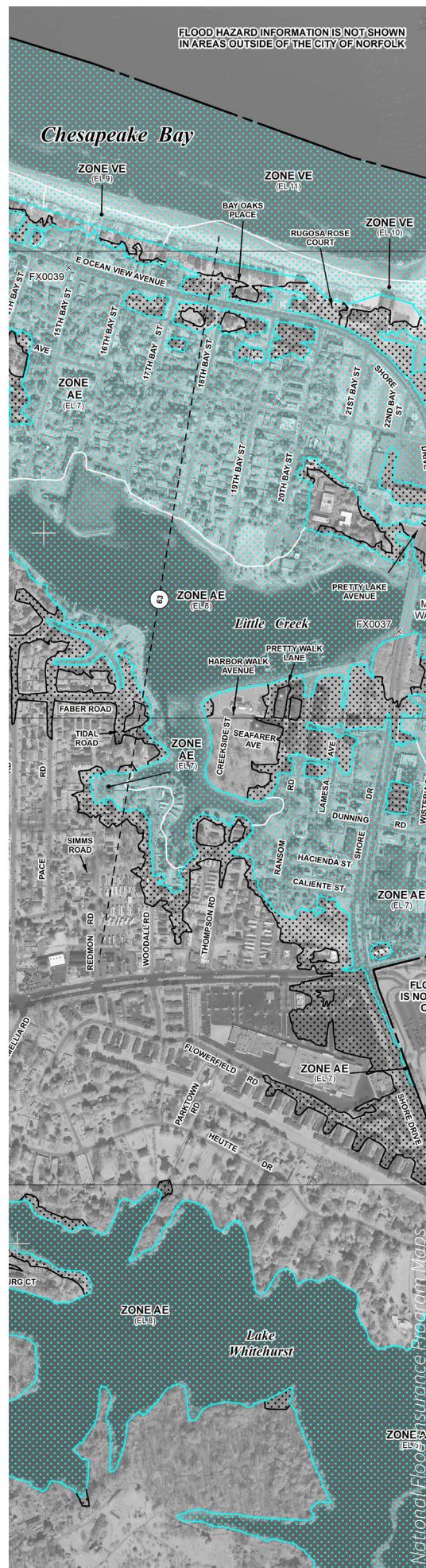


Elevating Homes Pattern Book

THE CITY OF
NORFOLK





Elevating Homes Pattern Book

April 2023

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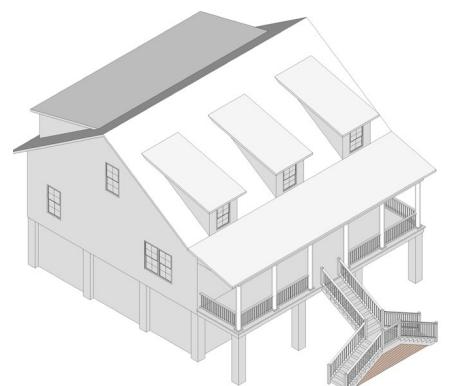
Introduction, Overview and Using the Pattern Book

Purpose and Goals

The Hampton Roads region contains some of the most vulnerable communities in the United States to the impacts of sea level rise and related flood risks. Norfolk's Vision 2100 plan provides a framework for discussing and adapting neighborhoods to rising sea levels and the increasing frequency of flooding.

The goal of this Pattern Book is to **increase affordable housing opportunities** in the city of Norfolk, by providing safe, resilient homes. By raising homes out of the flood plain, homeowners will have an opportunity to reduce their flood insurance costs as well as costs associated with the preparation for and recovery from major flood events, making home ownership in the city more affordable, especially for those on fixed incomes. The Pattern Book **also promotes economic development** for local businesses, supporting the growing home elevation industry across the region.

By utilizing the guidelines and kit of parts outlined in this Pattern Book, owners will be able to elevate their homes responsibly - retaining the architectural character of their neighborhoods as well as encouraging the continued social engagement that makes our communities stronger.



Coastal District Raised Home



Flooding in the 1960s in Downtown



Modern Flooding in Ocean View



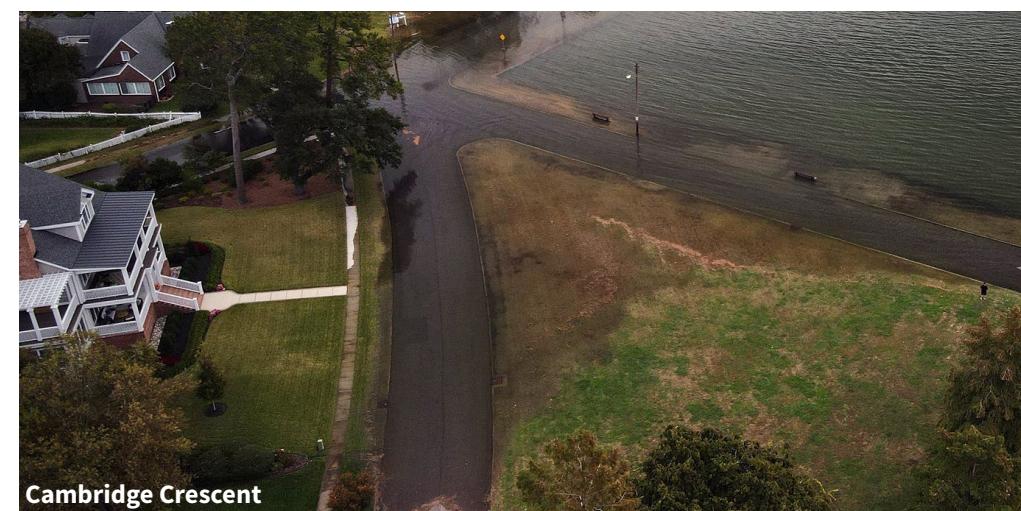
Street Flooding in Riverview

Advantages of Elevating your Home

Elevating a home out of the flood plain typically results in...

Reduced Insurance & Recovery Costs

- Typically reduces insurance premium costs under NFIP.
- Minimizes cost of preparation and flood recovery efforts.



Reduced Environmental Impact

- Retention of original structures prevents demolition and new construction waste
- Conservation of land and natural resources by not polluting land and waterways with materials and toxins from flooded structures

Preserved Community Character

- Protects historic structures
- Keeps neighborhood fabric intact
- Increases skill of building trades in Hampton Roads and develops a regional exportable industry

Additional Considerations

Elevating a home out of the flood plain can cause...

Significant Effect on Appearance

- Elevating a home by greater than 4 feet can greatly impact the scale of the building at the street level
- Affects traditional and existing detailing
- Can pose a risk to significant details and integrity of historic homes if not designed carefully
- Requires attention to detail to prevent drastic change and negative impact to the human scale of the neighborhood



Unique Conditions - Variable Costs

- Because each home's structure and conditions are unique, costs vary from home to home.

Substantial Improvement Designation

- If an elevation project cost exceeds 50% of the current market value of the structure before construction, then FEMA considers the project a 'Substantial Improvement.'
- A substantial improvement designation requires a complete code review of a home, incurring additional costs to bring areas up to code.
- Requires an additional application during permitting process



Additional Considerations

Additional Considerations

For more information on SI/SD Determination, refer to FEMA 213: *Answers to Questions about Substantially Improved/Substantially Damaged Buildings* (2018).

Understanding a ‘Substantial Improvement’ Determination

A home elevation project is considered as a 'Substantial Improvement' (SI) under NFIP if the costs equals or exceeds 50% of the market value of the structure before the start of construction.

- Choosing to elevate a home above the required DFE/Freeboard is always considered a substantial improvement (for example - raising a home a full story for parking access rather than a required 3 Foot DFE.)
- SI projects are required to meet the most stringent code requirements as required by local or federal law.

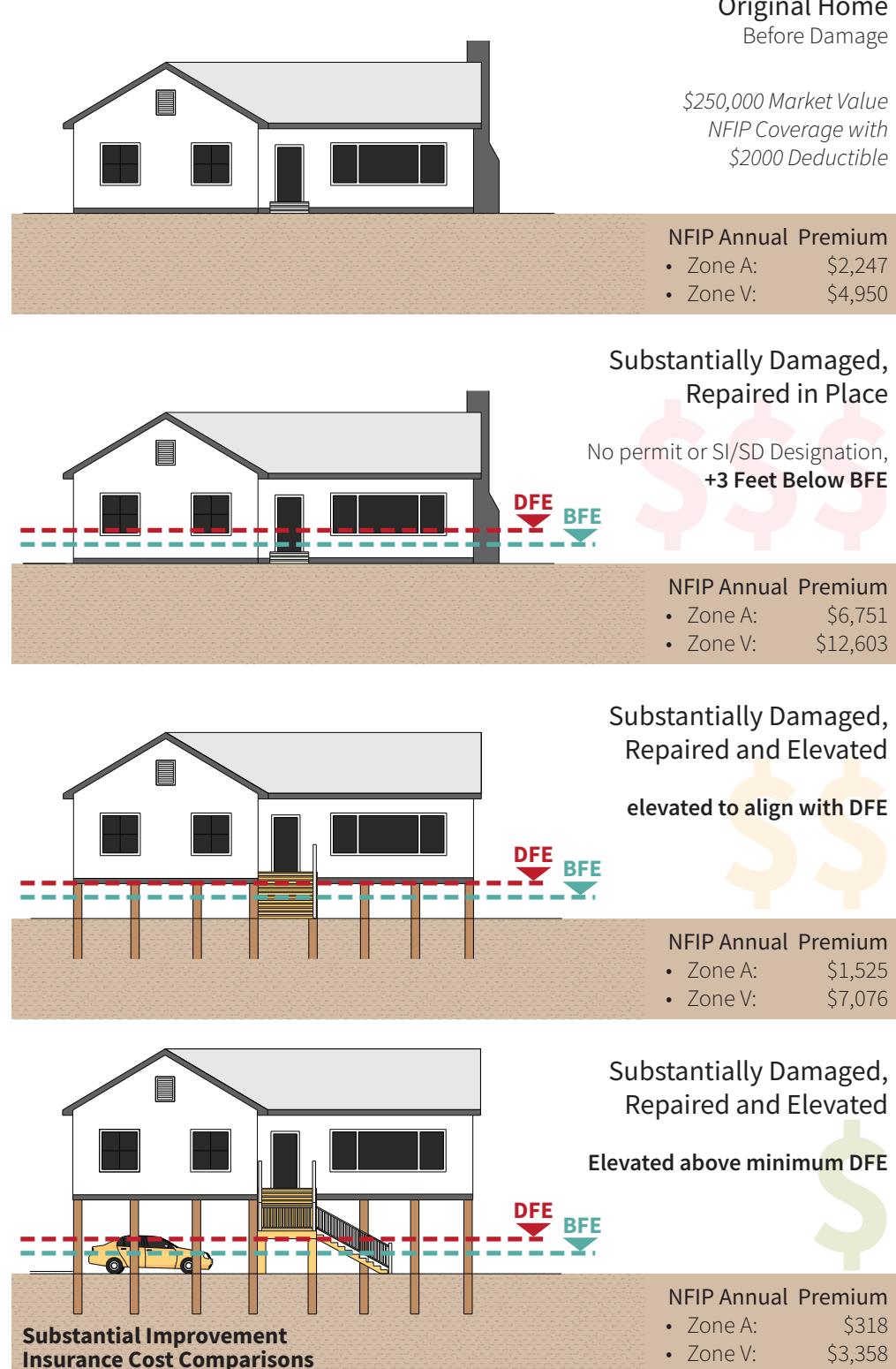
Substantial Damage

Homes that sustain damage from a flooding or disaster event where costs of repairs or restoration to its original condition equal or exceeds 50% of the market value prior to the damage, qualifies as 'Substantial Damage' (SD)

- Any work on SD-qualifying structures automatically qualifies as a Substantial Improvement project.

Increased Cost of Compliance (ICC)

- If the home qualifies as an SI/SD project, owners can file an ICC claim to help pay to bring their home into compliance.
- Claims are only paid on buildings in flood hazard zones that local officials determine are substantially damaged.
- ICC can provide up to \$30,000 towards the cost of bringing buildings into compliance.



adapted from FEMA 213

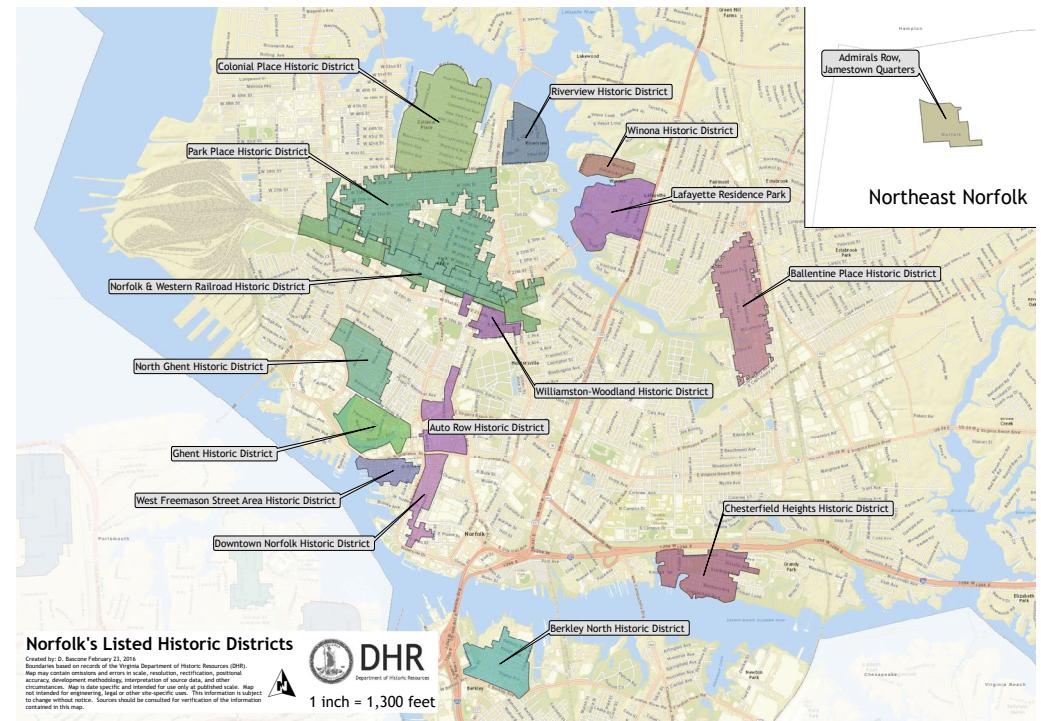
Historic Designation

There are four locally-zoned historic districts in Norfolk, as well as more recognized at the State or National Level. Additionally, some properties are independently listed on the National and State registers.

- Compliance with local, state and federal preservation requirements takes precedence over the guidelines of this pattern book.
- If your home is designated as a historic property on the National Register, any proposed alterations or changes to the property must meet the Secretary of Interior Standards for the Treatment of Historic Properties in order to receive tax credits or funding.
- Homes in local districts are required to meet the city's Local Design Guidelines.
- Historic home elevation projects should be conducted with a registered preservation professional or architect to ensure compliance with local, state and federal preservation requirements.
- Historic Structures are exempt from NFIP Substantial Improvement designation.

Certificate of Appropriateness (COA)

- Proposed elevation projects within a local historic district are required to receive formal approval by issuance of a COA.
- COAs are issued through the City Planning Departments' Design Review Process.
- To determine if your project requires a COA, contact the City Planning Department.



Understanding Flood Terminology

Types of Flooding

Precipitation Flooding

- Quantity + Duration of rainfall can increase risk of flooding
- Occurs when rain intensity exceeds capacity of storm drain systems.

Flash Flooding

- High-speed floods that are caused by excessive rainfall in a short period of time (usually within 6 hours)
- Waters rise and fall very quickly

Tidal Flooding

- Caused by tidal variations, exacerbated by wind speeds, waves, and sea level rise.
- Primarily affects beachfronts and areas connected to bays and large bodies of water, but can move inland to low-lying areas

Storm Surge

- Abnormal rise of water generated by a storm, over and above the predicted high and low tides.

Shallow Flooding

- Flood area created outside of a defined flood channel; defined by areas of ponding or standing water



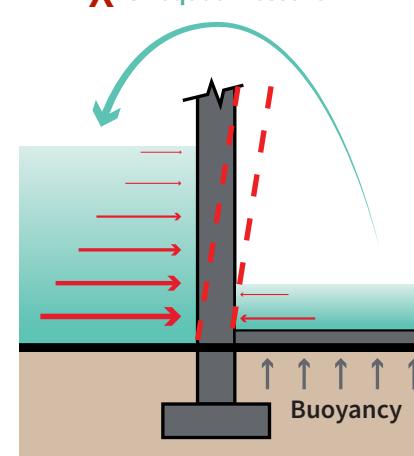
Understanding Flood Terminology

Water Forces

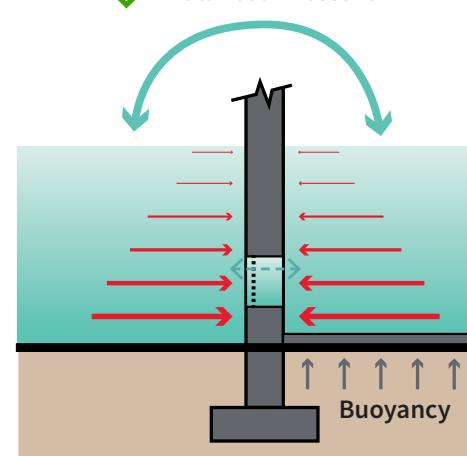
Buoyancy

- Upwards lifting forces that floodwaters exert on lowest subgrade level

✗ Unequal Pressure

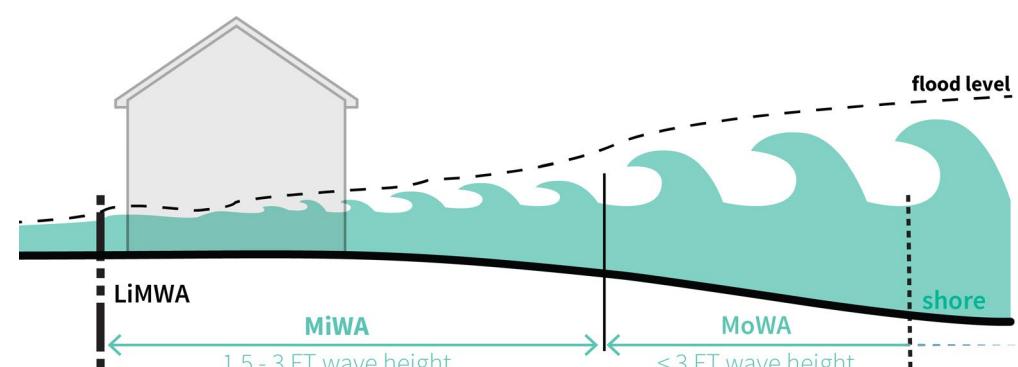


✓ Balanced Pressure



Wave Action

- Effects of wave movement inland from a body of water.
- Increased by high wind speeds and storm surges
- Moderate Wave Action (MoWA) - Wave Height between 1.5 - 3 feet
- Minimal Wave Action (MiWA) - Wave Height less than 1.5 Feet



LiMWA

- Limits of Moderate Wave Action:
- Designates the extent of areas Affected by wave heights between 1.5 and 3 Feet.

Erosion

- Gradual removal and lowering of ground surface over a wide area, over a period of time

Scour

- Removal of supporting soil around a foundation by moving water, causing risk of building collapse



Understanding Flood Terminology

Flood Maps

NFIP

- National Flood Insurance Program
- Maintained by FEMA

FIRM

- Flood Insurance Rate Maps
- Outlines community flood zones
- Corresponds to zoning standards

Storm Surge Maps

- Separate maps to determine anticipated additional flooding caused by coastal storms and hurricanes
- Not part of FIRM but are helpful in determining additional risk

Elevation Certificate

- Documents used to determine insurance premium rates under NFIP

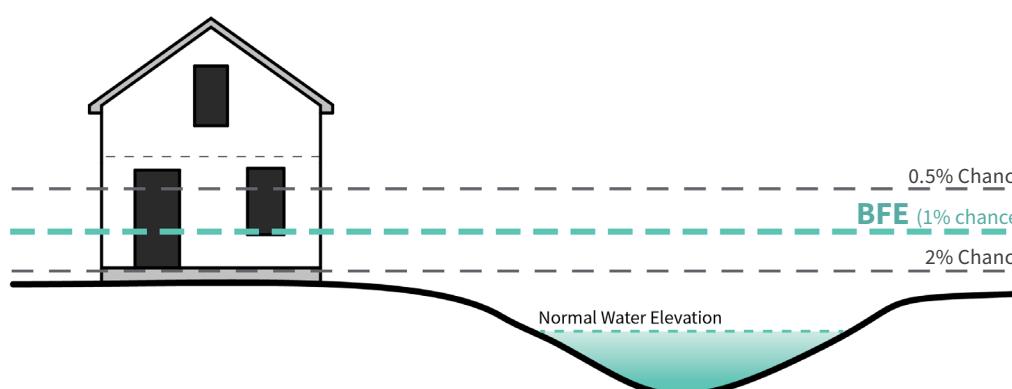


Flood Frequency

Frequency is determined by probability of a flood to **equal or exceed** previous flood levels. NFIP generally refers to three different benchmarks:

0.2% Annual Chance Flood (500-year)

- Flood that has 0.2% percent chance (1 in 500) to equal/exceed previous floods.



1% Annual Chance Flood (100-year)

- Flood that has 1 percent chance (1 in 100) to equal/exceed previous floods.

- **considered the base flood elevation (BFE) under NFIP**

2% Annual Chance Flood (100-year)

- Flood that has 2 percent chance (1 in 50) to equal/exceed previous floods.

Understanding Flood Terminology

FIRM Flood Zones

Special Flood Hazard Area (SFHA)

- Areas subject to flooding at the base flood elevation (all except zone X).

X Zone

- Areas that are outside the 0.2% annual chance of flooding. This zone is the least likely to flood.

X (shaded or 0.2%) Zone

- Areas that have a 0.2% annual chance of flooding and may see flooding if the flood event is abnormally large. Areas are subject to flooding depths less than 1 foot during a 1% chance flood.

AE Zone (Flood Plain)

- Areas subject to a 1% annual chance flooding event with water elevation levels determined (Base Flood Elevation). This area is most likely to flood during a flood event.

AH Zone (Flood Plain)

- Areas subject to a 1% annual chance flooding event caused by ponding water. Elevations determined.

AO Zone (Flood Plain)

- Areas subject to a 1% annual chance flooding with flood depths between 1 to 3 feet. Usually occurs due to sloping terrain

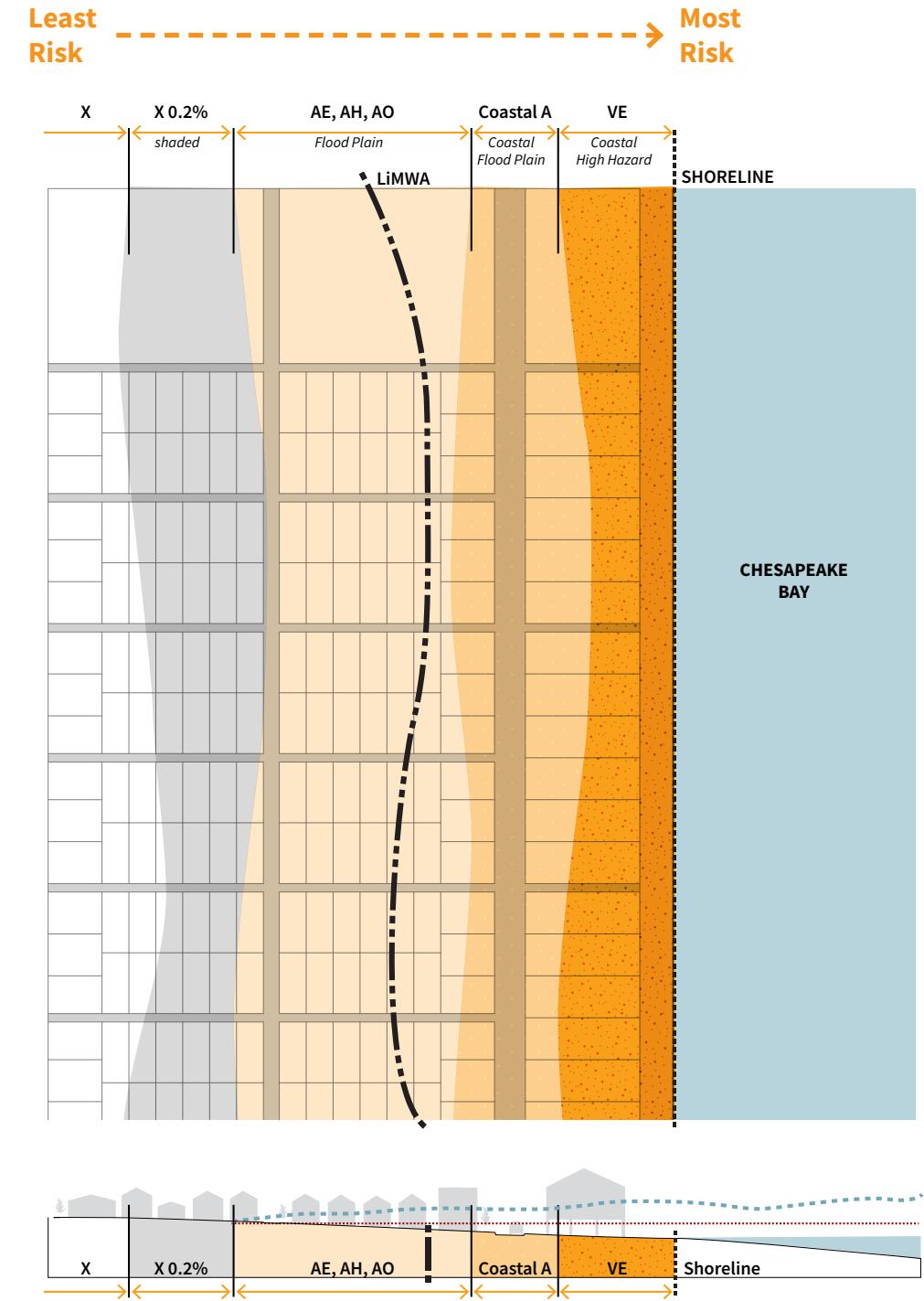
Coastal A Zone (Coastal Flood Plain)

- Areas subject to wave heights of 1.5 to 3 feet - zones of LiMWA

VE Zone (Coastal High Hazard)

- Velocity zone. Area subject to wave heights 3 feet or more and extending to the inward limit of the Coastal Primary Sand Dune

For more detailed information on flood terminology, refer to Chapter 2 of the *Homeowner's Guide to Retrofitting* (FEMA P-312, 3rd Edition).



Understanding Flood Terminology

Building Terms

Base Flood Elevation (BFE)

- elevation in feet of flood level relative to the established benchmark level for the community or area

Freeboard

- vertical distance (in feet) between BFE + DFE that adds a margin of safety
- Norfolk requires freeboard of three feet in zones AE, AH, AO, and Coastal A, and VE.

Design Flood Elevation (DFE)

- Considered BFE + Freeboard Height
- Minimum elevation to which lowest floor of building must be protected from flooding

Lowest Floor Elevation

- lowest enclosed area (including basements)
- unfinished/flood-resistant enclosures used for parking/storage do not apply

Building Envelope

- entire exterior surface of a building (including walls, doors + windows)
- can be affected by forces from moving and standing water pressure as well as wind and debris.

Breakaway Walls

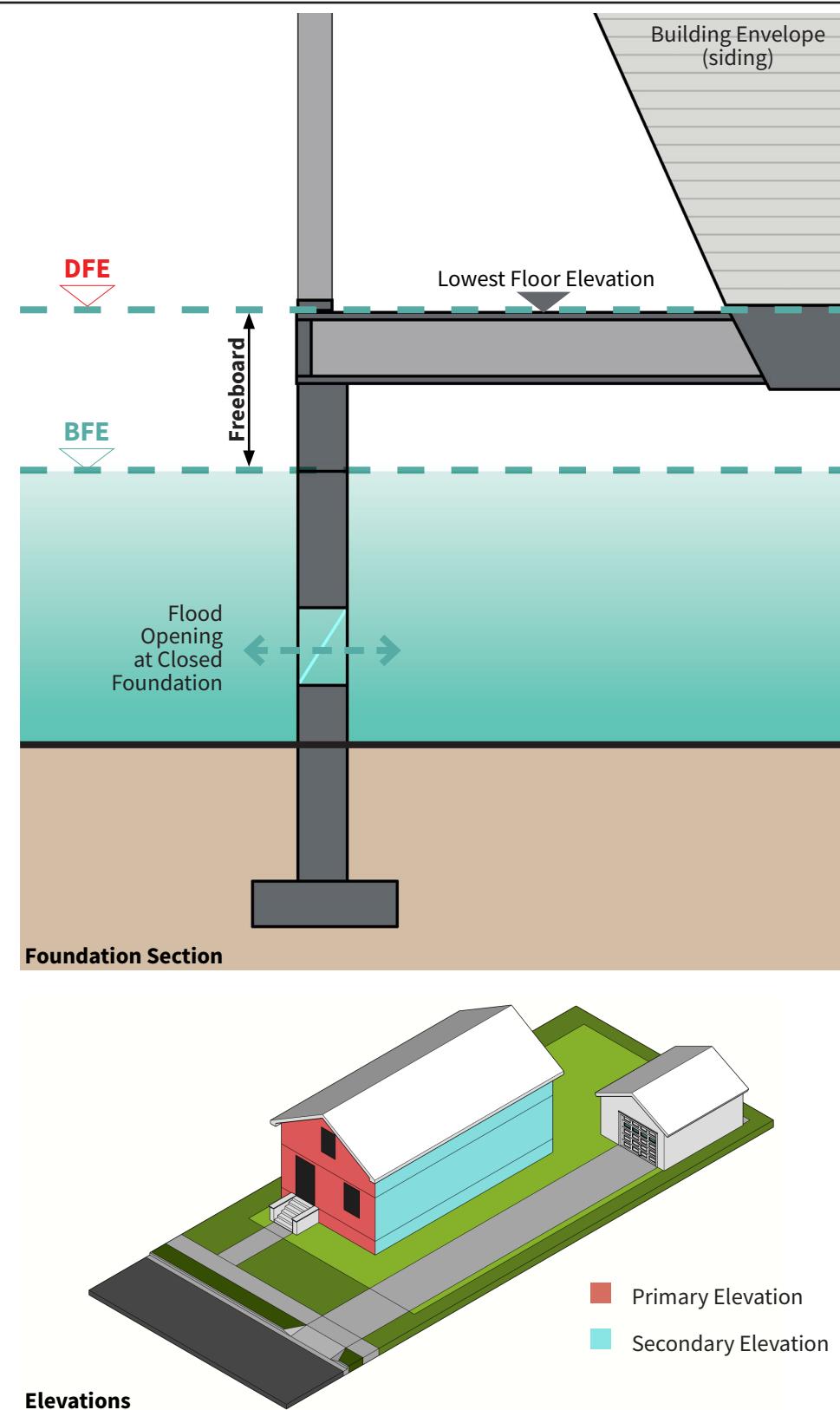
- wall not part of structural support, designed to collapse from flood forces without damaging the structure

Primary Elevation

- The main front of a building facing the street or sidewalk

Secondary Elevation

- Elevations not considered the main or front of a building; typically side and rear faces of the structure.



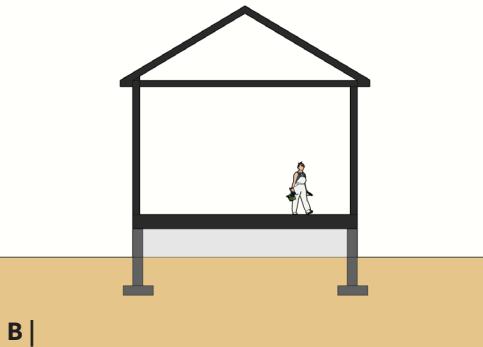
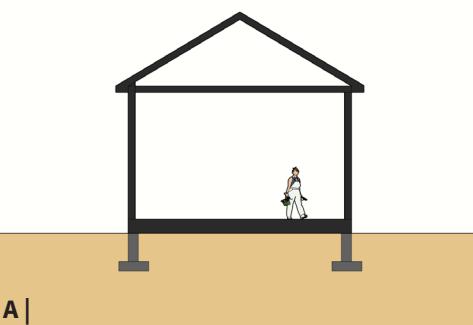
Understanding Foundation Types

Building Terms

Closed Types

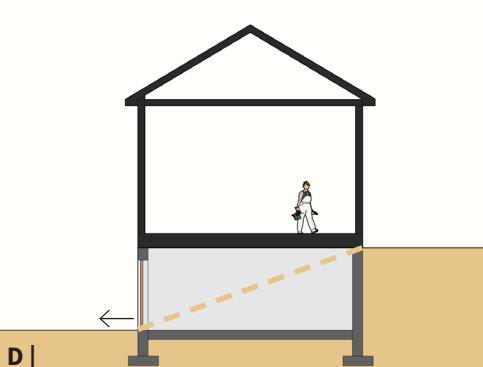
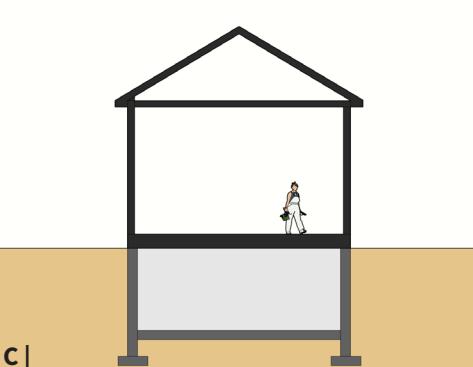
A | Slab-on-Grade Foundation

- lowest floor is constructed directly on a concrete or masonry slab foundation



C | Basement Foundation

- Any area of a building having its floor sub-grade (below ground level) on all sides.



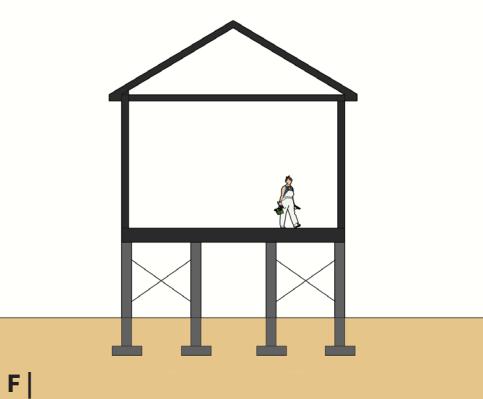
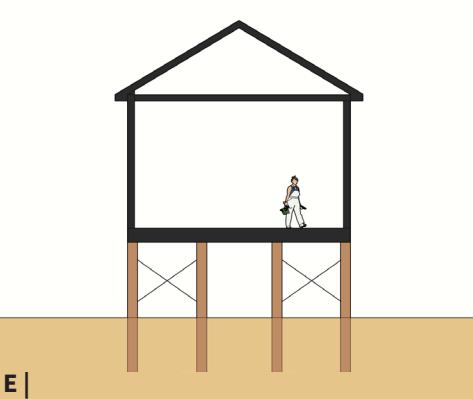
D | Walkout-on-Grade Foundation

- enclosed basement is on ground level on at least one side of the home
- not included in NFIP's definition of basement

Open Types

E | Pile Foundation

- Lowest floor of the building is lifted above ground plane by long piles driven into ground
- often used in beachfront/coastal conditions with less stable soils
- optional lateral bracing for stability against horizontal wave or storm forces (especially in coastal districts)



F | Post or Pier Foundation

- lowest floor is lifted above ground by posts or columns set into holes in ground onto concrete pads or footings
- optional lateral bracing for stability

Flood Damage-Resistant Materials

Material Classes

- NFIP classifies building materials by their ability to resist damage caused by floodwater saturation, referred to as “Flood Damage-Resistant Materials”.
- **Material classes 1 through 3 are NOT ACCEPTABLE for use below the BFE.** Use in elevated spaces above DFE only.
- NFIP will not accept claims for any non-essential finish materials (drywall, wall tiles, etc) located in lowest floor elevations.
- *Though many Class 4+5 materials are generally cleanable, some pollutants are difficult to remove - such as heating oil. In these cases, some individual pollutants may not successfully be cleaned.
- Floodwater is always assumed to be ‘black water’ - containing pollutants hazardous to human health, such as sewage, chemicals, heavy metals, and other toxins.
- ‘Clean’ Water includes potable (drinking) water as well as grey water (cooking, laundry, and bathing)
- Moving Waters are waters of low velocity (5 feet per second). Faster Moving water is capable of causing structural and material damage, no matter the class.

Class	Ability to Withstand:					
	Moving Flood Water Damage	Standing Flood Water Damage	Standing Clean Water Damage	Cleaning*	Wetting and Drying	Moisture (Water Vapor, seepage, etc)
5	✓	✓	✓	✓	✓	✓
4		✓	✓	✓	✓	✓
3			✓		✓	✓
2						✓
1	FOR USE IN COMPLETELY DRY AREAS ONLY					

■ Material meets requirements

■ Material does not meet requirements

■ Material permitted for use below BFE.

Cosmetic Repairs

- cleaning, sanitizing, or resurfacing of materials.
- Cost of cosmetic repair should be less than the cost of replacement of affected materials
- Flood damage-resistant materials should not cause damage or deterioration to adjacent materials

Flood Damage-Resistant Materials

Common Material Types

NFIP categorizes material use in 2 ways:

Structural Materials

- Materials necessary to provide structural support + rigidity to a building
- Includes:
 - floor slabs
 - beams
 - subfloors
 - framing
 - trusses
 - wall panels
 - I-Joists
 - Headers
 - Interior/Exterior Sheathing

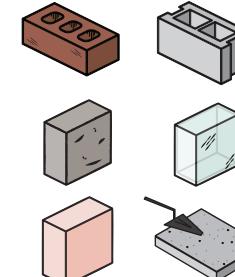
5

OK BELOW BFE

- Face/Glazed Brick
- Structural Glazed Clay Tile
- Solid or Veneer Stone
 - excluding marble and other porous types
- Cast Stone
 - with waterproof Mortar
- Cementboard
- Cement/Latex in Place
- CMU**

*Note: Unfilled Concrete Block Cells can hold flood water, which can prevent cleanability

Class Category



4

OK BELOW BFE

- Common Clay Brick
- Terrazzo Flooring
- Steel Headers/Beams**
- Steel Floor Trusses**
- Ferrous Metals**
- Glass Sheets
- Non-Papered Gypsum Board
- Recycled Plastic Lumber (RPL)

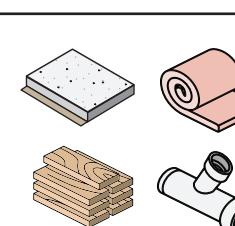


Finish Materials

- Coverings, Finishes and elements that do not provide structural support + rigidity
- Includes:
 - floor coverings (tiles, wood, etc)
 - Wall Surface Treatment
 - Ceiling Surface Treatment
 - Insulation
 - Cabinets
 - Doors
 - Partitions
 - Windows

3

- Inorganic Insulation
 - fiberglass, mineral wool: batt/blanket/blown
- Paper-Faced Gypsum Board
- Keene's Cement/Plaster
- Wood-Filled RPL
- Finish & Trim Woods
- Asphalt Tile
- Ceramic & Porcelain Tile
 - with mortar set

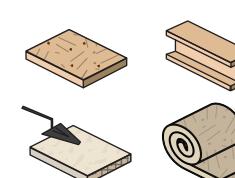


More detailed information about materials and construction methods can be found in FEMA NFIP Technical Bulletin 2.

- Before selecting a material for a project, make sure to review the manufacturer's specification and data sheets to confirm the material meets NFIP Requirements.
- The lists provided on this page are not exhaustive. Reference the most up-to-date requirements from NFIP, local and state codes.

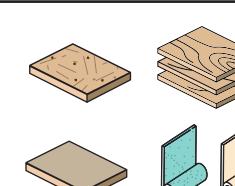
2

- Exterior and Edge-swell Resistant Oriented Strand Board (OSB)
- Greenboard
- Enamelled or plastic-coated hardboards
- Plaster
- Wood Doors
- I-Joists



1

- Mineral Fiberboard
- Oriented Strand Board (OSB)
- Particle Board
- All other Plywoods
 - not previously listed above
- Vinyl Sheets or Tiles
- Solid Wood Flooring



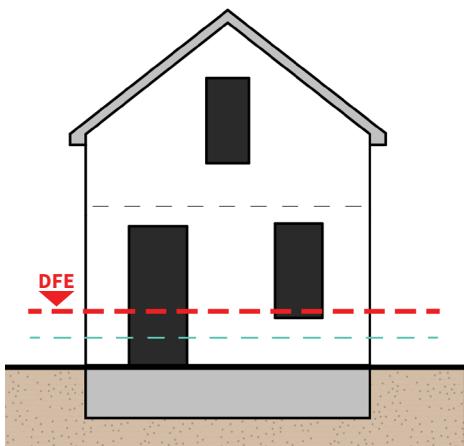
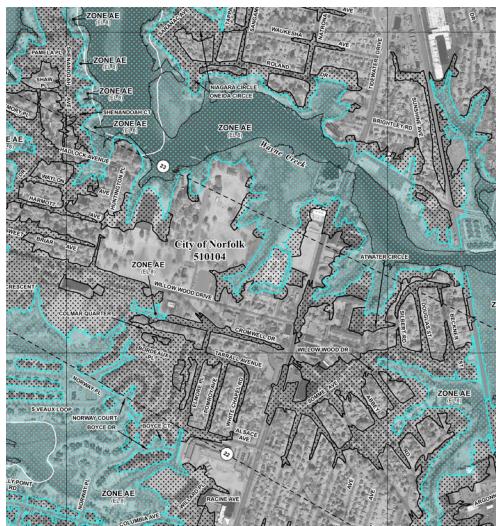
How to Use the Pattern Book

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

1

Identify your Flood Zone & Elevation.

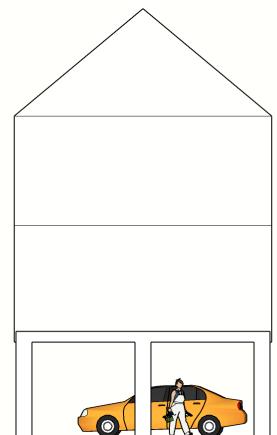
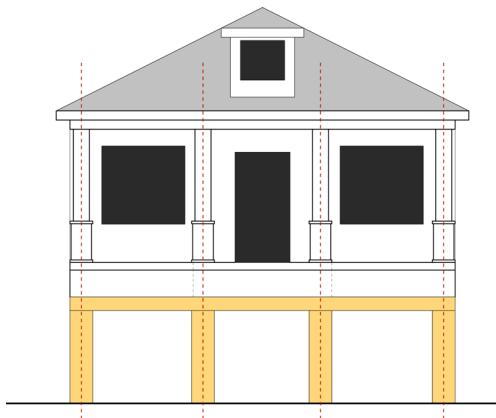
- Refer to NorfolkAIR & FIRM Maps
- Determine the BFE & DFE and Freeboard levels for your district
- Set your target elevation



2

Identify your Needs.

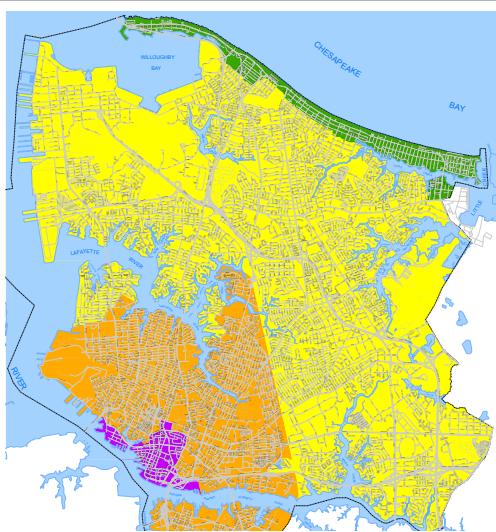
- Evaluate Style & Structure.
- Additional site needs - parking, storage, etc.
- Maintain connection to the street and sidewalk levels



3

Identify your Character District.

- Refer to NorfolkAIR.
- Traditional District
- Downtown District
- Suburban District
- Coastal District

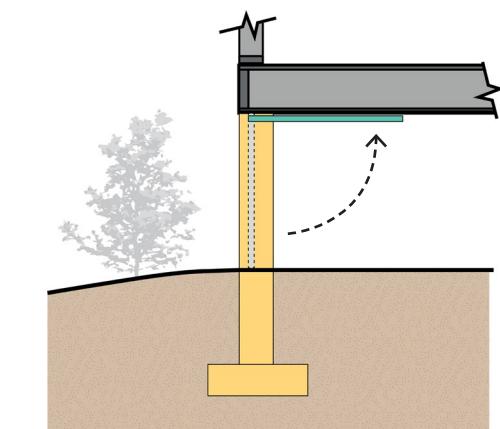
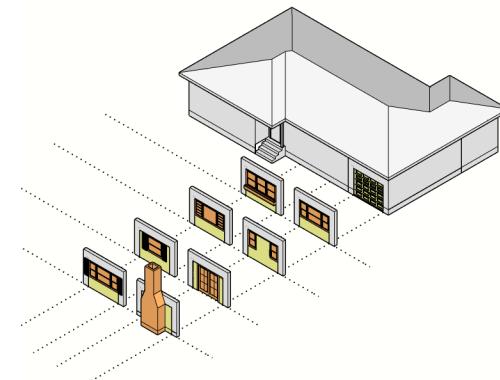
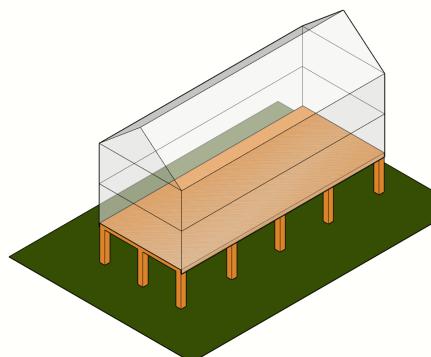


How to Use the Pattern Book

4

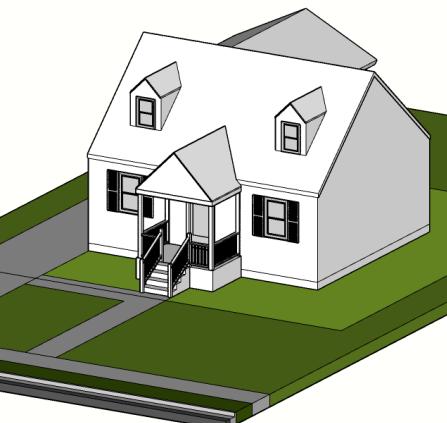
Use the Kit of Parts.

- Select your new foundation type.
- Select new access paths and strategies.
- Determine if your existing structure requires any infill or detail changes due to elevation.
- Determine if you are retrofitting porches and/or accessory structures.
- Select site treatment, improvements, and landscape patterns.



5

Assemble Parts to Create a Whole.



Locating your Character District

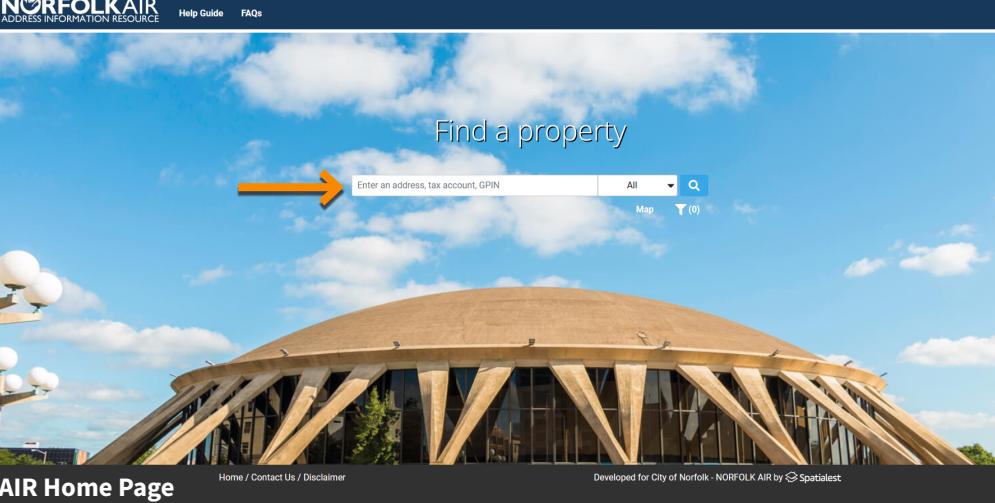
The City of Norfolk recognizes four distinct character districts within city boundaries. Each of these districts has established distinct development patterns that provide for the form, massing and scale of buildings within the district.

For more detailed descriptions and design requirements for these districts, refer to City Zoning Code.

How to Navigate City Zoning

1 | Navigate to NorfolkAIR

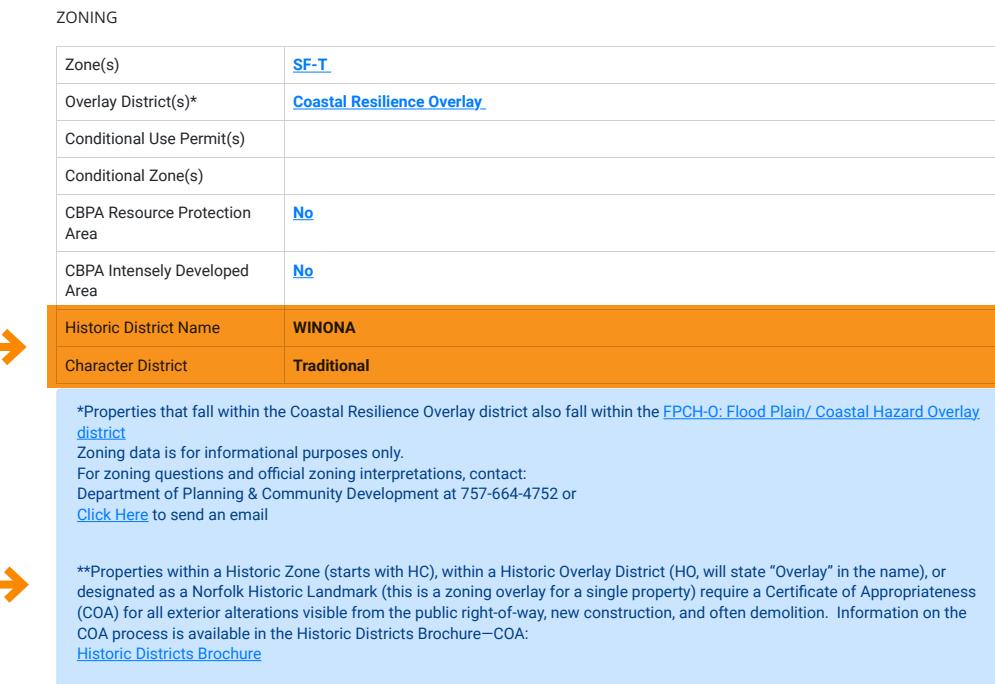
- Norfolk's 'Address Information Resource' web portal
- This tool compiles relevant zoning and municipal service information for your home, including structure details.
- Available at air.norfolk.gov



The screenshot shows the 'AIR Home Page' of the NorfolkAIR website. At the top, there is a search bar with the placeholder 'Enter an address, tax account, GPIN' and a magnifying glass icon. Below the search bar is a large image of a dome-shaped building. The page title 'AIR Home Page' is at the bottom left, and there are links for 'Home / Contact Us / Disclaimer' and 'Developed for City of Norfolk - NORFOLK AIR by Spatielast'.

2 | Enter your Information

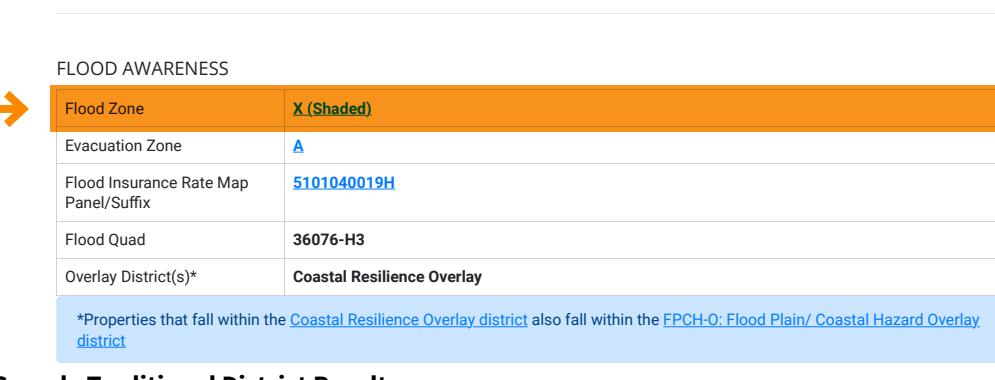
- Use your Address to locate your house record (or tax account number/GPIN)
- For Addresses, only enter your house number followed by the beginning of your street name.
- Wait a few moments for the suggestions box to pull a list of addresses.
- Do not use street abbreviations - type 'Road' instead of 'Rd', etc.



The screenshot shows the 'Planning' section of the NorfolkAIR website for a property in the WINONA Historic District, Traditional Character District. The 'ZONING' table includes: Zone(s) SF-T, Overlay District(s)* Coastal Resilience Overlay, Conditional Use Permit(s), Conditional Zone(s), CBPA Resource Protection Area No, CBPA Intensely Developed Area No, Historic District Name WINONA, and Character District Traditional. An orange arrow points to the 'Character District' row. Below the table is a note: '*Properties that fall within the Coastal Resilience Overlay district also fall within the FPCH-O: Flood Plain/ Coastal Hazard Overlay district'. Another note states: 'Zoning data is for informational purposes only. For zoning questions and official zoning interpretations, contact: Department of Planning & Community Development at 757-664-4752 or [Click Here](#) to send an email'. A second orange arrow points to this note.

3 | Review Character District

- Scroll down to the 'Planning section, or Click on 'Planning' Tab at the header.
- Results will indicate your character district and whether your home is considered historic - additional requirements may apply



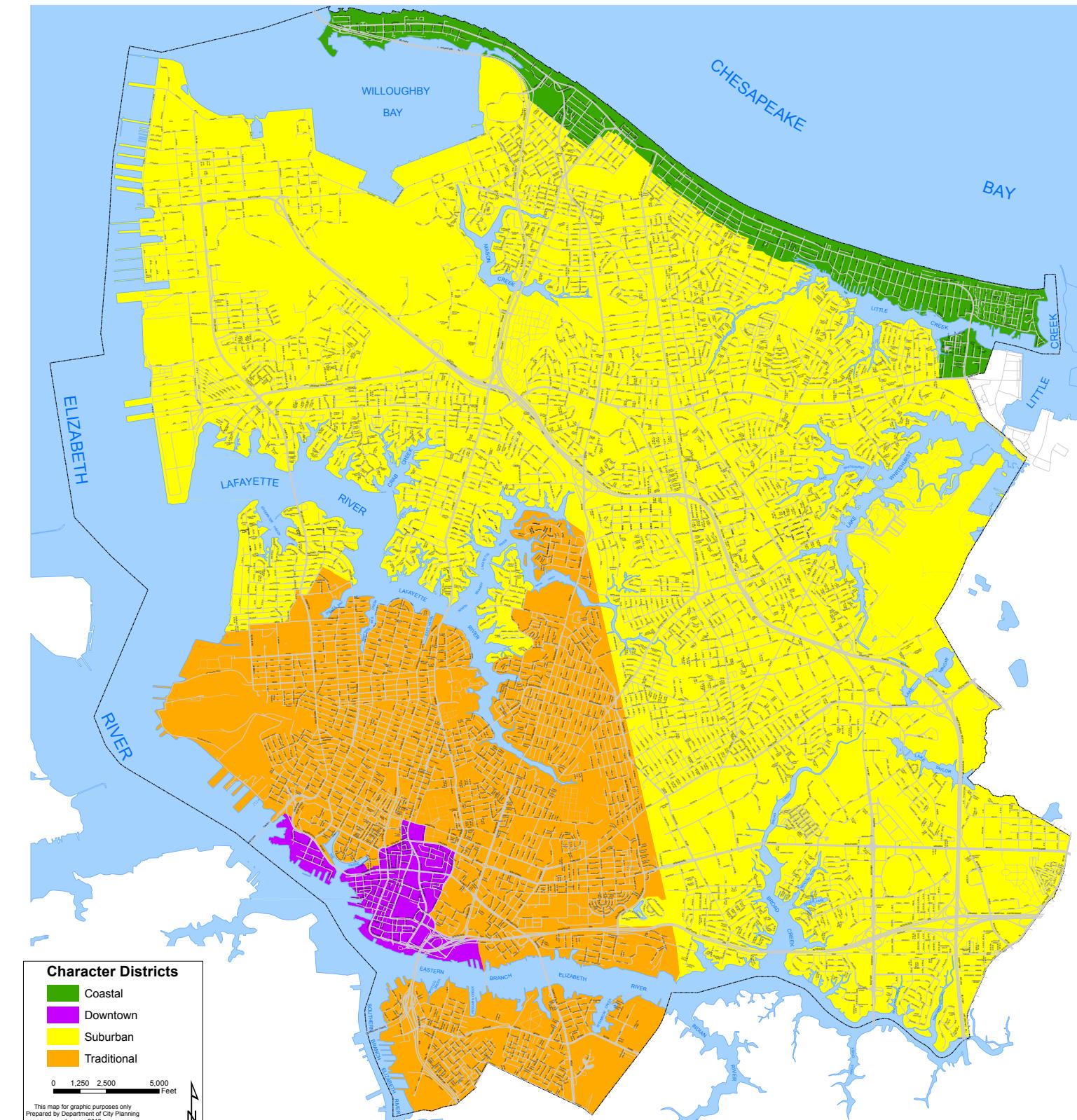
The screenshot shows the 'Flood Awareness' section of the NorfolkAIR website for a property in the Coastal Resilience Overlay district. The 'FLOOD AWARENESS' table includes: Flood Zone X (Shaded), Evacuation Zone A, Flood Insurance Rate Map Panel/Suffix 5101040019H, Flood Quad 36076-H3, and Overlay District(s)* Coastal Resilience Overlay. An orange arrow points to the 'Flood Zone' row. Below the table is a note: '*Properties that fall within the Coastal Resilience Overlay district also fall within the FPCH-O: Flood Plain/ Coastal Hazard Overlay district'. A third orange arrow points to this note.

4 | Review Flood Zone

- Scroll down to the 'Flood Awareness' section, or Click on 'More' dropdown tab at the header and select 'Flood Awareness' tab.
- General Information is provided for NFIP and Flood Zones. Click on underlined items for more information.

Locating your Character District

City of Norfolk | Character Districts



Community and Architectural Character

The Coastal Character District is a 7.5 mile-long area on the Chesapeake Bay. It is the City of Norfolk's "North Coast". This district is defined by its proximity to coastal waters, and is more impacted by tidal and storm surge flooding events.

Coastal District

Community Character

- Rectilinear grid of streets
- Bikeable and walkable
- Slower vehicle speeds
- Sense of community
- Close relationship between dwellings and the street
- Small scale, welcoming, commercial buildings
- Storefronts visible from streets
- Natural vegetation to protect the Bay and manage flooding
- Continuity achieved with combination of buildings and landscape
- Comfortable access to beach and other waterfront areas
- Proximity to the Chesapeake Bay and Little Creek

Architectural Character

- Multistory porches
- Porches on commercial buildings
- Diversity and individuality
- Simplified classical detailing
- Shingle and Arts and Craft style houses
- Soft colors and vibrant colors
- Large, vertically-proportioned windows complete with functioning storm shutters
- Diversity and individuality of architecture (not a development)



Community and Architectural Character

The Downtown District represents the core of Norfolk's city center. A mix of building types, heights and uses lends to some creative opportunities for home elevation projects.

Downtown District

Community Character

- Concentrated district including the core commercial, office, and residential uses with the highest density in the city.
- Continuous building fabric
- Bikeable and walkable
- Access to streetcar
- Large-scale multifamily residences mixed with smaller apartment buildings, row houses, and single family homes.
- Retail and commercial inter-mixed
- Close relationship between residential and commercial areas
- Welcoming storefronts with large windows, visible from streets
- Continuity achieved with continuous building fabric
- Close proximity to Elizabeth River

Architectural Character

- Diversity and individuality
- Variety of architectural styles
- Mix of time periods



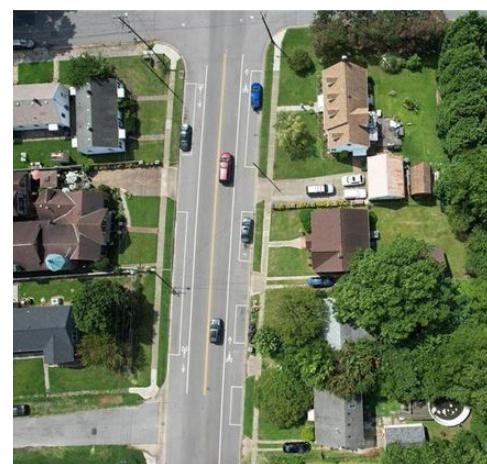
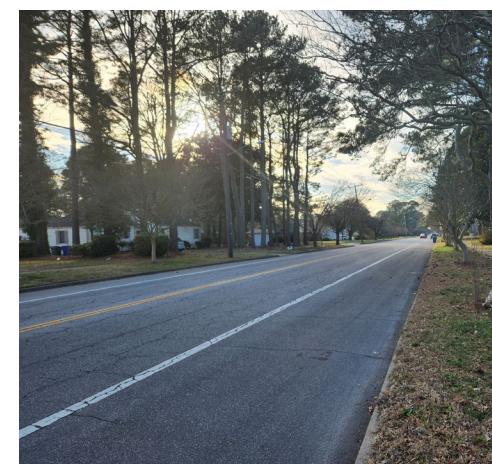
Community and Architectural Character

Representative of a majority of the residences in Norfolk, the Suburban district. Larger sites provide more opportunities for site improvements and access to elevated buildings. Single story projects present a unique challenge of balancing elevation heights and visual cohesion with both home and district.

Suburban District

Community Character

- Combination of rectilinear and curvilinear streets
- More auto-oriented
- Houses set back from streets
- Extensive landscaping: tall trees, dense planting beds, and flower gardens
- More space between buildings
- Less diversity in housing stock
- Commercial not intermixed with Residential (currently)
- Commercial parcels are larger in scale
- District as a whole is less “walkable” than it is “hikeable” and should be connected with wide multi-use paths/greenways
- Individual parcels should be broken down into smaller walkable environments



Architectural Character

- Variety of architectural styles
- Retail buildings tend to be freestanding with large parking lots
- Mostly freestanding buildings as objects in the landscape
- Visible signage and storefronts

Community and Architectural Character

Since many homes in this District are considered historic properties, careful attention to detail is required to protect historic architectural details and character. There are many opportunities to create elevated homes that rely on traditional elevation techniques like english basements and grand entry porticos.

Traditional District

Community Character

- Rectilinear grid of streets
- Continuous building fabric
- Bikeable and walkable
- Slower vehicle speeds
- Diverse Building Types: houses, apartments, row houses, duplexes, mixed-use buildings, small office buildings, and in-line retail
- Retail and commercial inter-mixed
- Close relationship between residential and commercial areas
- Welcoming storefronts with large windows, visible from streets
- Formal landscaping
- Continuity achieved with continuous building fabric



Precedents

Located just south of the Elizabeth River from Norfolk, Portsmouth is affected by similar flooding conditions. The city's Old Towne District has many examples of historic 18th Century homes built above the flood plain with traditional adaptation strategies.

Portsmouth, VA

Access Stairs

- Provides direct connections from main entry to public right-of-way
- Maintains entry in original location
- Openings at risers can help reduce visual weight of stairs
- Side approach reduces encroachment on public sidewalks
- Access within plane of front porches to reduce visual impact



Precedents

Portsmouth, VA

Crawlspace Vents

- Traditional design details to accommodate ventilation
- Used on foundation walls



Flood Openings

- Traditional hinge details allow for operable openings
- Prevents or limits damage caused by floodwaters and hydrostatic pressure



Railing Details

- Match in scale & style to original homes and district character
- Colors align with existing & original palette
- Required Code extensions align with finish and style, while remaining visually distinct from existing railing



Precedents

Portsmouth, VA

Porticos

- Covered front porches highlighted entry locations
- Provides architectural anchor for side approach stair access
- Can extend the full span of the primary elevation and include porch space



English Basements

- Partially-subgrade living spaces
- Traditional approach in port cities
- Detailing can inform foundation treatments for elevation projects in historic districts
- Breaks up foundations at houses along front lot lines - reducing monolithic appearances at pedestrian level.



Precedents

Portsmouth, VA

Aligned Scale of Elevation

- Home elevation projects on same block adhere to a similar scale & proportion



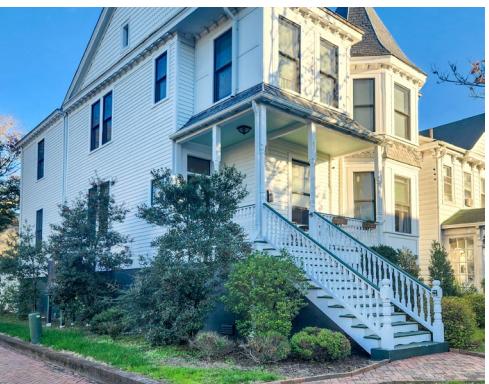
Screening Open Foundations

- Vertical louvers at traditional/ historic homes
- Recessed lattice screening between post foundations



Tiered Landscaping

- Incorporating landscaping to screen elevated foundations
- Helps to break up high or flat elevations



Elevated Utilities

- Prevents electrical damage to sensitive equipment



Precedents

Like Portsmouth, this southern port city is currently experiencing a large push to elevate residences as sea levels rise. The city government has provided a dedicated Floodplain Manager and specific guidelines to assist owners with their elevation projects.

Charleston, SC

Street Connection

- Retention of original access orientation & location
- Pedestrian connection



Porches

- Provides social connection
- Landscape integration
- Multiple Stories



Foundation Detailing

- Provides detail at street level to prevent appearance of one unbroken stretch of wall
- Operable windows and vents to mask visual impact of required flood openings



Piazza Screens

- Traditional detail used to provide street front access in narrow lots
- Can conceal new stairs along side elevations



Precedents

Savannah has many examples of raised homes in the urban context. Grand stairwells connect existing streets without disturbing the pedestrian experience.

Savannah, GA

Grand Entrances

- Curved stairways to connect to sidewalks
- Major Porticos to denote entry
- Traditional Railing details



Closed Foundations

- Varied depth of masonry to provide visual interest at foundation level
- Emphasis of structural form
- Water Tables emphasized



Landscaping

- Formal gardens with integrated access paths
- Varied plant height to create visual interest



Pier Foundations

- Additional storage and parking below the home
- Articulates existing structure
- Can be combined with solid/closed foundations at facade in urban/historic districts



Precedents

New Orleans has a long history of raising homes to protect themselves from floodwaters. Professional home raisers marketed services as early as the 19th Century, and cottages were constructed to keep living areas above water.

New Orleans, LA

Creole Cottages

- Traditional Approach to home elevation in marshy areas
- Open pier or post foundations
- Louver infill at bases in downtown districts
- Front approach stairwells



Screening Elements

- Different techniques to screen dramatic elevation changes
- Landscape, decking and stair orientation hide foundation
- Compatible with both open and closed foundation types



Precedents

Galveston is a unique mix of both historic and coastal homes, with parts of the community dating back to the 18th Century. Homeowners have long embraced the use of elevated structures to protect from tidal flooding, originating from a major elevation project following a major hurricane in 1900.

Galveston, TX

Carriage Houses

- Elevation of additional living or storage space above accessory garage/structure
- New Construction matches historic detail and character of homes
- Accommodates parking outside of the main building envelope



Raised Single Story Homes

- Maintained street connection
- Additional accessory spaces below the home
- Maintained Entry Location
- Detailing to match existing character and finish of home





Kit of Parts | Raising a House

Choosing your New Elevation Level

1 | Determine Required Elevation

- Determine your current lowest floor elevation
- Understand the minimum elevation required by zoning code & FIRM
- Determine the BFE for your site
- Evaluate any potential impacts of future storms or flood events

2 | Determine Freeboard / DFE

- Review any Freeboard Requirements for your FIRM Flood Risk Zone
- An additional Freeboard of 1 to 3 Feet can increase protection and reduce insurance premiums

3 | Additional Considerations

- Number of stories affects the complexity of the project
- Structural stability of all homes should be evaluated by a professional prior to project start
- New Elevation should be sympathetic to neighborhood scale

4 | Choosing Low vs. High

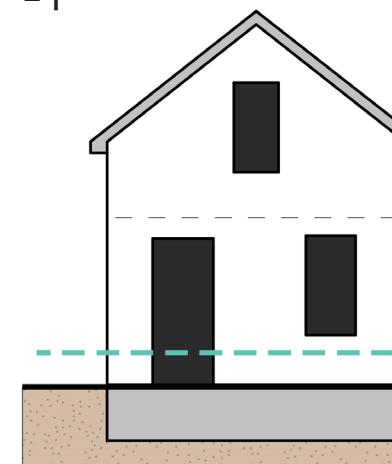
A | Low Elevation = 4 to 6 Ft.

- Less of a visual impact on the home
- No accessible space to use for parking or building access below the home

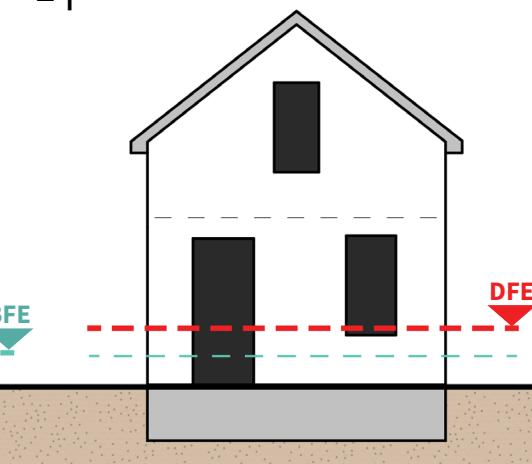
B | High Elevation - Full Story (9-10 Ft)

- Major Visual Impact, some costs not covered
- More Protection + Usable space

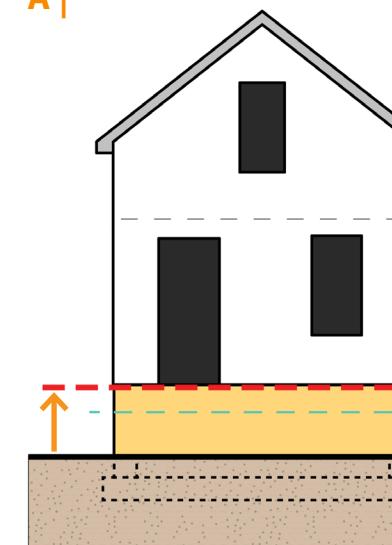
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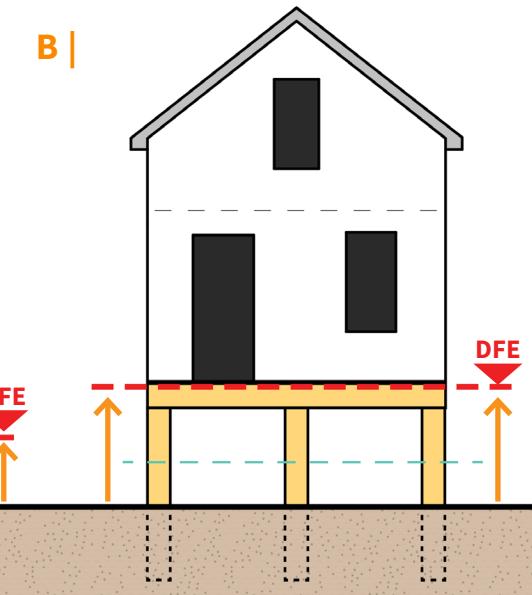
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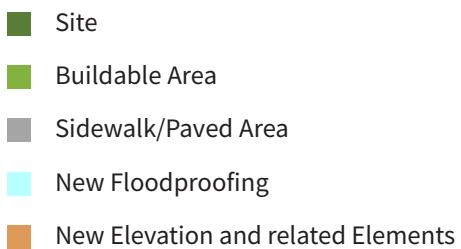
A |



B |

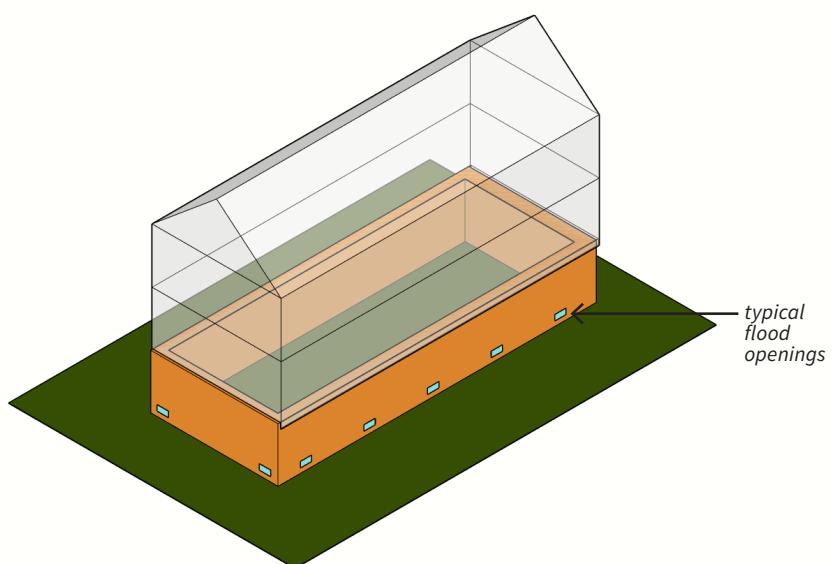


Base Options

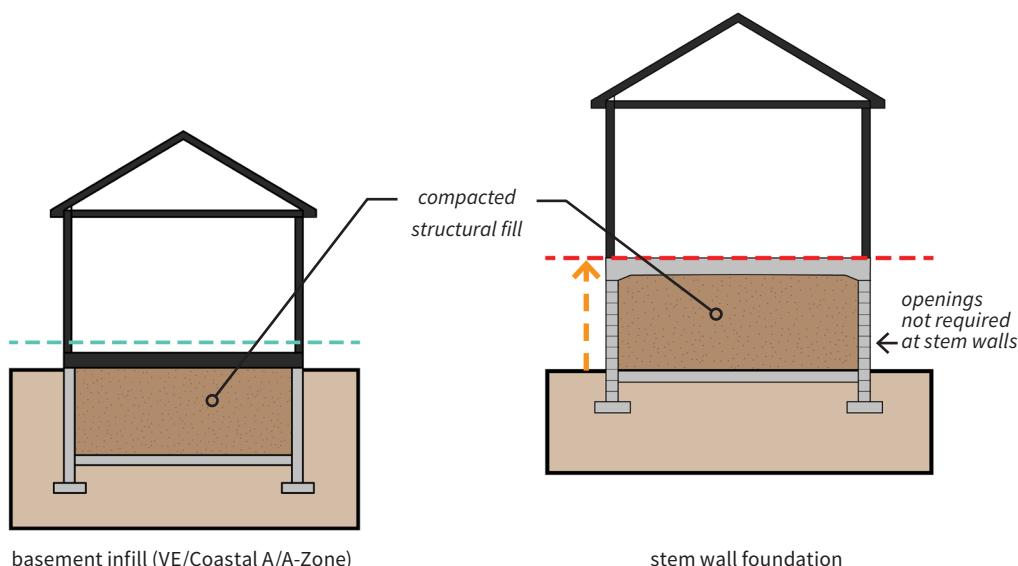


Closed Foundations

- Construct a solid, continuous foundation for new home elevation
- Finish new elevation with color or detailing appropriate to the home and character district
- Provide Screening of dramatic elevation changes with landscaping, decks or stairways.
- Wetproofing or compacted structural fill permitted below the BFE with approved materials (refer to Flood-Resistant Materials section)



- No enclosed habitable space is permitted below the BFE
- Note that NFIP requires existing basements and below-grade areas to be backfilled in VE (Coastal High Hazard) and A-Zone Homes for Significant Improvement Projects
- Choosing a **backfilled Stem Wall (raised slab-on-grade) Foundation** can give a solid foundation appearance without requiring flood openings.



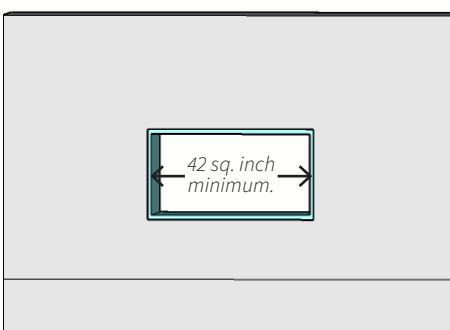
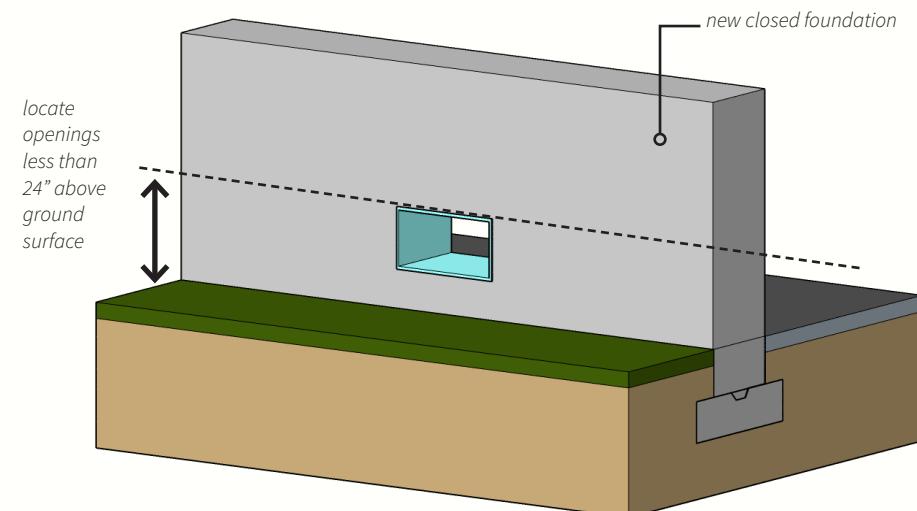
- For Stem Walls, there are additional constraints due to increased weight of foundation system and structural fill as compared to low soil bearing capacity. Consult with geotechnical engineers

Base Options

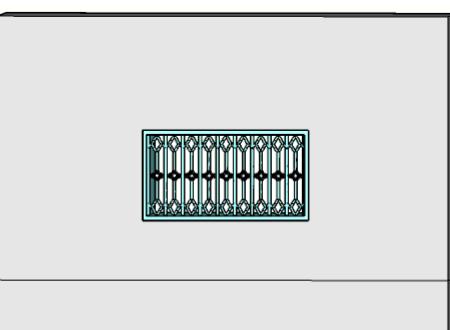
Flood Openings

- Flood openings are required to prevent damage or collapse due to hydrostatic pressure - water should be able to freely enter + exit
- Sizing should allow floodwaters to rise and fall at the same rate to allow equalization of pressure
- Note that using openings with screens or louvers may cause debris to clog and reduce effectiveness. Ensure sizing of screens allows for sediment to pass
- Non-Engineered Openings (openings in the foundation walls) should be a minimum of 42 sq. inches each.
- Any historic openings on secondary elevations may be infilled to match the wall. Ensure infill is recessed from existing window sills or lintels.
- Locations which require Flood Openings:
 - solid perimeter foundation walls
 - garage attached to elevated buildings
 - enclosed areas under buildings elevated on open foundations (see combined foundations)
 - ANY above-ground enclosed areas that are below the BFE.
 - Accessory Structures

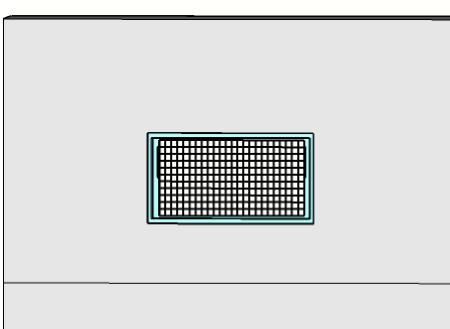
More detailed information about flood opening requirements can be found in FEMA NFIP Technical Bulletin 1.



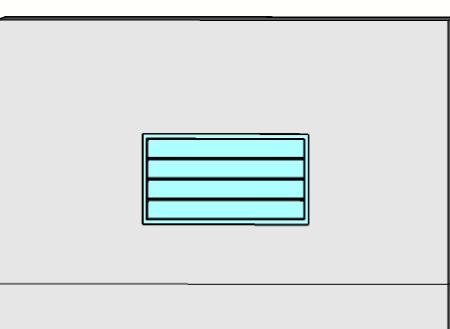
A | Basic Frame (open)



B | Wrought Iron (Traditional Detailing)



C | Mesh Screen



D | Operable Louvers

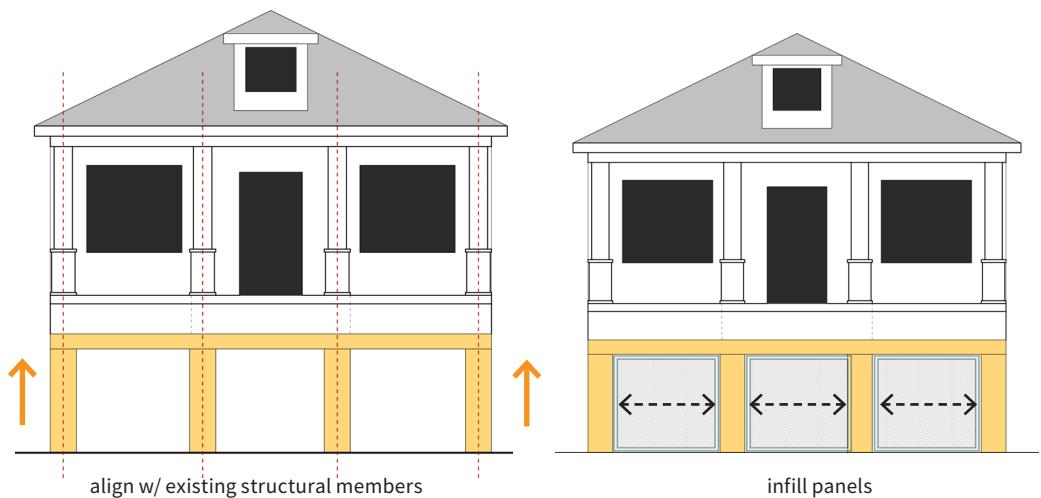
example of typical opening styles

Base Options

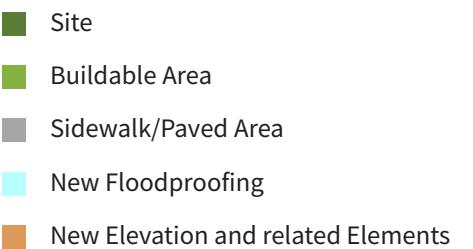


Open Foundations

- Lift home onto piers, posts, or piles that emphasize the visual appearance of the existing facades.
- Selection of pier, post, or pile; additional cross-bracing requirements, and other structural concerns is determined by soil load bearing capacity and horizontal flood forces.
- Opens Space to accessory use below structure (porch, storage, building access or parking)
- Ensure that columns, posts, or piers are scaled large enough in size to visibly support the structure
- Best at shorter elevations - high elevation projects may look 'stilted' or disproportionate to the home massing. May require extra detailing for higher elevation projects.
- NFIP and Norfolk Zoning Code require pile or column foundations in VE (Coastal High Hazard) Zones; recommended in Coastal A Zones**



Base Options

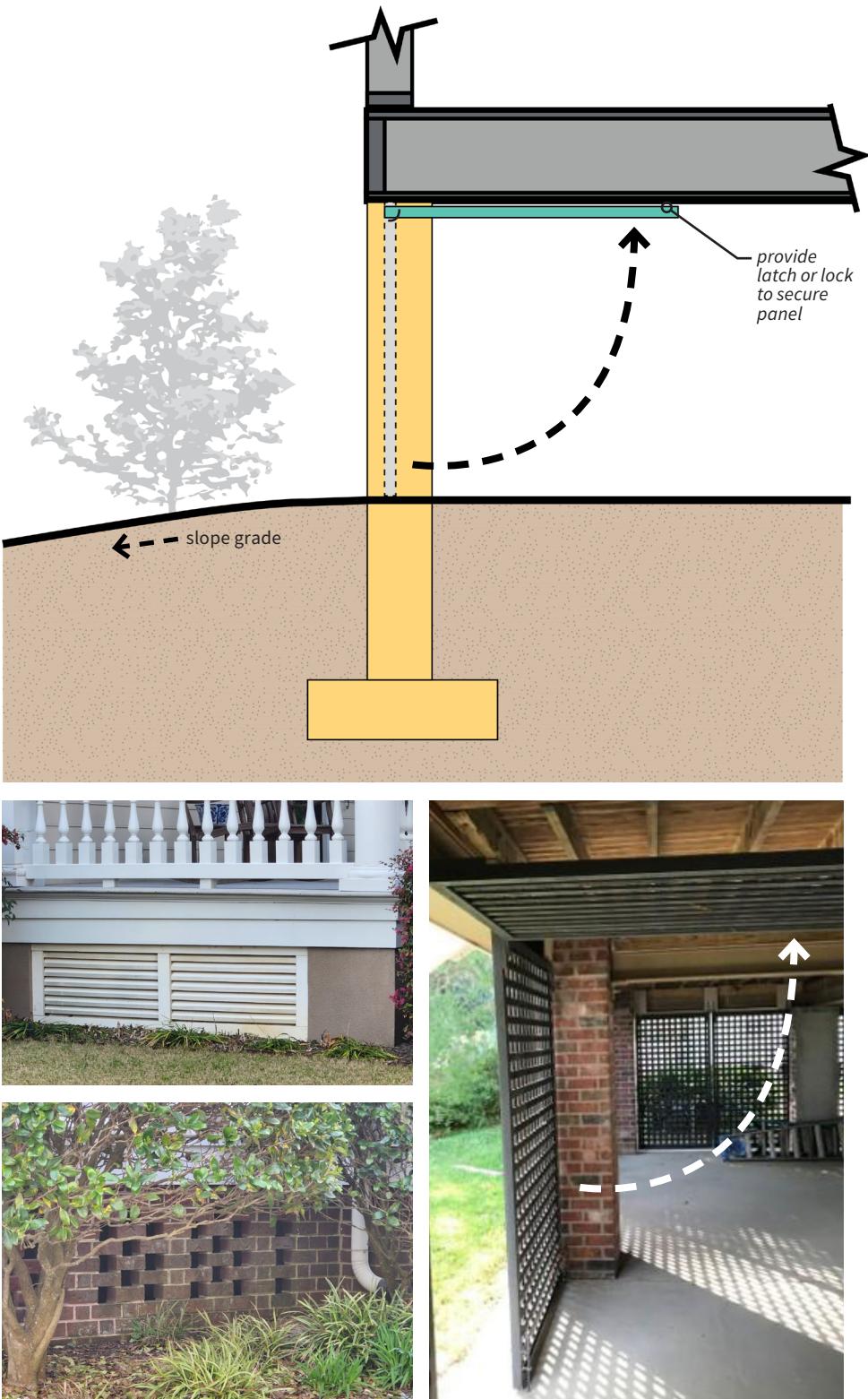


Pier & Post Infill

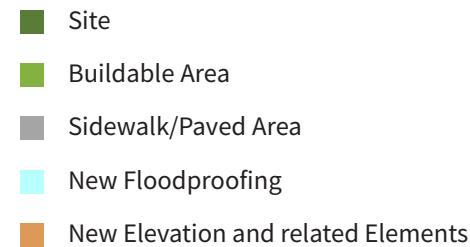
- Infill open foundations with screens or louver panels that can be removed or folded away to allow floodwaters to pass (preventing hydrostatic pressure)
- Screen infills can create the illusion of a solid foundation, which reduces 'stilted' appearance of homes
- For historic homes, open foundations on piers should be recessed, and no 'coastal' style louvers should be applied. Louvers or lattice should be constructed in line with the original period detailing and scale.

Note: Norfolk code prohibits breakaway screen construction in most flood zones

- Infill screens must be removable, secured, or hinged and secured to underside of foundation/floor (above BFE) to allow floodwaters to rise and fall without damaging the structure
- Post Infill can also provide screening for additional storage, parking, or other approved accessory uses beneath the home.

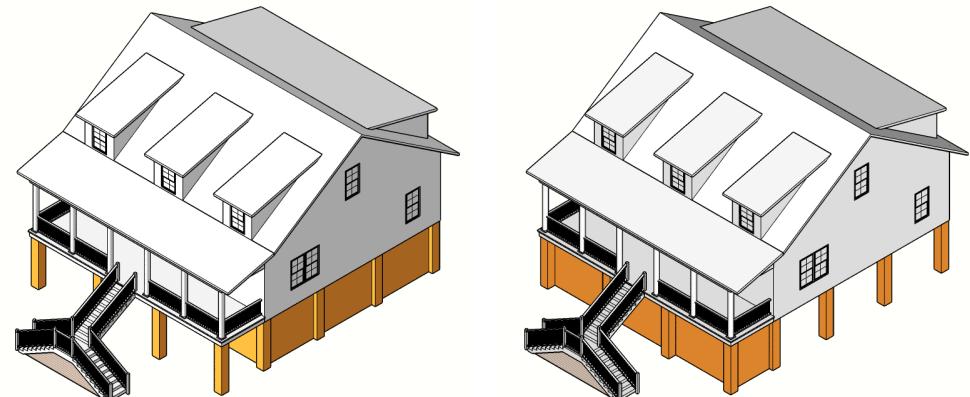
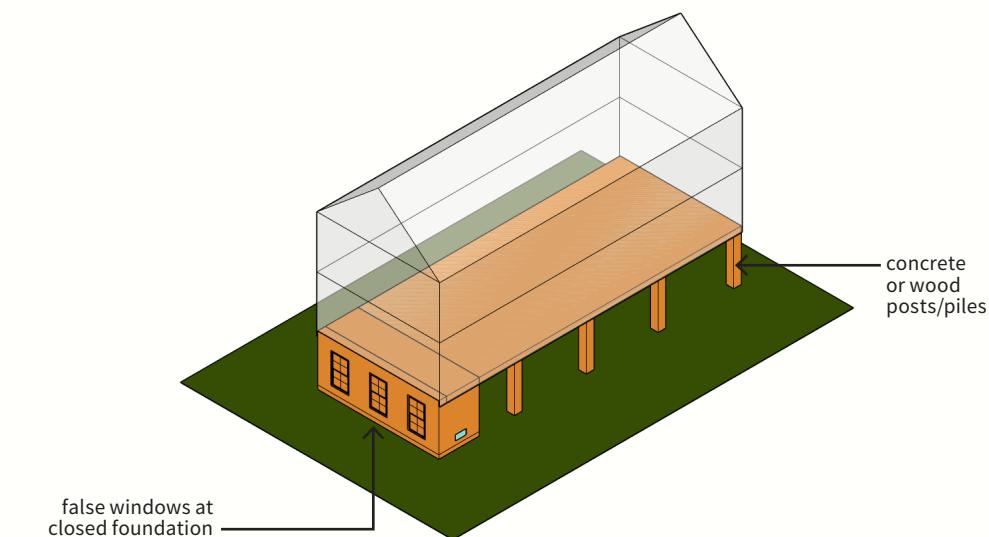


Base Options



Combined Foundations

- In Historic Districts or Downtown areas, providing a portion of closed foundation at the primary elevation with a concealed open foundation beyond may be the best solution for maintaining historic character while controlling flood risks and cost.
- For homes with primary elevations at the lot line, a traditional English basement layout can reduce a monolithic, flat visual at pedestrian level: create an open foundation at the primary elevation with solid foundation behind.
- Finish new elevation at primary facade in a manner consistent with the original design, style, or character district.
- Secondary elevations and spaces not visible from the primary street can be supported by post or pile systems
- Post materiality should match in scale and style of existing house (ie, masonry units for homes with masonry construction)
- Utilize post infill screening for open foundation elements that may be visible to reduce stilted appearance that is not compatible with original design.
- **No enclosed habitable space is permitted below the BFE** - any openings designed in line with traditional approach shall be 'blind openings' with false detailing to give the visual impact of a window while providing use as a flood opening



Base Options

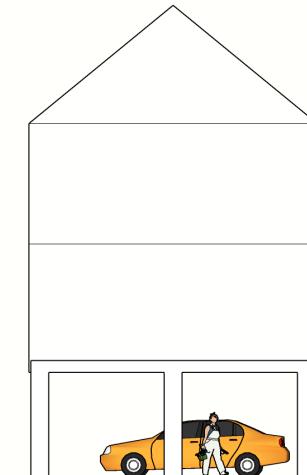
Spaces below the flood elevation cannot be used as living space according to NFIP. These spaces must be used for storage, parking or building access. Norfolk Zoning prohibits temperature-controlled habitable spaces below the BFE in most flood risk areas.

Items at risk of damage from floodwater damage should be moved before anticipated flooding events.

Space Use

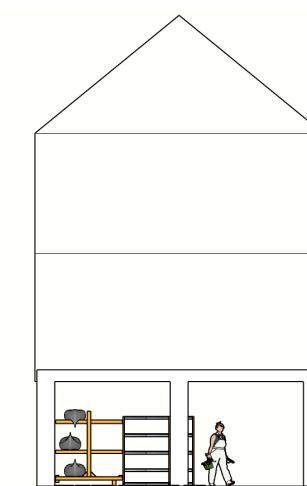
A | Parking

- Parking under the structure is dependent on height + bay width
- provide access from secondary elevation when possible
- Conceal from street view when utilizing space below historic homes
- Ensure garage doors visually conform with new base elevation



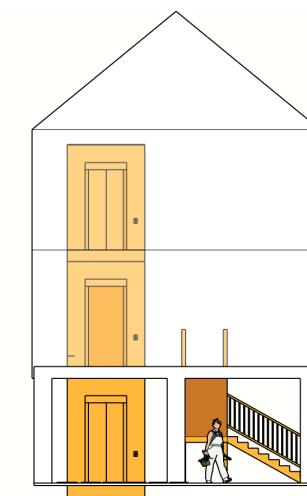
B | Storage

- Storage area for recreational vehicles and boats (bicycles, kayaks, golf carts), cisterns, yard tools, trash and recycling cans, etc.
- Ensure stored items can be temporarily moved above BFE or relocated during flood events.
- Adding screening elements can provide access control for secure storage.



C | Building Access

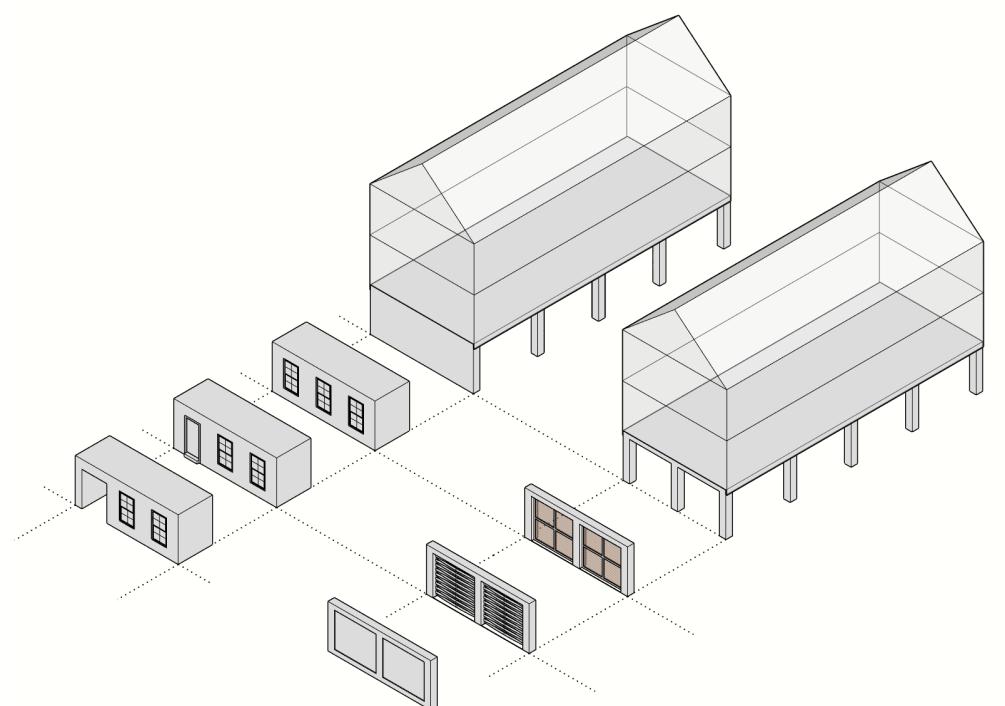
- Space underneath the elevated home can provide access for new interior stair or elevator units.
- Useful for small parcels or homes with no secondary elevations to conceal new access.
- Enclosed space below home to provide secure connection for utilities.



Base Options

Post Infill Styles

- Pattern scale, finish, color and quality of infill materials should be proportional to existing elements of house and the typology of the Character District.
- Screening materials should be finished, framed and recessed between posts, and designed to prevent breakaway/collapse.
- Do not adhere unfinished lattice or other materials to the exterior of posts, especially on historic homes.**
- Ensure materials are compliant with NFIP flood-resistant material classifications.
- Screening is not limited to the examples provided in this document. Creative approaches may be suitable for your home or district.



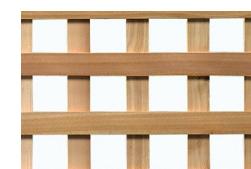
Common Screen Types

01 | Diagonal Lattice



Coastal
Downtown
! Suburban
! Traditional

04 | Square Lattice



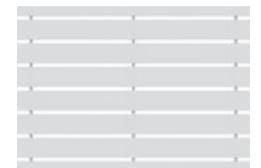
Coastal
Downtown
! Suburban
! Traditional

07 | Louvers



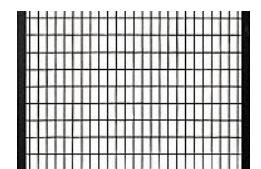
Coastal
! Downtown
Suburban
Traditional

02 | Horizontal Lattice



Coastal
Downtown
! Suburban
! Traditional

05 | Metal Mesh



! Coastal
Downtown
! Suburban
! Traditional

08 | Open Weave



! Coastal
Downtown
! Suburban
! Traditional

03 | Vertical Lattice



Coastal
! Downtown
Suburban
! Traditional

06 | Cast & Wrought Iron



Coastal
! Downtown
Suburban
! Traditional

09 | Breeze Block (Brise Soleil)



Coastal
! Downtown
Suburban
! Traditional

Base Options

■ Acceptable Use

! May be used, but requires review of design & Materials

□ Not Acceptable Use

Garage Infill Styles

- For single-story homes that include garage bays along the primary elevation, there are additional considerations for elevating the space.

- If the garage is below the roof plane, the garage should be elevated with the rest of the home and converted into additional living space.

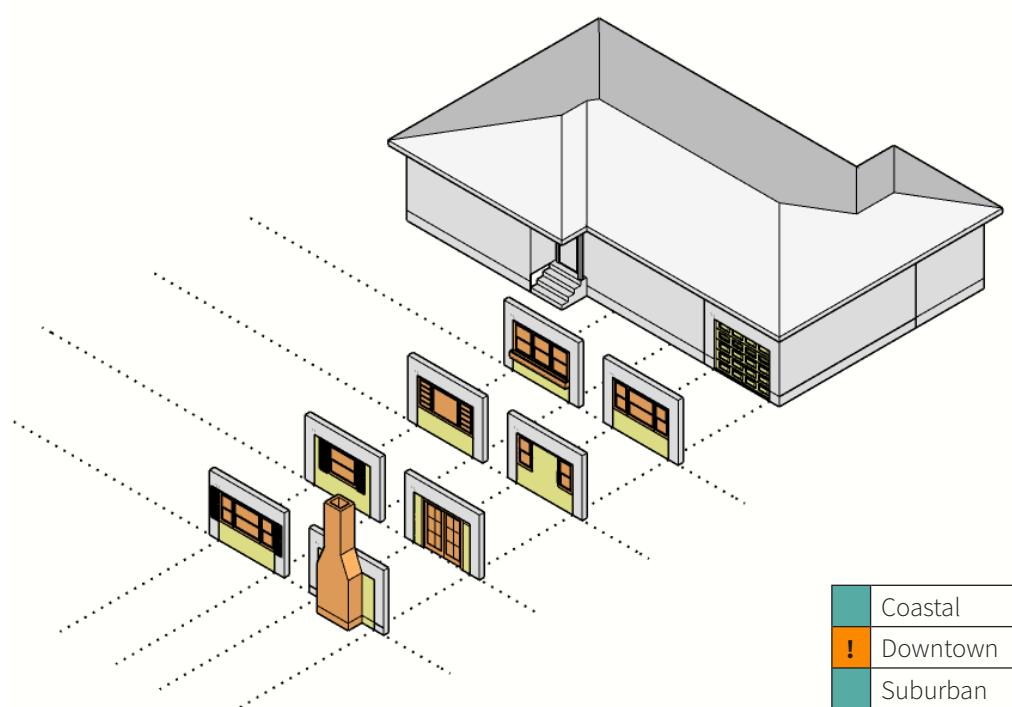
- Options for new spaces include new living room, office, home gym, laundry room, or bedroom. Note that conversion to an additional bedroom or bathroom may trigger additional requirements in a code or permit review.

- Utilize the existing proportions and architecture to inform new infill of garage opening:

- window sizing
- window locations
- window bays
- horizontal banding (ie, water tables)
- shutters
- porch location

- Some garage infill projects in the City have utilized the existing opening to install new fireplace and chimney elements. This is acceptable for non-historic properties, but may need additional code review.

- Design of any new elements should be compatible with existing home and character district typologies.



Coastal
! Downtown
Suburban
! Traditional

Base Options

Use of porches maintains face-to-face connections and social connectivity within neighborhoods - a goal of Vision 2100.

New Decks and Porches can also be constructed to provide additional screening of new elevation heights, creating a connection to the ground level and concealing some larger impacts of high elevation projects.

Porches & Decks

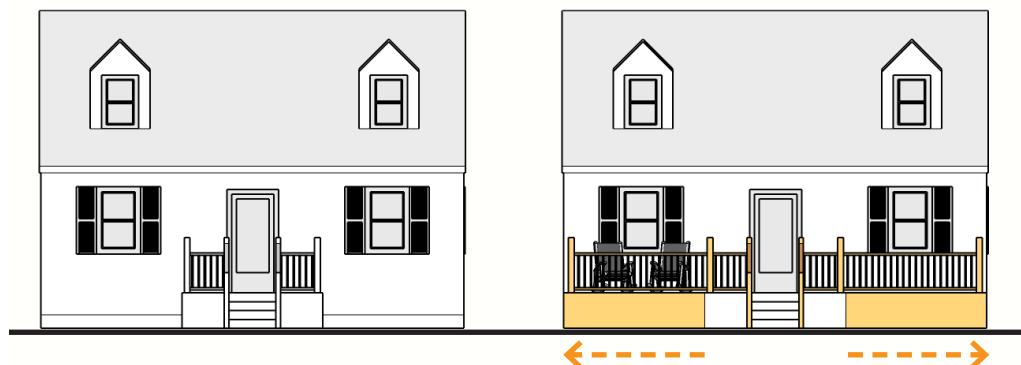
Retain Original Configuration

- Porches allow access at the original location
- Retains the amount of outdoor living spaces & transition from private to public space



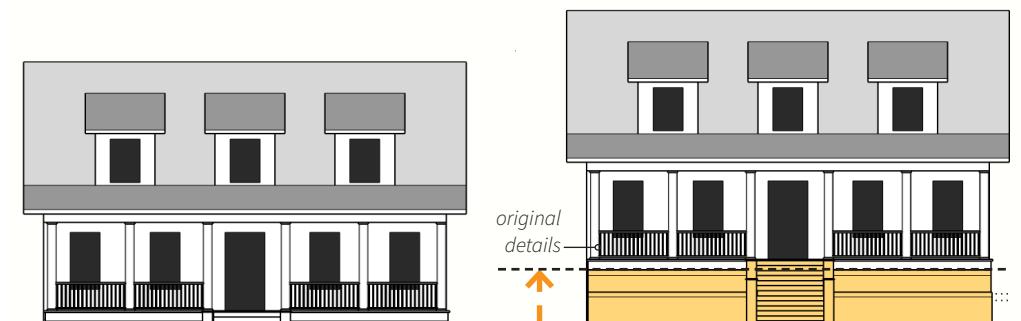
Expand Original Footprint

- Porches allow access at original locations
- Align porch extensions to scale of existing home and details.
- Increases the amount of outdoor living spaces & transition from private to public space



Protect Historic Details

- For historic homes, retain porches in their original material, finish and construction to ensure compliance with rehabilitation and credit requirements.

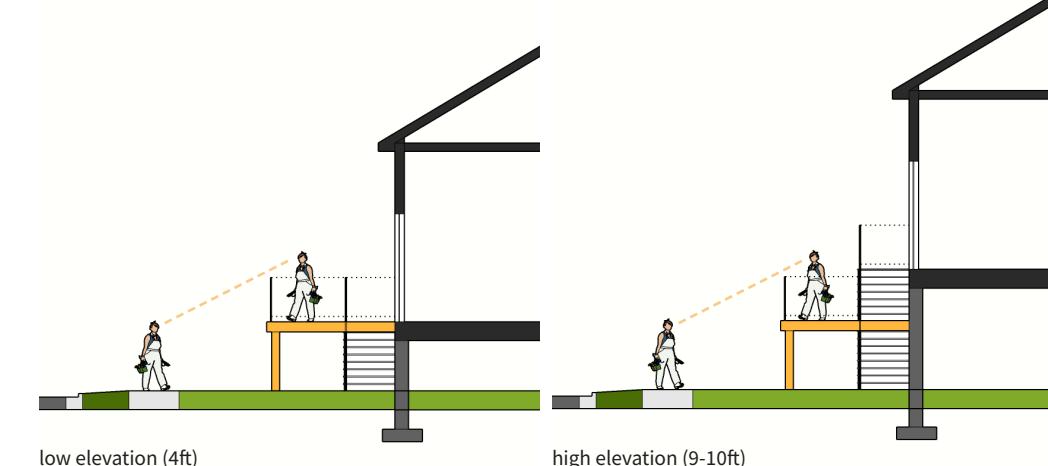


Base Options

Porches & Decks

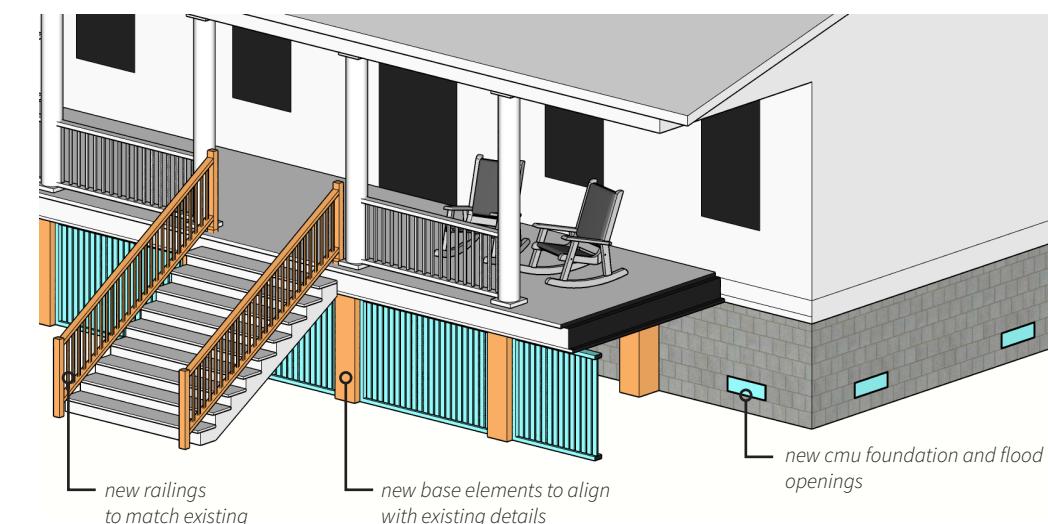
Maintain Sightlines

- Align new porches to allow social connection.
- Provide landings or tiers for porch and access stairs to provide moments of respite and prevent social disconnection between street & home.
- Minimize visual interruptions at railings, stairs, and posts.
- For enclosed porches on secondary elevations, reduce visual weight and impact of openings, columns, and roof plane. Integrate into existing architectural form and scale.
- For historic homes without existing front or main porches, do not locate new porch elements on primary elevation.



Align New Details

- Allows new deck and structure to screen less visually appealing foundation finishes like flat CMU walls (closed foundation types) or pressure-treated lumber piles and CMU columns (open foundation types)
- Retain original proportions and scale of original design



Building Utilities & Systems

Building Service

Elevate Service Equipment

- Elevate all equipment at least 12 inches above the required finish floor elevation.
- Exterior vent and fill pipes should have openings above the DFE.
- Anchor ground-level fuel tanks to prevent floatation, or elevate on platform.
- Equipment required to be above DFE (ducts, electrical items) may require finish floor to be elevated above DFE.**
- Maintain access for homeowners and maintenance workers, plumbers, etc.

Examples of Service Equipment:

A | HVAC Systems

- Air Conditioning units + compressors
- Heat pumps
- Furnaces
- Ductwork

B | Fuel Systems

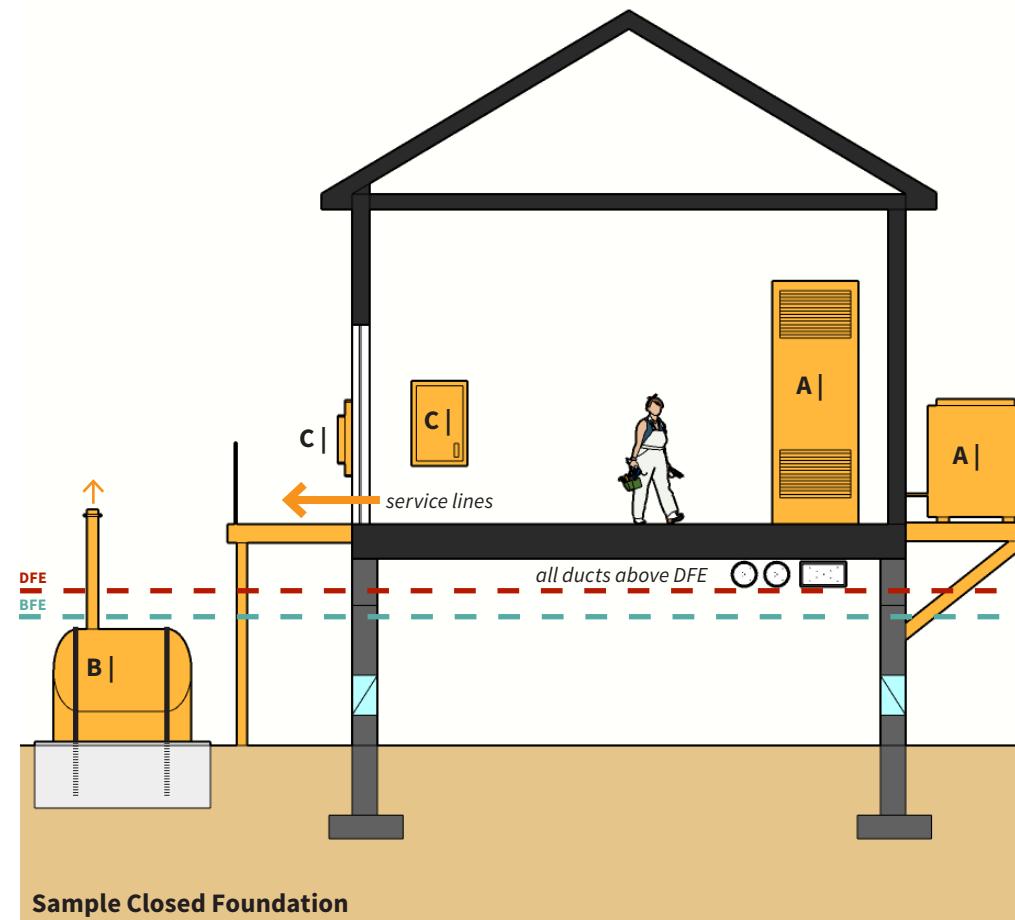
- Natural gas lines
- Fuel storage tanks

C | Electrical Systems

- Wiring, Switches + Outlets
- Lighting + Electrical Fixtures
- Fuse + circuit breaker Panels

Service Lines

- Elevate at least 12 inches above DFE; waterproof all conduit below.
- Elevate meters above BFE - contact utility provider for guidance on access requirements
- One option is to locate meter and line access at new/existing elevated space accessible from ground plane, like exterior deck

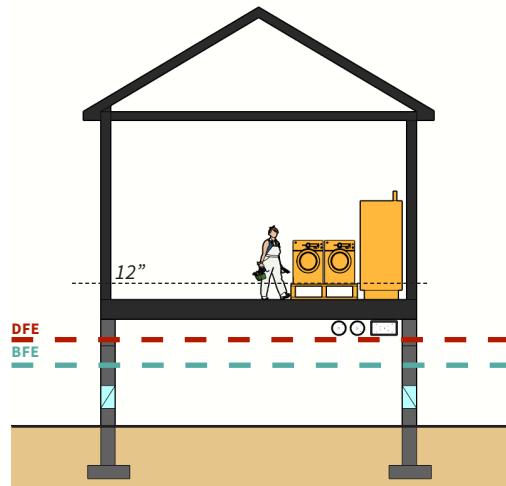


Building Utilities & Systems

Interior Systems

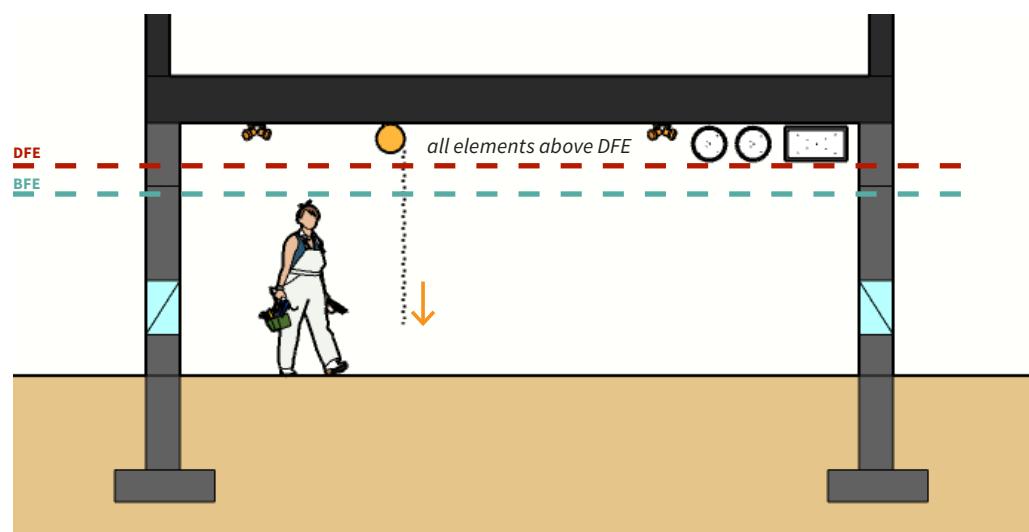
Interior Equipment

- Includes Washers, Dryers, + Water Heaters
- Elevate on masonry or pressure-treated lumber podium bases at least 12" above the DFE
- Some manufacturers offer compatible pedestal options for equipment (remove items before flood event).



BFE Solutions

- Protected wiring for fire alarms + emergency lighting are allowed below the BFE.
- Homeowners should maintain required life safety in accessory spaces beneath the home.
- Mount power access in accessory space beneath the elevated home above the DFE, and provide an isolated circuit from interior and service circuits.
- Wet-Rated Retractable cord reels can limit damage in event of flood while allowing for accessory storage and/or tool + vehicle charging.
- Work with a licensed plumber to install a plumbing backflow prevention valve to prevent sewer backups into your home.



Building Access

Stairs

Orientation

- Keep stair access points on primary elevations in their original location whenever possible
- Ensure stairs comply with Code and any required right-of-ways

A | Front Approach

- Common in coastal districts
- Useful for low elevation projects
- Expanding the width of runs can create a grand sense of entry to the home
- Break into multiple runs to integrate into tiered landscaping/site grading

B | Side Approach

- Useful in traditional districts with less buildable area on primary elevation
- Can be integrated into a porch/deck

C | L Approach

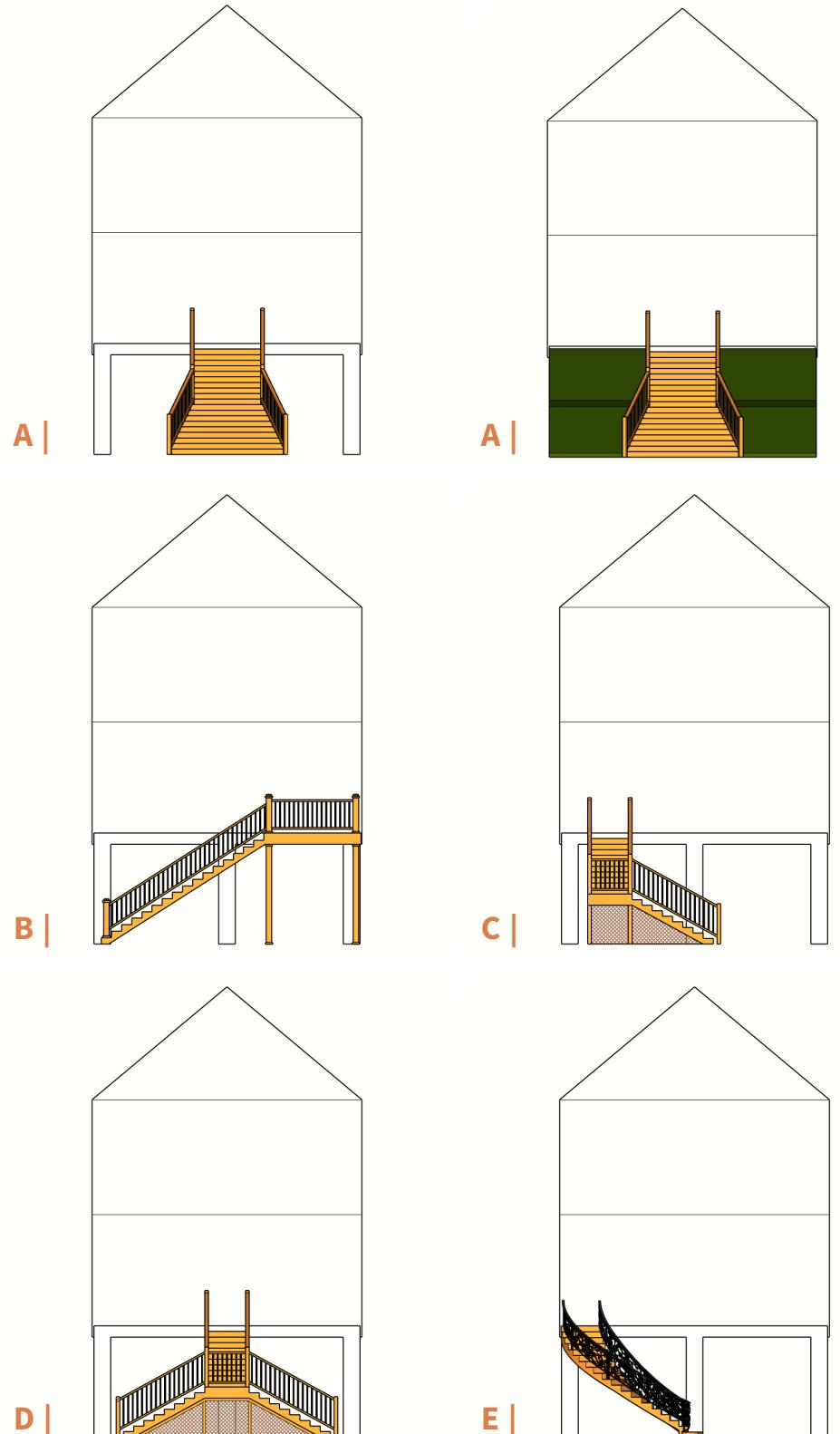
- Can integrate into existing porch structures and landscapes
- Many different configurations of runs, landings and directions

D | Split Approach

- Reduces visual impact of full story runs
- Able to be screened with landscaping

E | Curved Approach

- Traditional approach, useful in dense, urban environments
- Smoother transition between pedestrian experience (public realm) and the private home experience.
- Additional Code Requirements

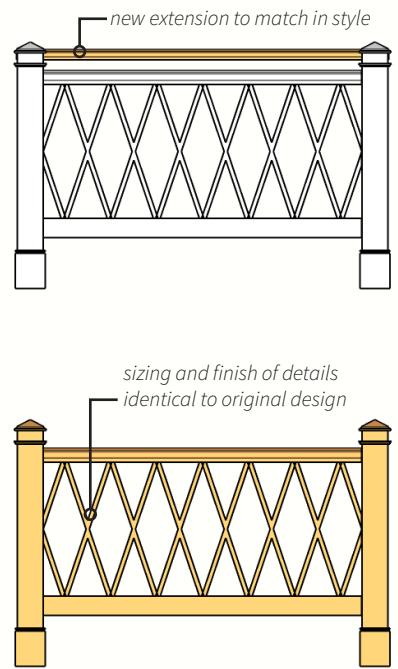


Building Access

Stairs

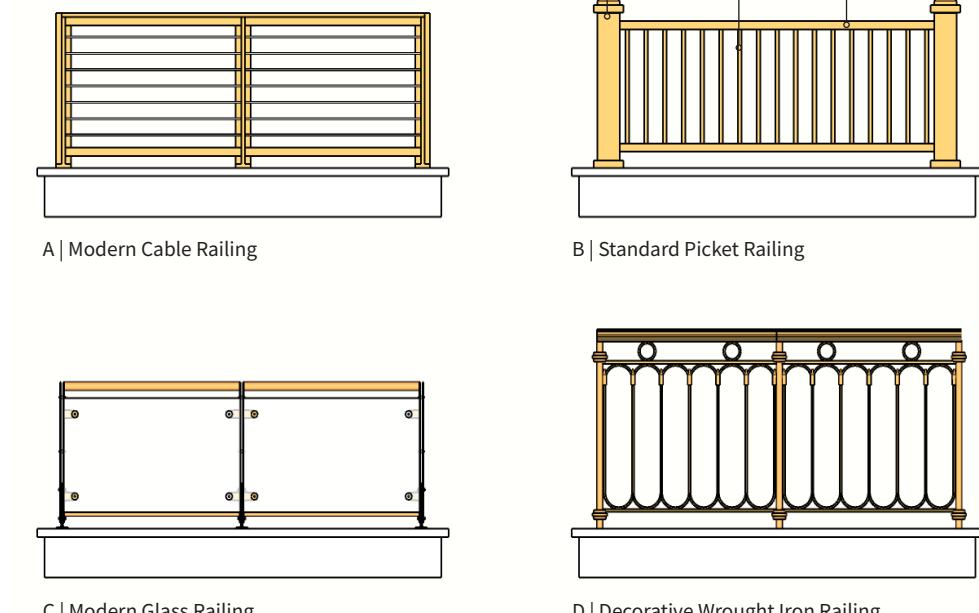
1 | Homes with Existing Railings

- Match the style and form of original railings at the home's exterior porches and stairs
- Blend existing styles by retaining original proportions in order to meet updated building codes
- New-code compliant extensions should match in scale and material, but remain distinct from historic material.
- Match existing colors, finishes and materiality.
- Salvage any existing features if possible and reuse in new applications.



2 | Constructing New Railings

- For homes without existing porches, stair railings, and other related conditions
- Match the style and finish of railings typical to your home's architectural style and character district
- Refer to pattern books and architectural guides for guidance on compatible railing design
- Ensure Code Compliance for handrail and porch railing heights, spacing, and diameters.
- Baluster style and pattern applicable per character districts



example of typical railing styles

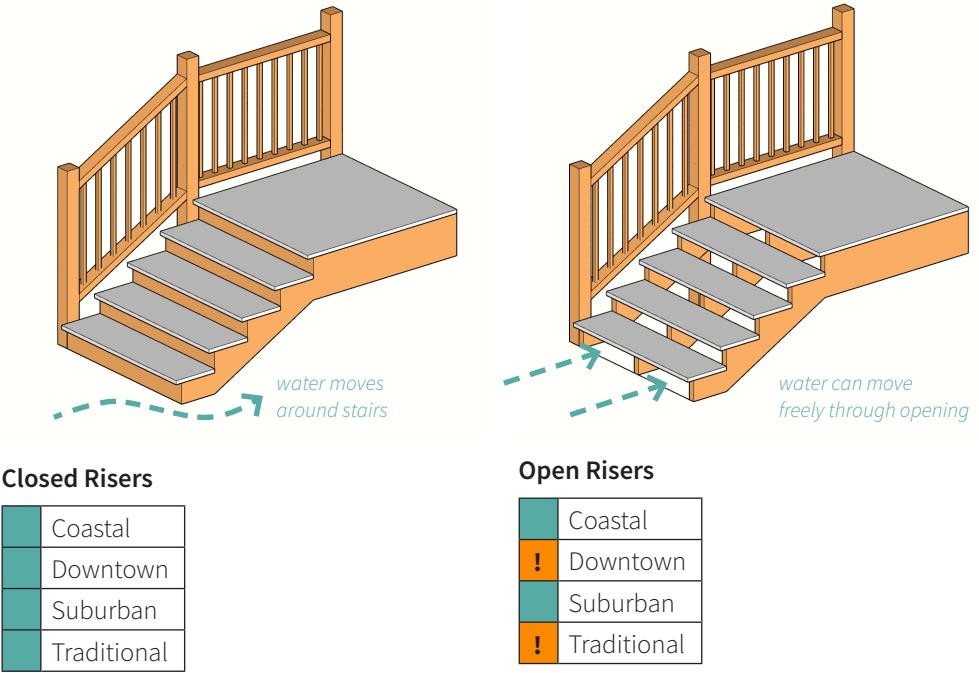
Building Access

Building Access

Stairs

Finish

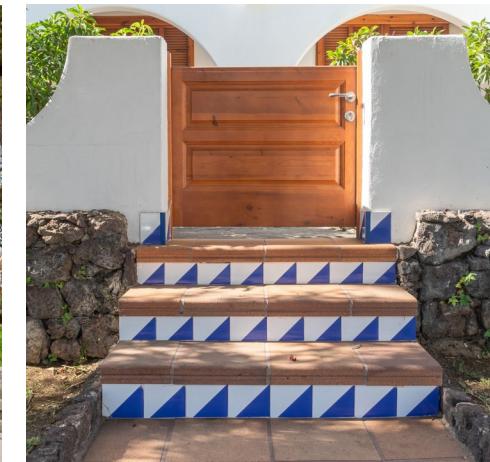
- Color and Materiality should be compatible with the existing home.
- Consider breaking up stair runs into smaller segments with a break in materiality or design.
- Multi-run stairs can be integrated into tiered landscaping and grade infill, which reduces visual impact on primary facade
- Provide open details on stair elements to reduce hydrostatic pressure or to provide visual lightness to structure
- Riser detailing to align with existing conditions or appropriate styles per character district (closed vs. open, tile or painted finish, etc)



Integrate Stairs into Landscaping

Coastal
Downtown
Suburban
Traditional

**use with larger lot sizes



Tiled Risers

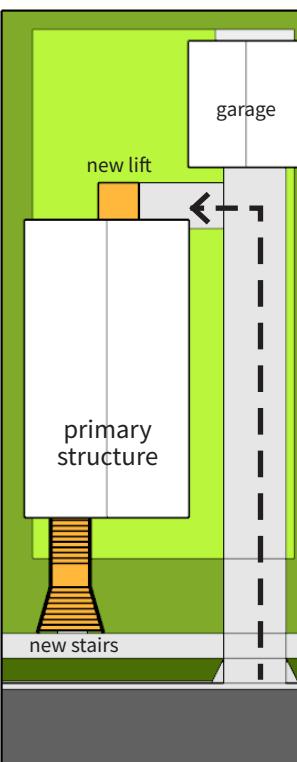
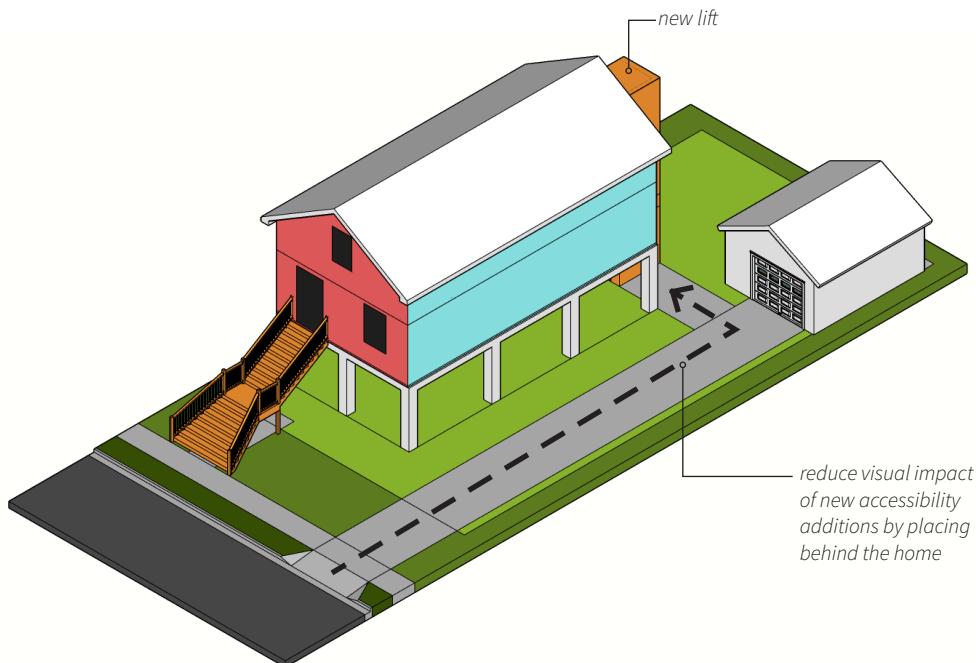
Coastal
!Downtown
Suburban
!Traditional

- Acceptable Use
- May be used, but requires review of design & Materials
- Not Acceptable Use

Ramps and Elevators

- Locate along secondary elevations (most concealed) or within the building envelope (if compatible with floor plan)
- Minimize visual impact of new ramps by screening behind railings or landscaping
- Ensure solutions do not damage critical historic details or fabric of home (if house qualifies for NRHP Listing)
- Use grade fill to reduce visual impact and slope of ramps or lifts
- Electrical operating equipment for lifts and elevators must be stored above the DFE during flood events to prevent damage or injury.**
- Ensure all new elevators comply with local and federal building & accessibility requirements (refer to FEMA Technical Bulletin 4 for details)
- Do not relocate primary access locations in order to install a new elevator or ramp without assessing other less visible options first.

There are several local, state and federal accessibility grant programs that may be available to supplement costs of installation of home access equipment or ramps. This funding is subject to availability and eligibility requirements.



Integrated Ramp at Porch

Site Improvements

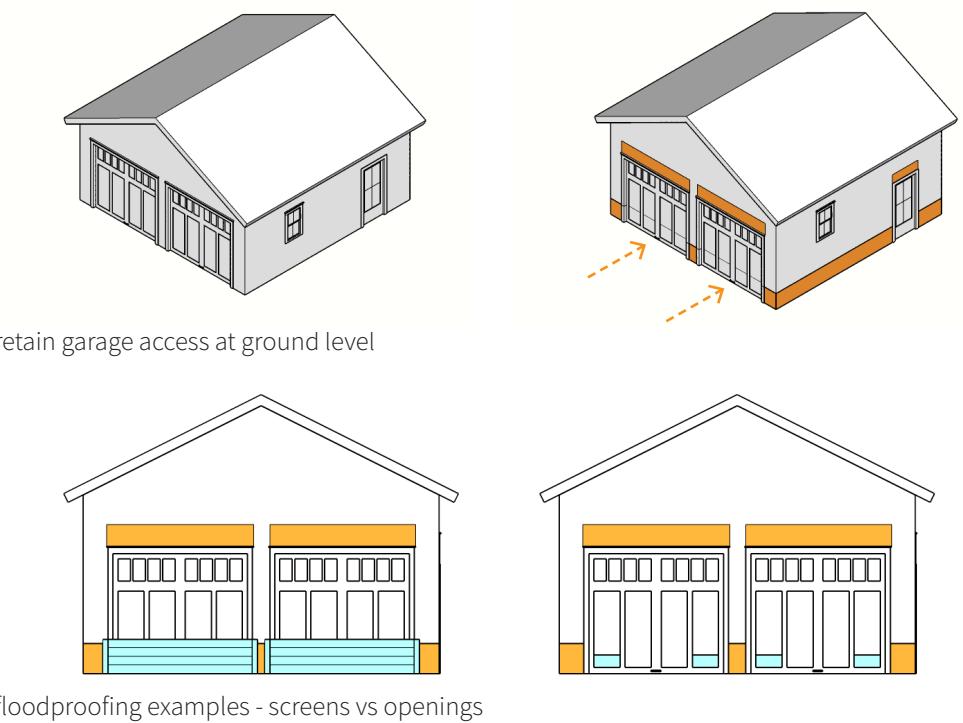
- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

Accessory Structures

1 | Wet Floodproofing

Existing Structures

- Provide new flood-resistant foundation for wood sheds or garages to improve resiliency
- Infill space created by elevation with new transom windows or panels
- Provide temporary shielding or flood openings at doors or windows below the BFE to prevent water infiltration
- Provide Mesh Screen infill rather than solid doors to utilize as covered patio or work space.
- Refer to 'Flood-Resistant Materials' slide for more guidance on appropriate materials for wetproofing.



2 | Construct New Elevated Structure

- Match the allowable square footage for accessory structures in your property's applicable flood zone.
- Any livable space should be elevated above BFE (ADU, Office, etc)
- Architectural style should complement existing home in scale, material and form and align with overall architectural character of your applicable Character District.
- In Downtown + Traditional Districts, consider utilizing original structure locations & configurations (image on right page was constructed on original historic kitchen location)



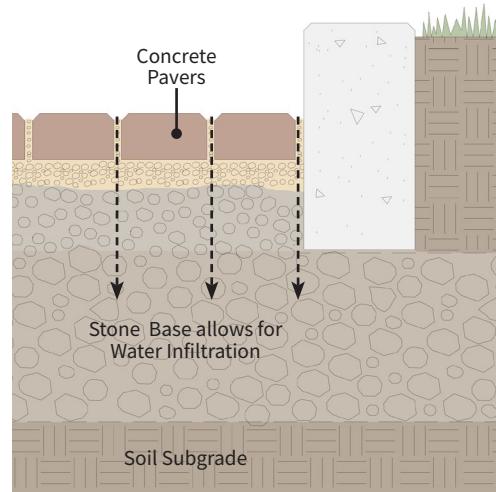
Site Improvements

Site improvement projects may not be covered costs under FEMA grant programs. Many of these suggestions are provided to improve the home experience, not necessarily to comply with NFIP Requirements. They can also help mask significant visual changes and improve the performance of your home.

Surface Treatment

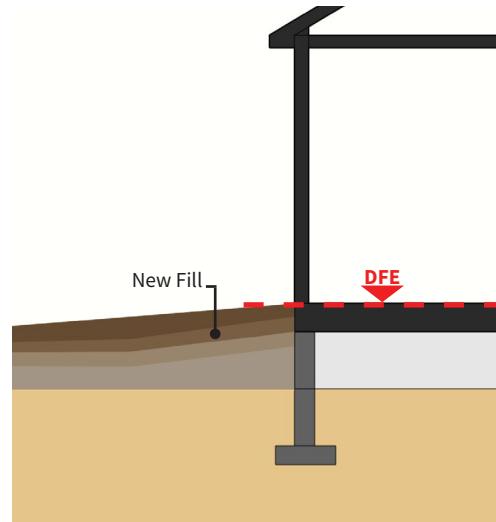
Permeable Hardscapes

- Replace driveways, sidewalks, patios and parking pads when feasible
- Allows rainwater to soak into soils rather than pooling on surfaces
- City Requires ICPI Certified Contractor for permeable pavement installation
- Not useful in areas with steep slopes or a high water table



Additional Ground Fill

- Can reduce the visual impact of new home elevation along primary elevation
- Slope away from foundation to allow water to flow away from building
- Plant new fill areas with dense or deep root species to prevent soil erosion



Rain Barrels & Cisterns

- Slows rainwater from soaking into soil, or collects at a downspout location
- Useful for managing ponding + small flood areas on a property
- Locate a safe distance away from building foundations to prevent damage
- Locate on secondary elevations



Site Improvements

Site improvement projects have the potential to make flood conditions better for your property while also making conditions worse for adjacent properties. Before selecting a method of improvement, Evaluate the project with local code and limit any potential negative impacts on neighboring sites and structures.

Landscape Patterns

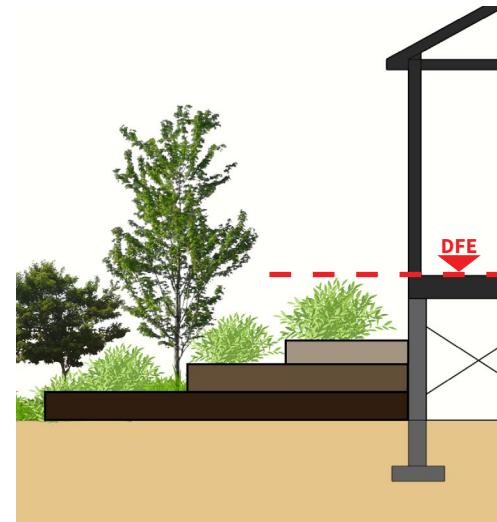
Conservation Landscaping

- Reduces Pollution and Flooding Impacts as well as landscape costs
- Includes Rain Gardens Planted w/ native plants
- Larger trees and shrubs with deeper roots and help capture rainwater



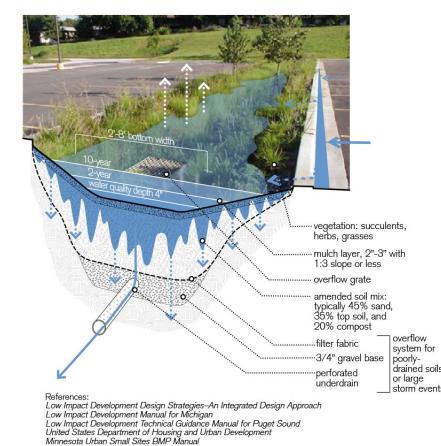
Tiered Landscaping

- Can help mask extreme elevation changes
- Multiple levels are generally suitable for larger parcels.
- Integrate with new stair or access paths for a more unified approach
- Floodwalls can be integrated as landscape features



Berms + Bioswales

- More feasible for use on larger sites
- Provides protection for historic landscape features



Site Improvements

Site Improvements



Saltwater-Tolerant Species

Norfolk is located in Plant Hardiness zone 8A

Landscape Species



FLORIDA MAPLE [*ACER FLORIDANUM*]



KENTUCKY COFFEETREE [*GYMNOCLADUS DIOICUS*]



AMERICAN ELM [*ULMUS AMERICANA*]



AMERICAN SYCAMORE [*PLATANUS OCCIDENTALIS*]



COTTONWOOD [*POPULUS DELTOIDES*]



PERSIMMON [*DIOSPYROS VIRGINIANA*]



WHITE OAK [*QUERCUS ALBA*]



SOUTHERN RED OAK [*QUERCUS FALCATA*]



RIVER BIRCH [*BETULA NIGRA*]



SWAMP CHESNUT OAK [*QUERCUS PRINUS*]



WILLOW OAK [*QUERCUS PHELLOS*]



EASTERN REDBUD [*CERCIS CANADENSIS*]



SOUTHERN MAGNOLIA [*MAGNOLIA GRANDIFLORA*]



EASTERN RED CEDAR [*JUNIPERUS VIRGINIANA*]



AMERICAN HORNBEAM [*CARPINUS CAROLINIANA*]



SERVICEBERRY [*AMELANCHIER CANADENSIS*]



SWEETBAY MAGNOLIA [*MAGNOLIA VIRGINIANA*]



WAX MYRTLE [*MYRICA CERIFERA*]



WINTERBERRY HOLLY [*ILEX VERTICILLATA*]



INKBERRY HOLLY [*SCEAVOLA PLUMIERI*]



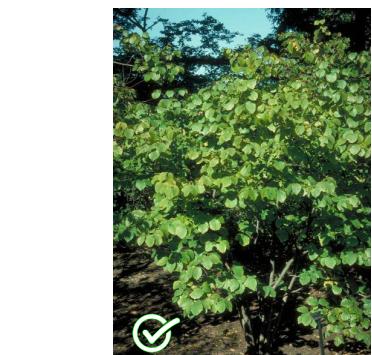
YAUPON HOLLY [*ILEX VOMITORIA*]



OAKLEAF HYDRANGEA [*HYDRANGEA QUERCIFOLIA*]



YUCCA [*YUCCA FILAMENTOSA*]



WITCHAZEL [*HAMAMELIS VIRGINIANA*]

Site Improvements

Site Improvements



Saltwater-Tolerant Species

Norfolk is located in Plant Hardiness zone 8A

Landscape Species



VIRGINIA SWEETSPIRE [*ITEA VIRGINICA*]



GRO-LOW FRAGRANT SUMAC [*RHUS AROMATICA*]



COREOPSIS [*COREOPSIS AURICULATA*]



SEASIDE GOLDENROD [*SOLIDAGO SEMPERVIRENS*]



FIREBALL BEE BALM [*MONARDA FISTULOSA*]



PURPLE CONEFLower [*ECHINACEA PURPUREA*]



BRANDYWINE VIBURNUM [*VIBURNUM NUDUM*]



RED TWIG DOGWOOD [*CORNUS STOLONIFERA*]



HYSSOP-LEAF THOROUGHWORT [*VIRGINIANA*]



GREEN & GOLD "PIERRE" [*CHRYSOGONUM VIRGINIANUM*]



VIRGINIA BLUE BELLS [*MERTENSIA VIRGINICA*]



PENNSYLVANIA SEDGE [*CAREX PENNSYLVANICA*]



SWEET PEPPERBUSH [*CLETHRA ALNIFOLIA*]



COMMON YARROW [*ACHILLEA MILLEFOLIUM*]



AMERICAN BONESET [*EUPATORIUM PERFORIATUM*]



SWITCHGRASS "SHENANDOAH" [*PANICUM VIRGATUM*]



SWITCHGRASS "PURPLE TEARS" [*PANICUM VIRGATUM*]



LITTLE BLUESTEM [*SCHIZACHYRIUM SCOPARIUM*]



BUTTERFLY WEED [*ASCLEPIAS TUBEROSA*]



BLUE FALSE INDIGO [*BAPTISIA AUSTRALIS*]



ROUGH GOLDENROD [*SOLIDAGO RUGOSA*]



PURPLE LOVEGRASS [*ERAGROSTIS SPECTABILIS*]



MUHLY GRASS [*MUHLENBERGIA*]



Case Studies | Applying the Pattern Book

Developing Case Studies

One design goal of the Pattern Book is to provide visually compatible solutions for home raising projects in the City of Norfolk. There are three main objectives to consider when approaching an elevation project:

1. Ensure the changes to your home are compatible with the existing design & district character.
2. Choose solutions that adequately reduces the flood risk to your property.
3. Secure the appropriate required financing to complete the project, through grants or loans

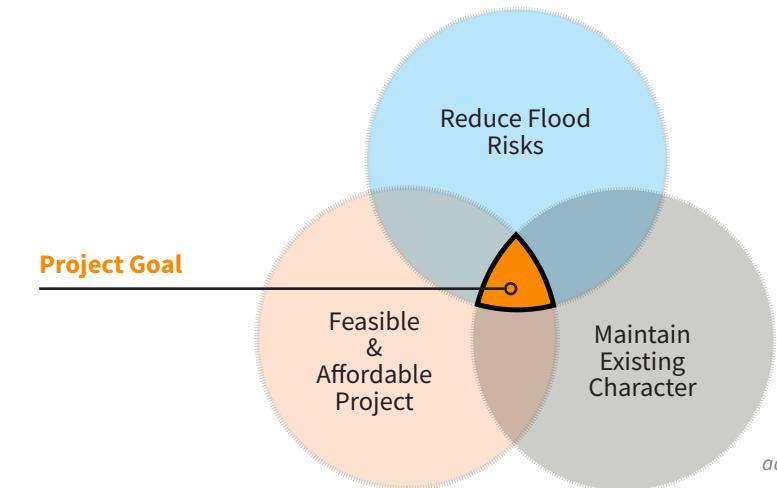
Generally, design details that are created as part of an elevation project should be compatible with the existing design and character of the home, as well as the district & neighborhood.

Raising a home on basic CMU or cinderblocks with no paint, screening, or other design detail can leave the house feeling cold and unfinished, and disconnected from the neighborhood.

Elevating Historic Homes

For historic homes, there are many more requirements and considerations when planning an elevation project.

- Secretary of the Interior Standards for Rehabilitation and Section 106 provisions apply for elevation projects of contributing properties in registered Historic Districts, or for homes determined eligible for the NRHP.
- The National Park Service has published a significant amount of guidance for flood adaptation projects that are stricter than the solutions provided in this document.
- Ensure any proposed solutions for your historic home align with these NPS Guidelines to ensure compliance and continued eligibility of your property.



adapted from NPS Flood Adaption Guidelines

Balancing Needs



Elevated Historic Homes

Coastal Character District

Coastal Bungalow (ca. 1920s)

Existing Features

A | Recessed Porch

- Carry porch columns to new base elevation

B | Existing Railings

- traditional wood picket style

C | Masonry Stairs

- Existing brick and stone stairs - match style in new elevation design

D | Symmetrical Primary Elevation

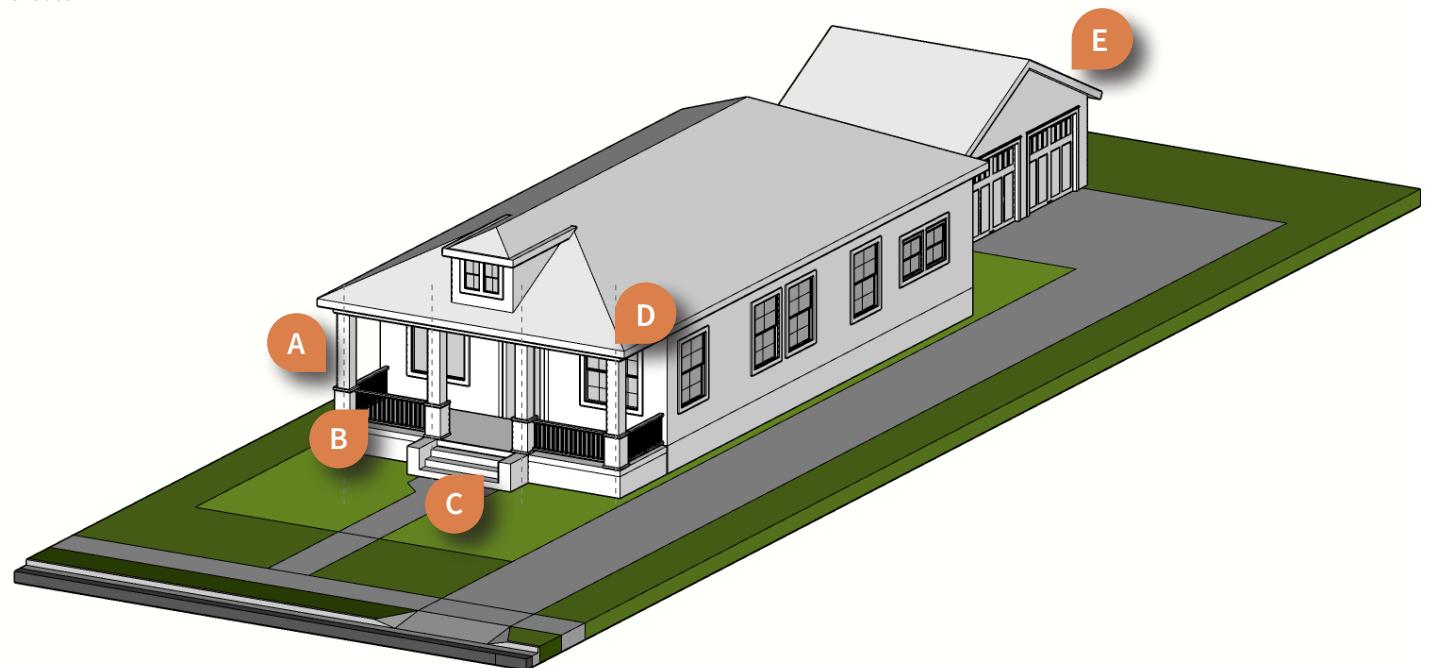
- Columns of equal scale and design
- Central Entry & Dormer
- Central access stairs
- Symmetrical railings

E | Detached Garage

- Detailing in line with house design & style

Existing Home (0 FT)

Flood Zone X - Shaded



Design Solutions

1 | Extend Porch Supports

- Aligns with NPS Rehabilitation strategy for historic homes
- provide infill screens between posts for visual weight

2 | Match Existing Railings & Stairs

- Cohesion between new and existing elements
- Central stair retains symmetry

3 | Closed Foundation w/ Flood Openings

- Provides visual weight at main facade

4 | Grade Infill & Retention Walls

- Reduces visual impact of elevation project.
- Traditional solution within district

5 | New Landscaping

- Reduces visual impact of elevation project.

6 | Wet Floodproofing @ Garage

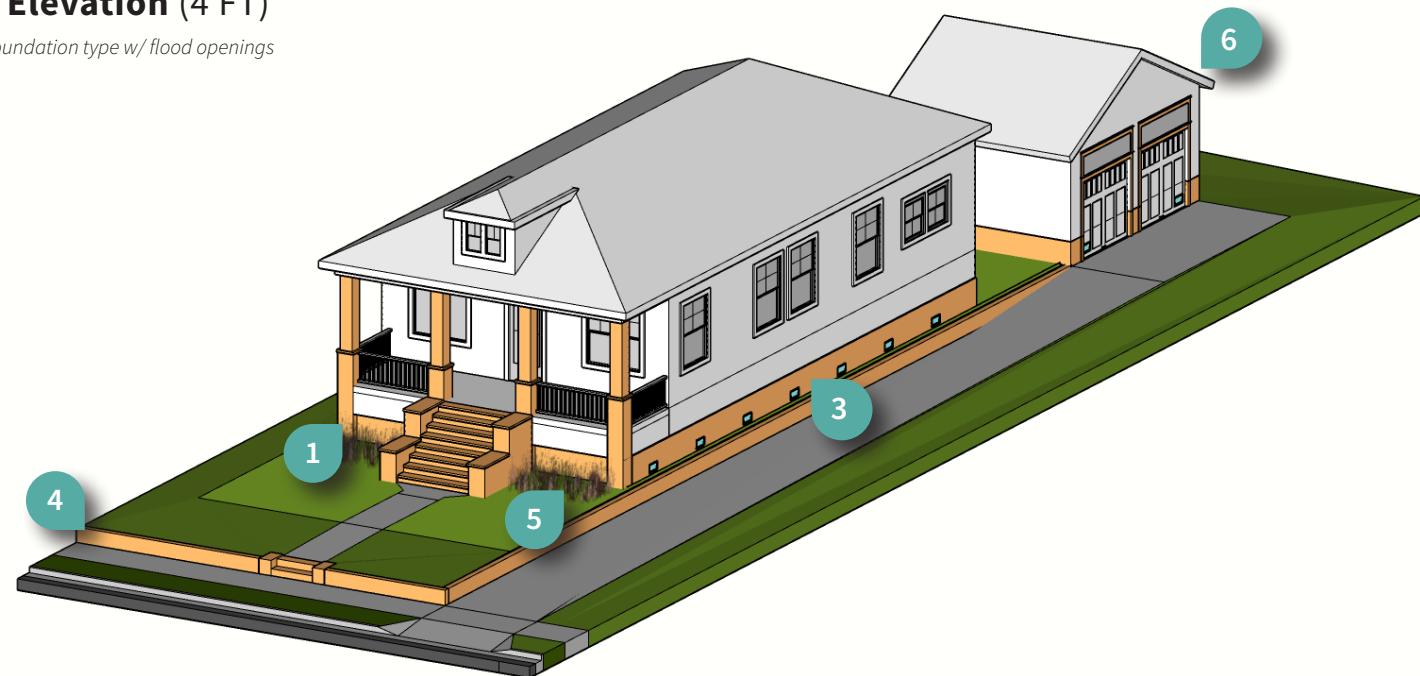
- Reduces flooding damage to accessory structure
- Higher elevation project can accomodate full ADU unit.

Coastal Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

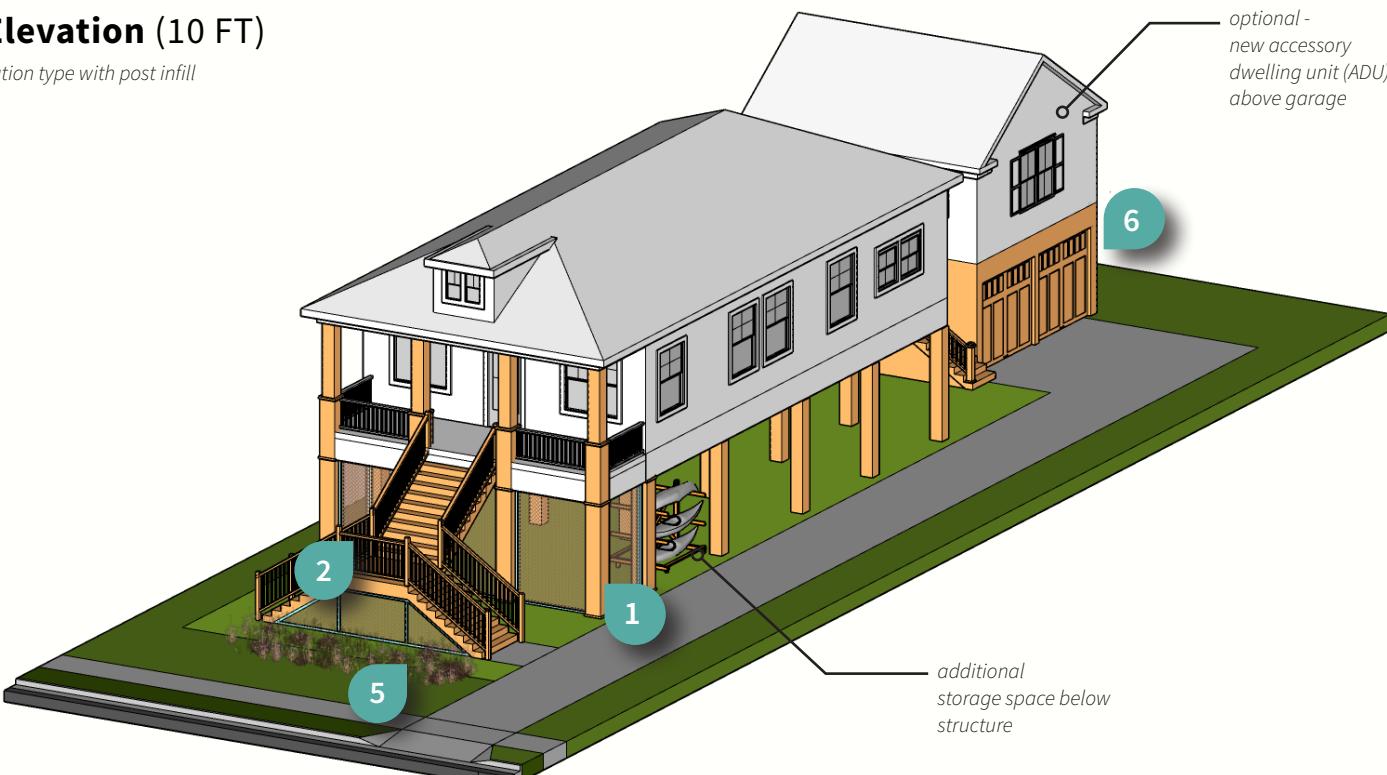
Low Elevation (4 FT)

closed foundation type w/ flood openings



High Elevation (10 FT)

open foundation type with post infill



Coastal Character District

Coastal Craftsman (ca. 1920s)

Existing Features

A | Corner-Wrapped Porch

- Carry porch columns to new base elevation with detailing along both primary elevations

B | Existing Porch Railings

- solid lapped siding style

C | Brick Massed Stairs

- Existing brick and stone stairs - match style in new elevation design

D | Asymmetrical Elevations

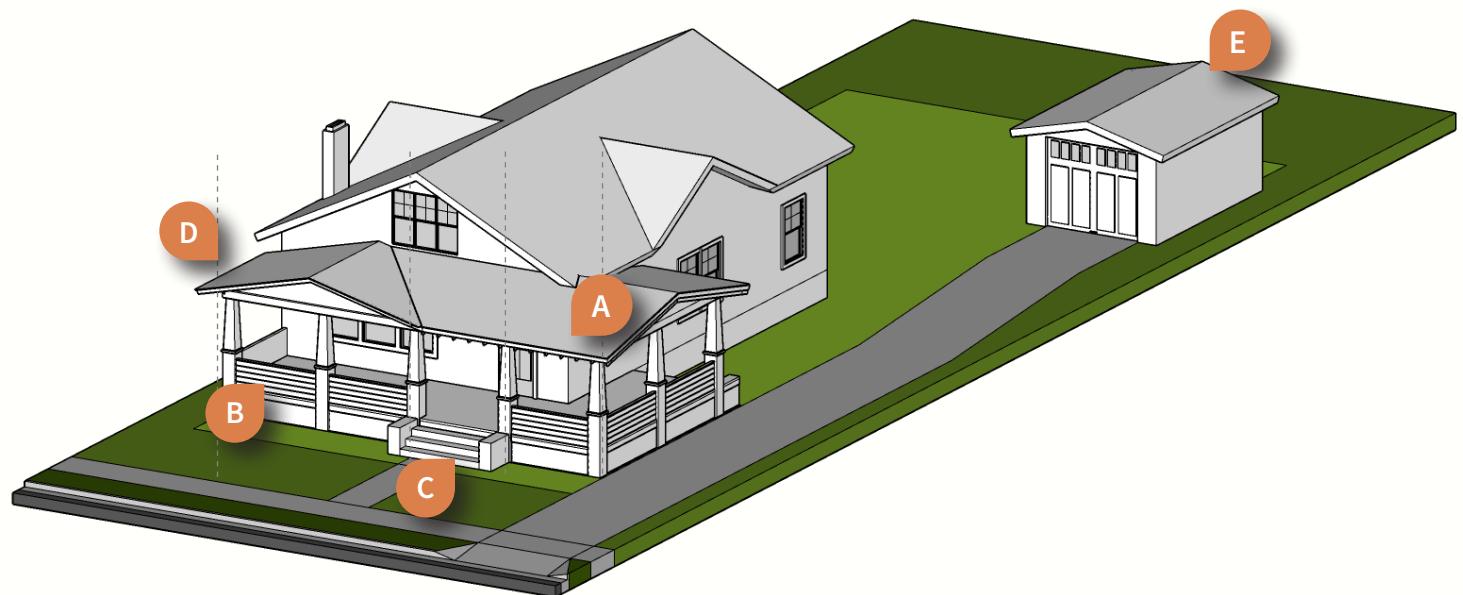
- Existing Porch is not symmetrical to the main house volume.
- Stairs are not symmetrical to entry

E | Detached Garage

- Detailing in line with house design & style

Existing Home (0 FT)

Flood Zone X



Design Solutions

1 | Extend Porch Supports

- Aligns with NPS Rehabilitation strategy for historic homes

2 | Compatible Stair Design

- Cohesion between new and existing elements

3 | Closed Foundation w/ Flood Openings

- Provides visual weight at main facade

4 | Post Infill

- Reduces visual impact of elevation project.
- Traditional solution within district
- Use different color or finish to differentiate between existing and new foundation construction.

5 | New Tiered Landscaping

- Reduces visual impact of the raised home

6 | Extend Stairs at secondary elevation

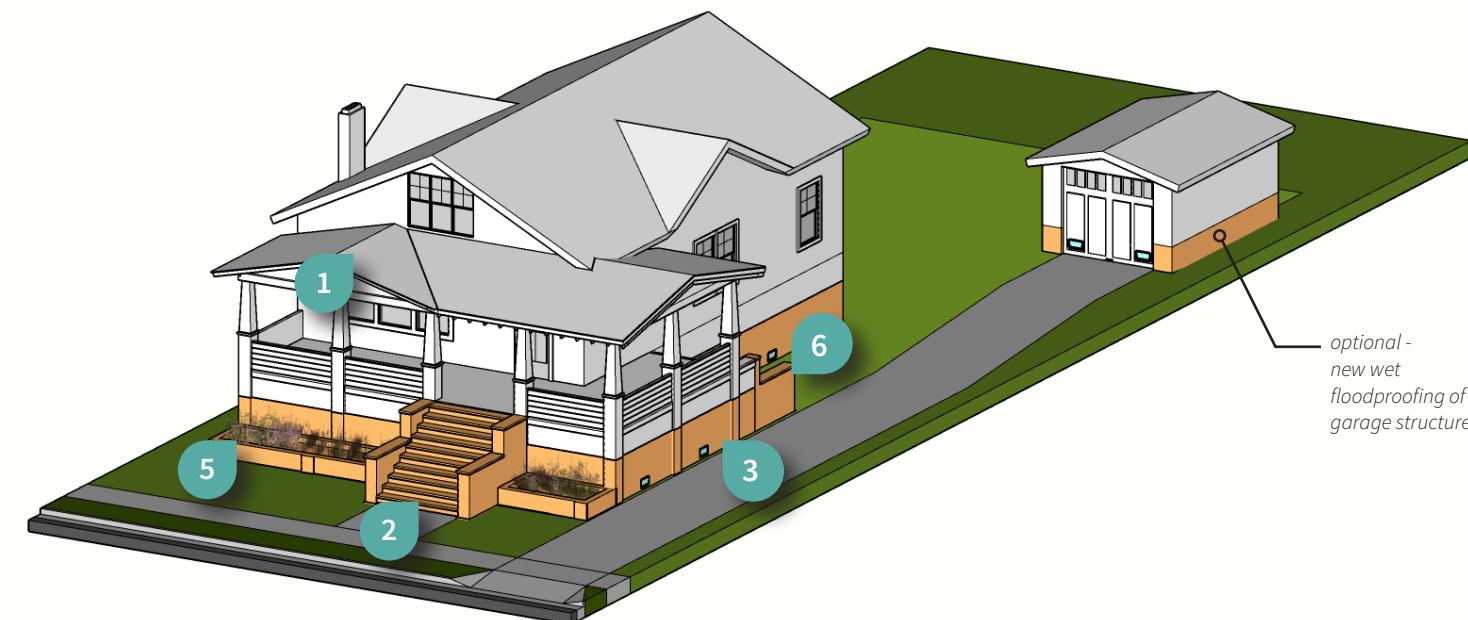
- Provides same level of access to the existing porch.

Coastal Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

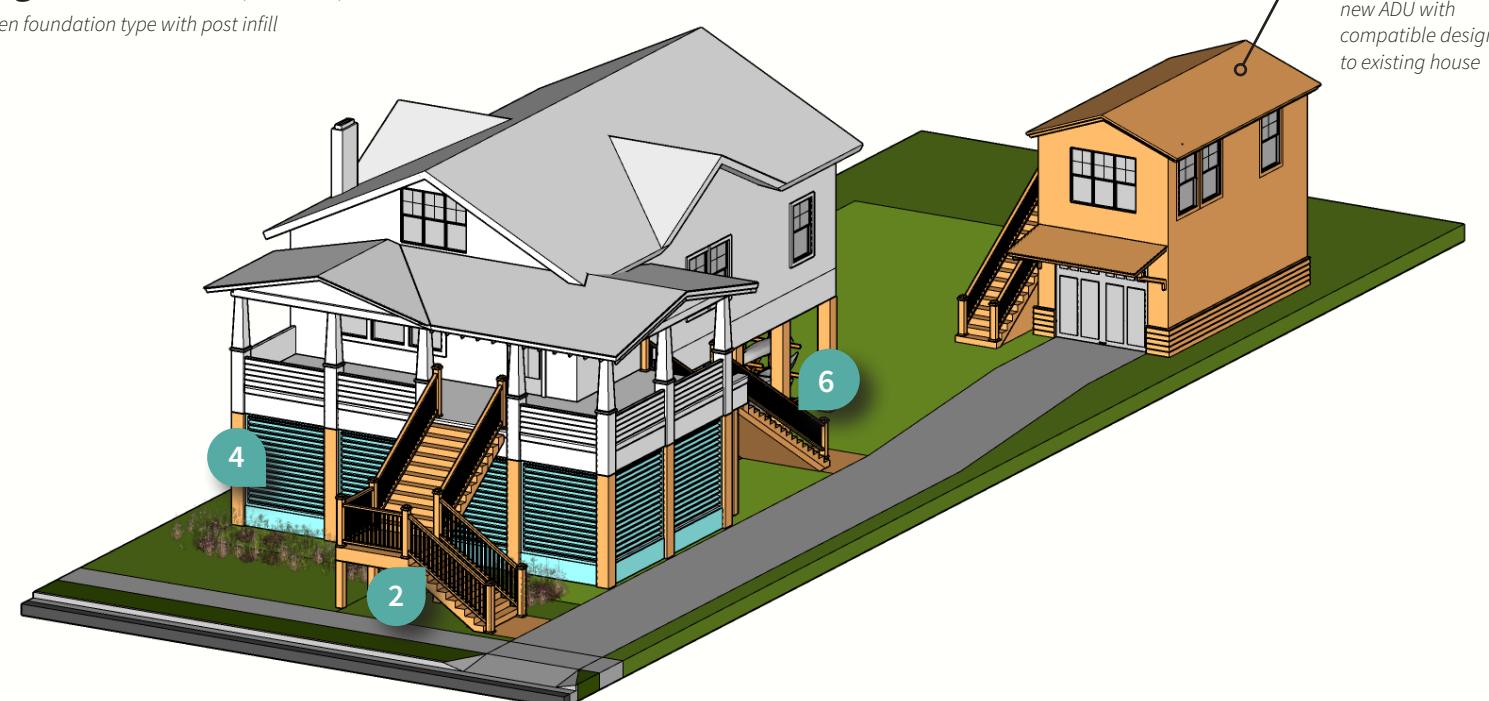
Low Elevation (4 FT)

closed foundation type w/ flood openings



High Elevation (10 FT)

open foundation type with post infill



Downtown Character District

Revival Rowhome (ca. 1890s)

Existing Features

A | Bay Windows

- Full-height projection on primary elevation w/ traditional details

B | Ornate Entryway

- asymmetrical front entrance
- Existing stone stairway

C | Full Lot Coverage

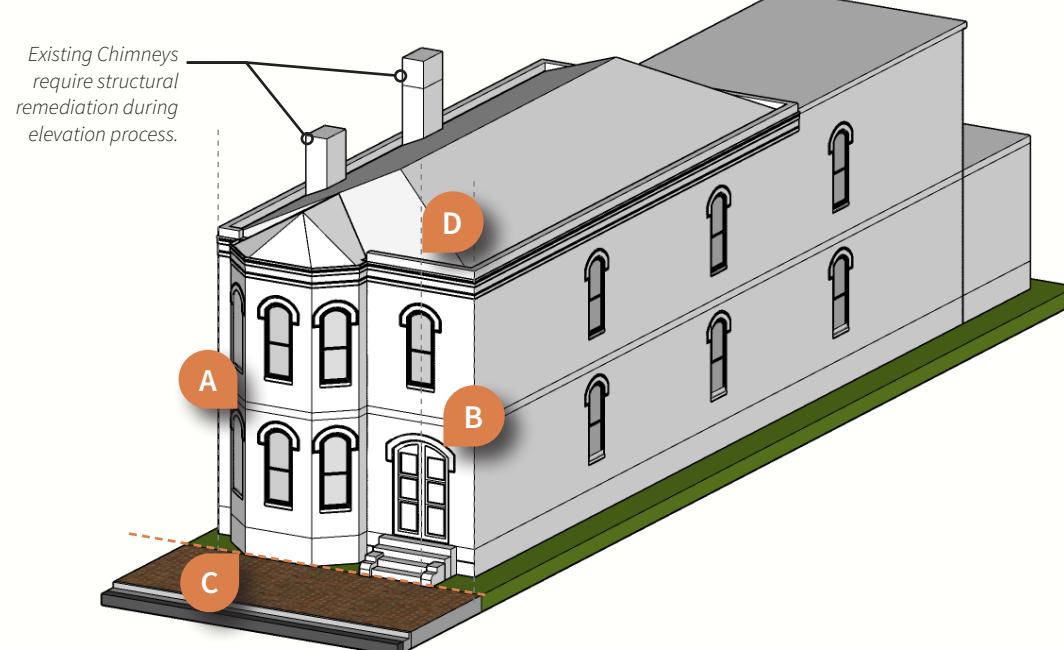
- Primary elevation aligns with front of buildable area

D | Asymmetrical Primary Elevation

- Columns of equal scale and design
- Central Entry & Dormer
- Central access stairs
- Symmetrical railings

Existing Home (0 FT)

Flood Zone AE; Historic District



Design Solutions

1 | Closed Foundation w/ Flood Openings

- Aligns with NPS Rehabilitation strategy for historic homes
- Provide detailing to match existing home

2 | New Stairs w/ Detailed Railings

- Cohesion between new and existing elements
- Minimal encroachment into sidewalk - maintain code minimum right of ways & clearances

3 | Louvered Infill of Stairway base

- Secure storage space for outdoor items

4 | Wrapped Stairwell

- Traditional approach to maximize space around bay

5 | Retain Entry Location

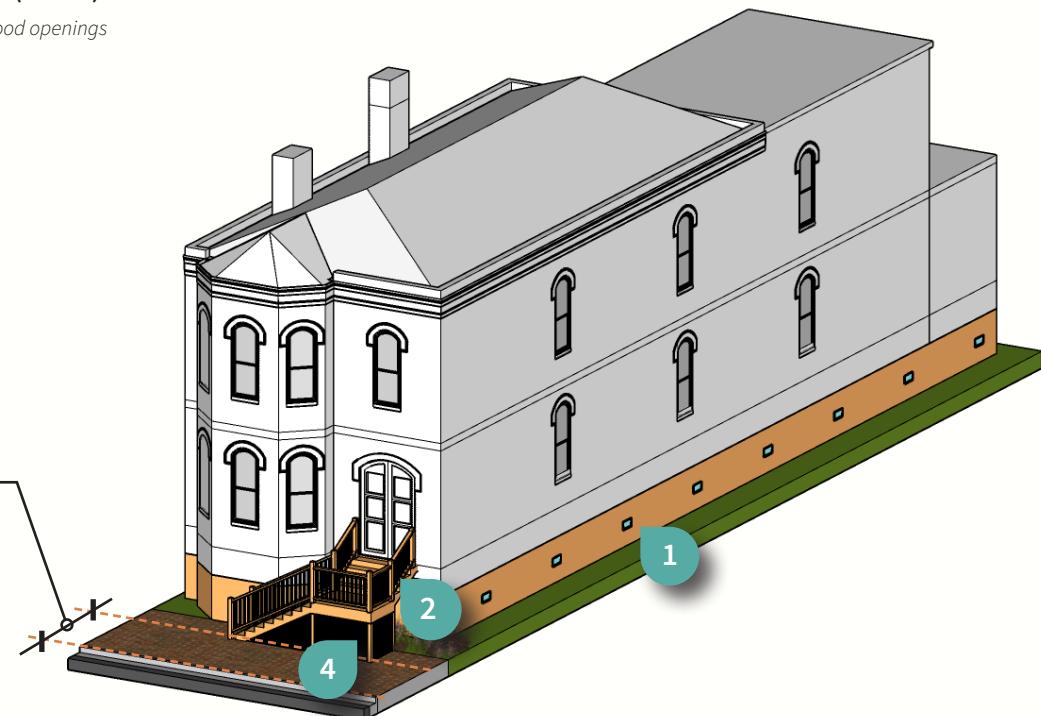
- Consistency w/ historic structure per NPS Guidelines

Downtown Character District



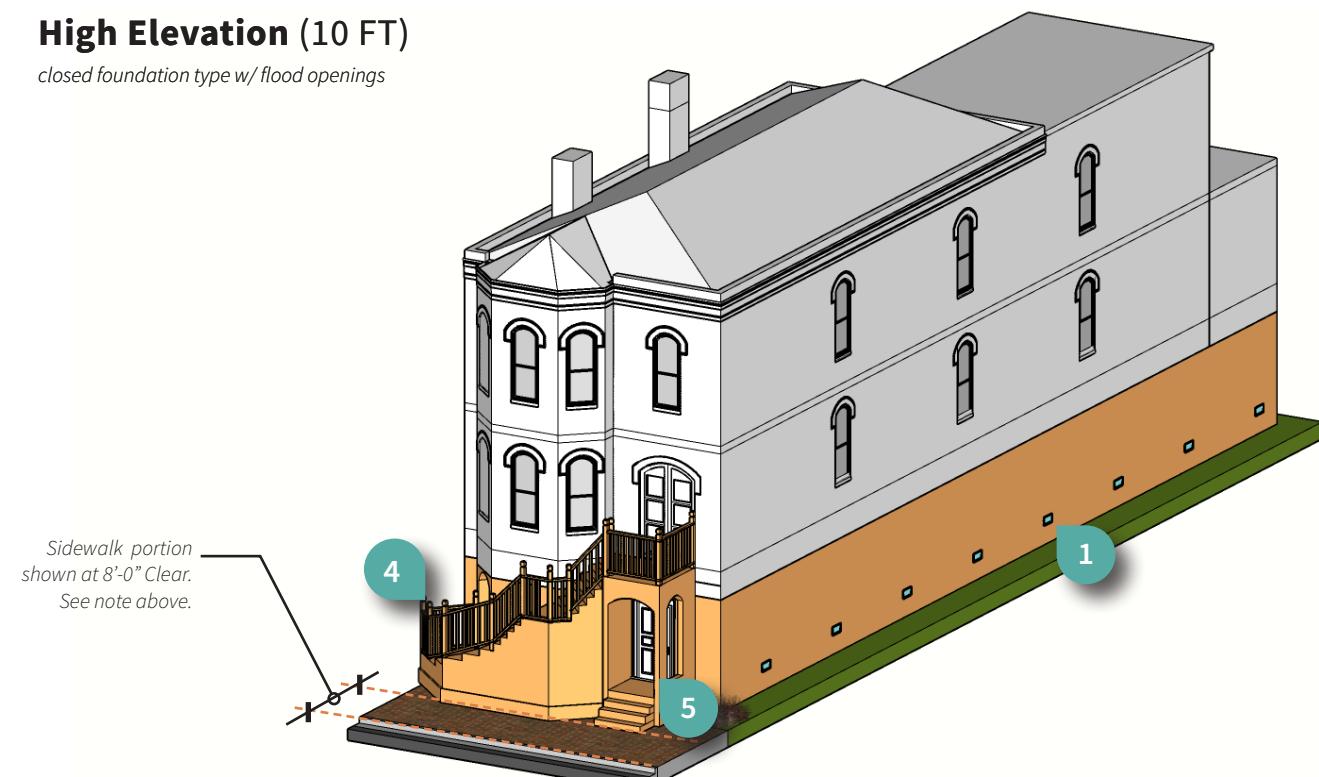
Low Elevation (4 FT)

closed foundation type w/ flood openings



High Elevation (10 FT)

closed foundation type w/ flood openings



Downtown Character District

Mansard Rowhome (ca. 1890s)

Existing Features

A | Bay Windows

- Full-height projection on primary elevation w/ traditional details

B | Ornate Entryway

- asymmetrical front entrance

C | Full Lot Coverage

- Primary elevation aligns with front of buildable area

D | Asymmetrical Primary Elevation

- Columns of equal scale and design
- Central Entry & Dormer
- Central access stairs
- Symmetrical railings

Design Solutions

1 | Closed Foundation w/ Flood Openings

- Aligns with NPS Rehabilitation strategy for historic homes
- Provide detailing to match existing home
- Side elevations may directly border other homes, or share structural walls between rowhomes.

2 | New Stairs w/ Detailed Railings

- Cohesion between new and existing elements
- Minimal encroachment into sidewalk - maintain code minimum right of ways & clearances

3 | Louvered Infill of Stairway base

- Secure storage space for outdoor items

4 | Wrapped Stairwell

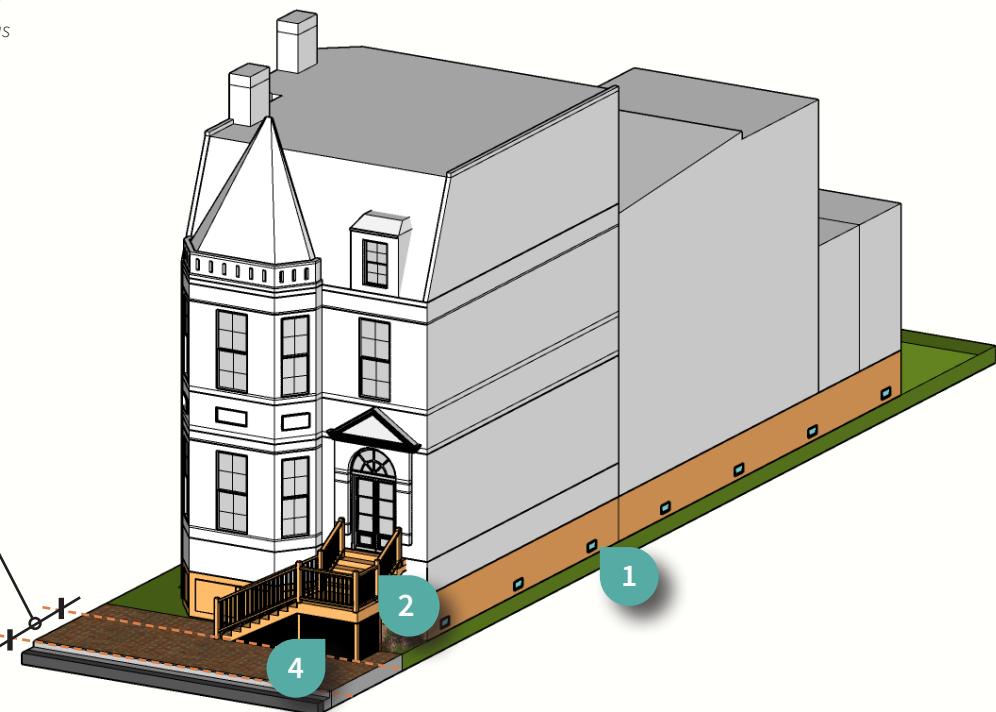
- Traditional approach to maximize space around bay

Downtown Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

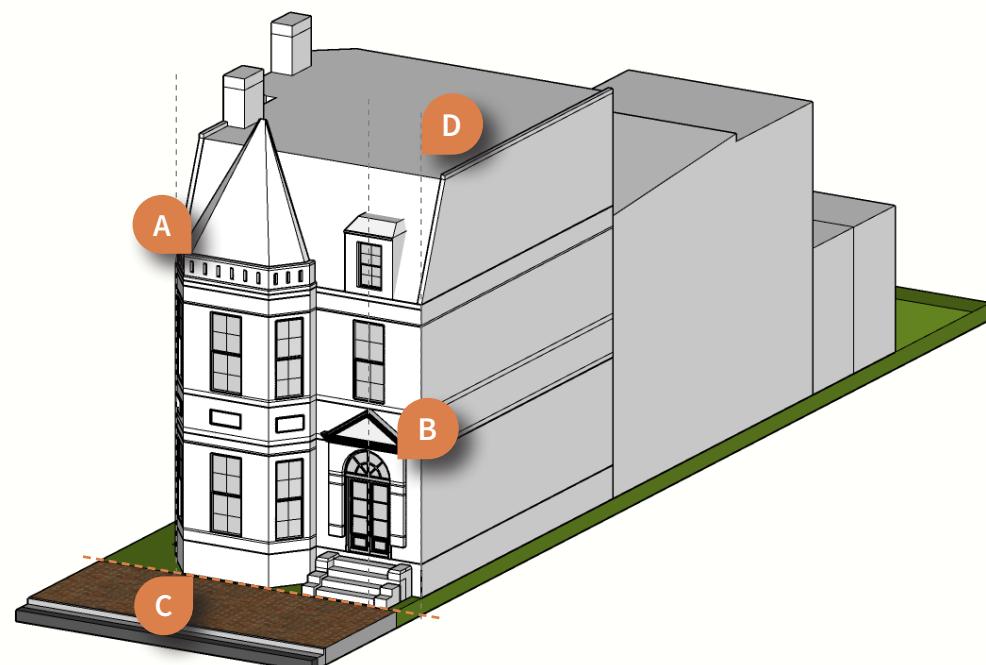
Low Elevation (4 FT)

closed foundation type w/ flood openings



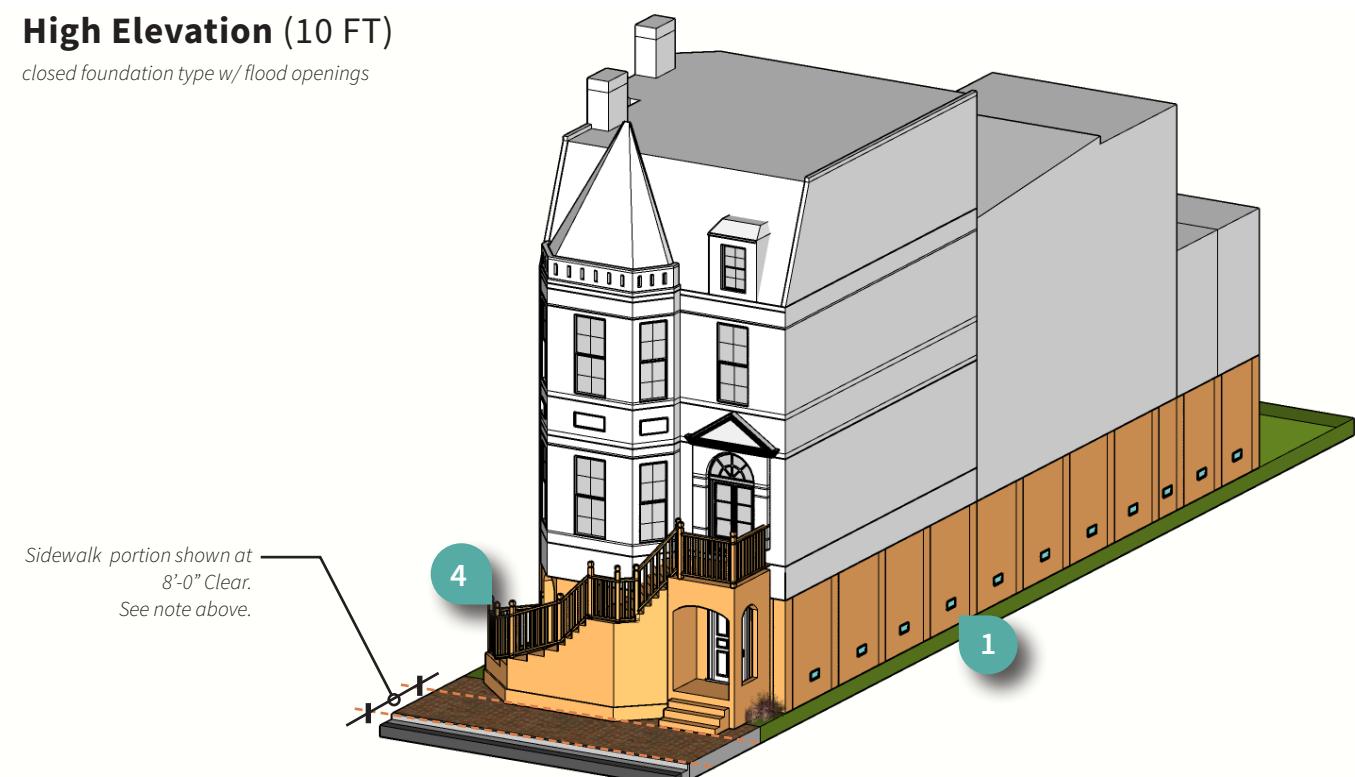
Existing Home (0 FT)

Flood Zone AE; Historic District



High Elevation (10 FT)

closed foundation type w/ flood openings



Suburban Character District

'Norfolk' Ranch Style (ca. 1950s)

Existing Features

A | A-Line Style Roof

- Single Gable roof with all elements under primary roof plane

B | Prefab Aluminum Awnings

- Detail over entry & garage Door

C | Brick Banding

- Horizontal element - align new details with bands

D | Symmetrical Structure, Asymmetrical Features

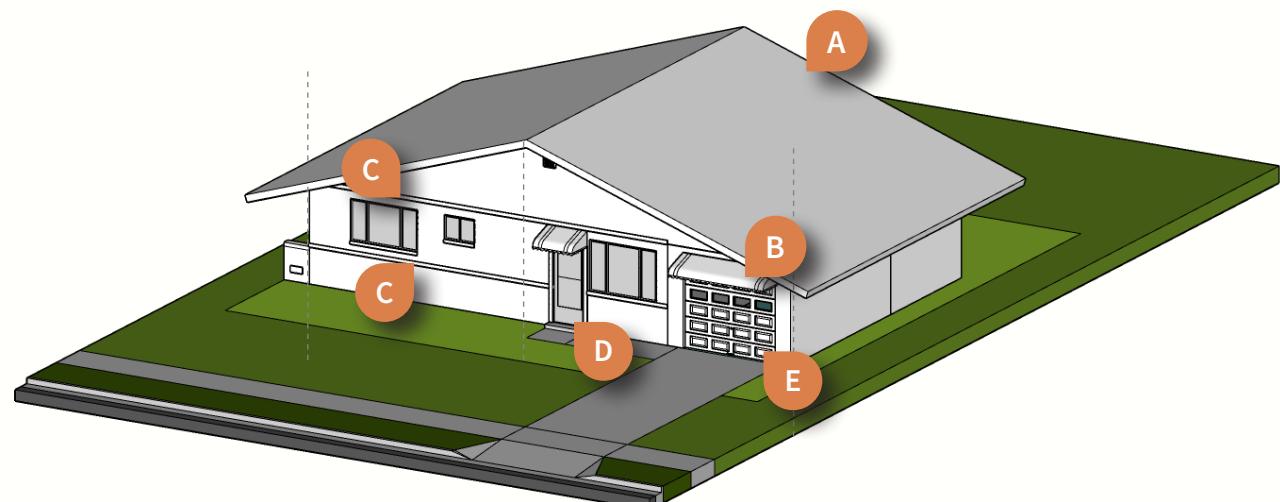
- Door and Window openings are not symmetrical on primary facade
- Roof line is symmetrical

E | Garage under Primary Roof

- Existing door will require infill - not an attached structure

Existing Home (0 FT)

Flood Zone X Shaded



Design Solutions

1 | Extend Porch Stairs

- use stacked brick - common for homes in this era

2 | Match Existing Openings @ Garage Infill

- match design style and finish for infill elements, including brick band, windows, or doors

3 | Closed Foundation w/ Flood Openings

- Provides visual weight at primary elevation

4 | Post Infill

- Reduces visual impact of elevation project.
- Concrete breeze blocks - traditional for 50s era construction

5 | New Tiered Landscaping

- Use stacked brick for planter walls - common for era
- Plants to align with existing home base level.

6 | New Porch

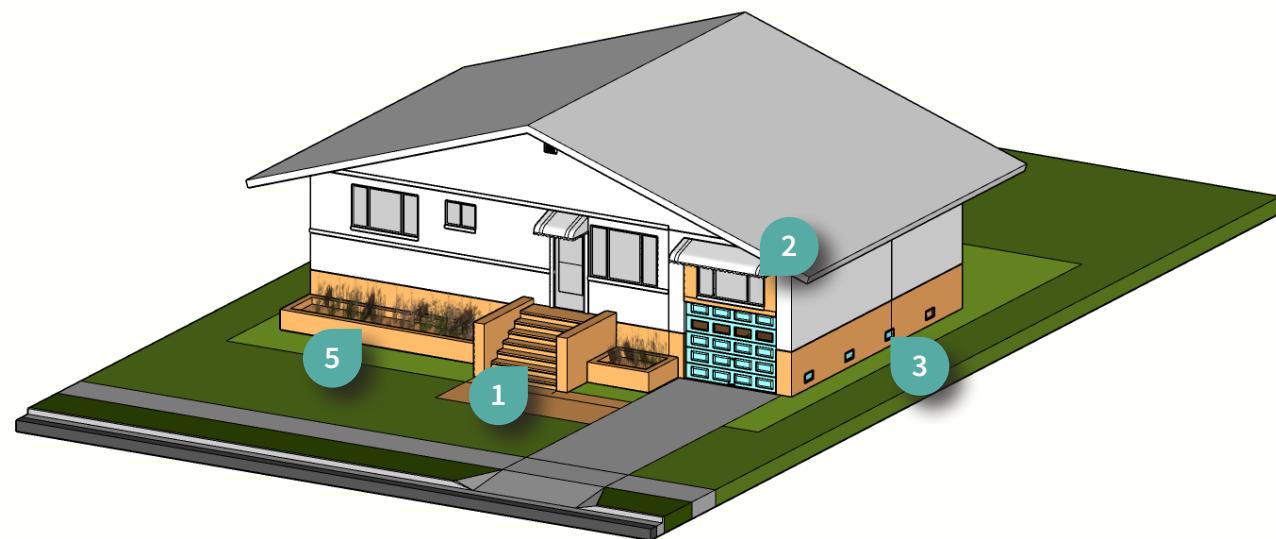
- Concrete breeze blocks - traditional for this era
- increases sightlines & reduces visual impact

Suburban Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

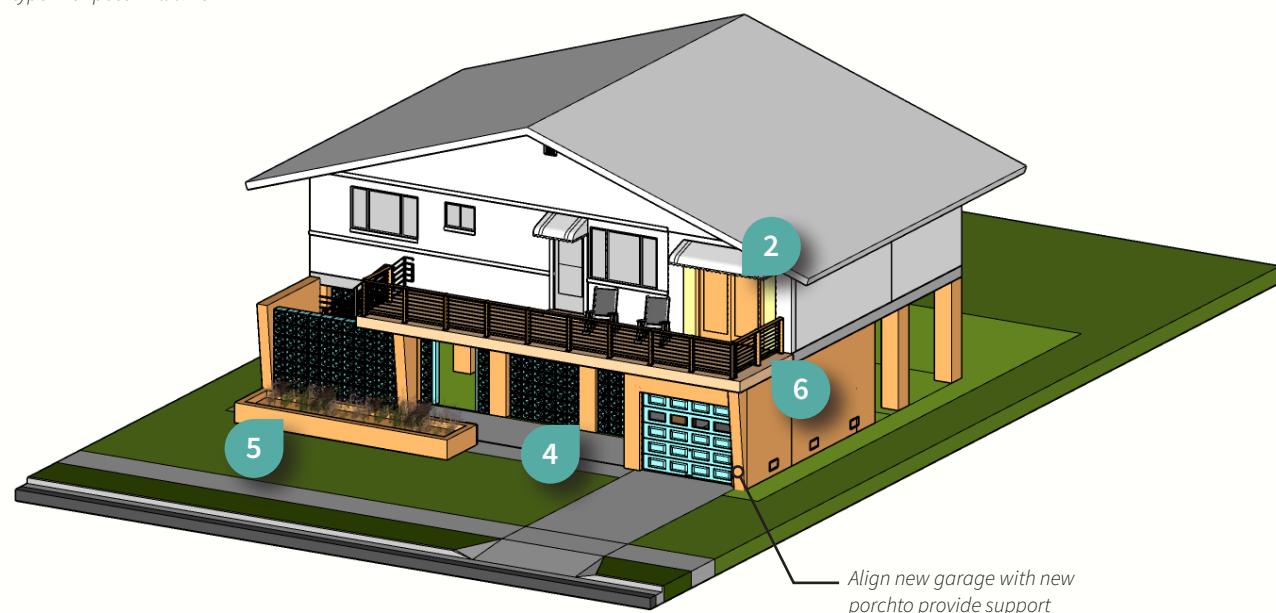
Low Elevation (4 FT)

closed foundation type w/ flood openings



High Elevation (10 FT)

open foundation type with post infill & new front porch



Suburban Character District

1-Story Ranch Style (ca. 1950s)

Existing Features

A | No Visible Foundation

- Lack of visual break between brick walls and ground plane
- Ranch homes often sit low to the ground

B | Picture window w/ side lights

- Existing detailing should inform style of garage infill windows

C | Sheltered Entry

- Located off-center of primary elevation

D | Asymmetrical Elevations

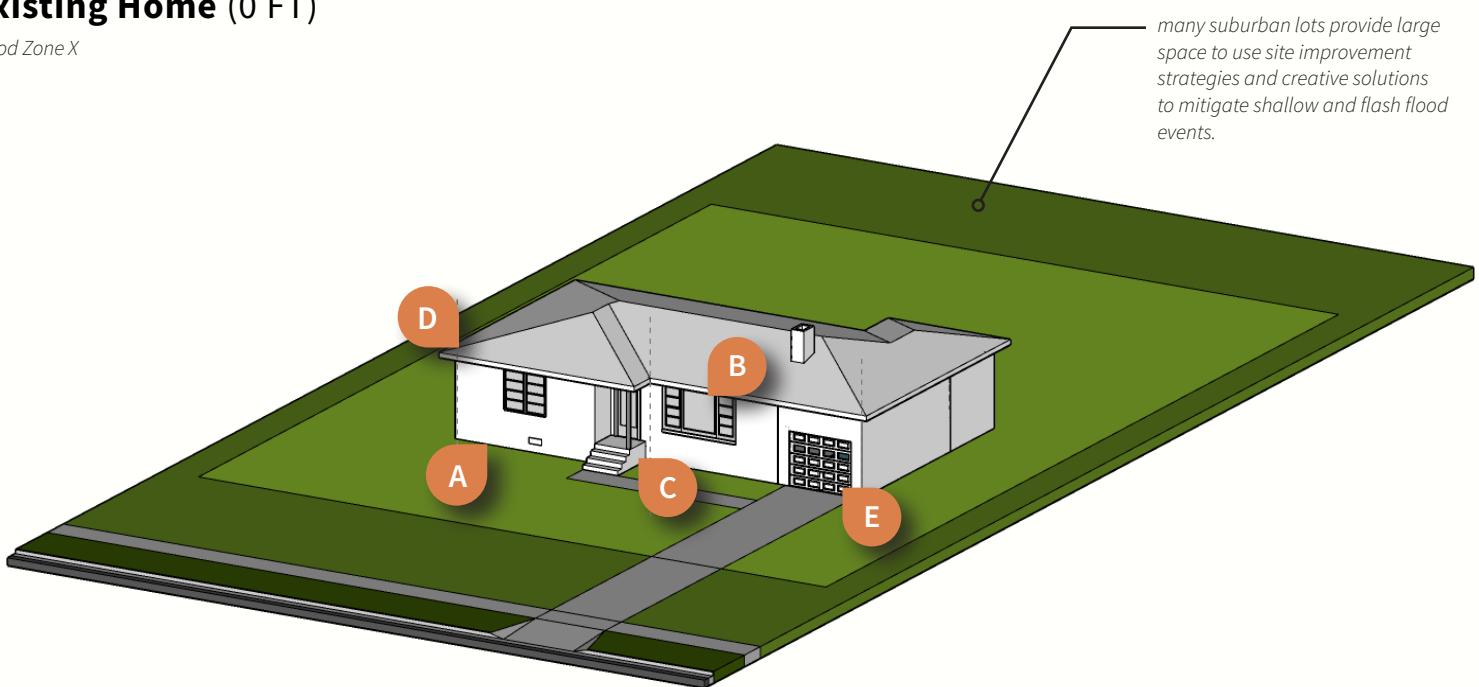
- Door and Window openings are off-centered

E | Garage under Primary Roof

- Existing door will require infill - not an attached structure

Existing Home (0 FT)

Flood Zone X



Design Solutions

1 | Extend Original Stair Orientation

- aligns with original style - break up into multiple runs

2 | Match Existing Windows @ Garage Infill

- match design style of existing feature windows

3 | Open Foundation

- Provides visual weight at primary elevation
- Provides covered space for outdoor storage

4 | Post Infill

- Reduces visual impact of elevation project.
- Concrete breeze blocks - traditional for this era

5 | New Tiered Landscaping

- Use stacked brick for planter walls - common for era
- Plants to align with existing home base level.

6 | Retain Garage at Existing Location

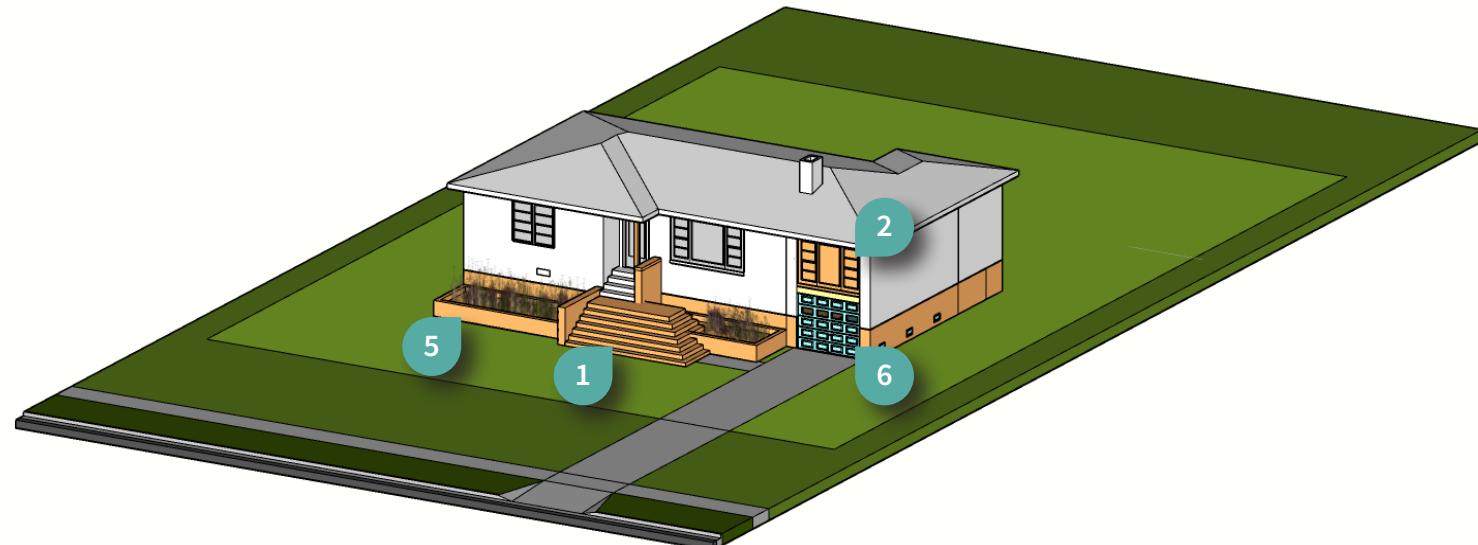
- Reduces visual impact of elevation project by keeping element in place.

Suburban Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

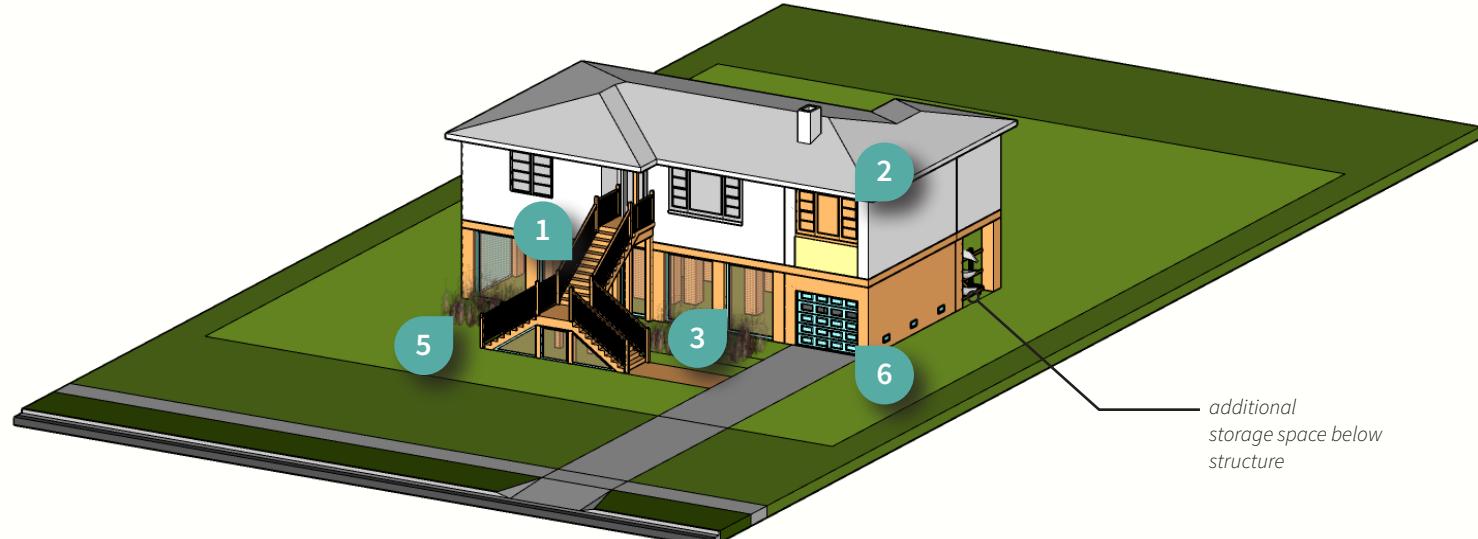
Low Elevation (4 FT)

closed foundation type w/ flood openings



High Elevation (10 FT)

open foundation type with post infill



Suburban Character District

Cape Cod Style (ca. 1940s)

Existing Features

A | Symmetrical Design

- Single Gable roof with all elements under primary roof plane

B | Window Shutters

- Traditional Detail

C | Gable Covered Porch

- Major feature of primary elevation

D | Detached Garage

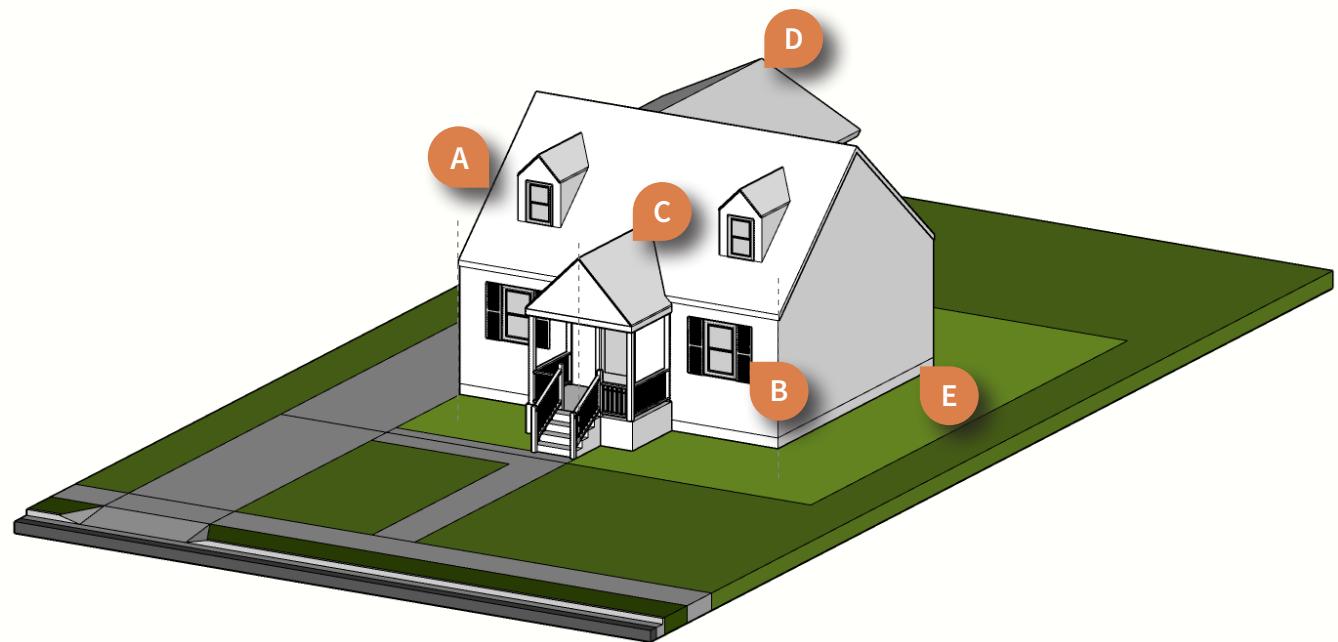
- Horizontal element - align new details with bands

E | Low Profile Foundation

- Horizontal element - minor separation between existing house and ground plane

Existing Home (0 FT)

Flood Zone X

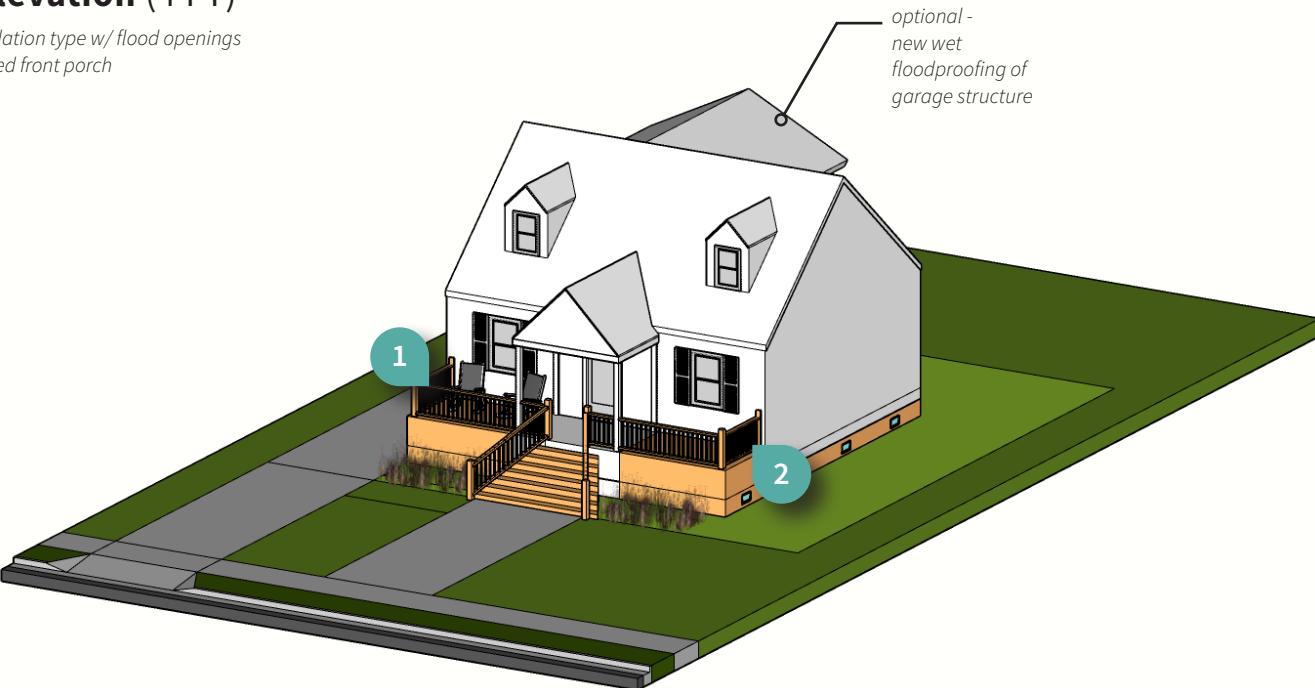


Suburban Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

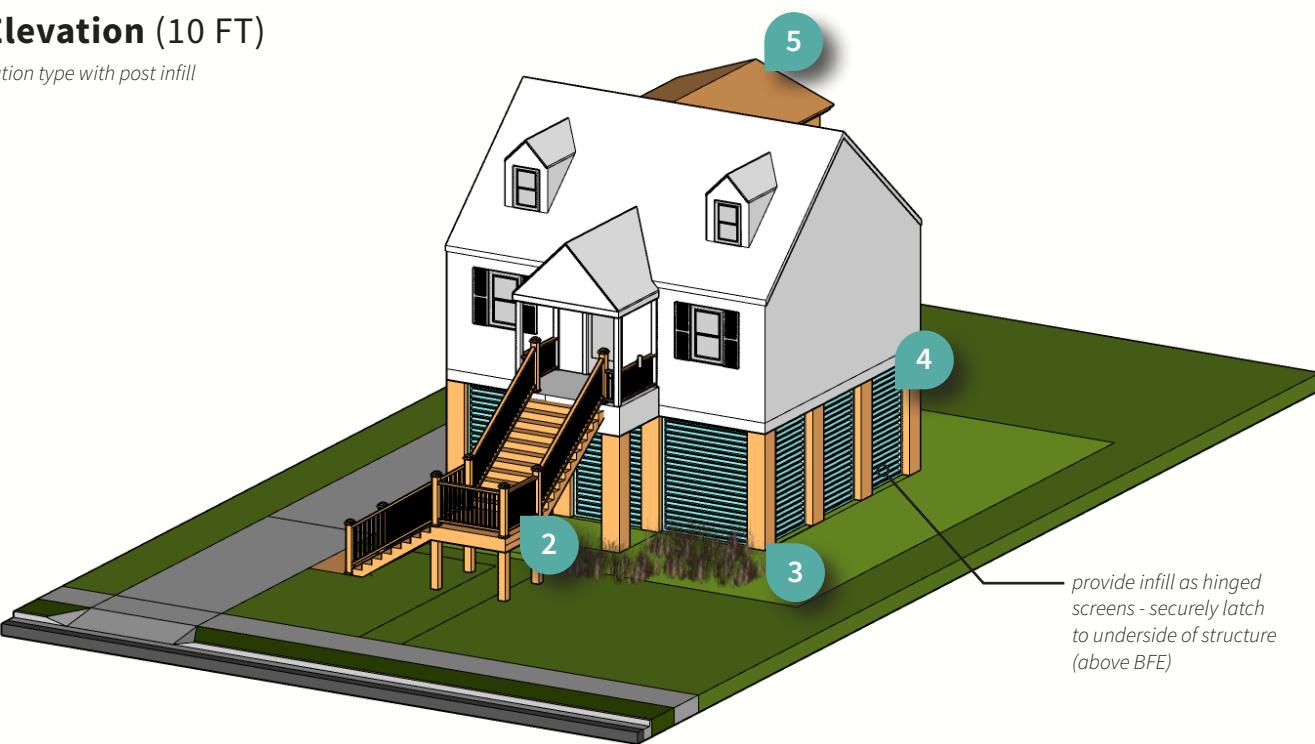
Low Elevation (4 FT)

closed foundation type w/ flood openings and expanded front porch



High Elevation (10 FT)

open foundation type with post infill



Traditional Character District

Two-Story Porch (ca. 1910s)

Existing Features

A | Asymmetrical Design

- Column elements appear unbalanced on primary elevation

B | Double Story Porch

- Increased outdoor living space

C | Brick Stairs

- Major feature of primary elevation

D | Existing Paved Driveway

- Potential area for permeable site improvements

Design Solutions

1 | Extend Original Stair Orientation

- Increases outdoor living space
- Provides additional sightlines

2 | Grade Infill

- Reduces severity of raising a multi-story home.

3 | Adjusted Stair orientation with Ground-Level Porch

- Allows for increased sightlines and accommodates full stair height needed for full-story elevation project.

4 | Post Infill

- Hinged screen with Louvers - traditional solution to allow water movement

5 | Permeable Paving

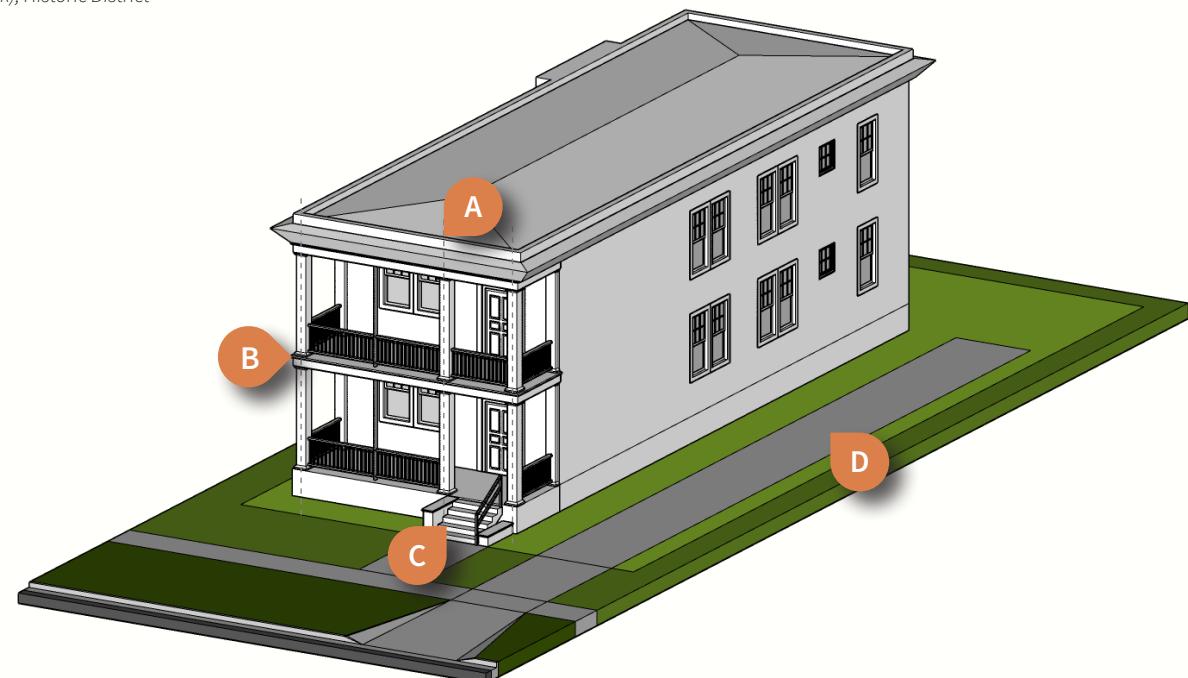
- Allows rainwater to pass through driveway

6 | Open Foundation with Hinged Panels

- Provides visual weight at primary elevation through panels
- Provides covered space for outdoor storage

Existing Home (0 FT)

Flood Zone AE (high risk); Historic District

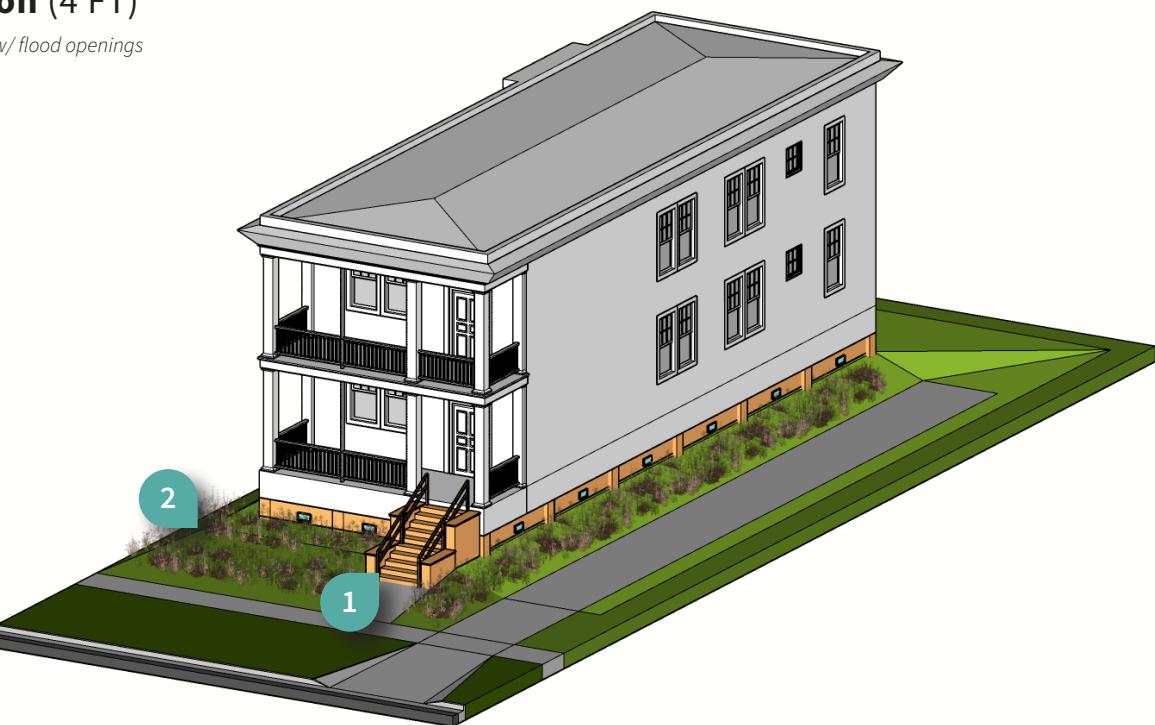


Traditional Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

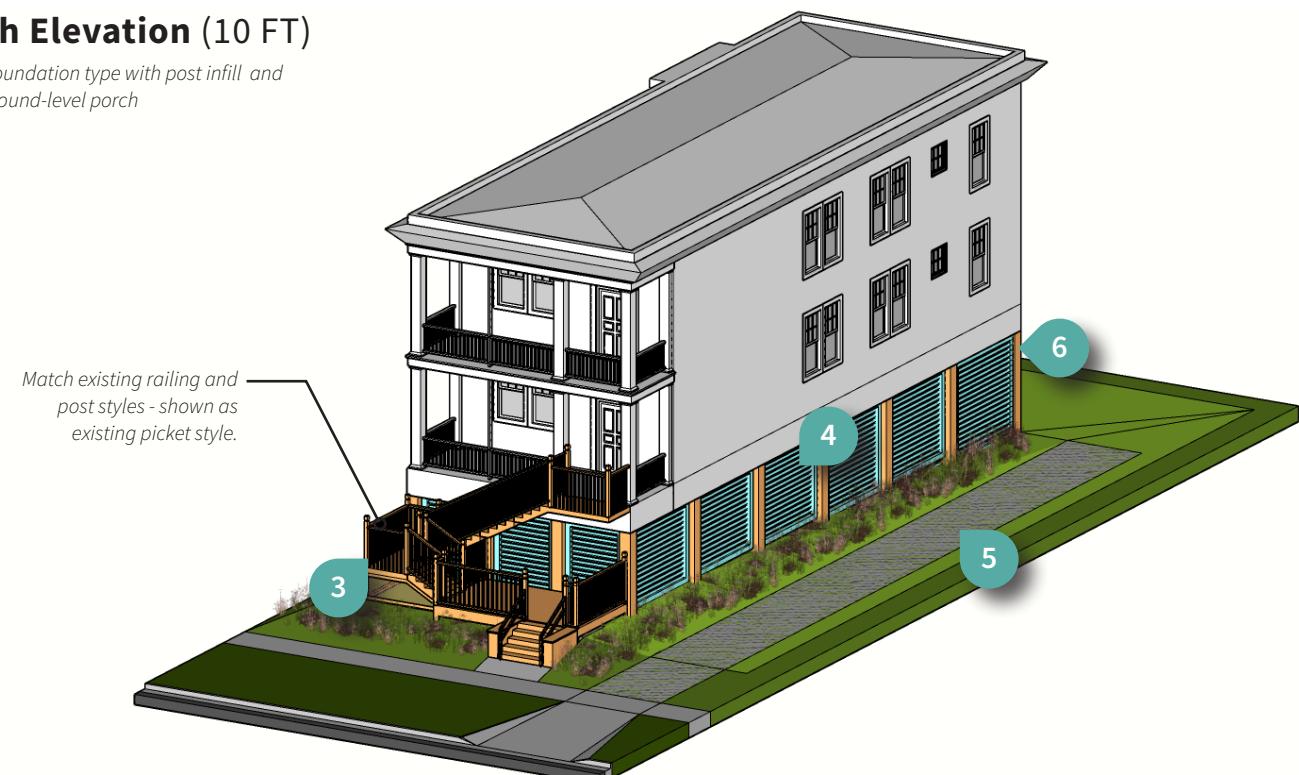
Low Elevation (4 FT)

closed foundation type w/ flood openings



High Elevation (10 FT)

open foundation type with post infill and new ground-level porch



Traditional Character District

Corner Lot Bungalow (ca 1920s)

Existing Features

A | Multiple Primary Elevations

- Front and Side of house visible from street

B | Existing Brick Chimney

- Increased structural considerations for elevation

C | Covered Porch

- Major feature of primary elevation
- Not Located under primary roofline of house

D | Detached Garage

- Existing single story structure.
- Potential to add an ADU.

Design Solutions

1 | Retain Original Porch Access

- Increases outdoor living space
- Retains historic entrance.

2 | Provide Solid Masonry base at Chimney

- Provide all required structure and flood openings

3 | Open Foundation

- Breaks up monolithic appearance of a full closed elevation

4 | Post Infill

- Louvres - traditional solution to allow water movement
- Separate clerestory screen breaks up vertical impact of elevation (high elevation)

5 | Wet Floodproofing of Garage

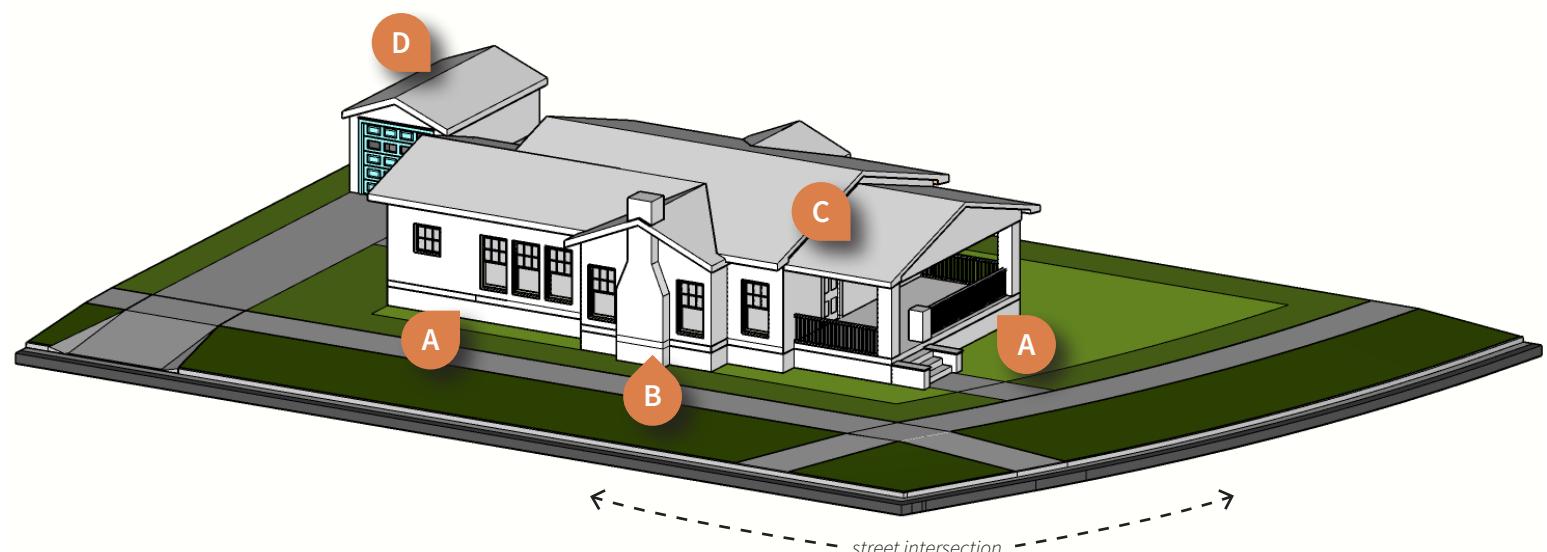
- Louvres - traditional solution to allow water movement

6 | New Ground Level Porch

- Provides sight lines and social connectivity

Existing Home (0 FT)

Flood Zone AE (high risk); Historic District

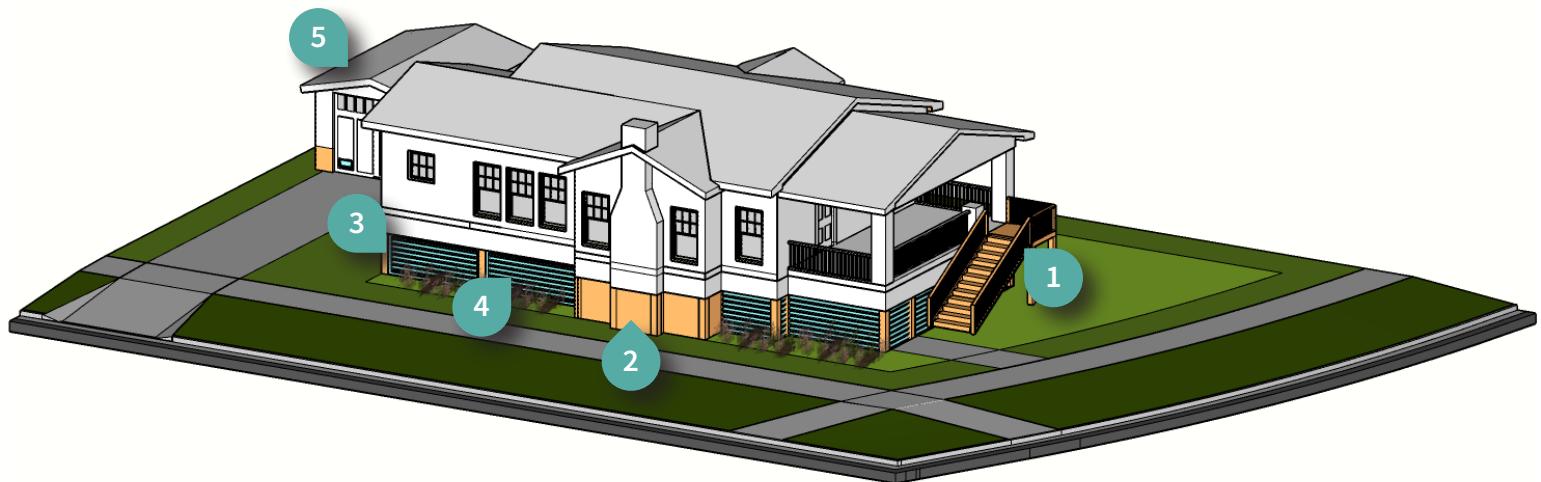


Traditional Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

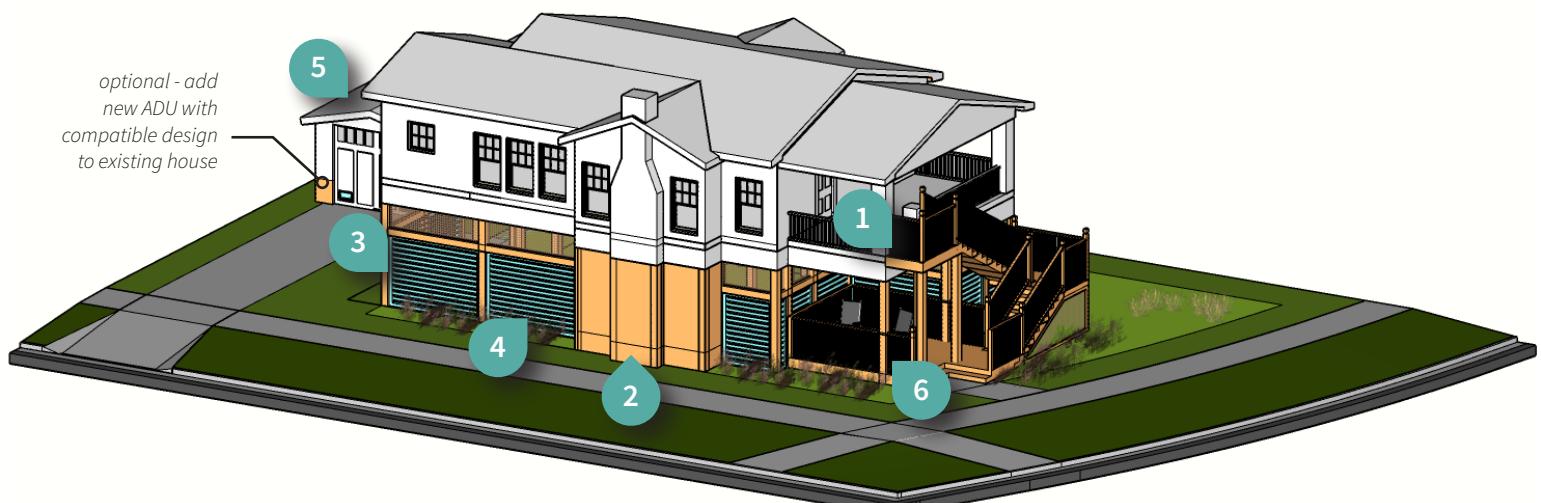
Low Elevation (4 FT)

open foundation with post infill



High Elevation (10 FT)

open foundation type with post infill and new ground-level porch



Traditional Character District

'Norfolk' Bungalow (ca. 1920s)

Existing Features

A | Single Primary Elevation

- Increased structural considerations for elevation

B | Existing Brick Chimney

- Increased structural considerations for elevation

C | Existing Brick Stairs

- Not original construction - can be reoriented.

D | Screened Porch

- Entry is off-center from rest of elevation.

E | Detached Shed

- Potential to add an ADU.

Design Solutions

1 | Retain Original Entry Location

- Retains historic entrance

2 | Reorient Stairway

- Provide access to existing driveway

3 | New Tiered Landscaping

- Breaks up monolithic appearance of a full closed elevation

4 | Post Infill

- Louvres - traditional solution to allow water movement
- Breaks up vertical impact of elevation

5 | Wet Floodproofing of Shed

- protect structure from damage
- new clerestory infill allows daylight into the space

6 | New Porch at Low Level

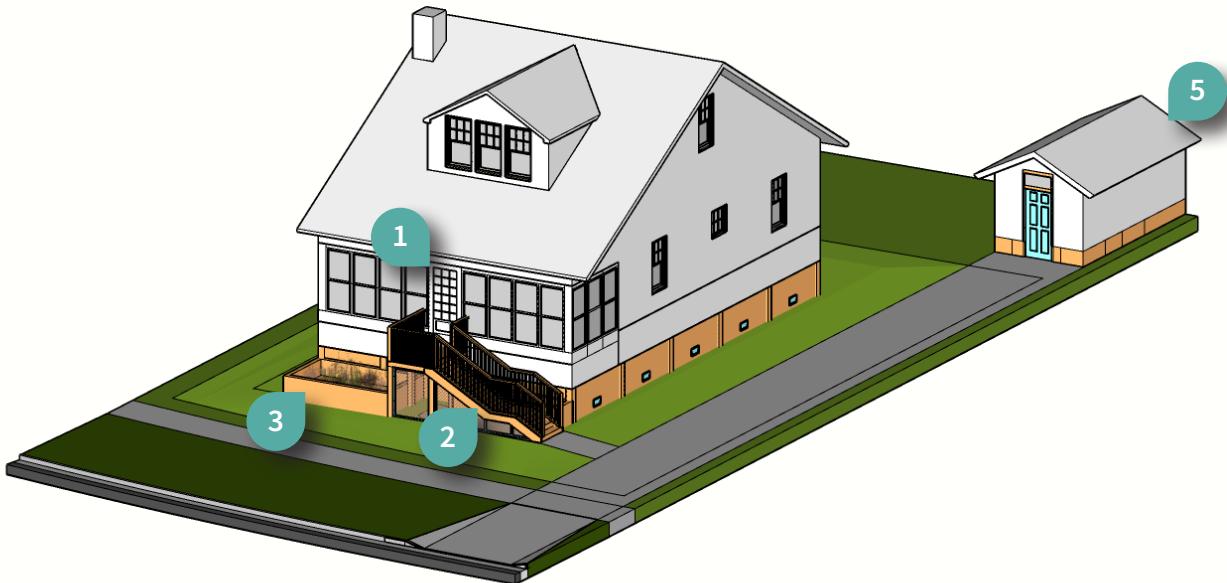
- Increased sight lines between public and semi-private outdoor living spaces

Traditional Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

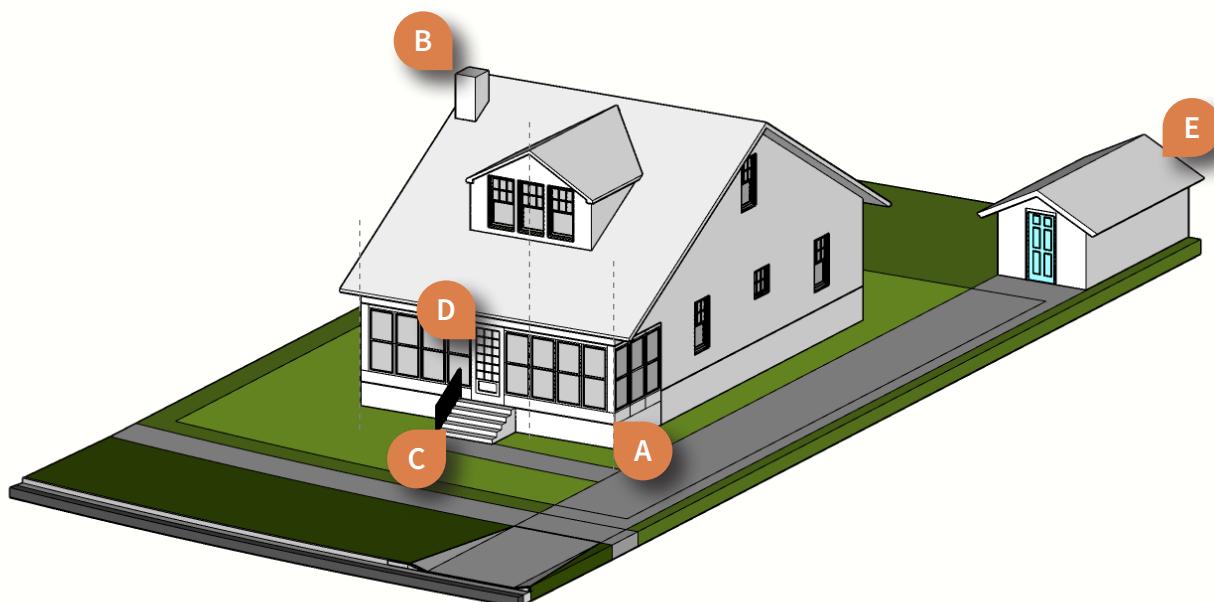
Low Elevation (4 FT)

closed foundation type w/ flood openings



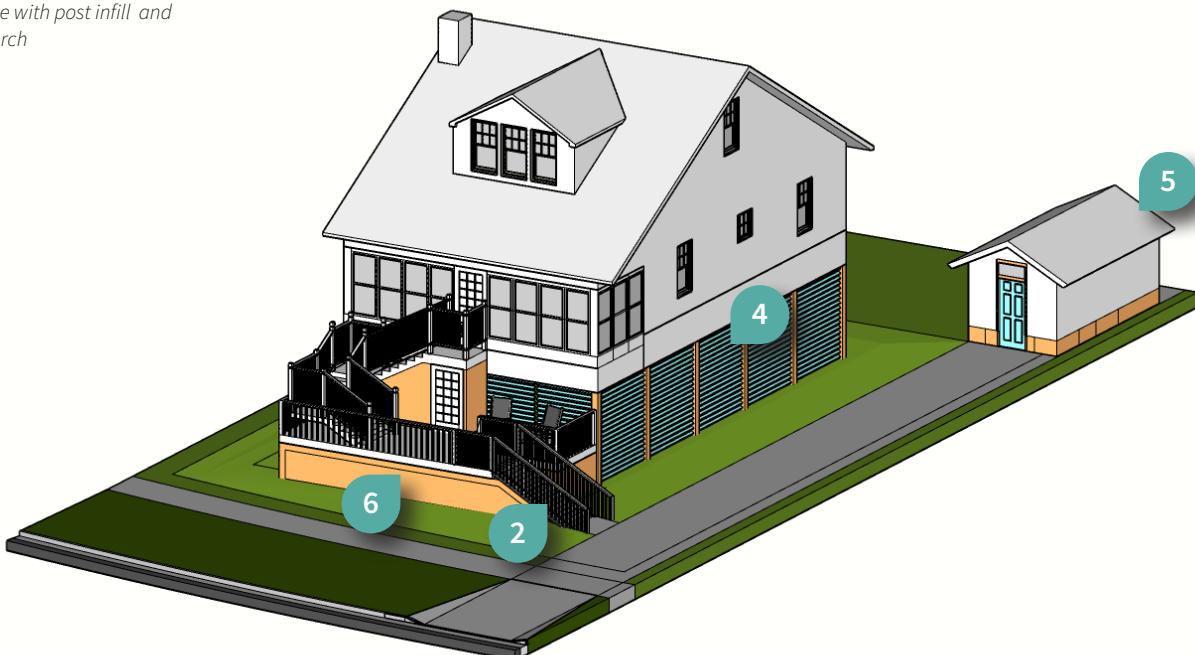
Existing Home (0 FT)

Flood Zone AE (high risk); Historic District



High Elevation (10 FT)

open foundation type with post infill and new ground-level porch



Traditional Character District

Federal Revival (ca. 1940s)

Existing Features

A | Symmetrical Design

- Traditional house style with double masonry chimneys

B | Window Shutters

- Traditional Detail

C | Monolithic Primary Elevation

- No articulation of brickwork, foundation base, or other face materials

D | Existing Enclosed Porch

- Screened elements with side approach

E | Double Brick Chimneys

- Additional weight & structural considerations during raise.

Design Solutions

1 | Extend Original Stair Footprint

- Visually screens raised foundation base
- Traditional federal style curved stairs adds detail

2 | New Tiered Landscaping

- Visually screens extreme elevation change

3 | Open Foundation

- Provide required structural support for main structure and single story additions (porch, wings)
- Sizing of posts to match visual weight of existing structure.

4 | Post Infill

- Reduces visual impact of elevation project

5 | New Garage

- Provide new enclosed parking space below existing wing.

6 | New Secondary Stairway

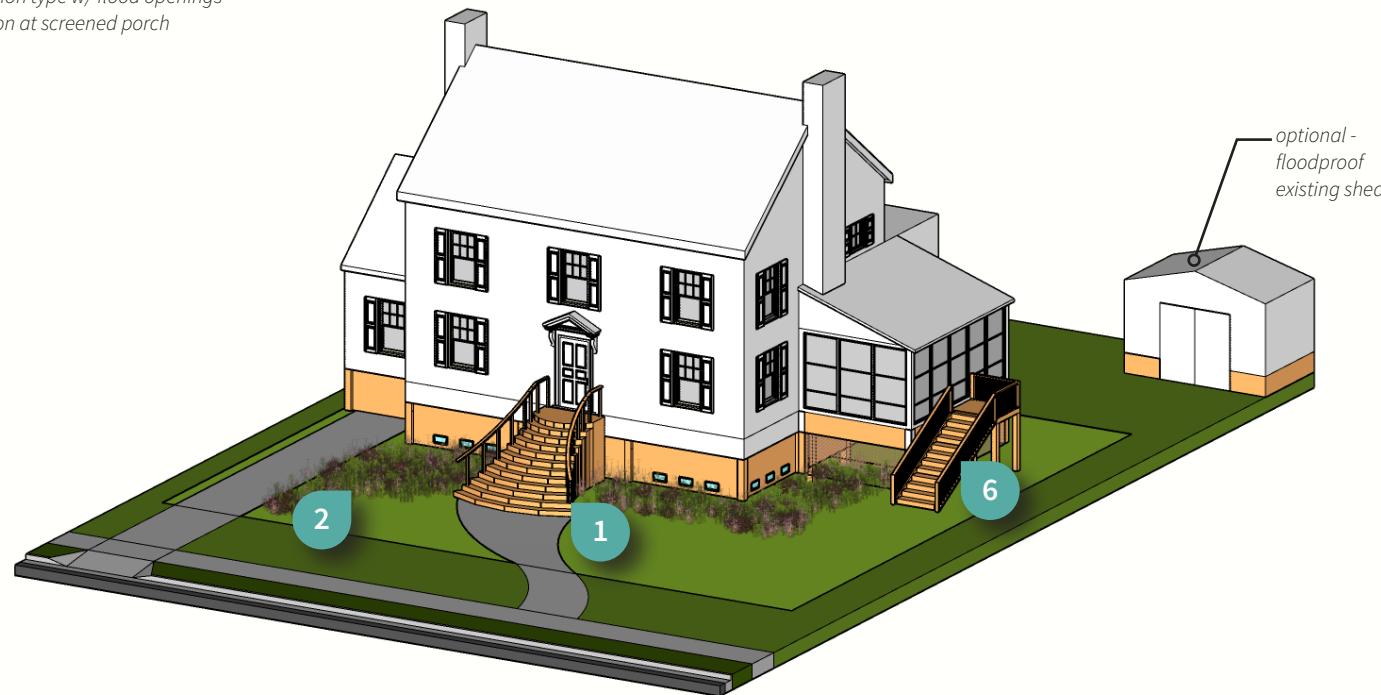
- Provides updated access to porch

Traditional Character District

- Site
- Buildable Area
- Sidewalk/Paved Area
- New Floodproofing
- New Elevation and related Elements

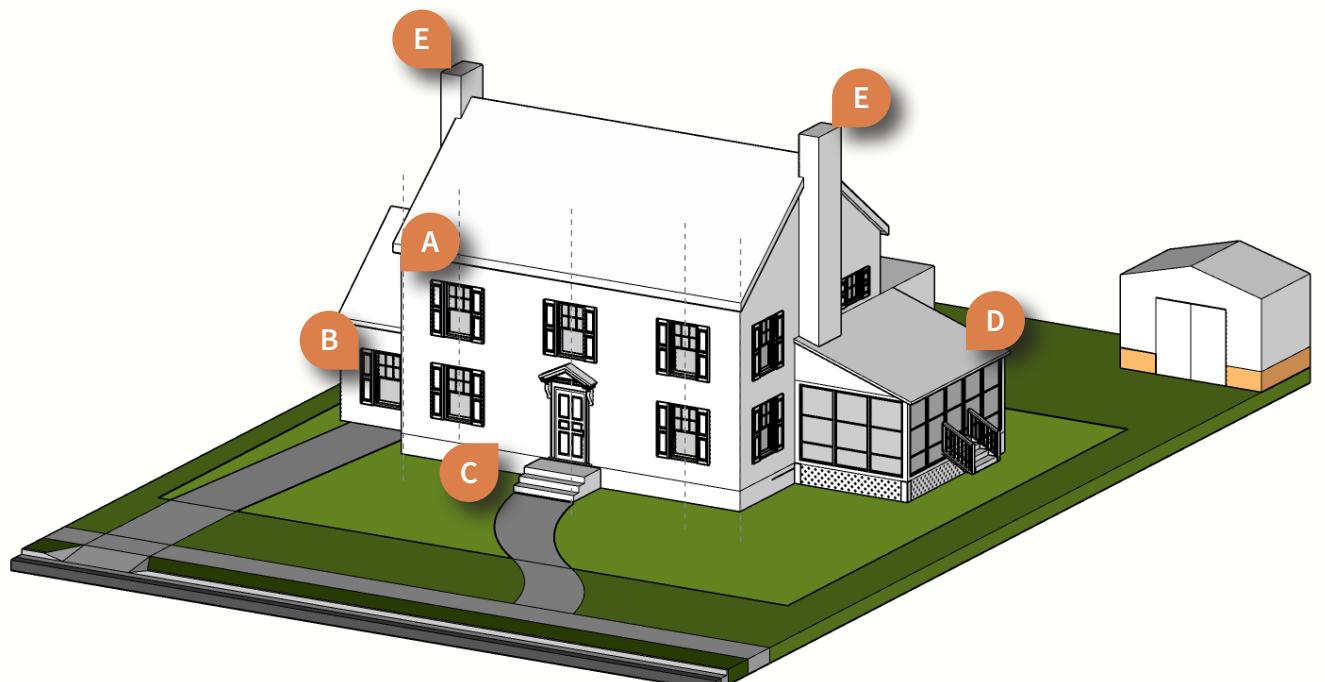
Low Elevation (4 FT)

*closed foundation type w/ flood openings
open foundation at screened porch*



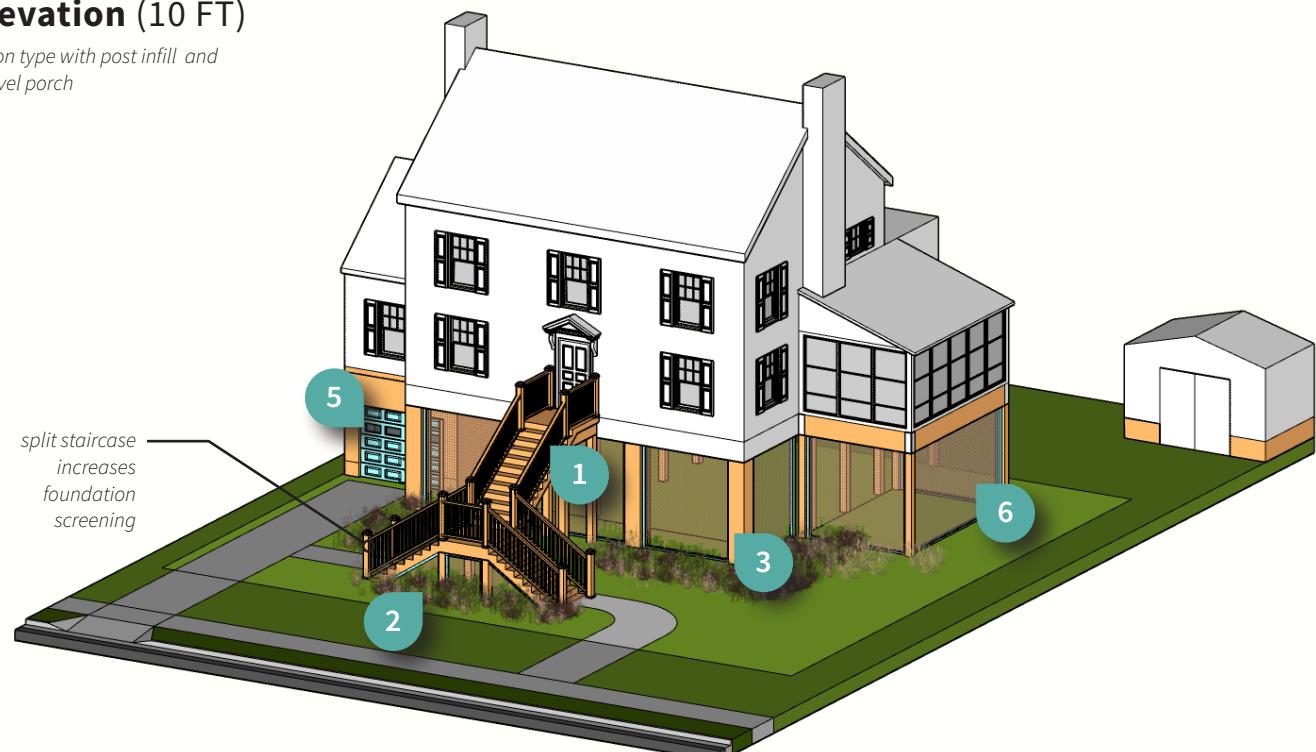
Existing Home (0 FT)

Flood Zone AE (high risk); Historic District



High Elevation (10 FT)

open foundation type with post infill and new ground-level porch



Site Applications

1.5 Story Waterfront Home

Site Details

City Flood District

- Coastal Floodplain District

City Character District

- Traditional District
- Colonial Place Historic District (State & National Register)

Construction Date

- 1911

Construction Type

- Wood Framing
- 3/4 Crawlspace
- Wood Deck
- Wood Patio

Finished Area

- 2,710 S.F.



Flood Details

FIRM Zone

- AE (High Risk)

BFE

- 8.1 Feet (per NAVD 1988)

Freeboard

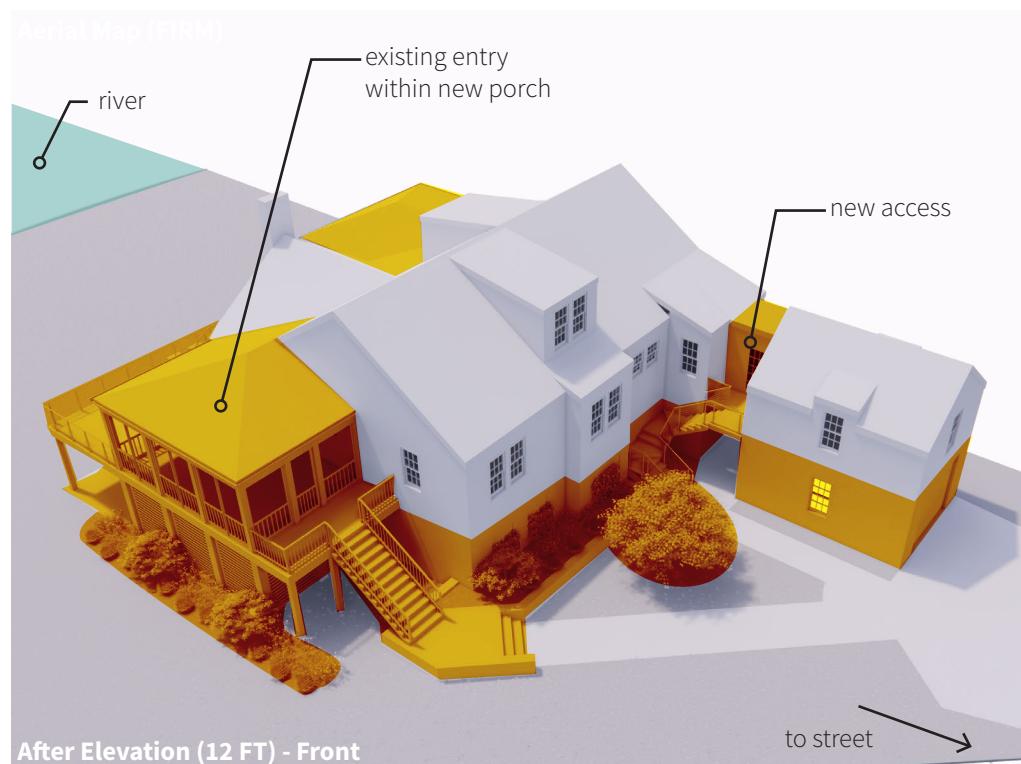
- 3 Feet (by City Zoning Ordinance)

Target DFE (BFE + Freeboard)

- **12 Feet (Rounded up)**

Foundation Type

- Combined
- Closed at existing footprint
- Open at new additions w/ screen infill



Site Applications

1.5 Story Waterfront Home

Existing Details

1 | Crawlspace Foundation

- Less difficult & expensive to lift

2 | Gable Roofs

- Dormer windows

3 | Exterior Deck & Patio

- extension of living space to outdoors

4 | Waterfront Facade

- Entry from rear of home (at garage) - adds additional challenges

5 | Masonry Chimney

- Maintain proper ventilation and location after elevation project.

6 | Accessory Garage

- Maintain proper ventilation and location after elevation project.



Elevation Strategies

1 | Open Foundation

- Provides storage & social space below home

2 | Horizontal Lattice Infill

- provides solid visual appearance for new base of home

3 | Screened Porches

- increased exterior living space
- distinct from existing home

4 | Split Stairwell

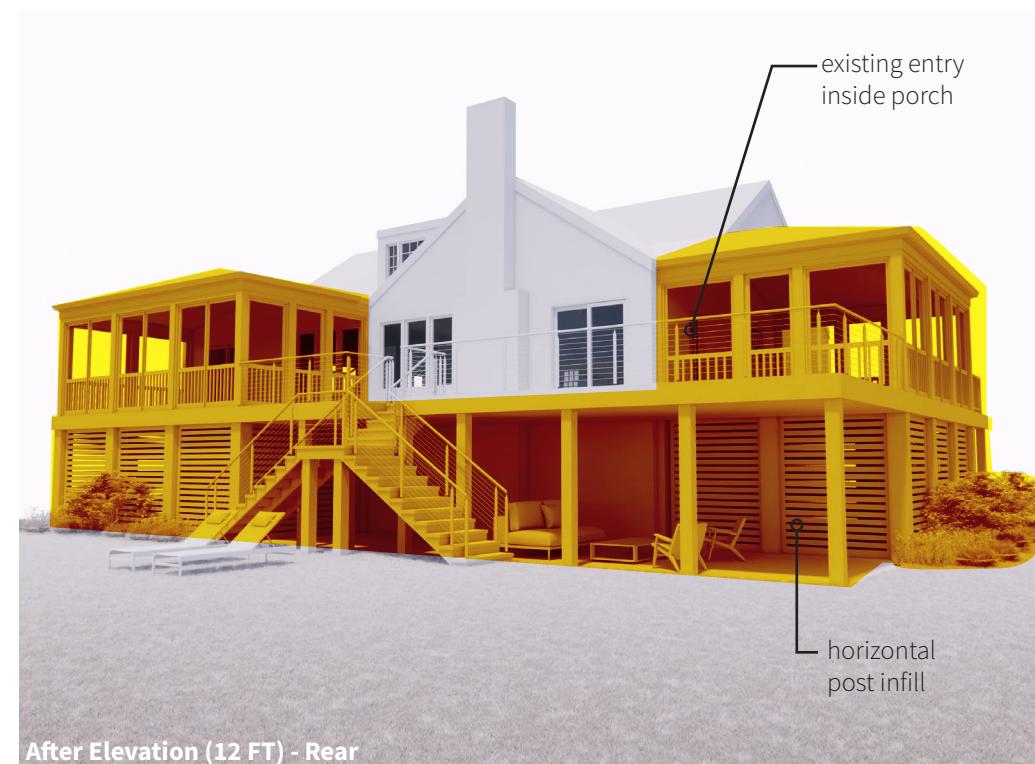
- Reduces visual impact of new height

5 | Modern Cable Railings

- Maintains visual connection to home
- Reduced visual interruption

6 | Landscaping

- Reduces visual impact of new height



Appendix A | Funding and Additional Resources for Raising Homes

Funding Coverage

The City of Norfolk is a participating Community in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS).

CRS participation recognizes the city and its residents for having management strategies that exceed the minimum requirements of NFIP standards, rewarding homeowners with discounted flood insurance premium rates.

Through these programs, FEMA is also able to offer project grants through the Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance programs. These grants are awarded to participating States, who are able to award money to local governments for mitigation projects.

NFIP and Grant Coverage

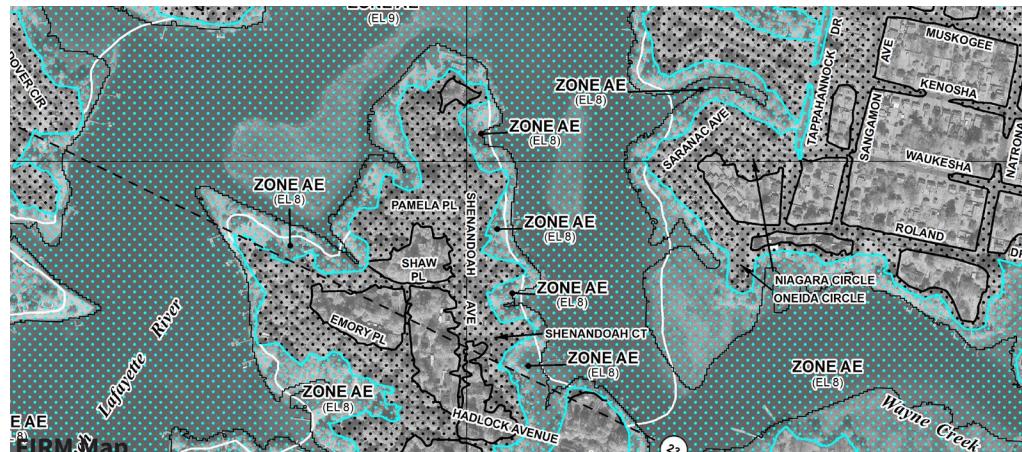
- NFIP Policies and grant funding will generally cover the basic structural changes required for a home elevation project, including temporary cribbing and new CMU or Post foundation, and access stairs.
- The funding does not cover finish materials, as these are not permitted below the BFE; site or landscape improvements.
- Additional grant programs may cover the installation of finishes and site improvements



Temporary Cribbing



Charles Pinckney National Historic Site



Funding Sources

Local and State Programs

Flood/Hazard Mitigation Assistance (FMA/HMA)

- Grant program managed by the Virginia Department of Emergency Management (VDEM)
- Awarded to local eligible entities such as cities and counties.
- Individual property owners must apply through an eligible subapplicant (City of Norfolk) to be considered for funding opportunities.** Contact the local floodplain administrator for more information on how to participate.

Requirements:

- Elevation Certificate
- Flood Claim History
- Photos of property, including any accessory structures, flooding, or flood damage.
- Proof of Flood and Property Insurance

Visit the City of Norfolk website for more information: <https://www.norfolk.gov/1055/Flooding-Awareness-Mitigation>

Virginia Income Tax Credit

Credit = 25% of qualified expenditures.

Requirements:

- Must be listed on national registry - Individual property or contributing to historic district listing.
- Must be income producing or privately owned.
- Expenditures must meet threshold of adjusted value & can be accompanied by renovations.

The screenshot shows the City of Norfolk website with a sidebar for 'Flood Insurance' and 'Flood Zones/Regulations'. The main content is about the Hazard Mitigation Assistance (HMA) Grant Program, which provides funding for repetitive flooding damage. It includes requirements like an elevation certificate and a damage estimate over 50% of the home's market value. Helpful links include FEMA Hazard Mitigation Assistance and Status of Pending Projects or Applications.

The screenshot shows the State DHR website for historic homes. It features a large image of a red brick building and provides information on the Historic Rehabilitation Tax Credits. It includes contact information for Chris Novelli (804-482-6097) and a link to the 'Information' and 'Important Links' sections.

Funding Sources

Federal Programs

NFIP ICC Coverage

Additional insurance policy rider covering up to \$30,000 of costs for projects with Significant Improvement or Significant Damage (SI/SD) Determinations.

Requirements:

- Elevation Certificate
- Damage Estimate of over 50% original market value of the home by the local floodplain administrator
- Cost Estimate and Construction Contract

FHA 203K Loan / Mortgage

- Administered through the U.S. Department of Housing and Urban Development (HUD).
- Uses 120% of appraised value of home - home equity.
- Construction loan that converts to standard rate mortgage.
- Applications must be submitted through an FHA Approved Lender.

Federal Income Tax Credit

Credit = 20% of qualified expenditures.

Requirements:

- Must be listed on national registry - Individual property or contributing to historic district listing.
- Must be income producing or privately owned.
- Expenditures must meet threshold of adjusted value & can be accompanied by renovations.

The screenshot shows the FEMA website with a sidebar for 'Floodplain Management' and 'Get Financial Help'. The main content is about Increased Cost of Compliance (ICC) coverage, which helps offset costs for floodplain management ordinances. It includes a link to the 'FEMA Website'.

The screenshot shows the HUD website for 203(k) Rehab Mortgage Insurance. It includes a summary of the program, which enables homebuyers and homeowners to finance both the purchase (or refinancing) of a house and the cost of its rehabilitation through a single mortgage or to finance the rehabilitation of their existing home. It also includes a 'Type of Assistance' section and a 'HUD Website' link.

The screenshot shows the NPS website for historic preservation tax incentives. It features a large image of a historic building and provides information on the 20% credit for rehabilitation. It includes links for 'About', 'Before You Apply', 'Application Process', 'The Secretary's Standards for Rehabilitation', 'Planning Successful Projects', and 'Check Project Status'.

The screenshot shows the NPS website for historic homes, specifically the 'About the Incentives' page. It includes a '20% Credit' section, a 'Case Studies of Successful Projects' section, and a 'Annual and Statistical Reports Archive' section. The page also features a 'SEARCH' and 'MENU' bar.

Additional Guidance

There are many additional resources for home elevation projects at both the federal and the local level. Below are some of the most comprehensive and relevant documents that were utilized in developing this Pattern Book.

Technical Guidelines

- Federal Emergency Management Agency (FEMA) P-312. *Homeowner's Guide To Retrofitting: Six Ways to Protect Your Home from Flooding*. 3rd Edition, 2014.
- ASCE/SEI 24-14. *Flood Resistant Design and Construction*. 2015.
- FEMA - National Flood Insurance Program Technical Bulletins
- FEMA. *Foundation Requirements and Recommendations for Elevated Homes*. 2013.

Elevating Historic Homes

- National Park Service. *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings*. 2021

Landscaping & Site Improvements

- Virginia Department of Conservation and Recreation. "Native Plants Guide for Conservation, Restoration and Landscaping: Virginia Coastal Plain". 2011.
- US Fish & Wildlife Service. *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*. 2003
- Chesapeake Bay Native Plant Center. www.nativeplantcenter.net
- Chesapeake Bay Foundation. *Hampton Roads Homeowner's Guide to Flooding: Managing Polluted Runoff using Nature-Based Solutions*.

