities

File:	WFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Year Facility Was Built
CAPACITY	N	10,0	Capacity (Million Gallons/Day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Waste Water Distribution Sewers

File:	WDL.DBF
Mappable:	Yes

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
WW_DUCT▲	N	9,1	Waste Water Ductile Distribution Pipes (km)
WW_BRIT▲	N	9,1	Waste Water Brittle Distribution Pipes (km)
WW_TOTL▲	N	9,1	Total Waste Water Distribution Pipes (km)

E.1.6.3 Inventory Data for Oil

♦ **Crude and Refined Oil Pipe Segments**

File:	CRP.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Pipeline Name
OWNER	C	25	Pipeline Owner
CLASS▲	C	5	Analysis Class
MATRL	C	10	Material Type
DIAMETER	N	6,1	Nominal Pipe Diameter (inches)
LENGTH	N	6.2	Section Length (km)
JOINT	C	10	Joint Type
YEAR_B	N	4,0	Year Pipe Installed
COST▲	N	10,0	Unit Repair Cost (thous. $/segment)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Crude and Refined Oil Facilities

File:	CRF.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Year Facility Was Built
CAPACITY	N	10,0	Capacity (Thous. Barrels/Day or Thous. Barrels)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.6.4 Inventory Data Natural Gas

♦ **Natural Gas Pipeline Segments**

File:	NPL.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Pipeline Name
OWNER	C	25	Pipeline Owner
CLASS▲	C	5	Analysis Class
MATRL	C	10	Material Type
DIAMETER	N	6,1	Nominal Pipe Diameter (inches)
LENGTH	N	6,2	Section Length (km)
JOINT	C	10	Joint Type
YEAR_B	N	4,0	Year Pipe Installed
COST▲	N	10,0	Unit Repair Cost (thous. $/segment)
ELEVAT	N	7,1	Minimum Elevation (ft)
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Natural Gas Facilities

File:	NFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Year Facility Was Built
CAPACITY	N	10,0	Capacity (Million ft3/Day)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Natural Gas Distribution Pipes

File:	NDL.DBF
Mappable:	Yes

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
NG_DUCT▲	N	9,1	Natural Gas Ductile Distribution Pipes (km)
NG_BRIT▲	N	9,1	Natural Gas Brittle Distribution Pipes (km)
NG_TOTL▲	N	9,1	Total Natural Gas Distribution Pipes (km)

E.1.6.5 Inventory Data Electric Power

♦ Electric Power Facilities

File:	EFA.DBF
Mappable:	No

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Year Facility Was Built
CAPACITY	N	10,0	Capacity (Volts/Watts)
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Electrical Distribution Lines

File:	EDL.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
EP_BLW▲	N	9,1	Underground Electric Cables (km)
EP_ABM▲	N	9,1	Electric Cables Supported on Metal/Concrete Poles (km)
EP_ABW▲	N	9,1	Electric Cables Supported on Wood Poles (km)
EP_TOTL▲	N	9,1	Total Electric Cables (km)

E.1.6.6 Inventory Data Communication

♦ Communication Facilities

File:	CFA.DBF
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
OWNER	C	25	Facility Owner
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CLASS▲	C	5	Analysis Class
FUNCTION	C	10	Function of Facility
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
FOUNDATION	N	1,0	Foundation Type
BU_PWR	C	1	Back-up Power: Y = Yes N= No
ANCHOR	C	1	Equipment Anchored: Y = Yes N= No
YEAR_B	N	4,0	Year Facility Was Built
COST▲	N	10,0	Replacement Cost (thous. $)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

♦ Communication Distribution Lines

File:	CDL.DBF
Mappable:	Yes

Name	Type	Length	Description
TRACT▲	C	11	Census Tract
CM_BLW▲	N	9,1	Underground Communication Cables (km)
CM_AMB▲	N	9,1	Communication Cables Supported on Metal/Concrete Poles (km)
CM_ABW▲	N	9,1	Communication Cables Supported on Wood Poles (km)
CM_TOTL▲	N	9,1	Total Communication Cables (km)

E.1.6.7 Utility System Dollar Exposure

File:	EXPUT.DBF
Mappable:	No

Name	Type	Length	Description
COUNTY	C	30	County Name
PWFACILITY	N	15,0	Dollar Value of Potable Water Facilities (thous. $)
PWPIPELINE	N	15,0	Dollar Value of Potable Water Pipelines (thous. $)
PWDL	N	15,0	Dollar Value of Potable Water Distribution lines ((thous. $)
WWFACILITY	N	15,0	Dollar Value of Waste Water Facilities (thous. $)
WWPIPLINE	N	15,0	Dollar Value of Waste Water Pipelines (thous. $)
WWDL	N	15,0	Dollar Value of Waste Water Distribution lines ((thous. $)
OSFACILITY	N	15,0	Dollar Value of Oil System Facilities (thous. $)
OSPIPELINE	N	15,0	Dollar Value of Oil System Pipelines (thous. $)
NGFACILITY	N	15,0	Dollar Value of Natural Gas Facilities (thous. $)
NGPIPELINE	N	15,0	Dollar Value of Natural Gas Pipelines (thous. $)
NGDL	N	15,0	Dollar Value of Natural Gas Distribution lines ((thous. $)
EPFACILITY	N	15,0	Dollar Value of Electric Power Facilities (thous. $)
EPDL	N	15,0	Dollar Value of Electric Power Distribution lines (thous. $)
CMFACILITY	N	15,0	Dollar Value of Communication Facilities (thous. $)
CMDL	N	15,0	Dollar Value of Communication Distribution Pipelines (thous. $)
CNTY_FIPS	C	5	County Fips

E.1.7 Hazardous Materials Inventory

File:	HAZMAT.dbf
Mappable:	Yes

Name	Type	Length	Description
ID✚	C	7	Identifier
NAME	C	30	Facility Name
ADDRESS	C	40	Facility Address
CITY	C	30	City
STATE	C	2	State
ZIPCODE	C	10	ZIP Code
CONTACT	C	25	Contact Person
PHONE	C	14	Telephone Number
CAS	C	9	CAS Registry Number
CHEM_NAME	C	30	Chemical Name
CHEM_QUANT	N	10,0	Chemical Quality (lbs.)
SIC	C	4	SIC Number
CLASS▲	C	5	Class
BLDG_TYPE▲	C	4	Model Building Type
DESIGNLVL▲	C	1	Seismic Design Level: L = Low M = Moderate H = High
BIAS▲	C	1	Construction Quality Flag: = "P" for poor = "T" for typical = "S" for superior
FOUNDATION	N	1,0	Foundation Type
YEAR_B	N	4,0	Year Facility Was Built
EPA_ID	C	12	EPA ID Number
PER_AMNT	N	10,0	Permit Amount (lbs.)
ELEVAT	N	7,1	Elevation of Facility (ft)
LAT✚	N	12,8	Latitude of Facility
LONG✚	N	13,8	Longitude of Facility
GEORES	C	8	Geocoding Results Code
COUNTY✚	C	5	County FIP Code
COMMENT	C	40	Misc. Comments
ID_	C	8	HAZUS Internal ID

E.1.8 Demographics - Population Inventory

File:	POPHSNG.DBF
Mappable:	No

Name	Type	Length	Description
TRACT▲	C	11	Census Tract Number
POP▲	N	11,0	Total Population in Census Tract
HHLD▲	N	11,0	Total Household in Census Tract
GQ▲	N	11,0	Total Number of People in General Quarter
AGE_16▲	N	11,0	Total Number of People < 16 years old
AGE16_65▲	N	11,0	Total Number of People 16-65 years old
AGE_65▲	N	11,0	Total Number of People > 65 years old
RC_W▲	N	11,0	Total Number of People - White
RC_B▲	N	11,0	Total Number of People - Black
RC_NA▲	N	11,0	Total Number of People - Native American
RC_A▲	N	11,0	Total Number of People - Asian
RC_H▲	N	11,0	Total Number of People - Hispanic
INC_10▲	N	11,0	Total # of Households with Income < $10,000
INC10_15▲	N	11,0	Total # of Households with Income $10 - $15K
INC15_25▲	N	11,0	Total # of Households with Income $15 - $25K
INC25_35▲	N	11,0	Total # of Households with Income $25 - $35K
INC_35▲	N	11,0	Total # of Households with Income > $35,000
RES_D▲	N	11,0	Total in Residential Property during Day
RES_N▲	N	11,0	Total in Residential Property at Night
COM_WRK▲	N	11,0	Total Working Population in Commercial Industry
IND_WRK▲	N	11,0	Total Working Population in industrial Industry
COMM▲	N	11,0	Total Commuting at 5 PM
HUOO_SHU▲	N	11,0	Total Owner Occupied - Single Household Units
HUOO_MHU▲	N	11,0	Total Owner Occupied - Multi-Household Units
HUOO_MHS▲	N	11,0	Total Owner Occupied - Multi-Household Structure
HUOO_MOB▲	N	11,0	Total Owner Occupied - Mobile Homes
HURO_SHU▲	N	11,0	Total Renter Occupied - Single Household Units
HURO_MHU▲	N	11,0	Total Renter Occupied - Multi-Household Units
HURO_MHS▲	N	11,0	Total Renter Occupied - Multi-Household Structure
HURO_MOB▲	N	11,0	Total Renter Occupied - Mobile Homes
HUV_SHU▲	N	11,0	Total Vacant - Single Household Units
HUV_MHU▲	N	11,0	Total Vacant - Multi-Household Units
HUV_MHS▲	N	11,0	Total Vacant - Multi-Household Structure
HUV_MOB▲	N	11,0	Total Vacant - Mobile Homes
HU_U40▲	N	11,0	Structures Built Prior to 1940
HU_O40▲	N	11,0	Structures Built After 1940
HURO_AV▲	N	5,0	Average Rent per Rented Occupied Unit
HUOO_AV▲	N	5,0	Average Value per Owner Occupied Unit

E.1.9 Agriculture Product Inventory

File:	AGP.DBF
Mappable:	Yes

Name	Type	Length	Description
TRACT	C	11	Census Tract Number
GRAIN	N	9,0	Value of Grain Crops (thous. $)
VEGFRUIT	N	9,0	Value of Vegetable/Fruit Crops (thous. $)
ORCHARD	N	9,0	Value of Fruit/Nut Orchards (thous. $)
LIVSTOCK	N	9,0	Value of Livestock (thous. $)
TIMBER	N	9,0	Timber Value (thous. $)
MACHINE	N	9,0	Value of Grain Crops (thous. $)

E.1.10 Vehicle Inventory

File:	VEH.DBF
Mappable:	Yes

Name	Type	Length	Description
TRACT	C	11	Census Tract Number
CARS	N	9,0	Value of Cars, Buses, Trucks, Etc. (thous. $)
TRAINS	N	9,0	Value of Railroad Rolling Stock (thous. $)
BOATS	N	9,0	Value of Boats (thous. $)

E.2 Hazard Databases

E.2.1 Liquefaction Database

File:	LQFDEF.DBF
Mappable:	Yes

Name	Type	Length	Description
TYPE▲	N	1,0	Liquefaction susceptibility factor: = 0 for none = 1 for very low susceptibility = 2 for low susceptibility = 3 for moderate susceptibility = 4 for high susceptibility = 5 for very high susceptibility

* Note: The liquefaction susceptibility database file is specified through the "Hazard/Data Maps" menu option. If no file is specified, **HAZUS** assumes no liquefaction.

E.2.2 Landslide Database[11]

File:	LNDEF.DBF
Mappable:	Yes

Name	Type	Length	Description
TYPE	N	2,0	Landslide Susceptibility Factors, 0 = Not Susceptible Soil 1 = Soil A, Slope Angle 15-20 2 = Soil A, Slope Angle 20-30 3 = Soil B, Slope Angel 10-15 4 = Soil B, Slope Angle 15-20 5 = Soil A, Slope Angle 30-40 6 = Soil C, Slope Angle 1-10 7 = Soil A, Slope Angle >40, or, Soil B, Slope Angle 20-30 8 = Soil B, Slope Angle 30-40 or, Soil B, Slope Angle >40 or, Soil C, Slope Angle 10-15 9 = Soil C, Slope Angle 15-20 or, Soil C, Slope Angle 20-30 or, Soil C, Slope Angle 30-40 or, Soil C, Slope Angle >40 3 = Soil A, Slope Angel 10-15 4 = Soil A, Slope Angle 15-20 6 = Soil B, Slope Angle 1-10 7 = Soil A, Slope Angle 20-30 8 = Soil A, Slope Angle 30-40 or, Soil A, Slope Angle >40 or, Soil B, Slope Angle 10-15 9 = Soil B, Slope Angle 15-20 or, Soil B, Slope Angle 20-30 or, Soil B, Slope Angle 30-40 or, Soil B, Slope Angle >40 or, Soil C, Slope Angel 1-10 10 = Soil C, Slope Angle 10-15 or, Soil C, Slope Angle 15-20 or, Soil C, Slope Angle 20-30 or, Soil C, Slope Angle 30-40 or, Soil C, Slope Angle >40

[11] The landslide susceptibility database file is specified through the "Hazard/Data Maps" menu option. If no file is specified, HAZUS assumes no landslide.

E.2.3 Water Depth Database

File:	WDPTHDEF..DBF
Mappable:	Yes

Name	Type	Length	Description
DEPTH▲	N	3,0	Water Depth (feet)

E.2.4 Soil Type Database[12]

File:	SOILDEF.DBF
Mappable:	Yes

Name	Type	Length	Description
TYPE▲	N	1,0	Soil type where: = 1 for soil type A (hard rock) = 2 for soil type B (rock) = 3 for soil type C (very dense soil and soft rock) = 4 for soil type D (stiff soils) = 5 for soil type E (soft soils) = 6 for soil type F (need site specific evaluation)

[12] This soil type user-defined database file is specified through the "Hazard/Data Maps" menu option. If no file is specified, HAZUS assumes a combination soil type D.

E.2.5 User Defined Hazard Maps

Four files are needed to run a scenario using the "User Defined" option in HAZUS. These are: Peak ground shaking acceleration map (PGA), peak ground shaking velocity map (PGV), spectral acceleration map at 0.3 seconds, and spectral acceleration map at 1.0 seconds.

The user has full control on how to name these files and on how many attributes or fields these files should contain. The only requirement, however, is to have one field named "VALUE" in all these files, which contain the ground motion information. Note that for the three acceleration files, the units of the "VALUE" field are in g's, while for the PGV file, the units of the "VALUE" field are in inches/second.

Files:	"User Defined"
Mappable:	Yes

Name	Type	Length	Description
VALUE▲	N	8.3	Ground motion parameter value

E.3 Analysis Databases

E.3.1 Damage Functions

E.3.1.1 Damage Function for General Building Stock

♦ **Capacity Curves**

There are 3 files, one for each design level (h = high, m = moderate, l = low)

File:	TCCH.DBF, TCCM.DBF, TCCL.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Model Building Type Label
SD_YIELD_O▲	N	7,3	Yield Spectral Displacement - Code (inches)
SA_YIELD_O▲	N	7,3	Yield Spectral Acceleration - Code (inches)
SD_ULTIM_O▲	N	7,3	Ultimate Spectral Displacement - Code (inches)
SA_ULTIM_O▲	N	7,3	Ultimate Spectral Acceleration - Code (inches)
KAPPA_OS▲	N	6,2	Degradation Factor for Short Duration - Code
KAPPA_OM▲	N	6,2	Degradation Factor for Medium Duration - Code
KAPPA_OL▲	N	6,2	Degradation Factor for Long Duration - Code
DAMP_O▲	N	4,0	Damping - Code
FRAC_O▲	N	6,2	Fraction - Code
SD_YIELD_I▲	N	7,3	Yield Spectral Displacement - Poor (inches)
SA_YIELD_I▲	N	7,3	Yield Spectral Acceleration - Poor (inches)
SD_ULTIM_I▲	N	7,3	Ultimate Spectral Displacement - Poor (inches)
SA_ULTIM_I▲	N	7,3	Ultimate Spectral Acceleration - Poor (inches)
KAPPA_IS▲	N	6,2	Degradation Factor for Short Duration - Poor
KAPPA_IM▲	N	6,2	Degradation Factor for Medium Duration - Poor
KAPPA_IL▲	N	6,2	Degradation Factor for Long Duration - Poor
DAMP_I▲	N	4,0	Damping - Poor
FRAC_I▲	N	6,2	Fraction - Poor
SD_YIELD_S▲	N	7,3	Yield Spectral Displacement - Superior (inches)
SA_YIELD_S▲	N	7,3	Yield Spectral Acceleration - Superior (inches)
SD_ULTIM_S▲	N	7,3	Ultimate Spectral Displacement - Superior (inches)
SA_ULTIM_S▲	N	7,3	Ultimate Spectral Acceleration - Superior (inches)
KAPPA_SS▲	N	6,2	Degradation Factor for Short Duration - Superior
KAPPA_SM▲	N	6,2	Degradation Factor for Medium Duration - Superior
KAPPA_SL▲	N	6,2	Degradation Factor for Long Duration - Superior
DAMP_S▲	N	4,0	Damping - Superior
FRAC_S▲	N	6,2	Fraction - Superior

♦ Fragility Curves

Structural

There are 3 files, one for each design level (h = high, m = moderate, l = low)

File:	TFCSH.DBF, TFCSM.DBF, TFCSL.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	N	5	Model Building Type Label
MEDIAN_ST▲	N	6,2	Median Displacement for Slight Damage State - Code
BETA_ST▲	N	6,2	Beta for the Slight Damage State - Code
OFFSET_ST▲	N	7,3	Offset for Slight Damage State - Code
MEDIAN_MT▲	N	6,2	Median Displacement for Moderate Damage State - Code
BETA_MT▲	N	6,2	Beta for the Moderate Damage State - Code
OFFSET_MT▲	N	7,3	Offset for Moderate Damage State - Code
MEDIAN_ET▲	N	6,2	Median Displacement for Extensive Damage State - Code
BETA_ET▲	N	6,2	Beta for the Extensive Damage State - Code
OFFSET_ET▲	N	7,3	Offset for Extensive Damage State - Code
MEDIAN_CT▲	N	6,2	Median Displacement for Complete Damage State - Code
BETA_CT▲	N	6,2	Beta for the Complete Damage State - Code
OFFSET_CT▲	N	7,3	Offset for Complete Damage State - Code
MEDIAN_SP▲	N	6,2	Median Displacement for Slight Damage State - Poor
BETA_SP▲	N	6,2	Beta for the Slight Damage State - Poor
OFFSET_SP▲	N	7,3	Offset for Slight Damage State - Poor
MEDIAN_MP▲	N	6,2	Median Displacement for Moderate Damage State - Poor
BETA_MP▲	N	6,2	Beta for the Moderate Damage State - Poor
OFFSET_MP▲	N	7,3	Offset for Moderate Damage State - Poor
MEDIAN_EP▲	N	6,2	Median Displacement for Extensive Damage State - Poor
BETA_EP▲	N	6,2	Beta for the Extensive Damage State - Poor
OFFSET_EP▲	N	7,3	Offset for Extensive Damage State - Poor
MEDIAN_CP▲	N	6,2	Median Displacement for Complete Damage State - Poor
BETA_CP▲	N	6,2	Beta for the Complete Damage State - Poor
OFFSET_CP▲	N	7,3	Offset for Complete Damage State - Poor
MEDIAN_SS▲	N	6,2	Median Displacement for Slight Damage State - Superior
BETA_SS▲	N	6,2	Beta for the Slight Damage State - Superior
OFFSET_SS▲	N	7,3	Offset for Slight Damage State - Superior
MEDIAN_MS▲	N	6,2	Median Displacement for Moderate Damage State - Superior
BETA_MS▲	N	6,2	Beta for the Moderate Damage State - Superior
OFFSET_MS▲	N	7,3	Offset for Moderate Damage State - Superior
MEDIAN_ES▲	N	6,2	Median Displacement for Extensive Damage State - Superior
BETA_ES▲	N	6,2	Beta for the Extensive Damage State - Superior
OFFSET_ES▲	N	7,3	Offset for Extensive Damage State - Superior
MEDIAN_CS▲	N	6,2	Median Displacement for Complete Damage State - Superior
BETA_CS▲	N	6,2	Beta for the Complete Damage State - Superior
OFFSET_CS▲	N	7,3	Offset for Complete Damage State - Superior

Non-structural/Drift Sensitive

There are 3 files, one for each design level (h = high, m = moderate, l = low)

File:	TFCDH.DBF, TFCDM.DBF, TFCDL.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	N	5	Model Building Type Label
MEDIAN_ST▲	N	6,2	Median Displacement for Slight Damage State - Code
BETA_ST▲	N	6,2	Beta for the Slight Damage State - Code
OFFSET_ST▲	N	7,3	Offset for Slight Damage State - Code
MEDIAN_MT▲	N	6,2	Median Displacement for Moderate Damage State - Code
BETA_MT▲	N	6,2	Beta for the Moderate Damage State - Code
OFFSET_MT▲	N	7,3	Offset for Moderate Damage State - Code
MEDIAN_ET▲	N	6,2	Median Displacement for Extensive Damage State - Code
BETA_ET▲	N	6,2	Beta for the Extensive Damage State - Code
OFFSET_ET▲	N	7,3	Offset for Extensive Damage State - Code
MEDIAN_CT▲	N	6,2	Median Displacement for Complete Damage State - Code
BETA_CT▲	N	6,2	Beta for the Complete Damage State - Code
OFFSET_CT▲	N	7,3	Offset for Complete Damage State - Code
MEDIAN_SP▲	N	6,2	Median Displacement for Slight Damage State - Poor
BETA_SP▲	N	6,2	Beta for the Slight Damage State - Poor
OFFSET_SP▲	N	7,3	Offset for Slight Damage State - Poor
MEDIAN_MP▲	N	6,2	Median Displacement for Moderate Damage State - Poor
BETA_MP▲	N	6,2	Beta for the Moderate Damage State - Poor
OFFSET_MP▲	N	7,3	Offset for Moderate Damage State - Poor
MEDIAN_EP▲	N	6,2	Median Displacement for Extensive Damage State - Poor
BETA_EP▲	N	6,2	Beta for the Extensive Damage State - Poor
OFFSET_EP▲	N	7,3	Offset for Extensive Damage State - Poor
MEDIAN_CP▲	N	6,2	Median Displacement for Complete Damage State - Poor
BETA_CP▲	N	6,2	Beta for the Complete Damage State - Poor
OFFSET_CP▲	N	7,3	Offset for Complete Damage State - Poor
MEDIAN_SS▲	N	6,2	Median Displacement for Slight Damage State - Superior
BETA_SS▲	N	6,2	Beta for the Slight Damage State - Superior
OFFSET_SS▲	N	7,3	Offset for Slight Damage State - Superior
MEDIAN_MS▲	N	6,2	Median Displacement for Moderate Damage State - Superior
BETA_MS▲	N	6,2	Beta for the Moderate Damage State - Superior
OFFSET_MS▲	N	7,3	Offset for Moderate Damage State - Superior
MEDIAN_ES▲	N	6,2	Median Displacement for Extensive Damage State - Superior
BETA_ES▲	N	6,2	Beta for the Extensive Damage State - Superior
OFFSET_ES▲	N	7,3	Offset for Extensive Damage State - Superior
MEDIAN_CS▲	N	6,2	Median Displacement for Complete Damage State - Superior
BETA_CS▲	N	6,2	Beta for the Complete Damage State - Superior
OFFSET_CS▲	N	7,3	Offset for Complete Damage State - Superior

Non-structural/Acceleration Sensitive

There are 3 files, one for each design level (h = high, m = moderate, l = low)

File:	TFCAH.DBF, TFCAM.DBF, TFCAL.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	N	5	Model Building Type Label
MEDIAN_ST▲	N	6,2	Median Displacement for Slight Damage State - Code
BETA_ST▲	N	6,2	Beta for the Slight Damage State - Code
OFFSET_ST▲	N	7,3	Offset for Slight Damage State - Code
MEDIAN_MT▲	N	6,2	Median Displacement for Moderate Damage State - Code
BETA_MT▲	N	6,2	Beta for the Moderate Damage State - Code
OFFSET_MT▲	N	7,3	Offset for Moderate Damage State - Code
MEDIAN_ET▲	N	6,2	Median Displacement for Extensive Damage State - Code
BETA_ET▲	N	6,2	Beta for the Extensive Damage State - Code
OFFSET_ET▲	N	7,3	Offset for Extensive Damage State - Code
MEDIAN_CT▲	N	6,2	Median Displacement for Complete Damage State - Code
BETA_CT▲	N	6,2	Beta for the Complete Damage State - Code
OFFSET_CT▲	N	7,3	Offset for Complete Damage State - Code
MEDIAN_SP▲	N	6,2	Median Displacement for Slight Damage State - Poor
BETA_SP▲	N	6,2	Beta for the Slight Damage State - Poor
OFFSET_SP▲	N	7,3	Offset for Slight Damage State - Poor
MEDIAN_MP▲	N	6,2	Median Displacement for Moderate Damage State - Poor
BETA_MP▲	N	6,2	Beta for the Moderate Damage State - Poor
OFFSET_MP▲	N	7,3	Offset for Moderate Damage State - Poor
MEDIAN_EP▲	N	6,2	Median Displacement for Extensive Damage State - Poor
BETA_EP▲	N	6,2	Beta for the Extensive Damage State - Poor
OFFSET_EP▲	N	7,3	Offset for Extensive Damage State - Poor
MEDIAN_CP▲	N	6,2	Median Displacement for Complete Damage State - Poor
BETA_CP▲	N	6,2	Beta for the Complete Damage State - Poor
OFFSET_CP▲	N	7,3	Offset for Complete Damage State - Poor
MEDIAN_SS▲	N	6,2	Median Displacement for Slight Damage State - Superior
BETA_SS▲	N	6,2	Beta for the Slight Damage State - Superior
OFFSET_SS▲	N	7,3	Offset for Slight Damage State - Superior
MEDIAN_MS▲	N	6,2	Median Displacement for Moderate Damage State - Superior
BETA_MS▲	N	6,2	Beta for the Moderate Damage State - Superior
OFFSET_MS▲	N	7,3	Offset for Moderate Damage State - Superior
MEDIAN_ES▲	N	6,2	Median Displacement for Extensive Damage State - Superior
BETA_ES▲	N	6,2	Beta for the Extensive Damage State - Superior
OFFSET_ES▲	N	7,3	Offset for Extensive Damage State - Superior
MEDIAN_CS▲	N	6,2	Median Displacement for Complete Damage State - Superior
BETA_CS▲	N	6,2	Beta for the Complete Damage State - Superior
OFFSET_CS▲	N	7,3	Offset for Complete Damage State - Superior

E.3.1.2 Damage Functions for Transportation Systems

♦ Damage Functions for Transportation Systems - PGA

File:	DFxxPGA.DBF where xx is: = HW for highways = RW for railways = LR for light rail = BS for bus = PH for port & harbor = FS for ferry = AT for airport
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Transportation System Classification Label
MEDIAN_S▲	N	7,2	Median PGA for Slight Damage State (g)
BETA_S▲	N	7,2	Beta for Slight Damage State
MEDIAN_M▲	N	7,2	Median PGA for Moderate Damage State (g)
BETA_M▲	N	7,2	Beta for Moderate Damage State
MEDIAN_E▲	N	7,2	Median PGA for Extensive Damage State (g)
BETA_E▲	N	7,2	Beta for Extensive Damage State
MEDIAN_C▲	N	7,2	Median PGA for Complete Damage State (g)
BETA_C▲	N	7,2	Beta for Complete Damage State

♦ Damage Functions of Transportation Systems - PGD

File:	DFxxPGD.DBF where xx is: = HW for highways = RW for railways = LR for light rail = BS for bus = PH for port & harbor = FS for ferry = AT for airport
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Transportation System Classification Label
MEDIAN_S▲	N	7,2	Median PGD for Slight Damage State (in.)
BETA_S▲	N	7,2	Beta for Slight Damage State
MEDIAN_M▲	N	7,2	Median PGD for Moderate Damage State (in.)
BETA_M▲	N	7,2	Beta for Moderate Damage State
MEDIAN_E▲	N	7,2	Median PGD for Extensive Damage State (in.)
BETA_E▲	N	7,2	Beta for Extensive Damage State
MEDIAN_C▲	N	7,2	Median PGD for Complete Damage State (in.)
BETA_C▲	N	7,2	Beta for Complete Damage State

E.3.1.3 Damage Functions for Utility Systems

♦ **Damage Functions for Utility Systems - PGA**

File:	DFxxPGA.DBF where xx is: = PW for potable water = WW for waste water = OS for oil system = NG for natural gas = EP for electric power = CM for communication
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Utility System Classification Label
MEDIAN_S▲	N	7,2	Median PGA for Slight Damage State (g)
BETA_S▲	N	7,2	Beta for Slight Damage State
MEDIAN_M▲	N	7,2	Median PGA for Moderate Damage State (g)
BETA_M▲	N	7,2	Beta for Moderate Damage State
MEDIAN_E▲	N	7,2	Median PGA for Extensive Damage State (g)
BETA_E▲	N	7,2	Beta for Extensive Damage State
MEDIAN_C▲	N	7,2	Median PGA for Complete Damage State (g)
BETA_C▲	N	7,2	Beta for Complete Damage State

♦ Damage Functions for Utility Systems - PGD (Facilities)

File:	DFPGD.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Utility System Classification Label
MEDIAN_S▲	N	7,2	Median PGA for Slight Damage State (g)
BETA_S▲	N	7,2	Beta for Slight Damage State
MEDIAN_M▲	N	7,2	Median PGA for Moderate Damage State (g)
BETA_M▲	N	7,2	Beta for Moderate Damage State
MEDIAN_E▲	N	7,2	Median PGA for Extensive Damage State (g)
BETA_E▲	N	7,2	Beta for Extensive Damage State
MEDIAN_C▲	N	7,2	Median PGA for Complete Damage State (g)
BETA_C▲	N	7,2	Beta for Complete Damage State

♦ Damage Functions for Utility Systems - PGD and PGD Multiplier (Pipelines)

File:	DFPL.DBF
Mappable:	No

Name	**Type**	**Length**	**Description**
NO▲	N	3,0	Identifier Number
***CLASS*▲**	C	5	Pipeline Analysis Class
DESCRIPT▲	C	42	Pipeline Classification Description
PGV_MULTIP▲	N	10,6	Peak Ground Velocity - Multiple
PGD_MULTIP▲	N	10,3	Peak Ground Deformation Multiple

E.3.2 Restorations Functions

E.3.2.1 Restoration Functions for Essential Facilities

File:	RREXX.DBF = FC for Medical Care Facilities = EF for Emergency Facilities = FS for Schools
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Essential Facility Classification Label
MEAN_S▲	N	7,2	Median Restoration Time for Slight Damage State (days)
SIGMA_S▲	N	7,2	Sigma for Slight Damage State
MEAN_M▲	N	7,2	Median Restoration Time for Moderate Damage State (days)
SIGMA_M▲	N	7,2	Sigma for Moderate Damage State
MEAN_E▲	N	7,2	Median Restoration Time for Extensive Damage State (days)
SIGMA_E▲	N	7,2	Sigma for Extensive Damage State
MEAN_C▲	N	7,2	Median Restoration Time for Complete Damage State (days)
SIGMA_C▲	N	7,2	Sigma for Complete Damage State

E.3.2.2 Restoration Functions for Transportation Systems

File:	RRxx.DBF where xx is: = HW for highways = RW for railways = LR for light rail = BS for bus = PH for port & harbor = FS for ferry = AT for airport
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Transportation System Classification Label
MEAN_S▲	N	7,2	Median Restoration Time for Slight Damage State (days)
SIGMA_S▲	N	7,2	Sigma for Slight Damage State
MEAN_M▲	N	7,2	Median Restoration Time for Moderate Damage State (days)
SIGMA_M▲	N	7,2	Sigma for Moderate Damage State
MEAN_E▲	N	7,2	Median Restoration Time for Extensive Damage State (days)
SIGMA_E▲	N	7,2	Sigma for Extensive Damage State
MEAN_C▲	N	7,2	Median Restoration Time for Complete Damage State (days)
SIGMA_C▲	N	7,2	Sigma for Complete Damage State

E.3.2.3 Restoration Functions for Utility Systems

♦ **Facilities**

File:	RRxx.DBF where xx is: = PW for potable water = WW for waste water = OS for oil system = NG for natural gas = EP for electric power = CM for communication
Mappable:	No

Name	Type	Length	Description
NO▲	N	3,0	Identifier Number
LABEL▲	C	5	Utility System Classification Label
MEAN_S▲	N	7,2	Median Restoration Time for Slight Damage State (days)
SIGMA_S▲	N	7,2	Sigma for Slight Damage State
MEAN_M▲	N	7,2	Median Restoration Time for Moderate Damage State (days)
SIGMA_M▲	N	7,2	Sigma for Moderate Damage State
MEAN_E▲	N	7,2	Median Restoration Time for Extensive Damage State (days)
SIGMA_E▲	N	7,2	Sigma for Extensive Damage State
MEAN_C▲	N	7,2	Median Restoration Time for Complete Damage State (days)
SIGMA_C▲	N	7,2	Sigma for Complete Damage State

♦ Pipelines

File:	INPWRPL2.DBF for Potable Water RRPL.DBF for Waste Water, Oil, and Natural Gas Pipelines
Mappable:	No

Name	Type	Length	Description
CATEGORY▲	C		Pipeline Category
DIA_FROM▲	N	3,0	Pipe Diameter - From (in)
DIA_TO▲	N	3,0	Pipe Diameter - To (in)
FIX_BREAKS▲	N	5,2	Number of Breaks Fixed per Day per Worker
FIX_LEAKS▲	N	5,2	Number of Leaks Fixed per Day per Worker
N_PERSONS▲	N	10,0	Number of Workers
PRIORITY▲	N	1,0	Priority Flag

E.3.3 Analysis Parameters

E.3.3.1 General Building Stock

File:	SQFTB;DG.DBF
Mappable:	Yes

Name	Type	Length	Description
OCCU▲	C	7	Occupancy Type
SQFTPERBLD▲	N	10,2	Area per Building (ft2)

E.3.3.2 Hazard Analysis Parameters

♦ **Short Period Amplification**

File:	T048.DBF
Mappable:	No

Name	Type	Length	Description
PGA▲	N	3,1	Peak Ground Acceleration (g)
SA▲	N	4,2	Spectral Acceleration (g)
A▲	N	4,2	For Soil Type A
B▲	N	4,2	For Soil Type B
C▲	N	4,2	For Soil Type C
D▲	N	4,2	For Soil Type D
E▲	N	4,2	For Soil Type E

♦ Mid Period Amplification

File:	T048.DBF
Mappable:	No

Name	Type	Length	Description
PGV▲	N	5,1	Peak Ground Velocity (in/sec)
SA▲	N	3,1	Spectral Acceleration (g)
A▲	N	4,2	For Soil Type A
B▲	N	4,2	For Soil Type B
C▲	N	4,2	For Soil Type C
D▲	N	4,2	For Soil Type D
E▲	N	4,2	For Soil Type E

♦ Liquefaction

File:	T0412.DBF
Mappable:	No

Name	Type	Length	Description
SUSCEPT▲	N	2,0	Liquefaction Susceptibility Codes: 0, 1, 2, 3, 4 or 5
LABEL▲	C	10	Liquefaction Susceptibility Codes Descriptions: None = 0 Very Low = 1 Low = 2 Moderate = 3 High = 4 Very High = 5
RATIO▲	N	5,2	Proportion of Area Susceptible to Liquefaction

♦ Landslide

File:	T0419.DBF
Mappable:	No

Name	Type	Length	Description
SUSCEPT▲	N	2,0	Landslide Susceptibility Classes: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10
LABEL▲	C	10	Landslide Susceptibility Classes : None = 0 Class I = 1 Class II = 2 Class III = 3 Class IV = 4 Class V = 5 Class VI = 6 Class VII = 7 Class VIII = 8 Class IX = 9 Class X = 10
RATIO▲	N	5,2	Proportion of Area Susceptible to Landslide

E.3.3.3 Inundation Analysis Data Files

File:	(User specified)
Mappable:	Yes

Name	Type	Length	Description
TYPE▲	N	1,0	Inundation potential: = 1 Low = 2 Significant = 3 High.

Note: The inundation potential user-defined database files (for dams, tsunami, levees, and seiches) are specified through the "Analysis/Inundation Files" menu option. If no files are specified, **HAZUS** assumes no potential. Refer to Chapter 9 Induced Damage Models - Inundation in the Technical Manual for more details.

E.3.3.4 Analysis Parameters for Fire Following

Note that data for this parameter is not part of the Technical Manual and could be supplied by the user.

E.3.3.5 Debris Module Databases

♦ Debris Generated from Wood, Brick, and Other

File:	T122.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Building Type ID
LABEL▲	C	5	Model Building Type Label
STRUCT_S▲	N	9,1	Slight Structural Damage State
STRUCT_M▲	N	9,1	Moderate Structural Damage State
STRUCT_E▲	N	9,1	Extensive Structural Damage State
STRUCT_C▲	N	9,1	Complete Structural Damage State
NONSTRUC_S▲	N	9,1	Slight Nonstructural Damage State
NONSTRUC_M▲	N	9,1	Moderate Nonstructural Damage State
NONSTRUC_E▲	N	9,1	Extensive Nonstructural Damage State
NONSTRUC_C▲	N	9,1	Complete Nonstructural Damage State

♦ Debris Generated for Reinforced Concrete and Steel

File:	T123.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Building Type ID
LABEL▲	C	5	Model Building Type Label
STRUCT_S▲	N	9,1	Slight Structural Damage State
STRUCT_M▲	N	9,1	Moderate Structural Damage State
STRUCT_E▲	N	9,1	Extensive Structural Damage State
STRUCT_C▲	N	9,1	Complete Structural Damage State
NONSTRUC_S▲	N	9,1	Slight Nonstructural Damage State
NONSTRUC_M▲	N	9,1	Moderate Nonstructural Damage State
NONSTRUC_E▲	N	9,1	Extensive Nonstructural Damage State
NONSTRUC_C▲	N	9,1	Complete Nonstructural Damage State

♦ Unit Weights for Brick, Wood, and Other Elements

File:	T121A.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Building Type ID
LABEL▲	C	5	Model Building Type Label
STRUCTURAL▲	N	8,1	Unit Weight for Structural Elements
NONSTRUCT▲	N	8,1	Unit Weight for Nonstructural Elements

♦ Unit Weights for Reinforced Concrete and Steel Elements

File:	T121B.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Building Type ID
LABEL▲	C	5	Model Building Type Label
STRUCTURAL▲	N	8,1	Unit Weight for Structural Elements
NONSTRUCT▲	N	8,1	Unit Weight for Nonstructural Elements

E.3.3.6 Casualties Parameters Module

♦ **Casualty Default**

File:	CASLTY.DBF
Mappable:	No

Name	Type	Length	Description
DESCRIPT▲	C	20	Time Description
VALUE▲	N	6,2	Commuting Distribution Ratio
INI_ENTRY▲	C	10	Variable Name CdfDay = Commuting Distribution Factor at Day Time CdfNight = Night Commuting Distribution actor at Night Time CdfComm = Commuting Distribution Factor at Peak Commuting Time

♦ Casualty Rates

Casualties Rate Due to Buildings Damage

There are 5 files for each level of structural damage: slight, moderate, extensive, complete with no collapse, and complete with collapse.

File:	T133A.DBF for slight T134A.DBF for moderate T135A.DBF for extensive T136A.DBF for complete with no collapse T137A.DBF for complete with collapse
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Building type ID
BUILDING▲	C	5	Building structural type
LEVEL_1▲	N	9,4	Injuries per 1,000 people requiring basic medical aid without requiring hospitalization
LEVEL_2▲	N	9,4	Injuries (per 1,000) requiring a greater degree of medical care and hospitalization, but not expected to progress to a life threatening status
LEVEL_3▲	N	9,4	Injuries (per 1,000 people) which pose an immediate life threatening condition if not treated adequately and expeditiously. The majority of these injuries is a result of structural collapse and subsequent collapse or impairment of the occupants.
LEVEL_4▲	N	9,4	Instantaneously killed or mortally injured (per 1,000 people)

Casualties Rate Due to Bridges Damage

There are 5 files for each level of structural damage: slight, moderate, extensive, complete with no collapse, and complete with collapse.

File:	T133B.DBF for slight T134B.DBF for moderate T135B.DBF for extensive T136B.DBF for complete with no collapse T137B.DBF for complete with collapse
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Bridge class ID
LABEL▲	C	5	Bridge class
LEVEL_1▲	N	9,4	Injuries per 1,000 people requiring basic medical aid without requiring hospitalization
LEVEL_2▲	N	9,4	Injuries (per 1,000) requiring a greater degree of medical care and hospitalization, but not expected to progress to a life threatening status
LEVEL_3▲	N	9,4	Injuries (per 1,000 people) which pose an immediate life threatening condition if not treated adequately and expeditiously. The majority of these injuries is a result of structural collapse and subsequent collapse or impairment of the occupants.
LEVEL_4▲	N	9,4	Instantaneously killed or mortally injured (per 1,000 people)

♦ Collapse Rates

Collapse Rate Due to Complete Structural Damage

File:	T138A.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Building type ID
BUILDING▲	C	5	Building type
P_COL_CP▲	N	5,1	Probability of Collapse Given a Complete Damage State
P_ET_COL▲	N	5,1	Probability of Collapse Given Collapse
ENTRAP▲	N	5,1	Collapse Rate

Collapse Rate Due Complete Bridges Damage

File:	T138B.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Bridges class ID
BUILDING▲	C	5	Bridge class
P_COL_CP▲	N	5,1	Probability of Collapse Given a Complete Damage State
P_ET_COL▲	N	5,1	Probability of Collapse
ENTRAP▲	N	5,1	Collapse Rate

E.3.3.7 Shelter Module Databases

♦ **Utility Factor**

Note that the utilities factors probabilities is a default number that is picked by the software and could be changed by the user if necessary.

Shelter Category Weighting Factors

File:	T142.DBF
Mappable:	No

Name	Type	Length	Description
CLASS▲	C	5	IW, EW, OW and AW
DESCRIPT▲	C	26	IW = Income Weighting Factor EW = Ethnic Weighting Factor OW = Ownership Weighting Factor AW = Age Weighting Factor
VALUE▲	N	6,2	Category Default Weight

♦ Shelter Relative Modification Factors

Income

File:	T143A.DBF
Mappable:	No

Name	Type	Length	Description
CLASS▲	C	5	Income Identification Label
DESCRIPT▲	C	35	Varies by Class label
VALUE▲	N	6,2	Relative Default Modification Factor

Ethnicity

File:	T143B.DBF
Mappable:	No

Name	Type	Length	Description
CLASS▲	C	5	Ethnic Identification Label
DESCRIPT▲	C	15	Varies by Class label
VALUE▲	N	6,2	Relative Default Modification Factor

Ownership

File:	T143C.DBF
Mappable:	No

Name	Type	Length	Description
CLASS▲	C	5	Ownership Identification Label
DESCRIPT▲	C	18	Varies by Class label
VALUE▲	N	6,2	Relative Default Modification Factor

Age

File:	T143D.DBF
Mappable:	No

Name	Type	Length	Description
CLASS▲	C	5	Age Identification Label
DESCRIPT▲	C	38	Varies by Class label
VALUE▲	N	6,2	Relative Default Modification Factor

♦ Shelter Damage State Probabilities

File:	T141.DBF
Mappable:	No

Name	Type	Length	Description
WEIGHT_FAC▲	C	4	Weight factor
VALUE▲	N	6,2	Value of the Damage State Probability

E.3.3.8 Direct Economic Loss Module Databases

♦ **Buildings**

Building Loss Data

Structural Repairs Cost

There are 4 files for each damage state: complete, extensive, moderate, and slight.

File:	T152A.DBF for complete T152B.DBF for extensive T152C.DBF for moderate T152D.DBF for slight
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
W1▲	N	9,1	Repair Cost for Class W1
W2▲	N	9,1	Repair Cost for Class W2
S1▲	N	9,1	Repair Cost for Class S1
S2▲	N	9,1	Repair Cost for Class S2
S3▲	N	9,1	Repair Cost for Class S3
S4▲	N	9,1	Repair Cost for Class S4
S5▲	N	9,1	Repair Cost for Class S5
C1▲	N	9,1	Repair Cost for Class C1
C2▲	N	9,1	Repair Cost for Class C2
C3▲	N	9,1	Repair Cost for Class C3
PC1▲	N	9,1	Repair Cost for Class PC1
PC2▲	N	9,1	Repair Cost for Class PC2
RM1▲	N	9,1	Repair Cost for Class RM1
RM2▲	N	9,1	Repair Cost for Class RM2
URM▲	N	9,1	Repair Cost for Class URM
MH▲	N	9,1	Repair Cost for Class MH

Repairs Costs for Acceleration-Sensitive Non-Structural Elements

File:	T153.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
SLIGHT▲	N	9,1	Repair Cost for Slight Nonstructural Damage State
MODERATE▲	N	9,1	Repair Cost for Moderate Nonstructural Damage State
EXTENSIVE▲	N	9,1	Repair Cost for Extensive Nonstructural Damage State
COMPLETE▲	N	9,1	Repair Cost for Complete Nonstructural Damage State

Repairs Costs for Drift-Sensitive Non-Structural Elements

File:	T154.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
SLIGHT▲	N	9,1	Repair Cost for Slight Nonstructural Damage State
MODERATE▲	N	9,1	Repair Cost for Moderate Nonstructural Damage State
EXTENSIVE▲	N	9,1	Repair Cost for Extensive Nonstructural Damage State
COMPLETE▲	N	9,1	Repair Cost for Complete Nonstructural Damage State

Cost Modifiers

File:	T15A.DBF
Mappable:	No

Name	Type	Length	Description
CNTY_FIPS▲	C	2	County 5-digit FIPS code
COUNTY_NAM▲	C	20	County Name
INDEX▲	N	5,1	Cost modifier index

Contents

Contents Value as Percentage of Replacement Value

File:	T155.DBF
Mappable:	Yes

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
VALUE▲	N	4,0	Contents Value as Percentage of Replacement Value

Percent Content Damage

File:	T156.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
SLIGHT▲	N	3,0	Percent Content Damage for Slight Nonstructural Damage State
MODERATE▲	N	3,0	Percent Content Damage for Moderate Nonstructural Damage State
EXTENSIVE▲	N	3,0	Percent Content Damage for Extensive Nonstructural Damage State
COMPLETE▲	N	3,0	Percent Content Damage for Complete Nonstructural Damage State

Business Inventory

Annual Gross Sales

File:	T157.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
***LABEL*▲**	C	5	Occupancy Type Label
SALES▲	N	20,0	Annual Gross Sales or Production

Business Inventory as Percent of Gross Annual Sales

File:	T158.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
***LABEL*▲**	**C**	**5**	**Occupancy Type Label**
INVENTORY▲	N	5,1	Business Inventory as Percentage of Annual Gross Sales

Percentage of Business Inventory Damage

File:	T159.DBF
Mappable:	Yes

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
***LABEL*▲**	C	5	Occupancy Type Label
SLIGHT▲	N	3,0	Percent Business Damage for Slight Nonstructural Damage State
MODERATE▲	N	3,0	Percent Business Damage for Moderate Nonstructural Damage State
EXTENSIVE▲	N	3,0	Percent Business Damage for Extensive Nonstructural Damage State
COMPLETE▲	N	3,0	Percent Business Damage for Complete Nonstructural Damage State

Repair Time

Building Cleanup and Repair Time - Construction

File:	T1510.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
NONE▲	N	9,1	Construction Time for None Structural Damage State
SLIGHT▲	N	9,1	Construction Time for Slight Structural Damage State
MODERATE▲	N	9,1	Construction Time for Moderate Structural Damage State
EXTENSIVE▲	N	9,1	Construction Time for Extensive Structural Damage State
COMPLETE▲	N	9,1	Construction Time for Complete Structural Damage State

Building Cleanup and Repair Time - Extended

File:	T1511.DBF
Mappable:	Yes

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
NONE▲	N	9,0	Construction Time for None Structural Damage State (Days)
SLIGHT▲	N	9,0	Construction Time for Slight Structural Damage State (Days)
MODERATE▲	N	9,0	Construction Time for Moderate Structural Damage State (Days)
EXTENSIVE▲	N	9,0	Construction Time for Extensive Structural Damage State (Days)
COMPLETE▲	N	9,0	Construction Time for Complete Structural Damage State (Days)

Building and Service Interruption Multipliers

File:	T1512.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
NONE▲	N	9,0	Construction Time Multiplier for None Structural Damage State
SLIGHT▲	N	9,0	Construction Time Multiplier for Slight Structural Damage State
MODERATE▲	N	9,0	Construction Time Multiplier for Moderate Structural Damage State
EXTENSIVE▲	N	9,0	Construction Time Multiplier for Extensive Structural Damage State
COMPLETE▲	N	9,0	Construction Time Multiplier for Complete Structural Damage State

Income Loss Data

Rental and Disruption Costs

File:	T1513.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
RENTPERM▲	N	5,2	Rental Cost Per Month
RENTPERD▲	N	5,2	Rental Cost Per Day
DSRPTPERD▲	N	5,2	Distribution Cost Per Month

Percent Owner Occupied Values

File:	T1514.DBF
Mappable:	Yes

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	5	Occupancy Type Label
OWNER▲	N	3,0	Percent Owner Occupied

Wages and Capital Related Income

File:	T1515.DBF
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identification ID
LABEL▲	C	7	Occupancy Type Label
INCPERY▲	N	15,3	$ Income Per Year
INCPERD▲	N	8,3	$ Income Per Day
WAGEPERD▲		8,3	$ Wages Per Day
EMPPERD▲		8,3	Employment Per Day
OUTPERD▲		8,3	$ Industry Output per Day

Recapture Per Day

File:	RECAPF.DBF
Mappable:	No

Name	Type	Length	Description
OCCU▲	C	5	Occupancy Type Label
WAG_FAC▲	N	5,2	Wages Recapture (%)
EMP_FAC▲	N	5,2	Employment Recapture (%)
INC_FAC▲	N	5,2	Income Recapture (%)
OUT_FAC▲	N	5,2	Industry Output Recapture (%)

♦ Military Installation

Value Breakdown Ratios

File:	MIVALPCT.DBF
Mappable:	No

Name	Type	Length	Description
OCCUP▲	C	6	Occupancy Type Label
PCT_STR▲	N	3,0	Structural Elements Ratio
PCT_NSA▲	N	3,0	Non-structural Element Ratio - Acceleration Sensitive
PCT_NSD▲	N	3,0	Non-structural Element Ratio - Drift Sensitive

Damage to Loss Ratios Factors

File:	MILOSSR.DBF
Mappable:	No

Name	Type	Length	Description
OCCUP▲	C	6	Occupancy Type Label
STR_S▲	N	3,0	Factor For Structural Element With Slight Damage State
STR_M▲	N	3,0	Factor For Structural Element With Moderate Damage State
STR_E▲	N	3,0	Factor For Structural Element With Extensive Damage State
STR_C▲	N	3,0	Factor For Structural Element With Complete Damage State
NSA_S▲	N	3,0	Factor For Non-Structural (Acceleration Sensitive) Element With Slight Damage State
NSA_M▲	N	3,0	Factor For Non-Structural (Acceleration Sensitive) Element With Moderate Damage State
NSA_E▲	N	3,0	Factor For Non-Structural (Acceleration Sensitive) Element With Extensive Damage State
NSA_C▲	N	3,0	Factor For Non-Structural (Acceleration Sensitive) Element With Complete Damage State
NSD_S▲	N	3,0	Factor For Non-Structural (Drift Sensitive) Element With Slight Damage State
NSD_M▲	N	3,0	Factor For Non-Structural (Drift Sensitive) Element With Moderate Damage State
NSD_E▲	N	3,0	Factor For Non-Structural (Drift Sensitive) Element With Extensive Damage State
NSD_C▲	N	3,0	Factor For Non-Structural (Drift Sensitive) Element With Complete Damage State
CNT_S▲	N	3,0	Factor For Contents With Slight Damage State
CNT_M▲	N	3,0	Factor For Contents With Moderate Damage State
CNT_E▲	N	3,0	Factor For Contents With Extensive Damage State
CNT_C▲	N	3,0	Factor For Contents With Complete Damage State

♦ Lifelines

Replacement Cost

File:	T1516.DBF
Mappable:	No

Name	**Type**	**Length**	**Description**
LABEL▲	C	5	Transportation System Label
VALUE▲	N	12,0	Replacement Value
PER▲	C	2	Units
DESCRIPT▲	C	55	Transportation System Component Classification

Transportation Systems Damage Ratio

File:	DRxx.DBF where xx is: = HW for highways = RW for railways = LR for light rail = BS for bus = PH for port & harbor = FS for ferry = AT for airport
Mappable:	No

Name	Type	Length	Description
NO▲	N	2,0	Identifier
LABEL▲	C	5	Transportation System Classification Label
DAMAGE_S▲	N	7,2	Damage Ratio for Slight Damage State
DAMAGE_M▲	N	7,2	Damage Ratio for Moderate Damage State
DAMAGE_E▲	N	7,2	Damage Ratio for Extensive Damage State
DAMAGE_C▲	N	7,2	Damage Ratio for Complete Damage State

Utility Systems Damage Ratios

File:	DRxx.DBF where xx is: = PW for potable water = WW for waste water = OS for oil system = NG for natural gas = EP for electric power = CM for communication
Mappable:	No

Name	**Type**	**Length**	**Description**
NO▲	N	2,0	Identifier
***LABEL*▲**	C	5	Utility System Classification Label
DAMAGE_S▲	N	7,2	Damage Ratio for Slight Damage State
DAMAGE_M▲	N	7,2	Damage Ratio for Moderate Damage State
DAMAGE_E▲	N	7,2	Damage Ratio for Extensive Damage State
DAMAGE_C▲	N	7,2	Damage Ratio for Complete Damage State

E.3.3.9 Indirect Economic Loss Module Databases

♦ **Analysis Factors**

File:	IMPLANDF.IMP
Mappable:	No

Name	Type	Length	Description
IND_CODE	C	6	Industry Code
S_IMPORTS	N	6.2	Supplemental Imports
SUPPLIES	N	6.2	supplies Inventories
DEMANDS	N	6.2	Demands Inventories
N_EXPORTS	N	6.2	New Export Markets
OTHER_EXP	N	6.2	Other Expenses

♦ Restoration and Rebuilding

File:	INDECRF.DBF
Mappable:	No

Name	Type	Length	Description
SECTOR	C	5	Economic Sector
YEAR1	N	5,1	% Restored after 1 Year
YEAR2	N	5,1	% Restored after 2 Year
YEAR3	N	5,1	% Restored after 3 Year
YEAR4	N	5,1	% Restored after 4 Year
YEAR5	N	5,1	% Restored after 5 Year

♦ Stimulus Effect

File:	INDECSTM
Mappable:	No

Name	Type	Length	Description
YEAR	C	1	Year Number
SECTOR	C	4	Economic Sector
VALUE	N	10,1	Total Stimulus Value

Appendix F. Questionnaire for Assessing Characteristics of Regional Building Stock

Workshop to Evaluate the Design and Construction of Local Region

F.1 Part 1: General Information

Name: ____ **Date**: ______________

Region or regions you represent: _________________________________

Type of Experience in Region **Number of Years Experience**
(e.g. designer, inspector, planner, plan checker contractor, etc.)

____________________________________ ___________

____________________________________ ___________

____________________________________ ___________

____________________________________ ___________

F.2 Part 2: Specific Design and Construction Practices for the Region

Review the Model Building Types in the Appendix. Do these Model Building Types completely represent the construction types in your region? That is, describe any building types which you cannot map into the Model Building Types.

____
____
____

Which building code is currently in effect in your region? _________________________

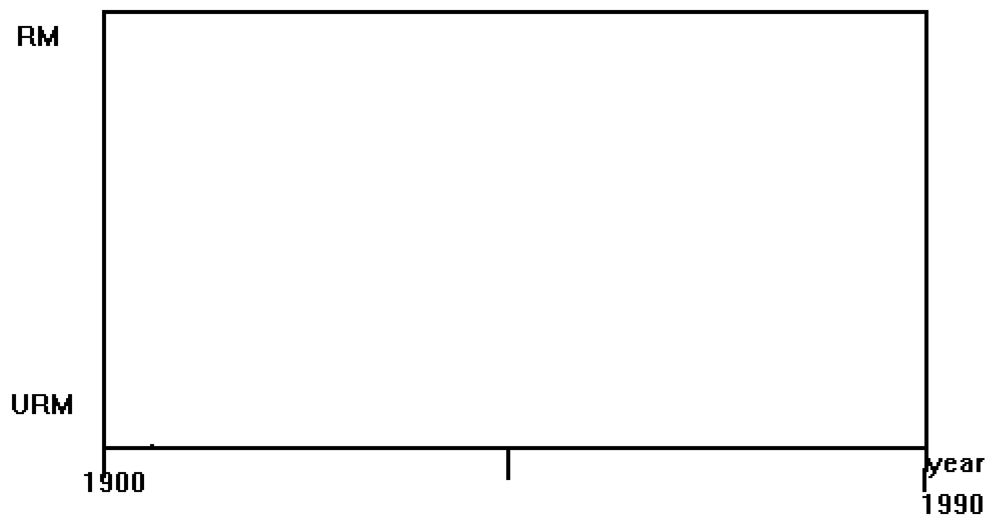
Are there building types that are unique to your region or that typify your region (e.g. brownstone, Victorian, adobe block)? Please give a description of these building types and what makes them unique.

____
____
____

Is there a year that you can identify for your region when Unreinforced Masonry (URM) ceased to be built?

Is there a year that you can identify in which Reinforced Masonry (RM) began to be built?

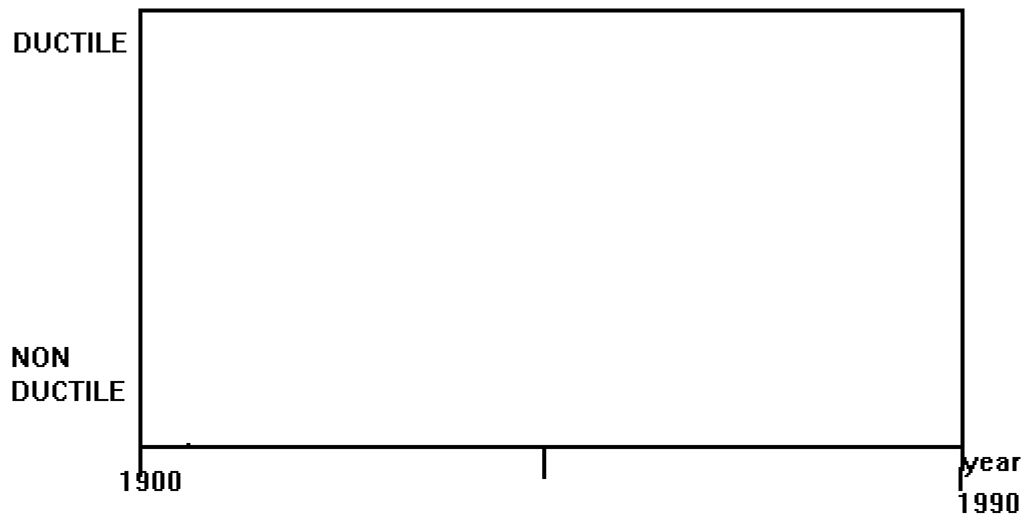
Represent the distribution of construction of RM and URM on the graph below.



When did you start to build Steel Moment Resistant Frames in your region?

When did you start to build ductile concrete in your region?

What is the distribution of ductile versus non-ductile concrete frames for your region:



When did you stop building steel frames with URM infill walls?

For high rise structures(8+ stories) in your region can you provide a distribution of structural type over time (steel, concrete, masonry).

For low rise large wholesale/light industrial structures in your region can you provide a distribution of structural type over time (steel, reinforced concrete, masonry, tilt-up, wood).

Reviewing the model building types as described Appendix A, can you identify important "benchmark" years? These would be years when significant code changes occurred in your region so that the performance of the structures, when subjected to natural hazards such as wind earthquake and flood, improved? Some examples might be required bolting of the structure to the foundation, required use of hurricane clips, or improved connection of tilt-up walls to roof diaphragms.

Year	Improvement	Code Requiring Improvement

Can you identify when significant changes in building practices occurred in your region that effect the calculation of vulnerability of buildings to natural hazards such as wind, earthquake and flood? Some examples might be introduction of a new building type such as tilt-ups, discontinued use of a particular building material, discontinued use of cripple walls, significant housing development during a particular era.

The current NIBS/FEMA methodology divides structures into three groups (pre-1950, 1950-1970, post-1970). Based upon your answers to the previous questions does this age breakdown make sense for your region? If not can you suggest something that better reflects the design and construction practices of your region? It can have more than three age groupings.

Is there any other information particular to your region that you feel is important assessing building vulnerability?

F.3 Part3: Occupancy to General Building Type Relationships for the Local Region

For several states in your region as shown below, insurance data suggests that the mix of building types in terms of percentage of total square footage is:

State ____________:

	Wood Frame	Masonry	Rfd. Concrete	Steel	Light Metal	Mobile Home
Residential						
Commercial						

State ____________:

	Wood Frame	Masonry	Rfd. Concrete	Steel	Light Metal	Mobile Home
Residential						
Commercial						

State ____________:

	Wood Frame	Masonry	Rfd. Concrete	Steel	Light Metal	Mobile Home
Residential						
Commercial						

State ____________:

	Wood Frame	Masonry	Rfd. Concrete	Steel	Light Metal	Mobile Home
Residential						
Commercial						

Based upon your experience, do these relationships look reasonable? If not which numbers are you questioning?

____

____

____

____

Use the table below to enter an improved distribution of building types for each occupancy.

Improved General Occupancy to Building Type Relationship for The Local Region

	Wood Frame	Masonry	Reinforced Concrete	Steel	Light Metal	Mobile Home
Residential						
Commercial						

Occupancy to model building type relationships have been developed for several counties based on the analysis of county assessor's records. The occupancy to model building type relationships are based upon percentage of total square footage for each occupancy. You'll note for certain occupancies such as government and non-profit agencies, assessor's files do not provide adequate information to establish a relationship. The occupancy to model building type relationships are found in the Appendix. Please review the appendix and identify which county best reflects your region.

County ____

Based upon your experience, what distributions do you think need revision?

Occupancy **Problem**

______

______

______

______

______

Please enter your improved estimates of occupancy to model building type relationships in the tables below.

URBAN

Label	Class	Wood Frame	Steel	Concrete	Masonry	Mobile Home
RES1	Single Family Dwelling					
RES2	Mobile Home					
RES3	Multi Family Dwelling					
RES4	Temporary Lodging					
RES5	Institutional Dormitory					
RES6	Nursing Home					
COM1	Retail Trade					
COM2	Wholesale Trade					
COM3	Personal and Repair Services					
COM4	Professional/Technical Srv					
COM5	Banks					
COM6	Hospital					
COM7	Medical Office/Clinic					
COM8	Entertainment & Recreation					
COM9	Theaters					
COM10	Parking					
IND1	Heavy					
IND2	Light					
IND3	Food/Drugs/Chemicals					
IND4	Metals/Minerals Processing					
IND5	High Technology					
IND6	Construction					
AGR	Agriculture					
REL	Church/Non Profit					
GOV1	General Services					
GOV2	Emergency Services					
ED1	Schools/Libraries					
ED2	Colleges/ Universities					

SUBURBAN

Label	Class	Wood Frame	Steel	Concrete	Masonry	Mobile Home
RES1	Single Family Dwelling					
RES2	Mobile Home					
RES3	Multi Family Dwelling					
RES4	Temporary Lodging					
RES5	Institutional Dormitory					
RES6	Nursing Home					
COM1	Retail Trade					
COM2	Wholesale Trade					
COM3	Personal and Repair Services					
COM4	Professional/Technical Srv					
COM5	Banks					
COM6	Hospital					
COM7	Medical Office/Clinic					
COM8	Entertainment & Recreation					
COM9	Theaters					
COM10	Parking					
IND1	Heavy					
IND2	Light					
IND3	Food/Drugs/Chemicals					
IND4	Metals/Minerals Processing					
IND5	High Technology					
IND6	Construction					
AGR	Agriculture					
REL	Church/Non Profit					
GOV1	General Services					
GOV2	Emergency Services					
ED1	Schools/Libraries					
ED2	Colleges/ Universities					

F.4 Part 4: General to Specific Occupancy Relationship for the Local Region

Based upon your experience, how would steel frames in your region be distributed among the five types listed below?

Steel Frame Distribution by Percentage of Total Square Footage

	Steel Moment Frame	Steel Braced Frame	Steel Light Frame	Steel Frame w/ Cast-in-Place Concrete Shear Walls	Steel Frame w/ Unreinforced Masonry Infill Walls	Other (Specify)
Low rise						
Mid rise						
High rise						

Confidence: ____

Is there either an age or occupancy factor that would cause you to skew your answers. For example a particular occupancy uses a unique structural type or does not use one of the types listed above. If so state your skewed answer in the table below

Factor Affecting Distribution ___________________________________

Steel Frame Distribution by Percentage of Total Square Footage

	Steel Moment Frame	Steel Braced Frame	Steel Light Frame	Steel Frame w/ CIP Concrete Shear Walls	Steel Frame w/ URM Infill Walls	Other
Low rise						
Mid rise						
High rise						

Factor Affecting Distribution ___________________________________

Steel Frame Distribution by Percentage of Total Square Footage

	Steel Moment Frame	Steel Braced Frame	Steel Light Frame	Steel Frame w/ CIP Concrete Shear Walls	Steel Frame w/ URM Infill Walls	Other
Low rise						
Mid rise						
High rise						

Factor Affecting Distribution ___________________________________

Steel Frame Distribution by Percentage of Total Square Footage

	Steel Moment Frame	Steel Braced Frame	Steel Light Frame	Steel Frame w/ CIP Concrete Shear Walls	Steel Frame w/ URM Infill Walls	Other
Low rise						
Mid rise						
High rise						

Based upon your experience, how would concrete structures in your region be distributed among the five types listed below?

Concrete Distribution by Percentage of Total Square Footage

	Concrete Moment Frames	Concrete Shear Walls	Concrete Frames w/ URM Infill Walls	Precast-Concrete Tilt-Up Walls	Precast Concrete Frames w/ Concrete Shear Walls	Other (Specify)
Low rise						
Mid rise						
High rise						

Confidence: ____

Is there either an age or occupancy factor that would cause you to skew your answers. For example a particular occupancy uses a unique structural type or does not use one of the types listed above. If so state your skewed answer in the table below

Factor Affecting Distribution ________________________________

Concrete Distribution by Percentage of Total Square Footage

	Concrete Moment Frames	Concrete Shear Walls	Concrete Frames URM Infill Walls	Precast-Concrete Tilt-Up Walls	Precast Concrete Frames w/ Concrete Shear Walls	Other
Low rise						
Mid rise						
High rise						

Factor Affecting Distribution ________________________________

Concrete Distribution by Percentage of Total Square Footage

	Concrete Moment Frames	Concrete Shear Walls	Concrete Frames URM Infill Walls	Precast-Concrete Tilt-Up Walls	Precast Concrete Frames w/ Concrete Shear Walls	Other
Low rise						
Mid rise						
High rise						

Factor Affecting Distribution ________________________________

Concrete Distribution by Percentage of Total Square Footage

	Concrete Moment Frames	Concrete Shear Walls	Concrete Frames URM Infill Walls	Precast-Concrete Tilt-Up Walls	Precast Concrete Frames w/ Concrete	Other

					Shear Walls	
Low rise						
Mid rise						
High rise						

Based upon your experience, how would masonry structures in your region be distributed among the three types listed below?

Masonry Distribution by Percentage of Total Square Footage

	Reinforced Masonry Walls w/ Wood/ Metal Deck Diaphragms	**Reinforced Masonry Walls w/ PC Diaphragms**	**Unreinforced Masonry (URM) Bearing Walls**	**Other**
Low rise				
Mid rise				
High rise				

Confidence: ___________________________________

Is there either an age or occupancy factor that would cause you to skew your answers. For example a particular occupancy uses a unique structural type or does not use one of the types listed above. If so state your skewed answer in the table below

Factor Affecting Distribution ___________________________________

Masonry Distribution by Percentage of Total Square Footage

	Reinforced Masonry Walls w/ Wood/ Metal Deck Diaphragms	**Reinforced Masonry Walls w/ PC Diaphragms**	**Unreinforced Masonry (URM) Bearing Walls**	**Other**
Low rise				
Mid rise				
High rise				

Factor Affecting Distribution ___________________________________

Masonry Distribution by Percentage of Total Square Footage

	Reinforced Masonry Walls w/ Wood/ Metal Deck Diaphragms	**Reinforced Masonry Walls w/ PC Diaphragms**	**Unreinforced Masonry (URM) Bearing Walls**	**Other**
Low rise				
Mid rise				
High rise				

Factor Affecting Distribution ___________________________________

Masonry Distribution by Percentage of Total Square Footage

	Reinforced Masonry Walls w/ Wood/ Metal Deck Diaphragms	Reinforced Masonry Walls w/ PC Diaphragms	Unreinforced Masonry (URM) Bearing Walls	Other
Low rise				
Mid rise				
High rise				

Appendix G. Hazardous Materials Classification and Permit Amounts

The most widely used detailed classification scheme is the one that has been developed by the National Fire Protection Association, and is presented in the 1991 Uniform Fire Code, among other documents. This classification scheme is shown in Table G1. Sixty material types have been defined (HM01 to HM60). The hazards posed by the various materials are divided into two major categories: Physical Hazards and Health Hazards. Depending upon the exact nature of the hazard, these two major categories are divided into subcategories. Examples are poison, carcinogen, mildly toxic, moderately toxic or skin irritant. These subcategories of hazards, with their definitions, and examples of materials that fall within each category, are contained in Appendix 11A and 11B of the Technical Manual. A more detailed description of these categories, with more extensive examples can be found in Appendix VI-A of the 1991 Uniform Fire Code.

Table G1 also contains minimum quantities of the materials that must be on site to require permitting according to the Uniform Fire Code. It should be noted that the minimum permit quantities may vary depending upon whether the chemical is stored inside or outside of a building. For facilities that have hazardous materials, but in quantities less than those listed in Table G1, it is anticipated that releases of these small quantities will not put significant immediate demands on health and emergency services, thus you may wish to exclude them from the database.

Table G1 Classification of Hazardous Materials and Permit Amounts

Label	Material Type	Permit Amount		Hazard Type Remarks
		Inside Building	Outside Building	
HM01	Carcinogens	10 lbs	10 lbs	Health
HM02	Cellulose nitrate	25 lbs	25 lbs	Physical
HM03	Combustible fibers	100 cubic ft	100 cubic ft	Physical
	Combustible liquids			Physical
HM04	Class I	5 gallons	10 gallons	
HM05	Class II	25 gallons	60 gallons	
HM06	Class III-A	25 gallons	60 gallons	
HM07	Corrosive gases	Any amount	Any amount	Health [1]
HM08	Corrosive liquids	55 gallons	55 gallons	Physical; Health
	Cryogens			
HM09	Corrosive	1 gallon	1 gallon	Health
HM10	Flammable	1 gallon	60 gallons	Physical
HM11	Highly toxic	1 gallon	1 gallon	Health
HM12	Nonflammable	60 gallons	500 gallons	Physical
HM13	Oxidizer (including oxygen)	50 gallons	50 gallons	Physical
HM14	Highly toxic gases	Any amount	Any amount	Health; [1]
HM15	Highly toxic liquids & solids	Any amount	Any amount	Health
HM16	Inert	6,000 cubic ft	6,000 cubic ft	Physical; [1]
HM17	Irritant liquids	55 gallons	55 gallons	Health
HM18	Irritant solids	500 lbs	500 lbs	Health
HM19	Liquefied petroleum gases	> 125 gallons	> 125 gallons	Physical
HM20	Magnesium	10 lbs	10 lbs	Physical
HM21	Nitrate film	(Unclear)	(Unclear)	Health
HM22	Oxidizing gases (including oxygen)	500 cubic feet	500 cubic feet	Physical [1]
	Oxidizing liquids			Physical
HM23	Class 4	Any amount	Any amount	
HM24	Class 3	1 gallon	1 gallon	
HM25	Class 2	10 gallons	10 gallons	
HM26	Class 1	55 gallons	55 gallons	
	Oxidizing solids			Physical
HM27	Class 4	Any amount	Any amount	
HM28	Class 3	10 lbs	10 lbs	
HM29	Class 2	100 lbs	100 lbs	
HM30	Class 1	500 lbs	500 lbs	
	Organic peroxide liquids and solids			Physical
HM31	Class I	Any amount	Any amount	
HM32	Class II	Any amount	Any amount	
HM33	Class III	10 lbs	10 lbs	
HM34	Class IV	20 lbs	20 lbs	
	Other health hazards			Health
HM35	Liquids	55 gallons	55 gallons	
HM36	Solids	500 lbs	500 lbs	
HM37	Pyrophoric gases	Any amount	Any amount	Physical [1]
HM38	Pyrophoric liquids	Any amount	Any amount	Physical
HM39	Pyrophoric solids	Any amount	Any amount	Physical
HM40	Radioactive materials	1 m Curie in unsealed source	1 m Curie in sealed source	Health [1]
HM41	Sensitizer, liquids	55 gallons	55 gallons	Health
HM42	Sensitizer, solids	500 lbs	500 lbs	Health
HM43	Toxic gases	Any amount	Any amount	Health [1]

Table G1 Classification of Hazardous Materials and Permit Amounts (Cont.)

Label	Material Type	Permit Amount		Hazard Type Remarks
		Inside Building	Outside Building	
HM44	Toxic liquids	50 gallons	50 gallons	Health
HM45	Toxic solids	500 lbs	500 lbs	Health
HM46	Unstable gases (reactive)	Any amount	Any amount	Physical[13]
	Unstable liquids (reactive)			Physical
HM47	Class 4	Any amount	Any amount	
HM48	Class 3	Any amount	Any amount	
HM49	Class 2	5 gallons	5 gallons	
HM50	Class 1	10 gallons	10 gallons	
	Unstable solids (reactive)			Physical
HM51	Class 4	Any amount	Any amount	
HM52	Class 3	Any amount	Any amount	
HM53	Class 2	50 lbs	50 lbs	
HM54	Class 1	100 lbs	100 lbs	
	Water-reactive liquids			Physical
HM55	Class 3	Any amount	Any amount	
HM56	Class 2	5 gallons	5 gallons	
HM57	Class 1	10 gallons	10 gallons	
	Water-reactive solids			Physical
HM58	Class 3	Any amount	Any amount	
HM59	Class 2	50 pounds	50 pounds	
HM60	Class 1	100 pounds	100 pounds	

[13] Includes compressed gases

Appendix H. Glossary of Terms

Attenuation Relationship - A relationship that describes how ground motions (acceleration and velocities) decrease as a function of distance from the earthquake source.

Building Period - Buildings tend to shake at different speeds. The period tells us how long it takes for a building to shake back and forth one time. Tall buildings have longer periods on the order of 1 to 4 seconds. Short buildings move back and forth very rapidly and have periods on the order of 0.1 to 0.4 seconds. The building frequency is also a measure of the speed at which a building shakes.

Building Frequency - The building frequency is the reciprocal of the period, that is it is a measure of how many times the building shakes back and forth every second. If a building has a period of 2 seconds, its frequency is 0.5 Hz (cycles per second).

CAS - Chemical Abstracts Service registry number. This is a numeric designation assigned by the American Chemical Society's Chemical Abstracts Service that uniquely identifies a specific chemical compound.

Damage Ratio - Cost of repair as a fraction of replacement cost.

Direct Economic Loss - In this methodology the costs of structural and non-structural repair, damage to building contents, loss of building inventory, relocation expenses, lost wages and lost income.

GIS (geographic information system) - Software tool for displaying, analyzing and manipulating spatially related data. Data is stored in layers which can be overlaid and combined to map data.

HAZUS - A software package developed to estimate losses estimates due to natural hazards for the United States. The name is derived from *Hazards U.S.*

Indirect Economic Loss - In this methodology the long-term regional economic effects.

Liquefaction - A phenomenon where due to shaking, soil losses its strength and essentially acts like a liquid.

MMI (Modified Mercalli Intensity) - A system for measuring the damage that occurs in an earthquake. The scale is measured from I to XII. A I is not felt by people and a XII causes essentially total damage to the built environment.

NEHRP -National Earthquake Hazards Reduction Program

PESH (potential earth science hazards) - In this methodology PESH is that group of physical attributes and consequences that describe the potential damageability of the earthquake. These include the ground motion (PGA, PGV, spectral acceleration, spectral velocity), ground failure (liquefaction, landslide and surface fault rupture), tsunami and seiche.

PGA - Peak Ground Acceleration. The largest acceleration that can be expected at a particular site due to an earthquake.

PGD - Permanent Ground Deformation - This is a quantification of the ground failure that occurs as a result of liquefaction, landslides and surface fault rupture. It is measured in inches and describes how far the surface of the ground moves.

PGV - Peak Ground Velocity

Seiche - Waves in a lake or reservoir that are induced because of ground shaking.

Shear Waves - Shear waves (S waves) are one of the many types of waves that are generated by an earthquake. Each type of wave shakes the ground differently (some fast, some slow, some up and down, some sideways).

Shear Wave Velocity - Shear waves travel through different types of soils at different velocities (speeds). Shear wave travel more quickly through rock and hard soils and more slowly through soft soils. The shear wave velocity can then be used as a measure of the type of soil.

Spectral Acceleration - The acceleration of earthquake motion at a specified building period. See definition of spectral velocity

Spectral Velocity - The velocity of earthquake motion at a specified building period. Earthquake shaking is a complex mixture of movements at different frequencies. Some of the shaking is fast and some of it is slow. Different buildings respond to different types of shaking. Short buildings tend to respond to fast shaking and tall buildings respond to slower shaking. Thus if an earthquake has a lot of fast shaking we would expect it to excite low rise buildings. By breaking apart the earthquake shaking and looking at one part at a time, in terms of building period, we can see which buildings will experience higher levels of motion.

Thematic Map - A map that uses color, patterns and/or symbols to graphically represent characteristics of a set of data. Graphical representations include shaded ranges, shaded individual values, bar charts, pie charts, graduated symbols and dot density.

TIGER files- Topologically Integrated Geographic Encoding and Referencing system. This is a system developed by the U.S. Census Bureau that can be used for inventory development. Files contain roads, streets, railways, waterways and census boundaries. See Section 6.8.5.

Tsunami - Tsunami translates as “harbor wave.” These ocean waves can be caused by the direct effects of subduction earthquake and the secondary effects of earthquake triggered submarine landslides. Their heights can be greater than 10 meters.