

## **Flood Mitigation Guidelines for Buildings in Zone D and Historic Buildings**

### **Background**

The City and County of San Francisco (the City) participates in the National Flood Insurance Program (NFIP). In support of the City's participation in the NFIP, the Federal Emergency Management Agency (FEMA) has issued a Flood Insurance Rate Map (FIRM) for the City. The FIRM has an effective date of March 23, 2021. The City has adopted the FIRM through its Floodplain Management Ordinance (no. 226-20). The FIRM identifies areas that are subject to inundation from a flood event having 1% chance of occurrence in a given year (referred to as the "Base Flood" or "100-year flood"). The areas subject to inundation during the Base Flood are referred to as Special Flood Hazard Areas (SFHAs). On the San Francisco FIRM, SFHAs are designated as:

- Zone AO-Area subject to inundation with sheet flow less than one foot.
- Zone AE – SFHAs subject to inundation due to tidal surge and waves that are less than three feet in height.
- Zone VE – SFHAs subject to inundation due to tidal surge with the additional hazards that accompany waves that are more than three feet in height.

The FIRM also identifies Zone D and Zone X areas outside SFHAs. The Zone D designation indicates an area of possible, but undetermined, flood risk and is used for structures over water, including the Port's piers and wharfs. There are two types of Zone X areas:

- "Shaded" Zone X – these areas, which are shown with shading on the FIRM, are subject to inundation during a flood having a 0.2% chance of occurrence in a given year (referred to as the "500-year flood")
- "Unshaded" Zone X – these areas, which are shown without shading the FIRM, are the areas outside identified flood hazards and are subject to minimal flood risk

New construction and substantial improvements of buildings and attendant utilities in SFHAs are required to comply with the City's Floodplain Management Ordinance. The ordinance, which meets the minimum requirements of the NFIP, incorporates the flood-resistant design and construction requirements of the California Building Code, which in turn incorporates the standards of ASCE 24-14.

### **Recommendations for buildings in Zone D and/or historic buildings/structures-**

New construction and substantial improvements in Zone D areas, which are outside of SFHAs, are not required to incorporate the flood-resistant design and construction standards of ASCE 24-14. Projects involving historic buildings are also exempt from compliance with ASCE 24-14 as long as these buildings maintain their historic structure designation status. Sponsors of rehabilitation projects in Zone D and/or projects involving historic buildings/structures should proactively take steps to mitigate current flood risk, and should also consider anticipated sea level rise during the design life of the respective project. For sea level rise guidance for capital projects, please refer to following webpage: <https://onesanfrancisco.org/sea-level-rise-guidance>.

Suggested flood mitigation measures for substantial improvements of historic buildings/structures and new construction and substantial Zone D buildings/structures-

- (1) **Buildings/structures**-If possible, elevating the lowest floor of the building and utilities above base flood elevation should be considered to mitigate or eliminate flood damage.

The project should be designed and anchored to prevent flotation, collapse, or lateral movement of the building/structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. The project can also incorporate various floodproofing measure including construction with materials resistant to flood damage and by methods and practices that minimize flood damage, and designing and/or locating building utilities to prevent water from entering or accumulating.

- (2) Attendant utilities and related facilities -Water, sewer, gas and electrical systems should be located and constructed to minimize or eliminate flood damage. Water supply systems should be designed to minimize or eliminate infiltration of flood waters into the systems. Sanitary sewage systems should be designed and constructed to minimize or eliminate infiltration of flood waters into the systems and discharges from sewage systems into flood waters.

Reference documents/guidelines

- (1) NFIP Floodplain Management Bulletin-Historic Structures (FEMA P-467-2)
- (2) Pier Floodproofing-Summary of Adaptive and Significant Interventions