PROJECT 3: Housing Recommendations for Disaster Relief

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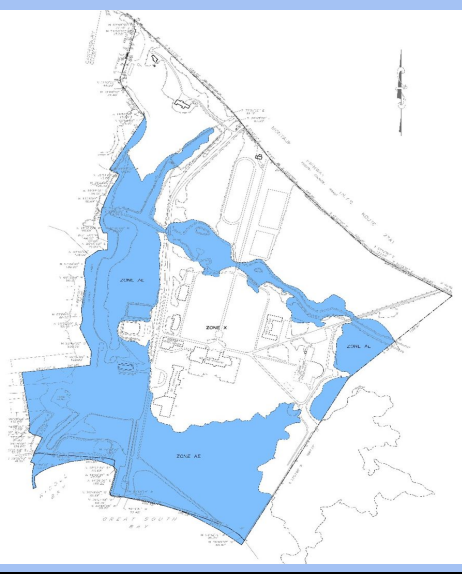
ARC 476

Identifying Hazards

FEMA Requirements

Zone X: Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage area less than 1 square mile; and areas protected by levees from 1% annual chance flood. Building will be placed in this zone

Zone AE: Base flood elevations determined



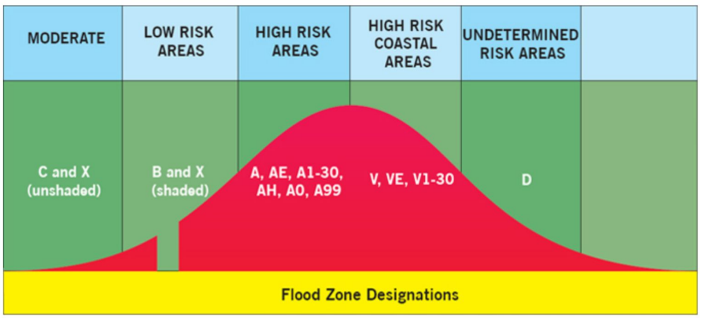
Our Project Site is in Oakdale, Long Island. It sits on 172.19 acres off the Great South Bay. Although most of our project area is outside the specific flood zone AE, we should design based off the potential for flooding due to how close the line of demarcation is. The “E” is for elevation and is an important factor when determining flood insurance rates.

This zone includes MoWA, MiWA, and the Riverine SFHA.

Flood Zone Determination

Flood Zone Determination & Certification Services

We complete Flood Zone Determination Request by providing the necessary flood information of the address. This is done by determining the location of the property on the FEMA. (FEMA has defined according to different levels of flood risk. These zones are described on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity of Flood in their respective areas or zones.



Flood Insurance Risk Zones means zone designations on Flood Hazard Boundary Map (FHBM) and "Flood Insurance Rate Map (FIRM) that indicate the magnitude of the flood hazard in specific areas of a community. Following are the zone definitions:

- Zone AE: Special flood hazard areas inundated by the 100-year flood; base flood elevations are determined.
- Our site is on the Designation Chart at low-high risk.

Flooding, Erosion, High Winds, Earthquakes

To resist the natural hazards that affect coastlines, proper planning, siting, design and construction are critical and require understanding of coastal environment and geology. Refer to the origin, structure, and makeup of the coastal region.

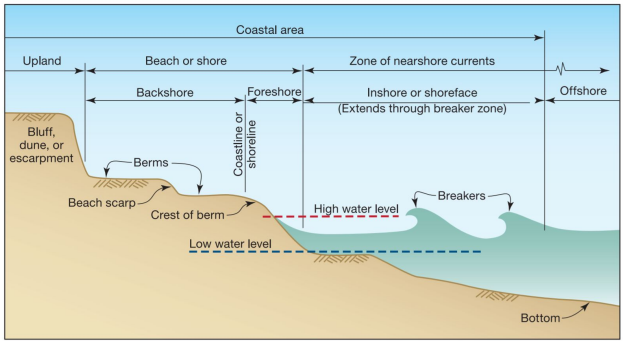


Figure 3-1. Coastal region terminology

SOURCE: ADAPTED FROM USACE 2008

Coastal sediment budgets are used by coastal engineerings and geologists to analyze and explain shoreline changes and project future shoreline behavior.

Designers should contact state coastal management agencies and universities to determine if this info is available.

Hurricanes, Nor'Easters, and High Winds

High winds are capable of imposing large lateral and uplift forces on buildings, which incur severe damage if improperly designed; especially when winds exceed the design levels.

- Refer to the ASCE 7-10 wind speed map for Risk Category II buildings on Long Island
- Investigate and address proper design and construction of residential structures close to open water or near coast.
- Three wind-related topics that deserve special attention from design professionals are speed up of wind due to topographic effects, wind-borne debris and rainfall penetration into buildings, and tornadoes.
- Designers should consider effects of long-term erosion on the wind speeds a building may experience over its lifetime.

Wind direction on our site is South-West. Wind speeds on Long Island can get 120 to 140 mph.

Landscape Risks

- Potential consequences of siting a building immediately adjacent to existing large trees should be evaluated carefully.
- The combination of wind and rain can weaken diseased trees, causing large branches to become wind-borne debris during high-wind events.
- The condition and species of the existing trees should be considered.

WIND HAZARD MITIGATION

Standard / Practice:

- Provide shutters for glazing protection
- Provide high bond strength asphalt roof shingles
- Provide roof sheathing with high wind prescriptive approach with additional underlayments
- Provide cladding system over vinyl siding which is designed to withstand potential wind pressures
- Providing metal connectors and fasteners with thick galvanized coating
- Choosing appropriate roof style

Benefit / Advantages:

- Reduce potential damage from wind-borne debris. Reduces potential wind driven infiltration
- Reduce potential shingles blown off during high winds
- Reduce water and wind damage to roof covering
- Reduce potential for walls being blown off during high winds by tested cladding.
- Reduce wear and tear on connectors to ensure strength against high winds.
- Reduces potential wind loads.

Salt Spray and Moisture

These hazards frequently lead to corrosion and decay of building materials in the coastal environment and are commonly underestimated by designers. Corrosion rate depends on varying factors. Consider:

- Humidity
- Wind direction and speed
- Seasonal wave conditions
- Distance of buildings from the shoreline
- Elevation above the ground
- Orientation of the buildings to the shoreline
- Rainfall rinsing
- Shelter and airflow in and around the building
- and Component materials

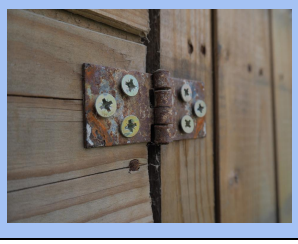
Metal connectors, straps, and clips used to improve a building's resistance to high winds and earthquakes often show signs of corrosion. Spray salt is taken airbourne by breaking waves and blown onto land by onshore winds. It accumulates on metal surfaces, accelerating the electrochemical process that causes corrosion.

CORROSION HAZARD

- It is important to note that the coastal environment brings hazards which can slowly deteriorate any structure such as salt-laden moisture, termites and weathering.
- The salt infused moist air can corrode any exposed metal surface so it is imperative to either limit to amount of exposed metal or provide more galvanized protection.

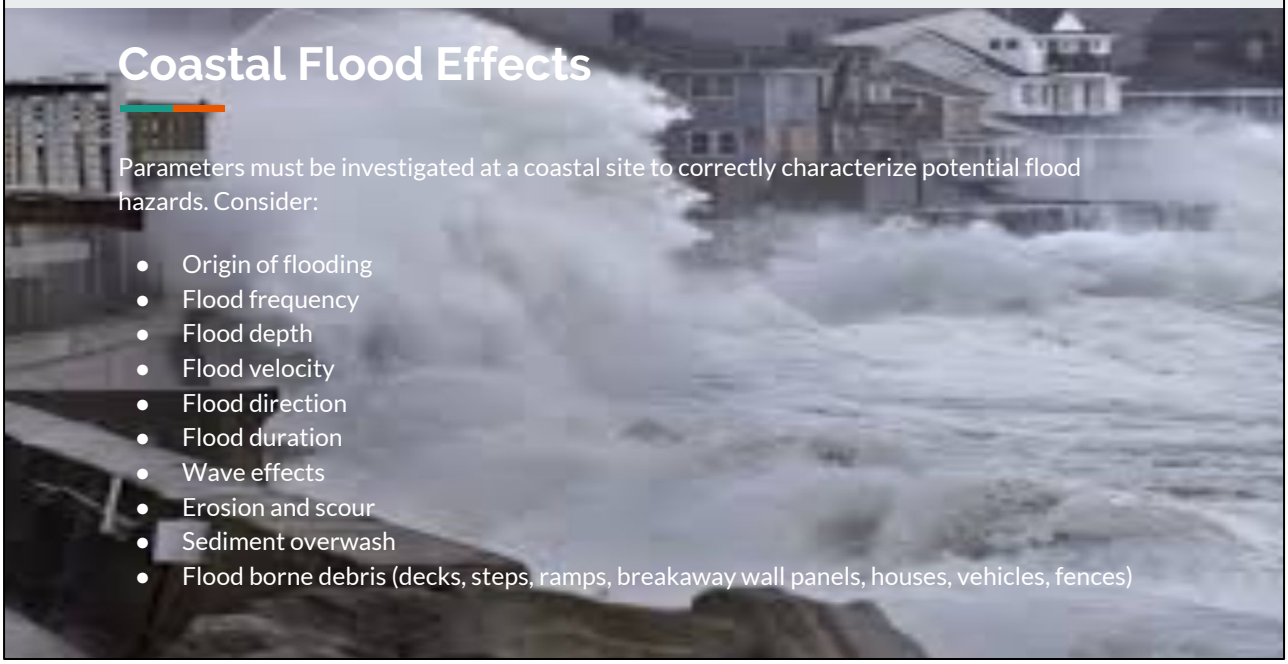
Standard / Practice:

- Use Stainless steel metal structures & Galvanized connectors coated with zinc.
- Utilize correct building materials for mitigation of potential corrosion.



Benefit / Advantages:

- Increased galvanized protection extends materials service life.
- Using concrete / Masonry foundation over wood piles would serve the structure for a longer duration



Coastal Flood Effects

Parameters must be investigated at a coastal site to correctly characterize potential flood hazards. Consider:

- Origin of flooding
- Flood frequency
- Flood depth
- Flood velocity
- Flood direction
- Flood duration
- Wave effects
- Erosion and scour
- Sediment overwash
- Flood borne debris (decks, steps, ramps, breakaway wall panels, houses, vehicles, fences)

Erosion

Designers should be aware some shorelines experience large seasonal fluctuations in beach width and elevation. These changes are the result of seasonal variations in wave conditions and water levels, and shouldn't be taken as long term shoreline changes.

- Evaluation of building site requires consideration of natural and human-caused shoreline changes. Some actions reduce and others increase flood hazards.
- Alteration to vegetation, drainage, or groundwater can sometimes make site more vulnerable to coastal storms or floods.
- Irrigation and septic systems can contribute to instability by elevating groundwater levels and decreasing soil strength.
- Zone A may become exposed to Zone V conditions. Site mapped outside 100 yr floodplain may become exposed to Zone A or V conditions.
- Designers should use highest long-term erosion rate in their siting decisions.

Our site is outside of the Zone A but can be exposed to Zone A conditions.

Evaluating Hazards of the Property

- Use all available information to characterize the type, severity, and frequency of hazards that have affected or could affect the property. (e.g. flood, wind, wildfire, and other natural hazards)
- Determine whether particularly severe storms are included in the short-term or long-term records and what effects those storms had on the overall trends.
- Examine the records for significant changes to the coastal system or inland and upland areas that will reduce, intensify, or modify the type, severity, and frequency of hazard occurrence at the property.
- Forecast the type, severity, and frequency of future hazard events likely to affect the property over a suitably long period of time, over at least 50–70 years.

NFIP Flood Insurance

Understanding methods and assumptions underlying flood insurance study (FIS) reports and Flood Insurance Rate Map (FIRM) is useful to the designer, especially in the case where FIRM is more than a few years old and where updated flood hazard determination is desired.

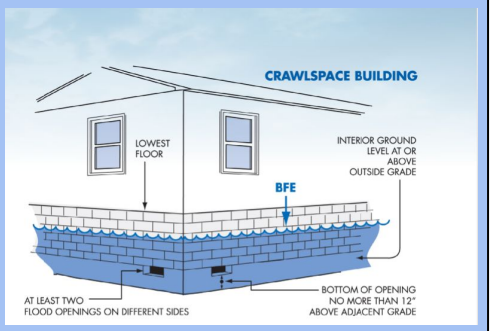
- Designers should determine whether FIRM still accurately represents flood hazards associated with the site under present day base flood conditions. If not, pursue updating the information in order to more accurately understand hazard conditions at the site.
- Review different company policies and determine best one for your needs.

NFIP General Requirements

Activity	General NFIP Requirement in All SFHAs
New Construction, Substantial Improvement, and Repair of Substantially Damaged Buildings	• Communities shall require permits for development in SFHAs and shall review permit applications to determine whether proposed building sites will be reasonably safe from flooding. • Buildings shall be designed (or modified) and anchored to prevent flotation, collapse, and lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. • Buildings shall be constructed with materials resistant to flood damage. • Buildings shall be constructed with methods and practices that minimize flood damage. • Buildings shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located to prevent water from entering or accumulating within their components during flooding. • Communities shall obtain and reasonably use any BFE and floodway data available from other sources for SFHAs for which the FIRM does not provide BFEs or floodways.
New Subdivisions and Other New Developments	• Communities shall review proposals for subdivisions and other new developments to determine whether such proposals will be consistent with the need to minimize flood damage within flood-prone area. • Proposals for new subdivisions and other new developments greater than 50 lots or 5 acres, whichever is less, and for which BFEs are not shown on the effective FIRM shall include BFE data. • Public utilities and facilities, such as sewer, gas, electrical, and water systems for new subdivisions and other new developments shall be located and constructed to minimize or eliminate flood damage. • Adequate drainage shall be provided for new subdivisions and new developments to reduce exposure to flood hazards.
New and Replacement Water Supply Systems	• New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems.
New and Replacement Sanitary Sewage Systems	• New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters. • On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

Foundation Recommendation

- Must have openings in the foundation walls below base flood elevation(BFE) to allow flood water to exit.
- The enclosure or crawl space below the building must contain a sufficient number of flood vent openings so that flood waters can flow under the building and not buckle the foundation.
- The flood vents must be properly located: on at least two different sides of the building. (preferably opposite sides)
- The top of the lowest floor must be above BFE



In A-Zone you can build on foundation. Place 8”x16” smart vents (size of concrete block) at a max of 1’ from grade every 200 square feet on at least two sides (ideally all sides) to allow water below BFE to flow through the piles. This will decrease pressure on walls.

There should be a Free Board height of 2’ from the top of BFE to the top of FF elevation.

All mechanical equipment should be elevated to this height.

Stairs should be in accordance to local building code so rise and run of stairs conform to requirements. Ramps complying to ADA standards must have max slope of 1:12 with a max rise of 30” and a max run of 30’ without a level landing. Landing length must be minimum of 60” turning radius.

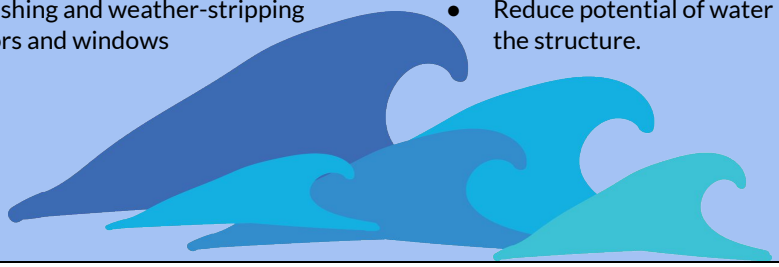
FLOOD HAZARD MITIGATION

Standard / Practice:

- Provide an additional 1 to 2 ft to the Required elevation of the lowest horizontal member of the building.
- Provide Open Foundations
- Improve flashing and weather-stripping around doors and windows

Benefit / Advantages:

- Reduces potential damage to structure by waves or floodwaters.
- Reduce potential damage to understory of the structure & reduce debris build up.
- Reduce potential of water infiltration into the structure.



Sea Level Rise

Two principal effects: (1) Increases storm tide elevations and allows for larger wave heights to reach coastal site and (2) leads to shoreline erosion.

- Designers should investigate potential sea level rise and determine whether projected sea level changes will increase flood hazards at the site.
- The NOAA site http://tidesandcurrents.noaa.gov/sltrends/sltrends.html provides historical information the designer can extrapolate into the future.
- Designers may also want to consider whether accelerated rates of rise will occur in the future.

Termites

Common to high humidity and frequent and heavy rains. Improper design and construction, and poor landscaping practices can contribute to issues. For preventive methods, consider:

- Consulting termite infestation probability map included in IRC. Most coastal areas have moderate to very heavy probability of infestation.
- Using preservation-treated wood products and/or naturally resistant wood species.
- Chemical soil treatments.
- Installation of physical barriers to termites like metal or plastic termite shields.

Rain and Snow

Rain penetration of building envelope during high wind events and vertical loads due to ponding on flat or low slope roofs need to be examined. Also ensure proper materials in regards to hail. Consider the design of:

- Roof shingles and tiles
- Metal roofs
- Skylights
- Glazing
- Other components

Snow calculations are more complicated than rain loads because snow drifts and distributes non-uniformly across a roof. Consider:

- Drainage of trapped and melted snow.
- Northern climate snow can result in ice dams which damage roofs and gutters and leave building more susceptible to wind damage.
- Ice formations and build up on structures, trees, and utility lines that can result in falling ice hazards.
- Design snow load at 25 lbs/sf

MATERIAL SELECTION

Material	Advantages	Special Considerations
Wood	• Generally available and commonly used • With proper design, can generally be used in most structural applications • Variety of products available • Can be treated to resist decay • Some species are naturally decay-resistant	• Easily over-cut, over-notched, and over-nailed • Requires special treatment and continued maintenance to resist decay and damage from termites and marine borers • Requires protection to resist weathering • Subject to warping and deterioration
Steel	• Used for forces that are larger than wood can resist • Can span long distances • Can be coated to resist corrosion	• Not corrosion-resistant • Heavy and not easily handled and fabricated by carpenters • May require special connections such as welding
Material	**Advantages**	**Special Considerations**
Reinforced Concrete	• Resistant to corrosion if reinforcing is properly protected • Good material for compressive loads • Can be formed into a variety of shapes • Pre-stressed members have high load capacity	• Saltwater infiltration into concrete cracks causes reinforcing steel corrosion • Pre-stressed members require special handling • Water intrusion and freeze-thaw cause deterioration and spalling
Masonry	• Resistant to corrosion if reinforcing is properly protected • Good material for compressive loads • Commonly used in residential construction	• Not good for beams and girders • Water infiltration into cracks causes reinforcing steel corrosion • Requires reinforcement to resist loads in coastal areas

Roofing Recommendation

- The finished surface at the top of the house that must be able to withstand the effects of the elements (i.e., wind, rain, snow, hail, etc.)
- Roofing material should lay relatively flat and should not wave or ripple.
- A wide variety of materials are available, including asphalt shingles, wood shakes, metal roofing, ceramic and concrete tiles, and slate, with asphalt shingles making up the bulk of the material used.
- Pitched roof recommended to keep characteristics of the buildings on the Oakdale site

Exterior Finish Recommendations

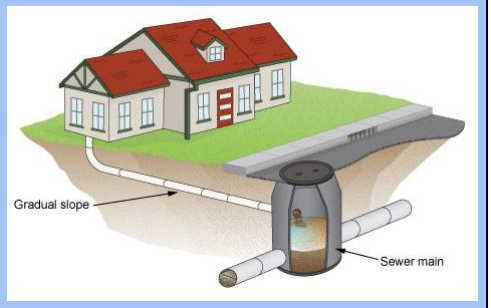
- Siding should be attractive, durable, insect- and vermin-resistant, waterproof, and capable of holding a weather-resistant coating.
- Brick finish recommended, existing buildings on site have brick finishes.
- All exterior surfaces will eventually deteriorate, regardless of manufacturer warranties or claims.
- The exterior siding or brick should be checked for cracks or gaps in protective surfaces.
- Plumbing, air vents, electrical outlets, or communication lines extend through an exterior wall, they should be carefully checked also.

Window Recommendation

- New materials, coatings, design, and construction features make it possible to choose windows that allow you to balance winter heating and summer cooling needs without sacrificing versatility or style.
- Some window glass is made of tempered glass, and laminated glass which resists breakage, if broken produces glass shards too small to cause injury.
- The glazing, or glass, can be a solid glass sheet (single glazed) or have two layers of glass (double glazed) separated by a spacer. Air trapped between the glass layers provides some insulation value.

Sanitary Drainage System

- The proper sizing of the sanitary drain or house drain depends on the number of fixtures it serves.
- The usual minimum size is 4 inches in diameter.
- The top two pipe choices for drain, waste, and vent systems are PVC or ABS.
- One fixture unit equals approximately 7½ gallons of water per minute.
- A house drain should be sloped toward the sewer to ensure scouring of the drain. The usual pitch of a house or building sewer is a ¼-inch drop in 1 foot of length.



Site should be evaluated for on-site wastewater disposal use with conventional (or alternative) septic tank system. Sites with topogrphical limitations, poor soils, or other evaluation criteria may be unsuitable for on-site disposal.

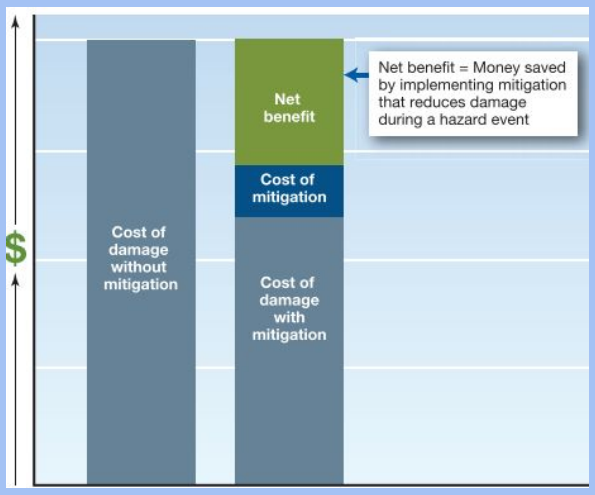
Energy Efficiency

- Development of energy-efficient buildings must be thought out using systems approach.
- Largest reduction in energy use will derive from considering R value of roof systems, insulation, and windows if budget allows.
- Refer to table 13.1 in HHS for cost-efficient R values. Also consult Energy Star table for insulation requirements.
- Potential for active or passive solar system incorporation to reduce energy use.
- Conduct and energy audit to identify areas where energy investments can be made.
- Local and regional topography and site conditions affect temperatures and moisture.
- Site is in a balanced climate. Refer to climate zones by county and know heating degree days or cooling loads needed within the region.
- Northeastern house should be tightly built but not so tight as to stop air from moving.

Find local homes 50 to 100 years old that are comfortable in both the summer and winter times.
Separate standards for the faculty dwelling and student dorms.

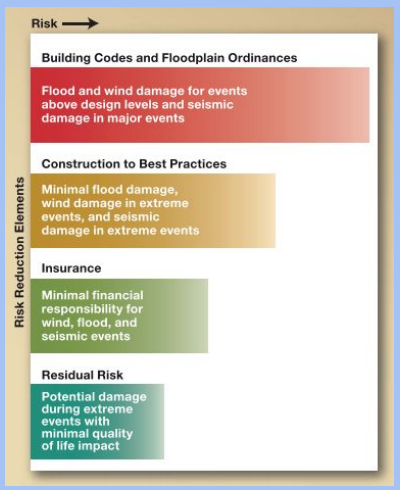
BENEFIT - COST MODEL

- Although exceeding the minimum regulatation requirements may be costly when developing a building. The long run demonstrates that you will have a net benefit for mitigating the issues before they arise.
- Net benefit is described as the money saved from the cost of damage when incorporating the cost of mitigation into the development.



LIMITING RISK

- Natural hazards are a inevitable factor to a buildings lifespan.
- Correct adaption to the building codes and floodplain ordinances along with construction to the best practices provides the highest ability to limit risk and destruction a building may endure.
- While sufficient insurance can limit the financial risk a building owner may have to endure resulting from a natural hazard such as a flood or category 5 storm.



You must discuss potential risks with the client so they understand all hazards when building in a flood zone.

BUILDING DEVELOPMENT RESOURCES

- State and Local land use regulations
- Coastal Zone Management Regulations (CZMR)
- National Flood Insurance Program (NFIP)
- FEMA conducted flood hazard studies which are published in FIRM AND FIS reports.

  (FIRM & FIS reports contains locations of flooding, in addition to frequencies of past Floods, and flood insurance zone designations)
- Floodplain management ordinances meet or exceed the minimum NFIP regulatory requirements.

<u>There are so many resources and standards which do I follow?</u>

Parting Recommendations

If any conflicts arise between the FEMA, HHS, PLO, and the Building Code than designers should adhere to the most stringent restriction.

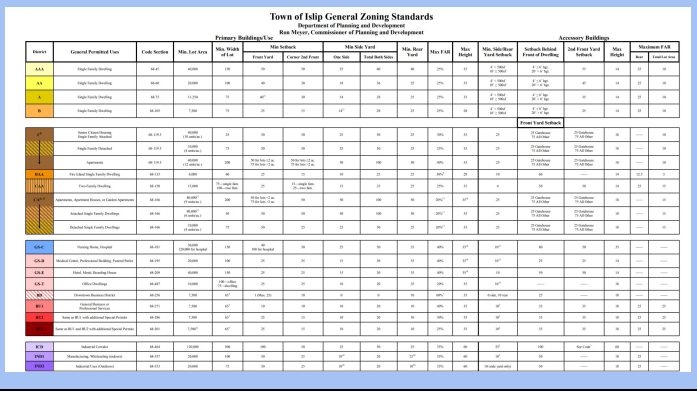
Refer to Appendix G: Flood Resistant Construction in the 2015 IBC.

Refer to Town of Islip General Zoning Standards.

Refer to Whole Building Design Guide for more recommendations at www.wbdg.org.

Refer to Energy Star requirements.

Refer to LEED and Green building council where applicable. leed.usgbc.org/leed.html https://new.usgbc.org/leed



Town of Islip General Zoning Standards

Department of Planning and Development

Ron Meyer, Commissioner of Planning and Development

District	General Permitted Uses	Code Section	Min. Lot Area	Min. Width of Lot	Min Setback		Min Side Yard		Min. Rear Yard	Max FAR	Max Height	Min. Side/Rear Yard Setback	Accessory Buildings			
					Front Yard	Corner 2nd Front	One Side	Total Both Sides					Setback Behind Front of Dwelling	2nd Front Yard Setback	Max Height	Maximum FAR: Rear / Total on Lot
AAA	Single Family Dwelling	68-47	40,000	150	50	50	15	40	40	15%	35	4' / 10ft if 8ft > 30ft if > 8ft	4' / 10ft if 8ft > 30ft if > 8ft	50	14	35 / 60
AA	Single Family Dwelling	68-48	20,000	100	40	30	10	24	25	15%	35	4' / 10ft if 8ft > 30ft if > 8ft	4' / 10ft if 8ft > 30ft if > 8ft	40	14	35 / 60
A	Single Family Dwelling	68-73	11,250	75	40[1]	30	14	28	25	15%	35	4' / 10ft if 8ft > 30ft if > 8ft	4' / 10ft if 8ft > 30ft if > 8ft	35	14	35 / 60
B	Single Family Dwelling	68-105	7,500	75	30	30	14[2]	28	25	15%	28	4' / 10ft if 8ft > 30ft if > 8ft	4' / 10ft if 8ft > 30ft if > 8ft	35	14	35 / 60
													Front Yard Setback			
A-T	Senior Citizen Housing Single Family Attached	68-110.3	40,000 (10 units/ac.)	25	50	50	25	50	25	50%	35	25	25 Gentleman 75 All Other	25 Gentleman 75 All Other	30	---- / ---- / 60
	Single Family Detached	68-110.3	10,000 (4 units/ac.)	75	50	50	25	50	25	25%	35	25	25 Gentleman 75 All Other	25 Gentleman 75 All Other	30	---- / ---- / 60
	Apartments	68-110.3	40,000 (1.25 units/ac.)	200	50 for Sch. 12 ac. 75 for Sch. 13 ac.	50 for Sch. 12 ac. 75 for Sch. 13 ac.	30	100	30	40%	35	25	25 Gentleman 75 All Other	25 Gentleman 75 All Other	30	---- / ---- / 60
PAA	Fire Island Single Family Dwelling	68-115	6,000	60	25	15	10	25	25	30%[3]	28	10	60	----	14	12.5 / 5
PA	Two-family Dwelling	68-130	12,000	75 - single floor 100 - two floors	25		25 - single floor 20 - two floors		15	25	35	6	50	50	14	35 / 35
P-T	Apartments, Apartment Houses, or Garden Apartments	68-106	40,000[4] (10 units/ac.)	200	50 for Sch. 12 ac. 75 for Sch. 13 ac.	50	30	100	30	30%[3]	35[5]	25	25 Gentleman 75 All Other	25 Gentleman 75 All Other	30	---- / ---- / 35
	Attached Single Family Dwellings	68-106	10,000[4] (4 units/ac.)	80	30	30	20	100	30	30%[3]	35	25	25 Gentleman 75 All Other	25 Gentleman 75 All Other	30	---- / ---- / 35
	Detached Single Family Dwellings	68-106	10,000 (4 units/ac.)	75	30	25	25	50	25	30%[3]	35	25	25 Gentleman 75 All Other	25 Gentleman 75 All Other	30	---- / ---- / 35
GA-C	Nursing Home, Hospital	68-101	10,000 150,000 for hospital	150	40 100 for hospital	30	25	50	35	40%	35[6]	60[7]	80	50	35	---- / ----
GA-D	Medical Center, Professional Building, Funeral Home	68-105	20,000	100	25	20	15	30	35	40%	35[6]	60[7]	25	20	35	---- / ----
GA-E	Hotel, Motel, Rooming House	68-209	40,000	150	25	25	15	30	35	40%	35[6]	60	50	50	35	---- / ----
GA-T	Office Dwellings	68-407	10,000	100 + office for dwelling	25	25	10	20	35	20%	35	60[7]	----	----	35	---- / ----
XX	Downtown Business District	68-236	7,500	65'	5 (Max. 25)	10	0	0	10	100%	35	0 only, 10 max	25	----	35	---- / ----
RA	Assisted Business or Professional Service	68-171	7,500	65'	30	30	10	20	35	40%	35	30'	35	35	35	25 / 25
RA	Same as RA with additional Special Permits	68-206	7,500	65'	25	25	10	20	35	50%	35	30'	35	35	35	25 / 25
RA	Same as RA and RC-1 with additional Special Permits	68-301	7,500[8]	65'	25	25	10	20	35	35%	35	30'	35	35	35	25 / 25
IC-D	Industrial Corridor	68-464	150,000	500	100	50	25	50	25	35%	60	25'	100	See Code	60	---- / ----
IND1	Manufacturing, Wholesaling (indoor)	68-137	20,000	100	30	25	10[9]	20	25[9]	35%	60	30'	30	----	30	25 / ----
IND2	Industrial Uses (Outdoors)	68-153	20,000	75	30	25	10[9]	20	30[9]	35%	60	30 (side yard only)	30	----	30	25 / ----