Florida Floodplain Managers Association
Coastal Committee

DRAFT
Policy and Design Options for Public Restrooms in Special Flood Hazard Areas

March 26, 2014

The above Florida public restroom in a VE18 zone was granted a variance (the minimum necessary to afford relief) from elevation requirements after maps changed from AE 10 during the design phase. Meeting V zone requirements on-site would have rendered the construction of this facility infeasible according to the design engineering firm. The design was developed to accommodate disabled citizens and to partially address a "hardship" in the limited land area because of sensitive, ecologically-significant mangrove habitat. Composting toilets are used with no running water or on-grid electricity. An emergency action plan was required as a condition for the variance which includes removal of effluent from tanks and filling them with clean water, removal of battery-powered electrical equipment and material that could block flood openings one to two days before expected landfall of a hurricane. All building materials below BFE are flood damage resistant.

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Acknowledgements:

FFMA's Coastal Committee, chaired by FFMA President Desiree Companion, included committee members who represent diverse backgrounds including building officials, floodplain managers, architects, engineers, planners and CRS coordinators. The State Floodplain Management Office provided project coordination and support and was instrumental in facilitating the functioning of the committee to help FFMA ensure that the broadest representation and participation in the committee's deliberations could be successfully achieved. The survey on communities' public restrooms was administered by staff from Collier County's Floodplain Section, and the participating communities who provided responses to the survey are greatly appreciated, though they remain anonymous in the paper as a condition of their participation in the survey. FFMA and the Committee are particularly appreciative of the gratis work on the part of Weiler Engineering Corporation, a Florida-based engineering firm with offices in Punta Gorda, Marathon and Key West, for providing schematics for an engineered public restroom. The restroom was designed to withstand the 1% annual chance flood level under site-specific conditions on a specific parcel in southwest Florida. The drawings and description of the engineered, flood resistant structure is provided to serve as an example of the kind of structure that could be custom-designed and built within a V zone on a specific site in southwest Florida that would meet all flood load requirements for the established BFE, however, not necessarily compliant with existing NFIP minimum regulations.

Disclaimer:

The narrative, recommendations, ideas, designs and concepts provided in this paper are intended for educational purposes only, and do not necessarily represent the views, opinions or perspectives of any organization that participated in the committee's work or of the individual members of the committee, or individuals and organizational members of FFMA. Further, the design concepts provided **are not** intended to represent an allowable design that could be constructed compliant with existing NFIP regulations or guidelines at the time of publication of this paper.

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Policy and Design Options for Public Restrooms in Special Flood Hazard Areas

1. Abstract

Most states experience significant broad-based economic value from tourism and by providing access to outdoor recreation activities enjoyed by both seasonal and year round residents. This is especially true in Florida where the most frequently pursued recreational activities in the "Sunshine State", which hosts nearly 90 million tourists and 30 million residents, involve water-oriented activities often occurring within designated Special Flood Hazard Areas (SFHAs). Design and construction costs, and aesthetic and convenience factors, challenge communities and private recreation providers in building National Flood Insurance Program (NFIP)-compliant elevated public restrooms. Though "public restrooms" are not defined in NFIP regulations or the International Building Codes upon which many state building codes are based, the Committee's proposed definition is provided in Section 4. NFIP elevation requirements identified on digital flood insurance rate maps (DFIRMs) may require that public restrooms (in Florida) must be constructed at an elevation of 10 to over 21 feet above sea level, resulting in designs of structures typically elevated on piers 7 to 18 feet or more above grade elevations. Therefore, communities and private providers have assumed the risk of constructing restrooms that may be flood resistant but not necessarily elevated to or above the Base Flood Elevation (BFE), and therefore, are viewed as non-compliant.

Florida contains 38% of the NFIP policies nationwide (FEMA, Region IV). The Florida Floodplain Managers' Association (FFMA), which includes members who are employed by 159 communities in Florida, initiated development of this paper. Communities and private recreation providers face significant challenges in meeting NFIP requirements for constructing facilities and especially public restrooms that must be elevated above the BFE, and also that comply with accessibility codes.

A number of potential opportunities within the existing NFIP framework of policies, standards and guidelines strongly support the appropriateness of allowing flood resistant, reasonably accommodating, and readily accessible, public restrooms to be built below established BFEs. We focus on the need for flexibility in NFIP guidelines to allow for the design and construction of public restrooms in both A and V zones in three basic options:

a) elevate facilities to meet existing or more restrictive future NFIP building standards;

b) construct engineer-certified facilities below BFE with breakaway walls as is currently allowed for structures used for access, storage or parking; or,

c) construct engineer-certified wet or dry floodproofed structures below BFE that are designed to withstand all 1% annual chance flood loads for the structures' specific locations.

The following challenges and opportunities identified by the Committee support the need for the NFIP to include regulations and/or guidelines that provide flexibility for engineer-certified below-BFE public restrooms that will withstand 1% annual chance flood loads:

- Lack of specific NFIP guidance and building standards that recognize public restrooms as unique, limited use facilities in SFHAs;
- Key existing NFIP guidelines, State building code standards, International Building Code (IBC), American Society of Civil Engineers' *Flood Resistant Design and Construction* (ASCE/SEI 24-05), and FEMA P-55 Coastal Construction Manual standards for other similar limited-use structures that could be applied for construction public restrooms below BFE in SFHAs;
- Compelling evidence (in Florida) from local government perspectives on the need for accessible and affordable public restrooms;
- Examples of conceptual drawings and outline specifications for construction of below-BFE public restrooms that are engineered to withstand all impacts of flood forces in a variety of flood zones;
- Cost comparisons for constructing elevated compliant public restrooms vs. non-elevated public restrooms built with breakaway walls, or that are engineered to withstand 1% annual chance flood wave loads; and,
- Conclusions that summarize a considered, systematic and comprehensive analysis using Florida as a model to show that flood resilient public restrooms can be designed, engineered and constructed to meet the intent of the NFIP flood resiliency objectives while ensuring cost affordability and convenient accessibility.

Public restrooms, if constructed to meet all structural requirements (NFIP, IBC, other local building codes, ASCE/SEI 24-05 and ASCE/SEI 7-10) developed for flood resiliency in the anticipated 1% annual chance flood conditions, could be considered compliant when built below the BFE in SFHAs. We strongly recommend that FEMA develop guidelines through publication of a Technical Bulletin that specifically provides flexibility for the construction of public restrooms to ensure maximum affordability and accessibility while ensuring flood resiliency in design and construction.

> NOTE: Notwithstanding the regulatory requirements that could be addressed through a Technical Bulletin specific to the construction of Public Restrooms in SFHAs, NFIP insurance issues concerning the effects on flood insurance, the cost of insurance coverage, or the ability of public restroom owners to self insure, or to obtain a limited basic flood insurance coverage are not specifically addressed in this paper.

2. Background

NFIP minimum regulatory standards allow the enclosure of structures below BFE if used solely for storage, parking or building access, and "functionally dependent uses" as defined in 44CFR 59.1, in A or V zones, with conditions. Since public restrooms are considered to be "non-residential" structures, it is their use "beyond storage, parking and access" that effectively disallows them from being built below the BFE. Therefore, public restrooms must be built in accordance with standards for non-residential structures and must be constructed at an elevation at or above the BFEs established on FIRMs in V zones, or may be below BFE in A

zones if dry floodproofed as required by the NFIP, FBC and ASCE/SEI 24-05. As is reiterated elsewhere, the Committee found no specific body of NFIP regulations or guidelines that address the unique, limited use of public restrooms and the ability of engineers and architects to design such buildings to withstand 1% annual chance flood loads.

In one FEMA document *Technical Bulletin – 5, Free-of-Obstruction Requirements* (August 2008), page 25, the guideline briefly mentions restroom buildings and comfort stations with respect to site development practices. The language in this section, excerpted below, appears to be conspicuously inconsistent with respect to the intent of the Bulletin regarding obstructions:

> **"One question that arises is whether restroom buildings or comfort stations can be treated differently than other types of V zone structures and be constructed below the BFE, particularly when those facilities are situated in public parks or recreation areas. The answer is no. These structures must meet the same V zone design and construction requirements as other buildings."**

This commentary does not speak to the issue of an "obstruction", and does not reference any federal regulation or provision that would justify the inclusion of this statement within the aforementioned Bulletin. The quoted statement provides no justification or basis as to why public restrooms could not be treated with the same construction requirements as other types of V zone structures that are permitted to be constructed below the BFE.

In FEMA 543, *Design Guide for Improving Critical Facility Safety from Flooding and High Winds* (January 2007), "critical facilities" and "accessory structures" (see definitions) are addressed in sections 1.1.1 and 2.3.5.5, respectively. In the latter reference, the technical documents advise that:

> **"Some minor accessory structures need not fully comply, but may be "wet floodproofed" using techniques that allow them to flood while minimizing damage. Examples include small storage sheds, garages, and restrooms. Accessory structures must be anchored to resist flotation, collapse, and lateral movement. Flood resistant materials must be used and utilities must be elevated above the DFE (plus freeboard, if required). Openings in walls must be provided to allow the free inflow and outflow of floodwaters to minimize the hydrostatic loads that can cause structural damage."**

However, no NFIP, IBC/FBC or ASCE/SEI 24-05 regulations or standards specifically recognize public restrooms as unique, exceptional types of non-residential construction or, specifically prohibits them, or considers the unique limited use of public restrooms in SFHAs whether elevated or not. Additionally, none of the regulations or standards considers the additional public benefit that these facilities may provide if they are not elevated.

Many public restrooms are inherently designed to withstand frequent wash-down cleaning and contain floor drains and may experience conditions of temporary inundation by water, and, therefore, are constructed with flood resistant materials consistent with the intent of

44 CFR 60.3(a)(3)(ii) and (iii). In A zones, "non-residential" public restrooms may be built below the BFE if dry floodproofed in accordance with 44 CFR 60.3(c)(3)(ii) and (4) and certified as such by an engineer. However, in V zones, public restrooms and their related utilities, because they are of a use that is "beyond storage, parking or access", must be located above the BFE as required for both residential and non-residential structures to ensure protection against impacts from water damage, hydrodynamic and hydrostatic forces including wind and wave forces.

During personal communication with committee members, some communities have indicated that they favor the idea of building very low-cost, uninsured, "disposable" buildings, not elevated, but that provide the basic restroom facilities needed by the public, with the understanding that such minimal cost facilities would be sacrificed in the event of 1% chance or greater annual flood levels. This perspective continues that such small buildings, built with environmentally-compatible materials, which may need to be rebuilt (presumably on an infrequent basis), are much less expensive to build and much more accessible than NFIP-compliant buildings that are much more costly to design, construct, insure, and access by a broad range of users. This type of structure, as well as portable structures that may be constructed on the chassis or framework of RVs, would presumably not be subject to insurance coverage or building standards that now exist. Such portable structures may be a viable and prudent option for communities if installed consistent with NFIP regulations or guidance documents as "road ready" and as regulated under Rules 64E-6.0101, Florida Administrative Code. These types of structures were not addressed further by the Committee; however, they can be addressed as possible alternatives, albeit they must be made to meet certain, to-be-defined guidelines consistent with NFIP regulations or guidelines.

While public restrooms are typically built with flood damage resistant materials, their destruction due to wave and wind loads is considered an unacceptable loss of public funds when such structures built post-FIRM below the BFE would need to be rebuilt. (Note, some structures may be below the BFE as a result of subsequent map changes.) Furthermore, the rationale provided by NFIP guidance suggest that debris potentially impacts other structures, and cleanup of debris from damaged public restrooms caused by wave and storm surge are yet additional expenses resulting from non-elevated structures.

During the Florida Floodplain Managers Association's (FFMA) 2012 Annual Meeting, the State NFIP Coordinating Office and FEMA Region IV staff conducted an interactive session entitled "An Interactive Session on Bath Houses in V zones". The session presented typical NFIP regulations indirectly related to public restrooms, and the absence of specific and succinct NFIP, IBC or ASCE 24 regulations or guidelines that require public restrooms to be built at or above the BFE. FEMA Region IV and State staff emphasized that the construction of below BFE public restrooms is not compliant with current NFIP regulations. Photographs of compliant and non-compliant public restrooms in V zones were viewed to illustrate the wide-spread deviations that exist among public restrooms on publicly-accessible Federal, State and Local government properties.

Participants engaged in active discussion about the desirability for some reasonable flexibility in guidelines and standards for the construction of public restrooms in SFHAs.

Ultimately, there was consensus that FFMA should appoint a committee to focus on policies and structural design considerations for public restrooms in V zones. On October 24, 2012, FFMA Board of Directors tasked its Coastal Committee to follow through and further investigate concerns of members and to develop a white paper on the subject. As a result, the Coastal Committee also came to the conclusion that it should include recommendations for the development of policies that would enable public restrooms to be built below the BFE in both A and V zones while ensuring that restrooms would be designed to be flood resistant and otherwise compliant with the intent of the NFIP to ensure flood resiliency for new structures.

Specifically, the FFMA Board's charge to the Coastal Committee was fourfold:

- conduct research and compile findings;
- develop draft policy and design concepts;
- broadly seek public and private agency input and consensus, as needed; and,
- produce a white paper on proposed new policies for review and consideration by the FFMA Board of Directors, State Floodplain Management Office, Association of State Floodplain Managers (ASFPM), and ultimately, FEMA

3. Justification for New Guidance Specific to Public Restrooms in SFHAs

3.1. Geographic Conditions – Florida as a Case Study

With its 1,200 mile coastline, 2,276 miles of tidal shoreline, an estimated 11,000 miles of rivers, streams and waterway (StateofFlorida.com), approximately 7,700 lakes and 4,500 islands greater than 10 acres, Florida is believed to have more waterfront beach parks than any other state in the nation. Further, Florida has 183 communities with jurisdictional areas that include V zones (State Floodplain Management Office). The number one resource-based outdoor recreation activity sought by Florida's 25 million residents and nearly 90 million annual tourists (in 2012) is visiting coastal saltwater beaches (*Outdoor Recreation in Florida – 2013*, and *Florida Shore & Beach Preservation Association 2013).* In addition, Florida has one of the highest per capita populations of retired residents, and has among the most recreationally active citizens aged 65 or older, many of whom have limited mobility or are physically disabled. Nearly 20% of Florida residents aged 18 years of age or older have some form of disability, and nationwide, the percentage varies from the upper 17% to over 26% according to information on the Centers for Disease Control website, which underscores the importance of having accessible public restrooms. In Florida, the state has just over 4 million children aged less than 18 years according to information on the Florida Department of Health website. Additionally, Florida is a primary vacation destination for many of the nation's families who travel with their children specifically for the opportunity to access the many year-round outdoor recreational opportunities available at public beaches and parks.

3.2. Economic Values Associated with Outdoor Recreation in Floodplains

Significantly, Florida has much at stake in its attempts to afford Florida's residents and visitors with access to public restrooms at beaches and waterfront parks. According to *Outdoor Recreation in Florida 2013*, Florida's comprehensive outdoor recreation plan, 63% of Florida residents (12.6 million people), and 49% of tourists (29.4 million people) participated in saltwater beach activities (not including saltwater fishing). Participation in saltwater beach activities by age group shows that 62% aged 55-64, and 44% aged 65 and older enjoyed this activity during a 12-month period in 2011. Among the most popular saltwater beach parks in Florida, Honeymoon Island State Park's annual visitation of 1,044,295 (2012-13) generated more than $46.3 million in revenue for the local economy according to the Florida Parks Service website. Florida beaches have an annual recreational value of about $50 billion. Florida's beaches had approximately 810 million day visits in 2012, the most of any state or country in the world (Dr. James Houston, 2013 as quoted from *Florida Shore & Beach Preservation Association 2013).*

Outdoor recreation pursuits by visitors and seasonal residents to Florida together may count among the highest revenue producing industries in the State according to the Florida Department of Economic Opportunity website. Add to these numbers the parks and facilities within non-coastal SFHA's and the significant need to provide restrooms for public use is obvious. A cost benefit analysis that could demonstrate the added benefit for not elevating public restrooms was intentionally not addressed because of other, more compelling factors that support the need to have affordable, aesthetically designed and accessible restrooms. Rather, it was the consensus of the committee that the more apparent physical characteristics for providing safe, utilitarian, cost effective and readily accessible restroom facilities within SFHAs for all users was substantially more critical. Section 3.3 includes a discussion of comparative approximate construction costs of elevated versus non-elevated structures that more directly serves as the basis for change in current policy.

NFIP elevation requirements identified in V zones on digital flood insurance rate maps (DFIRMs) can result in public restrooms (in Florida) that must be constructed at an elevation ranging from 10 to over 21 feet above sea level, resulting in designs of structures typically elevated on piers 7 to 18 feet or more above grade elevations. (see Appendices 9.3 and 9.4 for example pictures of not compliant and compliant public restrooms). These building standards result in extreme difficulties for communities to provide and maintain reasonably affordable, readily accessible, restroom structures for the public. The cost for designing and constructing such essential facilities to meet flood water and wind load construction requirements established in the International Building Code that incorporates the NFIP-required flood provisions and ASCE 24, has become nearly financially infeasible for many communities.

3.3. Comparison of Approximate Costs for Elevated vs. Non-Elevated Restrooms

Communities and design professionals have a number of variables to consider when designing bathroom facilities for public beaches. Materials, finishes, environmental conditions, site size and orientation are just a few of the physical and structural considerations to evaluate. The cost examples provided below are simply to illustrate approximate differences in costs that may be

realized, all other things being equal. For comparison purposes, the construction cost estimates evaluate the following: a) at-grade (flow through) wet floodproofed; b) at-grade "dry floodproofed" though vented for air circulation; and c) elevated structures in a V zone with a BFE of 10 feet above grade. These values represent the differing costs for the same size structure (760 square feet) as further discussed in Section 7, and depicted graphically in Appendix 9.5. The estimated costs for construction include those design and construction methods and materials that would be required to facilitate the engineered designs and accessibility requirements consistent with current Florida Building Code regulations except for the height requirements under option a) and b) below.

a) At-grade, concrete block, flood resilient material and flow-through openings: $85,000

b) At-grade, concrete walls and ceiling, and flood proofed: $130,000

c) Elevated, concrete block standard material $225,000

As previously mentioned, site conditions play a substantial role in construction costs. Each of the example costs provided can fluctuate 30-50% depending on other elements that may be considered as part of the building design. Depth and size of footers, type of construction and materials, labor costs and other factors all play a significant role and vary community by community.

3.4. Legal Requirement for Providing Public Restrooms – Florida Example

By State law, Florida requires "sanitary facilities" to be provided near "public bathing areas" to ensure that such facilities are used by patrons. Excerpts from Florida Statutes and Rules of the Florida Department of Health relevant to the provision of "sanitary facilities" are provided below.

Chapter 514.011 (4) Florida Statutes "Public Bathing Place"

"Public bathing place" means a body of water, natural or modified by humans, for swimming, diving, and recreational bathing used by consent of the owner or owners and held out to the public by any person or public body, irrespective of whether a fee is charged for the use thereof. The bathing water areas of public bathing places include, but are not limited to, lakes, ponds, rivers, streams, artificial impoundments, and waters along the coastal and intracoastal beaches and shores of the state.

Rule: Section 64E-9.013 (2)(j.), F.A.C. Sanitary facilities shall be provided and shall be as near to the bathing area as prudent to ensure patron use.

Rule: Section 64E-9.002, F.A.C. "Water Theme Park" – Means a complex with controlled access, fenced and gated attraction where guests enter through a limited number of entrances upon purchase of a ticket. These facilities are permanent and consist of multiple water recreation attractions. Lifeguards are present during all operating hours.

Rule: Section 64E-9.011, F.A.C. Water Recreation Attractions and Specialized Pools

(9) Water Theme Parks

(d) Sanitary Facilities within a water theme park shall be as near to the water recreation attractions as prudent to ensure patron use, but not over 200 feet walking distance from any exit of a water attraction.

4. What are Public Restrooms and Why are So Many Not Compliant or Non-Conforming?

4.1. "Public Restrooms" are Not Defined

Public restrooms (sanitary facilities, comfort stations, bath houses, changing rooms, etc.) are not defined in NFIP regulations. Public restrooms or sanitary facilities are not defined in the 2010 Florida Building Code (FBC). Public restrooms are also not defined in the International Building Code (IBC). In practice, public restrooms are neither residential nor non-residential structures, nor are they given a use classification unique to the limited purpose they serve.

Under the NFIP and the IBC/FBC, public restrooms are not considered to be "accessory structures" or "functionally dependent uses" and would not be approved for construction in V zones if they were to be designed with breakaway walls as is allowed for below-BFE enclosures such as garages or storage facilities. Since they are considered to be "non-residential" structures, public restrooms in A zones are approved for dry floodproofing only and may not be wet floodproofed. (Reference, 44 CFR 60.3 (c)(3) and (4), and ASCE 6.2.1)

4.2. Defining "Public Restroom"

For the purposes of the Committee's charge, the Committee developed the following working definition for a public restroom predicated on the concept that NFIP, IBC, FBC and ASCE-24 guidance will become more flexible to allow public restrooms to be built below BFE:

"Public Restroom" in a special flood hazard area is a structure designed and constructed to meet the sanitary needs of the public when visiting coastal and non-coastal properties. Such structures may include toilet rooms, changing rooms, shower stalls, required plumbing including backflow preventers, a minimum service drop for electrical equipment for lighting and receptacles, grinder pumps, lift stations, and/or septic tanks and drainfields. Public restrooms shall provide the above elements only, and may also be called "comfort stations", "bath houses" or "bathrooms". Public restrooms shall be designed and constructed to withstand hydrodynamic, hydrostatic and wave load impacts, and extended periods of flood inundation. Such structures shall meet or exceed the NFIP, IBC, FBC and the ASCE-24 standards for construction in A zones and V zones when constructed either above or below BFE.

NOTE: In some States or communities, additional higher standards that are more stringent must be met such as in areas of Coastal A zones and seaward of Florida's Coastal Construction Control Line, or similar designations.

NOTE: While this paper acknowledges that other facilities are often located in non-coastal and coastal high hazard areas that must be elevated, including concession stands, bath houses with various add-ons such as beverage machines, change machines and clothes washers and dryers, and the like, these facilities are not addressed or considered as part of the detached "public restrooms" as defined in this paper because they exceed the minimum necessary to accommodate the basic sanitation requirements of the public restrooms.

NOTE: This paper also does not address a variety of "portable" public restrooms which may include facilities that do not constitute "structures" as defined by the NFIP. Such mobile public restrooms may be subject to other NFIP regulations.

4.3. Why are Public Restrooms Not Compliant or Non-conforming in Special Flood Hazard Areas?

The Florida State Floodplain Management Office reports that it has found, through Community Assistance Visits that it conducts with communities and from General Technical Assistance requests, that federal, state and local communities are sometimes inclined to waive or grant variances from elevation requirements because they see public restrooms as not distinctly residential or non-residential and serve a critical public need.

Through the Committee's collective research, including first-hand observations by committee members, as well as the survey conducted by FFMA, the Committee found that the most common reasons why public restrooms may not be compliant or may be "non-conforming" are:

- Construction occurred prior to adoption of a floodplain ordinance, or is pre-FIRM;
- FIRM updates resulted in higher BFEs and/or changed from zones A to V after construction;
- Public restrooms are considered "required public-health facilities" and not subject to elevation requirements;
- Variances were issued to meet ADA requirements for limited space "hardships", and constructing long ramps are costly to install, obstruct flood water and building access, and are financially difficult to maintain;
- Variances to BFEs were issued because of high construction costs required to build above the BFE;
- Elevators installed to provide access to elevated structures are cost prohibitive and maintenance-prone or become unworkable in harsh coastal environments; and
- Restrooms were substantially damaged, but repairs did not include elevation;

4.4. Rational Nexus for Below-BFE Public Restrooms in SFHAs

As has been described above, neither the NFIP or IBC/FBC or ASCE/SEI 24-05 define the unique and limited use structures that provide sanitary facilities for the public. Over the 46-year life of the NFIP, no regulations or standards have been developed that would guide or specify requirements to ensure that public restrooms could reasonably and feasibly be built below BFE with flood damage resistant materials and that could withstand a 1% annual chance base flood or higher including wave loads. Since 1968, there has been much research on loss analysis due to flood conditions, understanding of hydrodynamic and hydrostatic effects of flood water, and scientific analysis of coastal flood/surge threats. Concomitantly, the building industry has produced better engineered buildings that incorporate stronger materials, and the insurance industry has been successful in encouraging the adoption of more specific building standards and regulations at the national, state and local levels. NFIP regulations and standards have not thus far kept abreast of the evolving industry to establish reasonable and prudent parameters for construction of public restrooms. The policies and standards presented herein are a good starting point for the NFIP to employ reasonable, appropriate and technically feasible new standards, or simply apply existing standards published in the NFIP, FBC ASCE/SEI-24-05, and FEMA P-55 Coastal Construction Manual. Such standards were developed for storage, parking, functionally dependent uses, and garage structures that may be built below the BFE in A and V zones, and that may withstand the aforementioned 1% annual chance base flood or higher standards and other hydrostatic and hydrodynamic wave loads associated with regulatory floodways and V zones. Despite the practical engineering standards that could be applied to ensure safe, flood damage resistant construction, there are no regulations in place that enable such designs to be considered or implemented by communities.

5. Existing Regulations Providing Standards for Structures in SFHAs

Through its research, the FFMA Coastal Committee has identified NFIP and State policies and regulations that are indirectly relevant to the issue of whether public restrooms could be designed and constructed to withstand flood forces below the BFE. It is clearly the intent of the Committee that any design concepts for consideration by FEMA, the International Code Council, and the Florida Building Commission should ensure that new or substantially improved public restrooms are flood resilient against storm surges and wave impacts when located below the BFE or Design Flood Elevation. There are several key existing regulations, policies and/or standards that provide for similar types of structures for public or private use that are permitted to be constructed below the BFE in SFHAs and these are summarized below. It seems reasonable that such regulations could also be applied to public restrooms.

First, however, the regulations concerning projects undertaken or funded by FEMA must consider the effects of construction in floodplain or wetlands. For example, 44 CFR*, Part 9*, which “sets forth the policy, procedure and responsibilities to implement and enforce Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands” also includes specific minimization standards for mitigation in the following sections of this set of regulations. These regulations further demonstrate the inconsistency with how NFIP regulations

attempt to grapple with the public interest for providing accessible restrooms while meeting the flood resiliency intent of the NFIP. (See example of 3-story public restroom in Appendix 9.4, Photo 15.)

44 CFR 9.11(d)(2) reads as follows:

"For a structure which is a functionally dependent use, or which facilitates an open space, the following applies. There shall be no construction of a new or substantially improved structure in a coastal high hazard area unless it is elevated on adequately anchored pilings or columns, and securely anchored to such piles or columns so that the lowest portion of the structural members of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level (the 500-year flood level for critical actions) (including wave height). The structure shall be anchored so as to withstand velocity waters and hurricane wave wash."

However, in 44 CFR 9.11(d)(3) (iii), provisions for non-residential structures that have been dry floodproofed may not be required to be elevated as follows:

"If the subject structure is non-residential, FEMA may, instead of elevating the structure to the 100-year or 500-year level, as appropriate, approve the design of the structure and its attendant utility and sanitary facilities so that below the flood level the structure is water tight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy."

However, in 44CFR 9.11(d)(3) (iv), the regulations further specify that an exception or variance would render the above not applicable:

"The provisions of paragraphs (d)(3)(i), (ii) and (iii) of this section do not apply to the extent that the Federal Insurance Administration has granted an exception under 44 CFR §60.6(b), or the community has granted a variance which the Regional Administrator determines is consistent with 44CFR 60.6(a)."

5.1. Existing Policies and Standards that <u>Could</u> Apply to Restroom Designs in A Zones

The following standards have been developed or extracted from existing building requirements that could guide the allowable construction of public restrooms below BFE in A zones:

5.1.1. Basic Requirements that Could Apply

A. Communities would be required to adopt the approved definition for a *Public Restroom* in flood damage prevention ordinances (See section 4.2).

B. All new construction and substantial improvements shall be reasonably safe from flooding: (Reference 44 CFR 60.3(a)(3) and ASCE/SEI 24-05, Section 5.0).

(i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;

(ii) be constructed with materials resistant to flood damage;

(iii) be constructed by methods and practices that minimize flood damages; and,

(iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

C. Materials used in new construction in flood hazard areas shall have sufficient strength, rigidity, and durability to adequately resist all flood-related and other loads during installation. (Reference ASCE/SEI24-05, Section 5.1).

D. Plumbing systems shall be designed and constructed to withstand flood waters and to prevent contamination of surface waters in accordance with the provisions of ASCE/SEI 24-05, Section 7.3.

5.1.2. Existing Standards That Could Apply

General: Structures that are not structurally connected to another structure shall be permitted below the BFE in A zones if designed to account for the following:

- Flood loads and combination of concurrent loads including the following: hydrostatic loads, hydrodynamic loads, wave action, debris impact, rapid rise and rapid drawdown of flood waters, prolonged inundation, alluvial fan flooding, wave-induced and flood-related erosion and scour, deposition of sediments. (Reference ASCE/SEI 24-05, Section 1.6)

- The limits on human intervention to activate or implement dry floodproofing measures. (Reference ASCE/SEI 24-05, Section 6.2.3)

- The structure must be protected to the maximum extent possible using an appropriate alternative flood protection technique, such as wet floodproofing provided that such structures represent a minimal investment and are designed to have a low damage potential with respect to the structure and contents. (Reference TB 7-93 Wet Floodproofing, ASCE/SEI 24-05, Section 6.3).

- A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify

that the design and methods of construction to be used are in accordance with the accepted standards of practice for engineering as specified in 44 CFR 60.3(c)(3).

5.1.3. Siting: New Construction or Substantial Improvements

- In Coastal A zones, structures must be located landward of the reach of mean high tide or mean high water. (Reference ASCE/SEI 24-05, Section 4.3)
- In Coastal A zones, construction must not remove or otherwise alter sand dunes and mangrove stands, unless the alterations will not reduce the wave and flow dissipation characteristics of the sand dunes or mangrove stands. (Reference ASCE/SEI 24-05, Section 4.3)
- Require new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; (Reference 44 CFR 60.3(a)(5))
- Require new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters, and onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding. (Reference 44 CFR 60.3(a)(6))
- If the design flood elevation has been determined and a floodway has not been designated, structures and fill shall not be constructed or placed unless it has been demonstrated that the cumulative effect of proposed structures and fill, combined with all other existing and anticipated development, will not increase the base flood elevation more than one (1) foot. (Reference 44 CFR 60.3(c)(10); ASCE/SEI 24-05, Section 2.2).
- Structures and fill shall not be constructed or placed in floodway areas unless it is demonstrated that those structures and fill will not, during the design flood, (1) increase the flood level, and (2) reduce the conveyance of the flood. (Reference 44 CFR 60.3(d)(3), ASCE/SEI 24-05, Section 2.2).

5.1.4. Enclosure Requirements:

- Foundation walls that enclose an area below the BFE, and that do not meet the dry-floodproofing requirements, shall contain openings to allow for automatic entry and exit of floodwaters during design flood conditions (Reference 44 CFR 60.3(c)(5), ASCE/SEI 24-05, Sections 2.6).
- Foundation walls that enclose an area below the BFE, and that do not meet the wet-floodproofing requirements, shall be dry floodproofed using flood-damage-resistant materials and techniques that render the dry floodproofed portions of a structure substantially impermeable to the passage of floodwater below the BFE. Sump pumps

shall be provided to remove water accumulated due to any passage of vapor and seepage of water during the flooding event. Sump pumps shall not be relied upon as a means of dry floodproofing. Dry floodproofing shall be limited to the following: (1) Where flood velocities adjacent to the structure are less than or equal to 5 ft/sec during the design flood; and (2) If human intervention is proposed, where conformance with the limitations of Section 6.2.3 is provided. (Reference ASCE/SEI 24-05, Section 6.2)

5.1.5. Foundation Requirements:

- Fill shall be designed to be stable under conditions of flooding, including rapid rise and rapid drawdown of floodwaters, prolonged inundation, and flood related erosion and scour. (Reference ASCE/SEI 24-05, Section 1.5.4)

- The foundation shall extend to a depth based on geotechnical considerations to provide support during design flood conditions, taking into account the erosion and local scour of supporting soil based on an erosion analysis. (Reference ASCE/SEI 24-05, Section 1.5.3)

5.2. Existing Policies and Standards that <u>Could</u> Apply to Restroom Designs in V Zones

The following standards have been developed or extracted from existing structural requirements that could guide the allowable construction of public restrooms below BFE or DFEs in V-Zones:

5.2.1. Basic Requirements that Could Apply

A. Communities would be required to adopt the definition for a *Public Restroom* (See section 4.2) in flood damage prevention ordinances and must adopt a higher standard for requiring public restrooms to comply with or be more stringent than regulations for the construction of detached garages in V zones. (Reference ASCE/SEI 24-05, Section 9.3.2)

B. All new construction and substantial improvements shall: (Reference 44 CFR 60.3(a)(3)).

(i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;

(ii) be constructed with materials resistant to flood damage;

(iii) be constructed by methods and practices that minimize flood damages; and,

(iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to

prevent water from entering or accumulating within the components during conditions of flooding.

C. Plumbing systems shall be designed and constructed to withstand flood waters and to prevent contamination of surface waters in accordance with the provisions of ASCE/SEI 24-05, Section 7.3.

5.2.2. Existing Standards That Could Apply

General: Public restrooms that are not structurally connected to a structure shall be permitted below the BFE in V zones if designed to account for the following:

- Waves breaking against the side or underside of the structure;
- Drag, inertia, and other wave-induced forces acting on structural members supporting elevated structures;
- Uplift forces from breaking waves striking the undersides of structures;
- Wave run-up forces including those deflected by the structure; and
- Erosion and scour. (Reference ASCE/SEI 24-05, Section 4.2)
- The structure must be protected to the maximum extent possible using an appropriate alternative flood protection technique, such as wet floodproofing provided that such structures represent a minimal investment and are designed to have a low damage potential with respect to the structure and contents. (Reference TB 7-93 Wet Floodproofing, ASCE/SEI 24-05, Section 6.3)
- A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with the accepted standards of practice for meeting the provisions of 44 CFR 60.3(e)(4)(i) and (ii). (Also reference FEMA Coastal Construction Manual – Fourth Edition; FEMA P-55, August 2011)

5.2.3. Siting: New Construction or Substantial Improvements

- Be located landward of the reach of mean high tide;
- Be sited landward of shoreline construction setbacks; and,
- Not remove or otherwise alter sand dunes and mangrove stands, unless the alterations will not reduce the wave and flow dissipation characteristics of the sand dunes or mangrove stands. (Reference ASCE/SEI 24-05, Section 4.3)

5.2.4 Elevation Requirements:

- Structures that are not structurally connected to a structure are permitted below the elevations specified in ASCE-24, Table 4-1, if designed in accordance with the requirements of ASCE 24, Section 4 (Reference ASCE/SEI 24-05, Section 9.3.2).

- If enclosed with non-removable wall panels, or floodproofed, the walls shall conform to the breakaway wall requirements in ASCE/SEI 24-05, Section 4.6. (Reference ASCE 24, Section 9.3.2)

- The required height of structures above the DFE shall be determined by the structure category and the orientation of the lowest horizontal structural member relative to the direction of wave approach. (Reference ASCE-24, Section 4.4)

- Piles, pile caps, footings, mat or raft foundations, grade beams, columns and shear walls designed and constructed in accordance with ASCE/SEI 24-05, Section 4.5 shall not be required to meet the elevation requirements of ASCE-24, Table 4-1. (ASCE/SEI 24-05, Section 4.4).

5.2.5 Foundation Requirements:

- Public restroom foundations must be designed and constructed in accordance with ASCE/SEI 24-05, Section 4.5, to minimize forces acting on that system.

Having highlighted these existing building code regulations, the bulletins and technical code documents, this body of reference material provides a strong foundation towards achieving the flexibility that communities need to ensure that they are able to provide the essential public restroom facilities while also continuing to construct public buildings that are flood resilient as required by the NFIP.

6. Summary of Coastal Local Governments' Surveys on Public Restrooms

In 2013-2014 FFMA conducted an opinion survey with coastal communities to gather information about the nature of their constructed public restrooms in V zones. The survey was conducted to better understand and document the factors that result in the significant numbers of non-compliant or potentially non-compliant public restrooms observed in floodplains across the state. The survey consisted of six questions that were distributed electronically and whose answers were recorded and compiled to produce a statewide summary of results. A more complete analysis is provided in Appendix 6 which also includes a copy of the survey instrument.

The key findings of the survey together substantiate the need for more specific and clear NFIP guidance regarding the construction of public restrooms. In general, the Committee found that the survey results support the need for flexibility in design options that can be certified to ensure flood resiliency when restrooms are constructed below BFE, and the perceived excessive costs

for design and construction of compliant restrooms were a primary reason why non-compliant restrooms were constructed. This seemed to be the compelling reason why communities requested or approved variances from the NFIP-regulations which is not an acceptable reason for constructing non-compliant structures under the NFIP.

In summary, the survey found that among the 42 communities that responded:

1) 36% of communities with restrooms in V zones reported that none of their restrooms were below the BFE and one reported that they used portable restrooms below the BFE. (Question #6)

2) 58% of their public restrooms in V zones are below the BFE. (Question #6)

3) The top five reasons in ranking order why communities reported that they have below-BFE public restrooms in V zones are the following: (Question #1)

    1. Excessive costs of construction to elevate to the BFE
    2. ADA Code requirements must be met
    3. Restrooms are believed to be “facility-dependent uses” that may be built below BFE
    4. Restrooms were considered “accessory uses”
    5. Reduce the need for long ADA ramps that create excessive obstructions

4) Among the 42 responding communities, five indicated awareness of public restrooms engineered to withstand wave loads in V zones, but none were able or willing to provide photos or drawings that could be reviewed by the committee. (Question #3)

5) Among the 42 communities responding to the survey, four indicated that a variance had been granted to allow below BFE public restrooms. (Question #2)

6) 45% of communities responding to the survey indicated that they carried flood insurance, and of that number, 74% indicated that the community self-insured some or all of its structures. (Question #5)

7) Among the 42 responding communities, one indicated that a Benefit/Cost Analysis was used to justify not elevating (a) public restroom(s) above the BFE. (Question #4)

7. Overview of Design Concepts for Public Restrooms in V Zones

Please Reference Schematics of Conceptual Public Restrooms in Appendix 9.6

When designing structures to meet client’s needs, architects and engineers have a variety of materials and design concepts available to them. These resources enable design professionals to assist communities in determining what approach is most appropriate based on location, site conditions, and budget. NFIP regulations for V zone construction attempt to provide across-the-board regulations without regard to important location-specific features or State and local

building codes. Therefore, NFIP regulations unnecessarily limit or restrict the tools available to design professionals.

It is important to note that proposed public restrooms are subject to the same review for site and building conditions as any other public or private project. The decision-making process as to what type of building and how a site is developed requires evaluation of a variety of site specific conditions, such as wind zone, soil types, environmental constraints, and other relevant factors. NFIP regulations do not provide sufficient flexibility to allow communities to decide the type of project and construction techniques that are most appropriate for them. Building design and construction is not a one-size fits all process.

The 2010 Florida Building Code, Chapter 16, Structural Design provides sufficient references to support taking an alternative approach to construction of public facilities within the V zones. ASCE 7 is a document prepared by the American Society of Civil Engineers and the Structural Engineering Institute. This document, as referenced by the Florida Building Code, specifically addresses load requirements that satisfy a variety of conditions, including Flood Loads. Section 5.4.4 of ASCE/SEI 7-10 and FEMA P-55 Coastal Construction Manual in particular, provides load requirements for wave loads on both vertical and non-vertical walls. In addition, the document provides minimum design loads for impact loads, such as debris, which may be transported by flood waters.

See Section 9.5 for design schematics for two at-grade and one elevated public restroom facility. The at-grade structures are designed to withstand expected wave forces and meet existing engineering requirements of the Florida Building Code and ASCE/SEI 7-10. The elevated public restroom shows the design considerations necessary to meet NFIP requirements for structures in V zones.

Both are essentially identical in size (760 Sq. Ft.) and internal layout. Additionally, the typical design assumes a required 10 foot elevation requirement to meet lowest horizontal structure elevation requirements of the NFIP. Cost estimates for both types vary greatly dependent on the wave load, soils, proximity and exposure to salt/corrosive conditions, and other site considerations previously mentioned. The example costs per foot of elevation are based on examples, but will vary across the diverse geography of coastal areas throughout Florida and the U.S. See Section 3.3 for Comparison of Average Costs for Elevated vs. Non-Elevated Restrooms.

Most public beach restroom facilities are located in environmentally sensitive areas. Limitations on site size and requirements to minimize impacts to adjacent waterways, native vegetation and endangered or protected species, make ADA accessibility decisions one of the most important design considerations. Due to requirements of a 1:12 slope, long runs of ADA ramps may not be suitable. In our example of 10 feet above grade, an ADA compliant ramp would be 150 feet or longer once the 1:12 maximum slope and required five foot wide landings are accounted for. Considering it is common to elevate buildings 12-20+ foot above grade, it is easy to understand why “switch back” and other alternative ADA ramp designs have been incorporated to reduce the foot print and area of obstruction. ADA design requirements increase costs for a project and can typically cost $5,000-$9,000 per foot of elevation. Furthermore, because of their required

location, the ramps can typically be found to be in conflict with the NFIP requirement to provide clear area parallel to the wave direction under the elevated structure.

There are a number of variables that can be considered when designing any structure within the V zone. In Appendix 9.5 we provide example schematics of a typical beach bathroom facility. The schematics show one example of an elevated structure in order to highlight the vertical wall design and piling design considerations which are consistent with NFIP. In addition, an at-grade wet floodproofed design and an at-grade dry floodproofed (vented) alternative design, which would be in compliance with existing design requirements in ASCE/SEI 7-10 and FEMA P-55 Coastal Construction Manual, will withstand the wave loads. The alternative dry floodproofed (vented) at-grade schematic highlights some structural components to consider if the V zone BFE is higher than the vertical wall and above the roof line.

Some of the variables to consider when selecting a design approach which may have a significant affect on cost include:

- Required ventilation; air conditioning vs. sufficient vented openings
- Flood proofing vs. flood resilient materials and flood vents
- Roof truss materials
- Soil types and site conditions
- Foundation type
- ADA accessibility
- Context-sensitive design (e.g. orientation and aesthetics)
- Alternative designs and materials
- Maintenance requirements

8. Conclusions on Flood Resistant Below-BFE Restrooms in SFHAs

Public safety and loss of human life are comparatively small risks for non-elevated public restrooms since they are not typically occupied when severe-weather-causing floods are expected. State law requires public restrooms to be located near public bathing areas to ensure that facilities are used by the public. Evidence obtained by the Committee shows that there is a compelling public benefit for enabling the construction industry to design and construct flood resistant public restrooms that are accessible and affordable for communities and private recreation providers. Architects and engineers have determined that it is reasonable to develop designs and building specifications that render public restrooms flood resistant against hydrodynamic and hydrostatic forces, and wave and wind loads associated with the 1% annual chance base flood elevation established on DFIRMs. The NFIP, International Building Code and American Society of Civil Engineers and Structural Engineering Institute can address the pressing need for more detailed guidance with building standards that recognize that public restrooms are limited use facilities that can be constructed to withstand flood impacts below the base flood elevation.

The need for flexibility in NFIP guidelines to allow for the design and construction of public restrooms in three basic options are presented:

a) elevate facilities to meet current or more restrictive future NFIP building

standards;

b) construct engineer-certified facilities below BFE with wet floodproofing as is currently allowed for structures used for access, storage or parking; or,

c) construct engineer-certified facilities below BFE that are designed to withstand all 1% annual chance flood loads for the structures' specific locations.

By incorporating a definition for "public restroom", which is a unique, limited-use facility, that is clearly distinguished from either residential or non-residential structures, the NFIP can provide clarification and specific flood resilience standards for these essential public facilities. Based on the analysis and data presented herein, FEMA should expediently undertake development of a technical bulletin concerning appropriate design and construction standards based on existing standards for similar structures that may be built below the BFE in special flood hazard areas. At a minimum, a technical bulletin should provide flexibility to engineers and architects that design essential public restroom facilities for the public. The technical bulletin should retain guidance for the construction of elevated public restrooms, and provide new guidance that will enable public restrooms to be constructed below the BFE with wet floodproofing or dry floodproofing with walls that can withstand wave and wind loads associated with the 1% chance annual flood.

9. Appendices

9.1. Coastal Committee Members

Hubert Baxter, AIA, Architect, Bureau of Design and Construction, DEP
Scott Cannard, AIA, Architect, Department of Management Services
Desiree Companion, CFM, President, Florida Floodplain Managers' Association
James Linkogle, CFM, Vice President, Florida Floodplain Managers' Association
Richard Benton, CFM, Outreach Specialist, Risk Analysis Branch, FEMA Region VI
Christa Carrera, CFM, Floodplain Manager, City of Naples
Daniel Fitz-Patrick, CFM, Floodplain Management Specialist, State NFIP Coordinating Office
Michael Foster, Jr., Civil Engineer, Bureau of Design and Construction, DEP
Steve Gilbert, CFM, CBO, Building Official, City of Bradenton Beach
Jason Green, AICP, CFM, Planning Manager, Weiler Engineering Corporation
Lisa Jones, CFM, co-Chair, ASFPM Regulations Committee
Steve Martin, CFM, Program Manager, State NFIP Coordinating Office
Marlee McCleary, CFM, Floodplain Management Specialist, State NFIP Coordinating Office
Michael Powell, CFM, co-Chair, ASFPM Regulations Committee
Chuck Roberts, FFMA, President of Performance Management Group Inc., Lakeland, FL
Terri Turner, AICP, CFM, ASFPM Coastal Committee, Augusta-Richmond County, GA
Nancy Witty, CFM, FFMA Past President
Robert Wiley, P.E., CFM, Principal Project Manager, Collier County

9.2. Definitions

Accessory Structure (FBC). A structure not greater than 3,000 square feet (279 m squared) in floor area, and not over two stories in height, the use of which is customarily accessory to and incidental to that of the dwellings(s) and which is located on the same lot.(Florida Building Code 2010 Building)

Appurtenant Structure (NFIP). Means a structure that is on the same parcel of property as the principal structure to be insured and the use of which is incidental to the use of the principal structure. (44 CFR 59.1)

ASCE/SEI 7-10. American Society of Civil Engineers*, Minimum Design Loads for Buildings and Other Structures*.

ASCE/SEI 24-05. American Society of Civil Engineers and Structural Engineering Institute *Flood Resistant Design and Construction.*

Coastal Construction Control Line (CCCL). Is the line established pursuant to the provisions of Section 161.053, F.S., and recorded in the official records of the county, which defines that portion of the beach-dune system subject to severe fluctuations based on a 100-year storm surge, storm waves, or other predictable weather conditions (Florida Administrative Code, Rule 62B-33.002(12)).

Coastal A Zone (CAZ). Area within a *special flood hazard area,* landward of a V zone or landward of an open coast without mapped V zones*.* In a Coastal A zone, the principal source of flooding must be astronomical tides, storm surges, seiches, or tsunamis, not riverine flooding. During the *base flood* conditions, the potential for breaking *wave heights* shall be greater than or equal to 1.5 ft (ASCE/SEI 24-05, 1.2).

Coastal High Hazard Area (Zone V). Area within a *special flood hazard area* extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area that is subject to high velocity wave action from storms or seismic sources. This area is designated on *FIRMs* as velocity zones V, VO, VE, or V I-30 (ASCE/SEI 24-05, 1.2).

Critical Facilities. Critical facilities commonly include all public and private facilities that a community considers essential for the delivery of vital services and for the protection of the community. Critical facilities commonly include all public and private facilities that a community considers essential for the delivery of vital services and for the protection of the community. They usually include emergency response facilities (fire stations, police stations, rescue squads, and emergency operations centers [EOCs]), custodial facilities (jails and other detention centers, long-term care facilities, hospitals, and other health care facilities), schools, emergency shelters, utilities (water supply, wastewater treatment facilities, and power), communications facilities, and any other assets

determined by the community to be of critical importance for the protection of the health and safety of the population.

Base Flood Elevation (BFE). The height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum of 1929 or other datum as specified.

FFMA Coastal Committee. The Committee appointed by the Florida Floodplain Managers Association that researches and provides recommendations to the organization and that has prepared the white paper on *Policy and Design Options for Public Restrooms in Special Flood Hazard Areas.*

Flood Insurance Rate Map. Official map of a community on which the Federal Insurance and Mitigation Administration has delineated both special flood hazard areas and the risk premium zones applicable to the community (ASCE/SEI 24-05, 1.2).

Floodplain. Any land area, including watercourse, susceptible to partial or complete inundation by water from any source (ASCE/SEI 24-05, 1.2).

Floodproofing. Any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

Floodproofing, Dry. Floodproofing method used to render a structure envelope substantially impermeable to the entrance of floodwater.

Floodproofing, Wet. The permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing flood waters to enter the structure (Reference FEMA TB 7-93).

Flood Damage Resistant Materials. Any construction material capable of withstanding direct and prolonged contact with floodwaters, without sustaining any damage that requires more than cosmetic repair.

Florida Building Code (FBC). The commission shall adopt, by rule pursuant to Sections 120.536(1) and 120.54, Florida Statutes, the Florida Building Code which shall contain or incorporate by reference all laws and rules which pertain to and govern the design, construction, erection, alteration, modification, repair, and demolition of public and private buildings, structures, and facilities and enforcement of such laws and rules, except as otherwise provided in this section (Florida Statute 553.73(1)(a)). The Florida Building Code shall contain provisions or requirements for public and private buildings, structures, and facilities relative to structural, mechanical, electrical, plumbing, energy, and gas systems, existing buildings, historical buildings, manufactured buildings, elevators, coastal construction, lodging facilities, food sales and food service facilities, health care facilities, including assisted living facilities, adult day care facilities, and facilities for the control of radiation hazards, public or private educational facilities,

swimming pools, and correctional facilities and enforcement of and compliance with such provisions or requirements (Florida Statute 553.73(2)).

Florida Building Commission. The Florida Building Commission is created and located within the Department of Business and Professional Regulation for administrative purposes. Members shall be appointed by the Governor subject to confirmation by the Senate. The commission shall be composed of 25 members (Florida Statute 553.74 (1)). The commission is authorized to adopt and promote, in consultation with state and local governments, other boards, advisory councils, and commissions, such recommendations as are deemed appropriate to determine and ensure consistent, effective, and efficient enforcement and compliance with the Florida Building Code, including, but not limited to, voluntary professional standards for the operation of building departments and for personnel development. Recommendations shall include, but not be limited to, provisions for coordination among and between local offices with review responsibilities and their coordination with state or regional offices with special expertise (Florida Statute 553.76(5)).

International Building Code (IBC). Published by the International Code Council and used by the Florida Building Commission to develop the base code in Florida to form the foundation for the Florida Building Code (Florida Statute 553.73(3)).

International Code Council (ICC). Published the International Codes needed to develop the base code in Florida to form the foundation of the Florida Building Code (Florida Statute 553.73(3)).

Lowest Floor. Lowest floor of the lowest enclosed area, including basement; however, an unfinished or flood-resistant enclosure used solely for parking, building access, or storage shall not be considered the lowest floor provided such an enclosure is built as specified in this standard (ASCE/SEI 24-05, 1.2).

National Flood Insurance Program (NFIP). Established by the Administrator of the Federal Emergency Management Agency for the purpose of enabling interested persons to purchase insurance against loss resulting from physical damage to or loss of real property or personal property related thereto arising from any flood occurring in the United States (42 U.S.C., (50)(1) § 4011(a)).

Non-conforming. A non-conforming restroom is one that is not compliant with current building or NFIP floodplain construction standards because it was constructed prior to the development of original or updated Flood Insurance Rate Maps or flood damage prevention ordinances. The non-conformance is not considered to be a violation and is allowed to continue until a triggering event occurs, such as a substantial improvement or damage (see FEMA P-758 for description).

Portable Restrooms. Portable restrooms as regulated under Rules 64E-6.0101, Florida Administrative Code.

Public Bathing Place. Means a body of water, natural or modified by humans, for swimming, diving, and recreational bathing used by consent of the owner or owners and held out to the public by any person or public body, irrespective of whether a fee is charged for the use thereof. The bathing water areas of public bathing places include, but are not limited to, lakes, ponds, rivers, streams, artificial impoundments, and waters along the coastal and intracoastal beaches and shores of the state Chapter 514.011(4), Florida Statutes.

Public Restrooms in SFHAs. "Public Restroom" in a special flood hazard area is a structure designed and constructed to meet the sanitary needs of the public when visiting coastal and non-coastal properties. Such structures may include toilet rooms, changing rooms, shower stalls, required plumbing including backflow preventers, a minimum service drop for electrical equipment for lighting and receptacles, grinder pumps, lift stations, and/or septic tanks and drainfields. Public restrooms shall provide the above elements only, and may also be called "comfort stations", "bath houses" or "bathrooms". Public restrooms shall be designed and constructed to withstand hydrodynamic, hydrostatic and wave load impacts, and extended periods of flood inundation. Such structures shall meet or exceed the NFIP, IBC, FBC and the ASCE/SEI24-05 standards for construction in A zones and V zones when constructed either above or below BFE.

Residential. Buildings and structures and portions thereof where people live or that are used for sleeping purposes on a transient or non-transient basis; (2) residential structures, including but not limited to one- and two-family dwellings, townhouses, condominiums, multifamily dwellings, apartments, congregate residences, boarding houses, lodging houses, rooming houses, hotels, motels, apartment buildings, convents, monasteries, dormitories, fraternity houses, sorority houses, vacation time-share properties; and (3) institutional facilities where people are cared for or live on a 24-hour basis in a supervised environment, including but not limited to board and care facilities, assisted living facilities, halfway houses, group homes, congregate care facilities, social rehabilitation facilities, alcohol and drug centers, convalescent facilities, hospitals, nursing homes, mental hospitals, detoxification facilities, prisons, jails, reformatories, detention centers, correctional centers, and prerelease centers. (ASCE/SEI 24-05, 1.2).

Sanitary facilities. See Public Restroom.

Special Flood Hazard Area (SFHA). Land in the floodplain subject to a 1% or greater chance of flooding in any given year; area delineated on the Flood Insurance Rate Map as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE, or V1-30 (ASCE/SEI 24-05, 1.2).

Structures – NFIP. A walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home (44 CFR 59.1).

Structures – NFIP for Insurance Purposes. A building with two or more outside rigid walls and a fully secured roof that is affixed to a permanent site (44 CFR 59.1).

Structures—IBC/FBC. That which is built or constructed (FBC 2010).

Substantial Improvements. Means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or

2) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure". (44 CFR 59.1)

9.3. Photographs of Typical Not Compliant Public Restrooms in V Zone

Photos 1 and 2. This replacement, below-BFE public restroom (with septic tank, drainfield and electrical equipment) was rebuilt in a VE 18 zone with piling foundation, but not elevated. Community issued a variance for the elevation, and the structure is constructed with flood resistant materials and a permanently open door facing away from the bay.

Photo 3. Located on federal property in a VE 19 zone, this below BFE composting public restroom was constructed with pre-cast walls and roof deck and flood resistant materials. The property is an environmentally sensitive area with no utilities.

Photo 4. Located on federal property in a VE 19 zone, this below BFE public restroom had significant repairs and improvements and constructed with flood resistant materials. The property is an environmentally sensitive area with no utilities.

Photo 5. A replacement public restroom below BFE but built to be wind resistant with a hip roof and flood resistant materials in a VE 16 zone. A pump station transfers wastes to an offsite sewage treatment facility.

Photo 6. A new composting public restroom below BFE funded with federal grant dollars in a VE 16 zone to provide facilities at a public boat ramp.

9.4. Photographs of Typical Compliant Public Restrooms in V Zone

Photos 7 and 8. Elevated county public restroom above the BFE in a VE 13 zone with steps and ADA ramp.

Photo 9. A Florida panhandle State public restroom in a VE 11 zone with extended accessibility ramp designed to meet ADA requirements. Such a ramp, though extensive in length, was designed to minimize obstructions by being located perpendicular to the shoreline.

Photos 10 and 11. A compliant masonry public restroom in Mississippi constructed after multiple hurricanes struck the coast. The $1.1 million cost for the facility was largely covered by FEMA Public Assistance funding, with three other similar structures also funded by FEMA or with a combination of State and federal sources. Note soda machine on right in a “cage” that can be lifted above floodwaters.

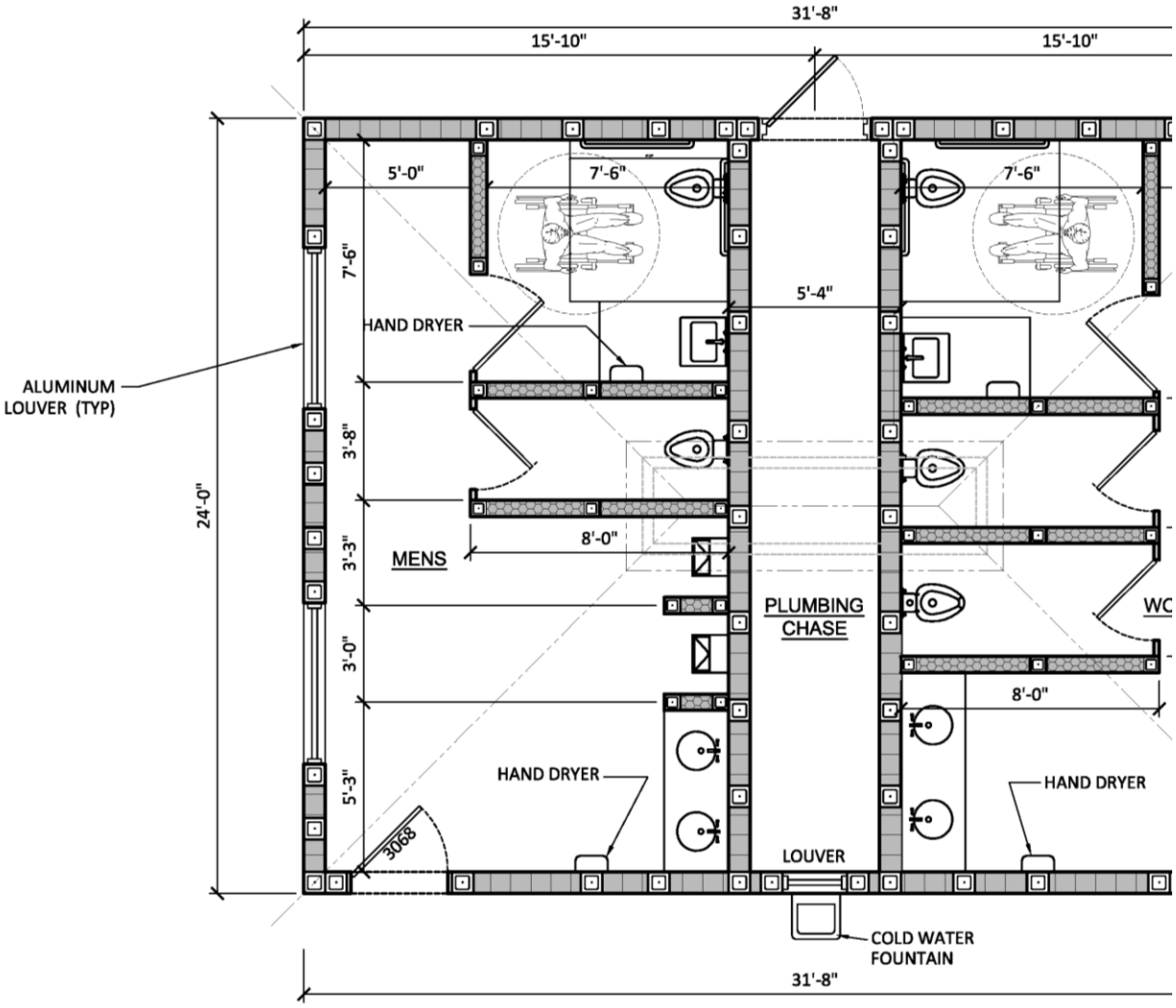
Photos 12 and 13. Compliant public restroom in a VE zone in a Florida panhandle State facility with concrete column foundations, accessible concrete walkways and an elevator to provide universal access. The elevator was not sustainable, so the State was required to construct an obstructive ramp to afford access.

Photo 14. Compliant public restroom on concrete pilings and located in a VE zone in southwest Florida. Extensive ramp to meet ADA requirements significantly expands the obstruction in this high hazard coastal zone. Ramp does not appear to be completely detached.

Photo 15. Public restroom in a VE-18 zone received a variance from elevation requirements after maps changed from AE 10 and after design was completed to accommodate disabled citizens and the sensitive ecologically significant marine environment. Composting toilets are used with no running water. A self-contained electric system with batteries and solar is used. A required emergency action plan was required as a condition for variance which includes removal of effluent from tanks and filling them with clean water as well as removing self-contained electrical equipment.

Photo 16. Dry floodproofed public restroom in southwest Florida in an AE zone is a compliant application for a non-residential structure. An emergency action plan is also adopted by the community to ensure that dry floodproofing has been implemented.

9.5. Schematics of Proposed Public Restroom Concepts for V-Zones



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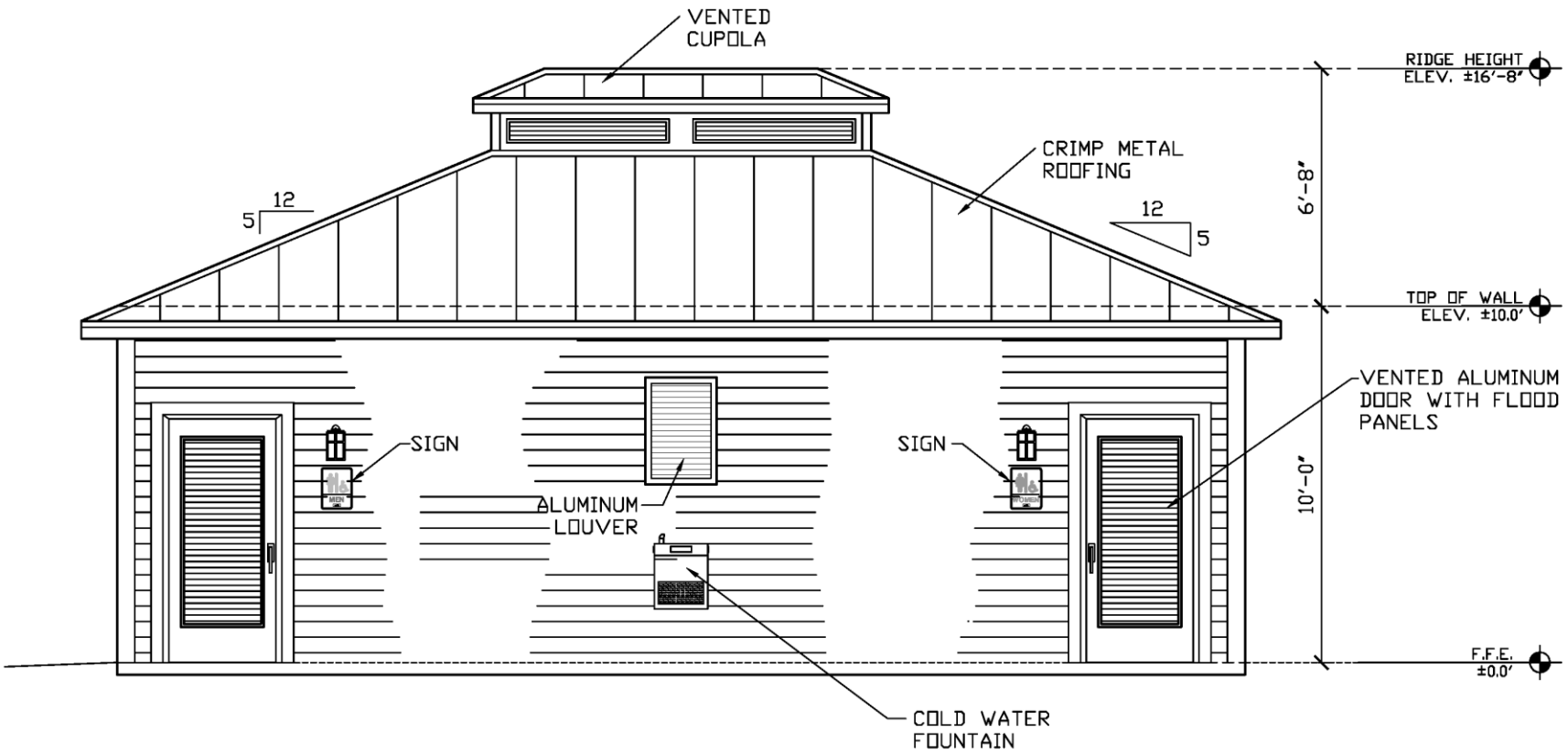
FLOOR PLAN
SCALE: NTS



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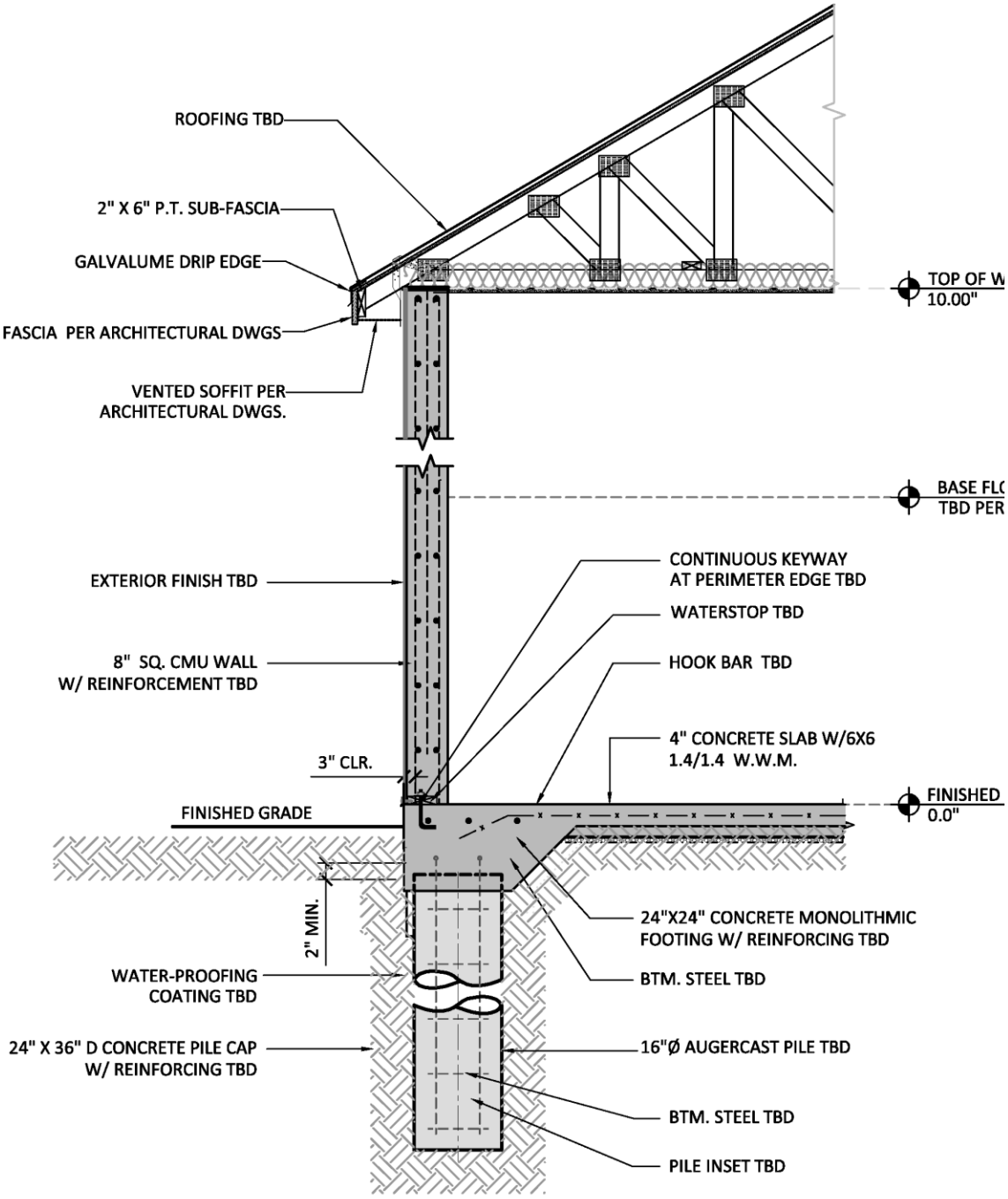
FRONT ELEVATION

SCALE: NTS



WALL FOOTING SECTION @ GRADE

SCALE: NTS

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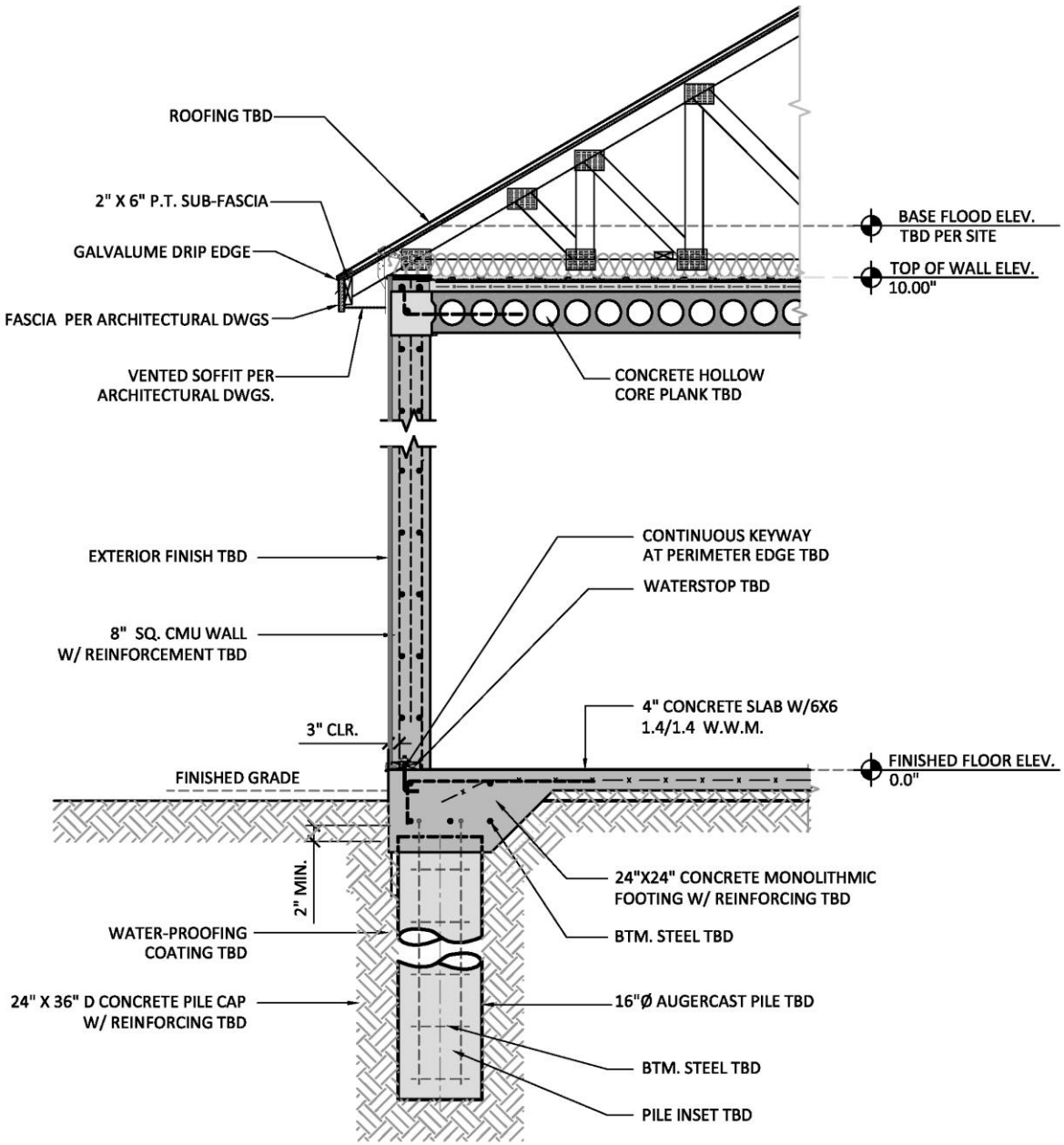

WALL FOOTING SECTION@ GRADE - DRY FLOOD PROOFED

SCALE: NTS

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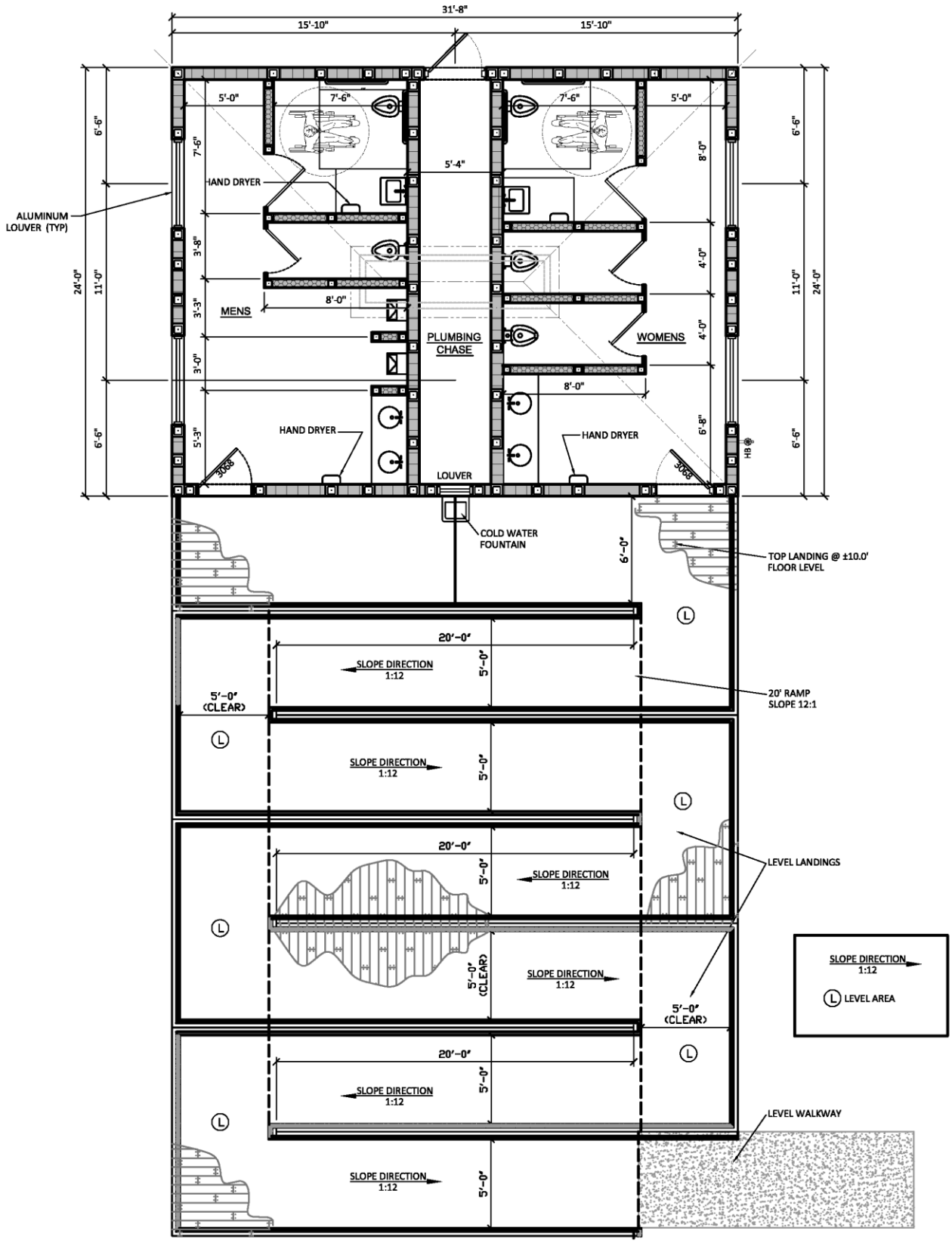

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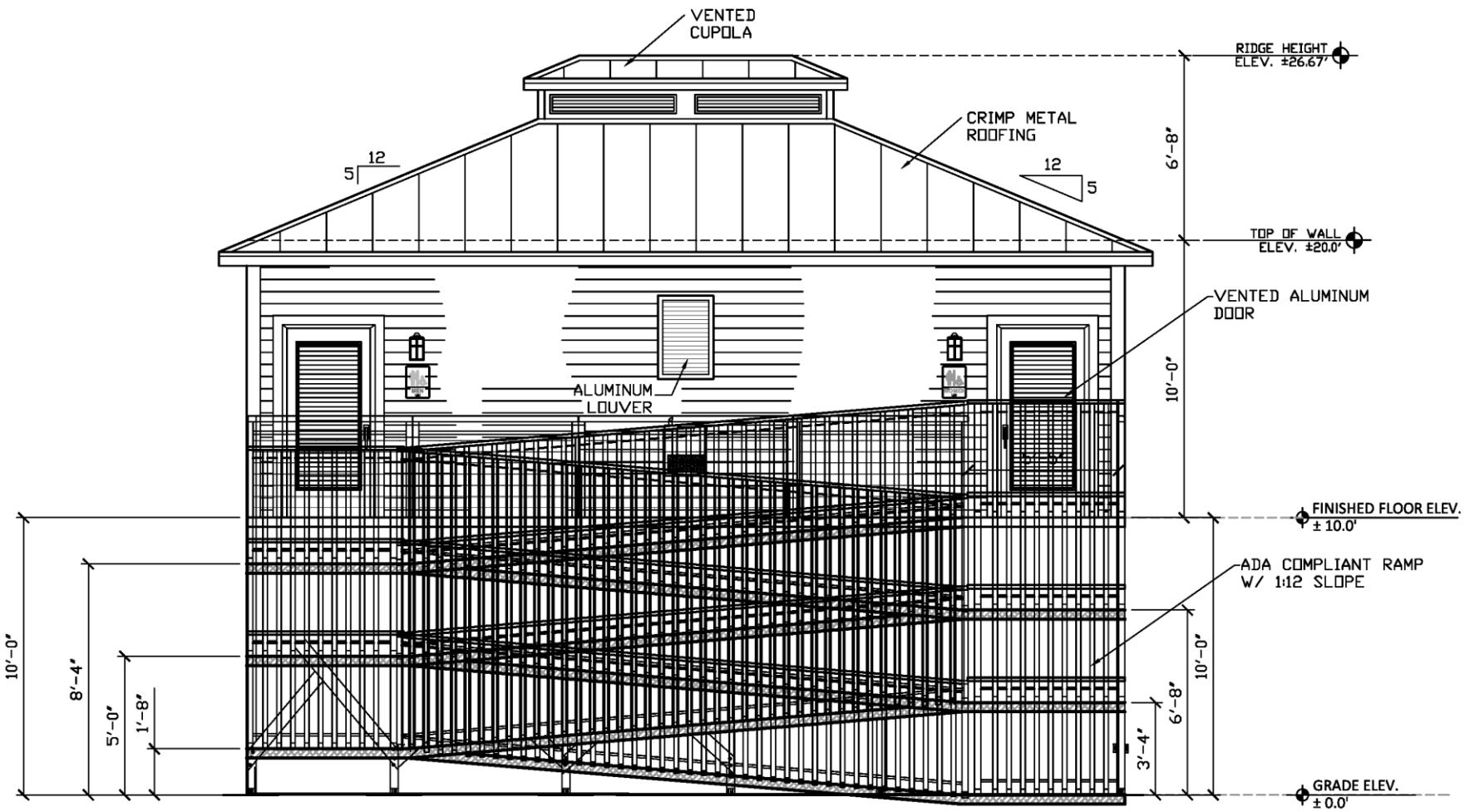
FLOOR PLAN - RAISED BUILDING
SCALE: NTS



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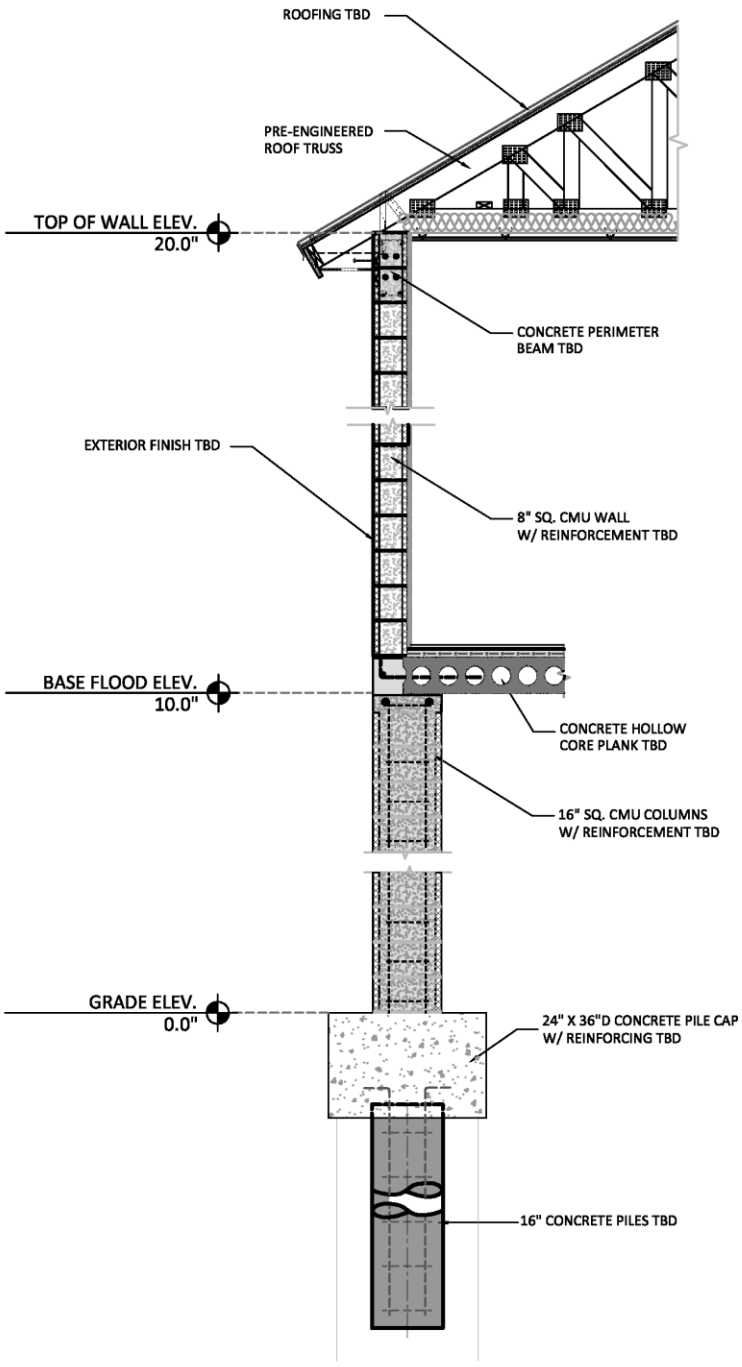
FRONT ELEVATION RAISED WITH ADA RAMP

SCALE: NTS



WALL FOOTING SECTION - RAISED

SCALE: NTS

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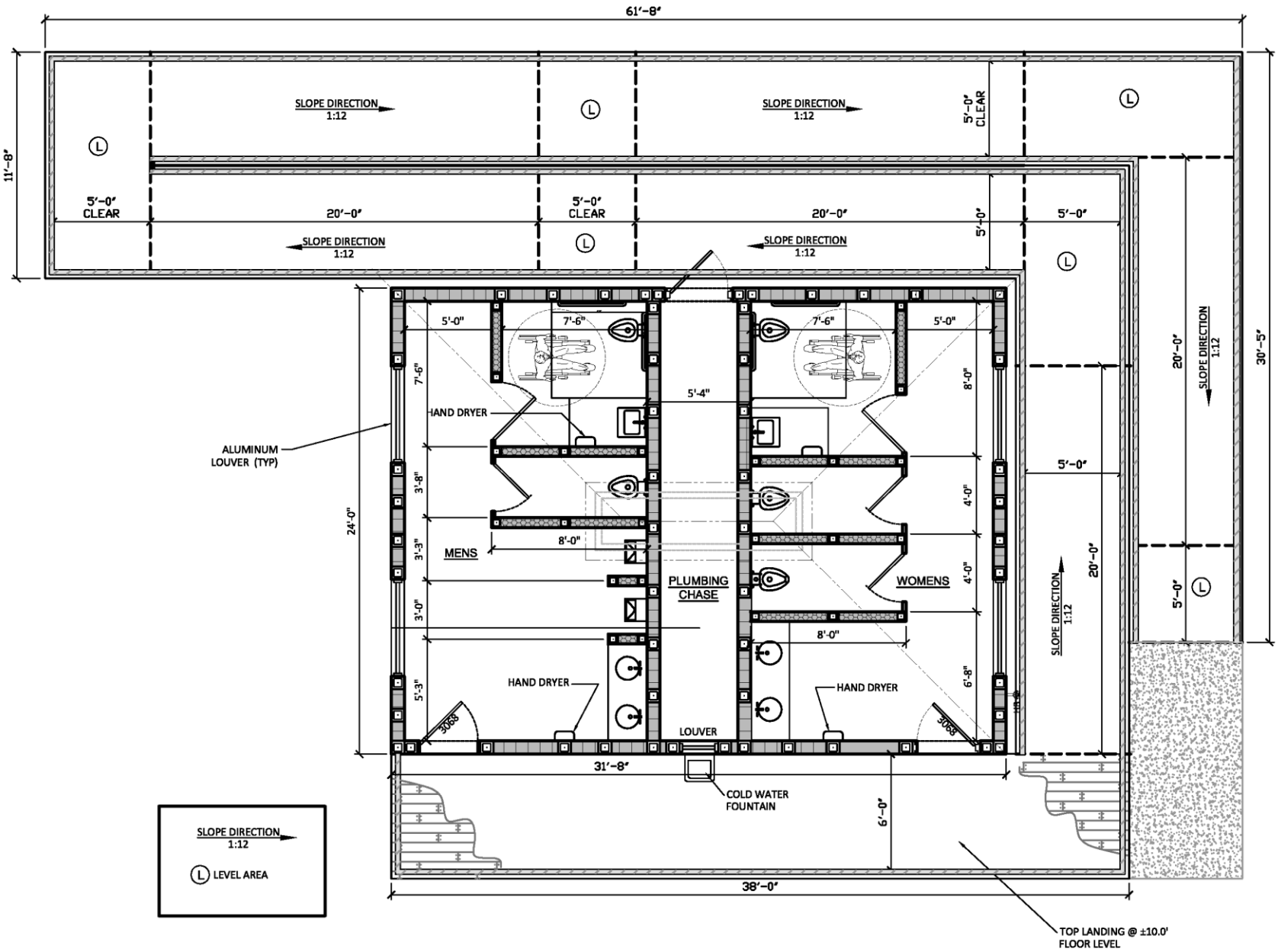

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FLOOR PLAN - RAISED - ALTERNATE

SCALE: NTS

9.6. Survey Support Documents

9.6.1. Survey Instrument

Florida Floodplain Managers' Association (FFMA)

2013-2014

Survey of Florida Coastal Communities Concerning Public Restrooms in V Zones

Typically, Florida's beach parks have ground elevations just a few feet above sea level. Base flood elevations often range from 10 to 20 feet above sea level in high-hazard coastal flood zones requiring public restroom facilities in V zones to be elevated to or above these heights in order to be compliant with National Flood Insurance Program (NFIP) and the Florida Building Code (FBC). In addition, Florida's Coastal Construction Control Line (FCCCL) may require even higher elevations than is depicted on FEMA flood insurance rate maps and the more stringent of the two must be used in setting building heights.

During design and construction of new public restrooms, many communities have found that the cost for elevating the limited-use, flood-resistant structures may be several times the cost for building them on grade or slightly above grade. However, since public restrooms are structures that are unique in their function and use, and tend to be resistant to the effects of low velocity flooding, community representatives have asked the FFMA Coastal Committee to address the lack of FEMA and FBC policies specific to public restrooms in V zones. One of the principal charges of the Committee is to recommend policies that recognize the public interest in allowing appropriately-designed restrooms below the BFE, and to propose public restroom design concepts that are engineered to make the structures flood and wave resistant to reduce or eliminate the need to repair or replace them following major storms.

Purpose of Survey. In order to present a statewide perspective and capture the experience of communities, FFMA has developed this survey to gather information from communities about the challenges they face when constructing restrooms above the BFE in V zones. The survey results will be summarized at the state-level only to present a statewide profile of responses. Individual responses shall remain confidential and are to be used exclusively for the purposes of this study.

QUESTIONS BELOW CONCERN PUBLIC RESTROOM CONSTRUCTION IN **V-ZONES** ONLY.

For FFMA verification purposes and follow up as needed, please provide:

Community Name: _____

Contact Name: _____

Contact Title: _____

Phone: _____

E-mail: _____

* *

1) Please consecutively rank the most frequent reasons why post-FIRM public restrooms may not be above the BFE (use 1 for the most frequent, 9 the least frequent, and use each ranking number only once – there can be no ties for the same ranking):

a) Cost of construction _____
b) ADA code compliance _____
c) Change in BFE with new maps _____
d) Exemption or variance granted _____
e) To reduce the need for long access ramps that would be "obstructions" in V zones _____
f) Restrooms at beaches are considered a "facility-dependent use" _____
g) Restrooms at beaches are considered to be "accessory uses" _____
h) Restroom is "historic" and granted a variance or exemption from NFIP standards _____
i) Other? _____ [Please identify the "Other" reason if ranked higher than "9". _____]

2) Has your community granted variances for public restrooms so they may be built below the BFE? YES ☐ NO ☐
If YES, please explain the criteria or rationale used in approving the variance. _____

3) Are you aware of any designs for public restrooms that are engineered to withstand wave loads in V zones? YES ☐ NO ☐
If YES, will you provide photos of structures or schematic drawings?

Attached ☐ Sent via Separate E-mail ☐ None Available ☐

4) Has your community conducted benefit/cost analyses that justifies not elevating a public restroom that will withstand wave loads vs. elevating the restroom? YES ☐ NO ☐
If YES, can you provide the BCA analysis?

Attached ☐ Sent via Separate E-mail ☐ None Available ☐

5) Does your community provide flood insurance for public restrooms in V zones?
YES ☐ NO ☐ If YES, select: NFIP ☐ or Self insured ☐ or Both ☐

The following question is asked to help quantify the extent of impact that public restroom construction in V zones has on local communities.

6) How many V zone public restrooms does your community have _____ , and of those how many are below the BFE? _____

Please e-mail your response to:

Ms. Cece McKiernan, Executive Director, Florida Floodplain Managers' Association

ffmacmckiernan@yahoo.com, or if you have questions, please call

Ms. Desiree Companion, FFMA President

at: 941-861-0802

9.6.2. Summary of Survey Results

Background

The survey was designed to capture relevant data on the extent of coastal communities with V zones having compliant and non-compliant restrooms. The Florida Department of Emergency Management (FDEM) provided a list of NFIP-participating Florida coastal communities with V zones. The FFMA Coastal Committee prepared a questionnaire consisting of six (6) questions.

One hundred eighty-two (182) coastal communities were initially contacted by telephone or e-mail to determine their willingness to participate. During the initial telephone contact thirteen (13) communities identified that they did not have any public restroom facilities in the V zones and there was no need to receive the questionnaire. The questionnaire was e-mailed to the remaining one hundred sixty-nine (169) communities in the last half of 2013. A second e-mailing effort to non-responding communities was conducted in January 2014.

Survey Results

Level of Participation:

A total of sixty-two (62) coastal communities provided some form of response information to the FFMA V zone survey questionnaire. A total of twenty (20) communities (which includes the original 13 described above) and one (1) water management district provided responses that were ranked as "Non-applicable (N/A)". The overall survey response rate was approximately thirty-four percent (34%). Deducting the "N/A" communities from the survey provided a response rate of approximately twenty-six percent (26%). Utilization of information from the forty-two (42) applicable responding coastal communities provided the following results.

Survey Question #1:

Q1 – Please consecutively rank the most frequent reasons why post-FIRM public restrooms may not be above the BFE (use 1 for the most frequent, 9 the least frequent, and use each ranking number only once – there can be no ties for the same ranking):

a) Cost of construction _____

b) ADA code compliance _____

c) Change in BFE with new maps _____

d) Exemption or variance granted _____

e) To reduce the need for long access ramps that would be "obstructions" in V-zones _____

f) Restrooms at beaches are considered a "facility-dependent use" _____

g) Restrooms at beaches are considered to be "accessory uses" _____

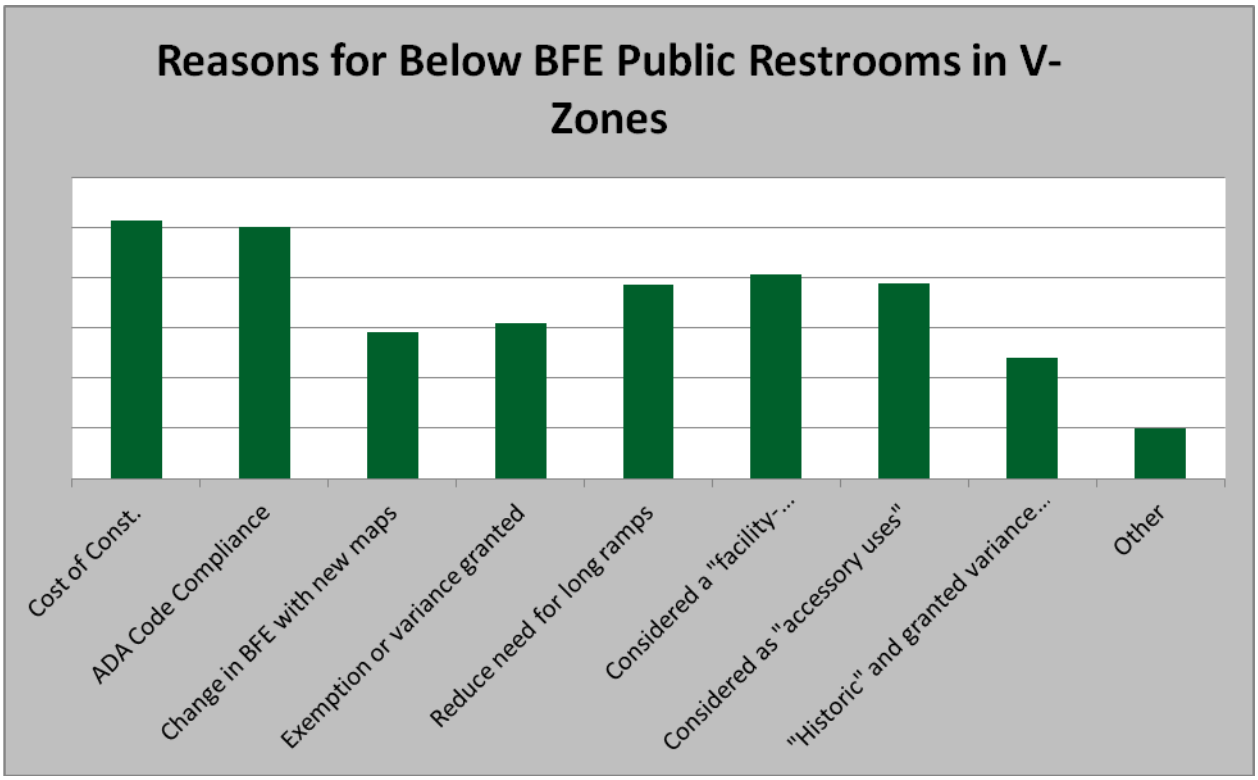
h) Restroom is "historic" and granted a variance or exemption from NFIP standards _____

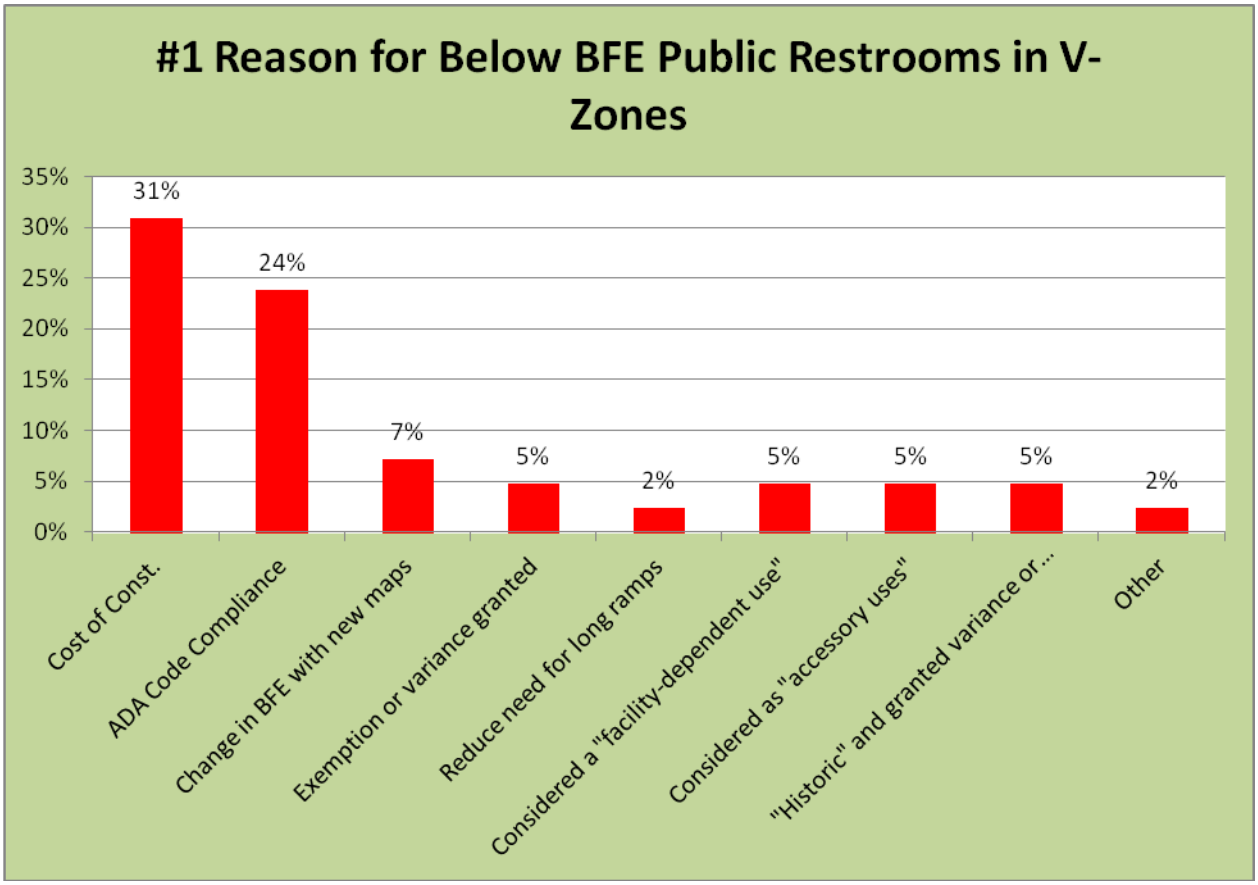
i) Other? _____ *[Please identify the "Other" reason if ranked higher than "9".* _____*]*

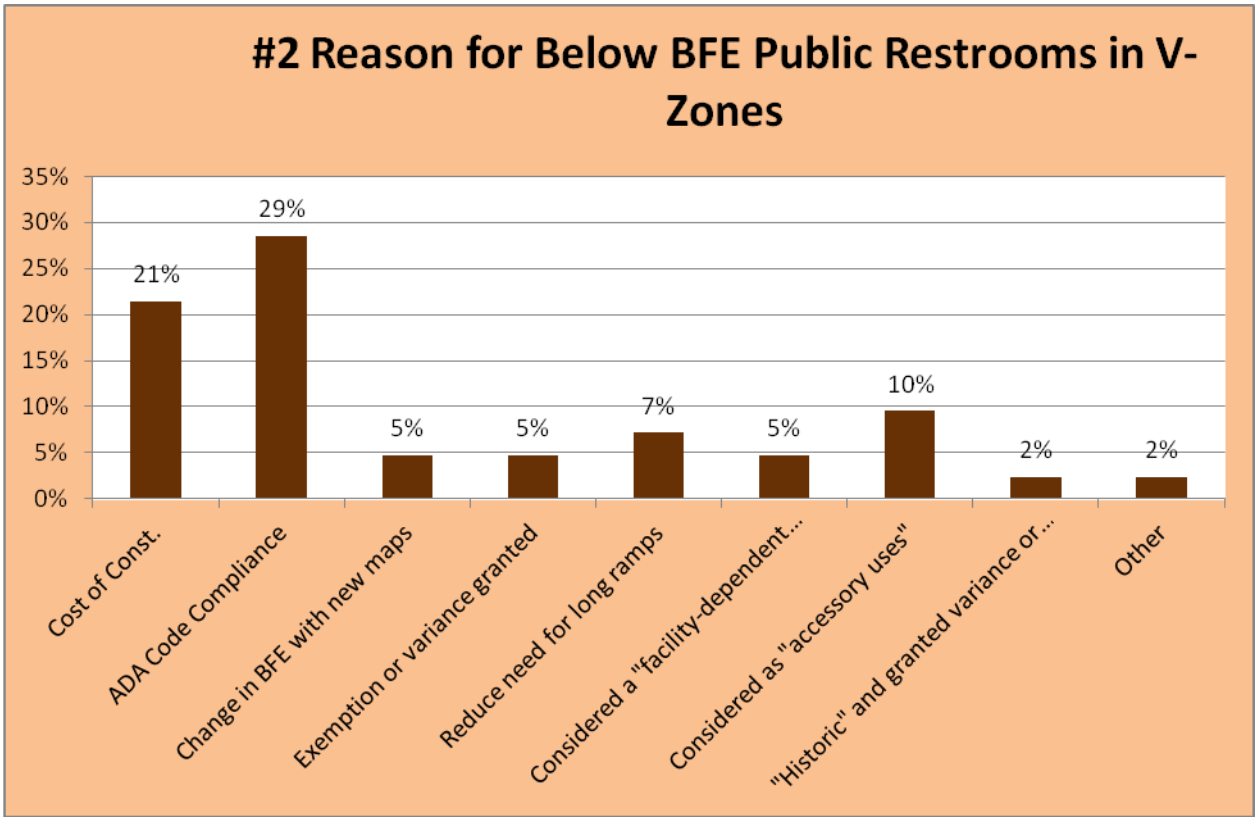
Question #1 provided options that were generally expressed at the 2012 FFMA conference. If a community has a V zone public restroom below BFE, what was the basis for the construction approval? The following three (3) graphs illustrate the results.

The top five identified reasons for having a public restroom below the BFE were:

1. Cost of Construction
2. ADA Code Compliance
3. Considered a "facility-dependent use"
4. Considered as "accessory uses"
5. Reduce the need for long ramps (which is also related to ADA Code Compliance)




#1 Reason for Below BFE Public Restrooms in V-Zones
35%
30%
25%
20%
15%
10%
5%
0%
31%
24%
7%
5%
2%
5%
5%
5%
2%
Cost of Const.
ADA Code Compliance
Change in BFE with new maps
Exemption or variance granted
Reduce need for long ramps
Considered a "facility-dependent use"
Considered as "accessory uses"
"Historic" and granted variance or ...
Other



The top two (2) identified reasons were far more commonly identified as “Cost of Construction” and “ADA Code Compliance” with over half of the respondents selecting them.

Survey Question #2:

Q2 Has your community granted variances for public restrooms so they may be built below the BFE? YES ☐ NO ☐

If YES, please explain the criteria or rationale used in approving the variance. _____

Result:

Of the forty-two (42) responding communities, four (4) indicated that a variance had been issued to allow construction of the public restroom below the BFE. That equates to a ten percent (9.5%) usage rate among responding communities.

Survey Question #3:

Q3 Are you aware of any designs for public restrooms that are engineered to withstand wave loads in V zones? YES ☐ NO ☐

If YES, will you provide photos of structures or schematic drawings?

Attached ☐ *Sent via Separate E-mail ☐* *None Available ☐*

Results:

Of the forty-two (42) responding communities, five (5) indicated an awareness of public restrooms engineered to withstand wave loads in V zones. That equates to approximately a twelve percent (12%) awareness rate among responding communities. Of those expressing awareness, none provided photos or drawings for review by the FFMA coastal committee.

Survey Question #4:

Q4 Has your community conducted benefit/cost analyses that justifies not elevating a public restroom that will withstand wave loads vs. elevating the restroom? YES ☐ NO ☐

If YES, can you provide the BCA analysis?

Attached ☐ Sent via Separate E-mail ☐ None Available ☐

Results:

Of the forty-two (42) responding communities, one (1) indicated that a Benefit/Cost Analysis (BCA) was used to justify not elevating the public restroom above the BFE. That equates to approximately a two percent (2%) BCA usage rate among responding communities, even though "Cost of Construction" was the top rated reason expressed for having the below-BFE public restroom.

Survey Question #5:

Q5 Does your community provide flood insurance for public restrooms in V zones?

YES ☐ NO ☐ If YES, select: NFIP ☐ or Self insured ☐ or Both ☐

Results:

Of the forty-two (42) responding communities, approximately forty-five percent (45%) indicated having flood insurance coverage, and of those with flood insurance, approximately seventy-four percent (74%) indicated the community self-insured some or all of the structures. Fifty-two percent (52%) of the responding communities indicated they did not have flood insurance coverage. Approximately two percent (2%) of the responding communities did not provide an answer to this question.

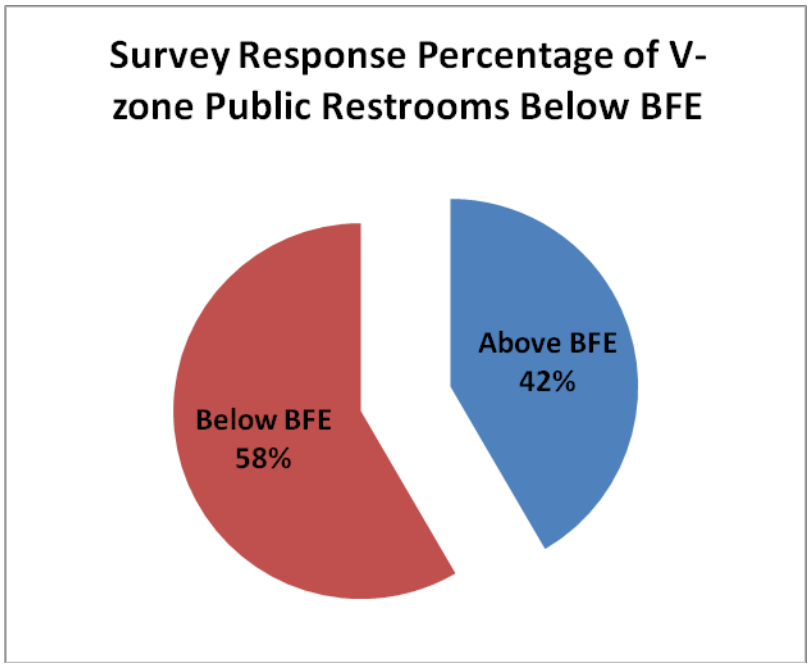
Survey Question #6:

(The following question is asked to help quantify the extent of impact that public restroom construction in V zones has on local communities.)

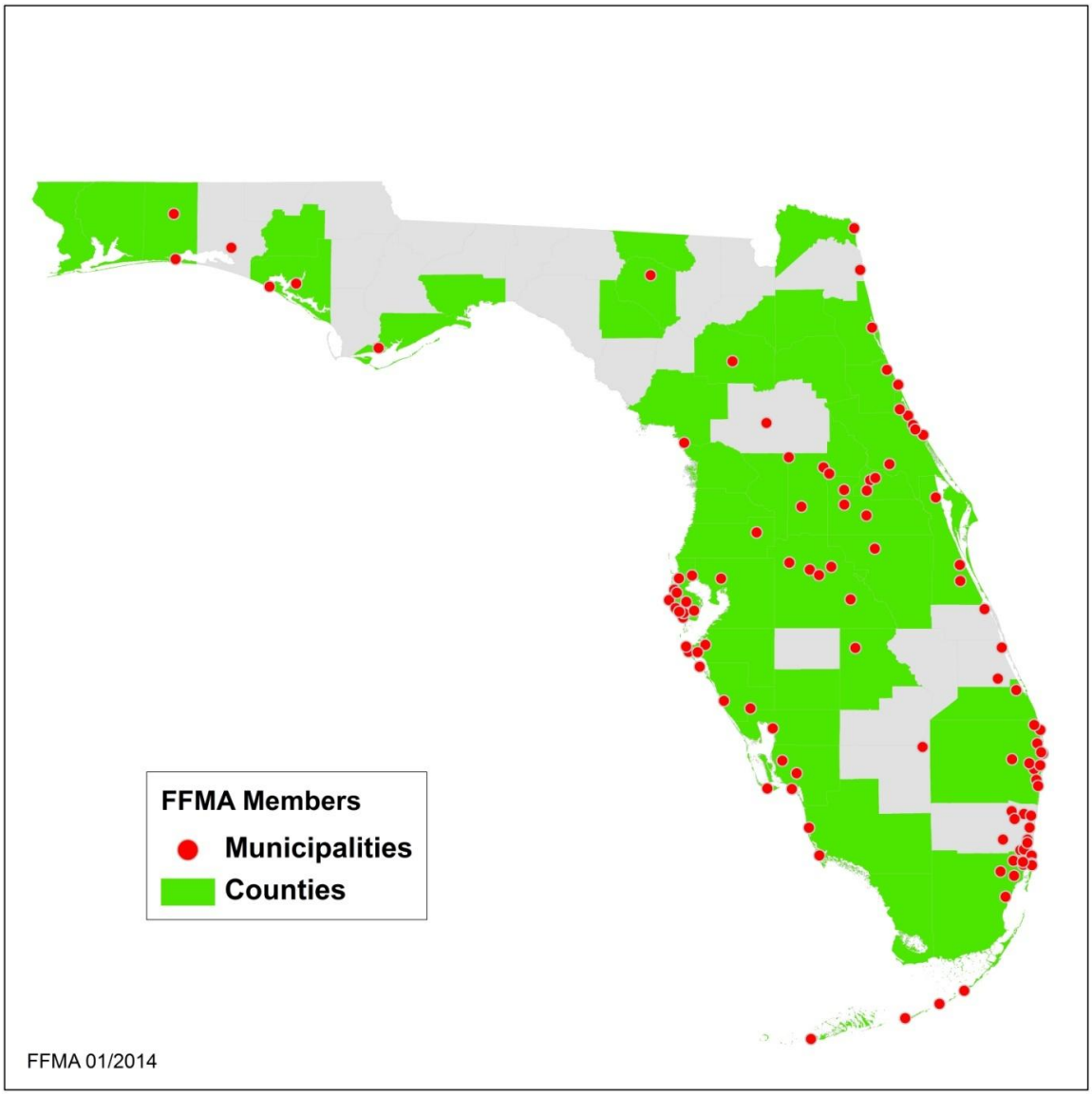
Q6 How many V zone public restrooms does your community have _____ , and of those how many are below the BFE? _____

Results:

A total of one hundred thirteen (113) public restroom facilities were identified as being located within the V zone. Of the forty-two (42) responding communities, thirteen (13) indicated they did not have any public restrooms in the V zone. That equates to thirty-one percent (31%) of the communities that chose to participate in the survey rather than simply say "N/A". Of the twenty-nine (29) communities indicating the presence of public restrooms in the V-zone, ten (10) of them indicated that none of their public restrooms in the V zone were constructed below the BFE and one (1) community indicated their usage of portable restrooms. One (1) community indicated the presence of below-BFE public restrooms in the V zone, but did not provide the number of structures. A total of sixty-six (66) below-BFE public restroom facilities were identified by the remaining eighteen (18) communities. That equates to approximately fifty-eight percent (58%) of the identified public restrooms in the V zone being below BFE.



9.7. Map of Communities with Staff who are Members of FFMA



9.8. References (Some, but not all publications are cited in the report.)

ASCE/SEI 7-10
ASCE/SEI 24-05
FEMA , Coastal Construction Manual Volume II FEMA P-55, August 2011
FEMA 543, *Design Guide for Improving Critical Facility Safety from Flooding and High Winds*
FEMA's (August 2008) *Technical Bulletin – 5, Free-of-Obstruction Requirements*,
Florida Building Code 2010
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Outdoor Recreation in Florida 2013
StateofFlorida.com