7.2.1 Emergency Preparedness Vulnerability Assessment

Before performing any manual mitigation or designing an emergency preparedness plan (EPP), healthcare facilities should assess their functional, physical-nonstructural, and structural vulnerabilities in the event of a disaster. By knowing the answers to the questions posed below, a facility can create the right EPP for itself based on its geographic location, building structure, etc. This questionnaire covers a wide array of possible vulnerabilities, some of which may not be applicable to all facilities at all times, especially given that most disaster codes are called for disasters of limited extent and duration (e.g., traffic accidents).

Appropriate personnel should participate in the evaluation of aspects of the facility about which they are most knowledgeable (e.g., pharmacists should evaluate pharmaceutical supplies). In some instances, the assistance of a qualified plumber, electrician, licensed structural engineer, etc., will also be necessary.

The following areas are covered:

Functional Vulnerability

Physical-Nonstructural Vulnerability

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Structural Vulnerability

Functional Vulnerability

Electricity

1. How much electricity does the facility use, on average, in one day? _____ kWh/24 hours

   (a) Can the following levels of light illumination be continued even in an emergency?

   ☐ Corridors leading to exits, exit direction signs, and doorways — 30 lux

   ☐ Exit direction signs on face of luminaire and in nursing station, pharmacy, blood bank area, central suction pump area, telephone switchboard area, central sterile supply, issuing area, main electrical control center, hospital elevator exits, stairwells, and life safety areas (life support areas) — 50 lux

   ☐ Operating room (OR): surgical table, delivery room, obstetrical table — 27,000 lux

   ☐ OR: emergency table — 22,000 lux

   ☐ Recovery room for OR and obstetrical suites, nurseries, and cardiac catheterization laboratories — 100 lux

   ☐ Medication preparation area, coronary care units, dialysis units, and intensive care units (ICUs) — 300 lux

   ☐ Psychiatric patient bed area — 20 lux

   ☐ Emergency department (ED) treatment areas — 500 lux[1]

   (b) What is the total minimum power needed for the facility to still function (e.g., if all nonessential systems are turned off — extraneous lights, televisions, etc.)? _____

2. Does the facility have at least two sources of electric energy? ☐ Yes ☐ No If yes:

   (a) What are the sources? _____ (source 1)

   _____ (source 2)

   (b) What are their capacities? _____ (source 1)

   _____ (source 2)

   (c) What type of fuel do they use? _____ (source 1)

   _____ (source 2)

   (d) In the event that the fuel supply is damaged during an emergency, identify an alternate method for supplying fuel or running critical systems. _____

   (e) Is there a preventive maintenance plan for the generators? ☐ Yes ☐ No

   (f) How often are the generators tested? _____

3. Where is the facility's backup generator(s) located? _____

   (a) If it is on the roof, is it protected from high winds? ☐ Yes ☐ No ☐ NA

   (b) If it is in the basement or at ground level, is it protected from flooding? ☐ Yes ☐ No ☐ NA

4. Are the fixtures anchoring the generator and the backup generator strong yet flexible? ☐ Yes ☐ No

5. Does the facility have at least one portable generator in addition to its backup generator that can be used to provide power in the ICU, etc.? ☐ Yes ☐ No

   (a) If yes, how many portable generators does the facility have? _____

   _____

   (b) What are their energy sources? _____

   (c) How long can they provide energy? _____

   (d) Are properly rated extension cords available for the portable generators? ☐ Yes ☐ No

   (e) Where are they kept? _____

   (f) Are any kept in the ICU? ☐ Yes ☐ No

6. Is there a basic map of how electricity is fed into the facility and the locations of major feed lines and switching points throughout the facility? ☐ Yes ☐ No

7. Where does electricity feed into the facility? _____

   (a) What company(ies) or entity(ies) provides electricity to the facility? _____

   _____

   (b) If the facility has a double-ended substation and a feed to one end goes down, is that end automatically switched to be fed from the other end? ☐ Yes ☐ No

   — Can either feed supply the full capacity? ☐ Yes ☐ No ☐ NA

8. Is the electricity fed via a dedicated transmission line? ☐ Yes ☐ No

   (a) Does the normal power system have special dedicated circuits for the following?

— ED	☐ Yes	☐ No
— OR	☐ Yes	☐ No
— ICU	☐ Yes	☐ No
— Laboratories	☐ Yes	☐ No
— Sterilization area	☐ Yes	☐ No
— X-ray areas	☐ Yes	☐ No
— Elevators	☐ Yes	☐ No
— Kitchen cold-storage area	☐ Yes	☐ No
— Water pumping systems	☐ Yes	☐ No
— Heating, ventilating, and air-conditioning (HVAC) system	☐ Yes	☐ No

   (b) Are these circuits identified on the basic map mentioned earlier? ☐ Yes ☐ No

9. Does each treatment space and patient bed have access to receptacles on the critical branch of the emergency power system? ☐ Yes ☐ No

   (a) If not, identify which ones do not: _____

   — Does each of these areas have access to outlets on the normal (i.e., nonemergency) circuits? ☐ Yes ☐ No ☐ NA

10. Does the facility have its own power substation? ☐ Yes ☐ No

11. Does the facility have single or double feeding from the local utility? ☐ Single ☐ Double

12. Where are the electric company's three closest substations, and can they supply electricity by a direct special line in case of emergency? ☐ Yes ☐ No If yes, then specify:

    Substation: _____ Address: _____

    Substation: _____ Address: _____

    Substation: _____ Address: _____

13 Where are emergency lighting systems (e.g., stationary lights) located?

    Area: _____ Type of lighting: _____ No.: _____

    Area: _____ Type of lighting: _____ No.: _____

    Area: _____ Type of lighting: _____ No.: _____

14. Does the facility have basic electrical repair supplies and tools in an emergency kit that is likely to survive a disaster? ☐ Yes ☐ No

15. Does the institution have a policy on the use of extension cords to meet emergency needs? ☐ Yes ☐ No

Water Supplies

1. Based on normal daily usage, how much water is necessary on a daily basis? _____

   (a) If usage varies by season, please note:

   Winter: _____

   Spring: _____

   Summer: _____

   Fall: _____

   (b) How much of this water must be potable? _____

2. What is the minimum amount of water needed per day to keep the following operations continuing?

   (a) Vacuum systems (if hooked to water): _____

   (b) HVAC: _____

   (c) Sterilization: _____

   — Can bottled water be used? ☐ Yes ☐ No

   (d) Toilets: _____

   — Can water be supplied manually? ☐ Yes ☐ No

   (e) Parenteral systems: _____

   (f) Surgical scrub sinks: _____

   (g) Fire sprinklers: _____

   (h) Film-development equipment: _____

   (i) Sink and kitchen faucets: _____

   (j) Laundry: _____

   (k) Dialysis equipment. _____

3. How much potable water is necessary in treating the maximum number of patients the facility can accommodate during a disaster? _____

4. What is the source of the facility's main water supply? _____
   (a) How many major pipes provide water to the facility? _____
   (b) Are the water piping systems labeled or otherwise marked so it is easy to get to crucial areas? ☐ Yes ☐ No
   (c) Where are the facility's water storage tanks that are fed by the major pipes? _____
   (d) How much water do the storage tanks contain? _____
5. Does the facility have a backup potable water supply in tanks, bottles, drums, etc ? ☐ Yes ☐ No
   (a) What is the capacity of the backup supply? _____ gallons
   (b) For how many days are the reserves estimated to last (should be at least four days)? _____
   (c) Can the water's potability be tested? ☐ Yes ☐ No
   — If yes, how? _____
   (d) Is there a reserve supply that can be decontaminated? ☐ Yes ☐ No
   (e) Does the facility have a supply of liquid chlorine bleach that contains 5.25% sodium hypochlorite or iodine and no soap or fragrances to treat water if necessary? ☐ Yes ☐ No
   (f) Are there backup supplies of distilled water for pharmacy use? ☐ Yes ☐ No
6. Does the facility have a water-pumping system to help in water pressurization? ☐ Yes ☐ No
   (a) If yes, how many pumps? _____
   — Capacity of each: _____
7. What is the best way of supplying water to the facility in an emergency when all other supplies fail?

   _____
8. Does the facility have a basic plumbing repair kit and tools? ☐ Yes ☐ No
9. Does the facility have an adequate supply of paper or plastic goods for food distribution to conserve the use of water that runs the dishwasher? ☐ Yes ☐ No
10. Does the facility have an adequate supply of linens and gowns to conserve the use of water that runs the laundry? ☐ Yes ☐ No

Refuse Collection

1. How is solid waste currently disposed of? _____
2. Where are secure areas in which solid waste can be stored in the event of the following (only answer for natural disasters for which the facility is at risk)?[2]
   (a) Flooding _____
   (b) Severe winds: _____
   (c) Earthquakes: _____
3. Have alternate haulers been identified? ☐ Yes ☐ No
   (a) If yes, identify: _____

Sewage System

1. Where are sewer drains located? _____
2. Where is the facility's main sewer pipe hookup located? _____
3. Where does the facility's main sewer pipe hook up to the local sewer system? _____
4. Are there ways to prevent backflow? ☐ Yes ☐ No
5. How will human waste be handled? _____
   (a) Are portable latrines available? ☐ Yes ☐ No
   (b) Has red-bagging of human waste been considered if toilets cannot be flushed? ☐ Yes ☐ No
6. If sewage overflows, is lime or disinfectant available? ☐ Yes ☐ No
7. If sewage overflows, is there diking equipment or spill barriers available to contain it? ☐ Yes ☐ No
8. Are high-efficiency particulate-air (HEPA) respirators, rubber boots, gloves, splash goggles, and protective garments available for cleaning up sewage backups? ☐ Yes ☐ No
   (a) Are staff who must wear respirators properly fit-tested and given medical clearance? ☐ Yes ☐ No
9. Are mechanical dehumidifiers, wet/dry vacuums, squeegees, and/or moisture extraction equipment available to dry areas where sewage backup has occurred? ☐ Yes ☐ No
10. Is a nonpenetrating moisture meter available to test for subsurface contamination after a sewage backup? ☐ Yes ☐ No

Gas Systems

1. Is there a basic map of, and signs indicating, the facility's gas systems, including main shutoff valves? ☐ Yes ☐ No
   (a) Does the main supply line have a labeled shutoff valve? ☐ Yes ☐ No
   (b) Is there a way to shut off gas at the source? ☐ Yes ☐ No
   (c) Are all shutoff valves placed at the outlet of the source of the supply so as to be isolated from the piping system? ☐ Yes ☐ No
2. Do all facility gas systems meet NFPA 99 and state and local requirements? ☐ Yes ☐ No
3. Are there enough portable cylinders (e.g., E-cylinders) with regulators and connections to support patient needs? ☐ Yes ☐ No
4. Is there a monitor with a master alarm for conditions in all lines of the medical gas supply? ☐ Yes ☐ No
5. Is there an alarm system to warn of an accidental release of ethylene oxide (EtO) and other hazardous gases? ☐ Yes ☐ No
   (a) Are alarms run by a source independent of the main electric supply, such as batteries? ☐ Yes ☐ No

Communications

1. Indicate the different types of communication equipment available:

   Wire operated (e.g., phones, facsimile machines, computer modems)

   Type: _____ Location: _____ No.: _____

   Type: _____ Location: _____ No.: _____

   Type: _____ Location: _____ No.: _____

   Radio-wave operated (e.g., radios, pagers, televisions)

   Type: _____ Location: _____ No. _____

   Type. _____ Location: _____ No . _____

   Type: _____ Location: _____ No.: _____

   Combination radio / wire operated (e.g., cellular phones)

   Type: _____ Location: _____ No.: _____

   Type: _____ Location: _____ No.: _____

2. Are batteries of appropriate sizes available for systems such as pagers, cellular phones, and radios?
   ☐ Yes ☐ No

   (a) Where are extra batteries kept for each system? _____

   _____

   _____

   _____

   (b) Are batteries periodically checked to make sure they still have current? ☐ Yes ☐ No

   (c) Are extra batteries of every size kept in the disaster shed or kit? ☐ Yes ☐ No

3. Where is the point of origin of the telephone trunk lines feeding the facility? _____

   (a) Where are the facility's secondary phone lines?

   Location: _____

   Location: _____

   Location: _____

   Location: _____

4. Are some phone lines available that do not run through the switchboard? ☐ Yes ☐ No

   (a) If yes, where are they located? _____

   _____

   _____

5. In case of a network failure, are there personal computers that are not on the hospital network but that are set up for e-mail and faxes? ☐ Yes ☐ No

6. How is the telephone system supplied with power in the event of a failure of the power distribution network? _____

7. Is the emergency radio communication system set up to operate independently of the building's service and emergency power systems if needed? ☐ Yes ☐ No

8. Where are all the operations areas for the public-address system?

   Location: _____

   Location: _____

   Location. _____

9. Is the computer system set up for e-mail? ☐ Yes ☐ No

10. Is the computer system set up for faxes? ☐ Yes ☐ No

11. Are healthcare workers (HCWs) available to act as runners to communicate messages internally? ☐ Yes ☐ No

12. Has an arrangement been made with a local radio or television station to broadcast information to responders in an emergency? ☐ Yes ☐ No

    (a) If yes, which stations? _____

13. Are ham radio operators contacted to provide communication between facilities and other external organizations or resources? ☐ Yes ☐ No

    (a) Do these operators know the facility's needs and priorities during a disaster? ☐ Yes ☐ No

Supplies/Equipment

1. What are the capacities of the facility's freezers and refrigerators? _____

   _____

   _____

   _____

2. How long is the reserve supply of food estimated to last (e.g., at a minimum, four days)?

   Nonperishable food: _____ days

   Perishable food _____ days

   (a) Are backup food supplies rotated on a regular basis? ☐ Yes ☐ No

3 Identify the generic names and quantities of the following drugs that are stockpiled:

   (a) Antibiotics _____

   (b) Oral, intramuscular, and intravenous analgesics: _____

   (c) Antiseptic solutions: _____

   (d) Other pharmaceuticals as listed on code-blue cards, such as epinephrine and sodium bicarbonate:

   _____

   (e) Are these drugs kept current (i.e., not expired)? ☐ Yes ☐ No

4. Identify the quantities of the following medical supplies/equipment that are stockpiled:

   (a) Gauze, elastic, and plaster bandages: _____

   (b) Traction equipment: _____

   (c) Different-sized x-ray plates: _____

   (d) Disposable latex and latex-free sterile gloves, gowns, masks, boots, and caps: _____

   (e) Vesical catheters: _____

(f) Intravenous solutions and setups: _____

(g) Orthopedic materials such as plates, pins, and screws: _____

(h) Pulse oximeters _____

(i) Arterial blood gas kits: _____

(j) Needle assortments: _____

(k) Manual resuscitators (varying sizes): _____

(l) Nasal pharyngeal airways (and K-Y Jelly): _____

(m) Endotracheal tubes: _____

(n) Laryngoscope stylets with extra batteries and bulbs: _____

(o) Suction catheters: _____

(p) Yankuners: _____

(q) Portable suction: _____

(r) Nonrebreathing oxygen masks: _____

(s) Portable oxygen: _____

(t) Nasal cannula face masks: _____

(u) Defibrillators: _____

(v) Nonrigid transporting devices: _____

(w) Rigid stretchers: _____

(x) Wheelchairs: _____

(y) Stairchairs: _____

5. Are latex-free alternatives available? ☐ Yes ☐ No

6. With regard to the sterilization systems:

(a) How many are there? _____

(b) What type are they? _____

(c) What is the capacity of each? _____

_____

_____

(d) What is the energy source, if any, for each? _____

_____

_____

(e) How much high-level disinfectant/sterilant solution is available? _____

(f) Can medical equipment be cleaned in the absence of water? ☐ Yes ☐ No

(g) Are autoclaves quality control tested with spore strips? ☐ Yes ☐ No

(h) Is EtO stored in a properly labeled National Fire Protection Association (NFPA)-approved cabinet? ☐ Yes ☐ No

7. Is the computer system set to automatically back up files, and are files copied and kept in a secure place? (The Joint Commission on Accreditation of Healthcare Organizations [JCAHO] requires facilities to consider how to protect patient information.)[3] ☐ Yes ☐ No

   (a) Are files over three years old microfilmed or stored off-site in a secure environment? ☐ Yes ☐ No

   (b) Are crucial records stored in fireproof cabinets or safety deposit boxes? ☐ Yes ☐ No

Space

1. Where is the largest main open area, accessible to an entrance, that can be used for triage?

   Location: _____

   Size: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

2. What is the size of the ED?

   Square feet: _____

   Location: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

3. What is the size of the OR?

   Square feet: _____

   Location: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

   (a) Where can makeshift ORs be created for smaller, less dangerous, procedures?

   Location: _____

   Size: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

4. Which hallways can be cleared for use as additional patient care zones?

   Location: _____

   Size: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

5. Is there an area where smaller wounds and injuries can be treated? ☐ Yes ☐ No

   (a) If yes, location: _____

6 What is the total number of patient beds? _____

   (a) How many intensive care beds? _____

   (b) How many ambulatory care beds? _____

   (c) How many regular care beds? _____

   (d) How many pediatric care beds? _____

7 Is there an area designated for decontamination in the event of a chemical or radiological spill?
☐ Yes ☐ No

   (a) If yes, location: _____

   (b) Is there a supply area for hazardous materials cleanup and decontamination materials?
   ☐ Yes ☐ No

   — If yes, location: _____

   (c) Are staff members trained to be able to handle decontamination? ☐ Yes ☐ No

8. What area can be used as an ancillary morgue?

   Location: _____

   Size: _____

   Circle services available. water, light, telephone, other:

   _____

   _____

9. Sleeping Areas/Refuge

   (a) Is there an area in which HCWs can sleep and keep their belongings? ☐ Yes ☐ No

   Location: _____

   Size: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

   (b) Is there space in which HCWs' families can take refuge in the event that their homes are damaged?
   ☐ Yes ☐ No

   Location: _____

   Size: _____

   Circle services available: water, light, telephone, other:

   _____

   _____

(c) Is there enough space to offer an area of refuge for community members who are homeless?
☐ Yes ☐ No

Location: _____

Size: _____

Circle services available: water, light, telephone, other.

_____

_____

10. Is there an area where friends and family members can wait for news of their injured loved ones?
☐ Yes ☐ No

Location: _____

Size: _____

Circle services available: water, light, telephone, other:

_____

_____

11. Is there an area designated as a place of prayer or silent meditation? ☐ Yes ☐ No

Location: _____

Size: _____

Circle services available: water, light, telephone, other:

_____

_____

12. Do the media have their own area, complete with supplies? ☐ Yes ☐ No

Location: _____

Size: _____

Circle services available: water, light, telephone, other:

_____

_____

Circle supplies included: pencils, paper, coffee machines, snack machines, facsimile machines, radios, phones, other: _____

Staff and Medical

1. What type of victim(s) is the facility equipped to treat? _____
2. What critical clinical professionals are available?

General surgeons: _____

_____

_____

Orthopedic surgeons: _____

_____

_____

Registered nurses: _____

Physicians: _____

Emergency physicians: _____

Cardiologists: _____

Pulmonary physicians: _____

Pediatricians: _____

Medical technicians: _____

Anesthesiologists: _____

Nurse anesthetists: _____

Social workers: _____

X-ray technicians: _____

Pharmacists: _____

Other: _____

(a) Is there a burn center? ☐ Yes ☐ No

(b) Is there a cardiovascular unit? ☐ Yes ☐ No

(c) How many surgical suites are available? _____

(d) Is there a rehabilitation unit? ☐ Yes ☐ No

(e) Are ED personnel trained in decontamination? ☐ Yes ☐ No

3. How many safety and security personnel are on staff? _____

4 How far away do most HCWs live? _____

(a) Identify HCWs with critical emergency-response roles who live within walking distance:

_____

_____

(b) Which HCWs have reliable transportation (e.g , boats, four-wheel-drive vehicles)?

_____

_____

_____

(c) Have HCWs with reliable transportation been assigned to carpools? ☐ Yes ☐ No

(d) Will the local emergency planning commission coordinate with the facility to get HCWs transported to the facility in an emergency (e.g., by helicopter)? _____

Patient Care Issues

1. What kinds of injuries are different types of disasters likely to create?

Car accident: _____

Hazardous materials incident: _____

Hostage crisis: _____

Explosion/bomb: _____

Fire. _____

Weather related (e.g., flooding or other as appropriate for the facility's region):

_____

_____

_____

Geology related (e.g., earthquake or other as appropriate for the facility's geographic location):

_____

_____

_____

These estimates can be used to determine the ideal composition of triage teams and which areas of the facility would be best converted into patient care centers.

Facility Characteristics (Internal and External)

1 How close is the facility to major highways? _____

(a) Are roads leading to major highways likely to be flooded in a storm? ☐ Yes ☐ No

(b) Identify all the different routes into town or to vital resource areas:

_____

_____

_____

(c) Is the facility located near a main body of water from which resources can be shipped in?
☐ Yes ☐ No

(d) Does the facility have a helicopter or other means to receive resources by air? ☐ Yes ☐ No

2. Is the facility designed so that patient care services are separate from general services? For example, are the following areas kept separate from patient care areas?

(a)	Boiler room	☐ Yes ☐ No
(b)	Generators	☐ Yes ☐ No
(c)	Water storage tanks	☐ Yes ☐ No
(d)	Dietary	☐ Yes ☐ No
(e)	Laundry	☐ Yes ☐ No
(f)	Mechanical rooms	☐ Yes ☐ No
(g)	Elevator rooms	☐ Yes ☐ No
(h)	Hazardous chemical storage	☐ Yes ☐ No

3. Are there illuminated signs located inside and outside the facility to direct people to the following areas?

(a)	Stairs	☐ Yes ☐ No
(b)	Fire escapes	☐ Yes ☐ No
(c)	Fire extinguishers	☐ Yes ☐ No
(d)	Elevators	☐ Yes ☐ No
(e)	Parking	☐ Yes ☐ No

Disaster Kits/Sheds/Trailers

1. Does the facility have a disaster kit/shed/trailer in which vital items are kept in case of emergency?
☐ Yes ☐ No

2. Where is the disaster kit located? _____

(a) Is it located in a cool, dry place? ☐ Yes ☐ No

(b) Does it contain enough reserves to last at least four days? ☐ Yes ☐ No

3. Circle items that are contained in the disaster kit(s):

food	linens	blankets	flashlights
batteries	extension cords	stockpile rope	water-purifying tablets
matches	candles	flares	duct tape
markers	work gloves	brooms	victim tags
sandbagging materials	repair kits (e g., plumbing, electrical)	medical supplies (including pharmaceuticals)	plywood (for broken windows)
blueprints of the facility			

4. Is there a backup kit in case it is impossible to get to the primary kit? ☐ Yes ☐ No

5. Are all foods sealed properly? ☐ Yes ☐ No

Physical-Nonstructural Vulnerability

Installations

1. Are all gas cylinders firmly fastened to a supporting structure? ☐ Yes ☐ No
2. Are bulk oxygen tanks bolted to a reinforced pad outside the facility? ☐ Yes ☐ No
3. Are EtO cylinders stored upright in a secure area and fastened to a solid structure?
   ☐ Yes ☐ No ☐ NA
4. Are EtO cylinders installed so that they may be closed at the connection to the cylinders?
   ☐ Yes ☐ No ☐ NA
5. Are oxidizing agents enclosed in containers with a fire-resistive rating of at least one hour?
   ☐ Yes ☐ No ☐ NA
6. Are compressed or volatile gases:
   (a) Kept away from radiators or other heat sources? ☐ Yes ☐ No ☐ NA
   (b) Stored where heavy items are not likely to strike or fall on them? ☐ Yes ☐ No ☐ NA
7. Are connections to medical gas pipes tight enough to prevent leakage? ☐ Yes ☐ No ☐ NA
8. Are medical gases stored in dry, cool, well-ventilated areas? ☐ Yes ☐ No
9. Are all vital pieces of roof-mounted equipment (e.g., generator) firmly secured? ☐ Yes ☐ No ☐ NA
10. Is the telephone communications control panel installed in a structurally secure location? ☐ Yes ☐ No
11. Are valuable medical supplies and equipment placed on a low shelf where there is less risk of their falling and becoming irreparably damaged? ☐ Yes ☐ No
12. Is heavy equipment (e.g., televisions) either firmly secured (to a load-bearing wall) or kept low to the ground? ☐ Yes ☐ No

Piping Installations

1. Are gas pipes installed:
   (a) Below the local level of frost penetration? ☐ Yes ☐ No ☐ NA
   (b) At a sufficient depth to protect against weather and geological stresses? ☐ Yes ☐ No
2. Are water pipes sufficiently flexible to withstand breakage during an earthquake? ☐ Yes ☐ No
3. In general, is the pressure in pipelines balanced (usually with a kicker block at the return or anchorage of the pipelines)? ☐ Yes ☐ No
4. Do pipe installations have a firm pipe bedding to avoid high deflections? ☐ Yes ☐ No
5. How are pipes connected to one another? _____
6. Do wastewater pipes have:
   (a) Traps installed to prevent sewer gas from entering the facility? ☐ Yes ☐ No
   (b) Vents installed near wastewater fixture traps or where piping changes direction to avoid too much pressure in the pipes? ☐ Yes ☐ No

Building Structure

1. If the building has platforms, can lower-level floors support the upper platforms if they fall?
   ☐ Yes ☐ No ☐ NA
2. Are balconies and the concrete veneer on the outside of the building made of relatively light materials (e.g., not heavy stone)? ☐ Yes ☐ No
3. Are all chimneys and fill-in walls reinforced (e.g., with wire mesh)? ☐ Yes ☐ No
4. Are heavy items kept off the roof when possible? ☐ Yes ☐ No ☐ NA
5. Are the interiors of windows covered with clear plastic? ☐ Yes ☐ No
6. Are walls void of major penetrations? ☐ Yes ☐ No

Structural Vulnerability

Ensure that the building's structural integrity is suitable for the kinds of disasters it is likely to have to withstand. Consider having a qualified engineer perform a structural inspection.

Geology

1. What are the geological hazards of the area surrounding the facility? _____

   _____
2. What is the seismicity of the area surrounding the facility? _____

   _____

   Seismicity information can be gathered through the National Earthquake Information Center at (303) 273-8500.

   (a) How far is the facility from any known earthquake faults? _____

   (b) Has the soil in the area been checked for load-bearing capacity? ☐ Yes ☐ No

   (c) Does the building's static load fall within the limits of the soil's load-bearing capacity? ☐ Yes ☐ No
3. What are the surrounding soil's characteristics and conditions? _____

   _____
4. Is the facility located on a hill or in a valley? ☐ Yes ☐ No
5. How high is the surrounding water table? _____

   Water-table information can be gathered from the city hall of the particular city or from the state.

   (a) If the facility is located on a floodplain, is the emergency generator(s) on the roof or on a raised surface (e.g., higher than the 100-year high-water table), rather than in the basement?
   ☐ Yes ☐ No ☐ NA

   (b) If the facility is located in a hurricane or tornado zone, is the emergency generator(s) in the basement or contained in the building, rather than on the roof? ☐ Yes ☐ No ☐ NA
6. Are water supply wells away from pollution sources as required by local codes? ☐ Yes ☐ No ☐ NA
7. Are water supply wells located on relatively high ground so that surface water will not run into them?
   ☐ Yes ☐ No
8. How close is the nearest seacoast, river, tributary, etc.? _____

Structure

1. What was/is the enforced building code:
   (a) At the time the facility was built? _____
   (b) Now? _____
   (c) Does the new code have stricter requirements? ☐ Yes ☐ No
   — If yes, has the building been retrofitted? ☐ Yes ☐ No ☐ NA
   (d) Was a structural engineer or architectural engineer consulted for retrofit and/or to ensure compliance with the code(s)? ☐ Yes ☐ No
   (e) Is the building in compliance with appropriate sections of the Standard Building Code (southeast region), National Building Code (northeast and central states), Uniform Building Code (western states), Building Officials and Code Administrators International (BOCA), NFPA, and state, local, and zoning regulations? ☐ Yes ☐ No
2. What is the physical composition of the building (concrete, masonry, wood, brick, steel, curtain wall, or a mixture)? _____
3. Is concrete prestressed to avoid shrinkage after hydration, change in temperature, or change in load? ☐ Yes ☐ No ☐ NA
4. Is all masonry reinforced, and how is it reinforced? ☐ Yes ☐ No ☐ NA

   _____
5. What is the composition of support beams (e.g., metal alloy, concrete)?

   _____
   (a) Is the composition adequate for the compression and tensile support requirements of the building? ☐ Yes ☐ No
6. What are the specifications of the wood and/or steel frames? _____
7. Are ground-floor supports, additions, and expansions adequate for structural inspection?
   Location: _____ Condition: _____
   Location: _____ Condition: _____
   Location: _____ Condition: _____
   Location: _____ Condition: _____
8. Are weak links in the building's structural skeleton reinforced as appropriate? ☐ Yes ☐ No
9. Are interior walls used to support floors (load bearing) in long buildings? ☐ Yes ☐ No
10. Do all columns have sufficient lateral support? ☐ Yes ☐ No
11. Are ground-level columns strong but flexible? ☐ Yes ☐ No
12. Where appropriate, are buttresses used to stiffen the building and keep tall buildings from tipping over? ☐ Yes ☐ No
13. To create more resistance in walls, are empty portico spaces filled in with concrete or strengthened masonry? ☐ Yes ☐ No
14. In tall buildings, is the stiffness of the steel frame suitable to avoid sway in high winds? ☐ Yes ☐ No

15. Are bolts on panels tightened as specified by structural engineers to allow for expansion and contraction in extreme weather conditions, and are there counterweights? ☐ Yes ☐ No

16. In areas where earthquakes are a risk, are masonry walls properly supported to absorb horizontal shocks? ☐ Yes ☐ No

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Sources:

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2. Pan American Health Organization (PAHO) *Health services organization in the event of disaster.* Washington (DC): PAHO;1983

3. Joint Commission on Accreditation of Healthcare Organizations. 1996. EC1.6.