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Guide Brief 9 – Summarizing Resilience Goals using Performance Goals Tables

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Guide Brief 9 – Summarizing Resilience Goals using Performance Goals Tables

Applicable Section(s) of Guide: Volume 1, Section 1.5, Developing a Plan for Community Resilience, p. 18
Volume 1, Section 4.1.5, Summarize the Results, p. 46

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

Purpose and Scope

This Guide Brief reviews the performance goals tables used in Step 3 of the Guide. These tables offer an approach to evaluate the anticipated recovery of building clusters and infrastructure systems and the services they support. The summary performance goals table gives community resilience planners a one-page view of what the community needs from its buildings and infrastructure systems when a routine, design, or extreme hazard event occurs.



1. Purpose of the Performance Goals Tables

Performance goals tables document the desired and anticipated performance of the existing built environment. The tables help identify performance gaps that impact the social dimensions of the community and set the stage for developing a community resilience plan. Desired and anticipated performance goals are expressed in terms of ‘time to recovery of function’.

The *desired performance goals* establish the recovery times for functions of the built environment following a hazard event. The recovery times are based on the social and economic recovery needs of the community. For example, the desired performance for critical facilities and services, such as emergency rooms and 9-1-1 call centers, is continuous service or minimal disruption for all hazard events at the routine and design levels. This is the vision setting part of resilience planning where a community decides on the type of performance that is desired.

The next step is determining the *anticipated performance* of the community’s existing building clusters and infrastructure systems (in terms of how long it will take them to restore functionality, often with temporary measures) for a selected hazard event. The community will estimate the expected performance of the existing system and identify system vulnerabilities relative to a hazard event. For instance, following a flood event, buildings and infrastructure systems may have damaged power and communication systems internal to the buildings or facilities that are necessary for their operation.

Vulnerabilities internal to the buildings or systems are often overlooked, as owners focus on the availability of external utilities.

Once the community identifies the desired and anticipated performance for all systems in the built environment, the performance gaps are prioritized based on their potential impact on community recovery. This comprehensive approach forms the basis for prioritizing community resilience goals and mitigation and recovery plans.

Community vulnerabilities for hazard events are best established through a comprehensive, inclusive process that pinpoints the gaps that may lead to widespread damage and disruption. With prioritized performance gaps between desired and anticipated performance, the community can develop short and long-term resilience plans for recovery of functionality.

2. Understanding the Performance Goals Tables

The performance goals tables are organized by four functional categories: critical facilities, emergency housing, housing/neighborhoods/business, and community recovery. These functional categories are further defined by short, intermediate, and long-term recovery phases (see Chapter 4 in the Guide) where:

- Short-term recovery (days to weeks) – critical facilities and emergency housing
- Intermediate recovery (weeks to months) - housing/neighborhoods/business
- Long-term recovery (months to years) – community recovery

The completed performance goals tables for the building clusters and infrastructure systems offer a snapshot of each functional category and, when viewed together, their dependencies. The Guide introduces these tables in the building and infrastructure system chapters in Volume 2. The Community Resilience Planning Example in Chapter 9 of Volume 1 illustrates their use.

Table 1 through Table 7 are taken from the Guide and provided with additional notes to explain their layout and use as follows:

- Table 1 has notes that explain the contents of the Building Clusters Performance Goals Table (see Table 12-3 in the Guide) using the completed table from the Riverbend example (see Table 9-11 in the Guide). Communities can use this same format, listing their building clusters in the first column and filling in the cells with their desired and anticipated performance in terms of recovery time for building or system function.
- Table 2 through Table 6 from Volume 2 of the Guide have notes that explain the table format used for each infrastructure system. The upper sections of the tables provide a representative list of system components that may influence its performance in the community, but are often either located outside of the community jurisdiction and/or owned and operated by other entities. This section is included to heighten community awareness of potential dependencies on systems and organizations outside of the community. The lower sections of the table, which aligns with the building clusters table, focus on the local service delivery to the building clusters that enable their functionality. For infrastructure systems that are privately owned, desired goals and anticipated performance will need to be set by the owners in collaboration with the community. These tables provide an overview of the desired goals and anticipated performance for each infrastructure system as it relates to the needs of the building clusters.

- Table 7 has notes that explain the content of the Summary Table (described in Volume 1 of the Guide in Section 4.1.5) that is shown in the Riverbend Summary Table (see Table 9-17 in the Guide). The Summary Table provides a one page summary of Table 1 through Table 6 based on the performance goals of the building clusters and infrastructure systems.

A set of performance goals tables is needed for each hazard event level (routine, design, extreme) considered by the community. Excel files with template that can be used for developing these tables are available at <https://www.nist.gov/el/resilience/community-resilience-planning-guide-briefs>.

Table 1. Riverbend Building Clusters Performance Goals Table (Table 9-11, Page 76 of Volume 1)

Disturbance ¹		Restoration Levels ^{2,3}	
Hazard Type	Earthquake	30%	Function Restored
Hazard Level	Design	60%	Function Restored
Affected Area	Community	90%	Function Restored
Disruption Level	Moderate	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:

- 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
- 30% 60% 90% Desired restoration times for percentage of elements within the cluster
- X Anticipated performance for 90% restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix
- Indicate levels of support anticipated by plan
R = Regional; S= State; MS=Multi-State; C = Civil (Corporate/Local)

- The selected building clusters are organized and listed in four functional categories in the first column, as shown in Section 3.2 of the Guide.
- The second column of the table indicates levels of support needed by the community for achieving the goal, as discussed in Section 5.2.1 of the Guide.
- The related *design hazard* performance goal for each building cluster, expressed in terms of 30 %, 60 %, and 90 % functionality levels are noted in the appropriate *phases* column, as discussed in Section 4.1.2 of the Guide. 30 % represents the minimum number of buildings in the cluster, or the system capacity in the cluster, that are needed to initiate community recovery. 60 % represents the minimum number needed to resume usual operations in the community. 90 % represents the number needed to achieve normal operating capacity.
- The anticipated performance of a building cluster in its present condition is indicated by the location of the blue X, as discussed in Section 4.1.4 of the Guide. This information is specific to the hazard event under consideration.
- The table includes a *Building Performance Category* (A, B, C, or D as defined in Guide Table 4.1) to ensure compatibility of performance between buildings and infrastructure systems and with codes and standards. The performance levels can also inform the design criteria to be used for new construction, as defined in Table 4-1 of Section 4.1.2.
- The heading table labeled *Disturbance* on the upper left side catalogues the parameters used in determining the anticipated performance of the clusters, and the support needed to achieve that goal, as define in Section 4.1.3. The building clusters, related *performance goals* and building *performance categories* vary for each of the three hazard levels. The anticipated performance may vary for each hazard type.

Table 2. Transportation Performance Goals Table (Table 13-3, Page 102 of Volume 2)

Disturbance ¹		Restoration Levels ^{2,3}	
Hazard Type	Any	30%	Function Restored
Hazard Level	Routine, Design, Extreme	60%	Function Restored
Affected Area	Localized, Community, Regional	90%	Function Restored
Disruption Level	Usual, Moderate, Severe	X	Anticipated Performance

Transportation Infrastructure	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+
Ingress (goods, services, disaster relief)										
Local Roads, Bridges and Tunnels	1									
State Highways, Bridges and Tunnels										
National Highways, Bridges and Tunnels										
Regional Airport										
National/International Airport										
Military Airports										
Marine Port										
Ferry Terminal										
Subway Station										
Rail Stations										
Egress (emergency egress, evacuation, etc.)										
Local Roads, Bridges and Tunnels										
State Highways, Bridges and Tunnels										
National Highways, Bridges and Tunnels										
Regional Airport										
National/Int'l Airport										
Military Airports										
Subway Station										
Ferry Terminal										
Rail Stations										
Community Recovery										
Critical Facilities										
Hospitals										
Police and Fire Stations	2									
Emergency Operational Centers										
Emergency Housing										
Residences										
Emergency Responder Housing										
Public Shelters										
Housing/Neighborhoods										
Essential City Service Facilities										
Schools										
Medical Provider Offices										
Retail										
Community Recovery										
Residences										
Neighborhood retail										
Offices and work places										
Non-emergency City Services										
All businesses										

Footnotes:

- 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
- 30% 60% 90% Desired restoration times for percentage of elements within the cluster
- X Anticipated performance for 90 % restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix
- Indicate levels of support anticipated by plan
R = Regional; S= State; MS=Multi-State; C = Civil (Corporate/Local)

- The *Transportation Performance Goals Table* contains additional functional clusters of transportation infrastructure organized by ingress and egress routes.
- Transportation services for building clusters are addressed in the *Community Recovery* section. The functional categories and building clusters are shown in gold to indicate *services to buildings*. The categories and clusters should replicate those in the *Building Clusters Performance Goals Table*.

Table 3. Electrical Energy Performance Goals Table (Table 14-3, Page 147 of Volume 2)

Disturbance ¹		Restoration Levels ^{2,3}						
Hazard Type	Any	30%	Function Restored					
Hazard Level	Routine, Design, Extreme	60%	Function Restored					
Affected Area	Localized, Community, Regional	90%	Function Restored					
Disruption Level	Usual, Moderate, Severe	X	Anticipated Performance					

Communications Infrastructure	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+
Power - Electric Utilities										
Community Owned or Operated Bulk Generation										
Generation Requiring Fuel Transport (Coal, Oil fired)	1									
In Place Fueled Generation (Hydro, solar, wind, wave, compressed air)										
Storage (Thermal, Chemical, Mechanical)										
Community Owned or Operated Distributed Generation										
Generation Requiring Fuel Transport (Coal, Gas, Oil fired)										
In Place Fueled Generation (Hydro, solar, wind, wave, compressed air)										
Storage (Thermal, Chemical, Mechanical)										
Transmission and Distribution (including Substations)										
Critical Facilities										
Hospitals, Police and Fire Stations / Emergency Operations Centers										
Debris / recycling centers/ Related lifeline systems	2									
Emergency Housing										
Public Shelters / Nursing Homes / Food Distribution Centers										
Emergency shelter for response / recovery workforce/ Key Commercial and Finance										
Housing/Neighborhood										
Essential city services facilities / schools / Medical offices										
Houses of worship/meditation/ exercise										
Buildings/space for social services (e.g., child services) and prosecution activities										
Community Recovery										
Commercial and industrial businesses / Non-emergency city services										
Residential housing restoration										

Footnotes:

- 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
- 30% 60% 90% Desired restoration times for percentage of elements within the cluster
- X Anticipated performance for 90 % restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix
- Indicate levels of support anticipated by plan
R = Regional; S= State; MS=Multi-State; C = Civil (Corporate/Local)

- The *Electrical Energy Performance Goals Table* contains additional energy categories with functional clusters related to energy generation organized by ownership (bulk and distributed power generation).
- Energy services for building clusters are addressed under the *Community Recovery* section. The functional categories and building clusters are shown in gold to indicate *services to buildings*. The building categories should replicate those in the *Building Clusters Performance Goals Table*.

Table 4. Communications Performance Goals Table (Table 15-1, Page 180 of Volume 2)

Disturbance ¹	
Hazard Type	Any
Hazard Level	Routine, Design, Extreme
Affected Area	Localized, Community, Regional
Disruption Level	Usual, Moderate, Severe

Restoration Levels ^{2,3}	
30%	Function Restored
60%	Function Restored
90%	Function Restored
X	Anticipated Performance

Communications Infrastructure	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+
Core and Communications Buildings										
Communications Hub (e.g., Central Office, IXP, Data Centers, etc.)										
First/Last Mile										
Critical Facilities										
Hospitals										
Police and fire stations										
Emergency Operation Center										
Emergency Housing										
Residences										
Emergency responder housing										
Public Shelters										
Housing/Neighborhoods										
Essential city service facilities										
Schools										
Medical provider offices										
Retail										
Community Recovery Infrastructure										
Residences										
Neighborhood retail										
Offices and work places										
Non-emergency city services										
Businesses										

Footnotes:

- 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
- 30% 60% 90% Desired restoration times for percentage of elements within the cluster
- X Anticipated performance for 90 % restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix
- Indicate levels of support anticipated by plan
R = Regional; S= State; MS=Multi-State; C = Civil (Corporate/Local)

- The *Communications Performance Goals Table* contains an additional communications category with functional clusters related to hubs (e.g., Central Offices). These facilities are owned by service providers, who can estimate the anticipated performance so that the community is aware of potential lapses in service coverage when a hazard event strikes.
- Communication services for building clusters are addressed under the *Community Recovery* functional category. The functional categories and building clusters are shown in gold to indicate *services to buildings*. The building categories should replicate those in the *Building Clusters Performance Goals Table*.

Table 5. Water Performance Goals Table (Table 16-2, Page 214 of Volume 2)

Disturbance ¹		Restoration Levels ^{2,3}	
Hazard Type	Any	30%	Function Restored
Hazard Level	Routine, Design, Extreme	60%	Function Restored
Affected Area	Localized, Community, Regional	90%	Function Restored
Disruption Level	Usual, Moderate, Severe	X	Anticipated Performance

Functional Category: Cluster	Support Needed ⁴	Overall Recovery Time for Hazard – Routine, Expected or Extreme								
		Phase 1 – Short-Term			Phase 2 – Intermediate			Phase 3 – Long-Term		
		Days			Wks			Mos		
		0	1	1-3	1-4	4-8	8-12	4	4-24	24+
Source										
Raw or source water and terminal reservoirs										
Raw water conveyance (pump stations and piping to WTP)										
Water Production	1									
Well and/or Treatment operations functional										
Transmission (including Booster Stations)										
Backbone transmission facilities (pipelines, pump stations, and tanks)										
Water for fire suppression at key supply points (to promote redundancy)										
Control Systems										
SCADA or other control systems										
Distribution										
Critical Facilities										
Wholesale Users (other communities, rural water districts)										
Hospitals, EOC, Police Station, Fire Stations										
Emergency Housing										
Emergency Shelters	2									
Housing/Neighborhoods										
Potable water available at community distribution centers										
Water for fire suppression at fire hydrants										
Community Recovery Infrastructure										
All other clusters										

Footnotes:

- 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
- 30% 60% 90% Desired restoration times for percentage of elements within the cluster
- X Anticipated performance for 90 % restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix
- Indicate levels of support anticipated by plan
R = Regional; S= State; MS=Multi-State; C = Civil (Corporate/Local)

- The *Water Performance Goals Table* contains additional water categories with functional clusters for source, transmission, and system control.
- Water services for building clusters are repeated under the *Community Recovery* functional category. The functional categories and building clusters are shown in gold to indicate *services to buildings*. The building categories should replicate those in the *Building Clusters Performance Goals Table*.

Table 6. Wastewater Performance Goals Table (Table 16-3, Page 215 of Volume 2)

Disturbance ¹		Restoration Levels ^{2,3}	
Hazard Type	Any	30%	Function Restored
Hazard Level	Routine, Design, Extreme	60%	Function Restored
Affected Area	Localized, Community, Regional	90%	Function Restored
Disruption Level	Usual, Moderate, Severe	X	Anticipated Performance

Functional Category: Cluster	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+
Treatment Plants										
Treatment plants operating with primary treatment and disinfection										
Treatment plants operating to meet regulatory requirements										
Trunk Lines										
Backbone collection facilities (major trunk line, pump stations, siphons, relief mains, aerial crossings)										
Flow equalization basins										
Control Systems										
SCADA and other control systems										
Collection Lines										
Critical Facilities										
Hospitals, EOC, Police Station, Fire Stations										
Emergency Housing										
Emergency Shelters										
Housing/Neighborhoods										
Threats to public health and safety controlled by containing & routing raw sewage away from public										
Community Recovery Infrastructure										
All other clusters										

Footnotes:

- 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
- 30% 60% 90% Desired restoration times for percentage of elements within the cluster
- X Anticipated performance for 90 % restoration of cluster for existing buildings and infrastructure systems
Cluster recovery times will be shown on the Summary Matrix
- Indicate levels of support anticipated by plan
R = Regional; S = State; MS=Multi-State; C = Civil (Corporate/Local)

- The *Wastewater Performance Goals Table* contains additional wastewater categories with functional clusters for treatment plants, trunk lines, and control systems.
- Wastewater services for building clusters are repeated under the *Community Recovery* functional category. The functional categories and building clusters are shown in gold to indicate *services to buildings*. The building categories should replicate those in the *Building Clusters Performance Goals Table*.

The performance goals tables contain useful and detailed information about the desired performance goals and the anticipated performance for the existing built environment and each hazard under consideration. This information is then incorporated into a single summary table.

The *Summary Community Performance Goals Table* is a high level summary of the 90 % goals for the building clusters and supporting infrastructure systems. It is organized in a similar manner as the *Building Clusters Performance Goals Table* around the four functional categories. However, the entries under each functional category represent each system of the built environment (buildings, transportation, energy, water, wastewater, and communication). The desired performance goals in the summary table represents the 90 % level of functional recovery. Similarly, the anticipated performance for each element is the time to achieve recovery of functionality, whether through temporary or permanent solutions. Comparing the performance goals between the buildings and infrastructure systems within each functional category provides a high-level summary of performance gaps and where the greatest need for solutions may exist to achieve recovery of functionality at the community scale. Communities may also consider developing similar summary tables for the 30 % and 60 % levels.

The *Summary Community Performance Goals Table* for the Riverbend example is shown in Table 7 (Table 9-17 in the Guide). In this table, several of the systems under each functional category have anticipated performance levels that generally match the desired recovery goals. Where they do not, such as is the case for buildings and wastewater systems in this example, short- and long-term solutions need to be identified to address the performance gap. A summary of the 30 % and 60 % performance levels is not shown in the table or the Guide example.

Table 7. Summary Community Performance Goals Table from the Riverbend Example (Table 9-17, Page 82 of Volume 1)

Summary Resilience Table	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+
Critical Facilities									
Buildings	90%							X	
Transportation		90%	X						
Energy		90%	X						
Water			90%		X				
Wastewater				90%				X	
Communication	90%			X					
Emergency Housing									
Buildings				90%					X
Transportation			90%	X					
Energy			90%	X					
Water			90%		X				
Wastewater				90%				X	
Communication				90%	X				
Housing/Neighborhoods									
Buildings						90%			X
Transportation			90%	X					
Energy			90%	X					
Water				90%				X	
Wastewater					90%			X	
Communication				90%			X		
Community Recovery									
Buildings								90%	X
Transportation				90%	X				
Energy			90%	X					
Water				90%				X	
Wastewater							90%	X	
Communication				90%			X		



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