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Guide Brief 11 – Determining Building Cluster Performance Goals

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Guide Brief 11 – Determining Building Cluster Performance Goals

Applicable Section(s) of Guide:	Volume 1, Section 4.1.2, Functional Categories and Functionality Levels for Building Clusters, pp. 39-40

Guide Briefs supplement the Community Resilience Planning Guide for Buildings and Infrastructure Systems (NIST SP1190)

Purpose and Scope

This Guide Brief presents factors to consider when selecting desired recovery phases and performance goals for a community's building clusters during Step 3 of the planning process.

Communities need to consider what is needed to keep their workforce in the community so that businesses can reopen quickly. Temporary and interim solutions can be used to accomplish their recovery goals while design, funding, and construction of permanent solutions are underway.

The primary intended audience for this Guide Brief is the collaborative planning team to support their discussions with social and economic stakeholders about setting the duration of the recovery phases and desired performance goals for the building clusters they use to provide services. This discussion can also help the stakeholders develop plans for their own recovery in a timely manner.

1. Building Cluster Performance Goals

In a resilient world, all buildings and infrastructure systems would recover rapidly from design level hazard events with little interruption in services. Buildings would remain usable, infrastructure systems would remain operational, and only a few days would be needed to clean up the mess and get back to normal operations. Unfortunately, this is often not the case. Buildings and infrastructure systems of any mature communities have been built over generations and are subject to changing demands, retrofit or mitigation needs, and deterioration. Newer facilities and systems specifically designed for design level hazard events will contribute to a community's resilience if they require only minor repairs and can resume occupancy and operations shortly after the event. In most communities, a number of buildings and supporting infrastructure systems do not meet current minimum code requirements and are unlikely to contribute to community resilience in their existing condition.

Every building and infrastructure system is not needed immediately following a hazard event. Rather, it is important that they be available when needed to support recovery. For example, hospitals are needed

immediately to care for the injured, but recreation centers can wait until people have time to use them. Schools need to reopen as quickly as possible, but not before the emergency response period is over, roads are open for buses, and families are settled. By setting specific performance goals for building clusters (groups of buildings with a common function defined in Step 3), communities will shape the sequence of recovery activities for their built environment and identify dependencies between systems. The first step is to determine when services are needed after a hazard event occurs and how long it will take to restore functionality of the building clusters and supporting infrastructure systems based on their anticipated performance. This approach can help prioritize the resilience projects that would be most beneficial.

Based on the desired recovery time and the support they provide to the social institutions, building clusters are assigned to one of the four functional categories (see Guide Table 4-2). The next step is to determine the desired and anticipated time to recovery of functionality for each building cluster. The dependencies of building clusters on each other and on supporting infrastructure systems may also need to be considered when determining time to recovery.

It is important that communities start each recovery phase (short-term, intermediate, and long-term) as soon as possible to signal the start of community recovery and encourage people to stay and help. As shown in Table 1, the Guide uses *time to recovery of function*, through temporary or permanent measures, to define the duration of the three recovery phases.

Getting People to Stay

The San Francisco Bay Area Planning and Urban Research Association reported in the publication *Safe Enough to Stay* [SPUR 2012] that there are many factors that determine whether a resident will choose to stay after a disaster or leave. People will cope with temporary housing and not having water or sewer for a few weeks, but not for months. They will stay and work toward recovery as long as recovery appears possible. This decision typically occurs within days to weeks, depending on the severity of the event and the options for relocation. http://www.spur.org/sites/default/files/publications_pdfs/SPUR_Safe_Enough_to_Stay.pdf.

The time needed to achieve community recovery depends on the extent of damage, the overall physical and mental health of the community, dependencies between systems, the characteristics of the community's economy, the governance structure, and the availability of financial resources. In setting desired performance goals, communities may want to consider the following recovery time goals. These time frames are consistent with the National Recovery Framework and based on the experiences of communities subjected to many types of hazards [FEMA 2011]:

- No more than one week to secure the disaster area, complete search and rescue operations, provide emergency food and shelter for displaced households, and begin debris removal
- Approximately 2 to 4 weeks to restore reasonable living conditions, whether through temporary or permanent measures, and 8 to 12 weeks to restore normal capacity. Adequate food must be available, along with water, sanitation, shelter, medical care, mental health care, and a governance structure that leads with a resilience vision and conviction.
- Business and commerce needs to be able to initiate recovery within 2 to 4 weeks, with a focus on recreating the jobs vital to restoring economic vitality. Full recovery may take months to years.

It is important that communities establish a rational set of desired performance goals that are achievable and do not over-promise. For example, a complete set of interim repairs and temporary solutions following significant damage may be possible in 24 months. Permanent repairs, with the goal of building back better, may take years because of the design and construction process and challenges of securing private or public funding (e.g., insurance, investments, or municipal, state, or federal funds) for reconstruction. The fragility of the population and the economy will likely be the driving force behind setting desired performance goals and identifying temporary solutions and repairs until permanent repairs can be made.

Building Cluster Performance Goals

The Guide defines the time to recovery of each building cluster or supporting infrastructure system in terms of three functionality levels (see Guide Table 4-3) – 30 % recovered, 60 % recovered, and 90 % recovered. While these levels are expressed as percentages, they are intended to signal when the capacity of the cluster or system is sufficient to start the recovery (30 %), when the capacity is sufficient to initiate usual operations (60 %), and when the cluster or system is fully restored and can operate at normal capacity (90 %). Some communities may find it easier to refer to the levels as minimal, functional, and operational. This information is recorded in the building cluster section of the performance goals table, as shown in Table 1.

Table 1. Riverbend's building performance goals table with 30%, 60%, and 90% recovery goals (Guide Table 9-11)

Disturbance [1]	
Hazard Type	Earthquake
Hazard Level	Design
Affected Area	Community
Disruption Level	Moderate

Restoration Levels [2,3]	
30%	Function Restored
60%	Function Restored
90%	Function Restored
X	Anticipated Performance

Building Clusters	Support Needed[4]	Design Hazard Performance								
		Phase 1 Short-Term			Phase 2 Intermediate			Phase 3 Long-Term		
		Days			Weeks			Months		
		0	1	1-3	1-4	4-8	8-12	4	4-24	24+
		Building Performance Category								
		A			B			C		D
Critical Facilities										
Emergency Operation Centers	R, S, MS	90%							X	
First Responder Facilities	R, S, MS	90%							X	
Memorial Hospital	R, S, MS	90%							X	
Non-ambulatory Occupants (prisons, nursing homes, etc.)	R, S, MS	90%							X	
National Aircraft Parts Factory (NAP)	R, S, C	90%							X	
Emergency Housing										
Temporary Emergency Shelters	R, S	30%	90%							X
Single and Multi-family Housing (Shelter in place)	R, S	60%			90%					X
Housing/Neighborhood										
Critical Retail	R, S, C		30%	60%	90%					X
Religious and Spiritual Centers	R, S			30%	60%	90%				X
Single and Multi-family Housing (Full Function)	R, S			30%		60%		90%		X
Schools	R, S			30%	60%	90%				X
Hotels & Motels	R, S, C			30%		60%	90%			X
Community Recovery										
Businesses – Manufacturing (except NAP)	R, S, C				30%	60%	90%			X
Businesses - Commodity Services	R, S, C				30%	60%		90%		X
Businesses - Service Professions	R, S, C				30%		60%		90%	X
Conference & Event Venues	R, S, C				30%		60%		90%	X

Footnotes:

1 Specify hazard type being considered
Specify hazard level – Routine, Design, Extreme
Specify the anticipated size of the area affected – Local, Community, Regional
Specify anticipated severity of disruption – Minor, Moderate, Severe

2 | 30% | 60% | 90% | Desired restoration times for percentage of elements within the cluster

3 | X | Anticipated performance for 90% restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix

4 Indicate levels of support anticipated by plan
R = Regional; S= State; MS=Multi-State; C = Civil (Corporate/Local)

It is a best practice to use interim repairs or temporary solutions after a hazard event to rapidly restore the functionality of buildings and infrastructure systems, even if it is partial functionality. For example, field hospitals are deployed when hospitals are damaged, temporary water lines are run on the surface until water mains can be repaired, modular class rooms or other spaces are used to provide temporary locations for schools while they are being repaired, washed out roads are temporarily refilled, etc. Buildings with minor damage can often resume usual operations after an event with appropriate temporary repairs, but permanent solutions are required to restore the normal operating capacity and improve resilience for the next event.

If communities meet the 30 % goals early, they will signal positive and progressive recovery to the community, as noted above. The 60 % and 90 % recovery goals should account for dependencies on other systems and economic recovery needs. An example of dependencies between building clusters is food distribution facilities that need to supply hospitals, emergency shelters, and grocery stores, potentially at different levels during the recovery process.

It is reasonable to depend on interim repairs and temporary solutions and, when possible, permanent repairs to achieve the 30 % and 60 % goals. The 90 % goal should reflect the time necessary to complete permanent solutions. Communities may record the 90 % goal in the last column of the performance goals table to signal an extended length of time (e.g., 24+ months for the Riverbend example in Table 1).

Riverbend set its desired performance goals to achieve the full 90 % recovery within 24 months of a hazard event. While this may be possible in many cases, some major building and infrastructure projects, (e.g., a new bridge), may require temporary repairs and eventually a replacement structure. The San Francisco-Oakland Bay Bridge is an example of such a situation. Although the cantilever section of the bridge was damaged in the 1989 Loma Prieta Earthquake, the bridge reopened with temporary repairs within 30 days. The replacement bridge was completed nearly 24 years later [Cabanatuan 2012].

Establishing desired and anticipated performance goals for building clusters and infrastructure systems is not an exact science and there is not a formulaic solution. It is best done through workshops that determine the consensus of the collaborative planning team based on their knowledge and experiences with past hazard events. Workshop participants need to keep in mind, however, that these are goals to define a new normal, a resilience normal. While significant hurdles must be overcome to achieve these desired performance goals, the goals should be determined with the overall objective in mind so they can become the basis of a community's resilience vision. When gaps are identified and the need for temporary solutions becomes apparent, it is worthwhile to revisit the desired goals and verify they are realistic and necessary.

2. Suggested Application to Representative Communities

Guide Brief 7 defines four representative communities: An **Urban City**; a **Suburban Community**; a **Single Industry Community**; and a **County** with incorporated and unincorporated communities.

The performance goals tables for the *Urban City* building clusters and supporting infrastructure systems will likely include desired and anticipated recovery times for all four functional categories – Critical Functions, Emergency Housing, Housing and Neighborhoods, and Community Recovery – based on available resources and mutual aid. The city's Building Department will direct and control the permitting, design, and construction standards, and the Emergency Management Department will direct the immediate response and short-term recovery. The supporting infrastructure systems will be a combination of local and regional systems that are both publically and privately owned. For infrastructure not owned or operated by the city, desired and anticipated performance goals for the supporting infrastructure should be established based on an informed understanding through collaboration with the service providers. Convening a Service Provider Council (see Guide Section 5.2.1) as part of the collaborative planning

team will help set recovery goals for building clusters at levels that serve the social and economic needs of the city.

The performance goals tables for the *Suburban Community* will likely focus on the first three functional categories – Critical Functions, Emergency Housing, and Housing and Neighborhoods – and concentrate on meeting the needs of residents. Primary performance goals will address keeping residents in their homes, returning people to work as quickly as possible, and reestablishing the main street businesses. Desired performance goals for infrastructure systems supporting building clusters should be established based on an informed understanding through collaboration with the service providers. The community needs to identify required support from infrastructure systems and establish mutual aid agreements.

The performance goals tables for the *Single Industry Community* will mirror those for the Suburban Community, with the addition of rows for the dominant industry and its rapid recovery. The business continuity plan of that industry will also inform the community resilience planning and pace of recovery. That industry should also be a strong source of support and collaboration for the community, as they have a common interest to help facilitate a speedy recovery of the community.

The performance goals table for the *County* with incorporated and unincorporated communities will depend on the size and composition of the county and may contain separate sets of performance goals for each community. If the county has an Urban City within its bounds, then the plans may follow, mirror, or depend on the city's plan. If the county is without an industrial or commercial center, then the plans may follow the path of the Suburban Community with a strong dependence on state and federal assistance.

3. References

Cabanatuan, M. (2012) Bay Bridge to open on Labor Day 2013, SFGate, San Francisco, CA. http://blog.sfgate.com/cityinsider/2012/02/08/bay-bridge-to-open-on-labor-day-2013/. Viewed 25 January 2017.

FEMA (2011) National Disaster Recovery Framework, Federal Emergency Management Agency, Washington D.C.

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