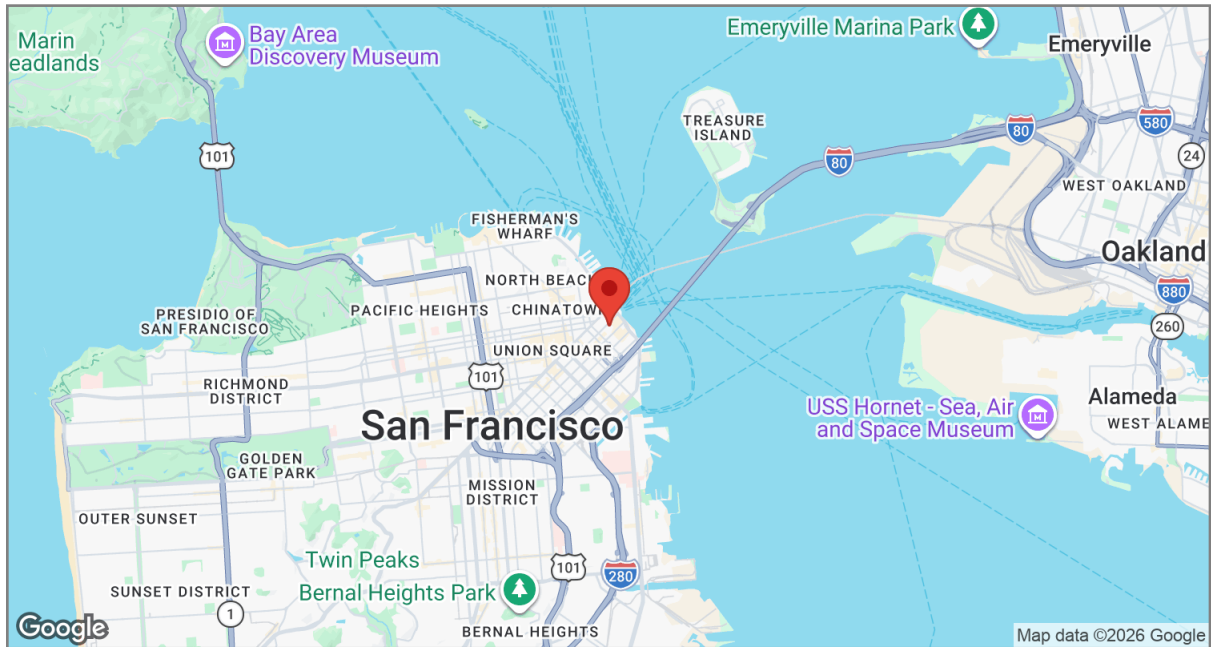


SEISMIC RISK ASSESSMENT REPORT

Created with the SP3-RiskModel *Advanced + Recovery*

Functional Recovery Time Report using the ATC-138 Functional Recovery (Beta) Methodology



Report Generated for:

123 Main Street, San Francisco, CA

Latitude: 37.79166°

Longitude: -122.39442°

Report Generated by:

v14.7.1 of the SP3-RiskModel

May 22, 2026



**Seismic Performance
Prediction Platform**

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1 SUMMARY OF INPUTS AND RISK RESULTS

Risk Model Inputs

Primary		Building Design Info	
Project Name:	Website	Level of Detailing (Dir. 1, 2):	Special,
Model Name:	123 Main Street		Special
Building Type:	Steel: BRBF CoreBrace with Back-up Frame	Drift Limit (Dir. 1, 2):	1%, 1%
Design Code Year:	2010	Risk Category:	(Cat. III)
Number of Stories:	8	Seismic Importance Factor, I_e :	–
Address:		Component Importance Factor, I_p :	–
	123 Main Street	Design Spectral Acceleration	
	San Francisco, CA	Mapped Short Period, S_s	–
Latitude:	37.79166°	Mapped 1 Second, S_1	–
Longitude:	-122.39442°	Design Short Period, S_{Ds}	–
Occupancy:	Commercial Office	Design 1 Second, S_{D1}	–
Analysis Options		Structural Properties	
Include Collapse in Analysis:	Yes	Mode Shapes Specified?	No
Consider Residual Drift:	Yes	<i>Directional Properties</i>	<i>Dir. 1</i> <i>Dir. 2</i>
Simulation Options		Base Shear Strength (g):	– –
Number of EQ Simulations:	2,500	Yield Drift (%):	– –
Collapse Distribution Truncation?	Yes	Design Model Period (T_1) (s):	– –
Truncation Level:	–	1 st Mode Period (T_1) (s):	– –
Component Distribution Truncation?	No	2 nd Mode Period (T_2) (s):	– –
Truncation Level:	–	3 rd Mode Period (T_3) (s):	– –
Cost Multipliers		Component Information	
Region Cost Multiplier:	–	Selection Method	Automatic
Date Cost Multiplier:	–		
Occupancy Cost Multiplier:	–		
Component Soft Cost Modifier:	–		
Building Layout Information		Building Stability	
Cost per Square Foot:	–	Collapse Definition Method:	FEMA P-154
Scale component repair costs with building value?	Yes	Score Calc Method:	Rapid Visual Screening Checklist
Total Square Feet:	–	FEMA P-154 Score:	–
Aspect Ratio:	–	Beta (Dispersion):	–
First Story Height (ft):	–		
Upper Story Heights (ft):	–		
Ground Motion and Soil Information			
Site Class:	–		
Site Hazard:	U.S. Geological Survey		
Edition:	–		

Recovery Time Options

Recovery Time Method	ATC-138 (Beta)
Building Replacement Time	–
Statistical Damage Correlation Model: Original FEMA P-58 Correlation Model (2012/2018)	

Factors Delaying Start of Repairs

Inspection	Yes
Financing	Yes
Permitting	Yes
Engineering Mobilization	Yes
Contractor Mobilization	Yes
Long Lead Time	No

Mitigation Factors

Inspector on Retainer	Yes
Engineer on Retainer	Yes
Contractor Relationship	Retainer
Funding Source	–
Cash on Hand	15.0%

Responses

Response	EDP	Method	Use as Default for Comps?	Derived From
Peak Story Drift Ratio	IDR	SP3 SRPE	Yes	–
Peak Floor Acceleration	PFA	SP3 SRPE	Yes	–
Residual Story Drift Ratio	RIDR	SP3 SRPE	Yes	Peak Story Drift Ratio
<i>Direction 1</i>				
Residual Drift Model:		–		
Record-to-Record Dispersion:		–		
<i>Direction 2</i>				
Residual Drift Model:		–		
Record-to-Record Dispersion:		–		

Structural Response Dispersion Options

Record-to-Record Dispersion Model:	FEMA P-58
Modeling dispersion:	–
Residual Drift Simulation Method:	–

Recovery Time Options Specific to ATC-138 (Beta)

HVAC

Need Ventilation for Reoccupancy?	–	Need Ventilation for Function?	Yes
Need Heating for Reoccupancy?	–	Need Heating for Function?	Yes
Need Cooling for Reoccupancy?	–	Need Cooling for Function?	Yes
Need Exhaust for Reoccupancy?	–	Need Exhaust for Function?	Yes

Elevator

Need Elevator for Function?	Yes	Max. Walkable Story	3
Use updated elevator components?	No		

Surge

Include Surge Demand?	No
-----------------------	----

Temporary Repair

Allow Temporary Repairs?	Yes	Allow Temporary Shoring?	–
--------------------------	-----	--------------------------	---

Fire

Allow Fire Watch for Occupancy?	No
---------------------------------	----

Plumbing

Is Potable Water Required for Occupancy?	–	Is Potable Water Required for Function?	–
Is Sanitary Piping Required for Occupancy?	–	Is Sanitary Piping Required for Function?	–

Electrical

Is Electricity Required for Function?	–
---------------------------------------	---

Egress

Percentage of the Exits Required for Occupancy?	–	Minimum Number of Exits Required for Occupancy?	–
Door racking affects egress?	–		

Flooding

Include flooding consequences?	Yes
--------------------------------	-----

“Smart” Components

Use “smart” piping components?	No
Use “smart” equipment components?	No

Component Checklist

Exterior

- Percent of Building Surface Glazed
 > 80.0%
- Does the building have glazing?
 > Yes
 - What type of glazing does the building have?
 > Insulating Glass Unit (Untested)
- Does the building have cladding?
 > Yes
 - What kind of cladding does the building have?
 > Precast Concrete Panels

Interior Finishes

- Are there partition walls in the building?
 > Yes
 - What kind of partition walls does the building have?
 > Metal Studs

Continued on next page

Component Checklist (*Continued*)

- What finish do the partition walls have?
 - > *Gypsum + Wallpaper*
- How are the partitions constructed?
 - > *Full Height: Slip Tracks with Returns*
- Does the building have raised access floors?
 - > *No*
- Does the building have suspended ceilings?
 - > *Yes*
- Are the ceilings laterally supported?
 - > *Yes (SDC D/E/F or equivalent)*
- What is the Ip factor used to design the ceilings?
 - > *1.5*
- Does the building contain pendant (non-recessed) lighting?
 - > *No*

Stairs and Elevators

- Does the building have stairs?
 - > *Yes*
- What type of stairs are in the building?
 - > *Prefabricated steel*
- Do the stairs have seismic joints?
 - > *Yes*
- Are there elevators in the building?
 - > *Yes*
- What type of elevators are in the building?
 - > *Traction*
- From which era are the building's elevators?
 - > *Post-2000 Seismic Zone 3*

Fire Suppression

- Does the building contain a fire sprinkler system?
 - > *Yes*
- Does the fire sprinkler system have braced horizontal mains?
 - > *Yes*
- Are the horizontal mains OSHPD certified (or equivalent)?
 - > *Yes*
- Are the fire sprinkler drops OSHPD certified (or equivalent)?
 - > *Yes*
- What type of ceiling do the fire drops enter into?
 - > *Soft Braced*

Piping

- Does the building contain potable water piping?
 - > *Yes*
- Is the building's water piping OSHPD certified or equivalent?
 - > *Yes*
- Does the building contain sanitary piping?
 - > *Yes*
- Is the building's sanitary piping OSHPD certified or equivalent?
 - > *Yes*
- What type of couplings do the pipes have?
 - > *Flexible*

Continued on next page

Component Checklist (*Continued*)

HVAC

- Does the building have an HVAC system?
 - > *Yes*
- Is the HVAC cooling/heating equipment seismically anchored?
 - > *Yes*
- How is the cooling/heating system configured?
 - > *Roof Top Units*
- Are the RTUs used for medical purposes (or equivalent)?
 - > *No*
- Are the RTUs small or large?
 - > *Large*
- Does the building have a control panel?
 - > *Yes*
- Is there an HVAC exhaust system in the building?
 - > *Yes*
- Is the HVAC exhaust system seismically anchored?
 - > *Yes*
- Does the HVAC distribution system meet OSHPD standards (or similar)?
 - > *Yes*
- Is there any large diameter ducting (6 SqFt+) in the HVAC system?
 - > *Yes*

Electrical

- Does the building have a backup battery/generator system?
 - > *Yes*
 - Is the battery backup system equipment seismically anchored?
 - > *Yes*
 - Which best describes the building's electrical system?
 - > *Full Commercial-grade Electrical System*
 - Is the electrical equipment seismically anchored?
 - > *Yes*
 - What best describes the buildings motor control centers?
 - > *Anchored*
-

Building Modifiers Checklist

Vertical Irregularities

Soft Story

Soft or Weak Story Vertical Irregularity? —

Sloping Site

Full story grade change? (FEMA Type non-W1 buildings) —

Setback

Outboard vertical elements of the lateral system at an upper story? —

Inboard vertical elements of the lateral system at upper stories? —

In-plane offset of the lateral elements greater their length? —

Split Level

Split level at one of the floor levels or at the roof? —

Other

Other observable vertical irregularity? —

Plan Irregularities

Torsion Irregularity? —

Non-parallel system? —

Re-entrant corner projection 25% of plan dimension? —

Diaphragm opening over 50% of the total diaphragm width? —

Other observable plan irregularity? —

Redundancy

At least two bays of lateral elements? —

Pounding

Floors Unaligned? —

Different building heights? —

End of block? —

Steel Braced Frames (S1)

K bracing geometry is visible? —

Construction Quality

Structural Construction Quality —

Non-structural Construction Quality —

Structural Material Deterioration —

Notes

No notes were provided.

Expected Loss

Expected loss in percent of total building value			
Shaking Intensity	Return Period	SEL (%)	SUL (%)
90% in 50 years	22 Years	0.0	0.1
50% in 30 years	43 Years	0.1	0.2
50% in 50 years	72 Years	0.3	0.6
50% in 75 years	108 Years	0.5	1.2
50% in 100 years	144 Years	0.8	1.7
20% in 50 years	224 Years	1.6	3.0
10% in 50 years	475 Years	4.4	6.6
DE	920 Years	21	40
5% in 50 years	975 Years	23	43
2% in 50 years	2475 Years	56	90
MCE _R	2880 Years	60	96

Recovery Time

Reported recovery times are the time required for the entire building to reach a recovery state (re-occupancy, functional recovery, or full recovery).

Median recovery time summary					
Intensity	ATC-138 Functional Recovery (Beta) [†]			FEMA P-58 [‡]	
	Re-Occupancy	Functional	Full	Full (Parallel)	Full (Series)
90% in 50 years	0 days	0 days	6 days	0.19 days	0.58 days
50% in 30 years	0 days	0 days	8 days	0.27 days	1.2 days
50% in 50 years	0 days	3 days	10 days	0.55 days	2.4 days
50% in 75 years	2 days	4 days	13 days	1.2 days	4.2 days
50% in 100 years	3 days	5 days	2.3 weeks	2.1 days	6.8 days
20% in 50 years	4 days	6 days	4.9 weeks	5 days	12 days
10% in 50 years	7 days	5.6 weeks	2.7 months	11 days	3.8 weeks
DE	2.3 months	3.4 months	4.1 months	3.1 weeks	7.7 weeks
5% in 50 years	2.6 months	3.6 months	4.3 months	3.2 weeks	1.9 months
2% in 50 years	38 months	38 months	38 months	38 months	38 months
MCE _R	38 months	38 months	38 months	38 months	38 months

[†] Does include factors delaying start of repairs

[‡] Does **not** include factors delaying start of repairs

2 FUNCTIONAL RECOVERY OVERVIEW

2.1 Summary Tables Per Intensity

Table 2.1. Recovery Times from the ATC-138 Functional Recovery (Beta) Methodology

Intensity	Return Period (years)	PGA (g)	Sa(T_1)* (g)	Reocc.			Function			Full		
				50 th	75 th	90 th	50 th	75 th	90 th	50 th	75 th	90 th
90% in 50 years	22	0.09	0.05	0d	0d	0d	0d	0d	0d	6d	7d	8d
50% in 30 years	43	0.15	0.10	0d	0d	0d	0d	0d	5d	8d	9d	11d
50% in 50 years	72	0.21	0.14	0d	3d	5d	3d	5d	7d	10d	2.1w	4.9w
50% in 75 years	108	0.26	0.19	2d	4d	7d	4d	6d	13d	13d	4w	2m
50% in 100 years	144	0.31	0.23	3d	5d	9d	5d	7d	1.8m	2.3w	6.3w	3m
20% in 50 years	224	0.37	0.30	4d	7d	3.7w	6d	4.7w	3.3m	4.9w	2.7m	4.1m
10% in 50 years	475	0.50	0.44	7d	2.2n	4m	5.6v	3.2n	4.9m	2.7n	4m	5.6m
DE	920	0.63	0.59	2.3m	5.2m	38m	3.4m	6.4m	38m	4.1m	6.8m	38m
5% in 50 years	975	0.64	0.61	2.6m	5.6m	38m	3.6m	7m	38m	4.3m	7.2m	38m
2% in 50 years	2475	0.83	0.86	38m	38m	38m	38m	38m	38m	38m	38m	38m
MCE _R	2880	0.87	0.90	38m	38m	38m	38m	38m	38m	38m	38m	38m

* Sa(T_1) is the spectral acceleration at T_1 where is the mean of T_1 in both directions

Table 2.2. Global Consequences

Intensity	Return Period	PGA (g)	Sa(T_1)*	P[red tag]	P[collapse]	P[excessive residual]
90% in 50 years	22 years	0.09	0.05	0.0%	0.0%	0.0%
50% in 30 years	43 years	0.15	0.10	0.0%	0.0%	0.0%
50% in 50 years	72 years	0.21	0.14	0.0%	0.0%	0.0%
50% in 75 years	108 years	0.26	0.19	0.0%	0.0%	0.0%
50% in 100 years	144 years	0.31	0.23	0.3%	0.0%	0.0%
20% in 50 years	224 years	0.37	0.30	2.6%	0.0%	0.2%
10% in 50 years	475 years	0.50	0.44	13%	0.0%	1.7%
DE	920 years	0.63	0.59	38%	0.0%	18%
5% in 50 years	975 years	0.64	0.61	42%	0.0%	20%
2% in 50 years	2475 years	0.83	0.86	76%	1.5%	51%
MCE _R	2880 years	0.87	0.90	80%	2.1%	54%

* Sa(T_1) is the spectral acceleration at T_1 where is the mean of T_1 in both directions

2.2 Recovery Time Plots

2.2.1 Recovery Time vs. Intensity

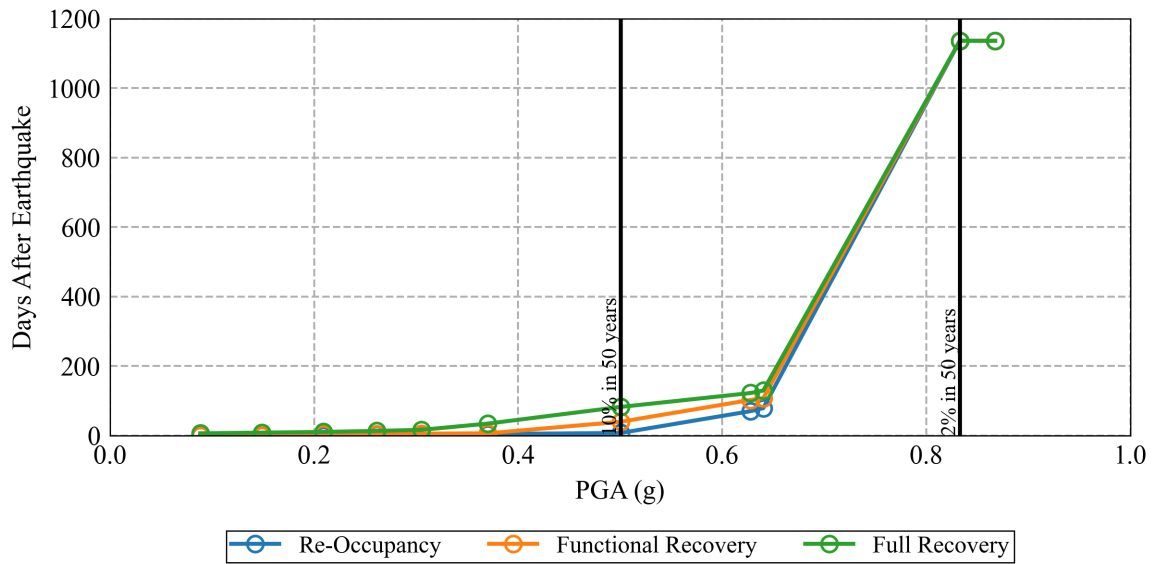


Figure 2.1. ATC-138 Functional Recovery (Beta) Methodology median recovery times

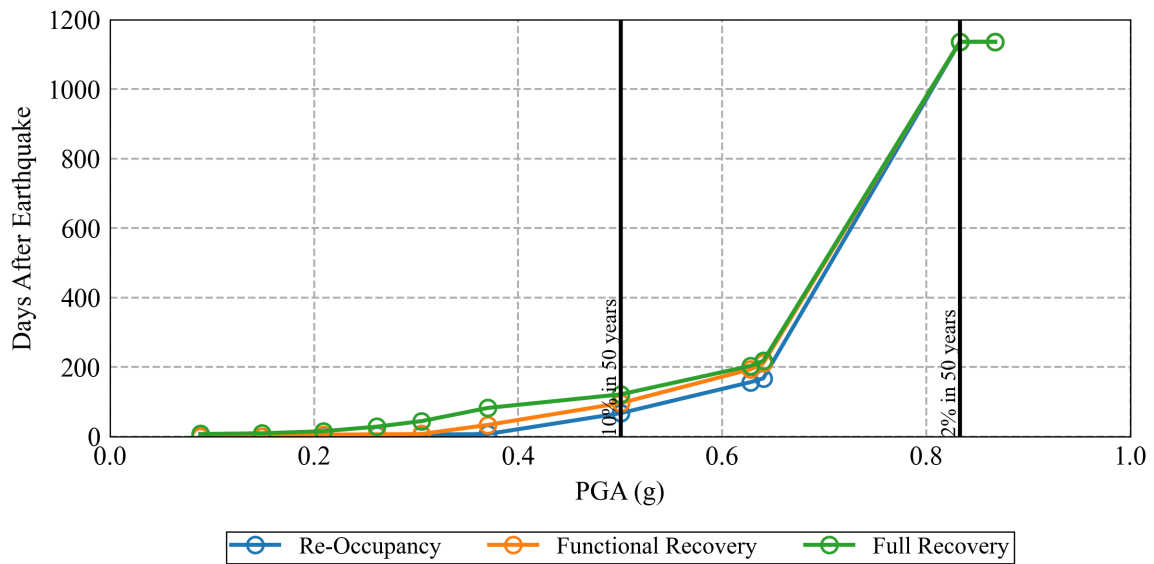


Figure 2.2. ATC-138 Functional Recovery (Beta) Methodology 75th percentile recovery times

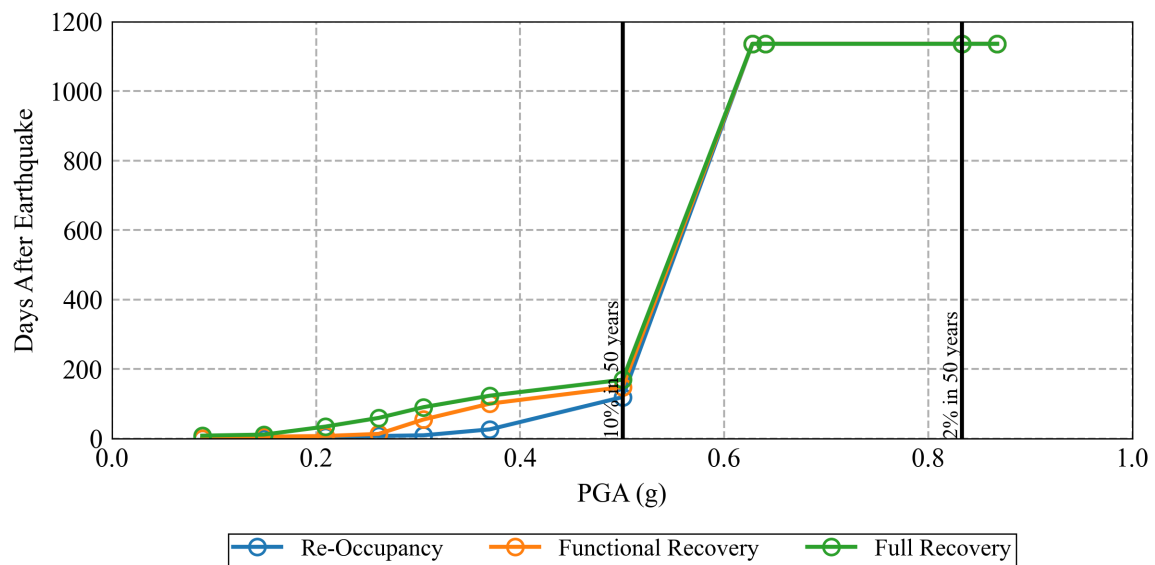


Figure 2.3. ATC-138 Functional Recovery (Beta) Methodology 90th percentile recovery times

2.2.2 Probability of Recovery

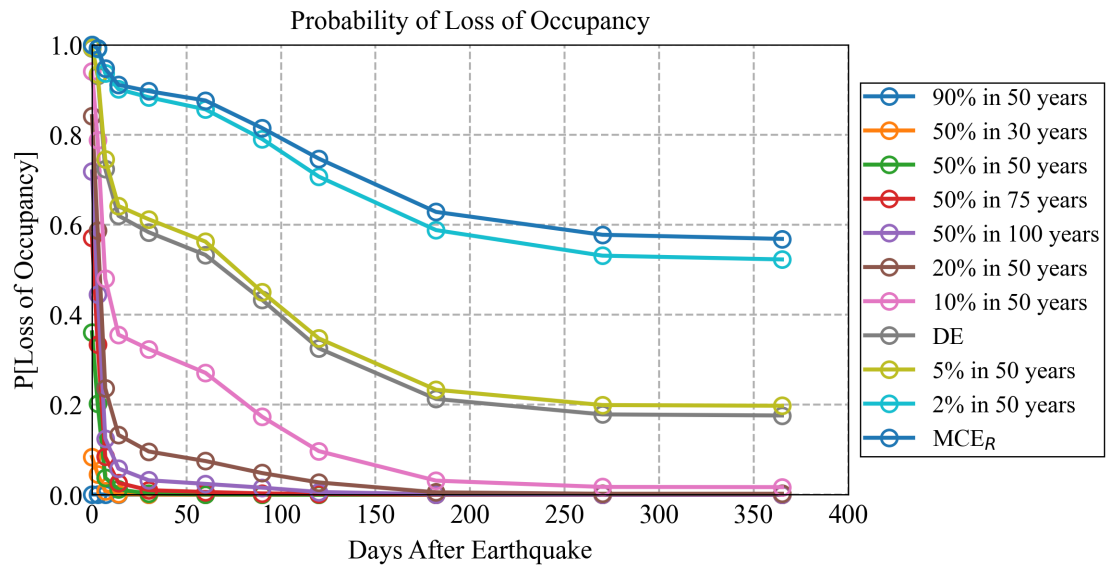


Figure 2.4. ATC-138 Functional Recovery (Beta) Methodology probability of non-reoccupancy.

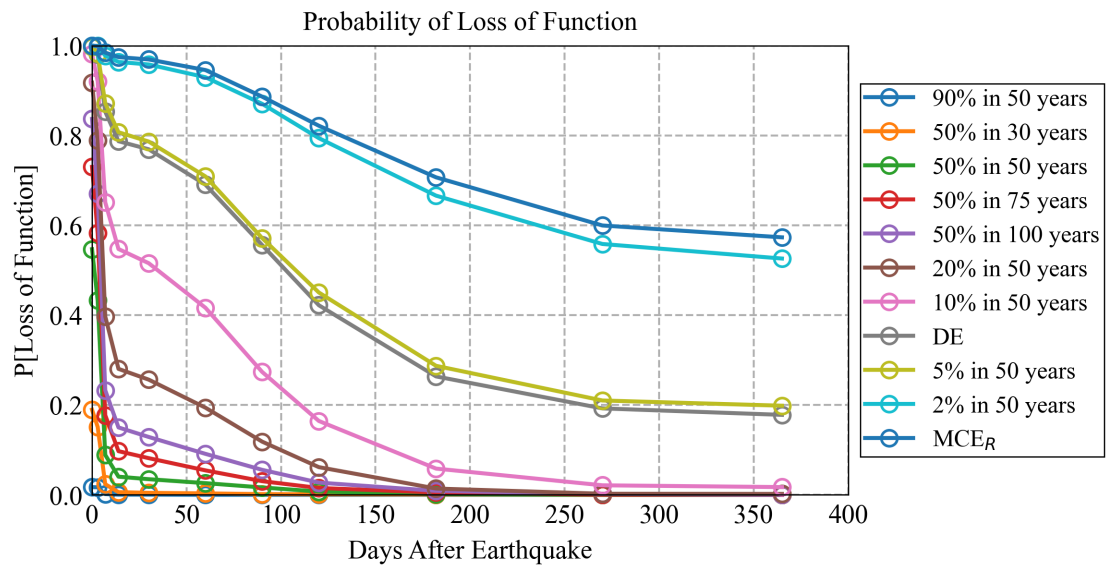


Figure 2.5. ATC-138 Functional Recovery (Beta) Methodology probability of functional failure.

2.2.3 Recovery Fragilities

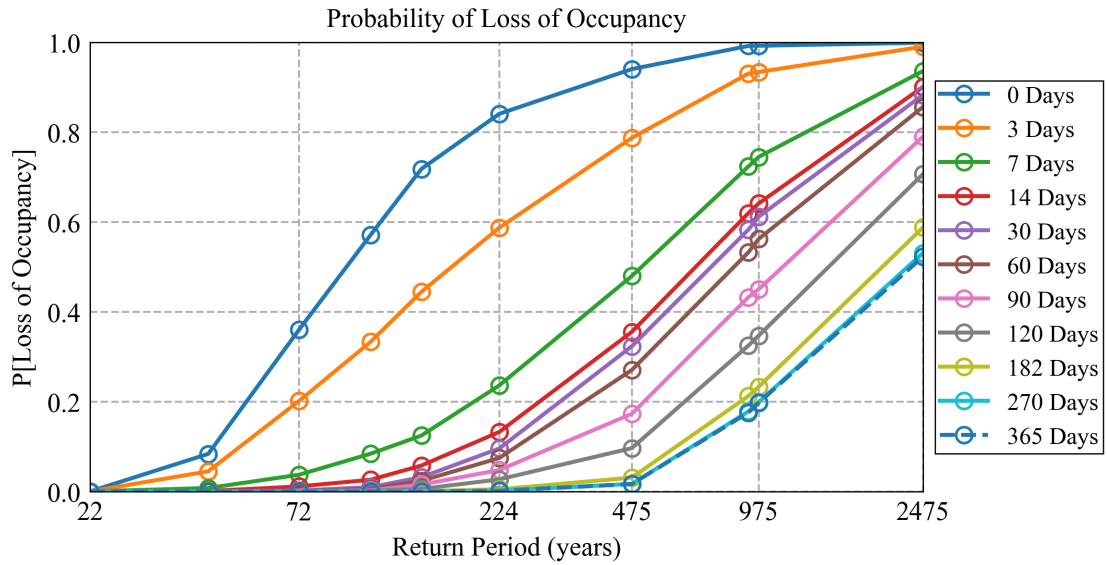


Figure 2.6. Reoccupancy curve fragilities for various target recovery times ATC-138 Functional Recovery (Beta) Methodology.

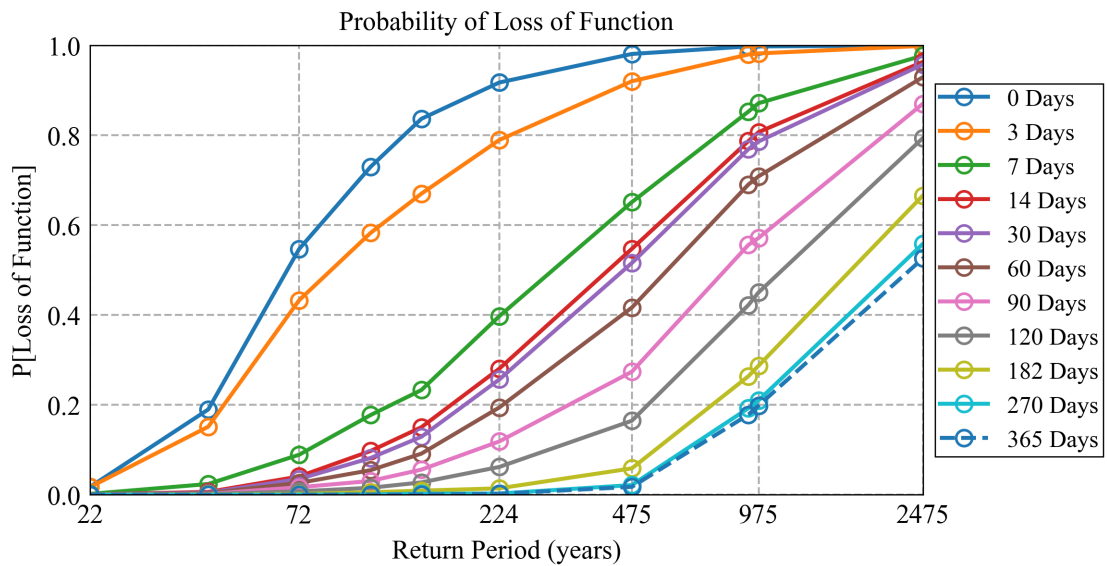


Figure 2.7. Functionality curve fragilities for various target recovery times based on the ATC-138 Functional Recovery (Beta) Methodology.

Table 2.3. Tabulated reoccupancy curve fragilities for selected target recovery times from the ATC-138 Functional Recovery (Beta) Methodology.

Return Period	PGA (g)	$S_a(T_1)$ (g)	0d	3d	7d	14d	30d	90d	182d	365d
22	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	0.15	0.10	0.08	0.05	0.01	0.00	0.00	0.00	0.00	0.00
72	0.21	0.14	0.36	0.20	0.04	0.01	0.00	0.00	0.00	0.00
108	0.26	0.19	0.57	0.33	0.08	0.03	0.01	0.00	0.00	0.00
144	0.31	0.23	0.72	0.44	0.12	0.06	0.03	0.02	0.00	0.00
224	0.37	0.30	0.84	0.59	0.24	0.13	0.10	0.05	0.01	0.00
475	0.50	0.44	0.94	0.79	0.48	0.36	0.32	0.17	0.03	0.02
DE	0.63	0.59	0.99	0.93	0.72	0.62	0.58	0.43	0.21	0.18
975	0.64	0.61	0.99	0.93	0.75	0.64	0.61	0.45	0.23	0.20
2475	0.83	0.86	1.00	0.99	0.94	0.90	0.88	0.79	0.59	0.52
MCE_R	0.87	0.90	1.00	0.99	0.95	0.91	0.90	0.81	0.63	0.57

Table 2.4. Tabulated functionality curve fragilities for selected target recovery times from the ATC-138 Functional Recovery (Beta) Methodology.

Return Period	PGA (g)	$S_a(T_1)$ (g)	0d	3d	7d	14d	30d	90d	182d	365d
22	0.09	0.05	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
43	0.15	0.10	0.19	0.15	0.02	0.01	0.00	0.00	0.00	0.00
72	0.21	0.14	0.55	0.43	0.09	0.04	0.03	0.02	0.00	0.00
108	0.26	0.19	0.73	0.58	0.18	0.10	0.08	0.03	0.01	0.00
144	0.31	0.23	0.84	0.67	0.23	0.15	0.13	0.06	0.01	0.00
224	0.37	0.30	0.92	0.79	0.40	0.28	0.26	0.12	0.01	0.00
475	0.50	0.44	0.98	0.92	0.65	0.55	0.52	0.27	0.06	0.02
DE	0.63	0.59	1.00	0.98	0.85	0.79	0.77	0.56	0.26	0.18
975	0.64	0.61	1.00	0.98	0.87	0.81	0.79	0.57	0.29	0.20
2475	0.83	0.86	1.00	1.00	0.98	0.96	0.96	0.87	0.67	0.53
MCE_R	0.87	0.90	1.00	1.00	0.98	0.97	0.97	0.89	0.71	0.57

3 DETAILED REOCCUPANCY AND FUNCTIONALITY RESULTS BY GROUND MOTION INTENSITY

3.1 50% in 50 years Intensity

3.1.1 Damage to Building Systems

Table 3.1 shows the percentage of realizations that the named system prevents reoccupancy/function for the 50% in 50 years intensity. Note that if a system prevents reoccupancy, it will also prevent functionality. This means that the functionality checks may all be fine, but if the reoccupancy checks indicate the building is not reoccupiable then the building will not be considered functional.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which that component is preventing reoccupancy/functionality at that milestone.

Overview of system checks for Building Reoccupancy (also affects function):

- **Red Tag (Structural):** This is a check of the structural components that can cause red tag. These components have safety classes of 1, 2, or 3.
- **Shoring:** This is a check that any damage requiring shoring is shored to ensure safety.
- **Hazardous Material:** This is a check that any hazardous materials in the building remain properly contained.
- **Fire Suppression:** This is a check that the fire system is functional to a degree which allows the building to be reoccupiable (unless a fire watch is considered sufficient for safety).
- **Entry Door Access:** This is a check of safe ingress/egress to the building as a whole. This can be inaccessible from exterior falling hazards or from entry door racking.
 - **Exterior Falling Hazard:** This checks that there are no exterior falling hazards over the entrances to the building.
 - **Entry Door Racking:** This checks that the entry doors are not racked and jammed from excessive residual drift.
- **Stairs:** This checks that there is a sufficient number of stairs to allow safe egress of the building.
- **Stairway Doors:** This checks that the stairway doors are not racked and jammed from excessive residual drift.
- **Exterior Enclosure:** This check is for the safety aspect of the exterior enclosure. This checks that occupants will not fall through the exterior enclosure, not that the enclosure is weather resistant.
- **Interior Falling Hazards:** This is a check that there is sufficient space inside the building to occupy without damaged components precariously hanging overhead.

Overview of system checks for Building Function (affects function only, not reoccupancy):

- **Elevators:** This checks that the elevators have sufficient capacity to allow the building to function to an acceptable degree (if the elevators are required for function).
- **Exterior Enclosure:** This checks that the enclosure is weather resistant enough to allow function to an acceptable degree.
- **Interior Space:** This checks that damage to the interior of the building is limited to an amount that will allow an acceptable degree of function.
- **Water (Plumbing):** This checks that there is running water in the building.
- **Electrical:** This checks that the electrical components can still provide a sufficient amount of power to the building (assuming external power is available).
- **HVAC:** This checks that the HVAC system is functional to an acceptable degree (if the HVAC system is required for function).

Table 3.1. Percent of realizations affecting building reoccupancy/function per system check - 50% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Building Reoccupancy (also affects function)								
Red Tag (Structural)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hazardous Material	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fire Suppression	1.9	1.7	0.1	0.0	0.0	0.0	0.0	0.0
Entry Door Access	11	5.4	0.6	0.2	0.0	0.0	0.0	0.0
Exterior Falling Hazard	7.6	3.7	0.4	0.2	0.0	0.0	0.0	0.0
Entry Door Racking	4.0	1.8	0.2	0.0	0.0	0.0	0.0	0.0
Stairs	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Stairway Doors	30	15	1.5	0.0	0.0	0.0	0.0	0.0
Flooding	2.1	2.1	1.7	0.6	0.0	0.0	0.0	0.0
Horizontal Egress	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exterior Enclosure	0.5	0.5	0.5	0.5	0.1	0.0	0.0	0.0
Interior Falling Hazards	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0
All Loss of Reoccupancy	36	20	3.8	1.2	0.2	0.0	0.0	0.0
Building Function (affects function only, not reoccupancy)								
Elevators	5.9	5.8	3.2	2.3	1.8	0.4	0.0	0.0
Exterior Enclosure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roof	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interior Space	0.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Electrical	12	12	1.5	0.0	0.0	0.0	0.0	0.0
Flooding	2.1	2.1	2.1	2.1	2.1	1.3	0.2	0.0
Potable Water	25	23	0.6	0.0	0.0	0.0	0.0	0.0
Sanitary Plumbing	26	23	0.6	0.0	0.0	0.0	0.0	0.0
HVAC Ventilation	8.3	8.2	2.2	0.0	0.0	0.0	0.0	0.0
HVAC Heating	8.3	8.2	2.2	0.0	0.0	0.0	0.0	0.0
HVAC Cooling	8.3	8.2	2.2	0.0	0.0	0.0	0.0	0.0
HVAC Exhaust	12	11	0.8	0.0	0.0	0.0	0.0	0.0
All Loss of Function	55	43	8.9	4.0	3.5	1.6	0.2	0.0

3.1.2 Red Tag Breakdown

Table 3.2. Probability of components contributing to red tagging - 50% in 50 years

Fragility ID	Fragility Name	Probability of Contributing to Red Tag (%)
Component breakdown unavailable		
Total		0.0

3.1.3 Damage to Individual Components

Table 3.3 shows the percentage of realizations that each component contributes to the loss of reoccupancy/function for the 50% in 50 years intensity. Note that if a component prevents reoccupancy, it will also prevent functionality.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which each component contributes to the loss of reoccupancy/functionality for that milestone time.

Table 3.3. Percent of realizations affecting building reoccupancy/functionality per component - 50% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Steel								
B1031.001	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.011b	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.021b	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1033.652a	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Red Tag							
B1033.653a	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Red Tag							
Envelope								
B2011.201a	0.2 / 0.2	0.2 / 0.2	0.1 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function)							
B2011.201b	0.5 / 0.5	0.5 / 0.5	0.5 / 0.5	0.5 / 0.5	0.1 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
B2022.002	3.9 / 4.2	1.8 / 2.0	0.1 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
Interior								
C1011.001c	0.0 / 0.2	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Interior Space							
C3011.001c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†No Reoccupancy/Functionality Consequences (Repair Time Only)							
C3032.004a	0.7 / 0.7	0.6 / 0.6	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004b	0.6 / 0.6	0.5 / 0.5	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004c	0.7 / 0.7	0.6 / 0.6	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004d	0.7 / 0.7	0.6 / 0.6	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
Stairs								
C2011.001a	0.1 / 0.1	0.1 / 0.1	0.1 / 0.1	0.1 / 0.1	0.1 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Stairs							
Conveying								
	†All components in this group: Elevators							
D1014.041	0.0 / 1.6	0.0 / 1.6	0.0 / 1.1	0.0 / 0.4	0.0 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
D1014.042	0.0 / 1.5	0.0 / 1.5	0.0 / 1.4	0.0 / 1.3	0.0 / 1.2	0.0 / 0.4	0.0 / 0.0	0.0 / 0.0
D1014.043	0.0 / 1.6	0.0 / 1.6	0.0 / 1.5	0.0 / 1.2	0.0 / 0.9	0.0 / 0.3	0.0 / 0.0	0.0 / 0.0
D1014.044	0.0 / 1.6	0.0 / 1.6	0.0 / 1.5	0.0 / 1.2	0.0 / 1.0	0.0 / 0.3	0.0 / 0.0	0.0 / 0.0

†System checks that are affected by this component

Continued on next page

Table 3.3 (Continued). Percent of realizations affecting building reoccupancy/functionality per component - 50% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 month	>3 mo	>6 months	>12 mo
Plumbing								
D2021.014a	0.2 / 0.2	0.2 / 0.2	0.2 / 0.2	0.0 / 0.2	0.0 / 0.2	0.0 / 0.2	0.0 / 0.0	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.014b	0.0 / 16	0.0 / 14	0.0 / 0.3	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Potable Water							
D2021.024a	0.4 / 0.4	0.4 / 0.4	0.3 / 0.4	0.1 / 0.4	0.0 / 0.4	0.0 / 0.1	0.0 / 0.0	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.024b	0.6 / 16	0.4 / 15	0.0 / 0.2	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2031.014b	0.0 / 2.5	0.0 / 2.3	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Sanitary Plumbing							
HVAC								
D3032.013f	0.0 / 6.4	0.0 / 6.4	0.0 / 2.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling							
D3041.011f	0.2 / 0.2	0.2 / 0.2	0.0 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.012d	0.0 / 0.2	0.0 / 0.2	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.031e	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.103c	0.0 / 10	0.0 / 9.4	0.0 / 0.6	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Exhaust							
Fire								
D4011.024a	1.3 / 1.3	1.3 / 1.3	1.0 / 1.3	0.3 / 1.3	0.0 / 1.3	0.0 / 0.8	0.0 / 0.1	0.0 / 0.0
	†Fire Suppression, Interior Falling Hazards, Interior Space							
D4011.054a	0.9 / 0.9	0.9 / 0.9	0.7 / 0.9	0.2 / 0.9	0.0 / 0.9	0.0 / 0.5	0.0 / 0.1	0.0 / 0.0
	†Fire Suppression							
Electrical								
D5011.013c	0.0 / 0.6	0.0 / 0.6	0.0 / 0.1	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical, Elevators							
D5012.013d	0.0 / 2.1	0.0 / 2.1	0.0 / 1.4	0.0 / 1.1	0.0 / 0.9	0.0 / 0.1	0.0 / 0.0	0.0 / 0.0
	†Elevators							
D5012.023c	0.0 / 2.0	0.0 / 2.0	0.0 / 0.2	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical, Elevators							
D5012.033c	0.0 / 10	0.0 / 10	0.0 / 1.3	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.013c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.023c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.033c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							

†System checks that are affected by this component

3.1.4 Selected Realizations for Full Recovery Time Near the 50th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

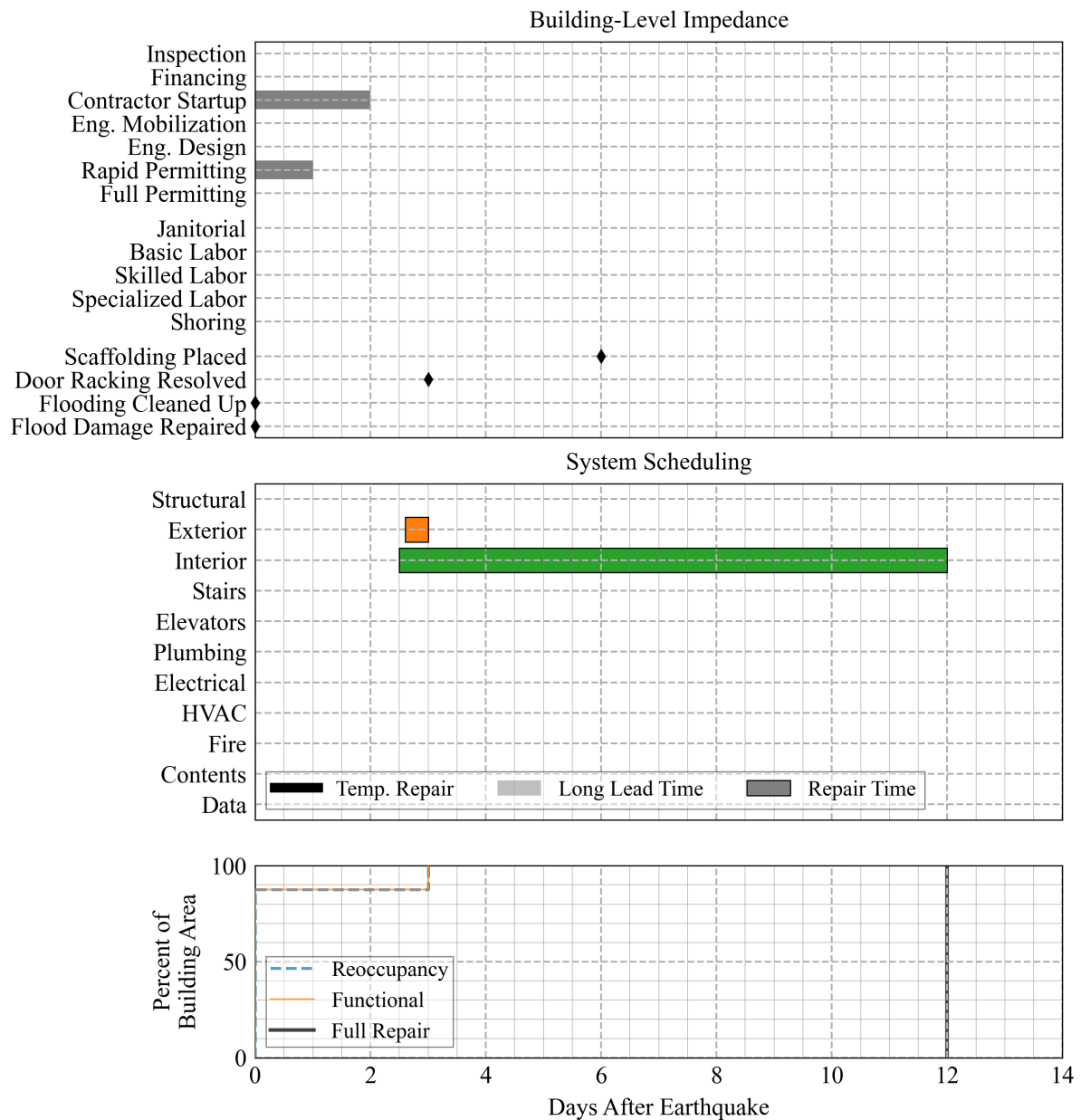


Figure 3.1. 50% in 50 years intensity example 1: full recovery time near the 50th percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

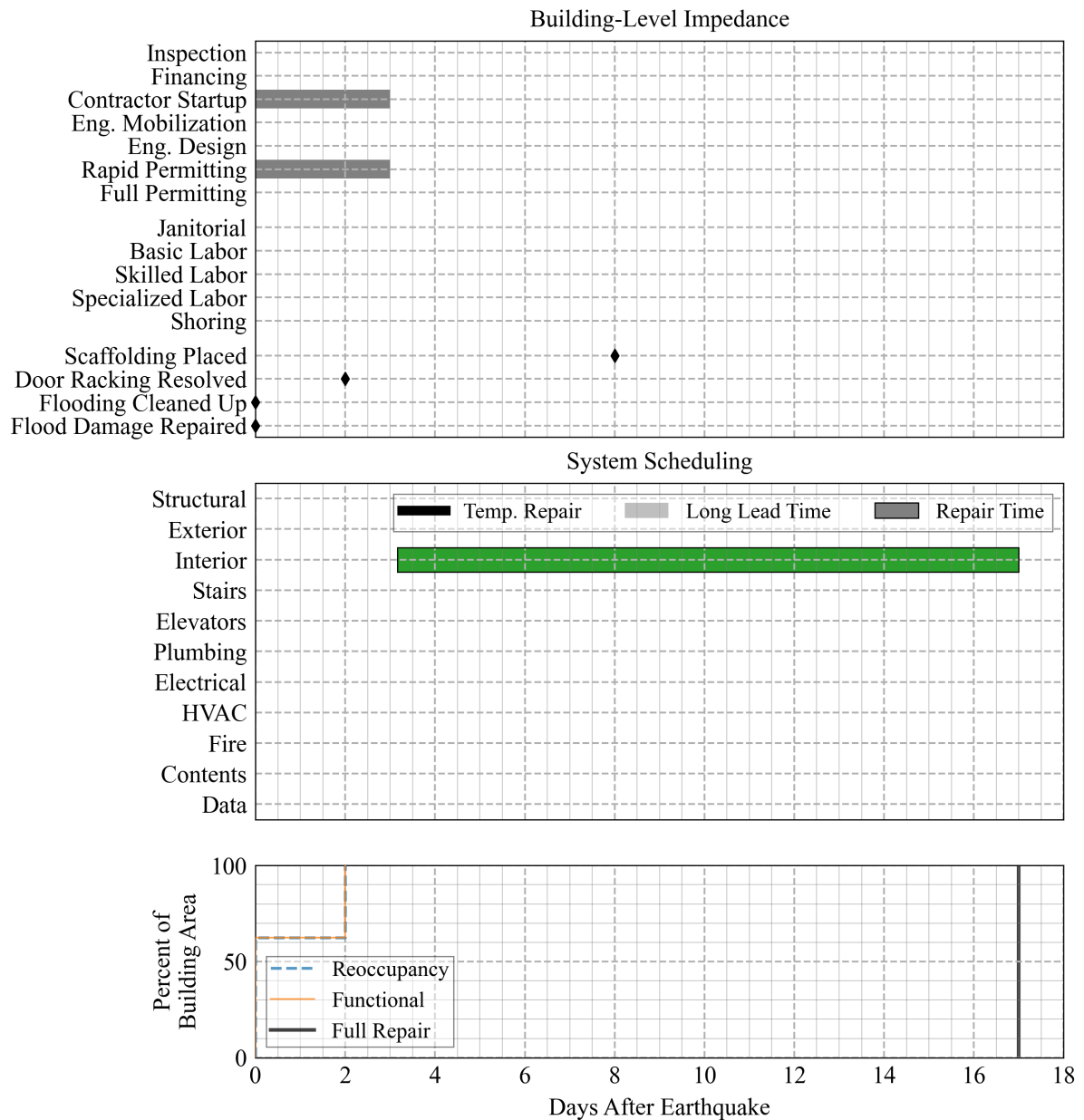


Figure 3.2. 50% in 50 years intensity example 2: full recovery time near the 50th percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

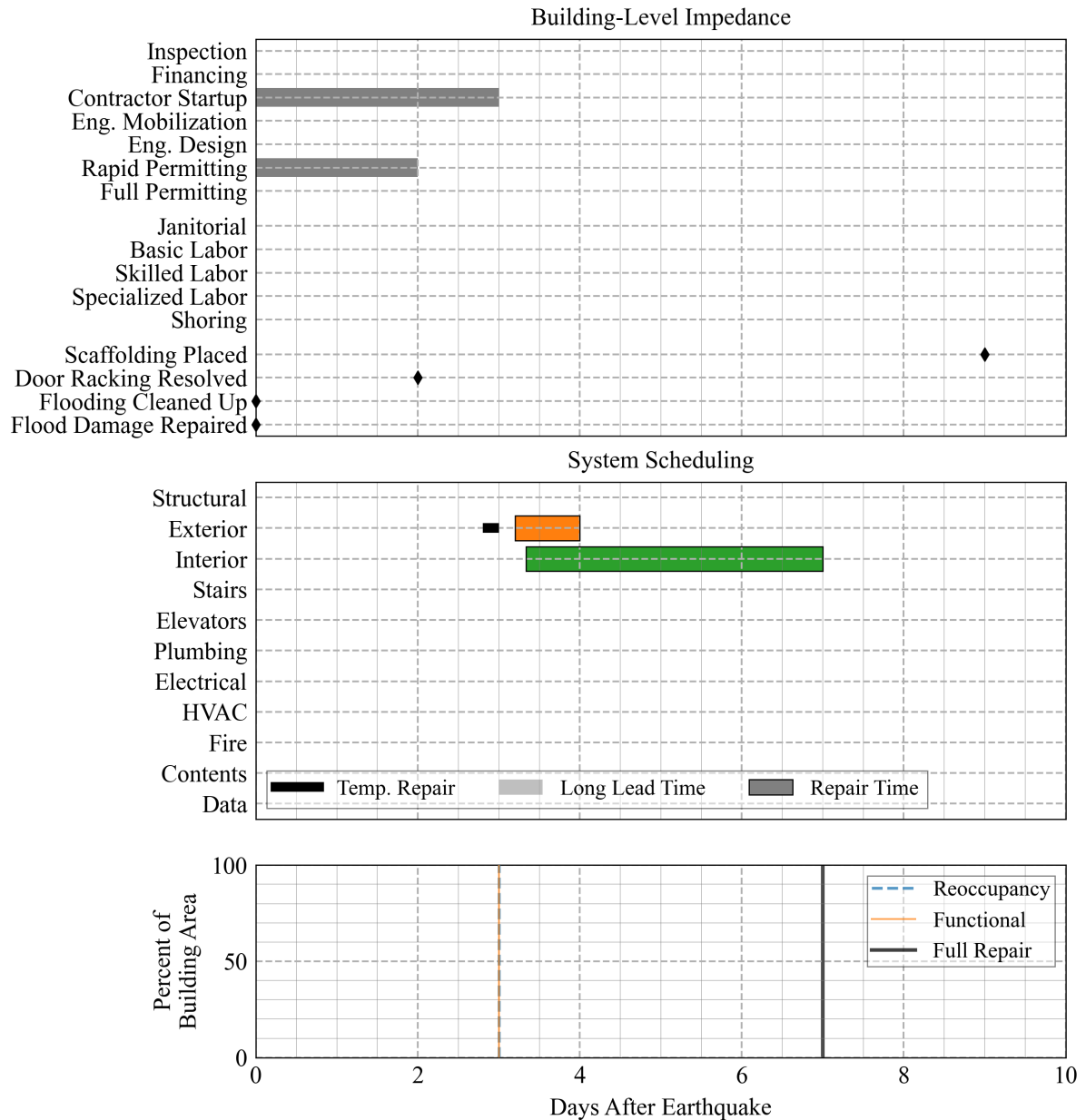


Figure 3.3. 50% in 50 years intensity example 3: full recovery time near the 50th percentile

3.1.5 Selected Realization for Full Recovery Time Near the 90th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

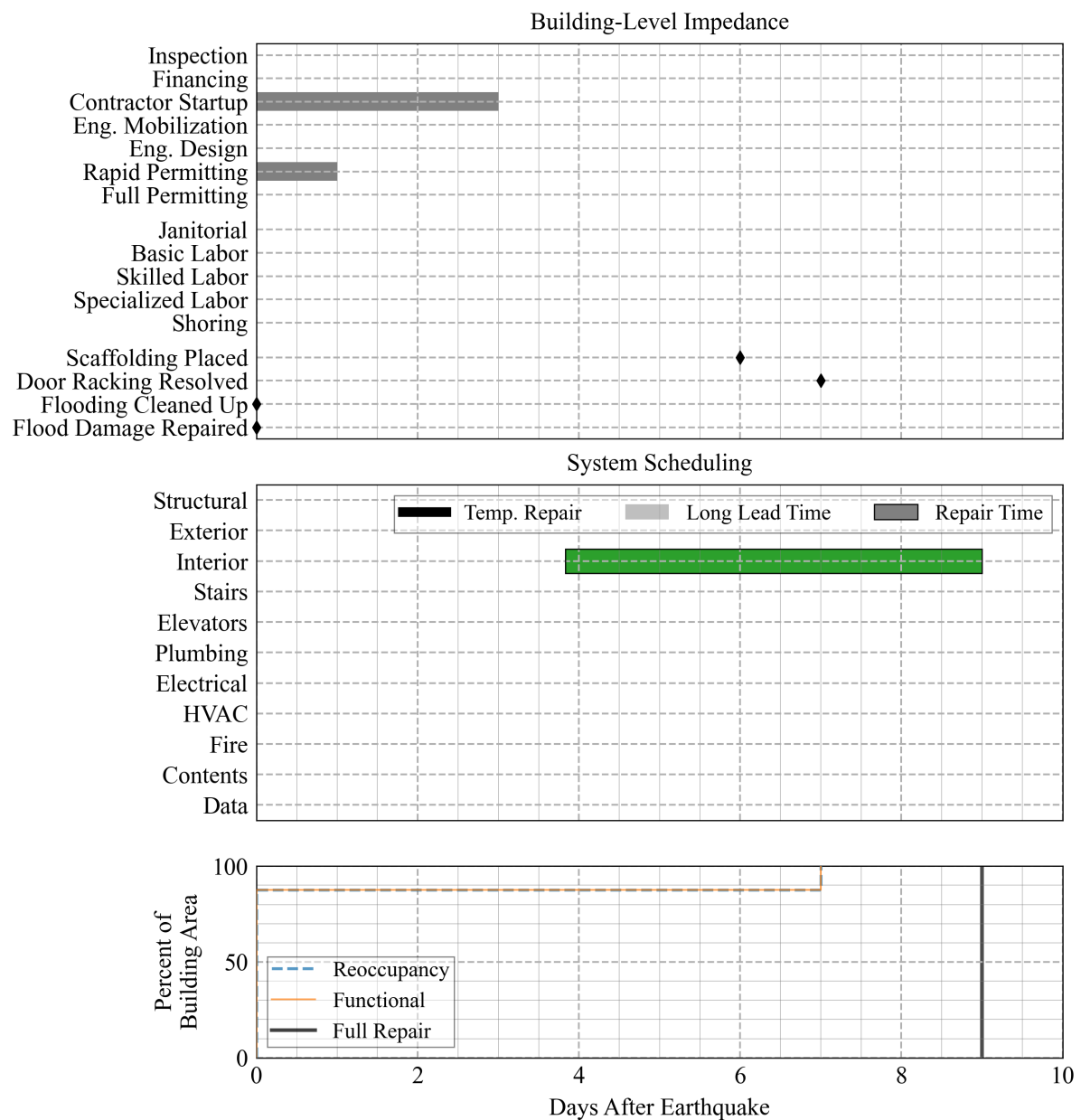


Figure 3.4. 50% in 50 years intensity example: full recovery time near the 90th percentile

3.2 10% in 50 years Intensity

3.2.1 Damage to Building Systems

Table 3.4 shows the percentage of realizations that the named system prevents reoccupancy/function for the 10% in 50 years intensity. Note that if a system prevents reoccupancy, it will also prevent functionality. This means that the functionality checks may all be fine, but if the reoccupancy checks indicate the building is not reoccupiable then the building will not be considered functional.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which that component is preventing reoccupancy/functionality at that milestone.

Overview of system checks for Building Reoccupancy (also affects function):

- **Red Tag (Structural):** This is a check of the structural components that can cause red tag. These components have safety classes of 1, 2, or 3.
- **Shoring:** This is a check that any damage requiring shoring is shored to ensure safety.
- **Hazardous Material:** This is a check that any hazardous materials in the building remain properly contained.
- **Fire Suppression:** This is a check that the fire system is functional to a degree which allows the building to be reoccupiable (unless a fire watch is considered sufficient for safety).
- **Entry Door Access:** This is a check of safe ingress/egress to the building as a whole. This can be inaccessible from exterior falling hazards or from entry door racking.
 - **Exterior Falling Hazard:** This checks that there are no exterior falling hazards over the entrances to the building.
 - **Entry Door Racking:** This checks that the entry doors are not racked and jammed from excessive residual drift.
- **Stairs:** This checks that there is a sufficient number of stairs to allow safe egress of the building.
- **Stairway Doors:** This checks that the stairway doors are not racked and jammed from excessive residual drift.
- **Exterior Enclosure:** This check is for the safety aspect of the exterior enclosure. This checks that occupants will not fall through the exterior enclosure, not that the enclosure is weather resistant.
- **Interior Falling Hazards:** This is a check that there is sufficient space inside the building to occupy without damaged components precariously hanging overhead.

Overview of system checks for Building Function (affects function only, not reoccupancy):

- **Elevators:** This checks that the elevators have sufficient capacity to allow the building to function to an acceptable degree (if the elevators are required for function).
- **Exterior Enclosure:** This checks that the enclosure is weather resistant enough to allow function to an acceptable degree.
- **Interior Space:** This checks that damage to the interior of the building is limited to an amount that will allow an acceptable degree of function.
- **Water (Plumbing):** This checks that there is running water in the building.
- **Electrical:** This checks that the electrical components can still provide a sufficient amount of power to the building (assuming external power is available).
- **HVAC:** This checks that the HVAC system is functional to an acceptable degree (if the HVAC system is required for function).

Table 3.4. Percent of realizations affecting building reoccupancy/function per system check - 10% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Building Reoccupancy (also affects function)								
Red Tag (Structural)	12	12	12	12	12	7.2	0.7	0.0
Shoring	13	13	11	10	9.8	5.1	0.4	0.0
Hazardous Material	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fire Suppression	11	10	3.0	2.0	2.0	1.3	0.2	0.0
Entry Door Access	76	53	19	3.3	0.9	0.4	0.0	0.0
Exterior Falling Hazard	58	43	17	3.3	0.9	0.4	0.0	0.0
Entry Door Racking	52	26	2.8	0.0	0.0	0.0	0.0	0.0
Stairs	27	27	27	27	27	13	1.0	0.0
Stairway Doors	87	43	5.0	0.0	0.0	0.0	0.0	0.0
Flooding	12	12	8.7	3.2	0.1	0.0	0.0	0.0
Horizontal Egress	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exterior Enclosure	54	48	20	14	12	7.8	0.9	0.0
Interior Falling Hazards	4.8	4.7	2.4	2.0	1.8	1.6	0.2	0.0
All Loss of Reoccupancy	94	79	48	36	32	17	3.1	1.7
Building Function (affects function only, not reoccupancy)								
Elevators	42	42	36	33	29	12	2.0	0.0
Exterior Enclosure	1.5	1.5	1.5	1.5	1.5	1.2	0.1	0.0
Roof	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interior Space	60	22	14	12	11	8.0	0.9	0.0
Electrical	43	43	17	7.7	5.7	3.4	0.2	0.0
Flooding	12	12	12	12	12	5.5	1.4	0.0
Potable Water	62	58	17	9.9	8.1	4.7	0.4	0.0
Sanitary Plumbing	63	59	17	9.9	8.1	4.7	0.4	0.0
HVAC Ventilation	38	37	19	6.6	4.7	2.8	0.2	0.0
HVAC Heating	38	37	19	6.6	4.7	2.8	0.2	0.0
HVAC Cooling	38	37	19	6.6	4.7	2.8	0.2	0.0
HVAC Exhaust	44	43	16	7.8	5.9	3.7	0.2	0.0
All Loss of Function	98	92	65	55	52	27	5.8	1.7

3.2.2 Red Tag Breakdown

Table 3.5. Probability of components contributing to red tagging - 10% in 50 years

Fragility ID	Fragility Name	Probability of Contributing to Red Tag (%)
B1031.001	Bolted shear tab gravity connections	0.08
B1031.011b	Steel Column Base Plates, Column 150 plf < W < 300 plf	0.92
B1031.021b	Welded column splices, Column 150 plf < W < 300 plf	8.9
B1033.652a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in ² , Story Height = 16ft, Bay Width = 30ft	2.1
B1033.653a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in ² , Story Height = 14ft, Bay Width = 30ft	4.0
Total		13

3.2.3 Damage to Individual Components

Table 3.6 shows the percentage of realizations that each component contributes to the loss of reoccupancy/function for the 10% in 50 years intensity. Note that if a component prevents reoccupancy, it will also prevent functionality.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which each component contributes to the loss of reoccupancy/functionality for that milestone time.

Table 3.6. Percent of realizations affecting building reoccupancy/functionality per component - 10% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Steel								
B1031.001	7.5 / 7.5	7.5 / 7.5	6.0 / 6.0	4.7 / 4.7	4.4 / 4.4	2.8 / 2.8	0.2 / 0.2	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.011b	0.9 / 0.9	0.9 / 0.9	0.9 / 0.9	0.9 / 0.9	0.9 / 0.9	0.8 / 0.8	0.1 / 0.1	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.021b	9.1 / 9.1	9.1 / 9.1	9.1 / 9.1	9.1 / 9.1	9.1 / 9.1	5.6 / 5.6	0.5 / 0.5	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1033.652a	2.2 / 2.2	2.2 / 2.2	2.2 / 2.2	2.2 / 2.2	2.2 / 2.2	1.6 / 1.6	0.1 / 0.1	0.0 / 0.0
	†Red Tag							
B1033.653a	4.1 / 4.1	4.1 / 4.1	4.1 / 4.1	4.1 / 4.1	4.1 / 4.1	2.8 / 2.8	0.4 / 0.4	0.0 / 0.0
	†Red Tag							
Envelope								
B2011.201a	17 / 17	15 / 15	8.4 / 9.4	1.3 / 2.6	0.2 / 1.6	0.2 / 1.3	0.0 / 0.1	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function)							
B2011.201b	2.8 / 2.8	2.8 / 2.8	2.8 / 2.8	2.6 / 2.6	1.2 / 1.2	0.5 / 0.5	0.1 / 0.1	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
B2022.002	71 / 77	59 / 60	27 / 27	14 / 14	12 / 12	7.8 / 8.1	0.9 / 0.9	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
Interior								
C1011.001c	0.0 / 60	0.0 / 19	0.0 / 14	0.0 / 12	0.0 / 11	0.0 / 7.9	0.0 / 0.9	0.0 / 0.0
	†Interior Space							
C3011.001c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†No Reoccupancy/Functionality Consequences (Repair Time Only)							
C3032.004a	4.2 / 10	4.1 / 6.8	1.8 / 3.7	1.4 / 3.0	1.2 / 2.7	1.1 / 2.2	0.2 / 0.3	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004b	4.1 / 8.9	3.9 / 6.1	1.7 / 3.2	1.3 / 2.5	1.2 / 2.2	1.1 / 1.9	0.2 / 0.3	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004c	3.9 / 6.4	3.8 / 4.9	1.7 / 2.6	1.3 / 2.1	1.1 / 1.9	1.0 / 1.7	0.2 / 0.3	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004d	4.1 / 7.1	3.9 / 5.2	1.7 / 2.6	1.3 / 2.0	1.1 / 1.8	1.0 / 1.6	0.2 / 0.2	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
Stairs								
C2011.001a	27 / 27	27 / 27	27 / 27	27 / 27	27 / 27	13 / 13	1.0 / 1.0	0.0 / 0.0
	†Stairs							
Conveying								
	†All components in this group: Elevators							
D1014.041	0.0 / 17	0.0 / 17	0.0 / 13	0.0 / 6.6	0.0 / 3.3	0.0 / 1.9	0.0 / 0.2	0.0 / 0.0
D1014.042	0.0 / 25	0.0 / 25	0.0 / 25	0.0 / 25	0.0 / 24	0.0 / 10	0.0 / 1.8	0.0 / 0.0
D1014.043	0.0 / 25	0.0 / 25	0.0 / 25	0.0 / 25	0.0 / 22	0.0 / 9.8	0.0 / 1.7	0.0 / 0.0
D1014.044	0.0 / 25	0.0 / 25	0.0 / 25	0.0 / 25	0.0 / 23	0.0 / 9.8	0.0 / 1.7	0.0 / 0.0

†System checks that are affected by this component

Continued on next page

Table 3.6 (Continued). Percent of realizations affecting building reoccupancy/functionality per component - 10% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 month	>3 mo	>6 months	>12 mo
Plumbing								
D2021.014a	2.0 / 2.0	2.0 / 2.0	1.5 / 2.0	0.7 / 2.0	0.2 / 1.9	0.1 / 0.9	0.1 / 0.2	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.014b	0.0 / 43	0.0 / 40	0.0 / 7.6	0.0 / 5.8	0.0 / 5.8	0.0 / 3.3	0.0 / 0.3	0.0 / 0.0
	†Potable Water							
D2021.024a	1.8 / 1.8	1.8 / 1.8	1.5 / 1.8	0.9 / 1.8	0.2 / 1.8	0.2 / 1.0	0.0 / 0.4	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.024b	2.9 / 47	2.6 / 42	0.9 / 8.2	0.8 / 6.2	0.8 / 6.2	0.5 / 3.7	0.1 / 0.2	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2031.014b	0.0 / 13	0.0 / 12	0.0 / 2.8	0.0 / 2.3	0.0 / 2.3	0.0 / 1.3	0.0 / 0.2	0.0 / 0.0
	†Sanitary Plumbing							
HVAC								
D3032.013f	0.0 / 25	0.0 / 25	0.0 / 13	0.0 / 3.3	0.0 / 3.2	0.0 / 1.9	0.0 / 0.2	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling							
D3041.011f	0.4 / 0.9	0.4 / 0.9	0.1 / 0.4	0.1 / 0.2	0.1 / 0.2	0.1 / 0.2	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.012d	0.2 / 1.0	0.2 / 1.0	0.0 / 0.4	0.0 / 0.2	0.0 / 0.2	0.0 / 0.2	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.031e	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.103c	0.0 / 34	0.0 / 33	0.0 / 9.9	0.0 / 4.8	0.0 / 4.7	0.0 / 3.1	0.0 / 0.2	0.0 / 0.0
	†HVAC Exhaust							
Fire								
D4011.024a	6.8 / 6.8	6.8 / 6.8	5.8 / 6.8	2.8 / 6.8	1.4 / 6.7	1.0 / 3.8	0.2 / 1.1	0.0 / 0.0
	†Fire Suppression, Interior Falling Hazards, Interior Space							
D4011.054a	6.9 / 6.9	6.9 / 6.9	5.7 / 6.9	2.9 / 6.9	1.3 / 6.8	0.8 / 3.5	0.1 / 0.8	0.0 / 0.0
	†Fire Suppression							
Electrical								
D5011.013c	0.0 / 7.6	0.0 / 7.4	0.0 / 4.0	0.0 / 2.0	0.0 / 1.2	0.0 / 0.8	0.0 / 0.1	0.0 / 0.0
	†Electrical, Elevators							
D5012.013d	0.0 / 16	0.0 / 16	0.0 / 16	0.0 / 15	0.0 / 13	0.0 / 4.4	0.0 / 0.9	0.0 / 0.0
	†Elevators							
D5012.023c	0.0 / 16	0.0 / 16	0.0 / 7.4	0.0 / 3.8	0.0 / 2.4	0.0 / 1.6	0.0 / 0.2	0.0 / 0.0
	†Electrical, Elevators							
D5012.033c	0.0 / 33	0.0 / 33	0.0 / 12	0.0 / 5.1	0.0 / 4.5	0.0 / 2.6	0.0 / 0.2	0.0 / 0.0
	†Electrical							
D5092.013c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.023c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.033c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							

†System checks that are affected by this component

3.2.4 Selected Realizations for Full Recovery Time Near the 50th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

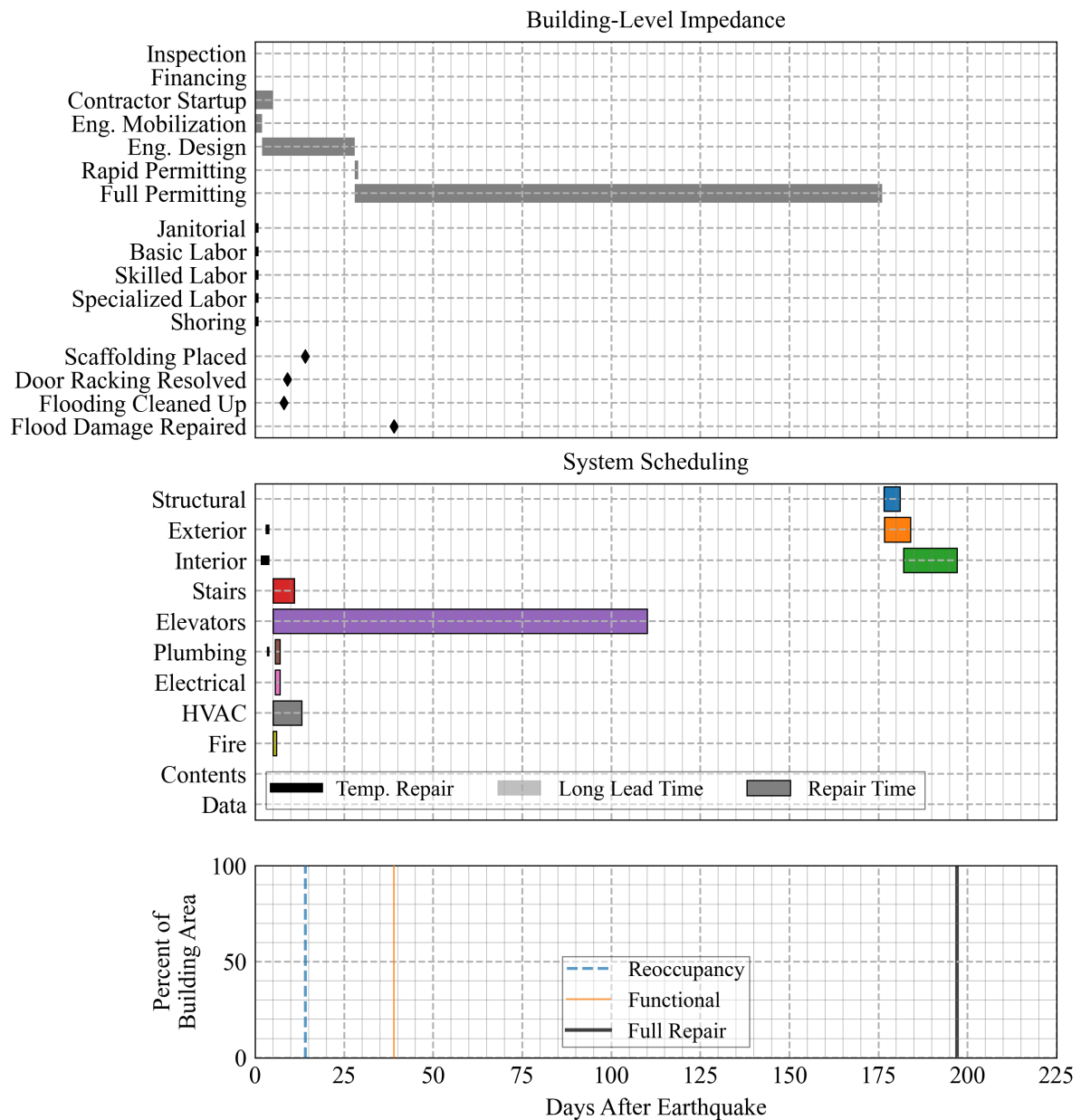


Figure 3.5. 10% in 50 years intensity example 1: full recovery time near the 50th percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

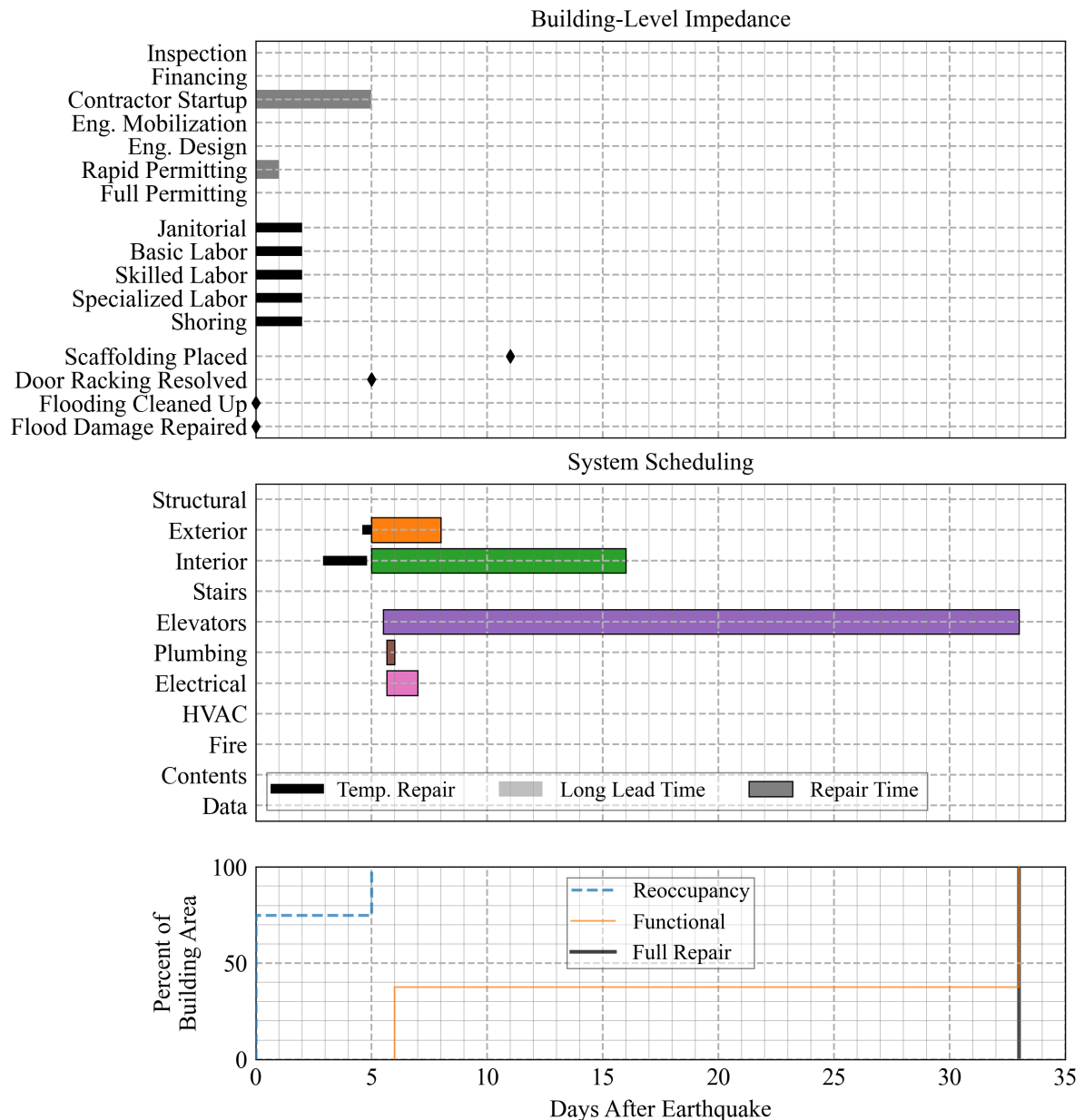


Figure 3.6. 10% in 50 years intensity example 2: full recovery time near the 50th percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

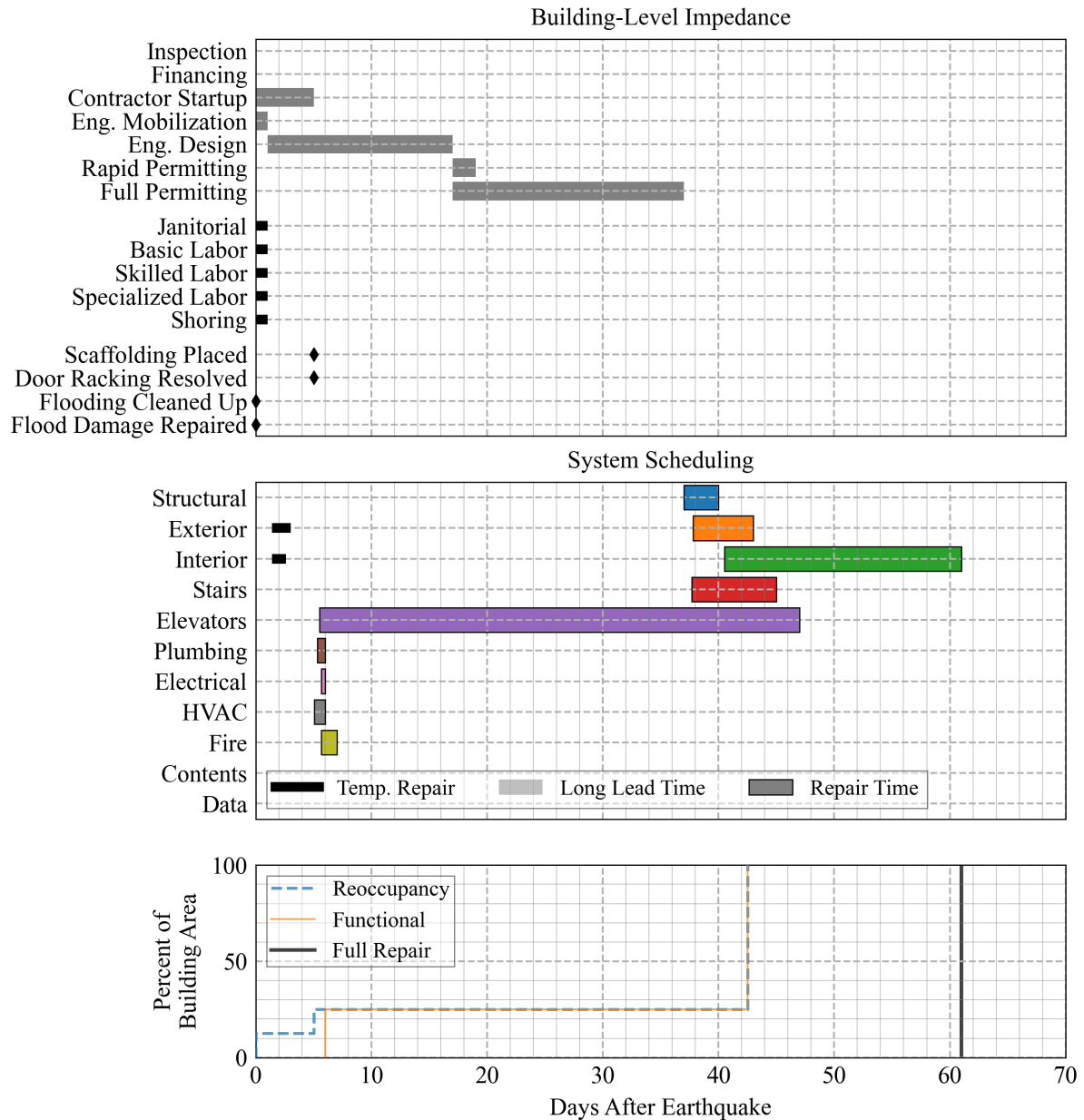


Figure 3.7. 10% in 50 years intensity example 3: full recovery time near the 50th percentile

3.2.5 Selected Realization for Full Recovery Time Near the 90th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

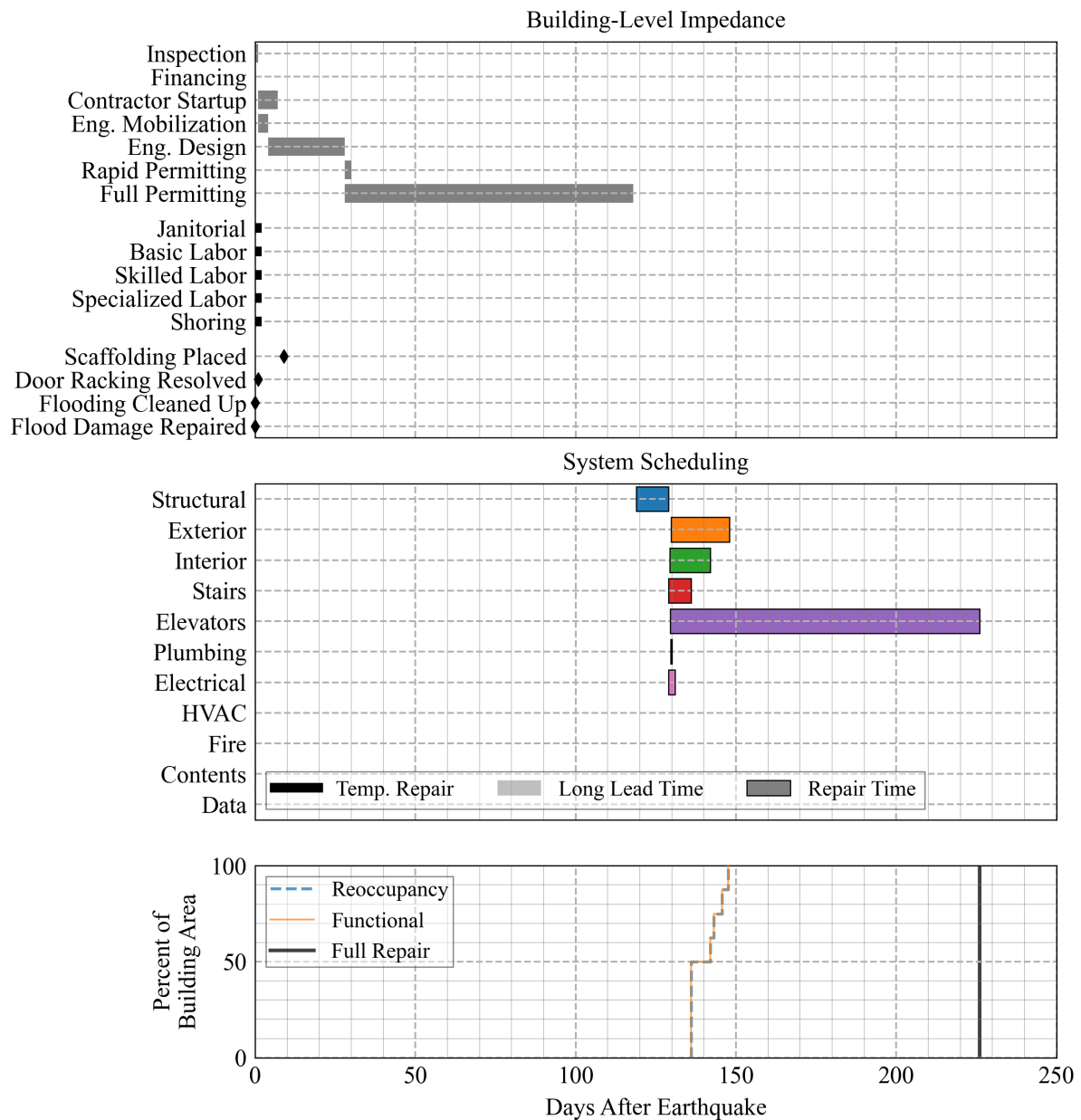


Figure 3.8. 10% in 50 years intensity example: full recovery time near the 90th percentile

3.3 DE Intensity

3.3.1 Damage to Building Systems

Table 3.7 shows the percentage of realizations that the named system prevents reoccupancy/function for the DE intensity. Note that if a system prevents reoccupancy, it will also prevent functionality. This means that the functionality checks may all be fine, but if the reoccupancy checks indicate the building is not reoccupiable then the building will not be considered functional.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which that component is preventing reoccupancy/functionality at that milestone.

Overview of system checks for Building Reoccupancy (also affects function):

- **Red Tag (Structural):** This is a check of the structural components that can cause red tag. These components have safety classes of 1, 2, or 3.
- **Shoring:** This is a check that any damage requiring shoring is shored to ensure safety.
- **Hazardous Material:** This is a check that any hazardous materials in the building remain properly contained.
- **Fire Suppression:** This is a check that the fire system is functional to a degree which allows the building to be reoccupiable (unless a fire watch is considered sufficient for safety).
- **Entry Door Access:** This is a check of safe ingress/egress to the building as a whole. This can be inaccessible from exterior falling hazards or from entry door racking.
 - **Exterior Falling Hazard:** This checks that there are no exterior falling hazards over the entrances to the building.
 - **Entry Door Racking:** This checks that the entry doors are not racked and jammed from excessive residual drift.
- **Stairs:** This checks that there is a sufficient number of stairs to allow safe egress of the building.
- **Stairway Doors:** This checks that the stairway doors are not racked and jammed from excessive residual drift.
- **Exterior Enclosure:** This check is for the safety aspect of the exterior enclosure. This checks that occupants will not fall through the exterior enclosure, not that the enclosure is weather resistant.
- **Interior Falling Hazards:** This is a check that there is sufficient space inside the building to occupy without damaged components precariously hanging overhead.

Overview of system checks for Building Function (affects function only, not reoccupancy):

- **Elevators:** This checks that the elevators have sufficient capacity to allow the building to function to an acceptable degree (if the elevators are required for function).
- **Exterior Enclosure:** This checks that the enclosure is weather resistant enough to allow function to an acceptable degree.
- **Interior Space:** This checks that damage to the interior of the building is limited to an amount that will allow an acceptable degree of function.
- **Water (Plumbing):** This checks that there is running water in the building.
- **Electrical:** This checks that the electrical components can still provide a sufficient amount of power to the building (assuming external power is available).
- **HVAC:** This checks that the HVAC system is functional to an acceptable degree (if the HVAC system is required for function).

Table 3.7. Percent of realizations affecting building reoccupancy/function per system check - DE

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Building Reoccupancy (also affects function)								
Red Tag (Structural)	24	24	24	24	24	18	2.9	0.0
Shoring	28	28	25	23	22	15	2.4	0.0
Hazardous Material	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fire Suppression	20	19	7.9	6.0	6.0	4.1	1.0	0.0
Entry Door Access	92	66	25	5.3	1.9	1.2	0.3	0.0
Exterior Falling Hazard	70	54	22	5.3	1.9	1.2	0.3	0.0
Entry Door Racking	82	40	3.9	0.0	0.0	0.0	0.0	0.0
Stairs	44	44	44	44	44	27	3.5	0.0
Stairway Doors	97	48	5.2	0.0	0.0	0.0	0.0	0.0
Flooding	21	21	15	5.1	0.1	0.0	0.0	0.0
Horizontal Egress	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exterior Enclosure	79	74	39	29	25	20	3.6	0.0
Interior Falling Hazards	12	12	8.3	7.7	7.2	6.2	1.8	0.0
All Loss of Reoccupancy	99	93	72	62	58	43	21	18
Building Function (affects function only, not reoccupancy)								
Elevators	59	59	55	52	48	26	7.3	0.2
Exterior Enclosure	12	12	12	12	12	9.1	2.1	0.0
Roof	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interior Space	83	41	29	25	24	19	3.6	0.0
Electrical	56	56	32	19	15	11	1.8	0.0
Flooding	21	21	21	21	21	9.2	1.6	0.0
Potable Water	75	73	34	23	19	14	2.2	0.0
Sanitary Plumbing	76	74	34	24	20	14	2.2	0.0
HVAC Ventilation	51	50	35	18	14	10	1.8	0.0
HVAC Heating	51	50	35	18	14	10	1.8	0.0
HVAC Cooling	51	50	35	18	14	10	1.8	0.0
HVAC Exhaust	56	56	32	19	15	11	1.8	0.0
All Loss of Function	100	98	85	79	77	56	26	18

3.3.2 Red Tag Breakdown

Table 3.8. Probability of components contributing to red tagging - DE

Fragility ID	Fragility Name	Probability of Contributing to Red Tag (%)
B1031.001	Bolted shear tab gravity connections	0.44
B1031.011b	Steel Column Base Plates, Column 150 plf < W < 300 plf	2.6
B1031.021b	Welded column splices, Column 150 plf < W < 300 plf	17
B1033.652a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in ² , Story Height = 16ft, Bay Width = 30ft	5.9
B1033.653a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in ² , Story Height = 14ft, Bay Width = 30ft	9.5
Total		38

3.3.3 Damage to Individual Components

Table 3.9 shows the percentage of realizations that each component contributes to the loss of reoccupancy/function for the DE intensity. Note that if a component prevents reoccupancy, it will also prevent functionality.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which each component contributes to the loss of reoccupancy/functionality for that milestone time.

Table 3.9. Percent of realizations affecting building reoccupancy/functionality per component - DE

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Steel								
B1031.001	20 / 20	20 / 20	17 / 17	14 / 14	14 / 14	10 / 10	2.2 / 2.2	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.011b	3.2 / 3.2	3.2 / 3.2	3.2 / 3.2	3.2 / 3.2	3.2 / 3.2	3.1 / 3.1	0.9 / 0.9	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.021b	21 / 21	21 / 21	21 / 21	21 / 21	21 / 21	16 / 16	2.6 / 2.6	0.0 / 0.0
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1033.652a	7.2 / 7.2	7.2 / 7.2	7.2 / 7.2	7.2 / 7.2	7.2 / 7.2	6.0 / 6.0	1.5 / 1.5	0.0 / 0.0
	†Red Tag							
B1033.653a	12 / 12	12 / 12	12 / 12	12 / 12	12 / 12	9.8 / 9.8	2.1 / 2.1	0.0 / 0.0
	†Red Tag							
Envelope								
B2011.201a	30 / 33	25 / 29	13 / 20	2.5 / 13	1.0 / 11	0.7 / 8.9	0.2 / 2.0	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function)							
B2011.201b	5.9 / 5.9	5.9 / 5.9	5.9 / 5.9	5.6 / 5.6	3.2 / 3.2	1.7 / 1.7	0.5 / 0.5	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
B2022.002	87 / 91	80 / 81	45 / 46	29 / 31	25 / 27	20 / 21	3.6 / 3.7	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
Interior								
C1011.001c	0.0 / 82	0.0 / 36	0.0 / 28	0.0 / 25	0.0 / 24	0.0 / 19	0.0 / 3.4	0.0 / 0.0
	†Interior Space							
C3011.001c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†No Reoccupancy/Functionality Consequences (Repair Time Only)							
C3032.004a	8.6 / 24	8.5 / 17	5.1 / 11	4.4 / 9.7	4.0 / 9.1	3.2 / 7.7	1.0 / 1.7	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004b	8.3 / 19	8.2 / 14	4.9 / 9.4	4.2 / 8.0	3.8 / 7.6	3.1 / 6.3	1.0 / 1.5	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004c	7.9 / 15	7.8 / 12	4.5 / 8.1	3.9 / 6.9	3.4 / 6.5	2.9 / 5.6	1.0 / 1.5	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004d	8.3 / 16	8.3 / 12	4.8 / 8.1	4.1 / 6.7	3.6 / 6.3	3.0 / 5.4	1.0 / 1.5	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
Stairs								
C2011.001a	44 / 44	44 / 44	44 / 44	44 / 44	44 / 44	27 / 27	3.5 / 3.5	0.0 / 0.0
	†Stairs							
Conveying								
	†All components in this group: Elevators							
D1014.041	0.0 / 30	0.0 / 30	0.0 / 24	0.0 / 13	0.0 / 9.6	0.0 / 6.7	0.0 / 1.4	0.0 / 0.0
D1014.042	0.0 / 43	0.0 / 43	0.0 / 43	0.0 / 43	0.0 / 41	0.0 / 23	0.0 / 6.7	0.0 / 0.2
D1014.043	0.0 / 43	0.0 / 43	0.0 / 42	0.0 / 42	0.0 / 40	0.0 / 22	0.0 / 6.5	0.0 / 0.2
D1014.044	0.0 / 43	0.0 / 43	0.0 / 43	0.0 / 42	0.0 / 40	0.0 / 22	0.0 / 6.7	0.0 / 0.2

†System checks that are affected by this component

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Table 3.9 (Continued). Percent of realizations affecting building reoccupancy/functionality per component - DE

	Immediate	>3 d	>7 d	>14 d	>1 month	>3 mo	>6 months	>12 mo
Plumbing								
D2021.014a	4.0 / 4.0	4.0 / 4.0	3.0 / 4.0	1.5 / 4.0	0.7 / 4.0	0.6 / 2.2	0.3 / 0.6	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.014b	0.0 / 56	0.0 / 53	0.0 / 18	0.0 / 14	0.0 / 14	0.0 / 10	0.0 / 1.8	0.0 / 0.0
	†Potable Water							
D2021.024a	4.0 / 4.0	4.0 / 4.0	2.7 / 4.0	1.4 / 4.0	0.9 / 4.0	0.7 / 2.0	0.2 / 0.4	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.024b	6.1 / 61	5.9 / 58	3.1 / 20	2.9 / 16	2.9 / 16	2.3 / 11	0.7 / 1.8	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2031.014b	0.0 / 20	0.0 / 19	0.0 / 7.5	0.0 / 5.9	0.0 / 5.9	0.0 / 4.4	0.0 / 0.9	0.0 / 0.0
	†Sanitary Plumbing							
HVAC								
D3032.013f	0.0 / 36	0.0 / 36	0.0 / 24	0.0 / 10	0.0 / 9.7	0.0 / 7.4	0.0 / 1.4	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling							
D3041.011f	1.3 / 2.2	1.3 / 2.2	0.7 / 1.4	0.7 / 0.9	0.7 / 0.9	0.5 / 0.5	0.1 / 0.1	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.012d	1.1 / 2.1	0.9 / 2.0	0.4 / 1.2	0.4 / 0.7	0.4 / 0.7	0.3 / 0.5	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.031e	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.103c	0.0 / 44	0.0 / 43	0.0 / 21	0.0 / 12	0.0 / 12	0.0 / 9.0	0.0 / 1.7	0.0 / 0.0
	†HVAC Exhaust							
Fire								
D4011.024a	13 / 13	13 / 13	11 / 13	6.8 / 13	4.3 / 13	3.0 / 7.8	0.7 / 1.5	0.0 / 0.0
	†Fire Suppression, Interior Falling Hazards, Interior Space							
D4011.054a	13 / 13	13 / 13	11 / 13	6.2 / 13	4.2 / 13	2.9 / 7.1	0.7 / 1.7	0.0 / 0.0
	†Fire Suppression							
Electrical								
D5011.013c	0.0 / 13	0.0 / 13	0.0 / 9.0	0.0 / 5.4	0.0 / 3.4	0.0 / 2.6	0.0 / 0.6	0.0 / 0.0
	†Electrical, Elevators							
D5012.013d	0.0 / 24	0.0 / 24	0.0 / 24	0.0 / 23	0.0 / 22	0.0 / 12	0.0 / 3.7	0.0 / 0.1
	†Elevators							
D5012.023c	0.0 / 25	0.0 / 25	0.0 / 16	0.0 / 9.4	0.0 / 6.4	0.0 / 4.9	0.0 / 0.8	0.0 / 0.0
	†Electrical, Elevators							
D5012.033c	0.0 / 44	0.0 / 44	0.0 / 22	0.0 / 14	0.0 / 12	0.0 / 9.0	0.0 / 1.6	0.0 / 0.0
	†Electrical							
D5092.013c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.023c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.033c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							

†System checks that are affected by this component

3.3.4 Selected Realizations for Full Recovery Time Near the 50th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

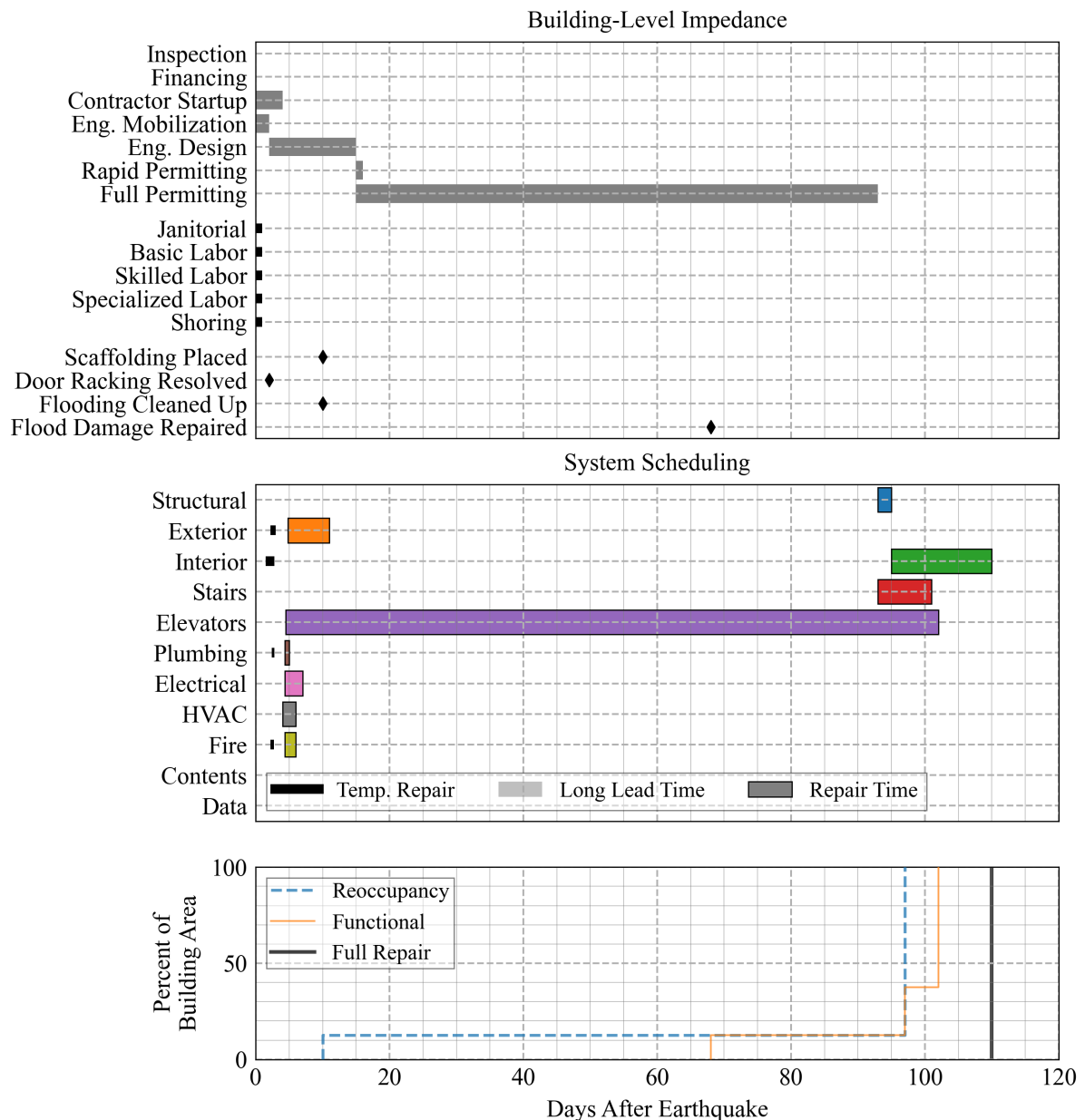


Figure 3.9. DE intensity example 1: full recovery time near the 50th percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

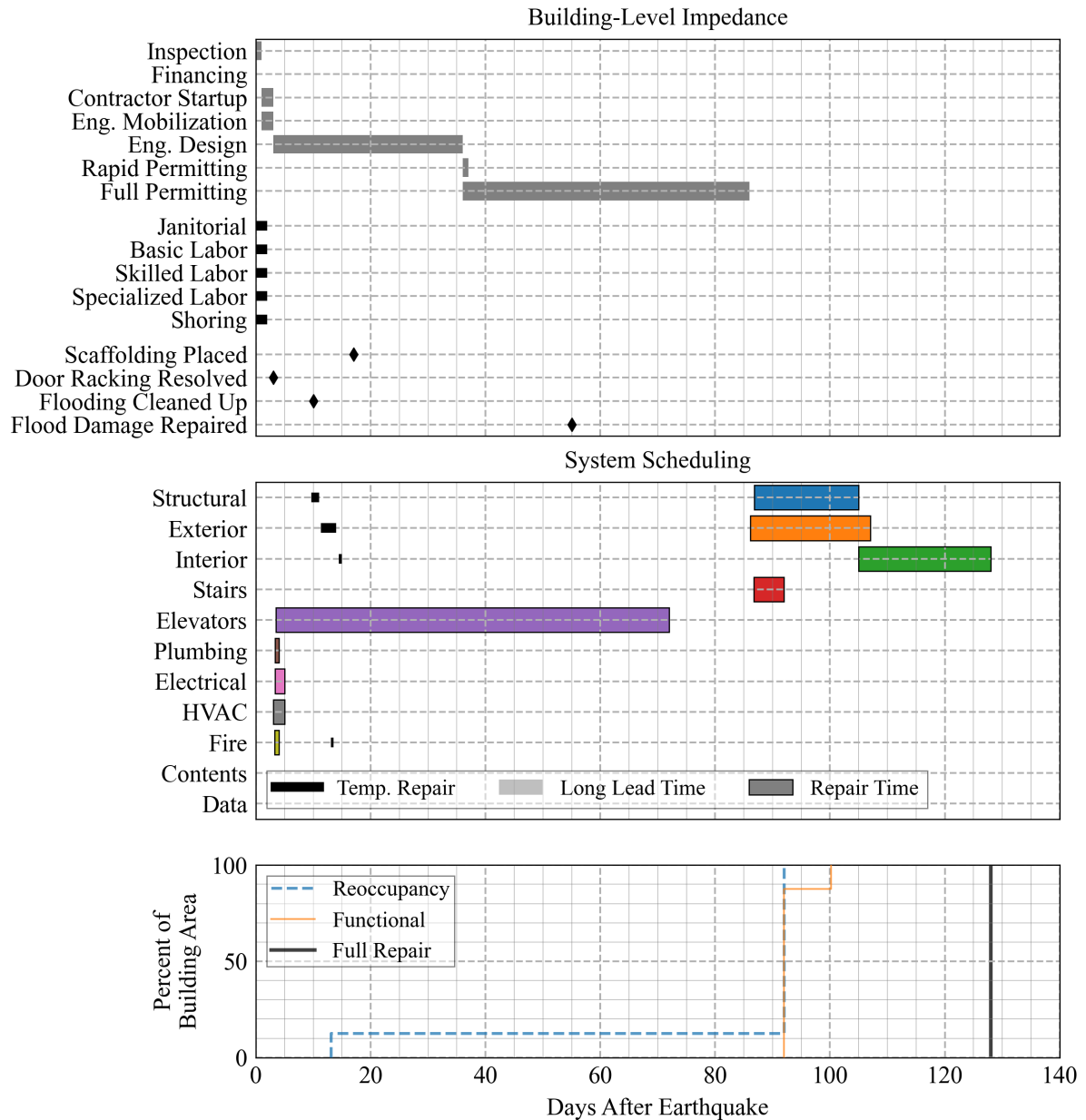


Figure 3.10. DE intensity example 2: full recovery time near the 50th percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

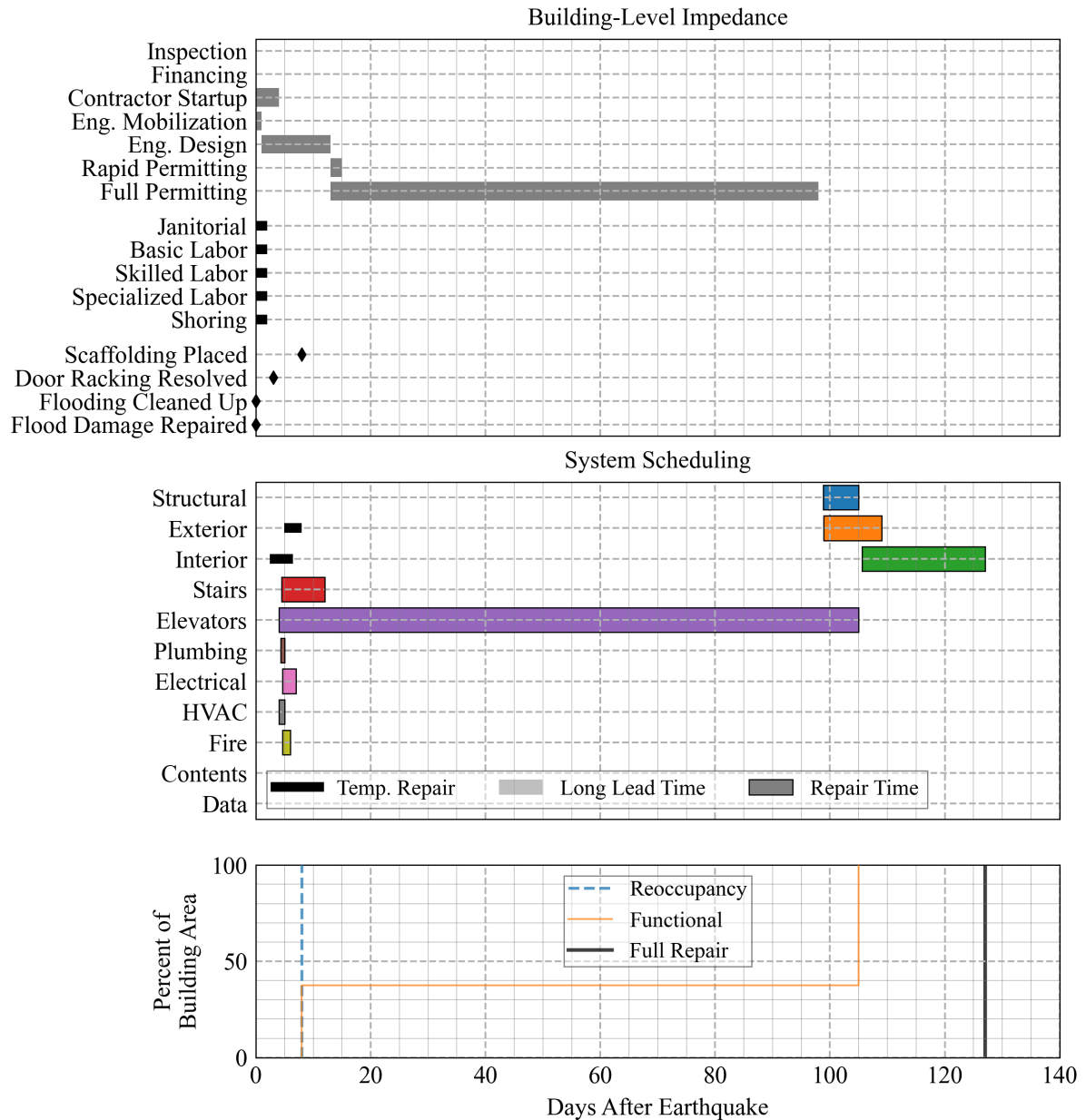


Figure 3.11. DE intensity example 3: full recovery time near the 50th percentile

3.3.5 Selected Realization for Full Recovery Time Near the 90th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (DE Percentile = 90) resulted in global failure, no scheduling was computed.

3.4 2% in 50 years Intensity

3.4.1 Damage to Building Systems

Table 3.10 shows the percentage of realizations that the named system prevents reoccupancy/function for the 2% in 50 years intensity. Note that if a system prevents reoccupancy, it will also prevent functionality. This means that the functionality checks may all be fine, but if the reoccupancy checks indicate the building is not reoccupiable then the building will not be considered functional.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which that component is preventing reoccupancy/functionality at that milestone.

Overview of system checks for Building Reoccupancy (also affects function):

- **Red Tag (Structural):** This is a check of the structural components that can cause red tag. These components have safety classes of 1, 2, or 3.
- **Shoring:** This is a check that any damage requiring shoring is shored to ensure safety.
- **Hazardous Material:** This is a check that any hazardous materials in the building remain properly contained.
- **Fire Suppression:** This is a check that the fire system is functional to a degree which allows the building to be reoccupiable (unless a fire watch is considered sufficient for safety).
- **Entry Door Access:** This is a check of safe ingress/egress to the building as a whole. This can be inaccessible from exterior falling hazards or from entry door racking.
 - **Exterior Falling Hazard:** This checks that there are no exterior falling hazards over the entrances to the building.
 - **Entry Door Racking:** This checks that the entry doors are not racked and jammed from excessive residual drift.
- **Stairs:** This checks that there is a sufficient number of stairs to allow safe egress of the building.
- **Stairway Doors:** This checks that the stairway doors are not racked and jammed from excessive residual drift.
- **Exterior Enclosure:** This check is for the safety aspect of the exterior enclosure. This checks that occupants will not fall through the exterior enclosure, not that the enclosure is weather resistant.
- **Interior Falling Hazards:** This is a check that there is sufficient space inside the building to occupy without damaged components precariously hanging overhead.

Overview of system checks for Building Function (affects function only, not reoccupancy):

- **Elevators:** This checks that the elevators have sufficient capacity to allow the building to function to an acceptable degree (if the elevators are required for function).
- **Exterior Enclosure:** This checks that the enclosure is weather resistant enough to allow function to an acceptable degree.
- **Interior Space:** This checks that damage to the interior of the building is limited to an amount that will allow an acceptable degree of function.
- **Water (Plumbing):** This checks that there is running water in the building.
- **Electrical:** This checks that the electrical components can still provide a sufficient amount of power to the building (assuming external power is available).
- **HVAC:** This checks that the HVAC system is functional to an acceptable degree (if the HVAC system is required for function).

Table 3.10. Percent of realizations affecting building reoccupancy/function per system check - 2% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Building Reoccupancy (also affects function)								
Red Tag (Structural)	51	51	51	51	51	41	10	0.1
Shoring	56	55	52	48	47	35	8.5	0.1
Hazardous Material	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fire Suppression	29	28	19	16	16	13	3.3	0.0
Entry Door Access	98	75	37	11	5.4	4.2	1.1	0.0
Exterior Falling Hazard	84	68	35	11	5.4	4.2	1.1	0.0
Entry Door Racking	93	46	4.9	0.0	0.0	0.0	0.0	0.0
Stairs	68	68	68	68	68	48	11	0.1
Stairway Doors	99	49	5.6	0.0	0.0	0.0	0.0	0.0
Flooding	30	30	22	8.4	0.4	0.0	0.0	0.0
Horizontal Egress	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exterior Enclosure	96	92	68	58	53	45	12	0.2
Interior Falling Hazards	28	28	26	24	24	22	8.5	0.1
All Loss of Reoccupancy	100	99	94	90	88	79	59	52
Building Function (affects function only, not reoccupancy)								
Elevators	77	77	74	73	70	51	24	0.7
Exterior Enclosure	37	37	37	37	37	31	9.6	0.2
Roof	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interior Space	96	71	59	54	51	45	13	0.2
Electrical	71	71	56	43	37	30	7.5	0.0
Flooding	30	30	30	30	30	17	4.5	0.0
Potable Water	87	86	61	50	45	35	8.5	0.0
Sanitary Plumbing	87	86	61	50	45	35	8.5	0.0
HVAC Ventilation	68	68	57	42	36	29	6.9	0.0
HVAC Heating	68	68	57	42	36	29	6.9	0.0
HVAC Cooling	68	68	57	42	36	29	6.9	0.0
HVAC Exhaust	72	72	56	43	38	31	7.4	0.0
All Loss of Function	100	100	98	96	96	87	67	53

3.4.2 Red Tag Breakdown

Table 3.11. Probability of components contributing to red tagging - 2% in 50 years

Fragility ID	Fragility Name	Probability of Contributing to Red Tag (%)
B1031.001	Bolted shear tab gravity connections	2.1
B1031.011b	Steel Column Base Plates, Column 150 plf < W < 300 plf	6.3
B1031.021b	Welded column splices, Column 150 plf < W < 300 plf	20
B1033.652a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in ² , Story Height = 16ft, Bay Width = 30ft	11
B1033.653a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in ² , Story Height = 14ft, Bay Width = 30ft	13
Total		76

3.4.3 Damage to Individual Components

Table 3.12 shows the percentage of realizations that each component contributes to the loss of reoccupancy/function for the 2% in 50 years intensity. Note that if a component prevents reoccupancy, it will also prevent functionality.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which each component contributes to the loss of reoccupancy/functionality for that milestone time.

Table 3.12. Percent of realizations affecting building reoccupancy/functionality per component - 2% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Steel								
B1031.001	46 / 46	45 / 45	42 / 42	38 / 38	37 / 37	30 / 30	8.4 / 8.4	0.1 / 0.1
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.011b	13 / 13	13 / 13	13 / 13	13 / 13	13 / 13	13 / 13	6.0 / 6.0	0.1 / 0.1
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.021b	42 / 42	42 / 42	42 / 42	42 / 42	42 / 42	35 / 35	9.5 / 9.5	0.1 / 0.1
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1033.652a	22 / 22	22 / 22	22 / 22	22 / 22	22 / 22	19 / 19	6.8 / 6.8	0.1 / 0.1
	†Red Tag							
B1033.653a	28 / 28	28 / 28	28 / 28	28 / 28	28 / 28	24 / 24	8.5 / 8.5	0.1 / 0.1
	†Red Tag							
Envelope								
B2011.201a	52 / 58	43 / 53	24 / 44	7.1 / 38	3.9 / 36	3.1 / 30	0.8 / 9.5	0.0 / 0.2
	†Exterior Falling Hazard, Exterior Enclosure (function)							
B2011.201b	11 / 11	11 / 11	11 / 11	11 / 11	8.3 / 8.5	6.1 / 6.3	1.3 / 1.3	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
B2022.002	97 / 98	94 / 94	72 / 73	58 / 61	52 / 57	45 / 47	12 / 13	0.2 / 0.2
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
Interior								
C1011.001c	0.0 / 96	0.0 / 64	0.0 / 57	0.0 / 52	0.0 / 51	0.0 / 44	0.0 / 12	0.0 / 0.1
	†Interior Space							
C3011.001c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†No Reoccupancy/Functionality Consequences (Repair Time Only)							
C3032.004a	19 / 42	19 / 35	16 / 30	15 / 28	14 / 27	13 / 24	4.6 / 7.2	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004b	18 / 37	18 / 31	15 / 27	14 / 24	13 / 23	13 / 21	4.5 / 6.7	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004c	15 / 27	15 / 23	13 / 19	11 / 17	11 / 16	10 / 15	3.8 / 5.4	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
C3032.004d	16 / 30	16 / 26	14 / 22	13 / 20	12 / 19	11 / 18	3.9 / 5.9	0.0 / 0.0
	†Interior Falling Hazards, Interior Space							
Stairs								
C2011.001a	68 / 68	68 / 68	68 / 68	68 / 68	68 / 68	48 / 48	11 / 11	0.1 / 0.1
	†Stairs							
Conveying								
	†All components in this group: Elevators							
D1014.041	0.0 / 43	0.0 / 43	0.0 / 38	0.0 / 27	0.0 / 24	0.0 / 20	0.0 / 4.6	0.0 / 0.0
D1014.042	0.0 / 63	0.0 / 63	0.0 / 63	0.0 / 63	0.0 / 61	0.0 / 46	0.0 / 22	0.0 / 0.7
D1014.043	0.0 / 63	0.0 / 63	0.0 / 63	0.0 / 62	0.0 / 61	0.0 / 45	0.0 / 22	0.0 / 0.7
D1014.044	0.0 / 62	0.0 / 62	0.0 / 62	0.0 / 62	0.0 / 60	0.0 / 45	0.0 / 21	0.0 / 0.7

†System checks that are affected by this component

Continued on next page

Table 3.12 (Continued). Percent of realizations affecting building reoccupancy/functionality per component - 2% in 50 years

	Immediate	>3 d	>7 d	>14 d	>1 month	>3 mo	>6 months	>12 mo
Plumbing								
D2021.014a	6.7 / 6.7	6.7 / 6.7	5.9 / 6.7	4.7 / 6.7	3.0 / 6.6	2.8 / 5.5	1.0 / 1.9	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.014b	0.0 / 68	0.0 / 66	0.0 / 40	0.0 / 36	0.0 / 36	0.0 / 28	0.0 / 6.4	0.0 / 0.0
	†Potable Water							
D2021.024a	7.7 / 7.7	7.7 / 7.7	6.5 / 7.7	4.1 / 7.7	2.9 / 7.6	2.5 / 6.2	1.0 / 2.3	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.024b	13 / 74	12 / 72	9.7 / 43	9.3 / 39	9.3 / 39	8.2 / 30	2.7 / 7.3	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2031.014b	0.0 / 31	0.0 / 30	0.0 / 19	0.0 / 17	0.0 / 17	0.0 / 14	0.0 / 3.4	0.0 / 0.0
	†Sanitary Plumbing							
HVAC								
D3032.013f	0.0 / 51	0.0 / 51	0.0 / 41	0.0 / 28	0.0 / 28	0.0 / 23	0.0 / 4.9	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling							
D3041.011f	3.0 / 4.6	2.9 / 4.6	2.3 / 4.0	2.1 / 3.2	2.1 / 3.2	1.8 / 2.8	0.7 / 0.8	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.012d	3.2 / 5.1	3.1 / 5.1	2.4 / 4.0	2.3 / 3.7	2.3 / 3.6	2.2 / 3.2	0.8 / 0.9	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.031e	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.103c	0.0 / 58	0.0 / 58	0.0 / 39	0.0 / 31	0.0 / 31	0.0 / 24	0.0 / 5.8	0.0 / 0.0
	†HVAC Exhaust							
Fire								
D4011.024a	21 / 21	21 / 21	19 / 21	15 / 21	13 / 21	9.8 / 17	2.7 / 5.3	0.0 / 0.0
	†Fire Suppression, Interior Falling Hazards, Interior Space							
D4011.054a	19 / 19	19 / 19	17 / 19	13 / 19	11 / 19	9.0 / 15	2.2 / 4.4	0.0 / 0.0
	†Fire Suppression							
Electrical								
D5011.013c	0.0 / 21	0.0 / 21	0.0 / 18	0.0 / 14	0.0 / 11	0.0 / 9.1	0.0 / 2.1	0.0 / 0.0
	†Electrical, Elevators							
D5012.013d	0.0 / 38	0.0 / 38	0.0 / 38	0.0 / 37	0.0 / 36	0.0 / 26	0.0 / 12	0.0 / 0.5
	†Elevators							
D5012.023c	0.0 / 36	0.0 / 36	0.0 / 30	0.0 / 23	0.0 / 18	0.0 / 15	0.0 / 4.0	0.0 / 0.0
	†Electrical, Elevators							
D5012.033c	0.0 / 58	0.0 / 58	0.0 / 41	0.0 / 32	0.0 / 30	0.0 / 24	0.0 / 6.2	0.0 / 0.0
	†Electrical							
D5092.013c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.023c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.033c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							

†System checks that are affected by this component

3.4.4 Selected Realizations for Full Recovery Time Near the 50th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (2% in 50 years Percentile = 50) resulted in global failure, no scheduling was computed.

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (2% in 50 years Percentile = 49) resulted in global failure, no scheduling was computed.

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (2% in 50 years Percentile = 51) resulted in global failure, no scheduling was computed.

3.4.5 Selected Realization for Full Recovery Time Near the 90th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (2% in 50 years Percentile = 90) resulted in global failure, no scheduling was computed.

3.5 MCE_R Intensity

3.5.1 Damage to Building Systems

Table 3.13 shows the percentage of realizations that the named system prevents reoccupancy/function for the MCE_R intensity. Note that if a system prevents reoccupancy, it will also prevent functionality. This means that the functionality checks may all be fine, but if the reoccupancy checks indicate the building is not reoccupiable then the building will not be considered functional.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which that component is preventing reoccupancy/functionality at that milestone.

Overview of system checks for Building Reoccupancy (also affects function):

- **Red Tag (Structural):** This is a check of the structural components that can cause red tag. These components have safety classes of 1, 2, or 3.
- **Shoring:** This is a check that any damage requiring shoring is shored to ensure safety.
- **Hazardous Material:** This is a check that any hazardous materials in the building remain properly contained.
- **Fire Suppression:** This is a check that the fire system is functional to a degree which allows the building to be reoccupiable (unless a fire watch is considered sufficient for safety).
- **Entry Door Access:** This is a check of safe ingress/egress to the building as a whole. This can be inaccessible from exterior falling hazards or from entry door racking.
 - **Exterior Falling Hazard:** This checks that there are no exterior falling hazards over the entrances to the building.
 - **Entry Door Racking:** This checks that the entry doors are not racked and jammed from excessive residual drift.
- **Stairs:** This checks that there is a sufficient number of stairs to allow safe egress of the building.
- **Stairway Doors:** This checks that the stairway doors are not racked and jammed from excessive residual drift.
- **Exterior Enclosure:** This check is for the safety aspect of the exterior enclosure. This checks that occupants will not fall through the exterior enclosure, not that the enclosure is weather resistant.
- **Interior Falling Hazards:** This is a check that there is sufficient space inside the building to occupy without damaged components precariously hanging overhead.

Overview of system checks for Building Function (affects function only, not reoccupancy):

- **Elevators:** This checks that the elevators have sufficient capacity to allow the building to function to an acceptable degree (if the elevators are required for function).
- **Exterior Enclosure:** This checks that the enclosure is weather resistant enough to allow function to an acceptable degree.
- **Interior Space:** This checks that damage to the interior of the building is limited to an amount that will allow an acceptable degree of function.
- **Water (Plumbing):** This checks that there is running water in the building.
- **Electrical:** This checks that the electrical components can still provide a sufficient amount of power to the building (assuming external power is available).
- **HVAC:** This checks that the HVAC system is functional to an acceptable degree (if the HVAC system is required for function).

Table 3.13. Percent of realizations affecting building reoccupancy/function per system check - MCE_R

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Building Reoccupancy (also affects function)								
Red Tag (Structural)	54	54	54	54	54	44	11	0.3
Shoring	58	58	55	52	51	39	8.7	0.2
Hazardous Material	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fire Suppression	32	31	20	18	18	14	2.9	0.0
Entry Door Access	98	73	36	10	5.0	4.1	1.4	0.0
Exterior Falling Hazard	84	66	34	10	5.0	4.1	1.4	0.0
Entry Door Racking	93	45	4.9	0.0	0.0	0.0	0.0	0.0
Stairs	71	71	71	71	71	51	12	0.4
Stairway Doors	100	48	5.7	0.0	0.0	0.0	0.0	0.0
Flooding	33	33	24	8.1	0.1	0.0	0.0	0.0
Horizontal Egress	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exterior Enclosure	96	94	71	61	55	47	13	0.6
Interior Falling Hazards	34	34	30	28	27	25	8.7	0.3
All Loss of Reoccupancy	100	99	95	91	90	81	63	57
Building Function (affects function only, not reoccupancy)								
Elevators	80	80	79	77	75	53	28	1.6
Exterior Enclosure	44	44	44	44	44	39	11	0.6
Roof	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interior Space	97	75	63	56	54	48	13	0.7
Electrical	74	74	60	48	42	34	8.1	0.1
Flooding	33	33	33	33	33	15	2.9	0.0
Potable Water	88	87	64	54	48	38	8.9	0.2
Sanitary Plumbing	89	88	65	54	48	38	8.9	0.2
HVAC Ventilation	70	69	59	44	38	32	7.2	0.1
HVAC Heating	70	69	59	44	38	32	7.2	0.1
HVAC Cooling	70	69	59	44	38	32	7.2	0.1
HVAC Exhaust	72	72	59	46	41	33	8.1	0.2
All Loss of Function	100	100	98	97	97	89	71	57

3.5.2 Red Tag Breakdown

Table 3.14. Probability of components contributing to red tagging - MCE_R

Fragility ID	Fragility Name	Probability of Contributing to Red Tag (%)
B1031.001	Bolted shear tab gravity connections	2.0
B1031.011b	Steel Column Base Plates, Column 150 plf < W < 300 plf	7.3
B1031.021b	Welded column splices, Column 150 plf < W < 300 plf	20
B1033.652a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = $5in^2$, Story Height = 16ft, Bay Width = 30ft	12
B1033.653a	CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = $5in^2$, Story Height = 14ft, Bay Width = 30ft	13
Total		80

3.5.3 Damage to Individual Components

Table 3.15 shows the percentage of realizations that each component contributes to the loss of reoccupancy/function for the MCE_R intensity. Note that if a component prevents reoccupancy, it will also prevent functionality.

Each column represents a milestone time after the earthquake and the values in that column indicate the percentage of realizations in which each component contributes to the loss of reoccupancy/functionality for that milestone time.

Table 3.15. Percent of realizations affecting building reoccupancy/functionality per component - MCE_R

	Immediate	>3 d	>7 d	>14 d	>1 mo	>3 mo	>6 mo	>12 mo
Steel								
B1031.001	49 / 49	49 / 49	45 / 45	42 / 42	42 / 42	34 / 34	8.3 / 8.3	0.2 / 0.2
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.011b	17 / 17	17 / 17	17 / 17	17 / 17	17 / 17	17 / 17	6.6 / 6.6	0.3 / 0.3
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1031.021b	45 / 45	45 / 45	45 / 45	45 / 45	45 / 45	38 / 38	9.9 / 9.9	0.3 / 0.3
	†Red Tag, Interior Falling Hazards, Shoring, Interior Space							
B1033.652a	27 / 27	27 / 27	27 / 27	27 / 27	27 / 27	24 / 24	8.0 / 8.0	0.3 / 0.3
	†Red Tag							
B1033.653a	29 / 29	29 / 29	29 / 29	29 / 29	29 / 29	27 / 27	7.9 / 7.9	0.3 / 0.3
	†Red Tag							
Envelope								
B2011.201a	55 / 63	46 / 58	26 / 50	7.8 / 43	3.9 / 42	3.5 / 37	1.2 / 11	0.0 / 0.6
	†Exterior Falling Hazard, Exterior Enclosure (function)							
B2011.201b	12 / 12	12 / 12	12 / 12	12 / 12	8.2 / 8.8	6.1 / 6.4	2.0 / 2.1	0.0 / 0.0
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
B2022.002	98 / 99	96 / 96	74 / 76	59 / 64	55 / 61	47 / 51	13 / 14	0.6 / 0.6
	†Exterior Falling Hazard, Exterior Enclosure (function), Interior Space, Exterior Enclosure (safety)							
Interior								
C1011.001c	0.0 / 97	0.0 / 66	0.0 / 60	0.0 / 55	0.0 / 54	0.0 / 48	0.0 / 12	0.0 / 0.6
	†Interior Space							
C3011.001c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†No Reoccupancy/Functionality Consequences (Repair Time Only)							
C3032.004a	23 / 46	23 / 39	18 / 33	16 / 30	16 / 29	15 / 26	5.2 / 7.5	0.2 / 0.3
	†Interior Falling Hazards, Interior Space							
C3032.004b	21 / 41	21 / 36	17 / 30	15 / 27	15 / 26	13 / 23	4.7 / 6.9	0.1 / 0.2
	†Interior Falling Hazards, Interior Space							
C3032.004c	19 / 29	19 / 27	15 / 22	13 / 19	12 / 18	11 / 17	4.0 / 5.4	0.2 / 0.3
	†Interior Falling Hazards, Interior Space							
C3032.004d	20 / 31	19 / 28	15 / 23	13 / 20	12 / 19	11 / 18	4.0 / 5.6	0.2 / 0.4
	†Interior Falling Hazards, Interior Space							
Stairs								
C2011.001a	71 / 71	71 / 71	71 / 71	71 / 71	71 / 71	51 / 51	12 / 12	0.4 / 0.4
	†Stairs							
Conveying								
	†All components in this group: Elevators							
D1014.041	0.0 / 45	0.0 / 45	0.0 / 41	0.0 / 31	0.0 / 26	0.0 / 22	0.0 / 5.2	0.0 / 0.0
D1014.042	0.0 / 64	0.0 / 64	0.0 / 64	0.0 / 64	0.0 / 63	0.0 / 45	0.0 / 25	0.0 / 1.5
D1014.043	0.0 / 64	0.0 / 64	0.0 / 64	0.0 / 64	0.0 / 63	0.0 / 45	0.0 / 25	0.0 / 1.4
D1014.044	0.0 / 65	0.0 / 65	0.0 / 65	0.0 / 64	0.0 / 63	0.0 / 46	0.0 / 25	0.0 / 1.5

†System checks that are affected by this component

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Table 3.15 (Continued). Percent of realizations affecting building reoccupancy/functionality per component - MCE_R

	Immediate	>3 d	>7 d	>14 d	>1 month	>3 mo	>6 months	>12 mo
Plumbing								
D2021.014a	7.8 / 7.8	7.8 / 7.8	6.3 / 7.8	4.1 / 7.8	2.9 / 7.8	2.4 / 5.4	0.9 / 1.7	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.014b	0.0 / 72	0.0 / 70	0.0 / 44	0.0 / 39	0.0 / 39	0.0 / 30	0.0 / 7.3	0.0 / 0.1
	†Potable Water							
D2021.024a	7.4 / 7.4	7.4 / 7.4	5.8 / 7.4	3.6 / 7.4	2.9 / 7.4	2.1 / 5.6	0.4 / 1.1	0.0 / 0.0
	†Potable Water, Interior Falling Hazards, Interior Space							
D2021.024b	15 / 79	15 / 77	11 / 49	10 / 44	10 / 44	8.7 / 34	2.8 / 7.7	0.0 / 0.2
	†Potable Water, Interior Falling Hazards, Interior Space							
D2031.014b	0.0 / 34	0.0 / 33	0.0 / 22	0.0 / 19	0.0 / 19	0.0 / 14	0.0 / 3.8	0.0 / 0.0
	†Sanitary Plumbing							
HVAC								
D3032.013f	0.0 / 53	0.0 / 53	0.0 / 43	0.0 / 29	0.0 / 29	0.0 / 23	0.0 / 5.2	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling							
D3041.011f	3.3 / 5.4	3.3 / 5.4	2.2 / 4.2	2.1 / 2.9	2.1 / 2.8	1.7 / 2.2	0.4 / 0.5	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.012d	3.1 / 4.9	3.1 / 4.9	2.2 / 4.0	1.9 / 2.9	1.9 / 2.9	1.7 / 2.3	0.5 / 0.5	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.031e	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†HVAC Ventilation, HVAC Heating, HVAC Cooling, Interior Falling Hazards, Interior Space							
D3041.103c	0.0 / 58	0.0 / 58	0.0 / 42	0.0 / 34	0.0 / 34	0.0 / 27	0.0 / 6.9	0.0 / 0.2
	†HVAC Exhaust							
Fire								
D4011.024a	23 / 23	23 / 23	21 / 23	15 / 23	12 / 23	9.4 / 16	2.0 / 3.4	0.0 / 0.0
	†Fire Suppression, Interior Falling Hazards, Interior Space							
D4011.054a	23 / 23	23 / 23	21 / 23	15 / 23	13 / 23	10 / 17	2.2 / 3.4	0.0 / 0.0
	†Fire Suppression							
Electrical								
D5011.013c	0.0 / 22	0.0 / 21	0.0 / 19	0.0 / 15	0.0 / 12	0.0 / 9.9	0.0 / 2.9	0.0 / 0.0
	†Electrical, Elevators							
D5012.013d	0.0 / 38	0.0 / 38	0.0 / 38	0.0 / 38	0.0 / 37	0.0 / 25	0.0 / 13	0.0 / 0.9
	†Elevators							
D5012.023c	0.0 / 37	0.0 / 36	0.0 / 32	0.0 / 26	0.0 / 22	0.0 / 18	0.0 / 4.0	0.0 / 0.1
	†Electrical, Elevators							
D5012.033c	0.0 / 60	0.0 / 60	0.0 / 45	0.0 / 36	0.0 / 34	0.0 / 27	0.0 / 6.5	0.0 / 0.1
	†Electrical							
D5092.013c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.023c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							
D5092.033c	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
	†Electrical							

†System checks that are affected by this component

3.5.4 Selected Realizations for Full Recovery Time Near the 50th Percentile

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (MCE_R Percentile = 50) resulted in global failure, no scheduling was computed.

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (MCE_R Percentile = 49) resulted in global failure, no scheduling was computed.

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (MCE_R Percentile = 51) resulted in global failure, no scheduling was computed.

3.5.5 *Selected Realization for Full Recovery Time Near the 90th Percentile*

Note that this is a single realization and may not be representative of a general trend. This selected realization is intended to give a sense of what the repair schedule may look like, it is not intended to generalize what the “typical” repair schedule looks like.

This particular realization (MCE_R Percentile = 90) resulted in global failure, no scheduling was computed.

4 COMPONENT DAMAGE OVERVIEW

4.1 Most Damaged Components

This section outlines the most damaged component at each intensity. “Most damaged” is determined by cost and does not necessarily mean that it’s the main component impeding building function.

Table 4.1. Most damaged Structural components at each intensity level.

Intensity	Component	Damage State	Expected Repair Cost
90% in 50 years	B1031.001	1	\$0
50% in 30 years	B1031.001	1	\$0
50% in 50 years	B1031.021b	1	\$116
50% in 75 years	B1033.653a	1	\$397
50% in 100 years	B1033.653a	1	\$2,873
20% in 50 years	B1033.653a	1	\$20,724
10% in 50 years	B1033.653a	1	\$95,050
DE	B1033.653a	1	\$187,249
5% in 50 years	B1033.653a	1	\$187,664
2% in 50 years	B1033.653a	1	\$220,473
MCE _R	B1033.653a	1	\$219,702

Table 4.2. Most damaged Non-Structural components at each intensity level.

Intensity	Component	Damage State	Expected Repair Cost
90% in 50 years	C3011.001c	1	\$13,809
50% in 30 years	C3011.001c	1	\$22,431
50% in 50 years	C1011.001c	1	\$40,703
50% in 75 years	C1011.001c	1	\$61,686
50% in 100 years	B2022.002	2	\$120,091
20% in 50 years	B2022.002	2	\$275,816
10% in 50 years	B2022.002	2	\$616,077
DE	B2022.002	2	\$839,622
5% in 50 years	B2022.002	2	\$835,480
2% in 50 years	B2022.002	2	\$766,151
MCE _R	B2022.002	2	\$730,682

Details of the most damaged components and their damage states:

- **B1031.001:** Bolted shear tab gravity connections
 - DS1a: Yielding of shear tab and elongation of bolt holes, possible crack initiation around bolt holes or at shear tab weld. Damage in field is either obscured or deemed to not warrant repair. No repair conducted.
 - DS1b: Yielding of shear tab and elongation of bolt holes, possible crack initiation around bolt holes or at shear tab weld.
- **B1031.021b:** Welded column splices, Column 150 plf < W < 300 plf
 - DS1a: Ductile fracture of the groove weld flange splice. Damage in field is either obscured or deemed to not warrant repair. No repair conducted.
 - DS1b: Ductile fracture of the groove weld flange splice.

- **B1033.653a:** CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in^2 , Story Height = 14ft, Bay Width = 30ft
 - DS1a: Cracking and tearing of welds and gussets adjacent to welds but crack length is less than critical for fracture. Significant yielding and local buckling in beams and columns adjacent to gusset.
 - DS1b: Severe yielding and buckling of beams and columns adjacent to the gusset with possibility of local tearing in buckled areas. Onset of weld fracture and buckling possible in gusset plates.
 - DS1c: Severe yielding and buckling of beams and columns adjacent to the gusset with possibility of local tearing in buckled areas. Onset of weld fracture and buckling possible in gusset plates. Remaining lateral strength of BRB system is questionable.
- **B2022.002:** Curtain Walls - Generic Midrise Stick-Built Curtain wall, Config: Insulating Glass Units (dual pane), Lamination: Unknown, Glass Type: Unknown, Details: Aspect ratio = 6:5, Other details Unknown
 - DS2: Glass falls from frame.
- **C1011.001c:** Wall Partition, Type: Gypsum with metal studs, Full Height, Fixed Below, Slip Track Above with returns
 - DS1: Screw pop-out, cracking of wall board, warping or cracking of tape, slight crushing of wall panel at corners.
- **C3011.001c:** Wall Partition, Type: Gypsum + Wallpaper, Full Height, Fixed Below, Slip Track Above w/ returns (friction connection)
 - DS1: Wall paper warped and torn.

4.2 Worker Days Summary

This table shows the expected worker days on a per-damage state basis. The header shows the probability of global failures (collapse and residual drift demolition) for reference.

The color scale is meant to indicate **relative** performance of components, not absolute performance. A “green” value does not indicate that the value falls in a pre-determined “good” range, just that it performs well compared to other components. Likewise, a “red” value does not indicate that the value falls in a pre-determined “bad” range, just that it performs worse compared to other components.

Table 4.3. Expected worker days per damage state (Worker Days)

	90% in 50 years	50% in 30 years	50% in 50 years	50% in 75 years	50% in 100 years	20% in 50 years	10% in 50 years	DE	5% in 50 years	2% in 50 years	MCE _R
P[Col](%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1
P[Res](%)	0.0	0.0	0.0	0.0	0.0	0.2	1.7	18	20	51	54
B1031.001 #1 (B1031.001: Bolted shear tab gravity connections)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.1	0.8	3.1	5.7	6.2	7.3	7.4
DS2	0.0	0.0	0.0	0.0	0.0	0.2	1.6	5.4	4.8	11	12
DS3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.0	0.9	2.6	3.9
Total	0.0	0.0	0.0	0.0	0.2	1.0	5.0	12	12	21	24
B1031.011b #1 (B1031.011b: Steel Column Base Plates, Column 150 plf < W < 300 plf)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.7	0.7	0.8
DS2	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.2	1.5	3.2	3.7
DS3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	1.5	1.5
Total	0.0	0.0	0.0	0.0	0.0	0.1	0.8	2.0	2.6	5.4	5.9
B1031.021b #1 (B1031.021b: Welded column splices, Column 150 plf < W < 300 plf)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.1	0.3	0.6	1.7	2.5	2.3	1.9	1.9
DS2	0.0	0.0	0.0	0.0	0.0	0.3	1.5	3.2	3.5	4.7	5.1
Total	0.0	0.0	0.0	0.1	0.3	0.9	3.2	5.7	5.8	6.6	6.9
B1033.652a #1 (B1033.652a: CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron...)											
DS1a	0.0	0.0	0.0	0.0	0.1	0.7	4.0	7.7	8.3	10	10
DS1b	0.0	0.0	0.0	0.0	0.1	0.5	2.5	4.2	4.4	5.4	5.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.6	2.3	4.1	4.6	5.3	5.1
DS2	0.0	0.0	0.0	0.0	0.0	0.1	1.0	3.1	3.4	7.1	8.3
Total	0.0	0.0	0.0	0.0	0.2	1.8	10	19	21	28	29
B1033.653a #1 (B1033.653a: CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron...)											
DS1a	0.0	0.0	0.0	0.0	0.4	2.1	8.9	17	17	19	19
DS1b	0.0	0.0	0.0	0.0	0.2	1.2	4.9	8.9	9.4	11	10
DS1c	0.0	0.0	0.0	0.0	0.2	0.9	5.2	9.2	10	11	10
DS2	0.0	0.0	0.0	0.0	0.0	0.3	2.0	5.0	5.1	8.5	9.0
Total	0.0	0.0	0.0	0.1	0.7	4.5	21	40	42	49	49
B2011.201a #1 (B2011.201a: Precast Concrete Panels 4.5 inches thick - in plane deformation)											
DS1a	0.0	0.0	0.0	0.0	0.1	0.3	0.9	1.2	1.2	1.2	1.2
DS1b	0.0	0.0	0.0	0.1	0.5	1.6	4.5	6.6	6.2	5.9	5.6
Total	0.0	0.0	0.0	0.2	0.6	1.9	5.4	7.8	7.5	7.1	6.7
B2011.201b #1 (B2011.201b: Precast Concrete Panels 4.5 inches thick - out of plane deformation)											
DS1	0.0	0.0	0.1	0.2	0.3	0.4	0.6	1.0	1.1	1.3	1.2

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Table 4.3 (Continued). Expected worker days per damage state (Worker Days)

	90% in 50 years	50% in 30 years	50% in 50 years	50% in 75 years	50% in 100 years	20% in 50 years	10% in 50 years	DE	5% in 50 years	2% in 50 years	MCE _R
P[Col](%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1
P[Res](%)	0.0	0.0	0.0	0.0	0.0	0.2	1.7	18	20	51	54
B2022.002 #1 (B2022.002: Curtain Walls - Generic Midrise Stick-Built Curtain wall, Config:...)											
DS1	0.0	0.1	0.9	3.5	7.5	15	27	31	30	22	21
DS2	0.0	0.1	0.8	3.8	10	25	63	92	94	90	86
Total	0.0	0.1	1.6	7.4	18	40	90	123	123	112	107
C1011.001c #1 (C1011.001c: Wall Partition, Type: Gypsum with metal studs, Full Height, Fixed Below,...)											
DS1	1.7	4.4	8.7	12	13	13	12	8.3	8.1	3.8	3.2
DS2	0.0	0.1	0.8	2.8	5.5	10	17	16	16	9.1	8.6
DS3	0.0	0.0	0.0	0.2	0.8	3.3	12	19	19	19	19
Total	1.7	4.5	10	15	19	26	40	44	43	32	30
C2011.001a #1 (C2011.001a: Prefabricated steel stair with steel treads and landings with seismic...)											
DS1	0.0	0.0	0.0	0.2	0.4	1.1	2.2	2.9	2.8	2.2	1.9
DS2	0.0	0.0	0.0	0.0	0.2	0.5	1.7	2.5	2.3	2.2	1.9
DS3	0.0	0.0	0.0	0.0	0.3	0.9	3.4	5.3	5.7	6.2	6.6
Total	0.0	0.0	0.0	0.3	0.9	2.4	7.3	11	11	11	10
C3011.001c #1 (C3011.001c: Wall Partition, Type: Gypsum + Wallpaper, Full Height, Fixed Below, Slip...)											
DS1	4.3	6.9	8.9	10	10	11	11	10	9.3	5.6	5.2
C3032.004a #1 (C3032.004a: Suspended Ceiling, SDC D,E,F (Ip=1.5), Area (A): A < 250, Vert & Lat...)											
DS1	0.0	0.0	0.1	0.3	0.3	0.4	0.6	0.8	0.7	0.6	0.6
DS2	0.0	0.0	0.2	0.3	0.3	0.4	0.8	1.1	1.0	0.9	0.9
DS3	0.0	0.1	0.8	1.6	1.7	2.7	4.2	6.8	6.3	7.4	6.8
Total	0.0	0.2	1.1	2.2	2.3	3.5	5.6	8.7	8.0	9.0	8.3
C3032.004b #1 (C3032.004b: Suspended Ceiling, SDC D,E,F (Ip=1.5), Area (A): 250 < A < 1000, Vert & Lat...)											
DS1	0.0	0.0	0.3	0.5	0.6	0.8	1.1	1.4	1.3	1.1	1.0
DS2	0.0	0.0	0.3	0.5	0.6	0.8	1.1	1.6	1.6	1.4	1.4
DS3	0.0	0.1	1.1	2.3	2.1	3.8	5.5	8.2	7.5	8.3	8.0
Total	0.0	0.2	1.6	3.3	3.3	5.4	7.7	11	10	11	10
C3032.004c #1 (C3032.004c: Suspended Ceiling, SDC D,E,F (Ip=1.5), Area (A): 1000 < A < 2500, Vert & Lat...)											
DS1	0.0	0.2	0.7	1.3	1.5	2.2	3.2	3.7	3.4	2.9	2.8
DS2	0.0	0.1	0.4	1.2	1.5	2.0	2.8	3.9	3.7	3.1	2.9
DS3	0.0	0.1	1.8	2.8	3.7	6.2	8.2	13	12	12	12
Total	0.0	0.4	3.0	5.4	6.8	10	14	20	19	18	18
C3032.004d #1 (C3032.004d: Suspended Ceiling, SDC D,E,F (Ip=1.5), Area (A): A > 2500, Vert & Lat...)											
DS1	0.0	0.3	1.1	1.9	2.3	3.1	4.7	5.2	4.8	3.9	3.8
DS2	0.0	0.2	0.8	1.4	1.3	2.3	3.9	5.3	4.8	4.8	4.5
DS3	0.0	0.1	1.4	3.5	3.9	6.7	10	15	16	17	16
Total	0.0	0.5	3.3	6.8	7.4	12	19	26	26	25	24
D1014.041 #1 (D1014.041: Traction Elevator Machine room component anchorage. Applies to Seismic Zone...)											
DS1	0.1	0.6	2.1	3.4	3.4	3.6	4.7	5.1	4.7	3.3	3.3
D1014.042 #1 (D1014.042: Traction Elevator Cab and Counterweight Components. Applies to Seismic Zone...)											
DS1	0.3	2.5	10	17	23	35	53	63	62	47	44
D1014.043 #1 (D1014.043: Traction Elevator Guide Rails. Applies to Seismic Zone 3 or greater and...)											
DS1	0.0	0.2	0.7	1.2	1.8	2.6	4.1	4.7	4.5	3.6	3.2
D1014.044 #1 (D1014.044: Traction Elevator Guide Rail Brackets. Applies to Seismic Zone 3 or greater...)											
DS1	0.1	0.4	1.5	2.8	3.9	6.0	10	11	10	8.5	7.6

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Table 4.3 (Continued). Expected worker days per damage state (Worker Days)

	90% in 50 years	50% in 30 years	50% in 50 years	50% in 75 years	50% in 100 years	20% in 50 years	10% in 50 years	DE	5% in 50 years	2% in 50 years	MCE _R
P[Col](%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1
P[Res](%)	0.0	0.0	0.0	0.0	0.0	0.2	1.7	18	20	51	54
D2021.014a #1 (D2021.014a: Cold or Hot Potable - Small Diameter Threaded Steel - (2.5 inches in...))											
DS1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.1	0.2
DS2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.2
Total	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.4	0.3	0.3	0.3
D2021.014b #1 (D2021.014b: Cold or Hot Potable - Small Diameter Threaded Steel - (2.5 inches in...))											
DS1	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.7	0.6	0.5
D2021.024a #1 (D2021.024a: Cold or Hot Potable Water Piping (dia > 2.5 inches), SDC D,E,F (OSPHD or...))											
DS1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DS2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1
Total	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.2	0.3	0.3
D2021.024b #1 (D2021.024b: Cold or Hot Potable Water Piping (dia > 2.5 inches), SDC D,E,F (OSPHD or...))											
DS1	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.2
DS2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Total	0.0	0.0	0.1	0.1	0.2	0.2	0.4	0.5	0.4	0.4	0.4
D2031.014b #1 (D2031.014b: Sanitary Waste Piping - Cast Iron w/flexible couplings, SDC D,E,F (OSHPD or...))											
DS1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
D3032.013f #1 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
DS1d	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1
Total	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.2	0.3	0.3
D3032.013f #2 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
DS1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
DS1d	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.2	0.3
Total	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.4	0.4	0.4
D3032.013f #3 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
DS1d	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	0.2	0.2	0.2
Total	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.5	0.4	0.4	0.4
D3032.013f #4 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1d	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.3	0.4	0.4
Total	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.5	0.6	0.6	0.6
D3032.013f #5 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DS1d	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.4	0.3	0.3	0.3
Total	0.0	0.0	0.1	0.1	0.1	0.3	0.4	0.6	0.5	0.5	0.5

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Table 4.3 (Continued). Expected worker days per damage state (Worker Days)

	90% in 50 years	50% in 30 years	50% in 50 years	50% in 75 years	50% in 100 years	20% in 50 years	10% in 50 years	DE	5% in 50 years	2% in 50 years	MCE _R
P[Col](%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1
P[Res](%)	0.0	0.0	0.0	0.0	0.0	0.2	1.7	18	20	51	54
D3032.013f #6 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DS1d	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.4	0.3	0.4	0.3
Total	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.7	0.5	0.6	0.5
D3032.013f #7 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0
DS1c	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1d	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.4	0.3	0.3	0.3
Total	0.0	0.0	0.1	0.2	0.1	0.2	0.4	0.6	0.5	0.5	0.5
D3032.013f #8 (D3032.013f: Compressor - Capacity: Large non medical air supply - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0
DS1b	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DS1c	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1
DS1d	0.0	0.1	0.1	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.3
Total	0.0	0.1	0.3	0.5	0.5	0.6	0.6	0.8	0.7	0.7	0.5
D3041.011f #1 (D3041.011f: (ATC-138 Beta) HVAC Galvanized Sheet Metal Ducting less than 6 sq. ft in...)											
DS1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
DS2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
D3041.012d #1 (D3041.012d: HVAC Galvanized Sheet Metal Ducting - 6 sq. ft cross sectional area or...)											
DS1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D3041.031e #1 (D3041.031e: (ATC-138 Beta) (RUGGED) HVAC Drops / Diffusers in suspended ceilings - With...)											
DS1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D3041.103c #1 (D3041.103c: HVAC Fan - Capacity: all - Equipment that is either hard anchored or is...)											
DS1a	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1c	0.0	0.1	0.3	0.5	0.6	0.9	1.3	1.5	1.5	1.4	1.1
Total	0.0	0.1	0.4	0.7	0.8	1.1	1.6	1.9	1.8	1.7	1.4
D4011.024a #1 (D4011.024a: Fire Sprinkler Water Piping - Horizontal Mains and Branches - Old Style...)											
DS1	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.5	0.5
DS2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Total	0.0	0.0	0.1	0.2	0.2	0.3	0.5	0.6	0.6	0.6	0.5
D4011.054a #1 (D4011.054a: Fire Sprinkler Drop Standard Threaded Steel - Dropping into braced lay-in...)											
DS1	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.3	0.3	0.3
DS2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.3	0.3	0.3
D5011.013c #1 (D5011.013c: Transformer/primary service - Capacity: <100 kVA - Equipment that is either...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.1
Total	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3

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Table 4.3 (Continued). Expected worker days per damage state (Worker Days)

	90% in 50 years	50% in 30 years	50% in 50 years	50% in 75 years	50% in 100 years	20% in 50 years	10% in 50 years	DE	5% in 50 years	2% in 50 years	MCE _R
P[Col](%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1
P[Res](%)	0.0	0.0	0.0	0.0	0.0	0.2	1.7	18	20	51	54
D5012.013d #1 (D5012.013d: Motor Control Center - Capacity: all - Equipment that is either hard...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1b	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1c	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Total	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.3	0.3
D5012.023c #1 (D5012.023c: Low Voltage Switchgear - Capacity: 100 to <350 Amp - Equipment that is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1b	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.1	0.1
DS1c	0.0	0.0	0.1	0.1	0.1	0.3	0.4	0.5	0.5	0.4	0.4
Total	0.0	0.0	0.1	0.2	0.2	0.3	0.6	0.7	0.7	0.6	0.6
D5012.033c #1 (D5012.033c: Distribution Panel - Capacity: 100 to <350 Amp - Equipment that is either...)											
DS1a	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DS1b	0.0	0.0	0.1	0.2	0.2	0.4	0.4	0.5	0.4	0.4	0.3
DS1c	0.0	0.1	0.4	0.7	0.7	1.0	1.4	1.5	1.5	1.1	1.1
Total	0.0	0.2	0.6	1.0	1.1	1.5	2.0	2.2	2.1	1.7	1.6
D5092.013c #1 (D5092.013c: Battery Rack - Capacity: all - Equipment that is either hard anchored or is...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
DS1b	0.0	0.0	0.0	0.1	0.2	0.2	0.5	0.6	0.6	0.7	0.7
DS1c	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.5	0.5	0.6	0.5
DS1d	0.0	0.0	0.0	0.1	0.2	0.3	0.6	0.8	0.8	0.7	0.8
DS1e	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.6	0.4	0.4	0.3
Total	0.0	0.0	0.1	0.3	0.5	0.8	1.8	2.6	2.5	2.5	2.4
D5092.023c #1 (D5092.023c: Battery Charger - Capacity: all - Equipment that is either hard anchored or...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
DS1b	0.0	0.0	0.0	0.1	0.1	0.1	0.4	0.5	0.6	0.5	0.5
DS1c	0.0	0.0	0.0	0.1	0.1	0.3	0.5	0.8	0.8	0.7	0.9
DS1d	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.9	0.7	0.8	0.7
Total	0.0	0.0	0.1	0.2	0.4	0.7	1.5	2.3	2.1	2.0	2.0
D5092.033c #1 (D5092.033c: Diesel generator - Capacity: 100 to <350 kVA - Equipment that is either...)											
DS1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1b	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.1
DS1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DS1e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2

4.3 Component Name Reference

This list is provided for reference where only the fragility ID is available.

- **B1031.001:** Bolted shear tab gravity connections
- **B1031.011b:** Steel Column Base Plates, Column 150 plf < W < 300 plf
- **B1031.021b:** Welded column splices, Column 150 plf < W < 300 plf
- **B1033.652a:** CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in^2 , Story Height = 16ft, Bay Width = 30ft
- **B1033.653a:** CoreBrace Buckling Restrained Brace (BRB), Moment-Connected Beams, Chevron Brace, Bolted Connection, Steel Core Area = 5in^2 , Story Height = 14ft, Bay Width = 30ft
- **B2011.201a:** Precast Concrete Panels 4.5 inches thick - in plane deformation
- **B2011.201b:** Precast Concrete Panels 4.5 inches thick - out of plane deformation
- **B2022.002:** Curtain Walls - Generic Midrise Stick-Built Curtain wall, Config: Insulating Glass Units (dual pane), Lamination: Unknown, Glass Type: Unknown, Details: Aspect ratio = 6:5, Other details Unknown
- **C1011.001c:** Wall Partition, Type: Gypsum with metal studs, Full Height, Fixed Below, Slip Track Above with returns
- **C2011.001a:** Prefabricated steel stair with steel treads and landings with seismic joints that accommodate drift.
- **C3011.001c:** Wall Partition, Type: Gypsum + Wallpaper, Full Height, Fixed Below, Slip Track Above w/ returns (friction connection)
- **C3032.004a:** Suspended Ceiling, SDC D,E,F ($I_p=1.5$), Area (A): $A < 250$, Vert & Lat support
- **C3032.004b:** Suspended Ceiling, SDC D,E,F ($I_p=1.5$), Area (A): $250 < A < 1000$, Vert & Lat support
- **C3032.004c:** Suspended Ceiling, SDC D,E,F ($I_p=1.5$), Area (A): $1000 < A < 2500$, Vert & Lat support
- **C3032.004d:** Suspended Ceiling, SDC D,E,F ($I_p=1.5$), Area (A): $A > 2500$, Vert & Lat support
- **D1014.041:** Traction Elevator Machine room component anchorage. Applies to Seismic Zone 3 or greater and elevators designed according to the ASME A17.1-2007 Standard or similar.
- **D1014.042:** Traction Elevator Cab and Counterweight Components. Applies to Seismic Zone 3 or greater and elevators designed according to the ASME A17.1-2007 Standard or similar.
- **D1014.043:** Traction Elevator Guide Rails. Applies to Seismic Zone 3 or greater and elevators designed according to the ASME A17.1-2007 Standard or similar.
- **D1014.044:** Traction Elevator Guide Rail Brackets. Applies to Seismic Zone 3 or greater and elevators designed according to the ASME A17.1-2007 Standard or similar.
- **D2021.014a:** Cold or Hot Potable - Small Diameter Threaded Steel - (2.5 inches in diameter or less), SDC D, E, or F (OSHDP or sim), PIPING FRAGILITY
- **D2021.014b:** Cold or Hot Potable - Small Diameter Threaded Steel - (2.5 inches in diameter or less), SDC D, E, or F (OSHDP or sim), BRACING FRAGILITY
- **D2021.024a:** Cold or Hot Potable Water Piping (dia > 2.5 inches), SDC D,E,F (OSHDP or sim),

PIPING FRAGILITY

- **D2021.024b:** Cold or Hot Potable Water Piping (dia > 2.5 inches), SDC D,E,F (OSPHD or sim), BRACING FRAGILITY
- **D2031.014b:** Sanitary Waste Piping - Cast Iron w/flexible couplings, SDC D,E,F (OSHDP or sim), BRACING FRAGILITY
- **D3032.013f:** Compressor - Capacity: Large non medical air supply - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D3041.011f:** (ATC-138 Beta) HVAC Galvanized Sheet Metal Ducting less than 6 sq. ft in cross sectional area, above code-minimum bracing similar to larger ducting, SDC D, E, or F (OSHDP or Sim)
- **D3041.012d:** HVAC Galvanized Sheet Metal Ducting - 6 sq. ft cross sectional area or greater, SDC D, E, or F (OSHDP or sim)
- **D3041.031e:** (ATC-138 Beta) (RUGGED) HVAC Drops / Diffusers in suspended ceilings - With independent safety wires, SDC D, E, or F (OSHDP or sim)
- **D3041.103c:** HVAC Fan - Capacity: all - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D4011.024a:** Fire Sprinkler Water Piping - Horizontal Mains and Branches - Old Style Victaulic - Thin Wall Steel - with designed bracing, SDC D, E, or F (OSHDP or sim), PIPING FRAGILITY
- **D4011.054a:** Fire Sprinkler Drop Standard Threaded Steel - Dropping into braced lay-in tile SOFT ceiling - 6 ft. long drop maximum, SDC D, E, or F (OSHDP or sim)
- **D5011.013c:** Transformer/primary service - Capacity: <100 kVA - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D5012.013d:** Motor Control Center - Capacity: all - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D5012.023c:** Low Voltage Switchgear - Capacity: 100 to <350 Amp - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D5012.033c:** Distribution Panel - Capacity: 100 to <350 Amp - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D5092.013c:** Battery Rack - Capacity: all - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D5092.023c:** Battery Charger - Capacity: all - Equipment that is either hard anchored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility
- **D5092.033c:** Diesel generator - Capacity: 100 to <350 kVA - Equipment that is either hard an-

chored or is vibration isolated with seismic snubbers/restraints - Combined anchorage/isolator & equipment fragility

5 DISCLAIMER

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