City of Charleston

South Carolina

Machinery and Equipment Elevation Requirements in the Floodplain

Machinery and Equipment (**M&E**) in the Special Flood Hazard Area (**SFHA**) must be elevated to the Design Flood Elevation (**DFE**) in accordance with South Carolina Residential and Building Codes and City of Charleston Ordinance §27-116(a)(2). Applicable Machinery, Electrical, Plumbing and Gas **(MEPG)** systems servicing buildings include HVAC units/compressors, HVAC ductwork, furnaces, hot water heaters, generators, solar panel systems, electrical panels, and electrical disconnect switches. Proper elevation of M&E systems may result in reduced flood insurance premiums.

Follow these 4 steps to determine the correct elevation for your M&E:

1. Determine Your Flood Zone and Base Flood Elevation

Use FEMA's Map Service Center or the City of Charleston GIS/Mapnet website to look up the address in question. The SFHA/floodplain is made up of flood zones AE and VE whereas X zones are outside of the SFHA. Properties located in the X zone do not have M&E elevation requirements. The Base Flood Elevation (**BFE)** follows the flood zone designation, for example, an AE-11 zone would have a BFE of 11' NAVD88, a VE-9 zone would have a BFE of 9' NAVD88. North American Vertical Datum 1988 (NAVD88) refers to the official vertical datum used for measuring elevations relative to sea level. An important distinction to make is that elevations measured in NAVD88 do not represent height above ground. Learn more about NAVD88 and vertical datums.

2. Determine Your Scope of Work

After determining your BFE for the property, you next need to determine the scope of work. Depending on the scope of work and Substantial Improvement determination, requirements will vary. The DFE is the Base Flood Elevation (BFE) plus Freeboard.

Project Type	Notes	Freeboard Requirement
New Construction Non-Residential Substantial Improvement/Repair New (Not Replacement) M&E Systems	If a non-residential structure's 1-year cumulative renovation or repair costs equal or exceed 50% of the building's value, existing M&E systems must be elevated to DFE. Any new M&E systems that are not replacement in-kind, regardless of the scope of work, shall be elevated at or above the DFE. **DFE = BFE + 2 ft. Freeboard.**	2 ft. freeboard
Residential Substantial Improvement/Repair	If a residential structure's 1-year cumulative renovation or repair costs equal or exceed 50% of the building's value, existing M&E systems must be elevated to DFE. **DFE = BFE + 1 ft. Freeboard.**	1 ft. freeboard

3. Establish Grade or First Floor Elevations

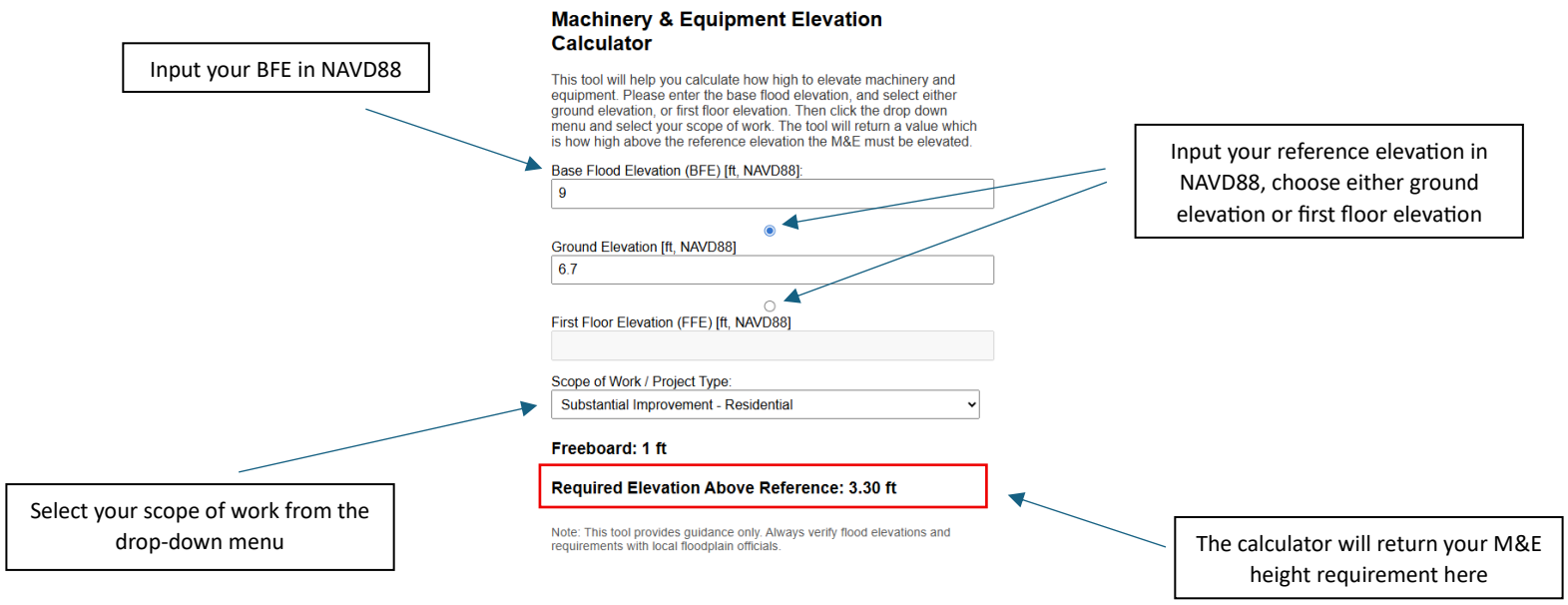
These are what are known as reference elevations. The difference between the reference elevation and DFE can be used to calculate the height of M&E. The reference elevation and DFE must be in the same vertical datum for the calculation to work.

- **South Carolina Licensed Professional:** A SC Licensed Surveyor or Engineer can perform a survey on the property to document elevations in a Site Plan with spot elevations or an Elevation Certificate. This is the most precise and widely accepted method.
- **Use Local Benchmarks or Known Elevations:** Reference historical or geospatial benchmarks, if available.
- **Geospatial Mapping Tools:** Tools like Google Earth, Google Maps, USGS Map Viewer, City Mapnet, or topographic maps may provide approximate elevation data. These tools should be used cautiously as grade elevations can vary significantly on a lot; they do not replace a licensed professional's survey data.

If you're uncertain about the elevation requirements for your property, datum conversions, or need assistance obtaining an elevation certificate, consult with a City of Charleston Floodplain Management official, Building Inspections staff, or SC Licensed Surveyor/Engineer.

4. Calculate M&E Height

Once you've gathered a reference elevation (first floor or adjacent grade), you can calculate M&E height requirements using the linked **M&E Elevation Calculator** (https://jrksc2025.github.io/elevation-calculator/elevation_calculator.html).



Exceptions for M&E Elevation:

- **Replacement In-Kind (Not Substantial Improvement):** If M&E is replaced in-kind rather than newly installed, it may remain at the existing level below the DFE until the structure is substantially improved. However, the replaced M&E may not be lowered below the existing elevation. In cases where M&E is damaged from a flood event, mitigation/elevation is advisable.
- **Historic Variance Granted:** A variance can be obtained for a historic building, providing relief from floodplain requirements. M&E elevation may still be required where feasible as a condition of variance approval. Learn more about historic variances.
- **Designed to Withstand Flood Loads:** In limited cases, M&E systems may be located below the DFE if they have been designed to prevent water from entering or accumulating within the components and to resist hydrodynamic loads and stress. In cases where this option is pursued, the M&E system design specifications must be submitted and approved by the City prior to installation. See below for additional policy guidance on ductwork and receptacles:
    - ❖ Existing HVAC Systems and Ductwork Below DFE
    - ❖ New Construction Electrical Systems Below DFE
- **Dry Floodproofing/Flood Panels:** M&E systems servicing non-residential structures are permitted below DFE within a dry floodproofed enclosure (NFIP Technical Bulletin 3) so long as they are not located in the Coastal-A or V flood zones.
- **Owned or Maintained by Utility Companies:** M&E such as water, sewer, gas and power service lines and meters, and public utility transformers, may not be required to adhere to all elevation requirements. More information on electrical meters and disconnects.