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July 17, 2018

Mr. Robert Stein
Chairman
The Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: DOCKET NO. 483 - The United Illuminating Company application for a Certificate of Environmental Compatibility and Public Need for the Pequonnock Substation Rebuild Project that entails construction, maintenance, and operation of a 115/13.8-kilovolt (kV) gas insulated replacement substation facility located 700 feet southwest of UI's existing Pequonnock substation on an approximately 3.7 acre parcel owned by PSEG Power Connecticut, LLC at 1 Kiefer Street, Bridgeport, Connecticut, and related transmission structure and interconnection improvements.

Dear Chairman Stein:

Enclosed please find the original and fifteen (15) copies of The United Illuminating Company's responses to the Siting Council's Second Set of Interrogatories dated June 25, 2018 in connection with the above-referenced docket.

Please feel free to contact me with any questions concerning this submittal at (203) 772-7787.

Very truly yours,

Bruce L. McDermott

Enclosures

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Interrogatory CSC-2-29

The United Illuminating Company
Docket No. 483

Witness: Richard Pinto
Page 1 of 1

Q-CSC-2-29: Referencing Figure ES-5 of the United Illuminating Company's (UI) Application, there appears to be an existing paved access drive on the southern portion of the site that runs in a roughly northeast to southwest direction. What is the purpose of an existing manhole cover roughly near the south side of that existing access drive?

A-CSC-2-29: The cover in question on the south side of the existing access drive on the proposed site is marked "Electric". UI investigated the manhole and determined that the cover is incorrectly marked and within the chamber there appears to be a water line. During detail engineering UI will determine the owner and purpose of this water line and make plans to relocate this facility.

See attachment CSC-2-29 for location details of the chamber in question.

Chamber Cover

Inside of Chamber

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File Path: H:\DWG\P1999\0221\V20\Survey\Plan\1999021V20_SRV01.dwg Layout: VT-03 NEW PEQUONNOCK AREA Plotted: Wed, January 17, 2018 - 1:39 PM User: mearley
Plotter: DWG TO PDF.PC3 CTB File: FO.STB
MS VIEW:
LAYER STATE:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER
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SEAL

SEAL

TO MY KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON. THIS MAP SHOULD NOT BE CONSIDERED AN ORIGINAL SIGNED AND SEALED SURVEY UNLESS IT BEARS THE EMBOSSED SEAL OR THE DIGITALLY ENCRYPTED ELECTRONIC SIGNATURE & SEAL OF THE LAND SURVEYOR BELOW.

MICHAEL L EARLEY PE LS — LICENSE # 70224

SCALE:
HORZ.: 1" = 40'
VERT.:
DATUM:
HORZ.: NAD 83
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

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DATE: 06/01/2017

VT-03

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Q-CSC-2-30: On page 2-6 of the Application, the original projected cost of the proposed replacement substation project was in excess of $125M. At the June 14, 2018 evidentiary hearing, UI testified that the updated cost was approximately $170M. Provide a breakdown of the costs for the following including percentages of what are transmission and distribution costs:

a. Proposed solution ($170M);
b. Rebuild substation on the same site; and
c. Construct replacement substation at the alternative site (375 Main Street).

A-CSC-2-30: UI references the costs officially reported to ISO-NE stakeholders in our final study report on January 23, 2017. The original and current estimated cost for this project is $171.3 million. There has been no significant increase in the expected cost. UI's statement that the project cost would be "in excess of $125M" was based on subsequent preliminary feedback that some project costs may be reduced. However, at this stage of design UI feels most confident in the record cost estimates filed with ISO-NE stakeholders for each alternative which are as follows:

Total Capital Cost Estimate (Millions)

	Transmission	Distribution	%T	%D	Total
A. Proposed Solution [1]	$130.8[2]	$40.5	76%	24%	$171.3
B. Rebuild On Site [1]	$200.4	$69.2	74%	26%	$269.6
C. Alternative Site (375 Main Street)[3]	$148.0	$47.0	76%	24%	$195.0
Alternative Site [1] (1/2 Mile Radius)	$150.5	$96.2	61%	39%	$246.7

1. Record cost estimate filed with ISO-NE includes PTF and Non-PTF.
2. Includes $128.2 million PTF and $2.6 million Non-PTF.
3. The estimated costs provided for Option C are based on an extrapolation of the cost estimate for the proposed project site and the ½ mile radius determined cost. Specific cost estimates for 375 Main Street are not fully developed and this value was not filed with ISO-NE. Estimated additional costs would include HPGF extensions, XLPE duct bank rebuild and extensions, site development, architectural enhancements, distribution duct line extensions, and additional complexities for construction crossing the existing 345kV duct banks.

UI expects the proposed project estimate to be refined as proposals are received for contracts in connection with major equipment, engineering, and construction related to this project. Final construction costs will be reported to the Council pursuant to R.C.S.A. Section 16-50j-62(c)(5).

Interrogatory CSC-2-31

The United Illuminating Company
Docket No. 483

Witness: Robert Sazanowicz
Page 1 of 1

Q-CSC-2-31: What is the approximate ground elevation at the 375 Main Street alternative site? Are the 100-year and 500-year flood elevations the same at the alternative site as they are at the proposed site? If not, also provide the 100-year and 500-year flood elevations at the alternative site.

A-CSC-2-31: UI has not performed a specific site survey for the property located at 375 Main Street. Based on information available in the City of Bridgeport Geographic Information System, the grade elevations appear less than or equal to the elevations surveyed at the proposed project site.

The property at 375 Main Street is within the same Zone AE 100 yr. flood boundary as the proposed project site and has a base flood elevation of 14 ft. NAVD88. Furthermore, the 500 yr. flood elevation is the same 15.9 ft. NAVD88 elevation at this location.

375 Main St. – Site Elevations NAVD88

Proposed Site – Site Elevations NAVD88

Note: Aerial imagery and topographic information taken from the Bridgeport Geographic Information System., http://www.bridgeportct.gov/gis/

Q-CSC-2-32: Generally, what are the feasible design options for an elevated substation at the proposed site to mitigate flood risk? Elevation by fill plus a gravel substation base? Elevation by fill plus a concrete substation base? Elevation by fill plus a gravel substation base surrounded by a concrete wall? A concrete base on silts such that flood waters could run under the substation (to handle potential sea level rise)? Comment on costs and feasibility of such options.

A-CSC-2-32: There are a number of factors that influence the methods used for elevating critical substation equipment for flood mitigation purposes. Typically this task is accomplished by a combination of adding additional clean fill to re-grade the site and increase the height of the concrete foundations used to support the equipment. The decision to increase the quantity of fill and “fill” the site is based on the least cost alternative as well as the need to maintain access to the site.

UI determined that the most cost effective approach to raise the finished floor elevation of the enclosures to the design flood elevation of 17ft (FEMA 100 +3) was to fill the site to an elevation between 12ft and 14ft and increase the above grade concrete foundation reveal to attain the required height. As the height of the reveal of the concrete foundations increases, other costs also increase such as those related to personnel access platforms and enclosure entrances.

Higher cost options such as elevating the entire substation on stilts or a filled site surrounded by a concrete retaining wall, while feasible to a limited height, also introduce higher initial costs in addition to operating and maintenance challenges such as:

- The need for larger equipment in order to offload material and equipment into the GIS hall or Power Distribution Center (PDC) after construction has been complete.
- Increased complexity and cost for future equipment additions or removals.
- Increased complexity of physical security measures.
- Possible elimination of available access for the UI Emergency mobile transformer for a concrete wall filled site option.

When determining the method used to elevate the site to a proposed finished floor elevation, a combination of cost, feasibility, and the Company’s ability to perform long term operation and maintenance is considered. Personnel and vehicle access to equipment is also necessary to maintain throughout the service life of the substation. Due to the limited area for the proposed site construction a filled site surrounded by a concrete wall would not facilitate adequate vehicle access roads and be within vehicle slope requirements nor would it allow operation, maintenance or utility emergency equipment to drive to the needed equipment on a safe low slope drive.

Interrogatory CSC-2-33

The United Illuminating Company
Docket No. 483

Witness: David Bradt

Q-CSC-2-33: At the June 14, 2018 evidentiary hearing, UI testified that the Federal Emergency Management Agency (FEMA) recommends at least one foot of extra elevation to address sea level rise (barring a site-specific study or calculation of sea level rise). Provide a copy of the FEMA document that provides such recommendation.

A-CSC-2-33: *See* attachment CSC-2-33, highlighted "Future conditions" on page 7 of 12.

Following is a link to the referenced FEMA document.

http://www.fema.gov/media-library-data/1381405016896-8bdeadf634c366439c35568a588feb24/SandyRA5DesignAboveBFE_508_FINAL2.pdf

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Designing for Flood Levels Above the BFE After Hurricane Sandy

FEMA

HURRICANE SANDY RECOVERY ADVISORY *RA5, April 2013*

Purpose and Intended Audience

Flooding in New York and New Jersey extended far beyond mapped Special Flood Hazard Areas (SFHA) and exceeded base flood elevations (BFEs) by several feet in some areas. Lessons learned from Hurricane Sandy can be used to guide repair and reconstruction efforts and design of new buildings to reduce susceptibility to future flood damage.

This Recovery Advisory reviews how coastal Flood Insurance Rate Maps (FIRMs) and BFEs are established and provides guidance on elevating buildings to minimize flood damage in cases where flood levels exceed the BFE. The intended audience for this advisory is primarily homeowners and designers, but it may be helpful to anyone involved in selecting lowest floor elevations for new construction and reconstruction of buildings in areas affected by Sandy.

Key Issues:

1. Elevating to the BFE does not provide complete protection against flooding. Storms more severe than the base flood can and do occur.
2. FIRMs are only as accurate as the topography, bathymetry, and technical information used, and the technical analyses performed, to create them. FIRMs are a snapshot in time and may become outdated as physical conditions, climate, and engineering methods change.
3. Once flood levels exceed the lowest floor of a building, the extent of damage increases dramatically, especially in areas subject to coastal waves (Figure 1).
4. Design and construction practices can minimize damage to buildings, particularly by elevating the building higher than the minimum required elevation.

This Recovery Advisory Addresses:

- FIRMs, FISs, and flood risk
- Building damage when flood levels rise above the lowest floor
- How high above the BFE a building should be elevated
- Effect of building elevation on flood insurance premiums
- Additional design considerations for mitigating flood damage, inside and outside mapped flood hazard zones

Terminology

Flood Insurance Rate Map (FIRM): A map produced by FEMA to show flood hazard areas and risk premium zones. The SHFA and BFE are both shown on FIRMs.

Special Flood Hazard Area (SFHA): Land areas subject to a 1 percent or greater chance of flooding in any given year. These areas are indicated on FIRMs as Zone AE, A1-A30, A99, AR, AO, AH, V, VO, VE, or V1-30. Mapped zones outside of the SFHA are Zone X (shaded or unshaded) or Zone B/Zone C on older FIRMs.

Base Flood Elevation (BFE): Elevation of flooding, including wave height, having a 1 percent chance of being equaled or exceeded in any given year (also known as “base flood” and “100-year flood”). The BFE is the basis of insurance and floodplain management requirements and is shown on FIRMs.

Figure 1: Back wall failure due to flood level above the lowest floor of a house in Ortley Beach, NJ

FIRMs, FISs, and Flood Risk

Constructing a building to the minimum National Flood Insurance Program (NFIP) requirements—or constructing a building outside the SFHA—is no guarantee the building will be undamaged by flooding. In order to make informed decisions during repair and reconstruction, owners, designers, and communities should understand the following:

- FIRMs are based on modeling of the best available topographic, hydraulic, and climate conditions data at the time of the Flood Insurance Study (FIS). However, there are inherent uncertainties in the modeling and analysis of BFEs and flood hazard zones. Some FIRMs, particularly older FIRMs, may no longer accurately reflect the shoreline location, land characteristics, and actual risk during a base flood event.
- The BFE is the flood level with a 1-percent-annual chance of occurrence. In coastal areas, the BFE is based on model studies of both historical and hypothetical storms.
- Floods can and do exceed the BFE and extend beyond the SFHA. In some recent storms (Katrina [2005], Ike [2008], and Sandy [2012]), flood levels exceeded the BFE by several feet in some areas and extended far beyond the SFHA shown on the FIRM. Figure 2 shows a comparison of the mapped SFHA at the time of Sandy (yellow hatched area) and the area actually flooded by Sandy (blue shaded area) for a portion of Coney Island, NY.

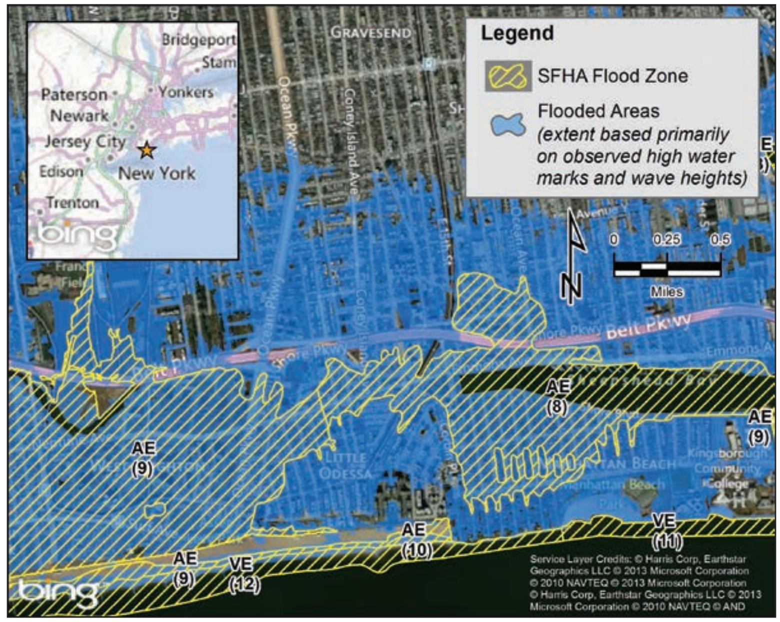


Figure 2: Comparison of SFHA and extent of inundation from Hurricane Sandy, Coney Island, NY

Sources of Flood Hazard Information

FIRMs and FISs.[1] FIRMs delineate flood hazard zones (e.g., Zone VE, Zone AE), which reflect the nature of the flood conditions expected during the base flood. FIRMs also show Zone X areas that are outside the SFHA but which are subject to flooding with a 0.2-percent-annual chance of occurrence (500-year flood).[2] FIRMs show BFEs associated with a flood that has a 1-percent-annual chance of occurrence (Figure 3). BFEs in coastal areas include wave effects and are higher than storm surge stillwater levels.

FIRMs are issued after an FIS is completed, and are then adopted by communities that regulate floodplain development. FISs are prepared using the specified models and the physical, hydraulic, and climate conditions in effect at the time of the FIS. The resulting FIRMs are drawn using the FIS data. FIRMs and FISs are thus a "snapshot" of flood risk at a certain time, and can become outdated as topographic or hydraulic or climate conditions change, or as engineering methods and models improve.

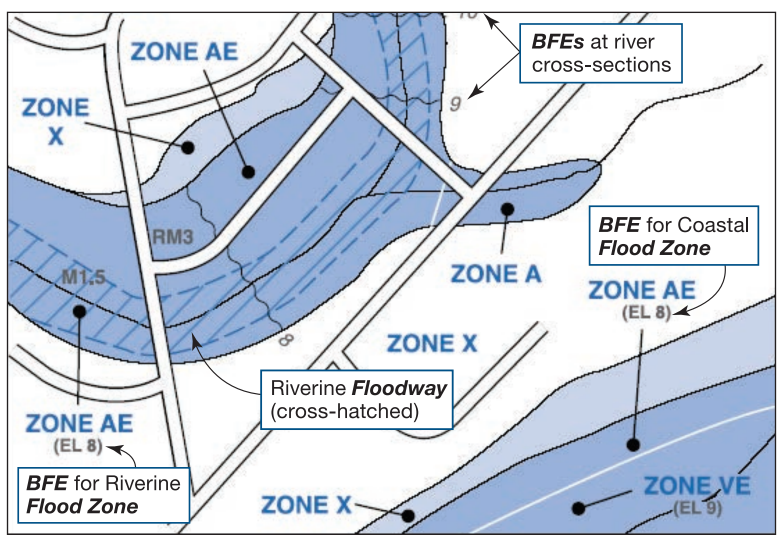


Figure 3: Sample FIRM showing flood hazard zones and BFEs

1 FIRM and FIS tutorials are available through FEMA (FEMA 2000a, FEMA 2000b)
2 FIRMs may also show areas where flood risks have not been studied or determined (Zone D).

Most FIRMs produced after approximately 2005 are based on FEMA's current computer models and engineering procedures. BFEs and flood hazard zones on FIRMs that are dated many years before this may understate actual flood risk. In such cases, elevating buildings above the BFE and extending flood-resistant construction practices outside the mapped SFHA is recommended. The date of the technical studies should be verified for any referenced FIRM by reviewing the associated FIS. Some recent FIRMs, even those published since 2005, are not based on new technical studies (e.g., FIRMs for New York City dated 2007 were based on storm surge models and statistical analyses from the 1980s).

It is critical for building owners, operators, designers, and others to understand that FIRMs do not account for future impacts related to:

- Shoreline erosion, dune loss, land subsidence, and sea level rise
- Multiple severe storms occurring over a short period of time
- Topographic and bathymetric changes, upland development, and addition of impervious surfaces that affect drainage and/or flooding
- Degradation or settlement of seawalls, levees, and floodwalls
- Changes in storm climatology (frequency and severity)

These future conditions can be addressed through building siting decisions in concert with design considerations and mitigation actions described in subsequent sections of this advisory. More information on coastal FIRMs and BFEs can be obtained in FEMA publications, specifically: Section 3.6 of FEMA P-55, *Coastal Construction Manual* (2011 edition) and Fact Sheet No. 3 in *Home Builder's Guide to Coastal Construction* (FEMA 2010a). Section 3.7.1 of FEMA P-55 also provides guidance on evaluating a FIRM to determine whether it still reasonably depicts base flood conditions.

Advisory Base Flood Elevation (ABFE) maps. After severe coastal storms FEMA may issue ABFE maps for areas where the existing FIRMs no longer adequately represent the actual base flood risk. ABFE maps are based on ***in-progress*** or ***approximate*** studies. Figure 4 shows an example ABFE map. They are intended to offer guidance on elevating new and reconstructed buildings. ABFE maps provide interim information for reconstruction efforts and can be used until the new FISs and FIRMs become effective.

Use of ABFE maps is mandatory only when a State or community adopts them. ABFE maps for portions of New Jersey and New York are available at http://www.region2coastal.com/sandy/abfe.

- ***New Jersey:*** ABFE maps were released for 10 New Jersey counties (Atlantic, Bergen, Burlington, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean, and Union) on December 14, 2012. New Jersey adopted the ABFE maps for reconstruction on January 24, 2013.[3]

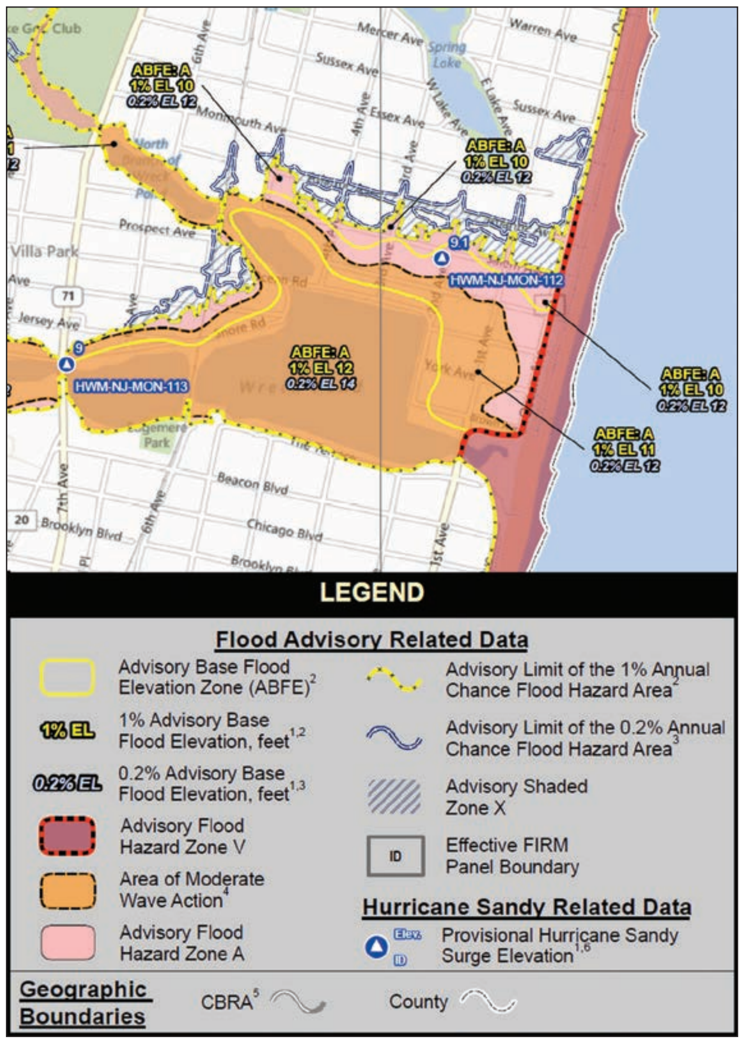


Figure 4: Example ABFE map (Monmouth County, NJ)

3 For more information, see "Local Flood Damage Prevention Ordinance – Adoption of Advisory Base Flood Elevation maps" (State of New Jersey 2013)

- ***New York:*** ABFE maps were released for six New York Counties (Bronx, Kings, New York, Richmond, Queens, and Westchester). ABFE maps were released for Westchester County and for portions of New York City on January 28, 2013. The remaining New York City ABFE maps were released on February 25, 2013. No ABFE maps will be released for Nassau and Suffolk Counties because their FIRMs are up-to-date and are based on current models and technical studies. As of January 31, 2013, New York City requires reconstruction to add freeboard above the effective BFE, but allows zoning relief for some reconstruction if owners build to the ABFE (if the ABFE is higher than the effective BFE plus freeboard).[4]

Probability of Flood Level Exceeding the BFE

FIRMs depict the regulatory limits of flooding, flood elevations, and flood hazard zones for the 1-percent-annual chance (100-year) flood event. Buildings constructed to the elevations shown on a FIRM offer protection only to the BFE. Some coastal storms result in flood levels that exceed the BFE. The blue line in Figure 5 shows the probability of a flood event that will result in floodwaters above the 100-year flood level. As shown on the figure, there is an 18 percent chance the 100-year flood level will be exceeded in a 20-year period, a 26 percent chance it will be exceeded in a 30-year period, and a 51 percent chance it will be exceeded in a 70-year period (typical useful life of a home). Therefore, a building elevated to the BFE has a significant chance of being flooded during its useful life and elevating above the BFE reduces this chance and can also reduce flood insurance premiums for the building. Likewise, buildings sited just outside the SFHA (beyond the 100-year flood hazard area, but especially those within the 500-year flood hazard area) still have a significant chance of being flooded over their useful life.

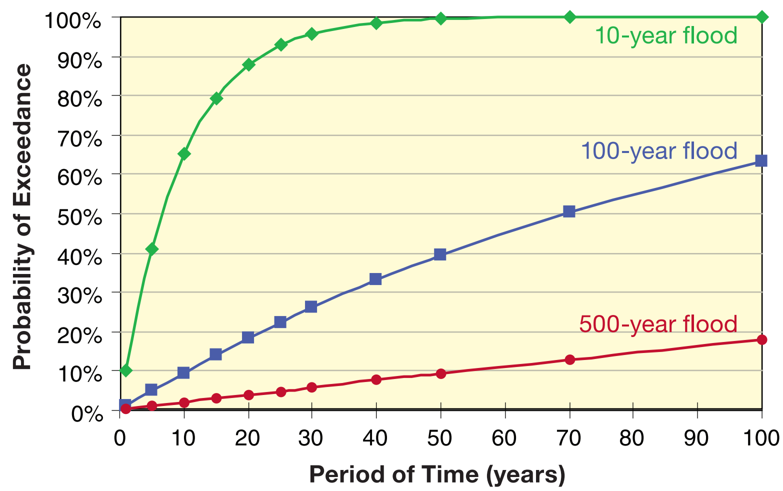


Figure 5: Probability of a flood exceeding the 10-year (10-percent-annual chance), 100-year (1-percent-annual chance), and 500-year (0.2-percent-annual chance) flood level during a given period of time (assuming no sea level rise)

> **Terminology**
>
> **Substantial Damage:** Defined by the NFIP as "damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred."
>
> **Substantial Improvement:** Defined by the NFIP as "any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the 'start of construction' of the improvement. This term includes structures that have incurred 'Substantial Damage,' regardless of the actual repair work performed."
>
> Refer to FEMA P-758, *Substantial Improvement/Substantial Damage Desk Reference* (2010b) for more information. Homeowners should consult a local building official to determine whether their local codes and regulations have more restrictive definitions.

Building Damage When Flood Levels Rise above the Lowest Floor

Buildings are designed to resist most environmental hazards (wind, seismic, snow, etc.), but are generally designed to avoid flooding by elevating the building above the anticipated flood elevation. The reason for this difference in design approach is because of the sudden onset of damage when a flood exceeds the lowest floor elevation of a building—building elements and contents get wet, and moving water imparts large structural loads on the building.[5]

Areas Subject to Wave Action

Severe flood damage is likely in areas where waves accompany coastal flooding. In Zone V areas, waves are capable of causing Substantial Damage (refer to text

4 For more information, see "Rebuilding After Sandy" webpage (New York City Department of Buildings 2013)
5 Refer to the flood damage calculator at http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/the_cost_of_flooding.jsp

box) to some buildings when the tops of the waves reach approximately 1 to 2 feet above the top of the floor. In contrast, inundation flooding (without waves) in Zone A areas may submerge the structure without causing Substantial Damage. This difference in building damage is a result of the energy of coastal waves striking and undermining buildings. This difference was obvious in the variation in flood damage caused by Hurricane Sandy (Figures 6 and 7).

Figure 6: Wave, storm surge, and erosion damage to oceanfront house at Rockaway, NY

Figure 7: Area subjected to shallow inundation, but not subject to waves or erosion at Long Beach, NY

Areas Protected by Barriers

When buildings are situated behind barriers such as dunes, seawalls, or levees, a failure of the barrier can result in rapid flooding and introduction of waves into the formerly protected area. Moreover, buildings close to barriers that fail are more likely to be physically damaged by water moving at high velocities than are buildings farther from the barrier. Buildings farther away are more likely to suffer inundation damage. Even when barriers remain intact, buildings close to them can be struck by waves that overtop the barrier.

How High Above the BFE a Building Should be Elevated

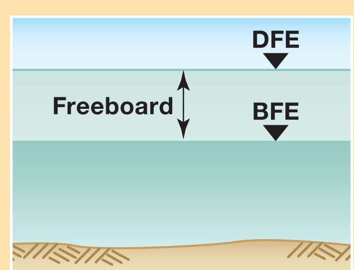
New buildings, buildings with Substantial Damage undergoing reconstruction, and buildings undergoing Substantial Improvements must be elevated so that their lowest floor[6] is at or above the BFE. Some States and communities require elevation above the BFE; this is known as adding freeboard. Adding freeboard or regulating to a flood more severe than the base flood results in a higher minimum building elevation. This is often known as the design flood elevation (DFE).

The amount of freeboard to be added depends on a number of factors. Before selecting a freeboard value, building owners and designers should decide whether a freeboard mandated by a State or community is sufficient to protect a particular building or if additional freeboard is needed.

Terminology

Freeboard: The vertical difference between the lowest floor[6] of a building and the BFE, usually expressed in feet. It can be thought of as a factor of safety to compensate for the fact that flood levels can reach higher than the BFE.

Design Flood Elevation (DFE): Regulatory flood elevation adopted by a local community. If a community regulates to minimum NFIP requirements, the DFE is identical to the BFE. Typically, the DFE is the BFE plus any freeboard adopted by the community.



6 In Zone A, lowest floor means the top of the lowest floor; in Zone V, lowest floor means the bottom of the lowest horizontal structural member of the lowest floor

Required Design Considerations

The selection of appropriate freeboard amounts must include consideration of locally adopted requirements, as well as the importance of the building to the community during and after a hazard event.

Building owners and designers should consult with building officials and floodplain managers regarding appropriate freeboard levels above the BFE.

Building codes and floodplain management regulations. Building codes may contain freeboard requirements or reference other documents with freeboard requirements. The International Building Code (IBC), which serves as the basis for the New York State, New York City, and New Jersey State building codes, requires buildings to be designed and constructed in accordance with the American Society of Civil Engineers' *Standard for Flood Resistant Design and Construction* (ASCE 24). ASCE 24 requires between 0 and 3 feet of freeboard above the BFE, depending on the flood hazard zone and the importance of the building.[7] New York State adopted freeboard in its residential building code, and some communities in both New York and New Jersey have adopted freeboard in their floodplain management regulations. Buildings must be elevated as high as the freeboard requirement in the building code or reference standard or floodplain management regulation. Owners may choose to build even higher.

Building height restrictions. Some communities may limit (through zoning or building regulations or restrictive covenants) the number of building stories or may specify a maximum height above the ground that a building floor level or roof cannot exceed. Such height restrictions may limit the vertical height of a building and preclude the amount of freeboard that some owners may desire. Owners and designers should check with communities to see if height restrictions exist and work with communities to relax those restrictions to achieve improved flood damage resistance.

Importance of the building to the community. Certain buildings and facilities (e.g., police, fire, emergency operations centers, and hospitals) are deemed critical or essential to a community and must remain partly or fully operational during and after severe flood events. In some cases, the community may determine that other buildings and facilities (such as schools, community centers, transportation, and utilities) are critical or essential for their community and should be capable of carrying out operations immediately after a severe storm. The recommendations in this advisory can also be applied to those buildings and facilities. To maintain needed functionality, these essential buildings and facilities should be elevated or protected to a higher elevation than most commercial and residential buildings. Building codes and ASCE 24 acknowledge this need and require additional freeboard. FEMA recommends that essential facilities be elevated or protected to the higher of: the code-mandated elevation, the community-mandated elevation, or the 500-year flood elevation. Communities may wish to use the flood of record[8] as the elevation/protection level for essential facilities.

For more information on category classification requirements, see Occupancy Category Table 1-1 ASCE 7-05 and Risk Category Table 1.5-1 in ASCE 7-10, as well as the guidance in FEMA 543, *Design Guide for Improving Critical Facility Safety from Flooding and High Winds*, January 2007. Note: ASCE 7-05 and ASCE 7-10 use different category classifications; also, check for any modifications made by your State or local jurisdictions.

ABFEs and BFEs

FEMA recommends that communities apply the adopted ABFEs to new construction, buildings undergoing Substantial Improvements, and Substantially Damaged structures to ensure that construction is built stronger, safer, and less vulnerable to future flooding events.

Construction and repair of buildings in communities that have adopted ABFEs must use the revised elevation in place of the BFE shown on the Effective FIRM.

Post-Hurricane Sandy ABFE maps are available for parts of New York and New Jersey at http://www.region2coastal.com/sandy/abfe. FIRMs for all other participating communities are available at https://msc.fema.gov/.

7 Use of the 1998 edition of ASCE 24 is required by the 2003 edition of the IBC. Use of the 2005 edition of ASCE 24 is required by the 2006, 2009, and 2012 editions of the IBC. The 2009 and 2012 IRC permit, but do not require, use of ASCE 24-05.

8 Refers to the highest recorded flood elevation for a given location.

Grant requirements. Hazard Mitigation Assistance and other Federal or State grants for elevating or reconstructing buildings often require projects to use ABFEs or other freeboard requirements.

Recommended Considerations

In addition to required design considerations, FEMA recommends review of available FIRMs, FISs, and ABFE information; evaluation of possible future conditions; and consideration of building owner risk tolerance when determining appropriate freeboard amounts.

Building owner tolerance for damage, displacement, and downtime. Many building owners never want to go through the disruption and damage sustained during Hurricane Sandy again. Reducing the probability of this occurring again will necessitate using either large freeboard amounts when repairing and rebuilding buildings and equipment or construction of tall flood barriers (where permitted). Freeboard and other flood-resistant design and construction practices should be incorporated to the maximum extent feasible.

Age of the Effective Flood Analysis. See subsection on FIRMs and FISs.

Availability of Preliminary FIRMs. When FISs are completed, the FIRMs are first issued as “Preliminary” maps to allow the public to submit comments and appeals. Once the comment period is over and appeals, if any, have been resolved, the final maps are issued. Preliminary FIRMs represent the best available data prior to final FIRMs being adopted and becoming effective. If preliminary BFEs are higher than effective BFEs,[9] buildings should be elevated above the BFEs shown on Preliminary FIRMs, with the amount of freeboard depending on the other factors described in this Recovery Advisory.

Availability of ABFEs. FIRMs for many of the New Jersey and New York counties affected by Hurricane Sandy were based on flood studies that are more than 25 year old. FEMA had initiated new FISs prior to Hurricane Sandy, but those studies were not complete and Preliminary FIRMs had not been issued when Sandy struck. As described in the FIRMs and Flood Risk subsection of this advisory, FEMA produced ABFE maps after Hurricane Sandy using data from the restudies in progress and other information. Buildings should be elevated at least as high as the ABFEs unless more detailed studies show the ABFEs are overly conservative.

Future conditions. Because FIRMs reflect conditions at the time of the FIS, owners, designers, and communities may wish to consider future conditions (such as sea level rise, subsidence, shoreline erosion, increased storm frequency/intensity, and levee settlement and failure) when deciding how high to elevate a building.

Rising sea levels have been well documented at National Oceanic and Atmospheric Administration (NOAA) tide gages in New Jersey, New York, and Long Island Sound.[10] Figure 8 shows an example of a sea level records between 1856 and 2006 in New York. Taken as a whole, sea level in the area affected by Hurricane Sandy has been rising at a rate of 2.4 to 4.1 millimeters/year (0.8 to 1.3 feet/century), averaging 3.0 millimeters/year (1.0 foot/century). If this rate of sea level rise continues into the future, the frequency of coastal flooding will increase. Today’s base flood will be more likely to occur in the future, and future BFEs will increase above today’s level. If the rate of sea level rise accelerates beyond the historical trend, as many scientists predict (New York City Panel on Climate Change 2009), sea levels could rise several feet in the next century, significantly increasing the risk of flooding to buildings inside and outside the SFHA.

Most buildings are expected to have a functional life span of many decades, so it is important to consider future conditions when designing new buildings or performing significant retrofits on existing ones. Although not incorporated into the BFE or ABFE, FEMA recommends that sea level rise be considered when selecting lowest floor elevations for new and reconstructed buildings. At a minimum, 1 foot of freeboard above the code-required freeboard is recommended to account for a continuation of the historical rate of sea level rise. Owners, designers, and communities should add additional freeboard if they want to plan for sea level rise above the historical trend. Section 3.3.4.1 of FEMA P-55, *Coastal Construction Manual* (CCM) (FEMA 2011), provides information on sea level rise statistics. Section 8.5.2 of P-55 illustrates simple procedures to estimate future effects of coastal erosion and sea level rise. State Coastal Zone Management (CZM) agencies should be consulted for erosion rate and other future conditions information that can be used with the CCM procedures.

9 If effective BFEs are higher than preliminary BFEs, local regulations will require use of the effective BFEs until such time as new maps are adopted and become effective.
10 Refer to NOAA Web site at http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml.

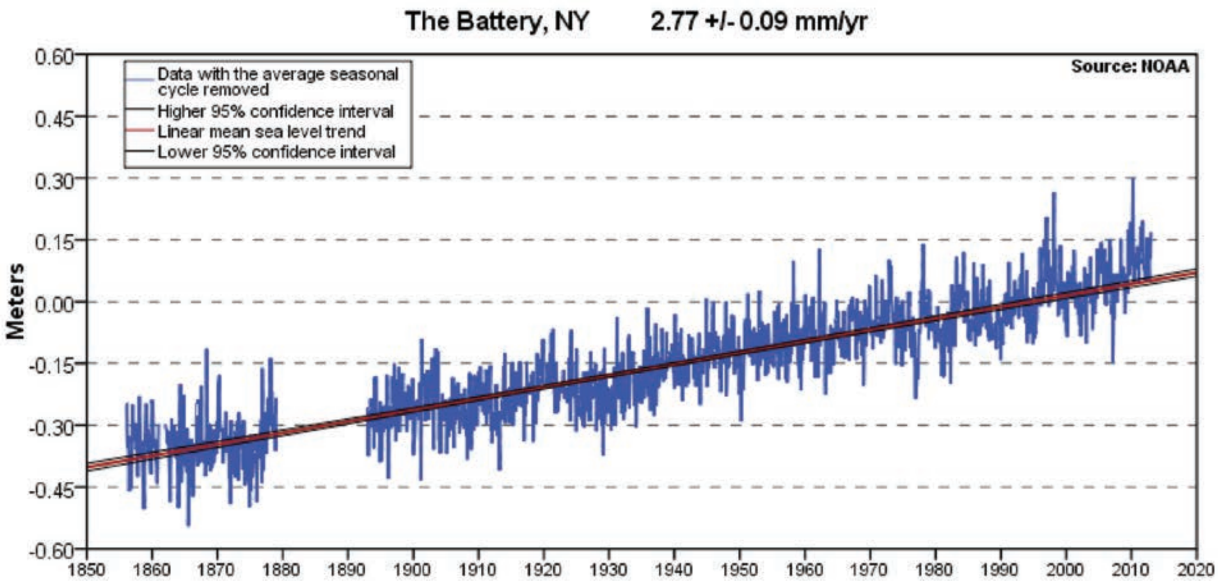


Figure 8: Sea level rise at The Battery, NY, 1856–2006 (Source: NOAA Web site)

Effect of Building Elevation on NFIP Flood Insurance Premiums

NFIP flood insurance premiums are affected by the elevation of the building in relationship to the BFE. As part of design considerations, building owners should be aware of two things:

- Flood insurance premiums drop significantly as freeboard increases, provided equipment is not located below the BFE and any enclosed space is compliant with NFIP requirements (e.g., flood openings in Zone AE, free of obstructions in Zone VE, etc.).
- The 2012 NFIP reauthorization legislation (called the Biggert-Waters Flood Insurance Reform Act of 2012) eliminates flood insurance premium subsidies and “grandfathering” for many existing buildings that are—or may be in the future—below the BFE (for more detail, see the text box on page 9 titled “Biggert-Waters impact on flood insurance premiums”).

Flood Premiums and Freeboard

According to the flood insurance premium rate tables in FEMA’s *Flood Insurance Manual*, premium savings can be substantial when freeboard is added to building design (FEMA 2013a). These savings can be enough to repay the added cost of elevating higher in just a few years’ time (AIR 2006, FEMA 2008).

- Adding 1 foot of freeboard above the BFE can save an owner approximately 25 to 40 percent in annual flood insurance premiums, depending on the flood hazard zone and building characteristics.
- Adding 4 feet of freeboard can save approximately 50 to 65 percent in annual flood insurance premiums in some flood zones.

Biggert-Waters Flood Insurance Reform Act of 2012

On July 6, 2012, a new law (hereafter called “Biggert-Waters”) took effect, significantly changing the NFIP and how flood insurance premium rates will be determined in the future (FEMA 2012). Changes affect how buildings are rated to reflect actual flood risk and eliminate grandfathering and flood insurance premium subsidies for many buildings.

Of importance to property owners, some buildings constructed in compliance with today’s BFEs and flood hazard zones may be subject to significantly higher flood insurance premiums in the future if revised FIRMs show higher BFEs and increased flood risk. For more information, please see FEMA’s *Flood Insurance Reform Act of 2012: Impact of changes to the NFIP* (FEMA 2013b).

Additional Design Considerations for Mitigating Flood Damage Inside and Outside Mapped Flood Hazard Zones

In addition to the design considerations described in other sections of this advisory, the following recommendations can help building owners minimize damage in the event that coastal flood levels rise above the BFE.

Design for Hazardous Wave Conditions

In addition to adding freeboard, buildings should be designed to withstand more hazardous wave conditions than the FIRM indicates (see Figure 10). Anticipate future conditions, including:

- Zone V conditions extending inland into the Coastal A Zone.
- Coastal A Zone (1.5- to 3-foot wave heights during the base flood) extending into the mapped Zone A.
- Zone A flood conditions extending landward of the SFHA boundary into Zone X (extend the freeboard elevation landward until the ground rises to this elevation). See Figure 10, A-2.[11]
- In other words, if a building is situated in one flood zone but is close to a more hazardous zone, property owners should consider designing, elevating, and using construction methods as if the building were located in the more hazardous zone.

Effect of Biggert-Waters on Flood Insurance Premiums

According to *Changes in the Flood Insurance Program: Preliminary Considerations for Rebuilding* (FEMA 2012):

> *Under the new law, flood insurance premium rates on many properties in special flood hazard areas will increase. The new rates will reflect the full flood risk of an insured building and some insurance subsidies and discounts will be phased out and eventually eliminated.*
>
> *Rates on almost all buildings that are,* **or will be**, *in special flood hazard areas will be revised over time to reflect full flood risks. Based on various conditions set forth in the law, subsidies and grandfathered rates will be eliminated for most properties in the future.*
>
> *Subsidies will be phased out for the following types of properties: non-primary residences, severe repetitive loss properties, business properties, and properties that have incurred flood-related damages where claims payments exceed the fair market value of the property.*
>
> *Policy rates will also increase based on one or all of the following circumstances:*
>
> - *After a change of ownership;*
> - *After there is a lapse in insurance coverage;*
> - *When a new or revised flood insurance rate map is issued; or*
> - *If there is substantial damage or improvement to a building.*

Elevate Bottom of Lowest Horizontal Structural Member to BFE

In all areas where flooding is anticipated, inside and outside the mapped SFHA, elevate the lowest floor so that the bottom of the lowest horizontal structural member is above the BFE (see Figures 11 and 12).

Even though the NFIP and some building codes allow the top of the lowest floor to be set equal to the BFE in Zone A, the top of the floor should be set above the BFE. Otherwise, the floor systems, floor coverings, floor insulation, lower walls, and utilities contained therein will incur flood damage during the base flood. In addition to structural damage, inundation may lead to costly repairs from mold or floodwater contamination.

Design Loads

In Zones V and A, design loads and conditions (hydrostatic loads, hydrodynamic loads, wave loads, floating debris loads, and erosion and scour) should be calculated using 100-year flood conditions. Loads can be based on freeboard levels if desired, but freeboard is usually used as a factor of safety against getting wet, not for design load calculations.[12]

11 If in Zone X, completing an Elevation Certificate may help implement this recommendation.
12 If the design flood is defined as a higher flood return period (e.g., 500-year flood), the design loads should be based on the higher flood level.

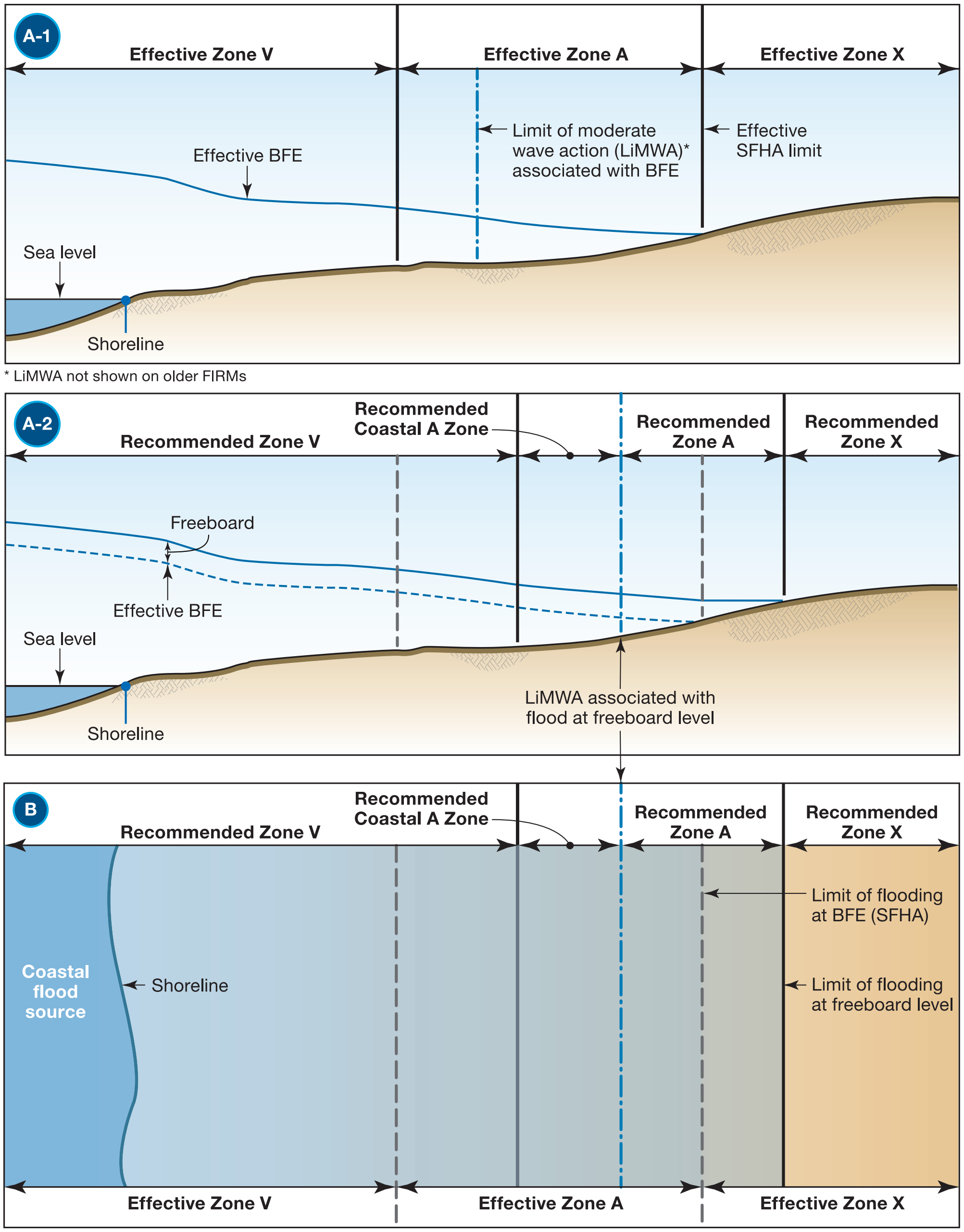


Figure 10.
Higher flood levels shift flood zones landward. Figure A-1 shows a cross-section of existing coastal flood hazards. Figure A-2 shows how recommended flood hazard zones shift as higher flood levels occur or higher freeboard is considered. Figure B is a map view comparing the existing and recommended flood hazard zones.

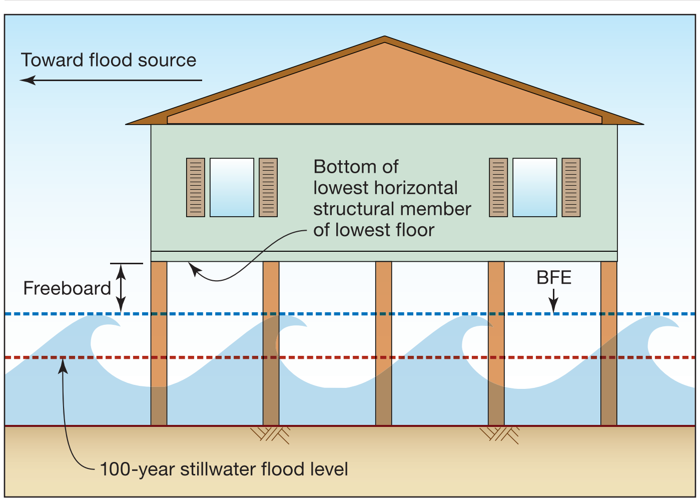


Figure 11: Recommended construction in anticipated Zone V and Coastal A Zones

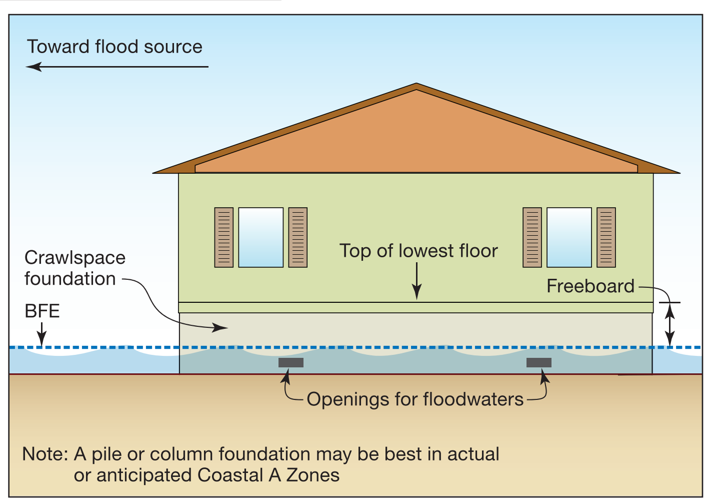


Figure 12: Recommended elevation in landward portion of Zone A. Applies also in Zone X where flooding is anticipated or likely; in Zone X, substitute freeboard elevation for BFE.

Property owners sometimes ask if elevating a home will result in higher wind loads on the building. Calculations indicate that wind pressures on elevated buildings are nominally higher than for non-elevated buildings, and therefore this is not generally a concern (FEMA 2009). Although the incremental wind load is generally small, the increased wind loads should be considered in foundation design and in the attachments of the elevated house to the foundation.

Use Strong Connections

Use strong connections between the foundations and the elevated building to prevent the building from floating or washing off the foundation if flood levels rise above the lowest floor. Refer also to Hurricane Sandy Recovery Advisory No. 1, *Improving Connections in Elevated Coastal Residential Buildings* (2013).

Use Flood Damage-Resistant Materials

Flood damage-resistant building materials and methods should be used not only below the lowest floor, but also for wall construction and floor finishes sitting directly on the lowest floor. For example, consider using drainable, dryable interior wall assemblies similar to those illustrated in Figure 13. This allows interior walls to be opened up and dried after a flood that rises above the lowest floor. Walls should be designed and constructed to accommodate flooding without damage (LSU 2012). To prevent wicking and limit flood damage, building owners can use the following flood damage-resistant methods and materials:

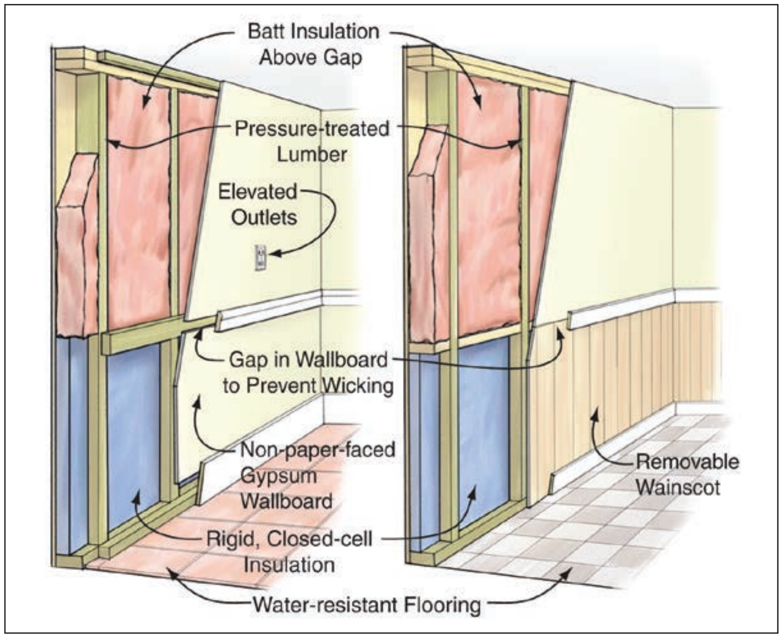


Figure 13: Wet floodproofing techniques for interior wall construction; details may vary depending on wall construction (Source: LSU, 2012)

- Construct walls with pressure-treated wood framing and with horizontal gaps in the wallboard (a chair rail can be used to conceal the gap)
- Elevate electrical outlets, wiring, and circuit panels to a location above the horizontal gap
- Install rigid or closed-cell insulation in lower portions of walls
- Below the horizontal gaps, use non-paper-faced gypsum wallboard, concrete board, or a removable wainscot; use a water-resistant drywall primer and finish with latex paint
- Use water-resistant flooring with waterproof, marine-grade adhesive

Resources and Useful Links

- AIR (American Institutes for Research). 2006. *Evaluation of the National Flood Insurance Program's Building Standards.* Available at http://www.fema.gov/library/viewRecord.do?id=2592.
- ASCE (American Society of Civil Engineers). 2005. *Standard for Flood Resistant Design and Construction*. ASCE 24-05.
- FEMA (Federal Emergency Management Agency). 2000a. *How to Read a Flood Insurance Rate Map – Tutorial*. Available at http://www.fema.gov/library/viewRecord.do?id=2324.
- FEMA. 2000b. *How to Read a Flood Insurance Study – Tutorial*. Available at http://www.fema.gov/library/viewRecord.do?id=2325.
- FEMA 543. 2007. *Design Guide for Improving Critical Facility Safety from Flooding and High Winds*. Available at http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=2441.

The FEMA Region II Web page provides useful information and links for disaster survivors and recovering communities, including available FEMA assistance and recovery initiatives. Please refer to http://www.region2coastal.com.

- FEMA. 2008. *2008 Supplement to the 2006 Evaluation of the National Flood Insurance Program's Building Standards*. Washington D.C.
- FEMA P-762. 2009. Local Officials Guide for Coastal Construction. Available at http://www.fema.gov/media-library/assets/documents/16036.
- FEMA P-499. 2010a. *Home Builder's Guide to Coastal Construction Technical Fact Sheet Series.* Available at http://www.fema.gov/technology-transfer/home-builders-guide-coastal-construction-technical-fact-sheet-series-fema-p-499.
- FEMA P-758. 2010b. *Substantial Improvement/Substantial Damage Desk Reference*. Available at http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=4160.
- FEMA P-55. 2011. *Coastal Construction Manua*l. Available at http://www.fema.gov/library/viewRecord.do?id=1671.
- FEMA. 2012. *Changes in the Flood Insurance Program: Preliminary Considerations for Rebuilding.* Available at http://www.seasideparknj.org/wp-content/uploads/2012/12/NFIP-Fact-Sheet.pdf.
- FEMA. 2013a. *Flood Insurance Manual,* January 1, 2013 edition. Available at http://www.fema.gov/flood-insurance-manual.
- FEMA. 2013b. Biggert Waters *Flood Insurance Reform Act of 2012, Impact of National Flood Insurance Program (NFIP) Changes*. Available at http://www.fema.gov/library/viewRecord.do?id=7187. Accessed April 4, 2013.
- Louisiana State University Agricultural Center. 2012. "Wet Floodproofing." Web page available at http://www.lsuagcenter.com/en/family_home/home/design_construction/Design/Remodeling+Renovation/Preventing+Flood+Damage/Wet+Floodproofing.htm. Accessed March 3, 2013.
- New York City Department of Buildings. 2013. "Rebuilding After Sandy." Webpage available at http://www.nyc.gov/html/dob/html/rebuilding_after_sandy/storm_update.shtml. Accessed April 2, 2013.
- New York City Panel on Climate Change. 2009. *Climate Risk Information*. Available at http://www.nyc.gov/html/om/pdf/2009/NPCC_CRI.pdf.
- NOAA (National Oceanic and Atmospheric Administration). 2013. *Sea Levels Online*. Available at http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml. Accessed March 11, 2013.
- State of New Jersey. 2013. "Local Flood Damage Prevention Ordinance – Adoption of Advisory Base Flood Elevation Maps." Letter published February 4, 2013. Available at http://www.nj.gov/dep/floodcontrol/docs/20130204community-abfe-letter.pdf.

For more information, see the FEMA Building Science Frequently Asked Questions Web site at http://www.fema.gov/frequently-asked-questions.

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Q-CSC-2-34: How will the costs of the proposed project be allocated? What costs are regionalized and what costs are localized? Estimate the percentages of the $170M that would be borne by UI ratepayers, Connecticut ratepayers, and remainder of New England (excluding Connecticut) ratepayers, as applicable. Estimate the incremental cost (per foot of additional elevation) to elevate the substation above its currently proposed elevation. Who would bear the additional costs of increasing the substation elevation above the FEMA standard?

A-CSC-2-34: In general, distribution costs are localized and most transmission costs (in UI territory) are regionalized providing that ISO-NE determines the transmission project provides a regional reliability benefit and is in accordance with good utility practices. The process that ISO-NE uses to make this regional cost recovery determination is referred to as the Transmission Cost Allocation (TCA) process and includes input from all New England stakeholders.

The following is the anticipated approximate cost allocation breakdown based on the proposed project scope and the estimates reported to ISO-NE stakeholders in the final study report issued on January 23, 2017.

Total Cost: $171.3M

Pool Transmission Facilities (PTF): $128.2M ($32.0M CT, $96.2M rest of New England)
These costs are typically shared across all New England ratepayers based on load share which is approximately 75% New England and 25% CT pending the ISO-NE TCA determination.

Distribution & Non-PTF Transmission: $43.1M
These costs are typically paid for by UI ratepayers.

Below are preliminary estimated costs associated with elevating the substation by an additional one or two feet (above the proposed project's 100yr + 3 ft. elevation).

Additional 1ft (100yr + 4ft): $1.2M

Additional 2ft (100yr + 5ft): $1.7M

UI will ultimately submit the proposed project through the ISO-NE TCA process for a regional cost recovery determination but preliminary indications are that any incremental flood protection costs beyond the current proposal will likely be borne by Connecticut ratepayers. This determination is based on ISO-NE's recent stated position on this subject provided in their presentation titled "ISO Recommendation For Cost Regionalization in Flood Hazard Areas" (dated April 26, 2018) which matches UI's current proposal (reference slide 8, 1st bullet).

See attachment CSC-2-34, "ISO Recommendation for Cost Regionalization in Flood Hazard Areas".

UI will, if ordered by the Council in the Decision and Order, increase the proposed base design flood elevation by up to two feet.

CSC-2-34

ISO Recommendation For Cost Regionalization in Flood Hazard Areas

Michael Drzewianowski

LEAD ENGINEER

Purpose

- Discuss with the Planning Advisory Committee (PAC) the ISO recommended level for regional cost recovery under the Schedule 12 of the Open Access Transmission Tariff (OATT) in flood hazard areas, as defined on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM)

Background

- Previous recommendation for regional cost recovery in flood hazard areas was to construct to the 100 year flood level plus an additional one (1) foot
  - This was developed after consultation with the System Design Task Force and review of national information available including recommendations from FEMA and the American Society of Civil Engineers (ASCE)
- Events in the past several years have changed the thought process on designing for flood hazard areas
  - Large storms e.g., Sandy, Irma
  - Other weather related events
  - Redesign of Flood Maps and industry standards (ASCE 24/FEMA Guidance)

Recent experience

- Recently the transmission owners have brought projects forward to the PAC and RC where the construction in the flood hazard areas differs from previous approaches
  - United Illuminating Coastal Substation Flood Mitigation Study
  - Eversource Seafood Way Substation
  - More projects being proposed

Industry Outreach

- In order to understand how Transmission Owners in New England and other parts of the country are handling this issue, the ISO utilized the North American Transmission Forum to ask members how they handle the following situations:

"In designing transmission substations, do you have design requirements related to equipment elevation to address flooding concerns? If so:

- What elevation do you use? Example: the greater of FEMA 100 year plus 2 feet or 500 year.
- If the locations are in coastal areas do you use an adder for sea level rise? If so what is that adder and how was it determined.
- How is that elevation used? Is it used to specify the bottom of the lowest piece of equipment, or does it specify the bottom of any sensitive equipment. As an example, it may be acceptable for the bottom of the transformer to be wet, but the control cabinet cannot tolerate submersion. Therefore, the standard used in response to item 1 is used to specify the minimum elevation of the control cabinet."

Industry Outreached - Continued

- Responses varied
  - Some were very detailed
  - Some companies had no defined standards

- Common themes in the responses
  - Followed ASCE-24 and FEMA guidance
  - Design Flood Protection Level that is the higher of the 100 year flood level plus 2 feet or 500 year flood level (before sea level rise allowance for coastal locations)
  - Allowance for sea level rise, typically 1 foot

FEMA/ASCE Recommendations

- Per FEMA Technical Fact Sheet 1.6: The International Building Code (IBC) requires buildings be designed and constructed in accordance with ASCE-24
  - https://www.fema.gov/media-library-data/20130726-1537-20490-8057/fema499_1_6_rev.pdf
- FEMA deems ASCE 24 to meet or exceed the minimum National Flood Insurance Program requirements for buildings and structures
- Per ASCE-24-14 a Flood Design Class 4 structure must be elevated or protected to the 100-year flood level + 2 feet or the 500 year flood level, whichever is higher (see Appendix for Flood Class 4 Definition)
- In addition, FEMA recommends a minimum adder of 1ft for Sea Level Rise on top of the ASCE-24 level (i.e. higher of either the 100yr + 3ft, or 500yr+1ft).
  - https://www.fema.gov/media-library-data/1381405016896-8bdeadf634c366439c35568a588feb24/SandyRA5DesignAboveBFE_508_FINAL2.pdf

ISO Recommendation

- After reviewing FEMA guidance, new standards and industry data, the ISO is recommending a change to the previous recommendation for regional cost recovery to the following
  - Inland locations – defined as areas that have no chance for "wave action"
    - The higher of the 100 year flood level plus 2 feet or 500 year flood level
  - Coastal Locations
    - The higher of the 100 year flood level plus 2 feet or 500 year flood level
    - Plus an additional 1 foot added for sea level rise
- For existing equipment that needs to be raised the recommendation is to the bottom of sensitive equipment
  - Example: The control cabinet of a transformer would be at the elevation listed above while the lower end of the transformer would be below. The bottom of the transformer could be submerged in water
- For new construction the recommendation is to the bottom of the equipment being installed.
  - Example: The bottom of the transformer would be at the higher of the two values shown above
- For control houses the level shall be at the control house floor in all situations

Next Steps

- Please submit comments on the materials in this presentation to pacmatters@iso-ne.com by May 10, 2018
- Modifications will be made to Planning Procedure 4, "Procedure for Pool-Supported PTF Cost Review"
  - Reliability Committee review process anticipated to begin in June 2018

Questions

APPENDIX

Appendix - ASCE Flood Design Class 4 Definition

ASCE Flood Design Class 4 Definition

- **ASCE Flood Design Class 4**
  - Buildings and structures that contain essential facilities and services necessary for emergency response and recovery, or that pose a substantial risk to the community at large in the event of failure, disruption of function, or damage by flooding. Flood Design Class 4 includes (1) hospitals and health care facilities having surgery or emergency treatment facilities; (2) fire, rescue, ambulance, and police stations and emergency vehicle garages; (3) designated emergency shelters; (4) designated emergency preparedness, communication, and operation centers and other facilities required for emergency response; (5) power generating stations and other public utility facilities required in emergencies; (6) critical aviation facilities such as control towers, air traffic control centers, and hangars for aircraft used in emergency response; (7) ancillary structures such as communication towers, electrical substations, fuel or water storage tanks, or other structures necessary to allow continued functioning of a Flood Design Class 4 facility during and after an emergency; and (8) buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released.

Q-CSC-2-35: At the June 14, 2018 evidentiary hearing, comparisons were made between the (administratively noticed) Petition No. 1218 PSEG Bridgeport Harbor Unit 5 Project design elevation and UI's proposed replacement substation elevation. The data are provided in the table below. Please comment on difference between the design elevations of the two adjacent projects.

	Petition No. 1218. BHU#5 Project	Docket No. 483 UI Pequonnock Replacement Substation Project
100-year flood elevation (BFE)	14 feet amsl	14 feet amsl
500-year flood elevation	15.3 feet amsl	15.9 feet amsl
Design Elevation	16.5 feet amsl	17 feet amsl
Design Elevation above BFE	2.5 feet	3 feet
Design Elevation above 500-year flood elevation	1.2 feet	1.1 feet

A-CSC-2-35: The datum used by FEMA for these elevations is NAVD88 not amsl. Note that in Bridgeport MSL = -0.22 NAVD88 (according to NOAA on the Bridgeport tide gage website). Information related to the PSEG facility was derived from the document titled – "State of Connecticut, Department of Energy & Environmental Protection, Coastal Consistency Compliance Statement" (CCCS) dated February 2016. Comments on the design elevations for the two adjacent projects include:

100-year flood elevation (BFE):

Both sites use the 100-year base flood elevation (BFE) of 14 ft. NAVD88.

500-year flood elevation:

UI estimated a 500-year flood elevation that was 0.6 ft. higher than the elevation estimated by PSEG. This higher estimation is the result of including greater wave effects, due to higher winds, during the 500-year flood than during the 100-year flood.

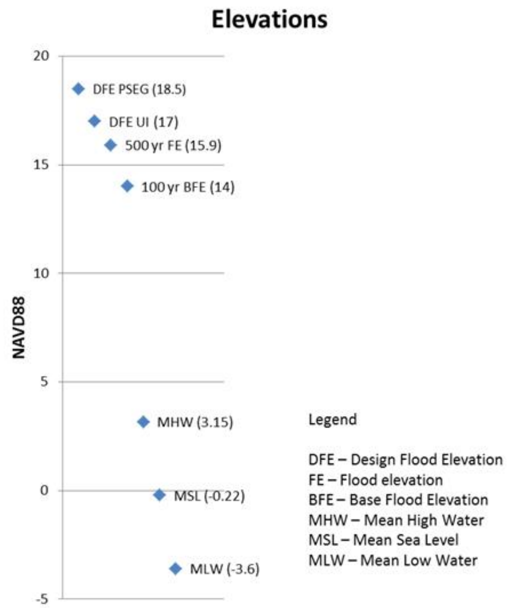
Design Elevation/Design Elevation above BFE:

UI identified a Design Flood Elevation (DFE) of 17 ft. NAVD88 based on an industry guidance of Base Flood Elevation (BFE) + 3 feet, which includes 1 ft. to account for future sea level rise. As stated in the CCCS, PSEG originally used a design flood elevation of 16.5 ft. NAVD88. However, according to a later document the design flood elevation (top of concrete) is actually 18.5 feet NAVD88 or BFE +4.5 feet (CSC Petition # 1218, Exhibit B – Preliminary Site Development Plans, Figure B-1 General Arrangement, Design note 2 on Drawing # BPHU5-DWG-014-C-0102).

Design Elevation above 500-year flood elevation:

The design flood elevation of 17 ft. NAVD88 for the UI site is 1.1 ft. above the estimated 500 year flood elevation of 15.9 ft. NAVD88 while the design elevation of 18.5 ft. NAVD88 for the PSEG site is 2.6 ft. above the 500 year flood elevation of 15.9 ft. NAVD88.

See graphic below for summary of elevations.



Interrogatory CSC-2-36

Q-CSC-2-36: What is the role of ISO-New England Inc. (ISO-NE) for this project or what studies/determinations have been made by ISO-NE relative to the project? Has ISO-NE made any comments or recommendations regarding UI's proposed replacement substation flood design/elevation? If yes, provide ISO-NE's comments/recommendations.

A-CSC-2-36: ISO-NE's role as the transmission system planning authority ensures that proposed transmission system modifications do not have an adverse reliability impact on the New England Bulk Electric System. In addition, ISO-NE is responsible for transmission project cost allocation determinations based on a review of system needs and the scope of mitigating solutions. ISO-NE issued a determination (i.e. PPA UI-16-T03) on December 28, 2016 that this proposed project will not have a significant adverse impact on the transmission system. A copy of this ISO-NE determination was provided in response to Interrogatory CSC-1-27. The Transmission Cost Allocation (TCA) process for this project has not yet been initiated because this process typically begins after completion of the siting process and the detailed design when the project scope and likely costs have been established. ISO-NE and regional stakeholders were consulted in regards to UI's proposed design flood elevation which at the time was considered to be conservative relative to past industry practices. Since then, ISO-NE has published recommendations regarding flood design elevations which are aligned with the proposed project. Please reference the response to Interrogatory CSC-2-34 for additional details.

Interrogatory CSC-2-37

The United Illuminating Company
Docket No. 483

Witness: Sara Cullen-Corson

Q-CSC-2-37: Compare the costs of cross-linked polyethylene (XLPE) cable vs. high pressure gas filled (HPGF) cable on a per circuit-foot basis. Estimate the total XLPE cable costs for the proposed project and the total HPGF costs for the proposed project. Also provide the total length of XLPE and length of HPGF in circuit-feet for the proposed project.

A-CSC-2-37: As part of the proposed Project, UI will extend two existing underground cable systems; one consisting of two, HPGF circuits, and one XLPE (3 cables per phase) system.

The costs in the table below include materials, and labor for complete installation of the applicable cable system.

Description	XLPE	HPGF
Cost Comparison (Per Circuit Foot)	$7,650	$1,450
Total Cost-Pequonnock	$3,213,000	$3,132,000
Total Length-Pequonnock (Circuit Feet)	420	2,160