Disaster Resilience Scorecard for Industrial and Commercial Buildings.
For Use by Building Owners, Operators and Managers.

Final Version, January 20th, 2020.

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Disaster Resilience Scorecard for Industrial and Commercial Buildings

Introduction

The Disaster Resilience Scorecard for Industrial and Commercial Buildings (hereafter referred to as "the Building Scorecard") enables the establishment of a baseline for the resilience of buildings and campuses to natural or man-made hazards, so allowing improvements to be identified and prioritized. It also allows progress to be tracked as improvements are made, as the effects of climate change become apparent, as the urban environment changes, or as the ownership and/or operation of the building changes.

The Building Scorecard adapts the United Nations Office for Disaster Risk Reduction (UNDRR)'s City Disaster Resilience Scorecard. It is intended for use by the owners, managers and operators of commercial, industrial and multi-residential buildings or campuses, both government- and privately-owned.

The Building Scorecard has been created by a team of volunteers for UN Private Sector Alliance for Disaster Resilient Societies (UN ARISE).

The "Ten Essentials" For Disaster Risk Reduction

Like the original City Scorecard, the Building Scorecard is structured around the "Ten Essentials" For Disaster Risk Reduction, originally created by UNDRR (then UN ISDR) in 2005. The most recent statement of these is shown in Figure 1 on the next page.

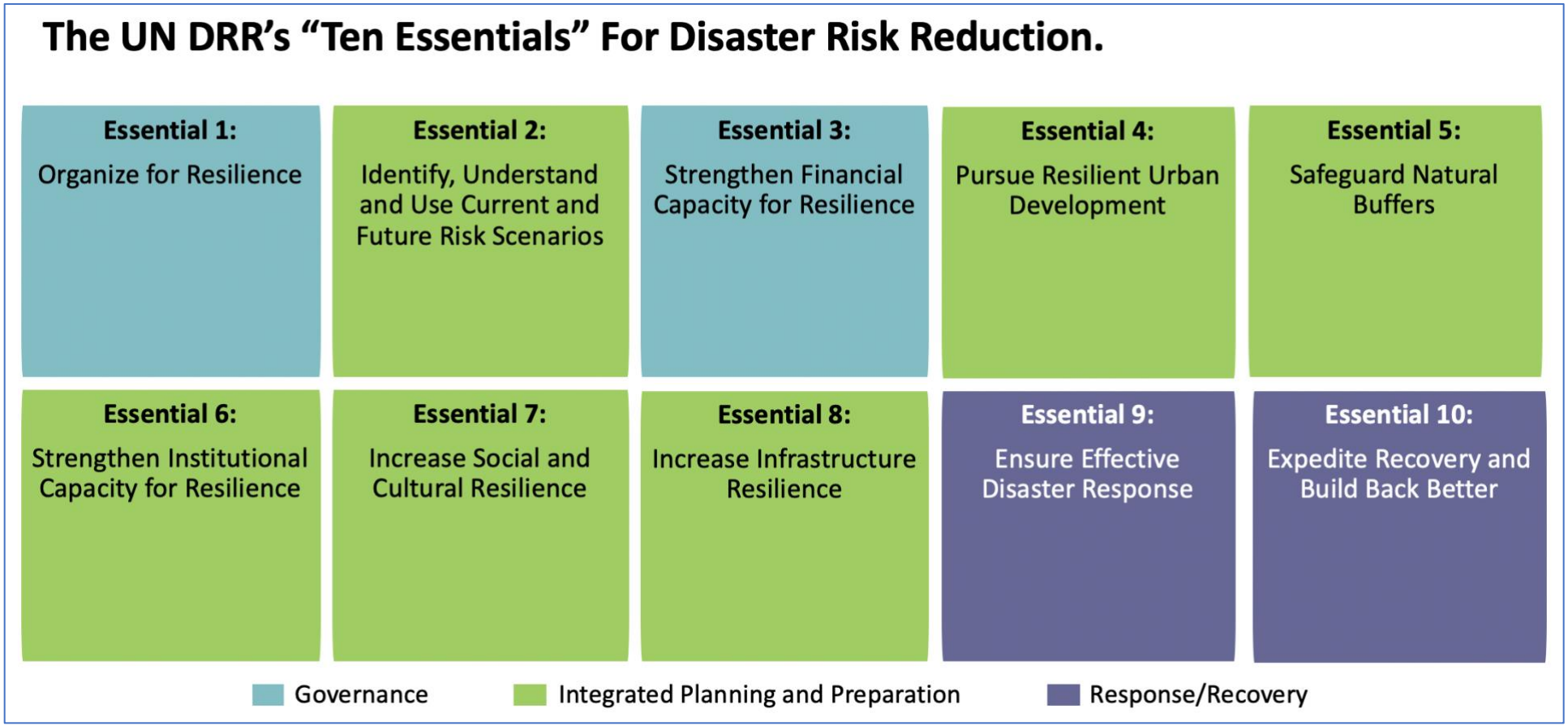
The Ten Essentials provide a holistic coverage of the many issues that affect resilience in the "system-of-systems" that makes up a city – these systems include buildings and facilities. Owners, operators and managers of buildings and facilities might be tempted to think that to become resilient, they merely need to address the structural soundness of their building and its emergency procedures. However, a moment's thought will show that the building cannot be truly resilient in isolation from the rest of the city or region in which it is located:

- The building and the city share the same risks, while the building's exposure and vulnerability to those risks may be affected by decisions the city makes (for example regarding land use or hard-cover), or the city's maintenance practices (for example clearing storm drains).
- The building's usability and viability in the aftermath of a disaster will be affected by the city's preparations for a disaster; by the impact on neighboring streets and buildings; and not least by the resilience of the community where the building is located and from whence it derives its workforce.
- Conversely, the city's and the local community's recovery from a disaster may depend on how effectively the ownership and management of commercial and industrial buildings in its area prepare for and respond to the disaster, and how well they cooperate with the city and each other.

The broader definition that the Ten Essentials bring to disaster resilience therefore means that the Building Scorecard goes beyond the more traditional issues of building hardening, emergency preparation, and so on, to address factors such as civic or community engagement – which building owners and managers may never have considered before – in order to manage the interdependencies just described. For the same reason, the Building Scorecard may direct attention to issues that the building owner or manager cannot immediately control – for example, the highways or water system, or the stance of neighboring building owners towards preparing for resilience. However, if those issues nevertheless affect the disaster resilience of the building then they need to be planned for

even if, in the short term, they cannot be corrected. In the longer term, they become subjects for negotiations, lobbying, advocacy and working through industry associations to bring about the necessary changes.

Figure 1: The UN DRR's "Ten Essentials"[1]



[1] Note that an Addendum was published in July 2018 synthesizing and expanding measures that apply to the public health implications of, and preparations for, disasters. While the Building scorecard does address hospital buildings, users from the health care sector are encouraged to review the Addendum, also.

Using the Building Scorecard

Application

The Building Scorecard applies to:

- Office accommodation (including academic buildings), whether privately or publicly owned or operated;
- Shopping malls and complexes;
- Public facilities such as schools, stadiums and the like;
- The buildings at industrial production or warehouse facilities and complexes, or other major installations such as refineries, airports or hospitals. (Note, however, that except where safety issues arise for building occupants, the Scorecard does not cover the resilience of operational or production process equipment, including servers in data centers, housed within those buildings, because these may raise highly specific resilience issues beyond the scope of a general-purpose instrument such as this scorecard);
- Multi-unit residential buildings (such as apartment blocks, social housing, and special facilities such as elder and other care homes);
- Campuses of buildings (such as office parks, industrial complexes, hospitals, schools, universities) as well as individual structures.

For simplicity, the Building Scorecard uses the generic term "building" to apply to all of the above. While some buildings, thus defined, may be in rural areas rather than cities, many of the wider issues of reliance on public infrastructure and need for community engagement still apply. There is no presumption as to the size of buildings evaluated – in principle the Building Scorecard applies to any size or complexity of building. However, for smaller or less complex buildings users may prefer to work with the summary scorecard (see below).

Components

The Building Scorecard comprises five components, the first three of which are in this document:

1. The Summary Scorecard, containing 33 assessments, which can be used to support exploratory, assessment and consensus-building workshops, whether within the building owner's/manager's organization, or with some combination of the city's planners and emergency managers, utilities, the building's tenants (people or businesses), or community representatives. These typically take 1-2 days, perhaps with some preparation work in advance. Users of the Summary Scorecard are however encouraged first to read the introduction to each Essential in the Detailed Scorecard, as well as the notes in the right-hand column of each table within the Detailed version. The summary scorecard can also be used for:
    a. Assessing smaller or less complex buildings;
    b. As a screening tool to identify which of the resilience Essentials need to be assessed in detail, using the relevant sections of the Detailed Scorecard, or to identify buildings in a portfolio where the Detailed Scorecard should be applied;
    c. As the executive summary for the Detailed Scorecard.
2. The Detailed Scorecard, containing some 120 assessments, which is intended to support more in-depth consultancy investigations of a building's or a portfolio's resilience. This may take from 3 days (if all the information is available) to several weeks.
3. An Action Guide, with possible follow-up actions once the scorecard results have been tabulated. We hope to develop this further in the future.

4. A separate spreadsheet, downloadable from the same location as this document, to enable data capture as the Building Scorecard is applied[2].
5. A second spreadsheet, also downloadable from the same location as this document, listing other relevant standards, which are cross-referenced to the relevant sections of the Building Scorecard. This is referred to as the "Crosswalk".

Key terms used

Throughout, the Building Scorecard takes the perspective of a composite actor referred to as "the building owner/manager". This refers, as applicable, to any or all of the following:

- The individual owner or owners of the building;
- The corporate owners of the building (who may have a portfolio of buildings);
- The operator(s) and/or manager(s) of the building, if different from owners;
- Corporate building management companies (providing services to the building owners);
- Apartment or business owners' cooperatives or committees, and/or tenants' organizations or representatives.

With existing buildings, improving resilience may require retrofitting existing structures and processes. However, in many cases this will be harder and more expensive than building those measures in to buildings as they are designed. To that extent, the Building Scorecard is also relevant to developers, architects and design engineers.

The Building Scorecard uses the following additional terms:

- *Stakeholders* are all that occupy (reside, work, visit), manage, service, and supply the building.
- *Internal stakeholders* are those who:
    - Have ownership of the building and/or responsibilities to support and manage it day-to-day;
    - Rely on the building's resilience for employment, regular access to services, or housing. This group are also referred to as *occupants.*
- *External stakeholders* are those in the surrounding community and society who:
    - May be directly affected by the building's performance during a disruption or disaster (neighboring residents and businesses, owners of neighboring buildings, local shopkeepers who rely on trade from the building's occupants, and so on);
    - Will be professionally affected where the building's performance affects the community (city or state governments, first responders, Chambers of Commerce, and so on);
    - Have a financial interest in the building, such as Real Estate Investment Trusts (REITS) and other investors.
- *Stakeholder groups* may include relevant official and unofficial groups of internal and external stakeholders at the global, country, state/municipal, city/town/village, local, neighborhood and building levels. Examples may include: those who regulate the design, construction and operation of buildings; organizations and associations representing specific industries/sectors, cultures, marginalized populations or groups with special needs; neighborhood and faith-based organizations, or any group that has interest in, may impact or be impacted by the building's resilience.

[2] We are well aware that a spreadsheet is an inferior option in many ways to an on-line portal for users to capture and share data, but at this time we do not have funds to create or maintain one. Sponsorship to create and maintain a portal is actively sought!

Measurement

Each measure in the Building Scorecard has a scale that runs from 0 (non-existent) to 5 (perfection), with an indication of what, in each assessment, would constitute each level of performance. There are several points to note here:

- The measurement scales are only intended to be *indicative* and need interpretation when applied in any particular case. If alternative measures exist that are more useful or capture your building's situation better, or for which data exists, then use those measures.
- If you do alter the scoring schema, it will be useful if any alternatives can also be structured using the 0-5 scale (or perhaps 0-1-3-5), like the existing measures, so that the spreadsheet tool that we have provided still works for them.
- It is important to record the reasoning behind each score.
- As drafted, all measures count equally: it is open to users to add weightings if they so choose, but the authors have not carried out any research that might justify such weightings.
- If an assessment does not apply to the building being assessed, then omit the score completely (in other words, leave it blank) and the tool will adjust the averaging calculation for the reduced number of scores. **Do not just enter a 0 or 5, or that will skew your scoring.**

The spreadsheet tool aggregates scores to produce a single number for each of the Ten Essentials and completes the summary Euler diagram (often called a "spider diagram" or "radar plot"). However, it is common for Scorecard users to wish to summarize with two (or more) scores within a single Essential. An example might be in Essential 4 where building codes may be suitable for the hazards faced, but enforcement of those codes is much weaker: a user might want a higher summary score for the assessments that address the former, and a lower one for those that address the latter. There is no reason why you should not do this, and the general guidance would be "do whatever makes the Building Scorecard most useful to you". Be aware, however, that you will have to adjust the spreadsheet tool manually to achieve this.

Completion sequence

There is no pre-defined sequence in which to complete the Building Scorecard. Many of those who have tested it reported that it may be useful to start with Essential 2, which provides a consideration of the actual hazards, exposures and vulnerabilities that the building faces, given its location, nature and other factors. Alternatively, based on experience with the City scorecard, some users may prefer to start with Essential 1, while others prefer to conclude with this Essential as they wish to define a governance and organization format that addresses the weaknesses identified in the rest of the Building Scorecard. Still others may start where they currently have the most information and then fill in the gaps around that. As above, our general guidance is to pick the approach that makes most sense for you.

Application to multiple buildings

Where the Building Scorecard is applied to multiple buildings in a company's portfolio, on a campus or within a given region, some assessments may only need to be completed once. For example, in Essential 1, governance arrangements may be common to all buildings in a portfolio or on a campus; in Essential 2, risk scenarios may be common to all buildings within a region; in Essential 6, resilience skills may be provided for all buildings company-wide; or in Essential 8, dependencies on critical external infrastructure may be common to all buildings on a campus. Taking advantage of such commonalities may simplify and save

time in applying the Scorecard. *But beware: care is needed in making any assumption of commonality, as there may be small but critical differences that affect resilience from building to building.* For example, under Essential 2, two adjacent buildings may share the same flood hazards, but they may have different exposure levels due to the landscape treatment around each affording a different level of freeboard; or under Essential 6, access to training may vary from area to area.

Caveats and constraints

Finally, there are some important caveats and constraints on how the Building Scorecard should be used:

- It is very important to understand that while scores are numerical, the Building Scorecard is not, nor could it ever be, *objective*. It aims only to be *systematic*, in enabling assessment of all of the many facets of disaster resilience of a building or facility; *structured*, in providing a framework for that consideration; and *transparent* in making the reasoning clear for each score awarded.
- The primary purpose of the Building Scorecard is to initiate thought about the disaster resilience of buildings or increase the depth and thoroughness of consideration. This applies to individual buildings, or where a company owns a portfolio of buildings and wants to assess the portfolio as a whole; however, care obviously needs to be taken when making building-to-building comparisons because these can easily lead to misleading impressions. The Building Scorecard has not been written for the purpose of supporting external benchmarking between otherwise unrelated buildings and neither the UNDRR, ARISE, nor the authors have any plans to publish scorecard data for purposes of enabling specific comparisons.
- The Building Scorecard can readily be used for managing risks from man-made as well as natural hazards – indeed, this is encouraged where a true multi-hazard or cascading failure scenario is to be considered. However, it does *not* specifically address risks from cyber-threats, and we strongly suggest that building owners address this separately using one the many specialized assessment instruments that are available.
- As stated, the Building Scorecard is focused on the building itself and its stakeholders/occupants. The resilience of operational or production process equipment, including servers in data centers, housed within those buildings is excluded because this may raise highly specific resilience or safety issues beyond the scope of this tool.

Building Scorecard Team

The Building Scorecard was drafted, peer-reviewed and beta tested by those listed in Figure 2 below. We are especially pleased to note that the Scorecard has received input from every continent.

Figure 2: Scorecard Authors, Peer Reviewers and BETA Testers

Authors		Peer Reviewers		Beta Testers	
Name	**Organization**	**Name**	**Organization**	**Name**	**Organization**
Arathi Gowda	Skidmore Owings Merrill	Alexander Pama	SM Prime (Philippines)	Melissa Jacobs	First Capital Realty (Canada)
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Authors		Peer Reviewers		Beta Testers	
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Debbra Johnson	Debbra AK Johnson LLC	Jurij Parascczak	IBM (US)		
Jason Bird	Jacobs Engineering	Louis Downing	Global Infrastructure Basel (Switzerland)		
Joyce Coffee	Climate Resilience Consulting	Michael Nolan	UN Global Compact (Australia)		
Pete Mulvaney	Jacobs Engineering	Raj Chintaram	African Union		
Peter Williams	Peter Williams Solutions LLC	Ryan Colker	Alliance for National and Community Resilience (US)		
Simone Skopek	Jones Lang Lasalle (ret'd)	Sandra Wu	Kokusai Kogyo (Japan)		
		Susan Dorn	US Green Building Council (US)		
		Thomas Tang	(Independent - US)		
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Part 1 – Summary Scorecard (33 Assessments)

Essential 1: Organize for Resilience

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
Essential 1: Organize for resilience. (For additional notes and examples, see Detailed Scorecard, Essential 1).				
1.1	**Resilience plans**	Do plans exist to increase or maintain the disaster resilience of the building?	The building has … 5 – … comprehensive, up to date plans to improve and/or maintain resilience that address all known and foreseeable future hazards. 4 – … comprehensive, up to date plans to improve and/or maintain resilience, with a few minor omissions in updating. 3 – … mostly comprehensive, mostly up to date plans, but with one or more significant omissions or slippage in updating. 2 – … some resilience plans, but there are many major omissions or slippages in updating. 1 – … only rudimentary plans – they omit major areas entirely or are too vague to be actionable; OR planning has been left to building occupants which means that plans may be mutually incompatible. 0 – … no resilience plans at all.	See Detailed Scorecard, Essentials 1 & 2 for list of hazards. Plans to increase or maintain disaster resilience will include review of updated data and assumptions on hazards and exposures, changes in building use, changes in land use around the building, changes in traffic levels, updates to key infrastructure serving the building, and so on. Essential 2 covers actual risk/hazard assessment in more detail. For emergency response plans, see Essential 9. Whether plans have actually been financed and implemented or not will be reflected in Essentials 3 and 8.
1.2	**Organization**	Is there an organization or clearly delineated process that integrates around a central focal point all internal and external building stakeholders, with clearly delineated roles and responsibilities?	5 – Yes, an organization exists that provides a single point of coordination with all internal and external stakeholders, effectively exchanging information with them and with clearly defined and documented roles and responsibilities. 4 – Yes, an organization exists, as above, but there are minor omissions in inclusion and some roles may not be documented or clearly defined. 3 – An organization exists, but with one or more significant omissions in inclusion, information exchange or role definition. 2 – There are several parts to the required organization, with no single point of coordination, and/or major omissions in inclusion, information exchange and role documentation.	A designated central focal point may be a person, office or team. One is required for clarity, efficiency of coordination, and accountability. Some organizations identify their focal point as the "Chief Resilience Officer". This may or may not be combined with the role of "Chief Sustainability Officer". Other organizations have a head of business continuity planning as the focal point. See Detailed Scorecard, Essential 1, for lists of internal/external stakeholders.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – Only rudimentary attempts to define a focal point and organization that coordinates all stakeholders and shares information. 0 – No focal point and no organization.	
1.3	**Momentum**	Are resilience issues routinely covered in decision making and does the building owner/manager have a track record in improving its resilience?	5 – Yes, resilience is clearly a significant criterion in all decision making and there is a documented track record in improving the building's resilience in the last 5 years with plans to do more. 4 – Yes, as above but with a few minor omissions. 3 – As above, but with one or more significant omissions, for example where resilience was not considered in some relevant decision. 2 – Resilience is a side-discipline removed from day to day decision making and progress in the last 5 years has not been extensive. 1 – Only occasional consideration of resilience issues – perhaps annually or semi-annually – and little if any progress in the last 5 years. 0 – Resilience is rarely if ever considered and much needs to be done if the building is to become more resilient.	For new buildings (less than 5 years old) a track record may not have had time to emerge. If so, address decision making processes only.
Essential 2: Identify, understand and use current and future risk scenarios. **(For additional notes and examples, see Detailed Scorecard, Essential 2).**				
2.1	**Risk under-standing**	Is there a sound understanding of the risks or hazards facing the building both now and in the future?	5 – Yes, risks have been compiled into coherent scenarios that take account of all known present hazards, combined risk possibilities and likely future ones arising as climate change or sea level rise take place. 4 – Yes, as above but with a few minor omissions. 3 – Some understanding of present risks but combined and/or climate change risks not included. 2 – Significant gaps in understanding and/or planning for combined risks or climate change. 1 – Rudimentary understanding of risk, but not adequate for making the building resilient. 0 – Little or no attempt to understand risk.	See Detailed Scorecard, Essentials 1 and 2 for potential sources of risk – natural, manmade and consequential (one risk arising as a consequence of another).
2.2	**Specific risks**	What specific natural, manmade and combined risks does the building actually face?	The building … 5 – … faces few if any hazards that increase the likelihood of damage or destruction either now or	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			in the future from climate change or sea level rise. 4 – … faces minor future hazards. 3 –... faces at least one hazard posing a risk of significant damage today, growing worse in the future. 2 – … faces at least two significant hazards today with significant worsening in prospect in the future. 1 – … faces at least one hazard capable of destroying the building today and worsening in the future. 0 – … faces multiple existential risks both now and in the future.	See Detailed Scorecard, Essential 2, for potential sources of risk – natural, manmade and consequential (one risk arising as a consequence of another).
2.3	**Consequences**	What monetary, legal and social consequences are there of the building being out of commission for one month?	5 – Negligible impacts on the financial or legal position of the owner, or on the community. 4 – A few minor impacts only. 3 – More significant financial or legal implications for the owner or implications for the community. 2 – Major financial or legal implications for the owner (requiring financing and legal support) or major implications for the community. 1 – Catastrophic implications for the owner (risk of going out of business) or for the community (requiring emergency intervention). 0 – Catastrophic implications for both.	
Essential 3: Strengthen financial capacity for resilience. **(For additional notes and examples, see Detailed Scorecard, Essential 3).**				
3.1	**Financial plan and strategy**	Does the building owner have a financial plan sufficient to meet resilience needs?	5 – Yes, a financial plan is in place that will allow the owner to meet all foreseeable resilience needs. 4 – Yes, a financial plan is in place with a few minor omissions in needs met, or funding sources tapped. 3 – A financial plan exists but has some more significant omissions. 2 – At least one major resilience need is currently unfunded. 1 – There is no single plan and there are multiple omissions in resilience needs funded or funding sources tapped.	For potential funding sources, see Detailed Scorecard, Essential 3.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			0 – No planning for resilience.	
3.2	**Upkeep and maintenance**	Is funding available to and accessible by the building owner/manager for maintenance and upkeep of the building, its systems and its emergency facilities?	5 – Yes, funding is available for maintenance and upkeep of all resilience-relevant items. 4 – Yes, funding is available with a few minor omissions. 3 – Funding of maintenance and upkeep shows some more significant shortfalls. 2 – Funding of maintenance and upkeep has several major gaps that will significantly compromise building resilience. 1 – Funding is demonstrably inadequate – building resilience may be seriously undermined as a result. 0 – No funding.	Funding may be driven in part by the importance of a district for the local or national economy, for example where some strategic industry may be concentrated.
3.3	**Contingency funds.**	Does the building owner/ manager have contingency funds to meet cash flow and out-of-pocket needs during the loss adjustment process prior to insurance paying out?	The building owner/manager has funds available to cover known/foreseeable cashflow needs and out of pocket expenses … 5 – … through a 12-month delay to pay-out. 4 – … through a 9-month delay to pay-out. 3 – … through a 6-month delay to pay-out. 2 – … through a 3-month delay to pay-out. 1 – … through a 1-month delay to pay-out. 0 – No insurance.	
Essential 4: Pursue resilient urban development. **(For additional notes and examples, see Detailed Scorecard, Essential 4).**				
4.1	**City, State or Central Government building codes**	Does the building comply with the latest version of city, state or central government building codes with respect to resilience?	5 – The building complies with or exceeds all relevant current city and state codes with upgrades as applicable to be adequate for the worst-case risks that apply in the area. 4 – As above but for the “average case” risks that apply in the area. 3 – Not all code standards implemented are suitable for known risks, but the owner uses at least a property maintenance code and fire code to keep building up to legal safe standards. A retrofit may be planned to update the building. 2 – Significant weaknesses exist in the codes embodied in the building, relative to risks. 1 – The building adopts only very basic codes and is unlikely to survive a disaster of known possibility for the area.	Compliance should be documented.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			0 – No, or unknown, code compliance.	
4.2	**Resilient building standards**	Independent of code compliance, does the building comply with external resilient building standards?	5 – The building achieved or exceeded maximum level of formal resilient building program certification (such as RELi Gold or higher, SuRe Gold certified, or IBHS FORTIFIED Gold). 4 – The building achieved minimum level of formal resilient building program certification and is working towards higher level. 3 – The building achieved minimum level of formal resilient building program certification (such as RELi certified, FORTIFIED Bronze, SuRe Bronze certified, or LEED certified with 2 of 3 resilience credits achieved). 2 – Participation in resilient building standards program is underway, but no formal assessment has been completed. 1 – There is awareness and interest in formal resilient building standards program, but no action taken. 0 – No awareness or interest in resilient building standards program.	A fuller list of applicable standards is contained in the "Cross-walk" that accompanies this document.
Essential 5: Safeguard natural buffers. **(For additional notes and examples, see Detailed Scorecard, Essential 5).**				
5.1	**Protection of ecosystem services**	Have the building and its surroundings been designed or retrofitted using Low Impact Development principles (LID) or equivalent and/or RELi (floodplain protection, heat island reduction) to protect relevant ecosystem services in the area?	5 – Yes, very high level of compliance with standards such as LID and RELi. 4 – Yes, high level of compliance but with some minor degradation to the environment. 3 – Ecosystem services have been identified, and protected to a degree, but more significant degradation has occurred. 2 – Identification, but significant degradation, of several ecosystem services. 1 – Only rudimentary attempts to identify and protect relevant ecosystem services. 0 – No interest in ecosystem service protection.	For a list of relevant ecosystem services, see Detailed Scorecard, Essential 5.
5.2	**Green infrastructure**	Have the building and its surroundings been fitted with the maximum green infrastructure systems, including renewable/locally sourced energy systems, to the extent allowed by	5 – Yes, to the maximum extent allowed by the city. Performance in use is recorded against KPIs. 4 – Yes, as above but less than the city would allow. 3 – Somewhat - systems are being implemented, but with ad hoc monitoring and no metrics.	Green infrastructure can both make the building more resilient and reduce its adverse impact on the resilience of the area around it. Renewable and locally sourced energy can improve resilience by reducing reliance on energy grids that may be prone to damage or disruption in a disaster.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
		city rules, using Low Impact Development (LID) principles or equivalent?	Green infrastructure and renewable energy opportunities are missed. 2 – Plans are under discussion with regulators, but significant possibilities are omitted. 1 – Minor applications of green infrastructure and renewable energy have been identified but not implemented, nor any application made to the City. 0 – No interest or application potential for green infrastructure or renewable energy solutions.	
5.3	**Responsible person**	Has a person been appointed to supervise and monitor the effectiveness and performance of ecosystem services?	5 – Yes - a responsible person is in place and has provided quarterly performance monitoring reports and made corrective actions as needed. 4 – Yes, a responsible person is in place and has initiated work in year 1. 3 – There is a funded position and the process of personnel selection is under way. 2 – The position is being scoped, and a position description and funding requirements are in preparation. 1 – The idea of a responsible person is under consideration 0 – There is no single person responsible and this is not under consideration.	For relevant ecosystem services, see Detailed Scorecard, Essential 5. The key question here is whether there is a clear responsibility for making sure that the ecosystem services in question are in a suitable condition to deliver the expected resilience benefits and have not become degraded over time.
Essential 6: Strengthen institutional capacity for resilience. **(For additional notes and examples, see Detailed Scorecard, Essential 6).**				
6.1	**Skills**	Do the building's owners/managers have the skills they need to be effective at maintaining or increasing resilience?	5 – Yes, a full complement of the required skills is available. 4 – Yes, with some minor shortfalls. 3 – Some more significant gaps, but training is in process. 2 – Several major shortfalls in required skills. 1 – No real attempt to make sure the required skills or knowledge are available. 0 – No skills or knowledge.	Skills may be accessed from external experts or in-house. See Detailed Scorecard, Essential 6 for full listing.
6.2	**Data**	Do the building's owners/ managers engage in data driven decision making?	5 – Yes, a comprehensive and integrated data set exists for the building and all key physical and IT systems; and the owners/managers make extensive use of data in resilience planning. 4 – Yes, as above but with a few minor omissions.	

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			3 – Data is available, but it is in several locations; and some resilience decisions are taken more on hunches than data. 2 – Significand shortcomings in data availability and in the use of data for decision making. 1 – Only rudimentary access to and use of data. 0 – No building data available and none used for resilience decisions.	
6.3	**Communications**	Are occupants made fully aware of all hazards that could occur within the building, how to prepare for these, and how to respond to, and recover from them?	Communications to inform, discuss and update occupants of all relevant hazards, required preparations and recovery actions 5 – … are organized into a comprehensive and integrated program using many forms of media, covering all required issues, with material updated annually or better. 4 – … are comprehensive and integrated as above, but with a few minor omissions. 3 – … are extensive but have some omissions and are not updated annually. 2 – … are extensive but only available on request, and are not updated annually; 1 – … only address some hazards, are available upon request, and are old and incomplete. 0 – No communications.	
Essential 7: Increase social and cultural resilience. **(For additional notes and examples, see Detailed Scorecard, Essential 7).**				
7.1	**Critical buildings**	If the building has a critical role in the community, or is a designated emergency shelter, how resilient is it?	The building scores an average of … 5 – … 4.0 or higher on this summary** (implying a high general level of resilience). 4 – … 3.5 to 4.0 on this scorecard. 3 – … 3.0 – 3.5 on this Scorecard. 2 – … 2.5 – 3.0 on this Scorecard. 1 – … 2.0 – 2.5 on this Scorecard. 0 – … less than 2.0 on this Scorecard.	** When calculating this average, omit the score for Essential 7 to avoid circularity and double counting. For definition of critical buildings, see Detailed Scorecard, Essential 7.
7.2	**"In-reach" (for residential buildings)**	How effectively have the building's owners/managers engaged building occupants, and how effectively will occupants (residents) assist in helping the vulnerable?	5 – Yes, occupants are fully engaged and conversant with disaster plans and what they need to do – including knowing who is vulnerable and may need additional help. 4 – Yes, occupants are fully conversant as above, with some minor gaps.	If the building has no residents, omit this assessment. An up-to-date roster of residents, and those needing assistance to evacuate in the event of a disaster, should be available.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			3 – Occupants are generally conversant and usually know who needs help, but there may be some gaps. 2 – Occupants have not been fully engaged and so lack key knowledge of how to respond to a disaster and who needs additional help. Some of the latter may be overlooked. 1 – Major gaps in occupant knowledge of disaster response and who need help. High probability of avoidable casualties as a result. 0 – No "in-reach" to occupants.	
7.3	**Outreach**	How effectively have the building's owners/managers engaged the city and community around them?	5 – High level of engagement with the local community on disaster readiness and with the city on broader disaster planning, involving multiple activities in each case. 4 – High level of engagement with either the local community or the city, but only moderate (involving a single activity) on the other. 3 – Moderate engagement (single activity) with both but plans to increase. 2 – Moderate engagement (single activity) with one but nothing with the other – no plans to increase. 1 – Only cursory attempts to engage with either - no activities yet carried out. 0 – No engagement.	For examples of outreach activities, see Detailed Scorecard, Essential 7.
Essential 8: Increase infrastructure resilience. **(For additional notes and examples, see Detailed Scorecard, Essential 8).**				
8.1	**Previous assessments**	Has an all-hazards vulnerability assessment been conducted for building/facility/assets?	5 – Yes, conducted and updated regularly. 4 – Yes, conducted but no schedule for updates. 3 – Some assessments conducted, but not all hazards. 2 – Assessment conducted but focused on some assets, systems only. 1 – Partial assessments only on limited hazards for limited assets. 0 – No assessments conducted.	
8.2	**Internal infrastructure – natural threats**	Do building/facility managers have a good understanding of natural threats facing their facility?	5 – Yes, complete 4 – Yes, complete for most systems/assets, with a few minor exceptions.	Builds on Essential 2.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			3 – Understanding of a limited set of hazards only – not all those that apply. 2 – Partial understanding, for a limited set of hazards 1 – Considerations only of risk only – not full understanding. 0 – No understanding	
8.3	**Internal infrastructure – man-made threats**	Do building/facility managers have a good understanding of man-made threats facing their facility?	5 – Yes, complete 4 – Yes, complete for most systems/assets, with a few minor exceptions. 3 – Understanding of a limited set of hazards only – not all those that apply. 2 – Partial understanding, for a limited set of hazards 1 – Considerations only of risk only – not full understanding. 0 – No understanding	Cyber-threats would normally be included in this heading. However, cyber security is a highly specialized issue best assessed with purpose-designed instruments. If such an assessment exists for the building, then it may be used as evidence here – but users are STRONGLY recommended NOT to simply estimate cyber security levels without the benefit of such an instrument.
8.4	**Internal infrastructure – man-made threats**	Has an adaptation plan been prepared to mitigate these risks?	5 – Yes, complete plan exists. 4 – Yes, complete plan applies to most systems/assets, with a few minor exceptions. 3 – Planning for limited hazards only. 2 – Partial planning. 1 – Consideration of response only – not yet a formal plan. 0 – No planning.	See Essentials 1 and 9
8.5	**Supporting public infrastructure - external**	Are vulnerabilities and risks to supporting infrastructure systems and services well understood?	5 – Yes, well understood. 4 – Yes, well understood with a few minor exceptions. 3 – Understood but with some more major exceptions – none of them critical. however. 2 – Several major infrastructure systems are not understood – these could be critical for the building. 1 – Only a rudimentary understanding. 0 – No understanding.	
8.6	**Supporting public infrastructure - external**	Has an adaptation plan been prepared to mitigate these risks?	5 – Yes, complete plan exists. 4 – Yes, complete plan applies to most systems, with a few minor exceptions. 3 – Planning for limited hazards only. 2 – Partial planning.	

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – Consideration of response only – not yet a formal plan. 0 – No planning.	
Essential 9: Ensure effective disaster response. **(For additional notes and examples, see Detailed Scorecard, Essential 9).**				
9.1	**Disaster response plans and drills**	Do the building owners/managers plan and practice for foreseeable disasters?	5 – Yes, comprehensive disaster response plans exist, and regular drills are held annually to practice post disaster recovery. 4 – Yes, comprehensive plans exist, and drills are held, as above, but the former have minor gaps and latter may not be annual. 3 – Plans exist, and drills are held but there are more significant gaps in content and timing. 2 – One or more major weaknesses exist in plans and drills/exercises that may undermine the disaster response. 1 – Only rudimentary attempts at planning and drills - unlikely to be effective. 0 – No plans or drills for disaster response.	See Detailed Scorecard, Essential 9, for plan contents and coverage. Drills and such will of course require the participation of building occupants and other stakeholders.
9.2	**Warning systems**	How timely and effective are warning systems in terms of their ability to reach all those who need them?	5 – Effective and timely warning systems exist that are proven to reach all occupants and stakeholders who need them. 4 – Effective and timely systems exist but their reach has a few minor gaps. 3 – Warning systems exist but they may not be as timely as required and have some more significant gaps in reach. 2 – Warning systems have major issues with timeliness and reach, such that lives may avoidably be put in danger. 1 – Only rudimentary warning systems with very restricted timeliness and reach. Highly unlikely to be adequate. 0 – No warning systems.	
9.3	**Emergency communications, equipment and people**	What is the level of readiness to respond to foreseeable disasters and emergencies with respect to 1) communications systems, 2) emergency equipment, 3) building facility systems and 4) people?	5 – High level of readiness in all four areas 4 – High level of readiness in all areas, with a few minor omissions 3 – High readiness in two or three of four areas or moderate readiness in all four. 2 – Partial readiness in two areas but low in the third and fourth.	Emergency equipment and communications requirements: see Detailed Scorecard, Essential 9. Note that communications systems include social media, call centers, and any other available means of with occupants – not just the traditional satellite

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – Significant gaps in readiness in all areas. 0 – Absence of readiness throughout, and no attempt to address this.	phone systems or back up radio for communicating with first responders.
Essential 10: Expedite recovery and build back better. **(For additional notes and examples, see Detailed Scorecard, Essential 10).**				
10.1	**Post disaster plans and drills**	In addition to disaster planning and drills, do the building owners/managers plan and practice for the post-disaster recovery period?	5 – Yes, comprehensive post disaster recovery plans exist, and regular drills or tabletop exercises are held annually to practice post disaster recovery. 4 – Yes, comprehensive plans exist, and drills are held, as above, but the former have minor gaps and latter may not be annual. 3 – Plans exist, and drills/exercises are held but there are more significant gaps in content and timing. 2 – One or more major weaknesses exist in plans and drills/exercises that may undermine the post disaster recovery. 1 – Only rudimentary attempts at planning and drills/exercises - unlikely to be effective. 0 – No plans or drills/exercises for post disaster recovery.	Immediate disaster response plans and drills are covered in Essential 9 above. However, while post disaster recovery plans and exercises address separate issues, they could be integrated with those in Essential 9. See Detailed Scorecard, Essential 10, for necessary plan contents.
10.2	**Learning and updates**	Do the building owners/managers learn from experience and from practice elsewhere?	5 – Yes, recovery plans and procedures are reviewed and updated in a formal annual process for direct experience (if applicable), and for learnings from other disasters. There is a demonstrable record of changes made. 4 – Yes, there are frequent reviews and updates, with a record of changes, but not as part of a specific process. Some minor improvements may be missed as a result. 3 – Reviews and updates are held but not annually and as a result the more significant learnings may be missed, and changes may not be made. 2 – The learning process of reviews and updates has significant weaknesses that undermine its effectiveness – needed changes are often omitted. 1 – Reviews and update processes are rudimentary at best.	

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			0 – No review and update process.	
10.3	**Speed of recovery**	Do the building owners/managers have access to the funds and equipment they need to ensure the fastest possible recovery of the building, and do they target recovery times?	5 – Yes, rapid access to funds and required equipment are assured, and recovery times are targeted, with a track record of rapid recovery. 4 – Rapid access is broadly assured, and times are targeted, but there are some minor gaps in equipment availability. 3 – Rapid access to funds or equipment is not assured in some significant instances, and times are not targeted. 2 – Major gaps in likely availability of funds or equipment will definitely slow down recovery by a significant amount. 1 – Only rudimentary attempts to confirm availability of funds or equipment. The building is unlikely to recover quickly. 0 – No thought or time given so far to this issue.	

Part 2 – Detailed Scorecard (116 Assessments)

Essential 1: Organize for Resilience

Essential 1 assesses the existence of an effective organization and planning focus within the building ownership/management, and its effectiveness in collaboration and sharing of information with internal and external stakeholders.

There are three levels of planning in the Building Scorecard, all with different timescales and considerations:

- The focus in Essential 1 is on building and maintaining resilience generally, over time:
- Planning and preparation for the management of actual disasters is covered in Essential 9;
- Planning and preparation for post disaster recovery are dealt with under Essential 10.

Some assessments under this Essential may apply across portfolios, campuses or other collections of buildings: for example, the focal point identified in 1.2.1 may apply to all buildings on a campus. This may simplify and speed up completion of the scorecard.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
1.1	**Planning for resilience.**			
1.1.1	**Existence of plans to maintain or improve the building's disaster resilience**	Do plans exist to increase or maintain the disaster resilience of the building? For new buildings – has the design process specifically accounted for its exposure to existing or anticipated hazards, whether singly or together?	5 – The building has up to date and comprehensive plans to increase or maintain its resilience in line with its exposure to known current and anticipated future hazards, either singly or in combination. 4 – The building has comprehensive plans, but they may be in need of minor updates, or they may use data and assumptions on hazards and exposures that are somewhat out of date (5 or more years old) or not specific to the building's locale or to existing/future hazards. 3 – There are some plans, but they have gaps; data and assumptions on hazards and exposure have more gaps, also. There is no multi-hazard assumption. 2 – Plans and/or assumptions on hazards and exposures have major omissions or inaccuracies. 1 – Plans are at best rudimentary and of doubtful value. 0 – No plans.	Current and future hazards are identified in Essential 2. This Essential uses the results from Essential 2 to ensure that plans address the hazards identified. Hazards may include, but are not limited to: • Flood - coastal storm surge, tidal, pluvial/storm water, or fluvial/riverine; • Seismic events - earthquake, vulcanism, and resulting tsunami; • Landslides and avalanches; • Severe weather - wind, tornado, hail, lightning, snow, ice-storms, drought, or severe heat or cold; • Wildfires; • Man-made risks - explosion, terrorism, or poison release; • Health issues such as pandemics, or sanitation issues in the aftermath of a disaster (please refer to the Healthcare Addendum to the City scorecard for more detail on the latter);

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				• Infrastructure disruption – loss of energy, water, sanitation, transportation or communications service; • Any combination of the above, whether in parallel or one as a consequence of another. Plans to increase or maintain disaster resilience will include review of updated data and assumptions on hazards and exposures, changes in building use, changes in land use around the building, changes in traffic levels, updates to key infrastructure serving the building, and so on. These plans are for improving resilience over the long term – for business continuity plans see 1.1.2 immediately below, and Essential 9. For emergency response plans, see Essential 9. Whether plans have actually been financed and implemented or not will be reflected in Essentials 3 and 8.
1.1.2	**Participation in programs to develop COOP**	Has the building ownership or management taken part in any formal campaign or program to assist in developing or updating a continuity of operations plans (COOP)?	5 – Training and support is available, and the building ownership and management has participated recently (within the last 2 years) and fully in a training program. The content and validity of the resulting new or updated COOP has been audited. 4 – Training and support are available, but the building ownership/management has not participated within the last 24 months. The previous COOP has however been audited. 3 – Training and support is available, but the building owner/manager has not participated within the last 3 years, and then not fully (for example with all relevant staff) or in having the program audited. 2 – No training is currently available, but the building owner/manager is working (alone or with others) to create this.	COOP plans are sometimes referred to as Emergency Response Plans (ERP). However, they need address more than the immediate response to the disaster and include recovery and restoration. The existence of such plans is covered in Essential 9. COOP programs offering training, support or advice may be sponsored by local or regional governments, other agencies, NGOs, universities and technical colleges, or insurance providers. These programs may offer financial incentives for taking part. The actual quality and completeness of the COOP and its compatibility with those of the city and other businesses are addressed in Essential 9.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – Training and support are available, but the building owner/manager has only participated in a cursory way (for example having a junior employee attend). 0 – No training and no plans to create this.	As noted, tenants' organizations may be included in the definition of building owner/manager as applicable.
1.2	**Organization, coordination and participation.**			
1.2.1	**Presence of resilience planning and management focus for internal stakeholders**	Is there a person, office or team designated by the building ownership/management to coordinate resilience planning response and recovery with internal stakeholders?	5 – A dedicated focal point is designated for the building. They communicate information to residents/employees and are clearly accountable for leading all resilience activities within the business ownership/ management and internal stakeholders. 4 – A focal point is designated but is not dedicated – they must share time with other responsibilities, including to more than 5 other buildings within the ownership/management organization. 3 – There is no formal designee – resilience duties are split between different functions. They are largely executed but would benefit from more coordination. A semi-formal coordinator may have been appointed (or may have volunteered) for the building but has no actual executive powers. 2 - A focal point is informally designated (or has volunteered) and executes some aspects coordination from time to time. 1 – A focal point is designated in theory but does not really carry out the role. 0 – No focal point.	Internal stakeholders include, but are not limited to: • Building owners/managers and their staff or agents who may have responsibilities to support and manage the building day-to-day; • Business or residential occupants, including those with disabilities (see 1.2.3.1 below). (External stakeholders are defined in 1.2.2 below). A designated central focal point may be a person, office or team. One is required for clarity, efficiency of coordination, and accountability. Some organizations identify their focal point as the "Chief Resilience Officer". This may or may not be combined with the role of "Chief Sustainability Officer". Other organizations have a head of business continuity planning as the focal point. In apartment buildings the focal person/office would liaise with owners and tenants' organizations or cooperatives as applicable. The role of these entities in maintaining resilience and responding to disasters should be clearly defined. Cohesion within the building and with adjacent building owners/managers and occupants is critical. Internal stakeholders include, but are not limited to: • Building owners/managers

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				• Business or residential occupants, including those with disabilities (see 1.2.3.1 below). External stakeholders are defined in 1.2.2 below.
1.2.2	**Coordination with external stakeholders**	Does the building ownership/ management coordinate resilience planning and exchange all relevant information with all external stakeholders?	The building owner/manager … 5 – … regularly exchanges all relevant information and coordinates with all known stakeholders and is confident that its needs and point of view are heard and acted upon by those stakeholders. 4 – … regularly exchanges all relevant information and coordinates with most external stakeholders. 3 – … regularly exchanges at least some information with several stakeholders, but not with one or more key stakeholders. 2 – … exchanges some information intermittently with some key stakeholders and the extent of coordination is limited. 1 – … exchanges information infrequently and incompletely, and there is no coordination as such. 0 – No information exchange or coordination at all.	Coordination would ordinarily be via the focal point in 1.2.1 above. "Regular" exchanges = annually, or more frequent. External stakeholders include, but are not limited to: • The city government; • State and other tiers of government, as applicable, including government agencies; • First responders, if separate from the above; • Crisis and emergency management authorities, if separate; • Utilities and communications companies; • Owners/managers and perhaps occupants of other buildings in the immediate vicinity; • Owners and managers of other businesses in the area (including shops and restaurants), and business organizations/Chambers of commerce; • Community organizations; • Environmental groups; • NGOs; • Scientific and risk management experts; • Healthcare and public health organizations (for residential buildings); • Insurers; • Those with a financial interest in the building – investors, bankers etc. Relevant information to be exchanged may include, as applicable: • Resilience plans (see 1.1.1 above), and roles or responsibilities (see below); • Building layouts and schematics, and any temporary or permanent changes to these; • Known changes to hazards or exposures;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				• Occupancy details – numbers, names, responsibilities (see below); • Identity of individuals with special needs or disabilities, and the help that they may need; • Industrial processes in the building; • Hazardous materials and equipment (see below); • Emergency response plans and capabilities (see also Essential 9).
1.2.3	**Clarity of roles and responsibilities**	Are the responsibilities of the building owner/manager, internal stakeholders and external stakeholders clearly articulated in planning, responding and recovering from disasters?	5 – All roles and responsibilities are fully documented. Responsibilities are shared among and agreed by all stakeholders and confirmed to be consistent with their expectations: there are no "gaps" for key items or actions to "fall down". 4 – As above but with a few minor omissions with minor stakeholders. 3 – Some more significant gaps exist in the documentation, sharing of, and agreement with roles and responsibilities, but there is overall clarity despite this. 2 – Several key roles and responsibilities are not documented and/or not agreed with the relevant stakeholders, such that role expectations are unclear or confused. 1 – Only rudimentary attempts exist at documentation and agreement. 0 – No documentation or agreements.	The key here is both documentation of roles AND of stakeholders' agreement to them.
1.2.3.1	**Responsibilities for occupant safety**	Are responsibilities for occupant safety before, during and after emergencies clearly articulated in occupant contracts such as leases or building association contracts? Are there clear assignments to address the needs of vulnerable individuals?	5 – There is clear and detailed articulation of roles and responsibilities for occupant safety using established language, in all contracts and leases. 4 – Clear articulation exists, but with some minor omissions (for example in documents covered) or minor ambiguities. 3 – More significant omissions or ambiguities are present, but overall responsibilities are still clear. 2 – Major omissions and ambiguities exist such that responsibilities are unclear or confused. 1 – Only rudimentary attempts are made to specify responsibilities for occupant safety. 0 – No attempt to specify.	Responsibilities for occupant safety are identified as a key subset of 1.2.3 above. Within this, responsibility for the safety of vulnerable individuals (people with disabilities affecting mobility, sight, hearing, mental health, intellectual awareness and so on, and also their immediate carers if applicable) is a key concern.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
1.2.4	**Hazardous materials and equipment**	Does the building owner/manager fully track and report potential hazards such as chemical storage, stored energy, industrial equipment, poisons, chemicals or combustibles in the building or on the property grounds?	The building owner/manager … 5 – … tracks, and makes full and frequent reports of, all hazardous materials and equipment and their locations even if not required to by statute/regulation. 4 – … complies with all statutes and regulations, although these may leave some gaps in coverage or content. 3 – … attempts to make full and frequent reports but may accidentally miss some items or miss reporting deadlines. 2 – … reports major items only. 1 – … is clearly not consistently able to track hazardous materials and equipment but does report where possible. 0 – No attempt to track.	This assessment covers situations where the building owner/manager is responsible for the items in question, or where a tenant business might be. Poisons, chemicals and combustibles may arise from areas one might not think to include – doctors' or veterinary surgeries, dry cleaners, nail salons, for example. FEMA published a guide to management of hazardous materials at https://www.fema.gov/pdf/plan/6-ch-c.pdf
1.2.5	**Institutional strength**	Is the building owner/manager likely to be held to their responsibilities before, during and after an emergency, either by regular compliance and law enforcement, through an anti-corruption agency or through internal discipline?	5 – There is a high level of confidence that institutions and disciplines (see right) are strong enough to ensure that building owners and managers will execute their responsibilities fully and conscientiously. 4 – A high level of confidence is justified although there may be some evidence of slippage in minor areas. 3 – There is broad confidence that the essentials will be upheld, although execution is lacking in some areas. 2 – Significant areas of concern exist, for example in code compliance or emergency exit management. 1 – There is evidence that building owners and managers are actively seeking to evade major areas of their disaster resilience responsibilities. 0 – Zero confidence is justified that responsibilities have been or will be enforced.	Many cities and countries have great intentions for disaster resilience, but those intentions are undermined by a lack of willingness or ability to enforce building codes (Essential 4), or legal and regulatory compliance. "Institutions and disciplines" in this context include: • Government enforcement, compliance and anti-corruption agencies/mechanisms; • Internal disciplines (company or personal), as validated by track record. Resilient building owners will aim to meet requirements regardless of formal enforcement; • Recognized professional and standards organizations that require compliance with their standards.
1.3	**Routine consideration of resilience issues in all decisions, and track record/momentum.**			
1.3.1	**Role of disaster resilience as a decision criterion**	Are disaster resilience considerations for the building routinely considered and/or updated as part of the normal	5 – All relevant decision-making processes routinely consider the implications of decisions concerning the building for its disaster resilience.	Decision making processes can include those made at the local level (for example by building managers on-site), or where applicable in regional, national or global level in corporate hierarchies.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
		decision-making process affecting the building?	4 – Most relevant decision processes include disaster resilience considerations, with a few minor exceptions. 3 – Disaster resilience is covered in a separate review process, perhaps annually. This will however reverse other decisions where they are major adverse implications for disaster resilience. 2 – Disaster resilience is addressed sporadically, rather than systematically. 1 – Ad hoc use of disaster resilience for the building as a decision criterion, usually where it helps the political climate for or against a decision. 0 – Disaster resilience is rarely if ever considered in relevant decision-making processes.	Relevant decisions concerning the building may relate to, as examples: • Building use; • Erection of other buildings on the same site; • Occupancy levels; • Layout, extension, refitting or remodeling; • Maintenance practices; • Encouragement or discouragement of community uses; • Installation of additional production machinery or facilities; • Physical systems within the building (lighting, alarms, HVAC, elevators, etc); • Information technology and communication systems within the building; • Record keeping; • Inspections and audits; • Capex and opex budgeting and controls (See Essential 3); • Selection of designers, contractors and operators with proven track record.
1.3.2	**Track record and momentum**	Do the building owners/managers have a track record of improving the resilience of the building in response to new information about hazards or exposures?	5 – The building has a substantial track record with 3 or more major improvements to resilience in the last 5 years, and 5 minor improvements per year for each of the last 5 years, with further improvements planned. 4 – At least 1 major improvement in the last 5 years, and 5 minor improvements per year for each of the last 5 years, with further improvements planned. 3 – No major improvements, but a steady stream of 5 or more minor improvements per year for each of the last 5 years. More are planned. 2 – Some (<5) minor improvements in each the last 5 years, but there are plans to increase this going forward. 1 – <5 minor improvements per year for each of the last 5 years and no plans to increase this. 0 – No improvements, and no plans.	If the building is less than 5 years old – omit this assessment. This assessment is intended to measure momentum and progress in improving resilience, irrespective of whether the building is now as resilient as it could be, or fully code-compliant and so on. Improvements may have been intended directly to improve resilience or they may have come about as side-effects of changes made for other reasons (such as energy system upgrades for the building or for the area as a whole). They include but are not limited to: • Structural updates or other physical mitigation measures; • Improved planning and governance;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				• Improved understanding of risk (that has been acted upon); • Improved internal or external stakeholder liaison; • Improved skills, drills and training; • Improved emergency and post-event response capabilities; A “major” improvement is defined as one that would have resulted in scores for any combination of 5 or more individual assessments in this scorecard improving by 2 whole points (for example from 2 to 4, 2.7 to 4.7). A “minor” improvement is defined as one that would have resulted in scores for any individual assessment improving by 1 whole point. If there is documented proof that no further improvements are needed under any of the Essentials in this scorecard, score 5 on this assessment.

Essential 2: Identify, Understand and Use Current and Future Risk Scenarios

Essential 2 assesses the understanding of disaster risks or hazards that the building owner/manager has currently, or that can be foreseen given the combined impacts of increasing urbanization and climate change. Building owners/managers need a view of the evolution of risks to their building, as currently unforeseen impacts are possible within the timespan of their ownership or management!

The original City Disaster Resilience Scorecard requires cities to have two scenarios – a "worst case" and an "average case", addressing the risks that apply to the area in question. This Building Scorecard makes extensive use of the same "worst case/average case" construct. Building owners and managers should align first with the worst-case scenario, if available, but should attempt to define both scenarios for each applicable risk.

However, it is *not* necessary to have completed the City scorecard – only that the building owner/manager has access to the two scenarios described therein, if these have been created. These may be provided by the city itself, but they may also come from elsewhere (for example, local universities, other businesses, state governments, professional organizations, or the building's owners). However, note that in cases where businesses acquire scenarios from multiple sources, there is a risk that inconsistency with assumptions used by others can result in a faulty understanding of risk and thus reduce resilience. Other assessments in the Building Scorecard address the presence and impact of these inconsistencies.

In Section 2.3, even risks that do not apply should be assessed as indicated – as their non-applicability is part of the overall risk profile for the building. In later Essentials (especially in Essential 8), questions relating to these irrelevant risks can then be excluded.

Where a building owner/manager is responsible for several buildings in the same area or region, some aspects of risk assessment may be applicable to all buildings. This may simplify and speed up completion of the scorecard - *although care is needed to be certain that any apparently minor differences, for example in freeboard above flood risk levels, do not in fact require different risk, exposure or vulnerability ratings for each building.*

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
2.1	**Threat and risk analysis.**			
2.1.1	**Scenario availability**	Do the building owner/managers have access to credible city-level "worst case" and average case" scenarios that address the risks that apply in the area?	The building owners/managers … 5 – … have access to credible city-level scenarios which address both a "worst case" and an "average case" situation. 4 – … have access to credible city-level scenarios from other sources than the city – while these are complete and realistic, they may be inconsistent with those used by the city or other businesses (see below). 3 – … have access to credible city-level scenarios which address a single case only – these are however a worst case.	(See introduction to this essential). As noted, Risks or hazards may include, but are not limited to: • Flood - coastal storm surge, tidal, pluvial/storm water, or fluvial/riverine; • Seismic events - earthquake, vulcanism, and resulting tsunami; • Landslides and avalanches; • Severe weather - wind, tornado, hail, lightning, snow, ice-storms, drought, severe heat or cold; • Wildfires; • Man-made risks - explosion, terrorism, poison release;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			2 – … have access to city-level scenarios which address a single case only – and this is not necessarily a "worst case". 2 – … do not have access to credible city-level scenarios, but they can construct an approximation. 1 – … have only a rudimentary understanding of the risks and hazards they face. 0 – No risk information available.	• Health issues such as pandemics, or sanitation issues in the aftermath or a disaster (please refer to the Healthcare Addendum to the City scorecard for more detail on the latter); • Infrastructure disruption – loss of energy, water, sanitation, transportation communications service; • Any combination of the above, whether in parallel or one as a consequence of another. Each of these hazards may have its own measurement scale, often based on international standards. As the last two bullet points imply, it is important to consider multi-hazard or cascading events as well as single occurrences (see below). City level scenarios may come from the city itself, or they could be generated for the city by other organizations such as national weather, geological or risk management agencies, insurers or private risk management specialists.
2.1.2	**Threat and risk analysis**	Has a threat and risk assessment (TRA) been done of the building, using the scenarios in 2.1?	5 – An insurance-grade TRA has been carried out, including an engineering study of the building's reinforcements against the scenarios in 2.1. 4 – An insurance-grade TRA has been carried out by experts, against the scenarios in 2.1 3 – A high-level risk assessment of natural, human and technology threats (probability and consequences) has been completed, but in house. 2 – A basic high-level threat profile was completed in-house. 1 – A TRA has not been carried out, but the building owner/managers are relying on one carried out for the area. 0 – No TRA exists for the building or the area.	Building owners and managers should not assume that risks for adjacent or near-by buildings, even of identical construction, are necessarily the same: • Exposure to flooding may be different, where for example one building has more freeboard due to its landscaping, or where another structure may divert flood water towards it; • Seismic risk may vary; • Fire risk may vary; • Most importantly, given that risk is a combination of probability and impact (consequences) – the consequences may vary depending on activities and occupation in the building, its exact location and so on; • As already noted, local factors such as design differences or the implementation of green building technologies may mean that one building is more or less resilient than an adjacent one.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
2.1.2.1	**Impact of climate change and sea level rise**	Does the TRA consider the impact of climate change on risk and exposure levels, through the remaining design life of the building?	5 – The impact of climate change and sea level rise (as applicable) is assessed over the full expected life of the building and fully assimilated into the TRA. 4 – The impact of climate change is broadly assimilated over the full expected life of the building with some minor omissions. 3 – The impact of climate change is considered, but over the full expected life of the building and not fully included in the TRA. 2 – Climate change is only referenced in outline with no consideration of specific impacts over the life of the building. 1 – Climate change is not considered in the TRA. 0 – No TRA.	Climate change and sea level rise will change the distribution of risk for all natural hazards except seismic events. A building that is relatively resilient now may be less so in 10, or 20 years' time. Note that this assessment asks only whether climate change and sea level rise are considered. The actual impacts of climate change are addressed in 2.3 below.
2.1.2.2	**Consideration of combined and multi-hazard risks**	Does the threat and risk assessment consider combined or multi hazard risks?	The TRA … 5 – … fully considers combined risks. 4 – … makes extensive consideration of combined risks, with a few minor omissions. 3 – … makes some consideration of combined risks but does not offer a complete coverage. 2 – … acknowledges combined risks as a possibility but does not consider them in the same detail as single risks. 1 – … does not consider combined risks at all. 0 – No TRA	Many risk assessments focus on a single overriding risk (say an earthquake or a hurricane) but fail to consider the risk from a combination of two or more events simultaneously. These could individually be sub-critical, but catastrophic when combined. Examples of combined risks events might be: • High temperature event and wildfire; • Earthquake and tsunami; • In each case, perhaps with a resulting power and water failure, or disease risk. Note that this assessment asks only whether combined risks are considered. 2.3.14 below addresses that actual *impact* of those combined risks.
2.1.2.3	**Consistency with city and regional risk scenarios**	Does the TRA use consistent risk assumptions with those provided for the city and the region?	The risk assumptions in the TRA … 5 – … are fully consistent with those used by the city and surrounding region. 4 – … are mostly consistent with those used by the city and region. 3 – … are consistent but with one or two significant issues. 2 – … are significantly weaker than those used by the city or region.	"Fully consistent with" = they assume the possibility of disasters of equal or greater magnitude, and they share consistent assumptions about exposure, vulnerability and impact generally.

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			1 – … bear no relation to those used by the city. 0 – No risk assumptions available.	
2.2	**Specific risks.**			
2.2.1	**Risk of pluvial and fluvial (rainfall and riverine) flooding**	What is the threat level of the building with respect to pluvial and fluvial flooding?	There has been a pluvial/fluvial flooding event at the location of the building known to have caused significant damage and disruption …. 5 – … zero times in the last 100 years. 4 – … in the last 75-100 years. 3 – … in the last 50-75 years. 2 – … in the last 25-50 years. 1 – … in the last 5-25 years. 0 – … in the last 5 years – OR, if you do not know. **(Except where the score is already 0, if climate change is expected to increase the chance of a flooding event, reduce the score by 1 or 2 points according to the severity of the increase).**	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life. When gauging how much to decrease scores by when considering the impact of climate change, consider: • Location in a designated high-risk flood zone or not. • Recent history with flooding. • How many days of heavy rain events are projected within the next decade, as modelled for a "business as usual" (increasing carbon) scenario. • Projections for ice-melt events, where relevant. • The probability of a flood affecting the building due to its location on a flood plain or proximity to river, stream, canal or water course or seasonal flooding. • The probability of a flood affecting the building due to drainage problems due to the proximity to the water table, saturated groundwater or poor surface storm drainage. • The level of freeboard around the building. 100-, 50-, 25-, 10- and 5-year risks may be designated by state or local emergency management agencies according to local classifications, insurers or risk management specialists. For the US, see for example https://www.fema.gov/flood-zones . If this risk has not been or cannot be evaluated, score 0.
2.2.2	**Risk of coastal storm surge flooding**	What is the threat level with respect to coastal storm surge flooding? (Tidal flooding – see below)	There has been a coastal flooding event at the location of the building known to have caused significant damage and disruption ….	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life.

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			5 – … zero times in the last 100 years. 4 – … in the last 75-100 years. 3 – … in the last 50-75 years. 2 – … in the last 25-50 years. 1 – … in the last 5-25 years. 0 – … in the last 5 years – OR, if you do not know. **(Except where the score is already 0, if climate change is expected to increase the chance of a storm surge flooding event, reduce the score by 1 or 2 points according to the severity of the increase).**	When gauging by how much to decrease scores when considering the impact of climate change, consider: • The probability of a flood affecting the building due to its location on a coastal flood plain, combined with hurricane risk. • The projected impact of sea level rise on coastal flooding extents and exposures. • The level of freeboard around the building. 100-, 50-, 25-, 10- and 5-year risks may be designated by state or local emergency management agencies according to local classifications, insurers or risk management specialists. If this risk has not been or cannot be evaluated, score 0.
2.2.2.1	**Risk of tidal ("sunny day") flooding**	What is the threat level with respect to tidal flooding driven by sea level rise?	5 – The building is not in any risk tidal flooding and this will not change under any climate change/sea level rise scenario. 4 – The building will incur minor tidal flooding once a year within 30 years. 3 - The building will incur more pronounced tidal flooding – temporarily closing access to the building – twice a year within 25 years. 2 – The building will incur more pronounced tidal flooding monthly within 20 years. 1 – The building will experience tidal floods with the risk of significant damage monthly within 15 years. 0 – The building is already experiencing tidal flooding as a nuisance and will experience significant damage monthly within 10 years.	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life. Factors affecting the assessment of coastal flood risk include, but are not limited to, the following: • The probability of a flood affecting the building due to its location on a coastal flood plain, combined with hurricane risk. • The projected impact of sea level rise on coastal flooding extents and exposures. The level of freeboard around the building. 100, 50, 25, 10 and 5-year risks would be as designated by state or local emergency management agencies according to local classifications, insurers or risk management specialists. If this risk has not been or cannot be evaluated, score 0.

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2.2.3	**Risk of wind (hurricane, typhoon, tropical storm or tornado).**	What is the threat level of the building with respect to high wind?	There has been a wind event at the location of the building known to have caused significant damage and disruption …. 5 – … zero times in the last 100 years. 4 – … in the last 75-100 years. 3 – … in the last 50-75 years. 2 – … in the last 25-50 years. 1 – … in the last 5-25 years. 0 – … in the last 5 years – OR, if you do not know. **(Except where the score is already 0, if climate change is expected to increase the chance of a wind event, reduce the score by 1 or 2 points according to the severity of the increase).**	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life. When gauging how much to decrease scores by when considering the impact of climate change, consider: • Whether the building is located in a region that is prone to hurricanes - the *current* probability in this region in terms of frequency of hurricanes. *[See maps: USA: http://www.geogiscart.podserver.info/3530/mapgallery.htm?ckattempt=1 OR http://community.fema.gov/hazard/hurricane/be-smart ASIA PACIFIC: http://reliefweb.int/sites/reliefweb.int/files/resources/map_1305.pdf].* • How many tropical storms/hurricanes are projected within the next decade, as modelled for a "business as usual" (increasing carbon) scenario. • Whether the building is located in a region that is prone to tornadoes or high winds *[See maps: USA: http://rethinksurvival.com/net-guide/hazard-risk-assessment/ OR http://www.wunderground.com/tornado/ CANADA & EUROPE: http://www.ustornadoes.com/2013/07/25/from-domestic-to-international-tornadoes-around-the-world/* • See also http://www.gdacs.org/Knowledge/archivedocuments.aspx and emdat.be. • How many tropical storms/hurricane events the region currently experiences. • How many tropical storms are projected within the next decade, as modelled for a "business as usual" (increasing -carbon) scenario.

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				100-, 50-, 25-, 10- and 5-year risks may be designated by state or local emergency management agencies according to local classifications, insurers or risk management specialists. If this risk has not been or cannot be evaluated, score 0.
2.2.4	**Risk of extreme weather (heat, hail, ice storm, extreme cold)**	What is the threat level of the building with respect to extreme weather?	There has been an extreme weather event at the location of the building known to have caused significant damage and disruption …. 5 – … zero times in the last 100 years. 4 – … in the last 75-100 years. 3 – … in the last 50-75 years. 2 – … in the last 25-50 years. 1 – … in the last 5-25 years. 0 – … in the last 5 years – OR, if you do not know. **(Except where the score is already 0, if climate change is expected to increase the chance of an extreme weather event, reduce the score by 1 or 2 points according to the severity of the increase).**	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life. When gauging how much to decrease scores by when considering the impact of climate change, consider: • Days of extreme heat (>100°F / 37°C) the region currently experiences. • Days of extreme temperature (>100°F / 37°C) that are projected by the next decade, as modelled for a "business as usual" (increasing carbon) scenario. • Days of ice storm events the region currently experiences. • Days of ice storm events that are projected by the next decade, as modelled for a "business as usual" (increasing carbon) scenario. • Days of extreme cold, both now and as projected. 100-, 50-, 25-, 10- and 5-year risks may be designated by state or local emergency management agencies according to local classifications, insurers or risk management specialists. If this risk has not been or cannot be evaluated, score 0.
2.2.5	**Risk of seismic event –**	What is the threat level of the building with respect to seismic events?	5 – No known seismic risk capable of causing significant damage to the building.	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life.

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	earthquakes, vulcanism		4 – A seismic event capable of causing significant damage to the building is more than 50% likely within the next 70 years. 3 – …more than 50% likely within the next 50 years. 2 – … more than 50% likely within the next 40 years. 1 – …more than 50% likely within the next 30 years. 0 – …more than 50% likely within the next 20 years.	Assess the likelihood from a regional seismic hazard map. • USA: *http://www.geogiscart.podserver.info/3530/mapgallery.htm?ckattempt=1* OR *http://community.fema.gov/hazard/earthquake/be-smart* • CANADA: *http://earthquakescanada.nrcan.gc.ca/hazard-alea/simphaz-eng.php* • EUROPE: *http://www.share-eu.org/node/90* • ASIA PACIFIC: *http://www.preventionweb.net/files/3285_UNISDRAsiaPacificRegional2.pdf* • AFRICA: *https://www.preventionweb.net/english/professional/maps/v.php?id=7483* If this risk has not been or cannot be evaluated, score 0.
2.2.6	**Risk of tsunami**	What is the threat level of the building with respect to tsunamis?	5 – No known tsunami risk capable of causing significant damage to the building. 4 – A tsunami event capable of causing significant damage to the building is more than 50% likely within the next 70 years. 3 – …more than 50% likely within the next 50 years. 2 – … more than 50% likely within the next 40 years. 1 – …more than 50% likely within the next 30 years. 0 – …more than 50% likely within the next 20 years.	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life. Factors affecting the assessment of tsunami risk include, but are not limited to, the following: • What is the probability of a tsunami affecting the building due to its location on a coastal flood plain or in a tsunami zone? • What is the level of freeboard around the building? If this risk has not been or cannot be evaluated, score 0.
2.2.7	**Risk of wildfire**	What is the threat level of the building with respect to a wildfire incident?	There has been a wildfire event at the location of the building known to have caused significant damage and disruption …. 5 – … zero times in the last 100 years.	"Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life.

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			4 – … in the last 75-100 years. 3 – … in the last 50-75 years. 2 – … in the last 25-50 years. 1 – … in the last 5-25 years. 0 – … in the last 5 years – OR, if you do not know. **(Except where the score is already 0, if climate change is expected to increase the chance of an extreme weather event, reduce the score by 1 or 2 points according to the severity of the increase).**	When gauging how much to decrease scores by when considering the impact of climate change, consider: • Is the building located in an area prone to wildfires? • When was the last fire and how much fuel has accumulated in the area since then? • Is the building located in proximity to external fire hazards, such as a railway, lumberyard, oil storage tank, cluttered buildings and grounds containing heavy mechanical or electrical equipment, or volatile materials? 100-, 50-, 25-, 10- and 5-year risks would be as designated by state or local emergency management agencies according to local classifications, insurers or risk management specialists. Designations should be as recent as possible, given that risk probabilities are increasing due to urban growth and climate change. If this risk has not been or cannot be evaluated, score 0.
2.2.8	**Risk of hazardous materials incident**	What is the threat level of the building with respect to a hazardous materials incident?	The building has … 5 – … no known hazardous materials risk on site or nearby, beyond that from cleaning and other daily use/housekeeping materials. 4 – … minor hazardous materials risk on site or nearby, for example from solvents used for cleaning equipment, or gasoline. 3 – … at least one significantly hazardous material on site or nearby (close enough to pose a threat to health or life). 2 – … two to four significantly hazardous materials on site or nearby. 1 – … four or more significantly hazardous materials on site or nearby. 0 – The building (or one nearby) is engaged in the manufacture of significantly hazardous materials	"Significantly hazardous" = capable of injuring health or threatening life (from poisoning, radiation, caustic burns, explosions and so on) in the quantities present. Consider the risk of hazardous materials incident: • From within the building; • From a neighboring site. If this risk has not been or cannot be evaluated, score 0.

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			and these are therefore continuously present in large quantities.	
2.2.9	**Risk of unwanted intruder or terrorist incident**	What is the threat level of the building with respect to an unwanted intruder or terrorist incident?	The building … 5 – … has a low to non-existent terror or intruder risk; and/or no intrusion or terror event has been attempted on it or others like it in anywhere in the same state or country in the last 30 years. 4 – … is an intrusion target by virtue of having large sums of money or other valuables (data, jewels, gold) within it; and/or intrusion events have taken place there or at others like it anywhere in the same state or country in the last 25 years. 3 – … is an intrusion or a slightly elevated terror target; and/or a terror or intrusion event has taken place there within the last 20 years. 2 – … is an intrusion or a moderately elevated terror target; and/or a terror or intrusion event has taken place there or at others like it anywhere in the same state or country within the last 15 years. 1 –… is an intrusion or a significantly elevated terror target; and/or a terror or intrusion event has taken place there or at others like it anywhere in the same state or country within the last 10 years. 0 – … is known to be an active terror target; and/or terror or intrusion events have taken place there or at others like it in anywhere in the same state or country in the last 5 years.	Note that risk of cyber intrusion is NOT included in this scorecard as it requires specialist knowledge and tools. Factors affecting the assessment of intruder or terrorist risk include, but are not limited to, the following: • Presence of high value items or cash; • Presence of children or minors; • Local political, economic or social factors; • The nature of occupant operations; • The site having political or historical symbolism and/or being near a site with political/historical symbolism; • Tenants or close neighbors that could be considered a potential target; • The site having an important function in critical infrastructure or is in immediate proximity to critical infrastructure; and/or the site being a likely target AND a soft target [i.e. vulnerable to attack]. Risk designations would be obtained from police and national or regional security agencies. If this risk has not been or cannot be evaluated, score 0.
2.2.10	**Risk of power failure**	What is the probability of a major power failures, either a threat to resilience in its own right or as a consequence of the above disasters?	Power failures in normal conditions …. 5 – …. have averaged less than 1 hour per year for the last 5 years; and/or power has not been interrupted by a disaster for 4 hours or more in the last 25 years. 4 – …. have averaged 1-5 hours per year for the last 5 years; and/or power has been interrupted by a disaster for 4 hours or more at least once in the last 25 years.	Where conflicting outcomes arise, go to the lowest applicable score. For example – if power failures have only averaged 1-5 hours a year, but there have been disruptions due to a disaster in the last 10 years – score 1.

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			3 – …. have averaged 5-10 hours per year for the last 5 years; and/or power has been interrupted by a disaster for 4 hours or more at least once in the last 20 years. 2 – …. have averaged 10-20 hours per year for the last 5 years; and/or power has been interrupted by a disaster for 4 hours or more at least once in the last 15 years. 1 – …. have averaged once per week for the last 5 years; and/or power has been interrupted by a disaster for 4 hours or more at least once in the last 10 years. 0 – Power supply is erratic on a daily basis; and/or power has been interrupted by a disaster for 4 hours or more at least once in the last 5 years.	
2.2.11	**Disruption to transportation routes**	What is the probability of a major disruption to transportation routes, either a threat to resilience in its own right or as a consequence of the above disasters?	Road transportation disruptions in normal conditions … 5 – … have averaged less than 1 hour per day for the last 5 years; and/or water/rail/air disruptions have averaged less than 1 day per year for the last 5 years; and/or transportation has not been interrupted by a disaster in the last 25 years. There are no vulnerable "bottlenecks" (tunnels, bridges etc.) to exit routes. 4 – … have averaged 1-2 hours per day for the last 5 years; and/or water/rail/air disruptions have averaged 1-2 days per year for the last 5 years; and/or transportation disruptions were increased from this level by a disaster in the last 25 years. 3 – … have averaged 2-3 hours per day for the last 5 years; and/or water/rail/air disruptions have averaged 2-5 days per year for the last 5 years; and/or transportation disruptions were increased from this level by a disaster in the last 20 years. 2 – … have averaged 3-4 hours per day for the last 5 years; and/or water/rail/air disruptions have averaged 5-10 days per year for the last 5 years; and/or transportation disruptions were increased from this level by a disaster in the last	Where conflicting outcomes arise, go to the lowest applicable score. For example – if road transportation disruptions have only averaged 1-2 hours a day, but there have been disruptions due to a disaster in disasters in the last 5 years – score 1. Disruption is as experienced by occupants in the building in question. Disruption in road transportation includes average commute delays as well as shipping goods by road (as applicable); those in water, air and rail systems are focused on shipping goods.

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			15 years. There are exit routes which avoid bottlenecks, but congestion is significant. 1 – … have averaged over 4 hours per day for the last 5 years; and/or water/rail/air disruptions have averaged 10-15 days per year for the last 5 years; and/or transportation disruptions were increased from this level by a disaster in the last 10 years. 0 – … are more normal than not; water/rail/air disruptions have occurred weekly for the last 5 years; and transportation disruptions were increased from this level by a disaster at least once in the last 5 years.	
2.2.12	**Disruption to water supply**	What is the probability of a major disruption to the water supply?	Water supply disruptions in normal conditions … 5 – … have averaged less than 1 hour per year for the last 5 years; and/or water has not been interrupted by a disaster for 4 hours or more in the last 25 years. 4 – … have averaged 1-5 hours per year for the last 5 years; and/or water has been interrupted by a disaster for 4 hours or more at least once in the last 25 years. 3 – … have averaged 5-10 hours per year for the last 5 years; and/or water has been interrupted by a disaster for 4 hours or more at least once in the last 20 years. 2 – … have averaged 10-20 hours per year for the last 5 years; and/or water has been interrupted by a disaster for 4 hours or more at least once in the last 15 years. 1 – … have averaged once per week for the last 5 years; and/or water has been interrupted by a disaster for 4 hours or more at least once in the last 10 years. 0 – … occur on a daily basis; and/or water has been interrupted by a disaster for 4 hours or more at least once in the last 5 years.	Where conflicting outcomes arise, go to the lowest applicable score. For example – if water failures have only averaged 1-5 hours a year, but there have been disruptions due to a disaster in the last 10 years – score 1.
2.2.13	**Disruption to communicat-ions**	What is the probability of a major disruption to phone and internet communications?	Communications failures in normal conditions … 5 – … have averaged less than 1 hour per year for the last 5 years; and/or communications have not	Where conflicting outcomes arise, go to the lowest applicable score. For example – if communications failures have only averaged 1-5 hours a year, but

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			been interrupted by a disaster for 4 hours or more in the last 25 years. Back-up systems are in place. 4 – … have averaged 1-5 hours per year for the last 5 years; and/or communications have been interrupted by a disaster for 4 hours or more at least once in the last 25 years. 3 – … have averaged 5-10 hours per year for the last 5 years; and/or communications have been interrupted by a disaster for 4 hours or more at least once in the last 20 years. 2 – … have averaged 10-20 hours per year for the last 5 years; and/or communications have been interrupted by a disaster for 4 hours or more at least once in the last 15 years. Back-up systems are in place but limited in extent. 1 – … have averaged once per week for the last 5 years; and/or communications have been interrupted by a disaster for 4 hours or more at least once in the last 10 years. 0 – … occur on a daily basis; and/or communications have been interrupted by a disaster for 4 hours or more at least once in the last 5 years.	there have been disruptions due to a disaster in the last 10 years – score 1. Communications failures includes both outages to phone or fata communications systems; and slower than acceptable speeds for data traffic.
2.2.14	**Combined risks**	What is the risk of any foreseeable *combination* of the above risks?	A combined risks event that causes significant damage in the location of the building has happened … 5 – … zero times in the last 100 years. 4 – … in the last 75-100 years. 3 – … in the last 50-75 years. 2 – … in the last 25-50 years. 1 – … in the last 5-25 years. 0 – … in the last 5 years – OR, if you do not know. **(Except where the score is already 0, if climate change is expected to increase the chance of a combined risks event, reduce the score by 1 or 2 points according to the severity of the increase).**	This assessment attempts to address the risk from a combination of two or more events from those listed above, simultaneously. These could individually be sub-critical, but catastrophic when combined. Examples of combined risks events might be: • High temperature event and wildfire; • Earthquake and tsunami; • In each case perhaps with a resulting power and water failure, or disease risk. "Significant damage" = damage preventing usage of the building for longer than 5 days and/or posing a threat to life.

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2.3	**Financial and legal implications.**			
2.3.1	**Monetary consequences of building shutdown**	What are the estimated financial losses in the event that the building must be shut-down for longer than 1 month?	The monetary consequences would be … 5 – … negligible. 4 – … low and generally manageable from internal resources. 3 – … manageable but will materially impact the performance of the organization. 2 – … likely to require additional funding or loans. 1 – … seriously damaging to the business. 0 – … catastrophic – business closure.	See also Essential 3.
2.3.2	**Legal or contractual consequences of building shutdown**	What are the legal /contractual implications in the event that the building must be shut down for longer than 1 month?	The legal and contractual consequences would be … 5 – … negligible. 4 – … low and generally manageable without further implications. 3 – … manageable but will result in legal action. 2 – … likely to result in significant lawsuits. 1 – … a major legal exposure for the business that materially affects creditworthiness or cost of capital. 0 – … catastrophic – business closure.	See also Essential 3.
2.3.3	**Social and economic consequences of building shutdown**	What are the social and economic implications for the community in the event that the building must be shut down for longer than 1 month?	The social and economic implications would be … 5 – … negligible. 4 – … low and generally manageable without further implications. 3 – … manageable but will result in social or economic impacts to the community, relating both to local employment and other factors. 2 – … likely to result in significant adverse social or economic impact. 1 – … a major exposure for the community that will inflict permanent or near-permanent damage on it and/or the local economy. 0 – … a catastrophic impact on the community and/or local economy.	Some buildings provide irreplaceable services to the community, ranging from the provision of social services from a government building to representing a major focus of employment, in say, an already economically deprived area. See also Essential 7.

Essential 3 – Strengthen Financial Capacity for Resilience

Essential 3 addresses the "financial architecture" of disaster resilience – funding aligned to clearly defined needs, budgeting for these, locating and applying for funds (which may not always come from "obvious" sources), and protecting those funds. The availability of contingency funds (for use pending payment of insurance and recovery funds) is also covered, although managing the actual speed of payment is a post recovery planning issue and as such is covered in Essential 10. Completion of this Essential needs to build on the risk understanding covered in Essential 2, since risks effectively drive the financial impacts that need to be planned for.

Where a building owner/manager is responsible for a company-wide portfolio of buildings, or multiple buildings in the same administrative city or state, some aspects of financial capacity (for example insurance cover) may be applicable to all buildings. This may simplify and speed up completion of the scorecard.

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3.1	**Financial planning and budgeting.**			
3.1.1	**Understanding of likely costs to the building owner/ manager**	Does the building owner/ manager fully understand the detailed costs of a disaster that are likely to be incurred?	5 – A recent detailed study has been carried out of all likely costs – property, business interruption, out of pocket, liability, other – arising from the scenarios used for emergency planning in Essential 2. 4 – Detailed investigation of many cost areas, but not against scenarios in Essential 2. 3 – Partial knowledge of costs and what there is not related to scenarios used for emergency planning. 2 – Generic checklist used as high level or "back of an envelope" calculation but not related to specific disasters. 1 – Rudimentary assessment of costs, at best. 0 – Costs of disasters not considered.	"Recent" = in the last 18 months. It is critical to update understanding of needs regularly –as economic and social factors in the city change, and as the climate changes. Liability – legal or otherwise – may also extend to occupants' losses. Occupants should be made aware of where the building owner/manager's liability begins and ends in this regard.
3.1.2	**Presence of a plan or strategy for financing capital resilience improvements**	Does the building owner/ manager have a clear, costed financial plan, with funding and return on investment (ROI) identified, for financing capital resilience improvements required?	5 – A plan exists that is sufficient for all known and foreseeable resilience needs (see above and Essential 2), and the plan is being executed. 4 – A plan exists and is being executed but has some shortfalls (< 10%), relative to what is known or suspected to be required. Funding is however protected from year to year.	This assessment considers the extent to which the building owner/manager has specifically created a funded, costed, financial plan for executing the major (i.e. capital) resilience improvements required, given the business case that balances: • Risks – the likely hazards faced (as in Essential 2) and the operational, human, social and financial and other consequences of these;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			3 – A plan exists but is not reliably executed from year to year due to pressures of other priorities on funds. Multi-year fund allocations are not possible. Funding shortfall is 10-20%. 2 – Some planning has taken place for funds to meet resilience needs, and some funds may have been allocated, but the overall requirement is not clear, and funds are not protected from year to year. Funding shortfall is 20-50%. 1 – There is a generalized capital improvement fund, but this is not focused on resilience as an issue in its own right and availability varies from year to year. Known to leave a shortfall relative to need of >50%; or shortfall not assessed. 0 – No funds allocated to resilience, either directly or indirectly.	• Costs of resilience – even where these might mean a loss of efficiency, for example where a building receives reinforcement beyond that specified in a code. When considering ROI it may help to think of "Resilience dividends" – sometimes called co-benefits. These can arise in two ways: • "Inbound" dividends arise where investments elsewhere in the city have additional resilience benefits – for example where an investment in landscaping for aesthetic reasons also reduces likelihood of flooding. Inbound dividends will tend to reduce the separate costs of resilience and thus the funding needed (see 3.1.3). • "Outbound" dividends, where an investment in resilience also provides an additional, non-resilience benefit - for example where investment in a microgrid for resilience reasons also reduces energy or insurance costs. Outbound dividends increase the benefits of resilience and thus improve its ROI.
3.1.3	**Knowledge of funding sources, including incentives, and extent to which these have been accessed**	Has the building owner/ manager investigated all possible sources of funding for improving resilience and is there a plan for accessing these?	5 – All possible funding sources have been investigated and tapped, either directly or through the use of specialist consultants. Funds are fully adequate for requirements. 4 – There has been an extensive investigation of funding sources but not all of them have been approached. Funds are broadly adequate, but some minor shortfalls may exist. 3 – Several funding sources have been identified and tapped but these don't fully meet the needs of making the building or plant more resilient and keeping it so. 2 – Some attempts to look for and obtain funding. These will not meet needs and resilience improvements are being foregone as a result.	If internal revenues are known to be fully adequate for all resilience needs – so that there is no need to look for other funding – score 5 on this assessment. Beyond financing from internal revenues, alternative financing methods and sources may include, but are not restricted to: • Loans; • Leasing (e.g. for equipment); • Government grants, including matching grants and other incentives; • Tax savings; • Social impact or resilience bonds (where these pay for results achieved); • Development banks and aid organizations; • Utility programs; • Energy Service Companies or Resilience Service Companies;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – Little if any attempt to look for funding, and the building or plant is as a result significantly less resilient than it needs to be. 0 – No funds allocated to resilience, either directly or indirectly.	• Property Assessed Capital Expenditures (PACE)/on-bill financing; • Foundations that may have a direct interest in some aspect of resilience – for example where a conservation NGO might support restoration of ecosystem services, or an education NGO might support awareness and training; • Other government agencies that may have a direct interest in some aspect of resilience – for example where a transportation agency finances a new bridge that may also improve evacuation capacity; • Crowd-funding; • Public-private partnerships; • A sinking fund constructed around an engineers' assessment of appropriate amounts to reserve in the fund; • Savings in insurance costs. When looking for funding sources it may help to think of "Resilience dividends" – sometimes called co-benefits. These can arise in two ways: • "Inbound" dividends arise where investments elsewhere in the city have additional resilience benefits – for example where an investment in landscaping for aesthetic reasons also reduces likelihood of flooding. Inbound dividends will tend to reduce the separate costs of resilience. • "Outbound" dividends, where an investment in resilience also provides an additional, non-resilience benefit - for example where investment in a microgrid for resilience reasons also reduces energy or insurance costs. Outbound dividends increase the benefits of resilience and thus improve its ROI (see 3.1.2). Note – speed of access to funds to begin repairs or reconstruction is covered under Essential 10.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
3.1.4	**Funding of ongoing upkeep and maintenance**	Is maintenance of resilience critical items funded and protected in the normal budget evaluation process for operations and maintenance?	5 - Building owners/managers have ensured continued funding for maintenance of resilience-critical items and that the relevant equipment or facilities are and will continue to be 100% maintained. 4 – Maintenance of resilience-critical items is generally 100% funded as above but this is not guaranteed from year to year. 3 - Building owners/managers are attempting to protect ongoing maintenance funds for resilience-critical items, but this is to address an existing for foreseen shortfall (<20%) 2 – Some resilience critical items are not being properly maintained due to budgetary shortfalls of 20-50% 1 - Building owners/managers are not adequately funding ongoing maintenance of resilience critical items, to the tune of >50% shortfall. 0 – There is no maintenance of these items.	Many buildings may have been resilient when first built, only for lack of maintenance to resilience critical items to degrade this over time. Resilience-critical items might include, but are not restricted to – back-up generators, computer servers or communications equipment, flood pumps, soak-away zones, fire suppression systems, emergency heating or cooling equipment, and so on. Best practice for ensuring that funding is adequate is to conduct and maintain a reserve study that assesses asset replacement and repair costs, and to use this to establish a maintenance and repair fund sized to the task. Consider ICC's International Property Maintenance Code (IPMC): *https://codes.iccsafe.org/content/IPMC2018/preface*
3.2	**Insurance and contingency cover.**			
3.2.1	**Insurance cover**	Does the building have insurance cover for repairs and business continuity costs, making allowance for deductibles?	Insurance cover as of the current year … 5 – … fully meets all foreseeable clean-up, repair/replacement, recovery and business continuity costs. 4 – … meets 90% or more of foreseeable costs – and the building owner/manager has alternative funds to cover the shortfall. 3 – … meets 75-90% of known costs, but the building owner/manager has alternative funds if borrowing capacity is included. 2 – … meets 50-75% of foreseeable costs but there are inadequate alternative funds to cover the shortfall. 1 – … meets <50% of foreseeable costs, with no alternative funds available. 0 – No insurance.	Confirming the adequacy of insurance cover – both the extent and the risks covered - requires a careful estimate of what costs are likely to arise, and also how. For the latter, take into account causation and ancillary damage – for example, some policies cover fire damage, but not if the fire was the result of an earthquake; and some earthquake policies may cover structural damage but not fire damage that the earthquake may have initiated. Many insurance policies are written annually, so this assessment needs to consider the current year. Business continuity costs may be met by tenants, rather than owners or managers, but this assessment deliberately does not discriminate. Many small businesses survive a disaster only to go out of business afterwards due to loss of revenue while the local economy restarts. If occupant

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				businesses cannot pay rent due to business continuity issues the owner's cashflow will be impacted as if it was his own operations affected.
3.2.2	**Contingency funds to cover cash-flow and out of pocket needs until payout**	Does the building owner/ manager have contingency funds to meet cash flow and out-of-pocket needs during the loss adjustment process prior to insurance paying out?	The building owner manager has funds available to cover known/foreseeable cashflow needs and out of pocket expenses … 5 – … through a 12-month delay to pay-out. 4 – … through a 9-month delay to pay-out. 3 – … through a 6-month delay to pay-out. 2 – … through a 3-month delay to pay-out. 1 – … through a 1-month delay to pay-out. 0 – No insurance.	There may be lengthy delays over insurance payment which, combined with loss of business due to the disaster, could result in cashflow issues for smaller businesses or those with precarious finances. If the building has parametric insurance, which leaves a higher basis risk, but which typically pays out in a few days, see 3.2.1 above and score accordingly. Leave this assessment blank.

Essential 4 - Pursue Resilient Urban Development

Essential 4 addresses the development and application to the building of land use zoning and building codes that meet or exceed resilience requirements. Land use and zoning and adherence to building codes ensure the safety of their occupants during severe weather or seismic events and prevent buildings from disrupting natural ecosystems which may themselves confer resilience (see Essential 5). Building owners/managers need to make sure their buildings adhere to updated codes and incorporate resilience standards beyond minimum code requirements where the latter are not adequate for the hazards faced.

Where a building owner/manager is responsible for a campus, or multiple buildings in the same administrative city or state, some aspects of code compliance and land use zoning may be applicable to all buildings. This may simplify and speed up completion of the scorecard.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
4.1	**Building code compliance**			
4.1.1	**Current building codes**	Does the building adhere to latest city or state building code requirements for applicable disaster risks?	5 – New buildings and retrofits of existing buildings exceed latest editions of applicable code standards that have been adopted in last 5 years and adopts standards specific to worst case risks known to apply to the region, as identified in Essential 2. 4 – The building meets requirements of applicable minimum code standards that have been updated in the last 5 years and adopts some enhanced standards specific to "average case" risks known to apply to the region, as identified in Essential 2. 3 – The building meets requirements of applicable minimum code standards that have been updated in the last 10 years and adopts some enhanced standards specific to the "average case" scenario. 2 – The building meets all current minimum code standards in place within the jurisdiction, but these do not necessarily enable the required level of resilience relative to the "average case" scenario. 1 – The building was built to an earlier building code – while it may have been properly maintained for occupant health, safety and welfare, it does not meet today's known resilience needs.	See Essential 2 for risk assessment, and for consistency with city and state assessments of worst case and "average case" risks. In the absence of a defined set of building codes, consider ICC's International Building Code, International Residential Code, International Existing Building Code, International Plumbing Code, International Mechanical Code, International Energy Conservation Code, International Electrical Code and International Fire Code. The latest published edition of a model code or standard should be used even if the local jurisdiction is on an earlier edition of the code.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			0 – No, or unknown, code compliance.	
4.1.2	**Accessibility requirements**	Does the building meet legal and/or local code requirements for persons with disabilities to ensure safe entrance or exit for all occupants during an emergency?	5 – All entrances/exits meet or exceed accessibility requirements. 4 – Most entrances/exits meet minimum accessibility code requirements. 3 – One emergency entrance/exists meets accessibility requirements, and triage plan exists in case of extreme events. 2 – A retrofit is underway to ensure compliance with minimum requirements. 1 – There is awareness of accessibility issues, but no plan to retrofit or change design for new buildings. 0 – No entrances/exits meet accessibility requirements.	A triage plan should include a designated space as an "area of refuge" where disabled persons can safely wait until rescue assistance arrives. Another key issue is whether there is a roster of where people with disabilities or special needs people are located? Who has responsibility for this segment of the building occupants?
4.2	**Resilient building standards**			
4.2.1	**Resilient building programs**	Independently of code compliance, is the building enrolled in a program that promotes resilient building standards?	5 – The building achieved or exceeded maximum level of formal resilient building program certification (such as RELi Gold or higher, SuRe Gold certified, or IBHS FORTIFIED Gold). 4 – The building achieved minimum level of formal resilient building program certification and is working towards higher level. 3 – The building achieved minimum level of formal resilient building program certification (such as RELi certified, FORTIFIED Bronze, SuRE Bronze certified, or LEED certified with 2 of 3 resilience credits achieved). 2 – Participation in resilient building standards program is underway, but no formal assessment has been completed. 1 – There is awareness and interest in formal resilient building standards program, but no action taken. 0 – No awareness or interest in resilient building standards program.	Different countries may adopt different building resilience certification standards. This Scorecard does not attempt to choose between them. Adherence to green codes may confer additional resilience. This can include the International Green Construction Code and/or ANSI, ASHRAE, USGBC, or IES Standard 189.1, among others.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
4.3	**Beyond the building: code development and occupant education.**			
4.3.1	**Building code development**	Does the building owner/ manager participate in or engage with building code development, or with local planning and development steering organizations/committees?	The building owner/manager … 5 – … participates regularly on one or more building industry organizations such as BOMA or others that have an impact at local level in improving resilience standards and is seen as a leader in this subject locally or nationally. 4 – … participates regularly on one or more building industry organizations that have an impact at local level in improving resilience standards. 3 - … participates regularly, but the impact on local building resilience is as yet muted. 2 – … is a member of a building standards organization that has an impact locally, but participation is erratic. 1 – … is aware of local, national and international organizations, but has no interest or participation. 0 – … has no awareness of local, national or international building code or planning and development organizations.	Engagement is likely to be via a relevant organization or industry association that influences code development, such as BOMA, ASHRAE, ICC or USGBC – these may have a particular impact in the city where the building is located.
4.3.2	**Occupant awareness and education**	Are building occupants educated on the importance of adhering to building codes and standards?	5 – The building owner/manager routinely inspects tenant areas and requires rectification of noncompliance. There is audit enforcement of this. 4 – The building owner/manager requires rectification, provides support and is responsive to inquiries. There is however no audit. 3 – Occupants are informed when new codes or standards are enacted and implemented, but there is not always assurance of rectification. 2 – The building's standard lease agreement includes legally enforcable language requiring all new retrofit work to comply with codes or identified standards, and spaces must be maintained to ensure	Tenant activity such as blocking exits or unauthorized modifications to buildings or electrical supplies can undermine code compliance and thus resilience.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			occupant health, safety and welfare. There is rarely any inspection, however. 1 – The building owner/manager has published standards for repair, remodeling, construction and maintenance in the building designed to maintain or improve resilience, but there is no inspection. 0 – Occupants are not aware of current building code or building standards.	

Essential 5 - Safeguard Natural Buffers

Essential 5 addresses the extent to which the building preserves or, even better, enhances the protective functions offered by natural ecosystems. Examples may include ecosystem elements such as rain gardens, tree cover for water absorption and/or heat mitigation, green roofs, bio-swales, and other natural infrastructure that reduce impacts from disasters.

Where a building owner/manager is responsible for a campus, or multiple buildings in the same neighborhood, some aspects of safeguarding natural buffers may be applicable to all buildings. This may simplify and speed up completion of the scorecard.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
5.1	**Protection of ecosystem services**			
5.1.1	**Protection of ecosystem services**	Have the building and its surroundings been designed or retrofitted using Low Impact Development principles (LID), or equivalent, to protect relevant ecosystem services in the area?	5 – All relevant ecosystem services are identified, and the building has been designed or retrofitted to completely protect or even enhance them. 4 – All relevant ecosystem services are identified, and the building has been designed or retrofitted to protect them, but some minor degradation occurs. 3 – All relevant ecosystem services are identified, and the building has been designed or retrofitted to protect them, but some more significant degradation occurs. 2 – Some relevant ecosystem services are identified, but the building is known to be inflicting significant degradation on many of these. 1 – Only rudimentary attempts to identify and protect relevant ecosystem services. 0 – No interest in ecosystem service protection.	Relevant ecosystem services may include, but are not restricted to: • Flood attenuation (e.g. wetlands, sand dunes, coastal woodland, soak-away areas); • Water and run-off purification (from wetlands and some soil types); • Urban heat attenuation (e.g. tree cover); • Pollination; • Food (e.g. fish from coastal, lake or river waters); • Air pollution reduction (from some tree types); • Noise reduction (from woodlands); • Recreation, views (on or from open land). Standards such as RELi (https://gbci.org/reli) address protection for flood plains, trees that reduce heat island effects, etc.
5.1.1.1	**Damage to ecosystems**	Where the building is known or expected to damage existing ecosystem services on which the city depends, what compensating steps have been taken?	5 – A plan of action has been developed and implemented to fully reverse the damage, with a schedule to re-evaluate the solution. 4 – A plan of action has been developed and implemented, but it may not fully reverse the damage in question. 3 – Plans are under development with the City to fully reverse the damage in question.	If no ecosystem damage (unlikely!) omit this assessment. Relevant ecosystem services may include, but are not restricted to: • Flood attenuation (e.g. wetlands, sand dunes, coastal woodland, soak-away areas); • Water and run-off purification (from wetlands and some soil types);

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			2 – Potential damage has been considered and compensating measures are under evaluation for some but not all of the damage. 1 – Potential damage is known to be likely, but only rudimentary compensation measures are being considered. 0 – No consideration of potential damage and/or compensating measures.	• Urban heat attenuation (e.g. tree cover); • Pollination; • Food (e.g. fish from coastal, lake or river waters); • Air pollution reduction (from some tree types); • Noise reduction (from woodlands); • Recreation, views (on or from open land); • Green roofs and walls.
5.2	**Green infrastructure and energy**			
5.2.1	**Green infrastructure**	Have the building and its surroundings been fitted with the maximum green infrastructure to the extent allowed by city rules, using Low Impact Development (LID) principles or equivalent?	Green infrastructure systems … 5 – … have been installed to the maximum extent allowed by the city and are monitored and outcomes recorded to a defined set of KPIs. 4 – … have been installed and are monitored and outcomes recorded to a defined set of KPIs – but they are in some respects less than the city would allow. 3 – … are planned and in some cases implemented, but there is only ad hoc monitoring and no metrics are recorded. Some opportunities for green infrastructure are being missed. 2 – … are under discussion internally and with regulators, although significant green infrastructure possibilities are omitted. 1 – … have some minor applications identified but not implemented, nor any application made to the City. 0 – No interest or application potential for green infrastructure solutions.	Where green infrastructures improve resilience as well as, or better than, other methods, they represent a “win-win” for the building and the surrounding area. Green infrastructure systems include but are not restricted to: • Storm water soak away areas; • Rain-water recycling to at least grey water status; • Green roofing; • Passive heating and cooling; • Solar energy and heating (see also below); • Waste heat capture and re-use.
5.2.2	**Energy efficiency/ renewable energy**	Extent to which the building owner has implemented renewable energy or energy efficiency and storage measures.	5 – The building has achieved net-zero energy status using locally sourced energy generation and storage, and it can run independently of the grid for extended periods. 4 – Building improvements have reduced energy consumption by more than 50% and on-site renewable energy generation and storage exists to support critical functions for up to 3 days.	Apart from reducing GHG emissions, renewable energy usage may be more resilient provided that locally based energy storage exists; it can improve the usability of a building after a disaster; and it may reduce the load on damaged energy grids. The location of biogas facilities if applicable, needs to be chosen carefully to avoid

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			3 – Building improvements have reduced energy consumption by more than 50% and on-site renewable energy generation and storage exists to support critical functions for up to 1 day. 2 – Building improvements have reduced energy consumption by more than 20% and on-site renewable energy generation and storage exists to support critical functions for up to 12 hours. 1 – Energy audit was conducted, and energy-saving and storage measures are planned. 0 – No efforts have been made toward improved energy efficiency or use of renewable energy.	exposure to flooding and other hazards. Include within assessments 8.1.13 and 8.1.14 as applicable.
5.3	**Management of ecosystem impact.**			
5.3.1	**Responsible person**	Has a person been appointed to supervise and monitor ecosystem services performance?	A responsible person … 5 – … is in place and has provided quarterly performance monitoring reports and made corrective actions as needed. 4 – … is in place and has initiated work in year 1. 3 – … is funded, and the process of personnel selection is under way. 2 – … position description and funding requirements are in preparation. 1 – … is under consideration as an idea. 0 – There is no single person responsible and it is not under consideration.	The responsible person may be the existing head of operations, for example, or a separate role such as the facilities manager. Alternatively, for larger corporations this person may be the head of sustainability.

Essential 6: Strengthen Institutional Capacity for Resilience

Essential 6 addresses the capability of building owners/managers to identify risks and plan, prepare for, respond to and recover from disasters. There are two broad areas - skills; and information sharing, availability and access.

Aspects of institutional capacity such as skills and training may relate to an organization or campus as a whole, and therefore to all buildings. While care needs to be taken to assess the consistency of local accessibility of those skills and training, in principal this may simplify and speed up completion of the scorecard.

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
6.1	**Skills & training.**			
6.1.1	**Design & construction**	Do the building's owner/managers have the resources, skills and training to work with architects and builders to apply resilience considerations to the building's design, construction and retrofits?	The building owners/managers … 5 – … have the resources, skills and training at the highest levels and are considered leaders in resilient development or retrofits. 4 – … broadly have the resources, skills and training they need with a few minor exceptions. 3 – … have resources, skills and training in sustainability with some resilience training. 2 – … have significant gaps in their resources, skills and training. 1 – … have some awareness and minimal resources and resilience training. 0 – … no skills or resources and minimal if any awareness.	The extent to which owners and managers (especially those skilled in resilience) are involved in a building's design can positively influence its operational resilience. The data that's exchanged improves all aspects of managing for resilience. Building owners and managers do not have to be engineers or architects, but it is essential that they acquire and remain up-to-date and knowledgeable on what is required for resilience. Skills may be accessed from external experts or in-house. See also Essentials 2 and 10.
6.1.2	**Scenario planning**	Do the building's owners/ managers have the skills and training to use scenario planning to understand potential mid- and longer-term changes in the building's risk profile over years and decades?	The building owners/managers … 5 – … are trained and highly skilled in risk analysis and scenario planning. 4 – … have some staff who are skilled, but these people may not be dedicated to this role. 3 – … are risk aware and have some basic training in risk analysis and scenario planning. 2 – … have some significant skills shortages in risk analysis and scenario planning.	See also Essentials 2 and 8. Skills may be accessed from external experts or in-house.

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
			1 – … have only a rudimentary awareness of risk analysis and scenario planning. 0 – … have no training, skills or awareness in risk analysis or scenario planning.	
6.1.3	**Building management & operations**	Are the building's managerial and operational credentials up-to-date, and are staff trained on their roles and responsibilities related to resilience and disaster risk management?	5 – Management and operations staff are required to be resilience trained and to take disaster risk management training, obtaining and keeping these certifications current. 4 – Managers and operations staff broadly have the skills and training they need with a few minor exceptions. 3 – Role-specific resilience and disaster training is provided for relevant staff, and key operational staff are asked for feedback on their emergency management concerns and their roles. 2 – There is some basic role-specific training, but no attempt at feedback. 1 – Primary building staff are required to take basic and role-specific disaster training and maintain up-to-date credentials. Resilience may or may not be included. 0 – There are no requirements for training.	Resilience training, skills and credentials includes relevant required and optional courses or programs that may or may not lead to a professional designation or credential. They may be offered by any organization, academic, certification, regulatory, standards setting, or industry organization and/or association. Skills may be accessed from external experts or in-house. See also Essential 10.
6.1.3.1	**Back-up documentation**	Are all critical documents, manuals and disaster procedures/plans relating to the building, its equipment and its occupants both securely stored off site and available for use during and after a disaster?	All critical documents are … 5 – … both securely stored off site and available as needed. 4 – … both securely stored off site and available as needed, with some minor exceptions. 3 – … missing or not securely stored in some key cases. 2 – … available only with significant gaps and omissions. 1 – … largely absent or missing or stored insecurely. 0 – … not tracked or known to be available at all.	Experience has shown that lost access to critical documents during a disaster can seriously impede protection of the building and its activities and occupants; and can seriously impede the speed of recovery.

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
6.1.4	**Collaboration**	Do the building's owner/ managers have the skills and training to collaborate?	The building owners/managers … 5 – … are trained, highly skilled, and collaborate in their management processes for resilience. 4 – … are trained, and somewhat skilled, and integrate internal and external collaboration in their management processes for resilience with a few minor exceptions. 3 – … have some training and skills and collaborate in some of their management processes for resilience. 2 – … may have received basic training on collaboration but some years ago. 1 – … have minimal training and skills, and occasionally collaborate with select Stakeholders to gain input. 0 – … have no training or skills in collaboration.	As part of a complex changing environment, buildings both depend on, and are depended on by many internal and external stakeholders and their systems. Knowing who to collaborate with, toward what end and how to engage and carry out effective collaborations is a critical resilience capacity. One of the critical skills for collaboration is the use of multi-disciplinary, multi-stakeholder, cross-boundary engagement across the DRM/Resilience landscape. Skills may be accessed from external experts or in-house.
6.2	**Data and information**			
6.2.1	**Data collection and analysis**	Do the building's owner/managers routinely collect and analyze data to inform and update their Disaster Risk Management (DRM/Resilience Planning?	The building owners/managers … 5 – … collect their own and external data and routinely analyze this in developing, updating and improving their DRM/Resilience Plans – their resilience activities are "data-driven". 4 – … regularly collect internal and external data but don't always analyze it systematically. 3 – … regularly seek and use data internally and from a few external sources to help develop, update and upgrade their DRM/ Resilience Plans. 2 – … sometimes seek and use internal and external data in improving resilience plans. 1 – … only sporadically use internal or external data to help update and improve their plans.	Examples of data might include, but are not restricted to: • Weather; • Climate change or sea level rise; • Extent of flood or other risk, including changes to these; • Population changes in the community; • Development patterns; • Updated seismic understanding; • Changes to drainage; • Changes to critical infrastructure (see also 8.3.2); • Changes to disaster response capabilities (see also 8.3.3); • Building occupancy, usage patterns and operational performance; • Building structural performance; • Changes (positive or negative) to neighboring buildings;

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
			0 – … have not changed or updated plans or more than 2 years.	• Economic or social value of activity in the building; • Qualitative data on best practices and disaster experiences from elsewhere. Essential 9 lists external stakeholders with whom data sharing may be required. Some external data items may not be available consistently (or at all). This should reduce scores under this assessment. Building owners/managers should consider the use of outside experts that can both provide data and ensure that their planning/resilience data aligns with the most current, as well as, best practices. See also Essentials 1,8,9 and 10.
6.2.2	**Digital twin**	Does the building have a digital twin that can be shared electronically with first responders, and automatically updated for modifications to the building?	5 – A full digital twin exists for all relevant systems in the building and is always accessible by first responders and other relevant stakeholders. 4 – A nearly complete digital twin exists (some systems are omitted) and is always accessible by first responders and other relevant stakeholders. 3 – A nearly complete digital twin exist and can readily be made available to first responders on request. 2 – The basics for a digital twin exist but would require a separate (and time-consuming) transaction to exchange with first responders and ensure they have understood it. 1 – All system data is separate and not integrated. 0 – No digital systems data.	A digital twin is a technology construct that integrates computer aided design (CAD), building information management (BIM) and asset/bill of materials data with live operational feeds from occupancy sensors, SCADA data for key systems such as HVAC, and so on. This data can be essential for first responders, and for repairs after a disaster. At the present time (Jan 2020) digital twins of buildings are comparatively rare, so most users will score lower on this assessment. They are expected to become more common over time, however.

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
6.3	**Information sharing and inclusion.**			
6.3.1	**Planning and construction inclusion - stakeholders**	Are/were all relevant internal and external stakeholders included in the building's design & construction (or significant re-model, if applicable)?	5 – All relevant stakeholders are/were included in all phases of the project. 4 – Most relevant stakeholders are/were included in most phases. 3 – Most relevant stakeholders are/were included in select phases of the project. 2 – Some relevant stakeholders are/were included in select phases of the project. 1 – Cursory and sporadic attempts to involve some stakeholders. 0 – Stakeholders and stakeholder groups are/were not included	The extent to which all internal and external stakeholders provide input into a building's design (beyond the usual permitting processes) positively influences its function and operational resilience over its lifetime under all conditions.
6.3.2	**Resilience plans – internal stakeholders**	Are the building's DRM/resilience plans inclusive of, and reviewed with, all relevant internal stakeholders?	5 – Annual (or better) processes exist to review and update resilience plans with all internal stakeholders. Capabilities for the building to provide shelter (if applicable) are understood and internalized by staff. 4 – Plans are reviewed annually or better with most internal stakeholders. Shelter capabilities are understood. 3 – Triggers are in place to initiate a review and update of resilience plans with internal stakeholders, as needed. 2 – Review of resilience plans with internal stakeholders is tales place, but episodically. 1 – Review and update of resilience plans with internal stakeholders are only cursory and rudimentary. Very likely that important information may not reach all those who need it. 0 – No processes exist to review or update plans with any internal stakeholders.	Internal stakeholders are • Building owners/managers and their staff or agents who may have responsibilities to support and manage the building day-to-day; • Business or residential occupants, including those with disabilities. Internal and external stakeholders – see Essentials 1, 7, 8 and 9. Training and drills – see Essential 9.
6.3.3	**Resilience plans – continuity and knowledge transfer**	In cases of management and/or ownership changes are there processes in place to carry out a sound transfer of knowledge to	5 – A process has been integrated combining both management and ownership changes and is integrated in the building's admin and M&A due	Changes in staffing, ownership or management can downgrade resilience capabilities if incoming staff, owners or managers do not take the issue as seriously as those outgoing.

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
		ensure continuity of resilience planning?	diligence activities. This process has been used in the last year. 4 – A formal process is in place for an ownership change and an informal process is in place to discuss resilience continuity during a management change. 3 – Informal processes are in place to discuss resilience continuity for both cases. 2 – Informal processes are in place, but it is not clear that all the required information will be passed on. Both gaps and needless reinvention are therefore possible. 1 – A minimal and rudimentary process is in place. Both gaps and needless reinvention are therefore likely, requiring significant application of effort by the incoming owners/managers. 0 – No processes are in place at all. The new building owners/managers will have to recreate the entire resilience planning and process structure, even if with the support of the sellers.	See also Essential 9.
6.3.4	**Integration of planning and prevention into day-to-day business**	Do managers integrate resilience measures that include planning and prevention into their day-to-day operating and management practices?	Resilience planning and disaster prevention … 5 – … are fully integrated into day-to-day operations across safety, security, training, communications, data collection & analytics, regular reviews and change management. 4 – … are integrated into most relevant day-to-day activities, with some minor exceptions. 3 – … are integrated into some day-to-day processes. 2 – …are integrated in some respects into day-to-day business, but by no means complete coverage.	Resilience prevention measures generally require that building managers bring together and apply a mature level of collaboration, skills and tools, such as DRM, Business Continuity, Business Impact Analysis, Scenario Planning and so on to determine the actions that will prevent shocks and stresses from becoming disasters. When integrated in day-to-day operations, prevention becomes an institutional capacity and virtuous in that the building, its systems and its stakeholders are in a mode of continuous learning. The potential to prevent disasters then, at the early, mid- and long-term becomes possible at very high levels.

Ref.	Subject/Issue	Question/Assessment	Indicative Measurement Scale	Comments
			1 – … are not integrated into day-to-day operations – management is aware, but they remain separate, "one-off" issues. 0 – Little if any planning and prevention.	Inclusion in budgeting and financial processes – see Essential 3.
6.3.5	**Information – hazard awareness, preparedness and recovery**	Are occupants made fully aware of all hazards that could occur within the building, how to prepare from these and how to recover from them?	Communications to inform, discuss and update occupants of all relevant hazards, required preparations and recovery actions 5 – … are organized into a comprehensive and integrated program sing many forms of media, covering all required issues, with material updated annually or better. 4 – … are comprehensive and integrated as above, but with a few minor omissions. 3 – … are extensive but have some omissions and are not updated annually. 2 – … are extensive but only available on request, and are not updated annually; 1 – … only address some hazards, are available upon request, and are old and incomplete. 0 – No communications.	Well-informed building occupants will be better prepared to take on personal and professional accountability and contribute to the preparation and recovery processes, as well as help reduce the risks by preventing the event from cascading. Taking an "all facility" communications approach results in higher levels of resilience capacity. All relevant hazards: see Essential 2. This capacity will be influenced by the use of the building and the physical capabilities of the occupants. For example, a senior housing or a medical facility may have many vulnerable occupants less able to handle the information. This will de facto result in a lower score as such buildings and their occupants are inherently and unavoidably less resilient.

Essential 7: Increase Social and Cultural Resilience

Essential 7 examines the role that the resilience of the building plays in the social and cultural resilience in the community around it, and vice versa. The building is unlikely to be fully resilient without community engagement (for example in ensuring that the workforce can get to work after a disaster); and the community needs building owners/managers to recognize various dependencies that the community may have on the building.

Aspects of social and cultural resilience such as community engagement or cohesion may relate to all buildings on a campus or in one neighborhood. While care needs to be taken to assess local variations, in principal this may simplify and speed up completion of the scorecard.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
7.1	**Community role of the building.**			
7.1.1	**Critical buildings**	If it the building is critical by virtue of its role in the community (see right), how resilient is it?	The building scores an average of … 5 – … 4.0 or higher on this scorecard** (implying a high general level of resilience). 4 – … 3.5 to 4.0 on this scorecard**. 3 – … 3.0 – 3.5 on this Scorecard**. 2 – … 2.5 – 3.0 on this Scorecard**. 1 – … 2.0 – 2.5 on this Scorecard**. 0 – … less than 2.0 on this Scorecard**. **Exclude the scores for Essential 7 from the average used in this assessment.	The building may have been designated "critical" by the local government. But if not, as a rule of thumb criticality may be assumed for buildings that have one or more of the following attributes: • Housing more than 20 family units; • Contributing to the community infrastructure - energy, water, sewage, telecommunications, emergency services, storage of supplies, hospitals, etc; • Are public gathering places – for example schools, campuses, community centers, places of worship, shops/retail, stadiums; • Function as a community hub post-disaster (see below); • Housing key government functions (e.g. law and order), or social or welfare services; • House businesses that employ more than 10 people; • Have cultural or historic value.
7.1.2	**Role as a community shelter**	Does the building have potential to be a community hub or shelter for 5 days?	5 – Yes for 500 or more people, and it scores an average of 4.0 or higher on the Scorecard** (implying a high general level of resilience). 4 – Yes for 250 - 500 people, and it scores an average of 3.5 to 4.0 on this Scorecard**. 3 – Yes for 100 - 250 people, and it scores an average of 3.0 - 3.5 on this Scorecard**. 2 – Yes for 50 - 100 people, and it scores an average of 2.5 – 3.0 on this Scorecard**.	Possible shelter roles include, but are not limited to, shelters in the event any of the following disaster events: • Flood - coastal storm surge, tidal, pluvial/storm water, or fluvial/riverine; • Seismic events - earthquake, vulcanism, and resulting tsunami; • Landslides and avalanches;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – Yes for 20 - 50 people, and it scores an average of 2.0 – 2.5 on this Scorecard**. 0 – No. **Exclude the score for Essential 7 from the average used in this assessment.	• Severe weather - wind, tornado, hail, lightning, snow, ice-storms, drought, or severe heat or cold; • Wildfires; • Man-made risks - explosion, terrorism, or poison release; • Health issues such as pandemics, or sanitation issues in the aftermath of a disaster; • Infrastructure disruption – loss of energy, water, sanitation, transportation or communications service; • Any combination of the above, whether in parallel or one as a consequence of another. Sheltering implies suitability for use by people with disabilities. See also 8.1.1 for structural prerequisites and 9.2.1 for other requirements.
7.2	**Community engagement.**			
7.2.1	**Support for key personnel**	When disaster strikes, are there support mechanisms to account for, and assist staff for critical building operations and maintenance, and their families and homes, such that they will be able and willing to continue to operate the building?	5 – Full accounting and support is provided for critical building staff, and it has been shown from past disasters to confirm safety and enable them to continue to work through and after a disaster, confident that their own families and homes are cared for. 4 – Full accounting support is provided for critical building staff and is thought (but not proven from experience) to be enough to confirm safety and enable them to continue to work through and after a disaster. 3 – Some support is provided to critical staff. The most dedicated (or those who live on site) are likely to be accounted for and available through and after the disaster; 2 – Only basic accounting and help is provided to critical staff. Most are unlikely to be available to manage the building through a disaster and re-start activity.	This assessment addresses both confirming the safety of, and providing assistance to, critical staff and their families such that they will be able and willing to help restore building operations. Assistance may include, but is not limited to, relocation, provision of emergency power generators, food, water, basic flood and storm proofing, emergency transportation to work, training, and help with home and car insurance. Where blocked roads are likely to be an issue, the support needs to be sufficient to allow critical staff to remain on site from prior to the disaster.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – No accounting or help is provided to critical staff. They will almost certainly not remain in post through and after a disaster. 0 – Critical staff are not designated.	
7.2.2	**Where the building is for residential use, "in-reach" to occupants**	For residential buildings, does the building owner/manager engage occupants either directly or through their representative organizations?	Occupants are … 5 – … fully engaged, and fully informed of what to do in the case of a disaster. 4 – … fully engaged, with a few minor gaps for example where people do not wish to be engaged, or where some minor issue is not addressed. 3 – … generally engaged on the basic issues. 2 – … engaged around some aspects of disaster resilience, but significant gaps exist. 1 – … only cursorily engaged. 0 – No attempts to engage occupants. Occupants are essentially on their own.	If the building has no residential occupants, omit this assessment. The term "in-reach" is used here for communications with building occupants, to contrast with the more traditional term "outreach" to the community around the building. Extent and effectiveness of in-reach could be assessed by surveying occupants about what they know and feel they need to know better, and about the extent of mutual engagement.
7.2.2.1	**Where the building is for residential use, mutual support among occupants**	For residential buildings, can occupants be expected to know who may be vulnerable and need additional help, and to provide some of that help supporting the building owners/managers?	Occupants … 5 – … can be expected to know who among them may be vulnerable and need extra help (for example if elderly or disabled), and to provide some of that help. 4 – … can be expected to know who needs help, but not to provide much beyond incidental assistance. 3 – … generally know who may need additional help, but there may be some gaps in their knowledge – it is not systematic. 2 – … may or may not know who needs extra help, depending on personal acquaintanceships only. High probability that some vulnerable people will be overlooked. 1 – … probably would not know who is vulnerable and who may need extra help. Many vulnerable people are likely to be overlooked. 0 – … have not formed into a community at all and would not know who needs extra help.	If the building has no residential occupants, omit this assessment. Precise help to be provided would need to be documented and agreed – see 1.2.3 above. One key step in in-reach would be to ask vulnerable people themselves what extra help they might need and their level of confidence that this will be provided.
7.2.3	**Resilience plans – sharing with**	In buildings that are part of the community's critical infrastructure	5 – Annual (or better) processes exist to review and update resilience plans with relevant	Critical buildings and shelter capabilities – see 7.1 above.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
	external stakeholders specifically relevant to the local community	or are community emergency facilities - are the building's resilience plans inclusive of, and reviewed with relevant external stakeholders specifically relevant to the local community – and is there a focal person appointed to work with the community?	external stakeholders from the local community. Capabilities for the building to provide shelter (if applicable) are publicized and communicated, and a focal person is designated. 4 – Plans are reviewed annually or better with most relevant stakeholders from the local community. Shelter capabilities are publicized, and a focal person is designated. 3 – Triggers are in place to initiate a review and update of resilience plans with external stakeholders from the local community, as needed. No focal person. 2 – Review of resilience plans with external stakeholders from the local community is episodic. Shelter capabilities (if applicable) may not be known to all. No focal person. 1 – Review and update of resilience plans with relevant external stakeholders are only cursory and rudimentary. Very unlikely that important information will reach all those who need it. 0 – No processes exist to review or update plans with any external stakeholders.	External stakeholders specifically relevant to the local community may include, but are not limited to: • The city government; • First responders, if separate from the above; • Other owners and managers of buildings in the immediate vicinity; • Business organizations in the area; • Tenants organizations (business and/or residential, as applicable); • Community organizations. The focal person may be the emergency manager for the building, but for a large or complex building it may be sensible to designate another person to lighten workloads. See also Essentials 1 and 9.
7.2.4	**Outreach work in the local community**	Is the building owner/ manager part of a public awareness campaign on citizen safety and emergency preparedness by building type - such as suggesting household readiness tips for residential areas or signposting public shelters?	The building owners/managers … 5 – … regularly help to fund and organize awareness campaigns and drills on disaster resilience for the surrounding local community. 4 – … regularly help to organize (but not fund) awareness campaigns and drills on disaster resilience for the surrounding community, and they receive corporate approval/time off to do this. 3 – … regularly organize awareness campaigns and drills for the surrounding community, but recruit staff as volunteers in their own time. 2 – … help with awareness campaigns and drills for the surrounding community, but as individual volunteers in their own time.	

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – … make occasional efforts to help awareness campaigns and drills for the surrounding community. 0 – No community outreach	
7.2.5	**Community or city scorecards**	Is the building owner/manager active in working with or persuading the city or community to assess its disaster resilience with a structured assessment?	The building owners/managers … 5 – … are active promoters of and participants in structured city and community assessments, and they integrate their DRM/resilience planning with this; OR, they are actively campaigning to have the city complete such an assessment. 4 – … are participants in a structured assessment, but not promoters of it. They have fully integrated it with their own plan; OR, they would encourage a city-wide initiative. 3 – … were involved in a structured assessment and have included many aspects of it in their DRM/resilience plans and processes; OR: they would passively support a citywide initiative, if such an initiative arose. 2 – … have borrowed some aspects of the city's resilience structured assessment, if available. 1 – … made cursory use of a structured assessment used the city or community. 0 – … have ignored the structured assessment in use in the city or community; OR there is no such assessment and no plans to create one.	This assessment covers the ability and willingness (if any) of the building owner/manager to promote the use of structured assessments of resilience and disaster preparation to other owner/managers in the area. Various structured city and community-level frameworks exist, including the UNDRR's Making My Cities Resilient (MCR) Campaign (the City scorecard referred to in the introduction to this document); or the assessment framework used by the Rockefeller Foundation's 100 Resilient cities initiative. Building owners and managers may engage through a business organization such as a Chamber of Commerce or, in the USA, the various city "2030" initiatives that are under way.

Essential 8: Increase Infrastructure Resilience

Essential 8 addresses how well the many critical infrastructure systems within and around the building or facility will cope with the natural and man-made hazards/shocks they might experience, and how adaptive measure and contingencies have been developed to manage the risks.

The following may help simplify and speed up completion of this otherwise lengthy Essential:

- Essential 2 identified which risks apply to the building(s) being assessed. In this Essential, assessments related to risks that do not apply should be omitted. The summary spreadsheet used to capture outcomes will automatically take account of omitted assessments when computing scores.
- There may be a single answer for all buildings on a campus or in the same neighborhood.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
8.1	**Building/facility infrastructure (internal infrastructure) - natural hazards and severe weather threats.**			
8.1.1	**Occupant/ employee shelter**	Does the building provide a safe refuge for its occupants in the event of the most severe weather/natural hazard events identified in the scenarios in Essential 2?	5 – The entire building is designed to enable safe harborage for up to 5 days in the worst-case scenario in Essential 2. 4 – Parts of the building provides protection against the worst-case scenario in Essential 2. 3 – The building provides protection against the "average case" scenario in Essential 2. 2 – The building provides some protection against "average case" hazards. 1 – The building provides rudimentary protection against "average case" hazard impacts. 0 – No protection provided	(If not applicable – omit this assessment). (Scenarios – see Essential 2) Examples of shelter structural features include (as applicable): • Impact resistant glazing (glass); • Outward opening doors; • Tornado-proofing; • Use of high wind design codes; • Built to seismic design codes; • Built from non-combustible materials; • Hygiene and sanitary facilities; • Suitability for people with disabilities. See 9.2.1 for other shelter requirements.
8.1.2	**Effectiveness of structure and Infrastructure management program**	Is there a structure and infrastructure management program in place to monitor building condition and deficiencies, to maintain adequate levels of service and protection?	5 – A full structure and infrastructure management program is in place and is used to guide all CAPEX and OPEX investment decision making. 4 – A structure and infrastructure management program is mostly in place and is used to guide much of CAPEX and OPEX investment decision making. 3 – The major components of a structure and infrastructure management program are in	Examples of elements of a structure and infrastructure management program include, but are not limited to: • Asset management system with up to date data and records; • Regular condition assessments for building and supporting infrastructure; • Regular vulnerability assessments for building and supporting infrastructure; • Repair and replacement program is fully funded and in place (see also Essential 3);

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			place and are used to guide as much CAPEX and OPEX investment decision making as possible. 2 – Some components of a structure and infrastructure management program are in place and but are not leveraged to the full extent in CAPEX and OPEX investment decision. 1 – Rudimentary structure and infrastructure management practices – not a true "program" as such. 0 – No program or individual measures are in place at all.	• Regular audits/inspections take place (see also Essential 9); • Staff training (see also Essential 9). Records should indicate the number and magnitude of prior disaster events as these may contribute to corrosion, fatigue or other weakening of the structure.
8.1.3	**Flooding hazard: storm-water management system**	Does the building have an adequate storm-water management system to prevent storm water flood damage?	The building has … 5 – … a working storm-water management system proven to deal with the worst-case scenario from Essential 2. 4 – … a working storm-water management system sized to deal with the worst-case scenario from Essential 2. 3 – … a working storm-water system sized to deal with the "average case" scenario in Essential 2. 2 – … a storm-water system sized to deal with the "average case" scenario in Essential 2 but it is not fully operational. 1 – … only rudimentary protection against "average case" storm water impacts, and the system is likely not to function. 0 – No storm-water system or management methods exist to protect building against localized flood impacts.	If not applicable – omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, road or rail access remote from the building itself (see 8.3 below). Storm water systems are specified in local building codes, but these may not have kept up with changing weather conditions or changes to local urbanization levels and infrastructure. Examples of storm-water management: • Building not in a sump condition; • Building not in a floodplain; • Positive drainage away from critical facilities and buildings; • Storm-water collection and conveyance system, including storage and pumps with redundant power supply; • Storm-water pipe backflow prevention; • Adequate level of service (LOS) based on scenarios in Essential 2.
8.1.4	**Flooding hazard: wastewater management**	Is there an adequate wastewater collection, conveyance and treatment system?	The building has … 5 – … a working wastewater collection/ pumping/treatment system with adequate capacity and backflow prevention to ensure reliable service, proven to deal with the worst-case scenario from Essential 2.	If not applicable – omit this assessment. Examples of wastewater measures: • Backflow prevention from municipal collection system;

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			4 – … a working wastewater collection/ pumping/treatment system with adequate capacity and backflow prevention to ensure reliable service, sized to deal with the worst-case scenario from Essential 2. 3 – … a working wastewater collection/ pumping/treatment system with adequate capacity and backflow prevention to ensure reliable service, sized to deal with the "average case" scenario in Essential 2. 2 – … a wastewater collection/ pumping/ treatment system with adequate capacity etc to deal with the "average case" scenario in Essential 2 - but it is not fully operational. 1 – … only rudimentary management of even "average case" storm waste-water impacts, and the system is likely not to function. 0 – No wastewater collection measures in place to protect against system backup or overflow.	• Replacement of septic system, or at least ensuring overflow is highly unlikely; • Adequate capacity for peak/future demands; • Operational lift/pump station with redundant power supply.
8.1.5	**Coastal and fluvial flooding: protection measures**	Does the building have adequate coastal and fluvial flood defenses from extreme tide, storm surge or flood crest event to mitigate foreseeable flood risk and prevent operational impact?	The building … 5 – … has sufficient measures (or elevation), to protect it from current tidal, storm surge or fluvial flooding risks on the worst-case scenario in Essential 2. These measures are reliably estimated to be adequate for the next 25 years of climate change (more extreme weather events) and sea level rise. 4 – … has sufficient measures (or elevation, or it has an appropriate location) to protect it from current tidal, storm surge or fluvial flooding risks on the "average case" scenario in Essential 2. These measures are reliably estimated to be adequate for the next 15 years of climate change and sea level rise. 3 – … has today, sufficient measures to protect it from current tidal, storm surge or fluvial flooding risks on the "average case" scenario in Essential 2, but the impact of climate change has not been assessed.	If no flooding risk, omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, road or rail access remote from the building itself (see 8.3 below). Flood defenses are specified in local building codes, but these may not have kept up with changing weather conditions or changes to local urbanization levels and infrastructure. Examples of flood defenses: • Elevated building electrical and critical equipment; • Dry and wet floodproofing of buildings and critical equipment, including operable barriers; • Enhanced minimum design standards; • Landscaping to maximize freeboard around the building;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			2 – … would today suffer minor and short-lived impacts from tidal, storm surge or fluvial flooding in the "average case" scenario in Essential 2. The climate change outlook is more challenging, however. 1 – … would suffer major inconvenience, albeit not totally catastrophic impacts from tidal, storm surge or fluvial flooding in the "average case" scenario in Essential 2. The climate change outlook is more problematic: the building may already experience "sunny day flooding" from peak high tides. 0 – … is highly flood prone today and will become more so with climate change.	• Levees; • Coastal armoring to prevent erosion and mitigate wave energy. • External flood pumps.
8.1.5.1	**Tsunami**	Is the building away from coast, elevated or protected from tsunami impacts?	The building … 5 – …is elevated or protected from adverse impacts from any tsunamis in the worst-case scenario in Essential 2. 4 – … is elevated, appropriately located or protected from adverse impacts from any tsunamis in the "average case" scenario in Essential 2. 3 – … would suffer minor and short-lived impacts from a tsunami in the "average case" scenario. 2 – … would suffer more significant impacts from a tsunami in the "average case" scenario. 1 – … would suffer significant damage from a tsunami in the "average case" scenario. 0 – … would probably be destroyed by a tsunami.	If no tsunami risk, omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, or road or rail access remote from the building itself (see 8.3 below). Examples of protective measures: • Protective barriers/walls; • Hardened equipment and buildings; • Flood proof materials, enclosures, pumps.
8.1.6	**Seismic hazard**	Is the building designed to withstand earthquake?	The building … 5 – … is designed and equipped in line with REDI and URSC standards to avoid damage to structure and protect occupants from hazards associated with earthquakes in the worst-case scenario in Essential 2. 4 – … is designed and equipped in line with REDI and URSC standards to avoid damage to structure and protect occupants from hazards	If no seismic risk, omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, or road or rail access remote from the building itself (see 8.3 below). Seismic resistance is specified in local building codes, but these may not have kept up with

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			associated with earthquakes in the "average case" scenario in Essential 2. 3 – … would suffer minor and short-lived impacts from an earthquake in the "average case" scenario. 2 – … would suffer more significant impacts from an earthquake in the "average case" scenario. 1 – … would suffer significant damage from an earthquake in the "average case" scenario. 0 – … would be probably be destroyed by an "average case" earthquake, and no seismic protections are in place for structure or occupants.	changing scientific understanding, or changes to local urbanization levels and infrastructure. Examples of seismic hazard reduction: • Seismic reinforcement; • Protected utility services including gas; • Large equipment, heavy machinery, utility and process piping are all well secured; • Suspended ceilings braced; • Safety glass; • Regular inspections to secure structural and non-structural items.
8.1.7	**Wind hazard – storms, tornados**	Is the building designed to withstand extreme wind conditions?	The building … 5 – … is designed to FORTIFIED standards to withstand extreme wind speeds possible from storms and tornados in the worst-case scenario in Essential 2. 4 – … is designed to FORTIFIED standards to withstand extreme wind speeds possible from storms and tornados in the "average case" scenario in Essential 2. 3 – … is designed in parts to withstand extreme wind speeds possible from storms and tornados in the "average case" scenario in Essential 2. 2 – … would suffer some damage from extreme wind speeds in the "average case" scenario in Essential 2. 1 – … … would suffer significant and long-lived damage from extreme wind speeds in the "average case" scenario in Essential 2. 0 – …. Would probably be demolished.	If no wind risk, omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, or road or rail access remote from the building itself (see 8.3 below). Wind resistance is specified in local building codes, but these may not have kept up with changing weather conditions. Examples of wind hazard mitigation: • Adequate local wind building code; • Safe distance from neighboring falling structure, trees etc.; • Strong connections between foundation and walls, and between walls and roof, that are designed for expected wind conditions; • Braced gable end roof framing; • Window protection; • Tornado shelters; • Cladding that can withstand wind loads and wind-driven rain.
8.1.8	**Extreme drought (private system)**	Does the building have a potable & process water source	The building … 5 – … has a contingency plan for alternative water supply for both potable and non-potable	If no drought risk, omit this assessment.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
		contingency plan to withstand severe drought?	demands including cooling and process water sufficient to deal with the worst-case scenario in Essential 2. 4 – … has a contingency plan for alternative water supply for both potable and non-potable demands to deal with "average case" drought scenario in Essential 2. 3 – … would suffer minor impacts from a drought in the "average case" scenario. 2 – … would suffer more significant impacts for the duration of a drought in the "average case" scenario. 1 – … would suffer significant impacts from a drought in the "average case" scenario. 0 – … would be probably be unusable for the duration of an "average case" drought, and no alternative water resource plans have been prepared.	"Severe drought" = any drought long enough to stress water resources available to the community. Impacts may include damage or interruption to infrastructure services, communications, road or rail access remote from the building itself (see 8.3 below). Examples of drought protection: • Active use of conservation and reuse strategies; • Alignment of non-potable sources and demands; • Backup water supply source; • Consider USGBC LEED or RELi review of loss of water supply risks.
8.1.9	**Extreme heat**	Is the building likely to remain useable in the event of an extreme heat event?	The building has … 5 – … passive and/or active heat mitigation measures that allow it to continue to operate throughout an extreme heat event specified in the worst-case scenario in Essential 2. 4 – … passive and/or active heat mitigation measures that allow it to continue to operate throughout an extreme heat event specified in the "average case" scenario in Essential 2. 3 – … passive and/or active heat mitigation measures that allow it to continue to operate throughout an extreme heat event specified in the "average case" scenario in Essential 2, albeit with some discomfort and/or loss of productivity to residents and/or users. 2 – … some passive and/or active heat mitigation measures. It would continue to operate throughout an "average case" heat event, albeit that elderly residents would need additional help with cooling, or some industrial processes might be disrupted.	If no extreme heat risks, omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, or road or rail access remote from the building itself (see 8.3 below). Examples of heat reduction measures: • Site features that reduce heat island effect including shade trees, canopies, awnings, low albedo pavement and roof; • Passive cooling features of the base building that enable it to maintain 'livable temperatures" during peak summer conditions; • Features in the occupied spaces that reduce the impact of an extended heat wave; • Refuge areas for heating/cooling. See also 8.1.14. below.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – … rudimentary heat mitigation only. More significant discomfort and/or loss of productivity could be expected during an "average case" heat event. 0 – … no measures to mitigate extreme heat. It would be uninhabitable and/or largely unproductive in an "average case" heat event.	
8.1.10	**Winter storm and cold**	Is the building protected from excessive snow loads, ice storms, blizzards, avalanche and cold weather?	The building … 5 – … is designed to allow it to continue to operate through and after a cold/winter storm event specified in the worst-case scenario in Essential 2. 4 – … is designed to allow it to continue to operate through and after a cold/winter storm event specified in the "average case" scenario in Essential 2. 3 – … is sufficiently resistant to allow it to continue to operate throughout an "average case" cold/winter storm event, albeit with some discomfort and/or loss of productivity to residents and/or users. 2 – … is sufficiently resistant to allow it to continue to operate throughout an "average case" cold/winter storm event, albeit that elderly residents would need additional help with heating, or some industrial processes or deliveries might be disrupted. 1 – … has rudimentary resistance to cold and winter storm events. More significant discomfort and/or loss of productivity could be expected during an "average case" event. 0 – … has no effective mitigation for cold and winter storm events. It would be uninhabitable and/or largely unproductive in an "average case" event.	If no winter storm or avalanche risks, omit this assessment. Impacts may include damage or interruption to infrastructure services, communications, or road or rail access remote from the building itself (see 8.3 below). Examples of protective strategies: • Building/facility design including snow loading; • Snow and ice removal equipment and procedures in place; • Insulation, draft proofing and appropriate glazing; • Features such as heaters, etc. to prevent ice build-up on equipment and buildings; • Avalanche diversion measures – land contouring, building shaping. See also 8.1.14. below.
8.1.11	**Lightning**	Does the building have lightning protection to mitigate risk to equipment, staff and operations?	The building has … 5 – … operational lightning protection for the structure, grounds and critical equipment.	Impacts may include damage or interruption to infrastructure services, communications, road or rail access remote from the building itself (see below).

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			4 – … operational lightning protection for the most aspects of its grounds, structure and critical equipment – minor omissions only. 3 – … operational lightning protection but one or two significant gaps in its coverage. 2 – … several major gaps in its lightning protection. 1 – … only rudimentary lightning protection. 0 – … no lightning protection.	Examples of lightning protection: • Lightning protection/grounding system; • Covered walkways for pedestrians; • Surge protection for electrical equipment.
8.1.12	**Fire hazard: site**	Has the building/site incorporated measures to avoid damage from wildfire?	The building siting, grounds and supporting fire protection measures are sufficient to … 5 – … mitigate wildfire fire risk entirely. 4 – … mitigate wildfire fire risk with a few minor exceptions to outlying landscaping etc. 3 – … mitigate wildfire fire risk with one or two major exceptions to outlying structures. 2 – … mitigate wildfire some fire risk but with some major exceptions. 1 – … mitigate wildfire some fire risk but with some major exceptions, and the lack of vegetation management or use of flammable materials poses a threat to adjacent properties. 0 – No site/grounds fire protection measures are in place.	If no wildfire risk, exclude this assessment. Impacts may include damage or interruption to infrastructure services, communications, or road or rail access remote from the building itself (see below). Examples of fire protection measures: • Building location has adequate separation from adjacent buildings; • Vegetation management: fuel buffer zone and grounds maintenance to reduce fire hazards; • Roofing and walls that have low flammability; • Adequate water for fire-fighting; • Adequate and clearly marked escape routes for occupants; • Restricted smoking and other potential sources of ignition.
8.1.12.1	**Fire hazard: building**	Does the building have fire mitigation measures in place to protect life and property?	The building design, materials and fire safety program … 5 – … mitigate fire risk for the whole structure. 4 – … largely mitigate fire risk for the whole structure – a few minor improvements could be made. 3 – … mitigate fire risk for the whole structure with one or two significant exceptions. 2 – … mitigate some fire risk for the whole structure but there are several significant gaps.	Examples of building fire protection measures: • Limiting building height; • Appropriate construction and décor materials; • Building sprinklers; • Fire protection features and equipment in compliance with the local Office of the Fire Marshall; • Regular inspection of equipment as per the requirements of a documented Fire Safety Compliance Program;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – … have major gaps significant gaps – protection is rudimentary at best. 0 – No building fire protection measures are in place.	• Regularly updated Fire Fighter's Handbook for the building.
8.1.13	**Electrical power outage: backup power**	Does the building/facility have a redundant power supply feed and/or backup power?	The building has … 5 – … a backup power supply with adequate fuel to support all functions for at least 72 hours. The backup supply is itself located safely. 4 – … a backup power supply with adequate fuel to support all functions for at least 24 hours. The supply is itself located safely. 3 – … reliable backup power supply for critical functions only, for 72 hours; it may not be entirely safely located. 2 – … reliable backup power supply for critical functions only, for 24 hours and is also exposed in its own right. 1 – … partial backup power via secondary supply or renewable sources for some functions; this is significantly exposed to the disaster for which it may be required. 0 – No backup power supply is provided.	Examples of redundant power supply: • Backup generator with ample fuel supply (placed above any known flood level!); • On-site alternative energy sources (wind, solar, hydro, etc.); • Maintenance and testing procedures for back-up power generator (see also Essential 9); • Arrangements with supplier for fuel delivery; • Automatic power transfer switch operational and tested regularly; • Remote start and monitoring.
8.1.14	**Electrical power outage: climate control**	Does the building/facility have features to remain usable during power outage in peak winter/summer conditions?	The building has … 5 – … alternative/redundant heating/cooling measures to maintain moderate temperatures for occupants and equipment through any foreseeable outage. 4 – … alternative/redundant heating/cooling measures to maintain moderate temperatures for occupants and equipment, with some minor exceptions, through any foreseeable outage. 3 – … alternative/redundant heating/cooling measures for most of its area, in most temperature conditions, and through most foreseeable outages. 2 – … has alternative/redundant heating/ cooling measures with some significant weaknesses in dealing with foreseeable temperatures and maximum outage durations.	Examples of space conditioning: • Building design features that help to maintain 'livable' temperatures; • Features and procedures to avoid damage to the building fabric and systems during extended periods of extreme cold and heat See also 8.1.9 and 8.1.10 above.

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			1 – … alternative/redundant heating/cooling measures that would probably fail to deal with foreseeable temperatures with foreseeable maximum outage durations. 0 – The building has no backup heating/cooling systems in place	
8.1.15	**Communications outage**	Does the building have redundant communications and system operational controls in place?	Alternative/redundant communications systems … 5 – … are in place to maintain communications with building occupants, with first responders and for infrastructure system monitoring and operations. 4 – … are in mostly place with a few minor weaknesses or omissions. 3 – … have one or two more significant weaknesses or omissions, although broadly, communications would be maintained. 2 – … have major weaknesses or omissions, meaning that communications my not be maintained. 1 – … are only rudimentary, with patchy coverage of the building's systems (for example, an emergency satellite phone). 0 – No backup communications systems are in place at all.	Examples of reliable communications: • Redundant communications methods – e.g. cellular vs. radio, vs. wired connectivity; VOIP over internet vs phone system; • Mesh-style networking with multiple redundant links; • All communications systems also connected to backup power supply; • Remote control and monitoring of systems.
8.2	**Building/facility infrastructure (internal infrastructure) – man-made threats.**			
8.2.1	**Hazardous materials: building**	Are procedures and protocols in place for handling and storing hazardous materials including spill response, such that there is no risk to the surrounding land, groundwater, air or population?	Procedures and protocols are … 5 – … fully in place to safely handle and store hazardous materials and enforced. 4 – … fully in place to safely handle and store hazardous materials and enforced with a few minor exceptions. 3 – … broadly in place to safely handle and store hazardous materials and enforced with one or two more significant exceptions. 2 – … in place to safely handle and store hazardous materials but there are major gaps in extent and enforcement leaving some residual danger.	If no hazardous materials, omit this assessment. Examples of hazardous materials management: • Workplace hazardous materials information system; • Secure storage using safe storage protocols to limit access to chemicals; • Liaison with neighboring sites that have hazardous materials; • Maintenance procedures for managing PCBs, asbestos, and avoiding legionella and mold with a documented compliance program for environmental hazards procedures;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			1 – … are only rudimentary, leaving significant residual danger. 0 – No hazardous materials storage or safety handling protocols are in place.	• Regular inspections of gas equipment and a protocol to contact utilities before digging; • Public awareness and spill response/evacuation plan.
8.2.2	**Hazardous materials: site**	Is building located a safe distance from other facilities or sites containing hazardous materials?	The building is … 5 – … located a safe distance from superfund sites, or other facilities that store or produce hazardous materials. 4 – … closer than ideal to superfund sites, or other facilities that store or produce hazardous materials, but given the materials involved the risk is not excessive. 3 – … closer than ideal to superfund sites, or other facilities that store or produce hazardous materials, and some more significant risks arise that need to be addressed. 2 – … much closer than ideal to superfund sites, or other facilities that store or produce hazardous materials, and several significant risks arise that need to be addressed. 1 – … quite dangerously located, posing major risk to occupants and workers that need to be addressed. 0 – … located on or near a superfund or hazardous materials site posing extreme risk to occupants and workers that may or may not be addressable.	If no hazardous materials, omit this assessment. Examples of hazardous materials avoidance: • Located safe distance from superfund sites, old landfills, chemical storage or chemical manufacturing plants. • Not located on, adjacent to or downstream of river or stream which could convey hazardous materials to building/facility.
8.2.3	**Terrorism**	Does the building/facility employ physical security measures to protect against acts of terrorism?	Physical security features are … 5 – … in place to defend strongly against physical threats including building and site design and secure access. 4 – … in place to defend strongly against physical threats with a few minor exceptions. Overall security is not seriously compromised. 3 – … in place to defend against physical threats with one or two more significant exceptions. Overall security is somewhat compromised.	Examples of security features: • Bollards around vehicle accessible areas; • Access badges, gates and metal detectors; • Closed circuit video monitoring; • Anti-Terrorism Force Protection (ATFP) design features; • Site layout and landscape design for security; • Metal and explosive detectors; • Operational measures to avoid intruders including controlled access to building, garage, roof and plant room and parking areas;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			2 – …are in place in some cases but there are major gaps: overall security is significantly compromised. 1 – … are in place in only a few cases, and overall security is very weak. 0 – No design or security measures are in place.	• Sign-in for guests and deliveries; • Secure holding area for suspicious packages; • Security guards; • Security cameras and lockdown systems.
8.3	**Supporting public infrastructure (external infrastructure).**			
8.3.1	**Access: site**	Are roads and sites leading to and from the building designed to be accessible in case of an emergency event or other hazard?	Existing roads and sites … 5 – … have been assessed for accessibility in the case of an emergency, sites have been relocated to ensure accessibility, and access improvements have been made where necessary. 4 – … have been assessed for accessibility in the case of an emergency: site and access improvements have broadly been made where necessary. 3 – … have been assessed for accessibility in the case of emergency and plans for alternate routes or bypassing roads are in place in case of inaccessibility during a crisis. 2 – … have been assessed for accessibility in case of emergencies but not all have been determined or made to be accessible. 1 – … are known to have significant access issues, although some minor improvements have been made. 0 – No site access evaluations have been performed to ensure safe passage in the event of an evacuation.	Access includes: • Access for evacuation; • Access for emergency equipment/vehicles, supplies and personnel; It follows that access should be assessed for its two-way capability. Examples of reliable site access: • Redundant points of access to/from building location; • Elevated and protected points of access above flood stage; • Evaluation of access threats and risk; • Access hardening to improve performance and reliability of access; • Absence of bottlenecks (tunnels, bridges, major intersections) that may cause congestion.
8.3.2	**Critical infrastructure**	Is there data on the condition, capacity, risk and vulnerability to disaster of key elements of local and regional critical infrastructure in relation to the services they provide to the building?	The building owners/managers are … 5 – … aware of infrastructure capacity, condition, risk and vulnerability assessments, which have been performed on all public infrastructure services including utilities to ensure reliability. 4 – … aware of infrastructure capacity, condition, risk and vulnerability assessments, which have been performed on most public	Building owners and managers do not need to know all the technical details, but they should have access to a high-level briefing of the key issues with respect to the predicted useful life, the age, condition, recommendations for renewal, as well as data on capacity vs. demand in relation to the building for: • Roads and highways; • Bridges and overpasses; • Water supply and sewerage systems;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			infrastructure services including utilities to ensure reliability. 3 – … aware of infrastructure assessments, which have been performed on some public infrastructure services including utilities to ensure reliability. 2 – … aware of infrastructure assessments, but these have been performed on only a few public infrastructure services including utilities to ensure reliability. 1 – … are not aware of infrastructure assessments 0 – No adequate assessments.	• Water and waste-water treatment systems; • Storm-water systems; • Power and natural gas; • Communications; • Solid waste management.
8.3.3	**Disaster response infrastructure**	Are emergency relief assistance, response equipment, vehicles and related infrastructure available and located in multiple strategic locations?	5 – Relief assistance, response equipment and vehicles are staged near identified hazard areas when an imminent threat is known to ensure quick response times. A plan exists to bring in aid from external sources if need exceeds stockpile capacity. It is unlikely that resource shortages in any area of the community will exist during a disaster. 4 – Relief availability and plans mean that shortages will only exist in a few minor areas. 3 – Relief availability and plans leave one or two larger gaps such that resource shortages in some areas of the community may exist. 2 – Relief availability and plans have a number of major gaps such that resource shortages in many areas of the community will exist. 1 – Relief availability is not geographically distributed at all – major shortages will therefore exist due to blocked roads, shortages of trucks etc. 0 – No relief assistance equipment is available.	Examples of response infrastructure: • Infrastructure response plan (see also Essential 9); • Strategically located stockpiles of critical equipment, vehicles, fuel and related supplies. One key issue is whether firefighting and evacuation equipment is adequate to deal with high rise buildings.

Essential 9 – Ensure Effective Disaster Response

Essential 9 addresses the effectiveness and completeness of disaster preparations by the building owner/manager, in conjunction with those of the city and other agencies.

There are three levels of planning in the Building Scorecard, all with different timescales and considerations:

- Essential 1 focused on building and maintaining resilience generally, over time:
- Essential 9 (this Essential) focuses on planning and preparation for the management of actual disasters;
- Planning and preparation for post disaster recovery are dealt with under Essential 10.

Aspects of disaster response such as plans or emergency communications may relate to all buildings on a campus or in one neighborhood. While care needs to be taken to assess local variations which may have an outsized effect, this may simplify and speed up completion of the scorecard.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
9.1	**Plans and preparation**			
9.1.1	**Existence and completeness of plans**	Does the building owner/ manager have detailed plans for dealing with disasters – processes, procedures, responsibilities, equipment, communication channels and contents, and so on?	5 – Fully detailed and up to date plans exist that address the impacts anticipated by the worst-case scenario in Essential 2 and are critically reviewed at least annually. 4 – Fully detailed plans exist but may not be reviewed annually. 3 – Plans exist but may not be fully detailed in all areas (see right) and they only address the "average case" scenarios in Essential 2. 2 – Plans exist but have some gaps relative to the "average case" scenario in Essential 2 or may be out of date in some respects. 1 – Plans may exist but have significant deficiencies relative to the "average case" in Essential 2, in terms of coverage, fitness for purpose detail/specificity and obsolescence. 0 – No plans.	*This assessment is not intended to replace emergency planning and management manuals that may be in use in any given area. However, as a minimum*, emergency plans need to set out: • Roles and responsibilities – within the building and outside, as required for an extended period; • Processes and procedures for emergency staff; • Documented processes and procedures for workers, tenants, and the public as applicable; • Updated contact lists – police, fire, emergency management, etc; • Verifying by names the safety of those in the building; • "As built" plans for the buildings (see 9.2.4); • For wind events, procedures for protecting and shuttering glass windows and doors, removing outside items, and shutting off flammable gasses;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				• For flooding events, procedures for sand bagging doors, raising flood barriers, protecting assets from water, and for parking elevators above flood level etc • For hazardous materials spills or gas leaks, procedures to coordinate building staff and other external aid to determine source and quantity of spill or leak; to cordon off and secure the hazard area; and to shut down equipment such as HVAC and utilities as appropriate and avoid sparks or flame at all cost. • Information to be shared with whom, using which channels (including social media as applicable), and when; • Procedures to notify authorities including legal of any escape into sewers, storm drains, retention basins or soil; • Procedures for ordering an evacuation if appropriate: well-marked evacuation routes and gathering points, pre-identification of occupants with special needs, and securing of all areas; • Procedures for shelter in place if appropriate; • Required drill schedules (see 9.4); • Required equipment and testing schedules (see 9.2); • Intersection points with other agencies (see 9.1.2 and 9.1.3); • Sequences and procedures for safely restarting equipment. Special consideration will need to be given to firefighting and evacuation issues high rise buildings. There are numerous standards and certifications available from Disaster Recovery

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				Institute International (https://drii.org) that may help build competence in this area.
9.1.2	**Integration with intersecting plans and capabilities**	Have the building owner/ managers' plans been integrated with those of other relevant entities?	5 – All relevant entities regularly integrate their plans with the building owner/managers' emergency plans, building layouts and contents, such that they can accurately anticipate what they will find and how building management will react to an emergency. 4 – Emergency and building plans have been integrated with but there may now be some minor obsolete provisions and mismatches due to a lack of updating. 3 – Emergency and building plans have been integrated with some relevant entities, but not others. 2 – Significant gaps exist in the understanding by relevant entities of emergency and building plans. 1 – Only rudimentary data (e.g. from planning permits) available to other relevant entities. 0 – No plans and/or no sharing of data with relevant entities.	Depending on the type of building, other "relevant entities" include all internal and external stakeholders with a planning or disaster response role. These include (but are not restricted to): • City government; • City, state or national emergency management (if separate from government); • First responders – firefighters, police, ambulances, army (if applicable); • Utilities; • Communications companies; • Highways and transportation agencies; • Health agencies; • Air and water quality agencies; • Owners/managers of neighboring buildings; • Owners/managers of other businesses in the area; • The community. The score for this assessment could be validated by asking the other entities involved. See also Essential 6 for data sharing. (Shared drills – see below). (Information for first responders – see below).
9.1.2.1	**Integration with intersecting plans and capabilities – understanding of others' capabilities**	Does the building owner/ manager receive the required data and guidance from relevant entities on hazards/risks and emergency response capabilities, on which to create operable emergency plans for the building?	The building owners/managers have … 5 – … a full understanding built through regular collaboration with relevant entities of the hazards faced in the area; of response capabilities of emergency responders, utilities, communications providers, and others; and of their expectations for building management as to roles and responsibilities. 4 – … a good understanding of hazards and most agencies' position and capabilities, although there are detailed gaps.	Definition of "relevant entities" – see above. Information on risks – see Essential 2. One key area will be to understand triage strategies – in the event of a major widespread emergency what level of priority will the building receive relative to other buildings and businesses in the area?

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			3 – … have a deficient understanding with at least one major agency. 2 – … a deficient understanding with multiple significant gaps. 1 – … only a rudimentary and high-level understanding. 0 – No attempt to engage relevant entities.	
9.1.3	**Integration with intersecting plans and capabilities – proven consistency and interoperability**	Do the building owner/ manager and other relevant entities have *proven* interoperability of assumptions, plans, roles, equipment, processes, and communications?	5 – Plans are fully interoperable with those of all other relevant entities and tested to that effect. 4 – Plans are generally interoperable, with some detailed incompatibilities and inconsistencies. 3 – There are some more significant failures of compatibility, or interoperability has not been tested with at least one relevant entity. 2 – More significant known incompatibilities or lack of testing for interoperability. 1 – Some attempt to assess interoperability and compatibility at the level of a cursory reading of the plans of some relevant entities. 0 – No plans and/or no testing.	Interoperability applies on at least the following levels as between the building owner/operator and other relevant entities (see above): • Consistent, shared assumptions about hazards and exposures; • Mutually consistent response plans and expectations; • Mutually consistent and complementary responsibilities and role definitions; • Mutually consistent processes and procedures; • Interoperable physical equipment – hoses, power supplies, communications etc. • Data interoperability – ideally to the level of being able to exchange a full digital twin of the building with relevant entities such as firefighters. One key area will be interoperability of plans *en masse*. For example – do multiple building owners/operators in the same area all individually assume use of the same evacuation route, when the resulting collective traffic would cause traffic jams and delays?
9.1.4	**Business continuity plans**	Do the building owner/ operator, (and/or all business occupants, if applicable) have full business continuity plans that are updated at least annually?	The building owners/managers (and all business occupants, if applicable) … 5 – … have full business continuity plans, that are updated annually. 4 – … have updated business continuity plans, even if there are some gaps in coverage. 3 – … generally have some level of business continuity planning, albeit that there are some known gaps or delays to updates.	Buildings and their occupants may survive an emergency but the businesses within them may be left unable to operate, sometimes resulting in cashflow losses and even bankruptcy of the businesses themselves - and in turn, possibly the building owner. Business continuity planning needs to extend to at least the following:

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			2 – … have some level of continuity planning but with major gaps, or plans are known to be obsolete. 1 – … have continuity planning that is rudimentary at best. 0 – No business continuity planning, or extent of planning is unknown.	• Key systems and data backed up to a remote location; • Energy, water sanitation and HVAC; • Communications; • Front office functions; • Production facilities and operations; • Supply chain – key suppliers and transportation links; • Direction, management and accountability structures; • Workforce – can they physically get to work? Will they be more preoccupied with looking after their own families and homes? • Customers – can they get to the building, if applicable? • Alternative premises, if the current ones are unusable. Note that the same point about interoperability of plans *en masse* applies to this assessment as to 9.1.3.
9.2	**Emergency equipment and people readiness.**			
9.2.1	**Complete set of emergency equipment**	Is safety and emergency response equipment complete and adequate?	Safety and emergency equipment … 5 – … is available to evacuate the anticipated numbers of people in the building, or as applicable, support them for the anticipated period of time before help arrives. 4 – … is generally adequate with some small omissions in availability or quantity; 3 – … has one or two significant omissions of availability or quantity; 2 – … has numerous significant omissions of availability or quantity; 1 – … is generally significantly inadequate. 0 – … is not available.	Safety and emergency equipment may include, but is not limited to: • Generators; • Lighting and emergency lighting; • Batteries and manual phone chargers; • Battery-operated radios and internet connectivity; • Satellite phones and emergency radio equipment; • Flashlights; • Spare fuses; • Protective gloves and goggles for employees restoring power; • Water purification equipment; • Smoke detectors; • Crowd control equipment (including bullhorns) and emergency exit signs;

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				• First aid, suitable for a heavy casualty load;
				• Eye washing stations;
				• Defibrillators and other medical equipment;
				• Escape ladders;
				• Equipment for elevator breakdowns;
				• Equipment for evacuating disabled and elderly occupants;
				• Lists of tenants, workers or other occupants;
				• For remote locations or if the building is also a shelter:
				  ○ Food and drink for 5 days or longer;
				  ○ Cots and blankets;
				  ○ Toilet paper, diapers and sanitary supplies;
				  ○ Pet food and accommodation;
				  ○ Animal allergy medication (or separate accommodation);
				  ○ Rain capes or ponchos.
				
				Adequacy of supplies would be determined by the disaster scenarios in Essential 2, and the emergency plans in Essential 9. Special equipment may be needed for high rise buildings.

9.2.2	**Checking and reviewing equipment**	Is safety and emergency equipment frequently checked and maintained?	5 – All safety and emergency equipment is checked, maintained and/or exercised as applicable at least once per year. 4 – Most equipment is checked, maintained and/or exercised as applicable at least once per year. 3 – Some significant gaps in checking and maintenance and/or interval is longer than once per year. 2 – Generalized gaps in checking, maintenance and exercising, involving numerous items. 1 – Rudimentary efforts to check and maintain items. Equipment such as generators may not have been exercised for 2 or more years.	Emergency equipment may only be used intermittently, which necessitates regular checking to ensure it is in working order, if needed, and regular maintenance. Conversely, if the equipment is used regularly, checking is necessary to ensure that items have not worn out or been consumed when needed for disaster response.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			0 – No equipment, or no checking and maintenance within last 3 years.	
9.2.3	**People readiness**	Are key actors ready for the roles they need to fulfil in a disaster?	5 – The required numbers of people for each role are always ready, trained and available. 4 – The required numbers of people for each role are generally ready, trained and available – there may be some minor occasional gaps. 3 – The required numbers of people for each role are broadly ready, trained and available – although there may be some extended gaps. 2 – Significant gaps in people readiness. 1 – Key actors identified but there is a generalized lack of readiness. 0 – Key actors not identified.	Aspects of readiness will include, but are not limited to: • Someone on site or nearby 24/7 to coordinate an emergency response; • Sufficient trained staff, who have been instructed to create a family emergency plan at home that allows them to discharge their roles within the building; • Safety wardens and alternates who attend all training; • Staff qualified to work on electrical equipment, at all times – who know to deal with a power failure, how to turn off power equipment that is not connected to a back-up generator, and the operation and cable routing of the emergency power generation; • Staff trained to shut down other systems such as HVAC, air, water and steam, if applicable; • Engineering staff trained to use emergency equipment; • Employees trained in the location and use of fire extinguishers; • Staff trained to safely restart all the above in the required sequence and safely.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
9.2.3.1	**Information – resilience contributions**	To what extent are occupants' responsibilities and contributions to the resilience of the building identified, defined and agreed to?	Occupants' responsibilities and contributions to the resilience of the building … 5 – … are reviewed and agreed to, in writing, annually. These are also reinforced through a number of regular internal communications vehicles. 4 – … are renewed annually, as above, but the reinforcement does not reach all occupants. 3 – … are provided in writing annually and reviewed at an annual meeting. 2 – … are set out in writing annually. 1 – … are available in writing from Management. 0 – No specific occupant responsibilities and contributions to the resilience of the building are defined or shared.	"Occupants" = residents, other regular users and employees. The resilience of a facility is impacted by occupants following certain practices or policies that eliminate or lower risks and/or prevent events from cascading. Contributions can involve security, waste & material handling, on-site supply logistics, safety, maintenance, impact and vulnerability assessments, and incident/situation reporting. As noted in Essential 1, the role of owners' or tenants' committees or cooperatives in maintaining resilience and managing disasters should be clearly identified.
9.2.4	**Assistance to first responders**	Are the building owner/ manager and/or emergency staff able to assist first responders as required?	5 – All of the required assistance to first responders is available and has recently been tested. 4 – All of the required assistance to first responders is probably available but has not all been recently tested. 3 – Most of the required assistance is likely to be available but there are a few known gaps. 2 – Significant gaps exist in the information required for first responders. 1 – Information available for first responders is at best rudimentary, vague and/or highly incomplete. 0 – First responders' needs have not been addressed.	Required assistance will include, but not be limited to: • "As built" plans for the buildings including construction (e.g. combustible, non-combustible materials), floor plans, HVAC, location of underground cables, pipelines, gas shut-off valves and main power disconnection points. Going forward, these may increasingly be provided in the form of a digital twin (see Essential 6). • Fire detection and protection systems, emergency lighting and generators; • Evacuation routes, sheltering areas, and public address system; • Location of hazardous materials and copies of the MSDS sheets; • A complete up-to-date set of well-marked keys/combinations.
9.3	**Warning systems.**			
9.3.1	**Operational warning systems**	Are warning systems (alarms, PA systems etc.) present, operational and capable of reaching all parts of the building?	Warning systems … 5 – … are present, operational, tested at least once per year and capable of reaching all parts of the building;	

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			4 – … are present and operational but may not have been tested in the last year or may have minor issues of reach within the building. 3 – … are present but have operational issues that remain to be rectified, although these repairs are scheduled. 2 – … are present but have not been tested for 2 or more years. 1 – … are non-operational in some major respects or do not reach the entire building (Those not tested within 3 years are assumed to be non-operational). 0 – No warning systems.	
9.4	**Drills and practices.**			
9.4.1	**Drills**	Does the building owner/ manager practice and drill for disasters?	5 – Regular (at least annual) drills take place to fully test all emergency response plans and skills against the scenarios in Essential 2, and test interoperability with all other relevant entities. Performance is assessed and reported. 4 - Regular (at least annual) drills take place to generally test all emergency response aspects, and test interoperability with at least some relevant entities. Performance may not be assessed and reported. 3 – Regular tests and drills but they are not against the scenarios in Essential 2 and they may not include numbers of relevant entities. Performance is not reported. 2 – Test and drills are erratic and may not happen annually, and they may not be complete. Performance is not reported. 1 – Annual fire drills, but nothing else. 0 – No drills at all in the last 2 or more years.	("Other relevant entities" – see 9.1.2 above) Post disaster recovery drills – see Essential 10. Surprise drills are better than scheduled ones as a true test of preparation.
9.5	**Emergency communications.**			
9.5.1	**Emergency communications methods**	Are there methods of communications established that can be maintained during and after a disaster that enable communication between the building owner/manager,	5 – Social media accounts, a direct-to-public alert system and a call center function during and after a disaster are in place and are tested frequently. Social media accounts actively engage building occupants, who know where to look for information in a crisis.	Potential damage to communication systems requires that multiple methods be available to enable communication to take place. Redundancy of, and damage to physical systems for communication was covered in Essential 8.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
		occupants, first responders and disaster management teams?	4 – Social media accounts, a direct-to-public alert system and a call center function during and after a disaster, are tested regularly and social media accounts are used to communicate information with occupants regularly. Engagement may not be checked however. 3 – Multiple methods available to communicate with occupants, as above, but are used haphazardly and may not all be tested regularly. 2 – A selection of methods is available but not the full range. They may not be tested. 1 – Only one contact method available. 0 – No emergency contact methods specified.	

Essential 10: Expedite Recovery and Build Back Better

Essential 10 deals with post disaster recovery – restarting life or economic activity in the building, executing repairs and learning from what happened to enable an improved response next time around. The speed and effectiveness of post-disaster recovery is obviously a major determinant of the immediate and long-term impact of any given disaster. Yet while many aspects of it can be planned in advance, it is almost always overlooked.

There are three levels of planning in the Building Scorecard, all with different timescales and considerations:

- Essential 1 focused on building and maintaining resilience generally, over time;
- Essential 9 focused on planning and preparation for the management of actual disasters;
- Essential 10 (this Essential) focuses on planning and preparation for post disaster recovery.

Aspects of Essential 10, such as learning from past disasters may relate to all buildings in a portfolio, on a campus or in one neighborhood. While care needs to be taken to assess local variations, in principal this may simplify and speed up completion of the scorecard.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
10.1	**Preparedness / planning for post disaster recovery.**			
10.1.1	**Post disaster recovery planning**	Does the building owner/ manager have a clear plan (including recovery goals and objectives), pre-event, for restoration of post disaster usage of the building?	5 – A fully detailed plan exists and has been tested successfully in a disaster. 4 – A detailed plan exists but it either has never been tested or it may have minor gaps. 3 – A detailed plan exists but from experience or expert review it has significant gaps. 2 – No integrated plan, just multiple separate policies and procedures that between them leave significant gaps. 1 – Only a rudimentary attempt at post event planning. 0 – No planning.	Immediate disaster response plans and drills are covered in Essential 9 above. However, while post disaster recovery plans and exercises address separate issues, they could be integrated with those in Essential 9. Post disaster plans may include, but are not limited to arrangements for: • Safety and structural inspections; • Insurance liaison; • Restarting of critical services and equipment (see Essential 9); • Interim arrangements for when critical services and equipment (e.g. HVAC, drinking water, etc.) are unavailable for longer than expected; • Cleaning and restoration; • Preferred contractors for repairs; • Stockpiles of spare parts for key equipment; • Expedited permitting;

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
				• Engagement with city government and utilities for factors such as debris removal, road clearance, and services restoration; • Helping workers address issues at home or school; • Resettlement of business and residential tenants back into the building • Obtaining building supplies (e.g. canteen, sanitary, etc.); • Re-booting supply chains (for production, if applicable); • Pre-existing arrangements for the receipt and deployment of funds available for the building; • Contributing to efforts to announce the restoration of activity in the city. Objectives and goals may relate to such factors as: • Time to restore basic infrastructure; • Time to regain use of the building; • Time to resettle occupants; • Time to execute repairs; • Extent of interaction with/support for the community; • Costs from loss of business. If the plan has been tested in a real disaster, failure to achieve goals and targets clearly indicates the need for revisions and perhaps additional investment. Learning from experience of disasters is addressed in 10.3 below
10.1.2	**Post disaster recovery drills**	Does the building owner/ manager practice best management techniques from across the buildings industry, and drill for post disaster recovery as well as the disaster itself?	5 – Regular (at least annual) drills take place to fully test all post disaster arrangements against the scenarios in Essential 2, and test interoperability with all other relevant entities. Performance is assessed and reported. 4 - Regular (at least annual) drills take place to generally test all post disaster arrangements,	("Other relevant entities" – see 9.1.2 above). Due to the extended nature of post disaster processes, drills may take the form of a simulation, sometimes known as a "tabletop exercise".

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			and test interoperability with at least some relevant entities. Performance may not be assessed and reported. 3 – Regular tests and drills occur, but they are not against the scenarios in Essential 2 and they may not include numbers of relevant entities. Performance is not reported. 2 – Test and drills are erratic and may not happen annually, and they may not be complete. Performance is not reported. 1 – There is an annual review of plans, but not a true drill as such. 0 – No drills or reviews at all in the last 2 or more years.	
10.1.3	**Collaboration of building owners/ managers**	Are building owners/managers represented in a community of disaster prevention and recovery stakeholders working towards a common all-hazards disaster recovery framework to better manage pre- and post-disaster planning and operations?	The building's owners/managers … 5 – … are well represented in a coordinated fashion with a clear leadership position in the city in disaster prevention, management and recovery issues. 4 – … are well represented, with some exceptions. Leadership is not completely clear cut. 3 – … have a coordinated voice but are not in a position of leadership for disaster management and recovery in the city. 2 – … are participating, but in an uncoordinated and ad-hoc manner. 1 – … participation in only the most incomplete and rudimentary manner. 0 – No representation or participation.	This assessment concerns the representation of building owners and managers collectively in post disaster planning in the city. 10.1.3.1 below concerns the participation of the building owner/manager using the scorecard. Note that "post disaster planning" must also include, not just recovery planning, but improved mitigation and prevention with respect to the *next* disaster. (Participation in standards setting – see Essential 4)
10.1.3.1	**Recovery tabletop exercises**	Does the city hold, and do the building owner/managers participate in tabletop exercises and simulations related to recovery?	5 – Frequent (annual or better) recovery-focused exercises are held, the building owner/managers participate, and lessons are learned and acted upon. 4 – Frequent (annual) recovery-focused exercises are held, the building owner/managers participate, and lessons are learned and acted upon with some minor exceptions. 3 – An exercise was held in the last 3 years as a "one-off" – the building owner/managers	Tabletop exercises covering immediate preparation and response to disasters are frequently used; exercises related to longer term recovery (even if just, say, the first 6 months after a disaster), much less so.

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			participated, and lessons were learned, however. 2 – An exercise was held in the last 3 years – the building owner/managers participated but found it of little value. 1 – Only rudimentary attempts at tabletop exercises focused on recovery, and they are attended by only junior staff from the building. 0 – No exercises, or no attendance from building staff.	
10.2	**Learning from experience – building back better**			
10.2.1	**Learning from past disasters**	Are updated data, best practices and lessons from past disasters collected, analyzed and used for learning opportunities, and made publicly available?	The building's owners/managers … 5 – … participate in formal lessons learned activities with other stakeholders and produce a formal after-action report that is made publicly available. Forums or public hearings are held to gain community input on current successes and areas for improvement. 4 – … participate in formal lessons learned activities with other stakeholders and produce a formal after-action report that is made publicly available. No community input and data/practices/ lessons learned are not most current. 3 – … have an internal process to evaluate lessons learned, and makes improvements, but no public report. 2 – … have no formal process but may note areas for improvement. 1 – …make only rudimentary attempts to learn from others or direct experience. 0 – … have no evident interest in others' experiences.	This assessment applies to learning from disasters in other areas as well as those immediately experienced. Learning will include strengths and weaknesses revealed by the disaster in prior preparation and mitigation, as well as in recovery per se (see below).
10.2.2	**Adequacy of prior planning and preparation**	Has a vulnerability assessment been adapted to building-related risks or any shortcomings in preparation revealed by the disaster, and have corrective measures been implemented?	5 – Vulnerability assessments have been fully updated and shortcomings in plans and preparations have been addressed through revisions to these. 4 – With one or two minor exceptions, vulnerability assessments have been fully updated and shortcomings in plans and	Only complete this question if a disaster has been experienced in the last three years. Implementation of the required changes may be at the level of the building, or city-wide (e.g. building codes).

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			preparations have been addressed through revisions to these. 3 – Plans are in place to address vulnerability or planning and preparation issues, but they have not all been implemented as yet. 2 – Plans are in place to address some but not all issues, and implementation is lagging significantly. 1 – Significant vulnerability and planning issues are known but remain unaddressed – the building is likely to repeat the shortcomings revealed in the last disaster, next time. 0 - No attempt to learn from the past disaster.	
10.2.3	**Changes to the building and procedures from previous disasters**	Has there been demonstrated and timely change to the building and disaster management procedures as a result of past disasters, such as compliance with new building codes?	5 – The building and/or procedures have been completely overhauled to improve resilience as a result of lessons learned from the last disaster experienced; OR – the building and procedures were reviewed after the last disaster and no improvements were found to be needed. 4 – The building and/or procedures have been significantly upgraded to improve resilience since the last disaster, as a result of lessons learned from the last disaster experienced. 3 – Some upgrades to the building and procedures have been made, but more are known to be needed. These are in hand. 2 – Some upgrades to the building and procedures have been made, but more are known to be needed and no plans exist to carry them out. 1 – Rudimentary attempts to upgrade the building and procedures. 0 – No attempts at upgrades.	Examples of changes and improvements may include, but are not restricted to: • Structural reinforcements; • Addition of flood prevention barriers, landscaping; • Improved access or egress; • Improved signage; • Better emergency equipment; • Improved back up power supplies; • Improved disaster preparation, management and recovery procedures; • Improved liaison with other stakeholders including the community.
10.2.4	**Culture of resilience and safety**	Is there a culture of promoting resilience and safety within the building-owner community?	A culture of resilience … 5 - … has been adopted by the building owner/manager and its occupants who take the approach of continuous improvement. 4 – … has been created by the building owner/manager and occupants but is not yet consistently at the desired level.	Indications of a culture of resilience (which can include day-to-day safety) include, but are not limited to the following: • Ideas for improving resilience and safety are welcomed; • Resilience and safety issues can be reported without fear of retribution;

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			3 – … is aspired to and steps are in hand to work towards it. 2 – … is often referred to, and some progress exists, but without evidence of the required effort to achieve it. 1 – … exists with lip service only, 0 – No interest in a culture of safety – statutory compliance remains the extent of interest.	• Resilience and safety are discussed at every major meeting regardless of issue; • Relevant training and learning materials are available to all; • Funding is fully and routinely available for resilience and safety improvements; • There is a track record of improving resilience and safety; • Employees and tenants (business or residential) readily agree that there is a culture of resilience and safety.
10.3	**Building back faster.**			
10.3.1	**Speed of access to funds**	Can funding for repairs and reconstruction be accessed in sufficient time to prevent undue loss of economic activity to the building's business(-es) or the surrounding area?	5 – There is sound reason to believe, from direct experience of the past performance of funders, that funding will be accessible rapidly and seamlessly after a disaster. 4 – There is sound reason to believe, from the contractual obligations of funders, that funding will be accessible rapidly and seamlessly after a disaster – but this has not yet been tested. 3 – There is some reason to believe that funding will be accessible rapidly, but realistically, delays may be anticipated. 2 – It appears likely that loss adjustment and bureaucratic delays will delay funding accessibility, but internal finds are available to cover the delay (see Essential 3). 1 – It is known from direct experience or suspected that funding will significantly delay repairs or reconstruction. 0 – No funding identified (see Essential 3).	Adequacy of funds was covered in Essential 3. This assessment specifically addresses speed of access to such funds as may be available. The speed with which funds are likely to be made available after a disaster, either via relief payments or insurance, may determine the future viability of the building, and/or businesses within it. See also Essential 3 regarding identification of funding sources, and insurance coverage.
10.3.2	**Speed of access to skills and equipment**	Can the necessary skills, materials and equipment be accessed in sufficient time to prevent undue loss of economic activity to the building's business(-es) or the surrounding area?	5 – There is sound reason to believe, from direct experience of past disasters, that skills, materials and equipment will be accessible rapidly and seamlessly after a disaster. 4 – There is sound reason to believe, from resources available in the area or internally, that skills, materials and equipment will be accessible rapidly and seamlessly after a disaster – but this has not yet been tested.	The speed with which skills and equipment for repairs and reconstruction are likely to be available after a disaster may determine the future viability of the building and/or businesses and accommodation within it.

Ref	Subject / Issue	Question / Assessment Area	Indicative Measurement Scale	Comments
			3 – There is some reason to believe that skills, materials and equipment will be accessible rapidly, but realistically, delays may be anticipated. 2 – It appears likely that skills, material and equipment will be in short supply due to competition for their use, and hence access will be delayed. 1 – It is known from direct experience or suspected that access to skills, materials and equipment will significantly delay repairs or reconstruction. 0 – No attention paid to skills, materials and equipment availability.	
10.3.3	**Integration of "recovery thinking"**	Is recovery viewed holistically by the building owner/manager as part of a continuum, and inseparable from preparedness, response, mitigation, and sustainable development?	5 – The building owner/manager views recovery not as a one-time stand-alone exercise after a disaster but as part of process cycle addressing preparedness, response, mitigation and sustainability, and manages roles, activities and inputs to this end 4 – As above, but with some minor organizational or process discontinuities. 3 – As above, but more significant shortcomings in attempts to achieve this. 2 – As above, but recovery is still, in effect a one-time, stand-alone exercise. In effect, lip-service only. 1 – No attempt to create a continuum. 0 – No recovery planning.	

Part 3 – Action Guide

Introduction

One of the shortcomings of scorecards is that while they are very good at "baselining" – that is, capturing existing strengths and weaknesses, and also progress over time to address the weaknesses – they are much less useful for allowing users to see exactly *what*, specifically, they may need to change to improve resilience. While those changes will be specific to each situation, the Action Guide below is intended to help as a "thought starter" for identifying the actions that may be necessary.

Please note that:

- The Action Guide is NOT exhaustive, and neither will it apply in every case. Any user may decide to address weaknesses differently, and there will almost certainly be additional actions identified as being necessary that we have not listed.
- Many of the considerations for each action can be inferred from other parts of the Building Scorecard. For example – if there is a need to create a resilience plan under Essential 1, the need for a central organizational focus and stakeholder engagement can be inferred from other assessments in the same Essential.
- Investment cases may be needed for many actions.
- Priorities as between actions are not addressed as these will clearly depend on the circumstances of each building and each owner/manager.
- Resilience improvement actions need to be defined and structured in terms of short term actions (we must take these steps as soon as possible in the next 1-3 year time period to address gaps and weaknesses), to mid-term actions taken in a 3-5 year time period, and long term plans to be implemented in 5 to 10 year cycle. Short term actions may be plan preparations, development of contact lists and response plans. Mid-term plans may be capital improvements, or relocation to lower risk settings; long term plans may require replacement of existing structures.

Action Guide

Ref (from Detailed Scorecard)	To improve resilience scores, consider the following:	Comments
Essential 1: Organize for resilience.		
1.1 Planning for resilience	• Create, expand or update resilience plans to address current and future hazards. • Create, expand or update a continuity of operations plan (COOP – also called emergency response plan, or ERP) for the event that a disaster does occur.	There are three levels of planning in the Building Scorecard, all with different timescales and considerations: • The focus in Essential 1 is on building and maintaining resilience generally, over time: • Planning and preparation for the management of actual disasters is covered in Essential 9; • Planning and preparation for post disaster recovery are dealt with under Essential 10.
1.2 Organization, coordination and participation.	• Designate a single focal point or governing process. • Establish links and coordination/information sharing arrangements with all relevant internal and external stakeholders. • Obtain agreement to clear role and responsibility definitions.	

Ref (from Detailed Scorecard)	To improve resilience scores, consider the following:	Comments
	• Ensure responsibility for occupant safety is clarified and carried out.	
1.3 Routine consideration of resilience issues in all decisions, and track record/momentum.	• Restructure business and reporting processes/metrics and incentives to make sure resilience is included in all decisions. • Create process for assimilating new information about risks and distribute to all stakeholders as applicable.	
Essential 2: Identify, understand and use current and future risk scenarios		
2.1 Threat and risk analysis	• Ensure availability of scenarios that address known current and future risks, ideally in format of "average case" and "worst case". • Execute a threat and risk analysis with expert help as needed. • Ensure consistency of assumptions with stakeholder and peer organizations including the city and region.	• Scenarios may be available from multiple sources – internally, city regional or national government organizations, universities, peer organizations. • Data on event magnitudes and frequencies should explicitly include adjustments for the future impact of urbanization and climate change.
2.2 Specific risks	• (Understand hazard, exposure and vulnerability levels with respect to specific risks.)	• (See above)
2.3 Financial and legal implications	• Understand monetary (eg cashflow, lost revenue) and legal implications of building shutdown for longer than 1 month.	• Use this data to generate RoI for improving resilience.
Essential 3 – Strengthen financial capacity for resilience		
3.1 Financial planning and budgeting	• Understand likely costs of a disaster to building owner/manager. • Create strategy for financing improvements • Research ALL available funding sources (many of which may not be labeled resilience – for example, US EPA or US HUD) and plan to access these. • Ensure adequacy of budget for ongoing maintenance of resilience-critical items.	• Use this data to generate RoI for improving resilience.
3.2 Insurance and contingency cover	• Confirm insurance amount covered and risks covered, allowing for deductibles. • Confirm availability of contingency funds to tide over until insurance payout (may be a year or more).	• Needs to be repeated annually.
Essential 4 - Pursue resilient urban development		
4.1 Building code compliance	• Identify relevant City or State building codes governing resilience; • Ensure compliance with codes and create methods and processes to maintain compliance over time as the building is updated and as codes change.	• Include disability access as this is a major factor governing evacuation efficiency.

Ref (from Detailed Scorecard)	To improve resilience scores, consider the following:	Comments
4.2 Resilient building standards.	• Assess whether City building codes are sufficient for current and likely future hazards (from Essential 2). • Identify independent resilience certification standard such as ICC International Building Code, RELi or SuRe, if required. • Ensure compliance with standards adopted and create methods and processes to maintain compliance over time.	• (See cross "Cross-Walk" spreadsheet for listing of other codes).
4.3 Code development and occupant education	• Engage with City and State as required to create suitable codes if none exist or if existing ones need updating. • Ensure occupants understand importance of code compliance.	• Business occupants, in particular, may make modifications to their offices or workshops that may create resilience risks (for example, blocking exits, unauthorized modifications to electrical supply).
Essential 5 - Safeguard natural buffers		
5.1 Protection of ecosystem services	• Understand where and how the building may damage ecosystem services which have resilience benefits and take steps to remediate or offset such damage.	•
5.2 Green infrastructure and energy	• Maximize the use of green infrastructure to reduce the environmental impact of the building generally. • Maximize use of renewable/locally sourced energy to enable building to become more resilient to energy grid failures.	•
5.3 Management of ecosystem impact	• Make someone clearly responsible for impact of building on ecosystem services, and for driving use of green infrastructure/energy.	•
Essential 6: Strengthen institutional capacity for resilience		
6.1 Skills and training	• Ensure availability of skills for managing/monitoring design and construction, scenario planning, building management and risk/disaster management. • Ensure all building and building systems documentation is backed up and stored off-site.	• Skills may exist in-house or may be acquired externally.
6.2 Data and information	• Create systems and processes to collect and analyze data and information on resilience issues; apply these to updating resilience plans regularly. • Digitize building data to enable sharing with other stakeholders and emergency responders.	•
6.3 Information sharing and inclusion	• Create mechanism to regularly update all internal and external stakeholders on resilience plans and capabilities.	•

Ref (from Detailed Scorecard)	To improve resilience scores, consider the following:	Comments
	• Create mechanism to regularly update all internal and external stakeholders on risks, preparation and response.	
Essential 7: Increase social and cultural resilience		
7.1 Community role of the building.	• Ensure the building will be able to discharge any community function (public shelter, meeting place, public housing, place of worship, school) during and/or after a disaster.	• Buildings in question may be public or privately owned.
7.2 Community engagement	• Ensure critical building staff are fully supported (including their homes, families) so that they will be available to operate and restore the building post-disaster. • Create mechanisms and processes to account for and ensure the safety and support of residential occupants. • For buildings with a community role, ensure community leaders and organizations understand resilience plans for the building and any likely limitations; appoint a community liaison person.	• (Safety of workforce occupants – see Essential 9).
Essential 8: Increase infrastructure resilience		
8.1 Building/facility infrastructure – natural hazards	• Confirm that the building is a safe refuge for occupants in the event of disasters arising from risks assessed in Essential 2 – or make alternative plans for occupants. • Create processes for monitoring ongoing suitability as a refuge in the light of structural or occupancy changes, or external factors such as climate change or changes in the surrounding area.	• Consider the event history of the building as prior events may have fatigued or weakened the building structure making it more vulnerable to failure.
8.2 Building/facility infrastructure – man-made threats.	• Review procedures for handling hazardous materials, of applicable. • Review physical security measures that protect against terrorism.	• As above, consider the event history of the building as prior events may have fatigued or weakened the building structure making it more vulnerable to failure.
8.3 Supporting public infrastructure.	• Confirm likely access to roads and transportation systems leading to and from the building. • Understand likely resilience of key local and regional infrastructures in the event of disaster arising from risks in Essential 2, and likely impact on building performance and business continuity. • Understand capabilities and likely response times of disaster response systems (police, fire, ambulance) in the event of disaster arising from risks in Essential 2, and factor into disaster planning.	• See Detailed Scorecard for listing of critical infrastructures.
Essential 9 – Ensure effective disaster response		

Ref (from Detailed Scorecard)	To improve resilience scores, consider the following:	Comments
9.1 Plans and preparation	• Ensure fully detailed and up-to-date disaster response, and business continuity, plans that deal with the risks assessed in Essential 2; create processes for reviewing and updating these annually. • Ensure those plans are coordinated with other relevant entities and stakeholders, and that they shown to be interoperable.	• There are three levels of planning in the Building Scorecard, all with different timescales and considerations: • Essential 1 focused on building and maintaining resilience generally, over time: • Planning and preparation for the management of actual disasters is covered in this Essential; • Planning and preparation for post disaster recovery are dealt with under Essential 10.
9.2 Emergency equipment and people readiness	• Ensure complete and reliable set of emergency equipment, with process to ensue frequent checks and reviews. • Ensure key disaster response roles are fully staffed and documented, and actors regularly trained. • Ensure building occupants understand their roles and responsibilities in the event of a disaster, and their understanding is regularly refreshed.	•
9.3 Warning systems	• Provide warning systems that can reach all parts of the building and test these regularly.	•
9.4 Drills and practices	• Hold regular (at least annual) drills and practices for all disaster response processes and all occupants and stakeholders.	•
9.5 Emergency communications.	• Ensure multiple methods of communication are available between building owners/managers, staff, occupants, first responders and disaster management teams.	• These will include social media of various kinds.
Essential 10: Expedite recovery and build back better		
10.1 Post disaster recovery planning.	• Create plan for post disaster resumption of normal activity in the building – assessing and reporting damage, restarting key systems, re-stocking inventory, moving occupants back in, securing repair funds, and so on. • Hold practices and drills for these plans, just as for disaster response, with internal and external stakeholders, including table-top exercise with City. • Ensure representation of building owners/managers in city and state post-disaster recovery planning.	• There are three levels of planning in the Building Scorecard, all with different timescales and considerations: • Essential 1 focused on building and maintaining resilience generally, over time: • Essential 9 covered planning and preparation for the management of actual disasters; • This Essential covers planning and preparation for post disaster recovery.
10.2 Learning from experience.	• Create process to ensure lessons and data from prior disasters are included in resilience, disaster response and post-disaster plans.	

Ref (from Detailed Scorecard)	To improve resilience scores, consider the following:	Comments
10.3 Building back faster	• Confirm that funding for repairs and resumption of business activity can be accessed in time to prevent undue financial loss or displacement. • Confirm speed of access to necessary skills and equipment, similarly.	•