



**FLOOD RISK ANALYSIS, MITIGATION AND FLOOD EMERGENCY PREPAREDNESS SCOPING GUIDELINES**

**1.0** [GENERAL GUIDELINES](#)

**2.0** **FLOOD RISK ANALYSIS:**

**2.1** **Flood Risk Assessment** - Required to identify points and areas of flood risk

- a. Archival Drawings: Research in archival drawings (Alchemy) all relevant original and subsequent site/floor plans and sections (indicating elevations) and subsequent Site Surveys (enough spot elevations to provide confidence in the designer's risk assessment and mitigation recommendations).
- b. Vertical Elevations: Starting with Alchemy drawings, establish archival (original) elevations relative to datum for the site, all vulnerable building elements and openings in the building envelope, as well as floor levels, crawlspace and other areas that might be subject to flooding due to their location below the DFE. Note that spaces inside the building below the DFE will be vulnerable to flooding unless the envelope is completely protected from infiltration. If flood waters find a way to get into the building (whether through a slab rupture, openings such as a door, window or louver, or an unsealed pipe sleeve, or an open vent pipe below the DFE), flood waters will collect in interior spaces below the DFE to seek the level of the flood outside.
  - i. Typically Alchemy drawings will reference Borough (or Highway) Datum, which are different for each NYC borough. Use conversion charts or A&E's Conversion Calculator (on website) to convert datum between Borough, NVDG and NAVD88. (Note that 2007 FIRM's are in NGVD, but PFIRMs are in NAVD.) All DOB and DEP filings currently must utilize NAVD88, and should be in decimal feet. (See related websites for detail.)
  - ii. Original plans may reference project datum: A= 0'-0"; Actual = A+ X'-X" in specified vertical datum system, relative to sea level. Many times the actual is only found on the site survey or site plan, typically at a specific point.
  - iii. Establish baseline site/building elevations in NAVD88, with some outside and inside benchmarks (such as window sill height and 1<sup>st</sup> floor elevation) by starting with survey and building elevations. Translate to datum NAVD, and calculate vertical datum (elevation) of other elements using relative sectional dimensions.
- c. Field Verification: Field visit to specifically identify all vulnerable (where water might infiltrate) building elements below the project's Design Flood Elevation. Note that the DFE for **Flood Design Class 3** buildings, including schools, in an AE Zone will be 2 feet' above the FIRM or PFIRM, or (for SCA's comfort level) equal to the maximum water level reached in Hurricane Sandy, whichever of the three is greatest). DFE shall be in NAVD88. Requirements for V-Zone buildings are more stringent and thus the designer must design accordingly.
- d. Site Survey: Confirm some spot elevations of benchmarks as necessary by licensed surveyor. This will give validation to the DFE elevation across the site and building.

**2.2** **DOB Application** – Provide information as required for the project.

- a. FEMA Maps: With FEMA Flood Zone Maps and related information as required.



- b. Site Survey: Site Survey must be submitted: include all relevant areas of work.
- c. Flood Emergency Plan: This plan must be submitted to DOB (not BCC) for review and approval. It must comply with Local Law 109/13.
- d. CCD-1: Submission will be required to request deferral of the DOB approval of the Flood Emergency Plan and to request relief from the requirements of Appendix G for exiting at every required means of egress during the flood. The basis of the latter request will be that the school building will be evacuated during the flood and thus maintain one egress door only.
- e. Appendix G: Compliance with Appendix G as necessary. Schools are **Flood Design Class 3**; in zone AE, the required DFE is **2'** above the FIRM or PFIRM, whichever is higher. For SCA purposes, if the level of flood waters during Hurricane Sandy rose higher than **2'** above the FIRM or PFIRM, use the actual Sandy max level as the DFE. Requirements for V-Zone buildings are more stringent and must be designed accordingly.
- f. Substantial Improvement: See Appendix G requirements for projects that constitute a "Substantial Improvement". If applicable, the SCA will need to determine the "market value" of the building. Coordinate with A&E, DCM Director or Deputy Director for a Real Estate Assessment. Note that for projects constituting a Substantial Improvement, FEMA Floodproofing Certificates will be required.
- g. Certifications: Note that Appendix G may require certifications and progress inspections of installed flood barrier elevations.
- h. New Laws: Note that new Local Laws relevant to flood resiliency continue to be enacted. Designers are to keep apprised of them. (Refer to DOB website.)

### **3.0 MITIGATION**

#### **3.1 General**

Mitigation is required to prevent the risk of flood damage. For FEMA projects, mitigation is required as a condition of funding for repairs/replacements, to eliminate the risk of both the recurrence of flood damage and new flood damage to elements below the DFE. Note that the "least-risk" approach to mitigation is a "passive" one (no human intervention required). However, cost and disruption to the school program is also a concern and may lead to an "active" option instead.

- a. Typical mitigation options include:
  - Relocation/elevation of building system components to levels above the DFE or above potential flood water levels inside the building.
  - Wet Floodproofing that will accept flooding of areas built with flood-proof construction materials such that post-flood cleaning will restore such areas to full operation.
  - Passive Dry Floodproofing with barriers, reinforcing or other protection, permanently installed, that will keep floodwaters out or away from the building or vulnerable openings or building elements (walls, slabs, areaways, etc.) Note that for areas below the DFE, this may include making interior-interior as well as interior-exterior penetrations watertight.



- Active Dry Floodproofing with barriers or other protective equipment that will be temporarily installed before the anticipated flood, and removed after the event. Note that every piece of active dry floodproofing equipment must be stored and installed, with all of the associated downsides (poor installation, missing pieces, etc.). Therefore, if passive dry floodproofing is a reasonable option, it is the SCA's preference.
- A *Flood Event Manual and code-required Flood Emergency Plan* are to be developed for each site. Relying on human intervention carries potential risk, which is why each school is to have a site-specific "Flood Emergency Plan", detailing protocols for periodic inspections, maintenance, and operations related to devices and procedures. Also included are deployment, storage and installation plans for mitigation devices and equipment, and template documents for supervised "flood drills". **As per Section BC G107.5 of the 2022 NYC Building Code, the DOE will be required to do an annual inspection and a triennial deployment.**
- Standby Generators will be provided at Sandy-impacted schools that do not currently have a code-mandated emergency generator. This will typically be a gas-fired standby generator, meeting the requirements of Buildings Bulletin 2015-002 and the **2022 NYC Building Code**. The intention is to strategically deploy "flood emergency sump pumps", to be energized by the gas-fired standby generator, to rid the building of minor water infiltration that manages to get around dry floodproofing devices, by pumping it to the outside of the building above the DFE. (If gas is not an option, diesel will be considered. (If an Emergency Generator is in place, a standby ATS will pick up the flood-related loads. Additional fuel tank capacity may be required.)

b. Typical constraints:

When considering relocation of systems and/or equipment, be mindful of building space limitations on student-occupied floors, as well as Code requirements for running ducts through fire rated floors/walls. The mitigation proposal will consider all relevant building and site elements below the DFE. This does not necessarily mean that multiple redundant layers of floodproofing are required, only that all elements and areas below the DFE must be traced back to protection against floodwater infiltration.

- c. Typical Mitigation Elements and Solutions: Following are the building/site elements that were the most common points of water infiltration during Hurricane Sandy, along with A&E's suggested mitigation solutions in order of preference. Every case is unique however, and you may have other recommendations that best solve the specific risks and demands of each specific school.

**3.1 Floodproofing of the Building Perimeter:**

Floodproofing at the building envelope perimeter is the first line of defense. Unless the envelope is completely protected from infiltration, spaces inside the building below the DFE will be vulnerable to flooding. If flood waters get into the building (whether through a slab rupture, openings such as doors, windows or louvers, or an unsealed pipe sleeve, or an open vent pipe below the DFE), flood waters will collect and rise in interior spaces below the DFE to seek the level of the flood outside.



# School Construction Authority

Architecture & Engineering

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## AE Scoping Guidelines

## Flood Risk Analysis, Mitigation and Flood Emergency Preparedness

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### a. Foundation Walls and Slabs

- i. Consideration must be given by the Geotechnical, Structural and Civil Engineers as to the capacity of the existing foundation walls and slabs to resist the potential hydrostatic head that may develop under and around these surfaces during a Design Flood.
  - Research Alchemy Drawings for previous borings to show approximate ground water level. Perform additional borings/test pits to determine current water table elevation and fluctuations if appropriate.
  - Study original building documents to determine if the foundation walls and slabs were designed to resist hydrostatic head. Is existing basement or cellar floor slab a conventional slab on grade or is it a structured pressure-resisting slab?
- ii. The Geotechnical Engineer must evaluate existing soil conditions, water table level and potential rise, all in regard to establishing the design criteria of potential hydrostatic head or the probability of a water gradient being formed where the flood water seeping down will meet the ground water. Based on this analysis, the Structural Engineer must evaluate if the existing foundation walls or slabs are capable of resisting the anticipated loads.
- iii. If it is determined that the existing walls and/or floors are not capable of withstanding anticipated forces, and reinforcement is not feasible or cost effective, installation of new reinforced walls and/or slabs around/beneath boilers and other critical equipment may be considered to protect against flood water.

Generally waterproofing of the exterior or foundation walls would not be considered under mitigation; however selective repair of visibly open joints or cracks in concrete or masonry may be appropriate.

- If existing floor slabs are damaged and require replacement, provide waterproofing if appropriate.
- If the depth of the existing floor slab needs to be increased to mitigate against hydrostatic pressure, consider installing waterproofing on top of the existing floor slab and then adding concrete.

### b. Areaways

- i. Areaway curbs below the DFE should be raised to a height above the DFE if practical, and faced with masonry to match existing building. The structural capacity of the areaway walls must be confirmed.
- ii. Areaways with stairs down to a lower level should be considered for a raised curb/wall with a lockable self-closing flood-proof gate, closing in the direction of the flood. For a minor extension, modification to areaway stairs may be considered to extend up to the new higher areaway landing, with additional steps or a ramp back to surrounding grade.
- iii. Areaway windows below the DFE will be protected by the raised curb wall (see above), or should be sealed with masonry if they are not required for operation or by Code. For shallow areaways, where the DFE is not far above vulnerable openings (louvers,



windows, doors, etc.) and elevated curb walls are not practical, barriers or flood shutters may be considered as active dry floodproofing devices.

- iv. Areaway storm drains that pipe back into the building are to be protected from storm sewer back-up by installing a back-flow preventer in the main drainage line leaving the building. Areaway drains which empty into an open sump pit in the building interior must be fitted with a manual gate valve (accessible inside the school building) soon after the pipe enters the building from the areaway. The custodian will shut this gate valve as part of the Flood Emergency preparation.
  - v. Exterior areaway doors with saddles below the DFE may need protection against flooding caused by rain accumulation.
- c. Crawl Space/Pipe Tunnels with Vents
- i. Similar to *Foundation Walls and Slabs* above, consideration must be given by the Geotechnical and Structural engineers as to the capacity of the crawl space slab and walls to resist the potential hydrostatic pressures that may develop under and around these surfaces during a Design Flood. Scour-related infiltration may also undermine and damage vulnerable crawlspace or tunnels.
    - Investigations and solutions will be unique for each unique site.
    - If the existing walls and/or slabs are not capable of withstanding potential hydrostatic head, and it is not feasible to reinforce these elements, allowing water into the crawlspace/pipe tunnels may avoid damage to the foundation walls and slabs. Decisions may ultimately be determined by weighing the relative costs of reinforcing crawlspace/tunnel structure as opposed to sacrificing pipe insulation and ductwork by allowing water into the space.
  - ii. Generally, if a crawlspace slab ruptured during Sandy, replacement with a reinforced slab is advisable. If the crawlspace slab held, it would generally not be changed.
  - iii. If a dry floodproofing approach is feasible, seal old openings permanently with masonry and raise crawl space vents within the existing crawl space wall to a height above the DFE, or provide ventilation via a ducted system with Fresh Air Intake and Exhaust (fan-powered as necessary) with louvers located above the DFE. Minimize the number of new louver openings.
  - iv. If the wall/slab can resist hydrostatic pressure but raising the vents or providing other ventilation is impractical, consider flood shields/barriers (for temporary installation) to protect the vents; regroup required area of openings if possible to minimize the number of barriers.
- d. Exterior Doors: If the bottom of the door is below the DFE and is not otherwise protected from flooding;
- i. Consider flood barrier system for regular school-use doors.
  - ii. Consider “waterproof/water-tight” doors that can withstand flood waters up to the level of the DFE for custodial-use doors only. Use flood logs for all others.



- iii. See Appendix G for requirements to maintain egress during a flood event. Although Appendix G requires an available means of egress proximate to every exit, the SCA's intention currently is for a CCD-1 to be filed for limiting proximate egress above the DFE to one location due to the fact that schools will not be occupied during a flood event.
- iv. One means of exterior ingress/egress must be available for custodial or emergency staff after deployment of the dry floodproofing devices. If no egress doors open to an area above the DFE, such required mean of egress might be into a small exterior area protected by "flood walls/barriers", or might be an alternate egress opening above the DFE, with necessary attributes and signage. Temporary stairs to get over this barrier are required.
- v. In rare cases, unprotected doors might be considered for "wet floodproofing" in an area of flood-resistant and watertight construction. Entry vestibules on grade that enter below the DFE, but include steps that go up only to a first floor level above the DFE might be wet floodproofed, but any vulnerable points or openings (ventilation grilles, etc.) within the vestibule would need to be protected or raised. Note that if the 1<sup>st</sup> floor is below the DFE flood barriers would be needed either on the outside of the exterior doors, or if the objective is to maintain a means of egress, inside of the vestibule such that it is wet on the exterior side, but dry floodproofed on the interior.
- e. Exterior Windows: If sill is below the DFE
  - i. Consider flood barriers if practical and possible.
  - ii. Especially if a window replacement is funded already, consider implementing an alteration or reconfiguration (fixed sash on bottom) of the SCA's window standard, or the installation of flood-resistant windows, etc.
  - iii. For fixed windows below the DFE, consider glazing strength to withstand water pressure; replacement of glass with a stronger flood-resistant material may be considered.
- f. Exterior Wall: Portions below the DFE
  - i. Generally replacement of face brick in order to add a membrane or application of a membrane or coating on the exterior face of wall would not be considered. As part of mitigation, when the bricks and/or mortar below the DFE are open or loose, repointing is appropriate.
- g. Unit Ventilators: If below the DFE
  - i. If unit ventilators are located below the DFE, consider whether using the windows for natural ventilation, and perimeter heat from steam radiators is an option. If so, the masonry openings can be permanently sealed.
  - ii. If natural ventilation is not an option, consider other means of elevating the ventilation opening.
- h. Other Exterior Openings, such as P&D vents, gas vents, sewer vents, fresh air intakes, at the building surface or coming up into the yard near to the building



- i. Raise pipe openings to a level above the DFE, maintain functional requirements, and provide additional support as needed. Consider operational and code testing/filing repercussions.
- ii. Flood barriers/stoppers to temporarily seal the opening might be considered if there is no negative impact on safety or on operation required during the period of the event.
- iii. Properly seal pipe and/or conduit entering buildings permanently in place.
- iv. Accessible backwater valves fitted on the building's main drain lines (one on the main sanitary and one on the main storm), and located downstream of the house trap, will provide protection against flood water coming into the building from the public sewer.
- v. If the existing building has a combined sewer exiting the building, separate the storm and sanitary lines within the interior of the building and provide backwater valves on both services as noted above.

### **3.2 Floodproofing of Site Structures**

- a. Electric Vaults: Need to determine ownership, whether DOE or Utility.

- Advisory information should be provided to utility as needed.
- DOE owned and maintained vault must be protected.

- b. Hatch at Grade, such as coal chute or other cover

If an exterior hatch at grade is to remain, call for a waterproof Bilco-type hatch/cover.

- c. Seeded Areas below the DFE, adjacent to shallow crawlspaces or shallow grade beams, may be subject to damage by flood water scouring or creation of a hydraulic gradient during a Design Flood.
  - i. Seeded or planted areas that were scoured, and the scour exposed areas of the building foundation or slabs to damage, or such areas potentially subject to scour, must be evaluated by the Geotechnical and Civil Engineers, for a permanent solution. Concrete paving systems that can withstand potential scour should be considered. For seeded/grass areas to remain as such, a protective concrete "apron" may be installed two to five feet below grade (sloped away from the building), with soil and planting above. Installation of impervious pavement may trigger DEP requirements due to "added paved area". If pavement is preferred to landscaped areas, open cell or permeable pavers may be used to avoid the potential impacts of scour and not trigger added DEP requirements for site detention.
  - ii. Planters sometimes have open bottoms that allow flood waters to create undermining action. Provide closed concrete bottoms on such planters which allow for water to weep out, but not subject elements of the building to scour.



d. Playgrounds/Playyards

- i. Drainage piping from yards or areaways that comes back into the building at a level too low to gravity-feed to the storm sewer may dump into an open sump pit within the building and be pumped up to the main drain line out to the sewer.
  - Such lines must be fitted with a manual gate valve (accessible inside the school building) soon after the pipe enters the building from outside. The custodian will shut this gate valve as part of the Flood Emergency preparation.

e. Site Perimeter Flood Walls

Site Perimeter Flood Walls are generally not recommended, due to cost and the likelihood of creating a fortress-like appearance. For site perimeter walls to act as effective flood barriers, they must be designed to resist hydrostatic pressure and undermining. Where pile foundations would be required to support the proposed site perimeter walls, the costs are likely to be excessive.

### **3.3 Floodproofing of the Interior of the Building**

In general, elements subject to water infiltration and located below the DFE, that are being replaced (typically in the same location) should be raised up as high as is reasonable (to above the DFE if possible) while keeping them at a workable height for maintenance and operation. In the Boiler Room, the boilers, controls, burners, and other ancillary equipment must be elevated on a house-keeping pad above the level to which water might collect. Avoid cutting into hydraulic “pressure” slabs as much as possible.

Note that if the building envelope has been floodproofed to prevent flood water infiltration, interior mitigation can generally be minimal.

Systems/Spaces to consider include:

a. Elevators

- i. If the elevator’s lowest stop and/or pit are below the DFE, consider a program or other automatic safeguard if possible to make sure that the elevator stops at the floor level above the DFE.
- ii. If the way to protect the elevator is a manual lock-down at a level above the DFE, include in building’s Flood Emergency Plan and the Flood Event Manual.

b. Boiler Room/Boiler Pit

- i. If boilers are being replaced, fill shallow boiler pits and include a housekeeping pad (1’+/-, depending on operational needs and head room required and available). This will hold the boilers above any minor flood water infiltration that will be pumped out via sump pumps powered by the standby (or emergency) generator.
- ii. Generally, 6” to 12” high housekeeping pads are recommended for new boilers to maintain appropriate equipment service access. Evaluation of mounting heights, in consideration of required access and headroom, must be made for each specified boiler.



- iii. If boilers are being replaced and the boiler pit is a significantly lower separate level, keep the new boilers in the same space but raise on a high pad or other new structure to avoid flood risk. The weight of the pad or structure must be considered as compared to the structural capacity of piles, slab, etc.
- iv. Any equipment or components in the boiler room/pit that are being replaced should be raised up, on pads or racks or on the wall, as high as is reasonable while remaining at a workable height for maintenance and operation. (This would apply generally to any equipment in spaces below the DFE.)
- v. In the Boiler Room/Pit, maintain location and depth of Boiler Sump Pit and Pump piped to street sewer. This pump may be added to optional standby generator loads, provided it includes automatic shut-down of the pump under overload conditions. Note that during a flood, water filling the street sewer will prevent outflow pumping. Under this condition, the “flood emergency pump” will be relied on to pump any water infiltration up and out of the building above the level of the DFE.
- vi. Boiler Pit/Boiler Room where the concrete slab thickness is being increased
  - Block out in lowest corner of Boiler Pit, prior to adding the concrete, new sump pit (minimum depth 4”) for flood emergency pumps, which will be part of standby generator loads
  - Raise new boilers on pad +/- 12”
- vii. Boiler Pits where concrete slab thickness remains as is
  - Maintain location and depth of Boiler Sump Pit and Pump piped to street sewer; this pump will not be added to optional standby generator loads because the flood will prevent pumping to the sewer during a flood.
  - New flood emergency pumps which will be part of standby generator loads, will be floor mounted in lowest corner of Boiler Pit/Room without a sump pit. (Since there will be no pit, periodic testing of the pump will require containment.)
- viii. To address concerns about potential Boiler Pit or Room slab rupture from rising water table in a Design Flood, create a “watertight” room for the Boilers and ancillary equipment by adding reinforced concrete on top of existing slab in this new room, and new poured concrete walls with submarine doors, to seal it off from the rest of the Basement/Cellar/Crawlspace as needed. Electric service room should be relocated up or treated in a similar fashion.
- ix. Consider relocating the boilers out of the Cellar to a level above the DFE only if there are compelling and practical reasons to recommend this. Relocating steam boilers above the DFE poses a multitude of problems.
- x. If the Hot Water Heater is to be replaced, follow new SCA Standard for sizing. The installation should be raised as high as is practical.
- xi. If Boiler Room work is part of the scope of work, any existing T-12 lighting fixtures shall be replaced. Also replace exit and emergency lighting fixtures in the Boiler Room.



c. Electric Service Room

- i. If the electrical room is at the lowest level in the building (where water will accumulate should it get into the building), and the transformers or the service panels are at the floor level, the room itself should be floodproofed with a waterproof coating or membrane around the outside of the walls, and the room should be provided with a submarine door.
- ii. Ensure that all penetrations for cable/conduit through the foundation wall are sealed properly to prevent flood water from infiltrating. Note that all previously submerged electrical wiring/cable must be replaced; however undamaged conduit may be cleaned and re-used if this is a practical option.

d. Electrical Systems Partially or Completely Submerged in Water

If the electrical service equipment was partially or completely submerged in flood water, the following minimum electrical work indicated below shall be included:

- i. Electrical service equipment including, but not limited to, CT cabinet, service switchboard, power distribution board, lighting and power panel boards, and all service and power feeders (cables) shall be replaced. Electrical service equipment shall be installed on concrete pads or mounted on the wall, as allowed by service needs and ceiling height. The intention is to elevate it above the level of possible “seepage” infiltration of flood waters that might enter in spite of dry Floodproofing.
- ii. If a service upgrade is included, the property line box shall be replaced with new to accommodate larger capacity. Coordination with Con Edison will be made during design phase for new property line box size including issue regarding how to stop water coming in thru conduits from Con Edison manhole or transformer vault to electrical switch board room. Electric service cables from service end box to property line box shall be replaced.
- iii. Electric distribution equipment may be located above flood level on the 1<sup>st</sup> floor if space for a new electric room can be arranged with the school.
- iv. Low voltage systems including Fire Alarm, Public Address and Auxiliary system components shall be replaced if they were submerged in the water. Full replacement will be considered as required. If only Fire Alarm panel and few devices are damaged, they can be replaced if the existing fire alarm system is an approved system.
- v. Data cables shall be replaced if they were submerged in the water.

e. Flood Emergency Sump Pumps (fixed or portable if fixed is not practical)

- i. Submersible duplex flood emergency pumps are needed, with enough capacity to keep up with water infiltration that may infiltrate around the dry floodproofing barriers. The water will be pumped up to the outside of the building above the DFE (unlike non-emergency sump pumps, which pump water into the storm sewer), preferably onto DOE property onto a paved area, via a pipe with a downturn.
- ii. These pumps are part of the dry floodproofing/mitigation approach (for anticipated seepage, not to evacuate catastrophic inundation), and will be located where it is anticipated such flood water will collect– typically the lowest isolated areas below the



DFE. These may include: boiler pit; auditorium orchestra area; entry vestibules; sealed crawlspaces, etc.

- iii. Provide a 3' x 3' area at the existing slab level (to avoid cutting existing slabs) surrounded by 4" high curb, for the Flood Emergency duplex sump pump. When flood water fills this containment area, the pumps will activate; the containment will also facilitate periodic testing as part of routine maintenance. The regular Basement or Cellar level drains and/or sump(s) shall continue to provide drainage during normal conditions. Connect new sump pumps to the existing Auxiliary Alarm System as per SCA Design requirements. If the existing Auxiliary Alarm System is antiquated, provide a local alarm in the Boiler Room with notification in the Custodian's Office.
- iv. Provide electrical outlets (backed up by the Optional Loads ATS for the standby generator) proximate to where portable flood emergency pumps will be placed.

### **3.4 Optional Standby Generator** (for buildings without emergency generators)

All dry floodproofing measures anticipate a small amount of water infiltration. To avoid associated damage, school buildings with dry floodproofing will be provided with gas-fired optional standby generators to be located, if possible, on the building roof, with the gas rig outside at grade, mounted above the DFE.

- a. If a roof location for the generator is not possible or is impractical, consider a "fenced" enclosure elevated above the DFE. Generally, the generator is to have an acoustical and weather-proof enclosure. Acoustical requirements must take into account proximity to neighboring buildings (particularly with nearby residential properties) and NYC Building Code Requirements.
- b. If the gas rig cannot be located outside above grade, provide a Gas Meter Room located above the DFE or in a dry floodproofed area.
- c. Gas service requirements for standby generators (for both Con Ed and National Grid) include two separate curb valves - one for the non-emergency gas service to the building, and another for the gas to the standby generator.
  - i. The Fire Alarm System must be connected to the standby generator. The Fire Alarm requires battery back-up sized adequately for 24 hours standby and alarm, regardless of whether a secondary power source is also provided (NYC Electrical Code section 760.41(C)). A tap ahead of the main is still required for both Primary and Secondary power sources. Whenever a secondary power source is provided, the Fire Alarm must be connected to this secondary source (NYC Electrical Code 760.41(B)).
  - ii. Egress lights, when provided with 90 minutes battery backup, Code does not require a connection to a secondary power source.
- b. Note that the new gas-fired standby generator may also require a dedicated gas booster pump, depending on gas pressure available. Gas-fired generators require high pressure gas. As noted below, the gas booster pump for the generator shall be typically be located adjacent to the standby generator on the roof.



- c. Gas powered optional Stand-by generator shall be conform to the requirements of **Chapter 27 of the 2022 Building Code**. The gas booster pump for the standby generator will start by built-in Battery/UPS, which comes as an integral part of gas booster pump.
- d. If the school has an existing diesel generator, calculate the capacity needed to support required loads (for existing and new connected equipment). Confirm that the loads drawing power during a flood event can be supported by the Emergency Generator for at least 24 hours. If not, or if area is available for a supplemental tank to extend the run time to 48 hours, a supplemental tank should be added or the existing tank replaced with one with a larger capacity.
- e. Associated Requirements include:
  - i. Building's Bulletin 2015-02 and Chapter 27 of the **2022 NYC Building Code** - Comply with provisions. Note that in **Occupancy E** buildings less than 75' high, the optional standby generator will not have to power an elevator if it is not required of a new building of the same size.
  - ii. Emergency lights and other life safety systems as required by Chapter 27 already on power packs should remain if they are Code compliant.
  - iii. Elevator: If the building has an elevator without an emergency generator, advise the DCM Director or Deputy Director of this condition.
  - iv. The Optional Loads ATS must energize flood-related systems and equipment, as well as specific labeled outlets for portable pumps. The fire alarm system and emergency lighting (if they must be connected) must be on their own Emergency ATS **in a separate room**, separate from the "optional loads" ATS.
  - v. Diesel Generator: If the building already has a diesel-fueled code-required emergency generator (or if gas is not an option for the optional standby generator), no additional standby generator is needed. Calculate the amount of fuel need to provide power for anticipated loads for 48-hour period, and consult SCA as to the tank size. (The *Flood Emergency Plan and the Flood Event Manual* will direct school staff to make sure that the diesel tank is full prior to the storm.) The flood emergency sump pumps are to be added on the Optional Loads ATS.

#### **4.0      FLOD EMERGENCY PREPAREDNESS**

##### **4.1      Flood Emergency Plan**

Required to be submitted to DOB and posted in the building. This Plan describes storage, installation, maintenance and inspection of dry floodproofing systems and equipment. Refer to **Section BC G501**, which modifies Section 6.2.3 of ASCE 24-14.

##### **4.2      Flood Event Manual**

- a. The Flood Event Manual is a comprehensive description of, and guide to, active flood mitigation for the specific building. In addition to the detail related to the Fire Emergency Plan, it is to include requirements for periodic "Flood Drills" (including logs and certifications) for both installation and storage of the equipment as required. (A copy of the Flood



Emergency Plan will be included in the Manual.) The SCA, in conjunction with DSF, is developing a template for this manual.

- b. The *Flood Event Manual* is to include:
  - i. Floodproofing action plan/diagrams, details and signage
  - ii. Floodproofing equipment and components O&M guidelines
  - iii. Flood equipment installation explanation and detailed requirements
  - iv. Procedural Requirements for flood event drills and certifications

**End of Flood Risk Analysis, Mitigation and Flood Emergency Preparedness Scoping Guidelines**