

DISASTER RESILIENCE FRAMEWORK

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2. Community Disaster Resilience for the Built Environment

2.1. Community Level Disaster Resilience

Communities come in multiple sizes and shapes and they all face a wide variety of opportunities, challenges and hazards. A community can be as small as a neighborhood and as large as a city, region, state or nation. For purposes of this guideline, a community is defined as an area under the jurisdiction of a single emergency operations center such as incorporated cities and counties.

Boosting community disaster resilience is best initiated at the neighborhood level, organized around a well-orchestrated community effort and supported as needed by state and national efforts (NRC 2012). As illustrated in Figure 1, it begins with the recognition of the prevalent hazards and based on the consequences of the damage that occurs, develops a holistic plan for governance, dealing with the social issues, repair of the damaged infrastructure, and a means for financing the recovery.

People are the engine of resilience; governance and financing are the fuel. People that experience a hazard event need to be prepared for what they will experience and understand that community planning is in place for an orderly recovery so that they will “tip-in”, that is, stay and help rebuild. Safety, security, care for the vulnerable populations and the displaced households is needed to permit attention to be focused on overall economic recovery. Community governance must be aligned with the scope of the emergency, able to make quick though forward thinking decisions, deal with the onslaught of reconstruction permitting and inspection, and work to build back a more resilient community. With some organization and early action, financing can be made available from government sources, insurance, personal savings, and developer interests.

The physical infrastructure is the foundation for resilience. A strong foundation provides the tools and systems needed by the people, business and government to restore the neighborhoods, care for the vulnerable populations, and restore their economy. Figure 2 illustrates the value of resilience planning.

To understand what is needed from the physical infrastructure, it is best to define what a disaster resilient community looks like in terms of the resilience of individual buildings and infrastructure systems, considered in clusters, or groups of desired performance levels, and identify where the existing conditions fall short of the need. The description of what is needed to support the three phases of post event response and recovery becomes a metric for resilience and defines the existing gaps that represent opportunities for improvement.

2.1.1. Community Disaster Resilience for the Built Environment

The term "resilience" means the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents. (Presidential Policy Directive/PPD 21 – Critical Infrastructure Security and Resilience, www.whitehouse.gov). As it relates to the physical infrastructure, “resilience” means the ability of a building or system cluster to return to full occupancy and function as soon as it is needed to support a well-planned and expedited recovery.

Implementing a resilience plan for the physical infrastructure is a long term effort that requires constant attention, monitoring and evolution. Because of the cost and need to transform the governance, real estate and construction cultures, it can easily take up to 50 years or more to fully implement. Fortunately, once the resilience performance goals for buildings and systems are adopted, all new construction can be built in compliance at very little additional cost. Studies have shown that the increased costs range from 0 to

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5%. Unfortunately, this alone will only have a long term impact since the vast majority of buildings and systems will not conform until replaced or retrofitted. Retrofitting existing facilities to new the goals has been shown to be generally cost prohibitive. The resilience plan, however, allows the resilience gaps related to clusters of buildings or systems to be judged in terms of relative importance and mitigated as appropriate.

The San Francisco Planning and Research Association (SPUR) pioneered this style of resilience planning beginning in 2007. Their work was focus at the community level and specifically considered what San Francisco needed from it policies and program to become a Disaster Resilient City (www.spur.org). SPUR's work has produced multiple policy papers and recommendations covering the broad issues of disaster resilience. Their policy recommendations focused on what is needed before the disaster, for disaster response, and after the disaster as shown in Figure 3.

The Oregon Seismic Safety Policy Advisory Commission lead a planning effort in 2012-13 that followed the SPUR's lead and defined what Oregon needed to do to survive and bounce back from a magnitude 9.0 Cascadia earthquake and tsunami (http://www.oregon.gov/OMD/OEM/ossapac/docs/Oregon_Resilience_Plan_Final.pdf). It is a plan that determined the impacts of the earthquake statewide, defined acceptable time frames to restore functions need to accelerate state wide recovery, and recommends changes in practices and policies that if implemented over the next 50 years will allow Oregon to reach the desired resilience targets.

Communities need to determine the levels of disaster resilience required for their physical infrastructure. This is best done for several levels of hazard events and multiple performance levels and recovery times. Accordingly, each building and system will derive its resilience goals and performance levels from those defined for the community. The role each individual building or infrastructure system contributes to community disaster resilience will determine its resilience requirements. A community's disaster resilient plan will likely establish higher performance goals for critical facilities and supporting infrastructure systems. One such an approach is currently defined for the entire nation through the risk and occupancy categories in the International Building Code (IBC 2015). While there are a number of guidelines and standards related to specific types of buildings and infrastructure systems, no such uniform, national approach is currently defined or required for existing buildings or for new and existing infrastructure systems.



Figure 1. Community needs drive functional requirements for buildings and infrastructure systems.

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Figure 2. Community resilience counters damaging events through consistent, proactive planning and design measures.

SPUR'S RESILIENT CITY INITIATIVE

Before the Disaster

Our Before the Disaster work has focused on key questions related to disaster planning. What do we need to be doing now to make sure that our built environment can recover quickly from a major earthquake? Which existing buildings need to be retrofitted, and to what standard of performance? How do we encourage better performance from new buildings? How do we strengthen our lifelines so that our buildings are serviceable after an earthquake? SPUR addresses these and other questions in four Before the Disaster papers published in the February 2009 edition of the *Urbanist*.

Disaster Response

Disaster Response focuses on activities during the days and weeks following a catastrophic event, including damage assessment, ensuring the safety of responders, communications and control, evacuation, public health and safety and restoration of vital systems. SPUR has recently completed a paper on the culture of preparedness, which focuses on disaster planning and preparedness in San Francisco's neighborhoods.

After the Disaster

Our After the Disaster task force is asking several key questions: After a catastrophe, are we prepared to rebuild our city to a state even better than it was before? What plans and systems of governance does San Francisco need if it is to be effectively positioned to rebuild? What lessons can be learned from recovery experiences in lower Manhattan, New Orleans, Haiti, Chile, China and beyond? This task force will be working to complete major papers on long-term recovery, covering the topics of transportation, governance, planning and housing.

Figure 3: The SPUR Plan for San Francisco

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2.1.2. Diversity of Communities

Just as the prevalent hazards are different across the country, so are the communities with respect to their age, composition, and capabilities. The initial process of developing a disaster resilience plan requires an estimation of how quickly a community needs to recover from each of the prevalent hazards in order to maintain its population, workforce, and economic viability. Hurricane Katrina demonstrated that New Orleans was not resilient because of the impact the flood damage had on the long term housing of the workforce. Other cities, because of their location and the inherent resilience in their governance, ability to meet social needs, and the redundancy in their built environment, may be sufficiently resilient for all but extreme events. The 1994 Northridge earthquake's impact on the cities in the San Fernando Valley was a good example of inherent resilience.

From among the many metrics that give communities their distinguishing characteristics, the following serve to illustrate the impact of each and how they may inform the development of a resilience plan.

- **Attitudes.** Communities that have experienced a natural disaster learn from the experience. If the resulting recovery effort is orderly and successful, they develop a sense of contentment with their status quo even if the experience was based on a moderate event. If the resulting recovery was challenged, drawn out and less than successful in the short term, they move more aggressively toward a resilient state in the reconstruction process. A “window of opportunity” opens for 1 to 2 years during which people are interested in preparedness activities and making big changes to their planning processes and codes. Communities that have not experienced a severe hazard are unlikely to proactively develop disaster resilience plans. (Source needed)
- **Age of the Community.** Age brings mature and sophisticated social structures, efficient and informed governance, historically significant landmarks, deep rooted cultural values and more. It also brings an aging physical infrastructure that contributes to the resilience gaps. With more and larger gaps comes the challenging task of determining the priorities for closing the gaps in an orderly manner.
- **Architecture and construction.** Not all buildings and systems are built alike. Vulnerability to damage depends on the construction materials, the structural, non-structural and architectural systems, the quality of construction, the size and shape of the building or system, and its age. There are hundreds of permutations. Architecture and construction styles vary by community and impact the communities' resilience. For example, in San Francisco, the multi-family apartment buildings built throughout the city in the 20's and 30's are a unique construction style that is particularly vulnerable to moderate and larger earthquakes. The over 6000 buildings represent a significant amount of housing that will not be habitable after a moderate or larger seismic event and will create a demand for interim housing that cannot be provided within the city limits. As a result, one of San Francisco's early resilience programs is a mandatory program to retrofit these buildings to a shelter-in-place level.
- **Vulnerable, at-risk populations.** At risk persons need the most assistance after a disaster. They are least capable of taken care of themselves and they generally live and work in the oldest and most hazardous buildings. Included are older persons, the disabled, the chronically ill, the poor etc. The sizes and compositions of these populations vary greatly across communities as does the desire to care for them. If not taken into consideration, the emergency response resources needed to care for them will be extended and potentially may reduce the ability to execute an orderly recovery.
- **Economic drivers.** The financial health of a community depends largely on the availability of good jobs and a strong set of economic drivers. The vulnerability of the economy to a disaster depends on the transportability of its industries. Knowledge-based industries are can move

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quickly if the workforce or needed physical infrastructure is not quickly restored. Research and development industries are more rooted because of the related laboratory and test facilities. Manufacturing is deeply rooted and hard to move. Tourism, of course, only needs to be restored. The restoration times and priorities built into a community's disaster resilience plan need to recognize the mobility of the key industries.

- **Financial Conditions.** Communities are faced with broad ranging demands for governance and mitigation related to a wide range of issues all requiring staff support and mitigation funds. Among those is the need to support planning and building departments to the extent they have the band width to implement disaster resilient plans immediately. The speed of recovery will depend on the planning and approval process being able to accommodate the volume of requests.
- **Codes, standards, administration, and enforcement.** Strong local building codes are a key tool for building the right kind of physical infrastructure and requiring retrofit at opportune times. A community's history with the adoption, administration and enforcement of codes will have a significant influence on the degree of "inherent" resilience present in the physical infrastructure. There must be a commitment to funding these activities if the resilience plan is to ever have an impact.
- **Priorities for emerging public policies.** A transparent and holistic community disaster resilience plan with prioritized mitigation options offers the opportunity for a community to balance the cost and benefit of moving toward becoming resilient with other competing demands.
- **Resources.** Ongoing efforts to encourage development and achieve sustainability through energy efficiency and alternate energy generation have created a variety of new funding mechanisms. Community backed bonds, locally crafted loan programs, and in California, Mello-Roos parcel taxes, have been used to finance a class of buildings needing mitigation. Tax incentives can be enacted as a means of using public funds to underwrite mitigation activities that are needed for community resilience.

2.1.3 Acceptable Risks

Each community's current construction standards are a measure of their acceptable risk. Community construction practices vary dramatically across the nation from non-existent to compliant with the latest national standards. The lack of experience with a damaging hazard and the lack of transparency in the level of damage expected when a hazard occurs often leads to misconceptions of vulnerability.

There is no scientifically defensible basis for defining acceptable risk. Acceptable risks in the built environment are defined in model codes and standards relative to risks that the public finds acceptable for other activities or for losses. The community disaster resilience plan is a means of defining the level of risk acceptable to a community. National model building codes and standards represent the best mechanism for defining a minimum, uniform consensus definition of acceptable risk as it applies to the built environment. Codes and standards for design loads provide the bench mark for the hazard levels considered for community disaster resilience plans. Community resilience plans can further reduce the level of risk by adopting local provisions that exceed that required by model codes and standards.

2.2. Pathway to Community Resilience

Among the first steps to becoming a disaster resilient community is to define the clusters of buildings and infrastructure systems that form the foundation of response and recovery and community resilience. The desired performance of each cluster, for each prevalent hazard must also be defined and should be summarized in the Resilience Matrix for each defined hazard level; routine, expected and extreme. Once

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defined, the current status of each cluster can be estimated and also recorded on the matrix. The resilience gaps are illustrated when the expected performance of a cluster does not match the goal. A sample Resilience Matrix format is shown in Figure 4.

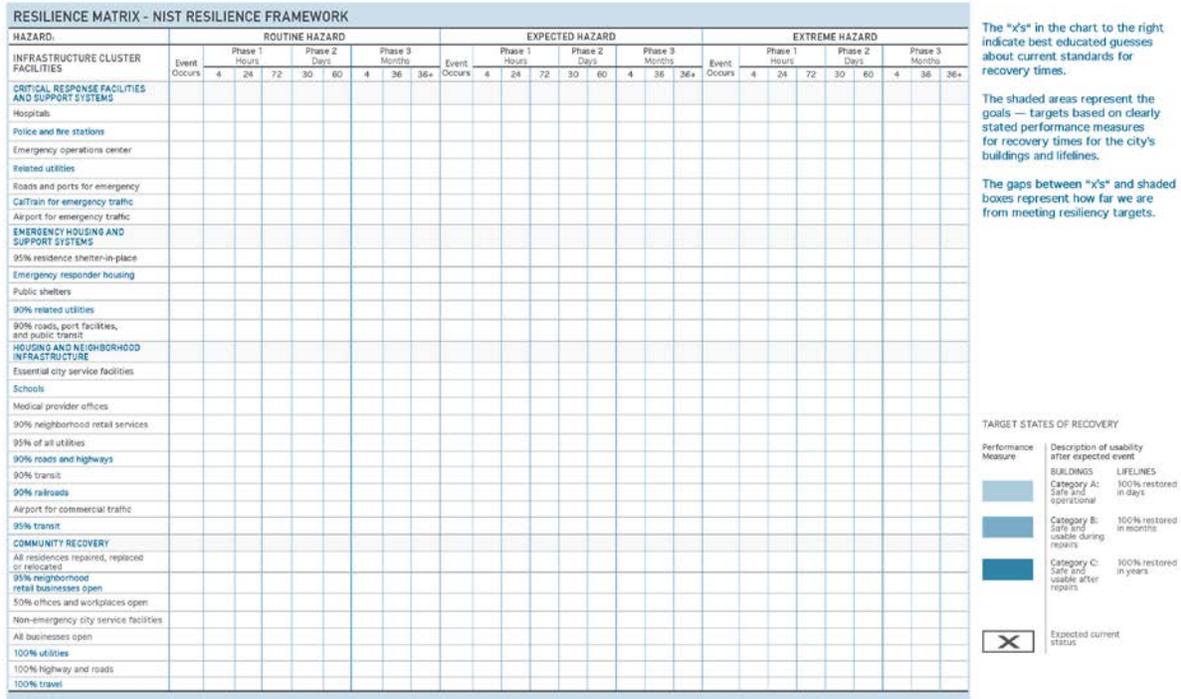


Figure 4: Resilience matrix that can be used to summarize the Resilience plan

2.2.1. Hazard Events

Developing the physical infrastructure needed to support a disaster resilience community begins with the identification of the hazards to be considered. This framework recognizes that resilience planning is best done at three levels for events that are routine, expected, and extreme. The definition of each level depends on the traditional characterization of the hazard, the type of physical infrastructure under consideration, a community’s tolerance for damage and the need to mandate repairs in a timely manner.

Communities should select the hazards to be considered in their framework related to the physical built environment from the following.

- Wind – storms, hurricane, tornadoes
- Earthquake – ground shaking, faulting, landslides, liquefaction
- Inundation – riverine flooding, coastal flooding, tsunami
- Fire – building and wildfire
- Snow/ Rain – freeze/thaw
- Man-made – blast, vehicular impact

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2.2.2. Hazard Levels for Resilience Planning

For each of the hazards selected, communities should determine the following three levels of occurrence for use in the framework. Figure 5 shows SPUR’s application of this principal for their recommended plan for San Francisco. Oregon’s plan was based on a single extreme event.

- Routine: Buildings and systems should be capable of remaining fully operational and not experience any significant damage.
- Expected: The building or system should be capable of remaining functional at a level sufficient to support the response and recovery of the community. This level is based on the design level normally used for buildings.
- Extreme: Maximum considered occurrence based on the historic record and changes anticipated due to climate change. Critical facilities and infrastructure systems should remain functional. Other building and infrastructure systems should perform at a level that protects the occupants at this hazard level and allows them to egress without assistance. In addition, emergency response plans should be based on scenarios that represent this extreme level.

Table 2-1 presents design hazard levels for buildings and facilities based on the American Society of Civil Engineers (ASCE) Standard 7-10 Minimum Design Loads for Buildings and Other Structures. Note that the extreme level is currently defined for seismic loads, but not for other loads. A scientific basis for other extreme loads that is risk consistent with current design practice needs to be developed. Design loads for infrastructure systems also need to be incorporated.

Table 2-1. Design Loads for Buildings and Facilities (ASCE 7-10)

Hazard	Routine	Expected	Extreme
Ground Snow	50 year	300 to 500 year ¹	TBD
Rain	²	²	²
Wind – Extratropical	50 year	700 year	3,000 year ³
Wind – Hurricane	50 to 100 year	700 year	3,000 year ³
Wind – Tornado	³	³	³
Earthquake ⁴	50 year	500 year	2,500 year
Tsunami	50 year	500 year	2,500 year
Flood	100 year	100 to 500 year	TBD
Fire – Wildfire	⁴	⁴	⁴
Fire – Urban/Manmade	⁴	⁴	⁴
Blast / Terrorism	⁵	⁵	⁵

¹ For the northeast, 1.6 (the LRFD factor on snow load) times the 50 year ground snow load is equivalent to the 300 to 500 year snow load.

² Rain is designed by rainfall intensity of inches per hour or mm/h as specified by the local code.

³ Tornado and Tsunami loads are not addressed in ASCE 7-10. Tornadoes are presently classified by the EF scale. Tsunami loads are based on a proposal for ASCE 7-16.

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⁴ Hazards to be determined in conjunction with design professionals based on deterministic scenarios.

⁵ Hazards to be determined based on deterministic scenarios. Reference UFC 03-020-01 for examples of deterministic scenarios.

Routine	Earthquakes that are likely to occur routinely. Routine earthquakes are defined as having a 70 percent probability of occurring in 50 years. In general, earthquakes of this size will have magnitudes equal to 5.0 - 5.5, should not cause any noticeable damage, and should only serve as a reminder of the inevitable. San Francisco's Department of Building Inspection (DBI) uses this earthquake level in their Administrative Bulletin AB 083 for purposes of defining the "service level" performance of tall buildings.
Expected	An earthquake that can reasonably be expected to occur once during the useful life of a structure or system. It is defined as having a 10 percent probability of occurrence in 50 years. San Francisco's Community Action Plan for Seismic Safety (CAPSS) assumed that a magnitude 7.2 earthquake located on the peninsula segment of the San Andreas Fault would produce this level of shaking in most of the City. Because structures can last for hundreds of years, but typically need to be refurbished every 30 to 50 years, a 50- year period is appropriate. Creating a resilient San Francisco based on this expected shaking intensity, associated with this size of earthquake is a practical and prudent basis for public policy.
Extreme (Maximum Considered Earthquake)	The extreme earthquake that can reasonably be expected to occur on a nearby fault. It is defined as having a 2 percent probability of occurrence in 50 years. The CAPSS defined magnitude 7.9 earthquake located on the peninsula segment of the San Andreas Fault would produce this level of shaking in most of the city.

Figure 5: Sample Hazard definition for earthquakes developed by SPUR for San Francisco

2.2.3. Mitigation and Performance Levels

TBD

2.2.4. Phases of Response and Recovery

For each hazard identified, resilience planning and the community framework should be developed around the following traditional phases of response and recovery.

Phase	Time Frame	Condition of the built environment
I	1 to 7 days	Initial response and staging for reconstruction
II	1 to 8 weeks	Workforce housing restored – ongoing social needs met
III	2 to 36 months	Long term reconstruction in support of economic recovery

2.2.5. Building and Infrastructure Clusters for Each Phase

For each response and recovery period, the infrastructure facility clusters need to be identified that includes both the buildings and the infrastructure systems as follows:

Phase 1: Critical Response Buildings, Emergency Housing and Support Systems

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- Phase 2: Housing and Neighborhood Buildings and Support Systems
- Phase 3: Buildings and Support Systems needed for Economic and Social Recovery

Refer to Chapters 5 through 9 for specific guidance on how to define the clusters of facilities and support systems needed for each phase of each Hazard.

2.2.6. Performance Goals, Values and Objectives

To assure that a community framework is compatible with others nation-wide, and to inform the building standards development process, common definitions of performance are needed for facilities and infrastructure systems. Setting goals for both safety and usability or functionality as metrics are important both for new construction and the retrofit of existing facilities and infrastructure systems. For new construction, such goals can minimize the cost of mitigation by planning for repairs that can be done rapidly. For existing construction, it determines the types of facilities and infrastructure systems that need to be retrofit to perform as expected.

For Buildings

- | | |
|------------|--|
| Category | Performance Standard |
| Category A | <i>Safe and operational:</i>
Essential facilities such as hospitals and emergency operations centers |
| Category B | <i>Safe and usable during repair:</i>
“shelter-in-place” residential buildings, neighborhood businesses and services and buildings needed for emergency operations |
| Category C | <i>Safe and not usable:</i> The minimum needed to save lives. These Facilities may be repaired or replaced as needed to restore the economy |
| Category D | <i>Unsafe – partial or complete collapse:</i> damage that will lead to casualties |

For Infrastructure Systems

- | | |
|--------------|--|
| Category | Performance Standard |
| Category I | Resume 100% service within days |
| Category II | Resume 90% service within weeks 100% within months |
| Category III | Resume 90% service within months 100% within years |

2.2.7. Vulnerability of Existing Buildings and Infrastructure Systems

The majority of buildings and infrastructure systems have been in service today have been designed to serve their intended functions on a daily basis given the normal environmental conditions in which they operate. The designs are provided by experienced architects and engineers following standards of practice. The standards of practice for design are continually evolving due to failures that occur. Failures lead to improved design procedures that often start as guidelines and sometimes are formalized into consensus-based design standards.

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In the early 20th century, communities started requiring minimum qualifications for engineers through licensure and began adopting building codes to set minimum standards of performance in the interest of protecting public safety. Since the latter half of the 20th century, this interest has grown beyond public safety to include resilience. For example, the 1971 San Fernando, California Earthquake led to the requirement that California's hospitals be designed to remain functional, in so far as practical, after a major earthquake.

Current design practices related to achieving resilience for the expected or extreme prevailing hazards are very uneven. However, the technologies needed to determine the expected performance of existing buildings and infrastructure systems are still being developed. Technologies related to building evaluation for seismic conditions is maturing and in its third generation. On the other hand, methods are just emerging for estimating infrastructure system performance and restoration times.

Architects and engineers deal with buildings and infrastructure systems one building/system at a time. The resilience levels achieved should be compatible with the goals of the community resilience plan. While it would be ideal to retrofit or replace all buildings and systems that do not meet those goals, it is neither necessary nor practical. What is important is that a community has a critical mass of buildings and systems to support recovery in the short term when taken as a whole. There is a need to evaluate and rate how long it will take for a cluster to return to service and compare that to the resilience goal.

As the last step in developing a disaster resilience plan, a community needs to evaluate each of its designated recovery clusters and estimate how long it will take to reach the designated goal for each level of the prevailing hazard. This information is added to the Resilience Matrix and is used to define the resilience gaps. The techniques that are available to do these estimates are outlined in Chapters 5 through 9 and the need and method to consider their interdependencies presented in Chapter 4.

SPUR use of the Resilience Matrix in 2009 is shown in Figure 6.

The Oregon Resilience Plan is similar in concept though focused on a single event and fewer building and infrastructure clusters. They defined seven task groups that represented each of the following clusters considered:

- Business and workforce,

- Coastal Communities,

- Critical and Essential Buildings

- Transportation

- Energy

- Information and Communications, Water and Waste Water

Each working group defined the current conditions, estimated the damage expected from the extreme event, determined target restoration times for minimal, functional, and operational level restoration, and provide recommendations on the next steps. The resilience matrix concept was used to present the information and define the gaps. The specific presentation was tailored to their plan. Examples of the Oregon Plan matrices' are shown in Chapters 5 through 9.

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TARGET STATES OF RECOVERY FOR SAN FRANCISCO'S BUILDINGS AND INFRASTRUCTURE									
INFRASTRUCTURE CLUSTER FACILITIES	Event occurs	Phase 1 Hours			Phase 2 Days		Phase 3 Months		
		4	24	72	30	60	4	36	36+
CRITICAL RESPONSE FACILITIES AND SUPPORT SYSTEMS									
Hospitals									X
Police and fire stations			X						
Emergency Operations Center	X								
Related utilities						X			
Roads and ports for emergency				X					
CalTrain for emergency traffic				X	X				
Airport for emergency traffic				X					
EMERGENCY HOUSING AND SUPPORT SYSTEMS									
95% residence shelter-in-place									X
Emergency responder housing				X					
Public shelters								X	
90% related utilities								X	
90% roads, port facilities and public transit								X	
90% Muni and BART capacity						X			
HOUSING AND NEIGHBORHOOD INFRASTRUCTURE									
Essential city service facilities								X	
Schools								X	
Medical provider offices									X
90% neighborhood retail services									X
95% of all utilities								X	
90% roads and highways						X			
90% transit						X			
90% railroads								X	
Airport for commercial traffic					X				
95% transit							X		
COMMUNITY RECOVERY									
All residences repaired, replaced or relocated									X
95% neighborhood retail businesses open								X	
50% offices and workplaces open									X
Non-emergency city service facilities								X	
All businesses open									X
100% utilities									X
100% roads and highways									X
100% travel									X

The "x's" in the chart to the right indicate SPUR's best educated guesses about current standards for recovery times. The shaded areas represent the goals — targets based on clearly stated performance measures (see next page) — for recovery times for the city's buildings and lifelines. The gaps between "x's" and shaded boxes represent how far we are from meeting resiliency targets.

TARGET STATES OF RECOVERY

Performance measure	Description of usability after expected event
	BUILDINGS Category A: Safe and operational
	LIFELINES Category B: 100% restored Safe and usable in 4 hours during repairs
	Category C: 100% restored Safe and usable in 4 months after moderate repairs
	Category D: 100% restored Safe and usable in 3 years after major repairs
	Expected current status

Note: Categories A–D are defined on page 10.

Figure 6 SPUR Application of the Resilience Matrix for their Expected earthquake

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2.2.8. Non-Construction Strategies

Implementing a Community's Disaster Resilience plan related to the physical infrastructure should begin with evaluating and validating the following activities or initiating them as needed. Each is a low cost activity that can be extensions of existing programs.

1. Adopting the latest national model building codes and standards for the physical infrastructure.
2. Assuring the effectiveness of the building department in enforcing current codes and standards and permitting and inspecting construction to assure that the latest processes are being followed.
3. Developing processes to be deployed for post event assessments and repairs.
4. Elevating the level of inter-system communication between the infrastructure community's providers and incorporating the interdependencies in their response and recovery plans.

This list to be expanded

2.2.9. Construction Related Strategies

To be developed to include the following topics

1. Prioritize gaps identified between the desired and expected performance of infrastructure clusters as summarized in the Resilience Matrix for the prevailing hazards.
2. For each gap, identify the guidelines and standards to be used to identify the deficiencies in individual public and private buildings and systems and process to define the gap in a transparent and publically available method.
3. Include retrofit of public buildings to achieve the resilience goals in the capital planning process and make it apart of the prioritization process.
4. Develop incentives to encourage new construction to be built to the resilient standards and deficient existing construction to be retrofit.
5. Support national efforts to improve code based design standards that match the needs defined in the of the SPUR matrices.
6. Identify building and infrastructure system clusters that need to be retrofit under mandatory programs and implement the retrofit through local ordinances that include some level of public funding.