An "Opening" Argument: The Controversy Over Floodshields & the Protection of Glass Storefronts & Curtain Walls

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Association of State Floodplain Managers Annual Conference

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Kansas City, MO

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- global law firm with approximately 1,000 highly skilled lawyers
- approximately 150 lawyers in real estate client service group
- 27 offices across North America, Europe and Asia
- diversified transaction and litigation practice serving clients in key business and financial markets around the world
- client base that includes publicly held multinational corporations, large and mid-sized privately held companies, emerging companies, not-for-profit organizations, government entities and individuals

What is Dry Floodproofing?

Dry floodproofing (44 CF 60.3(c)(3):

"the structure is watertight with walls substantially impermeable to the passage of water"

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Architectural Styles, glass

Hardwick Hall, more glass than wall

c. 1597, Chesterfield

Architectural Styles, glass

Erazmus Pavilion, no wall at all

c. 2013, Rotterdam

Architectural Styles, glass

Glass Farm, glass imitates wall

c. 2013, Schijndel

Architectural Styles, glass

Fulton Street Transit Center

New York City, 2014

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Architectural Styles, glass

Main Street revitalizations, USA

Show windows

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Regulatory Framework

Source	Guidance
44 CFR §60.3	FEMA TB 3 FEMA P 936 References ASCE 24 References IBC References USACE 1995
International Building Code Includes ASCE 24-14	IBC Commentary ASCE 24-14 Annex ASCE Interpretations
Local Codes e.g., New York City Building Code based on IBC	

44 CFR §60.3

Community Obligations for A-Zones:

- Building Sites:
  - New construction
  - Substantial Improvements
- Subdivisions
  - Flood damage generally
  - Utilities
  - Drainage
- Water Supply and Sanitary Sewer Systems
- Recreational Vehicles

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44 CFR §60.3

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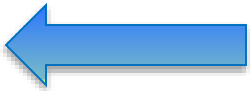

Dry floodproofing for nonresidential buildings

- Subdivisions
  - Flood damage generally
  - Utilities
  - Drainage
- Water Supply and Sanitary Sewer Systems
- Recreational Vehicles

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44 CFR §60.3
(must a "structure" have "walls"?)

Dry floodproofing – 44 CF 60.3

(c) [T]he community shall:

. . .

(3) Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's firm (i) [elevate] or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the **structure** is watertight 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;

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44 CFR §60.3

Dry floodproofing – 44 CF 60.3

(c) [T]he community shall:

. . .

(4) Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are **in accordance with accepted standards of practice** for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and (ii) a record of such certificates . . . .;

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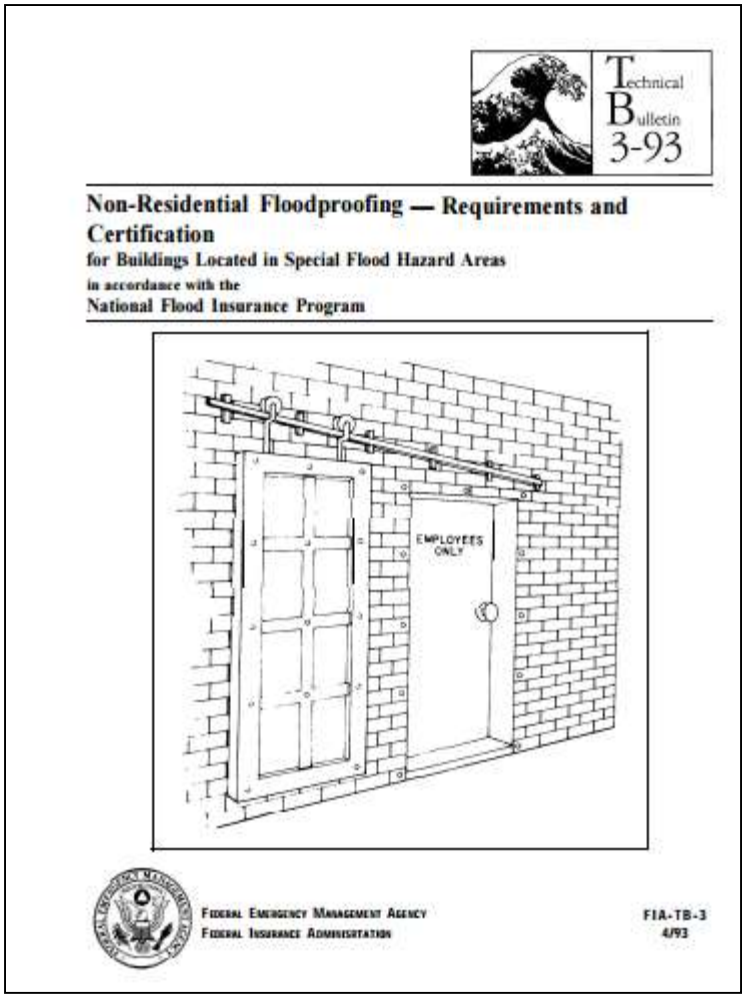
FEMA Technical Bulletin – TB 3 - 93



"The **building** must be watertight (i.e., floodwaters must not enter the **building envelope**)"

"The **building's walls** must be 'substantially impermeable to the passage of water.'"

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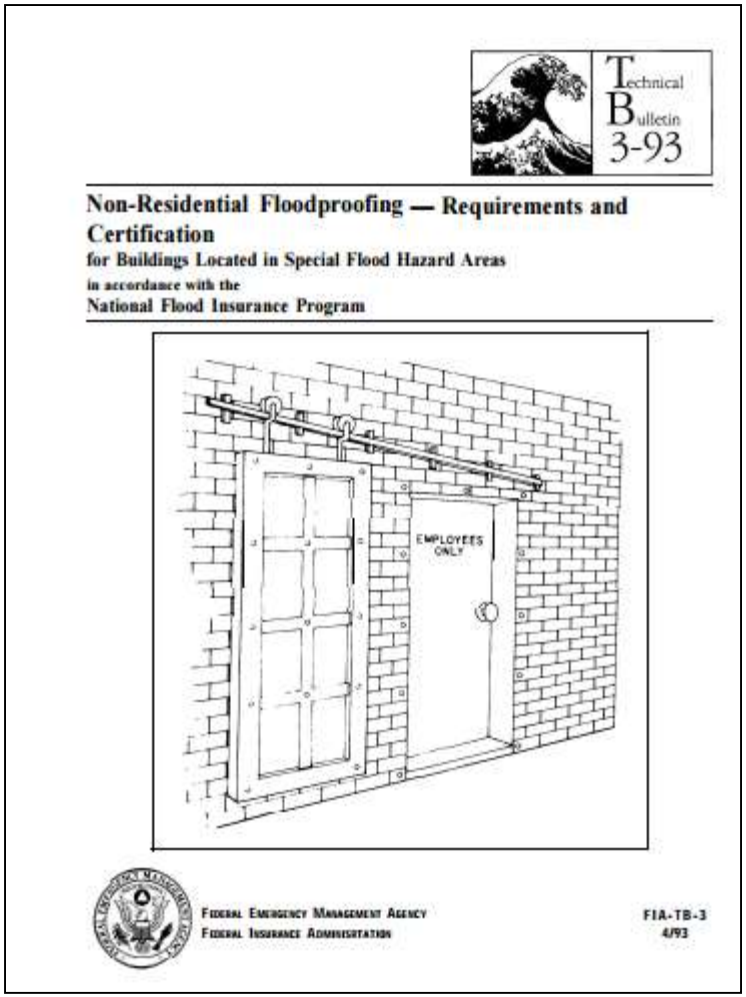
FEMA Technical Bulletin – TB 3 - 93



Floodproofing components for an individual building may also include **floodwalls**, small localized **levees**, or **berms** around buildings. However, such components, because they **are not part of the building itself**, are generally not credited for the flood insurance rating of a building under the NFIP and are therefore not detailed within this bulletin.

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FEMA PUBLICATION – P-936 - 13

Chapter 3: Dry floodproofing

- Continuous impermeable walls
- Flood shields for openings in exterior walls

Chapter 4: Floodwalls and Levees

- Barriers between the building and floodwaters

Publication 936

Home Mortgage Interest Deduction

For use in preparing 2016 Returns

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Future Developments

Reminder

Introduction

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FEMA PUBLICATION – P-936 - 13

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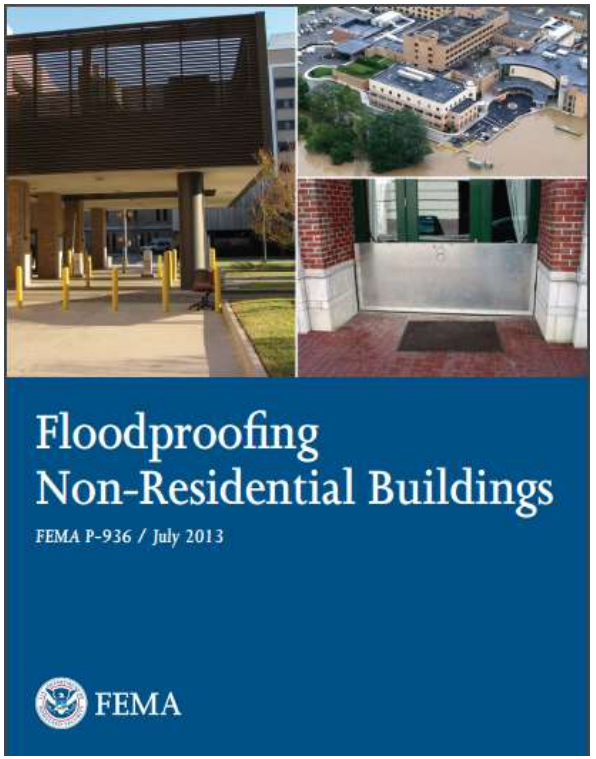

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Chapter 3: Dry floodproofing

- **Dry floodproofing.** A combination of measures that results in a **structure**, including the attendant utilities and equipment, being watertight with all **elements** substantially impermeable to the entrance of floodwater and with structural components having the capacity to resist flood loads.

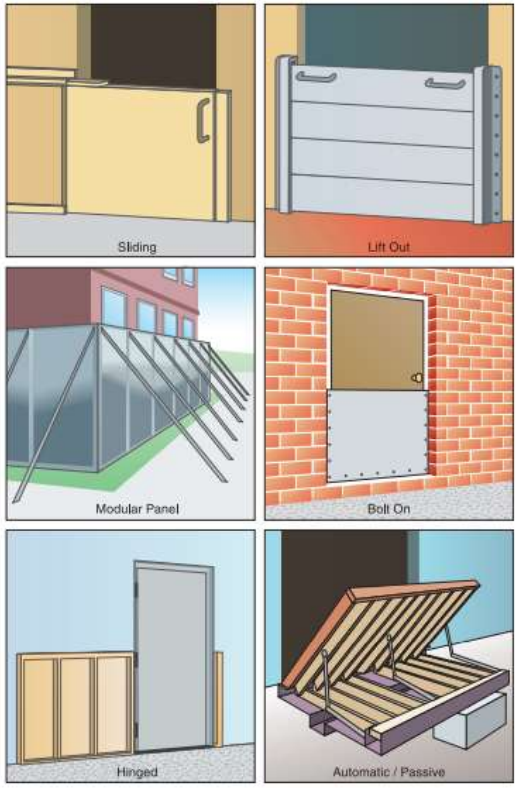

Figure 3-10. Types of flood shields

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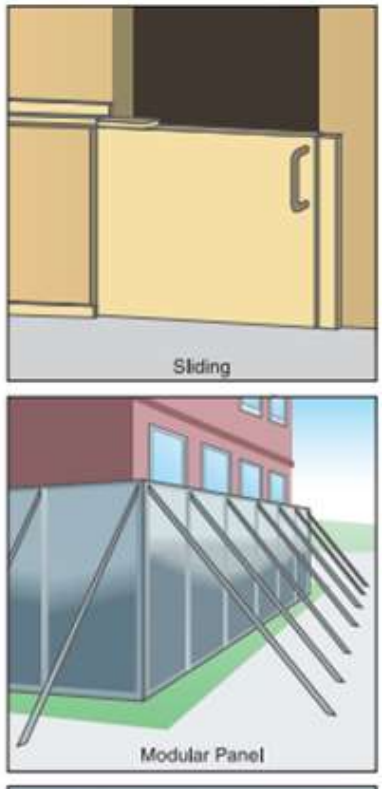
Chapter 3: Dry floodproofing

- "Must be designed so the **structure** is watertight below the BFE with **walls** substantially impermeable to the passage of floodwaters."



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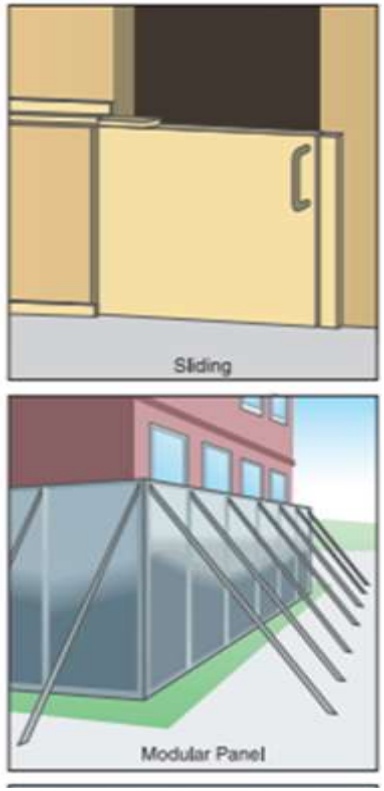

Figure 3-10. Types of flood shields

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Chapter 3: Dry floodproofing

- "The standards of practice require that the **building**, together with attendant utility and sanitary facilities, be designed so that it is watertight below the BFE, with **walls** substantially impermeable to the passage of water and with structural components that are capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy associated with the design flood event."

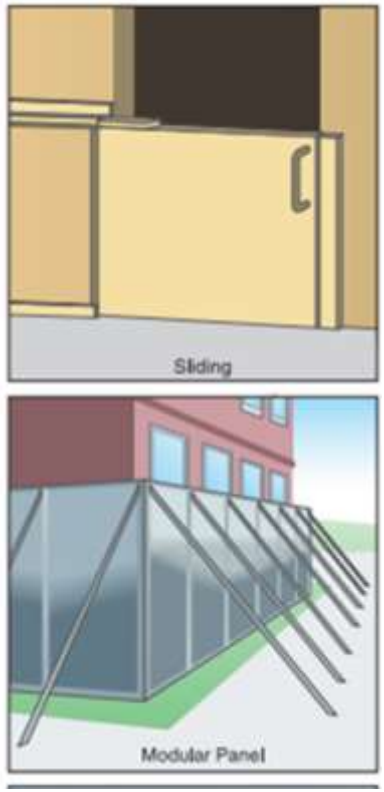

Figure 3-10. Types of flood shields

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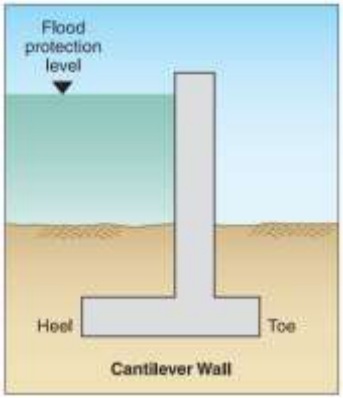
Regulatory Framework – FEMA P-936

Chapter 4: Floodwalls and Levees

- **Floodwall.** Constructed barrier of flood-damage-resistant materials to keep water away from or out of a specified area. Floodwalls surround a building or area and are off-set from the exterior walls of the building.



- **Levee.** Manmade barrier, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

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Chapter 4: Floodwalls and Levees

- Do not satisfy NFIP new construction/substantial improvement standards unless certified
- Often installed as retrofits/pre-FIRM facilities

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IBC, ASCE 24 - 14

Definitions

- **Dry Floodproofing**—A combination of measures that results in a **structure**, including the attendant utilities and equipment, **being watertight** with all elements substantially impermeable and with structural components having the capacity to resist flood loads.
- **Shield**—Removable or permanent substantially impermeable **protective cover for an opening in a structure** below the DFE, used in dry floodproofing the structure.

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IBC, ASCE 24 - 14

ASCE 24 Section 6.2.2

- "Dry-floodproofed areas of **structures** shall . . . [b]e designed and constructed so that any area below the [DFE], together with attendant utilities, equipment, and sanitary facilities, is flood resistant with **walls** that are substantially impermeable to the passage of water. Walls, floors, and **flood shields** shall be designed and constructed to resist hydrostatic, hydrodynamic, and other flood-related loads, including the effects of buoyancy resulting from flooding to the DFE."

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IBC, ASCE 24 - 14

Appendix C1.4.2: Flood Control Structure/Flood Protective Works

- Barriers that keep waters away from an area

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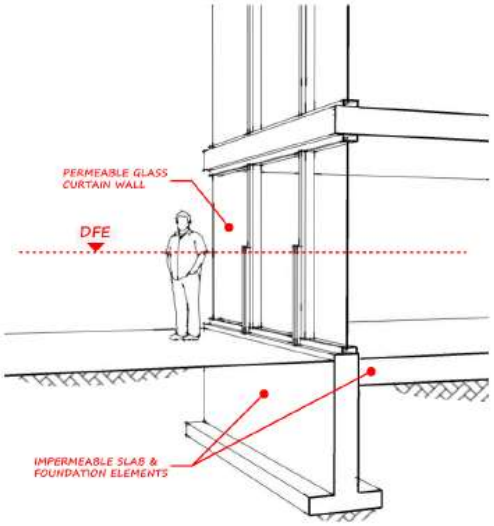
ASCE 24 Standards Committee Formal Interpretation 11/29/16

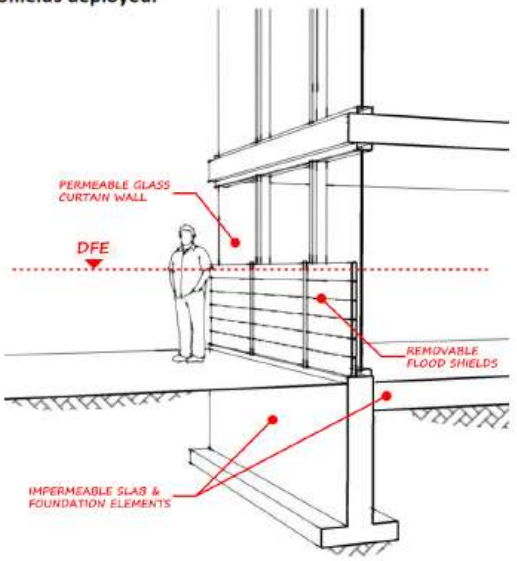
- **Question:** Does a building located in an AE-Zone with permeable exterior walls below DFE (i.e. glass curtain walls supported by impermeable reinforced concrete stem wall) meet the dry floodproofing requirements of Section 6.2.2 when removable flood shields are used as a component of the exterior building façade to render the permeable exterior wall impermeable from grade to the design flood elevation along the entire length of the building's façades?

ASCE 24 Standards Committee Formal Interpretation 11/29/16

Building Façade without Flood Shields:



Building Façade with Flood Shields deployed:



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ASCE 24 Standards Committee Formal Interpretation 11/29/16

Building Façade with Integrated Flood Shield Supports:

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ASCE 24 Standards Committee Formal Interpretation 11/29/16

Answer: Yes, the removable flood shields described and shown in the request meet the dry floodproofing requirements of ASCE 24-14, provided the following conditions are met:

1. when installed, the shields **are close to and attached to** the building façade,
2. the shield attachment is via **guides, fasteners or supports** that are **permanent parts of the building façade**, and
3. the building and flood shields meet all other dry floodproofing requirements, restrictions and limitations of chapter 6.

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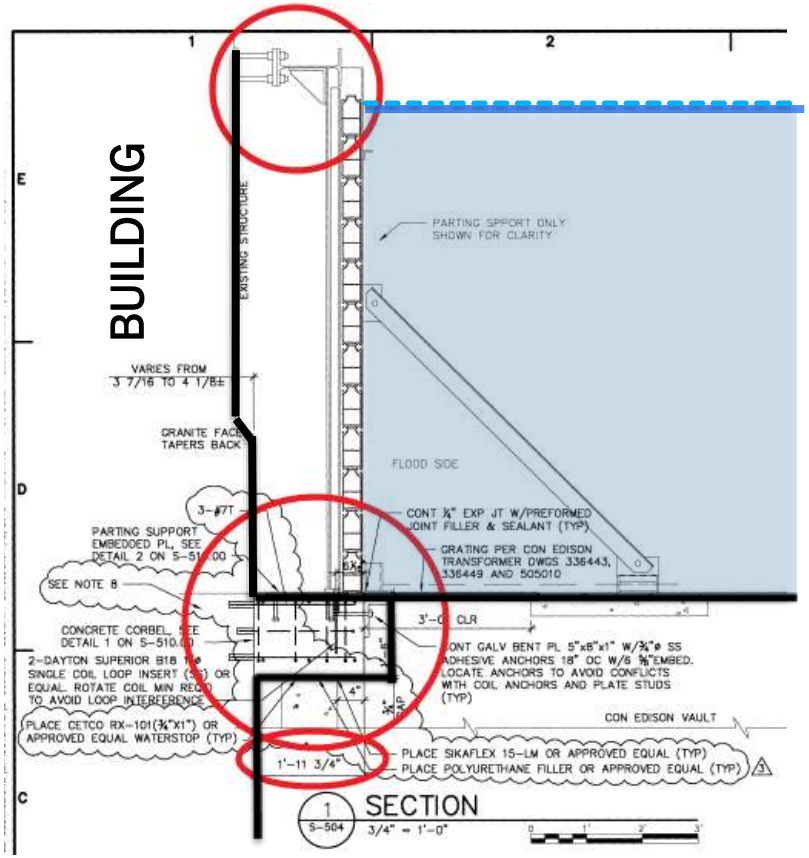
NFIP Compliant? IBC/ASCE 24 Compliant?

Dry floodproofing?

or

Flood control structure?



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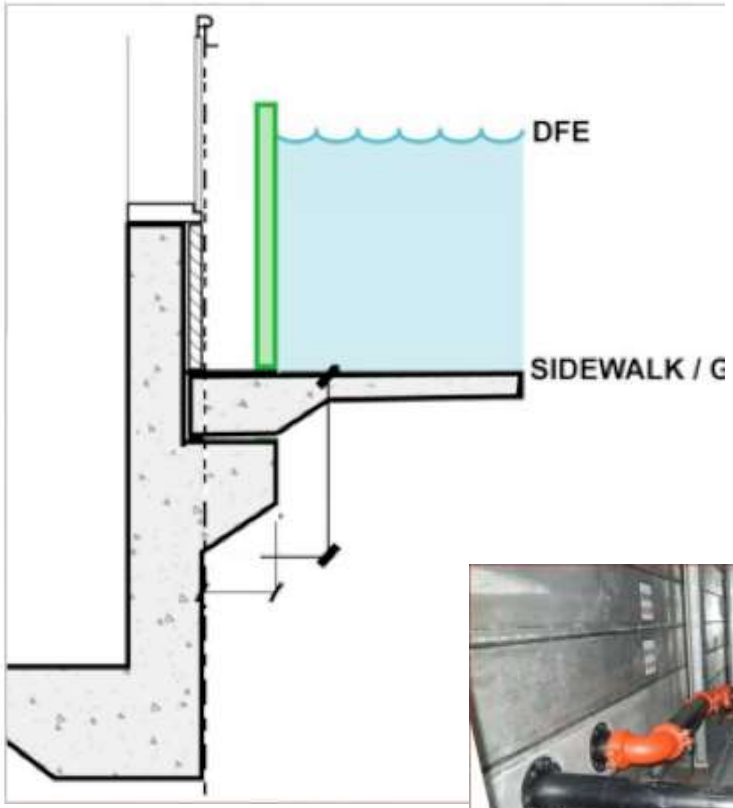

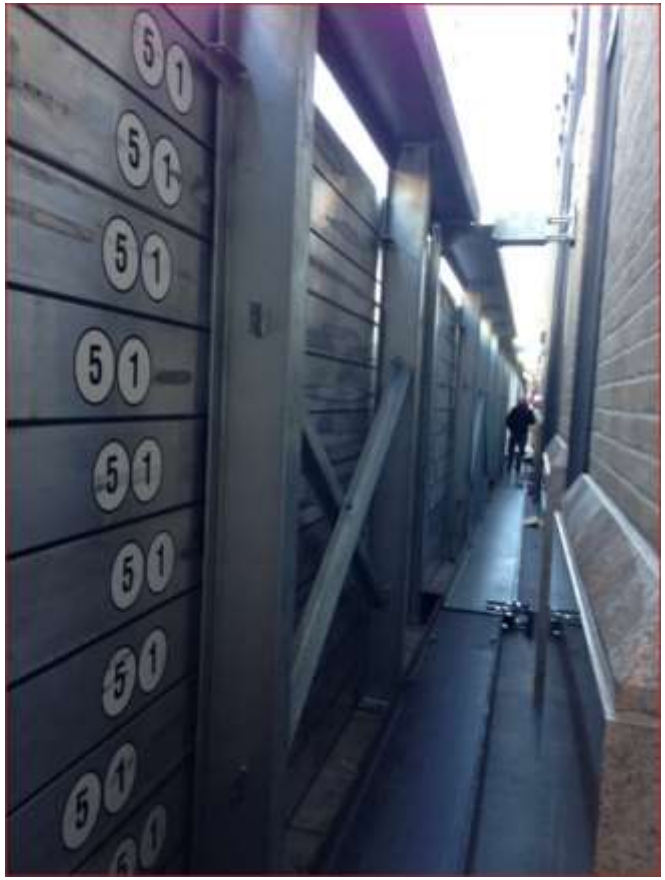

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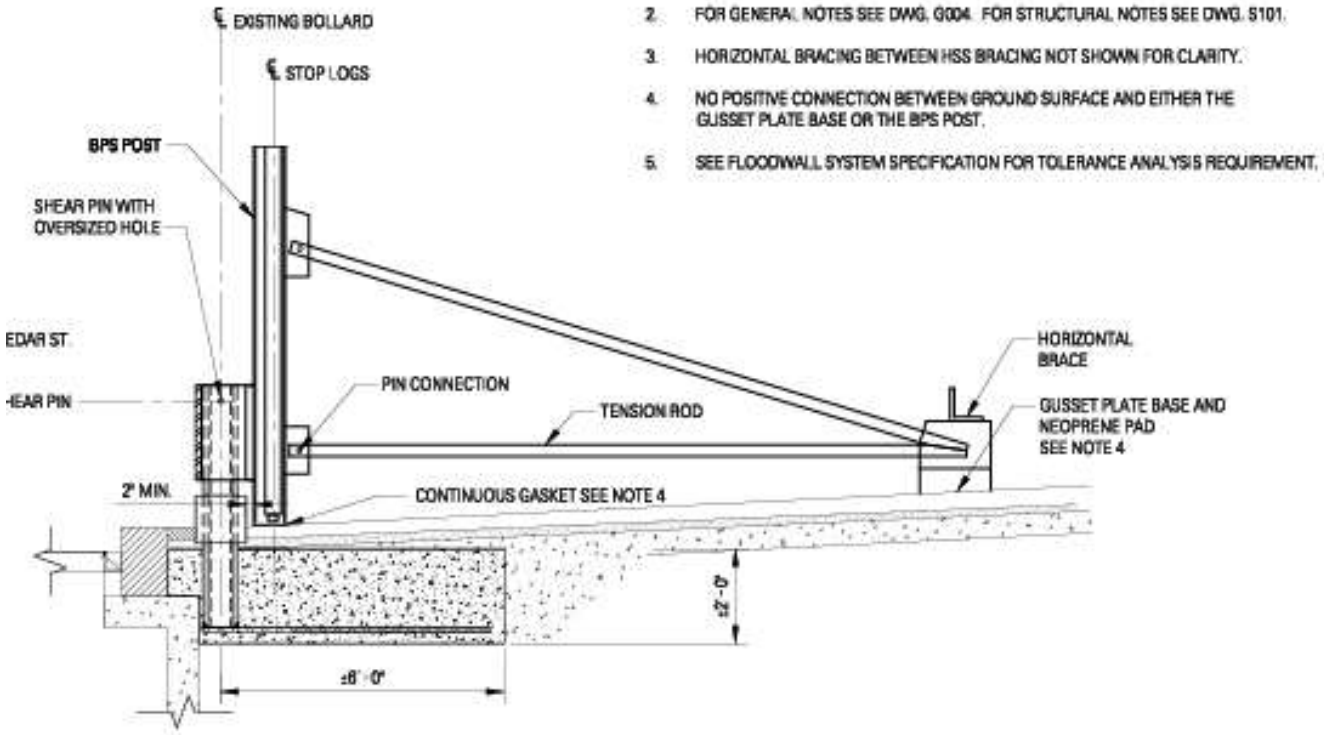

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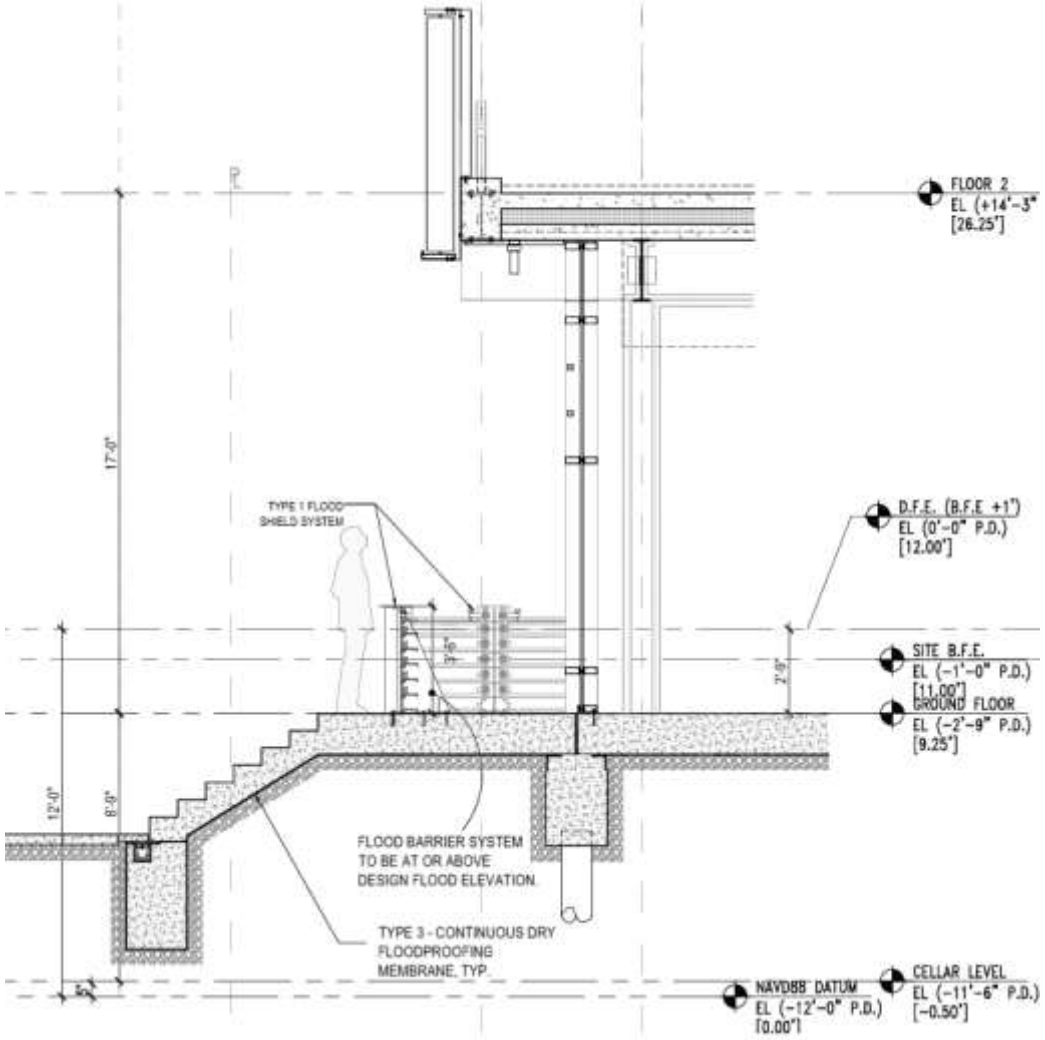

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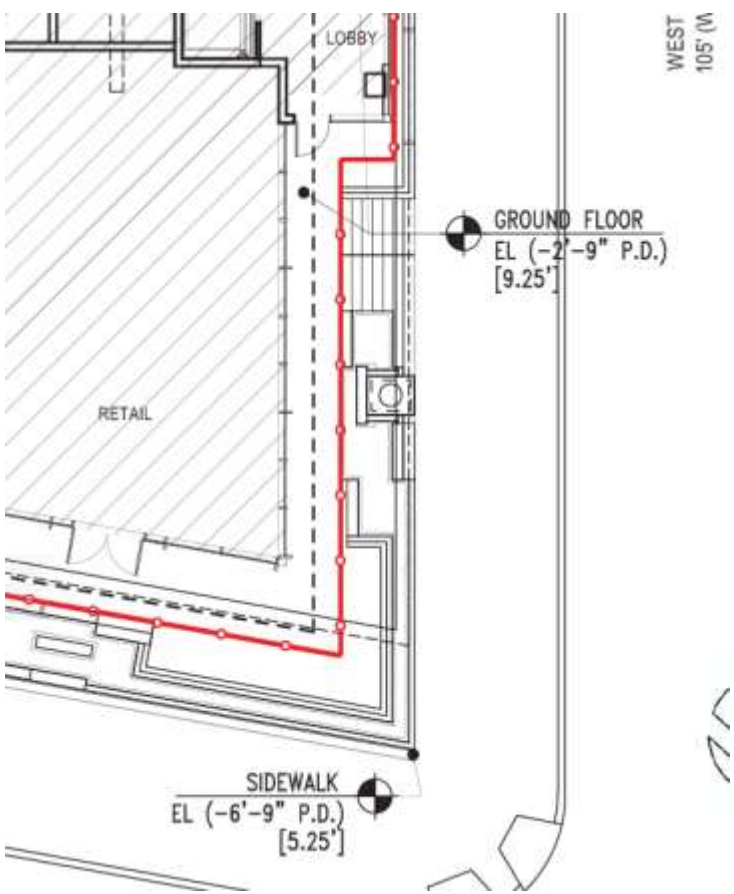

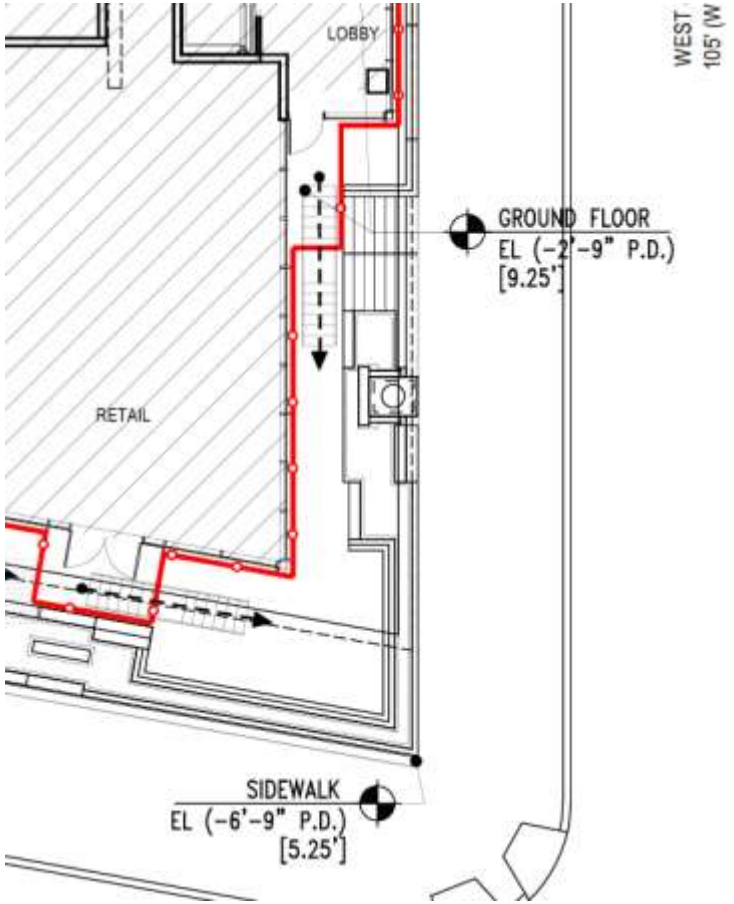

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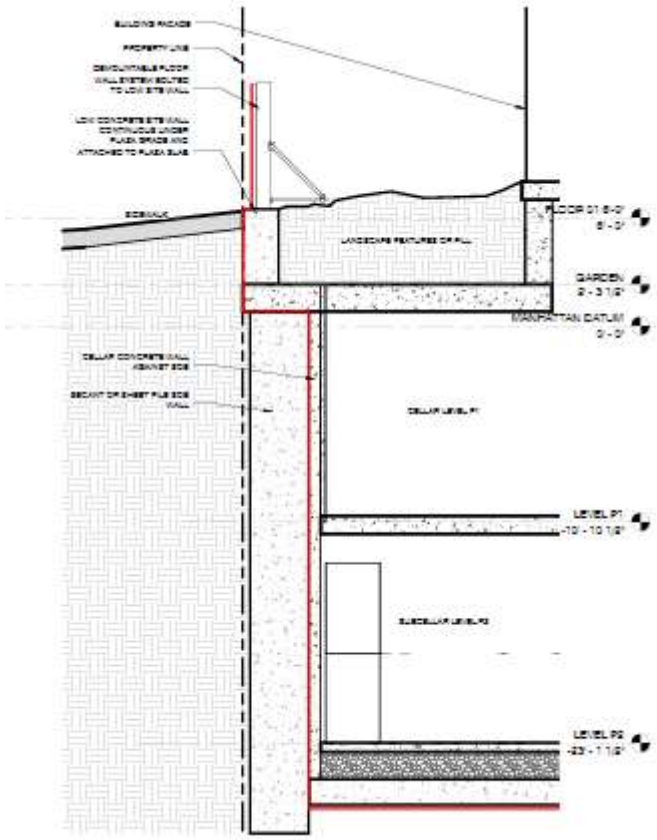

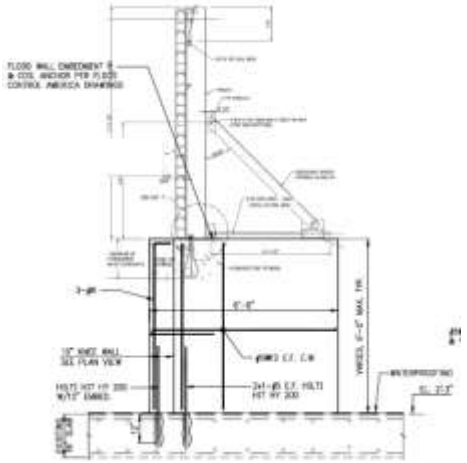

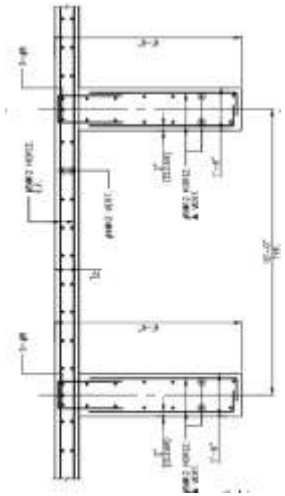

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FEMA Policy Call

FEMA Floodplain Management probably says (?) :

- dry floodproofing is inherently difficult to accomplish
- dry floodproofing failures can be catastrophic damage
- shields should be discouraged as much as possible

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FEMA Building Sciences should say that 44 CFR 60.3:

- does not require a minimum amount of wall
- requires any provided walls be substantially impermeable to the passage of water
- requires shields to be integral to the structure to satisfy 44 CFR 60.3
- requires dry floodproofing systems to meet ASCE 24 for all engineering loads and for flood action plans

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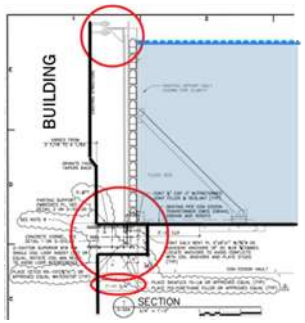
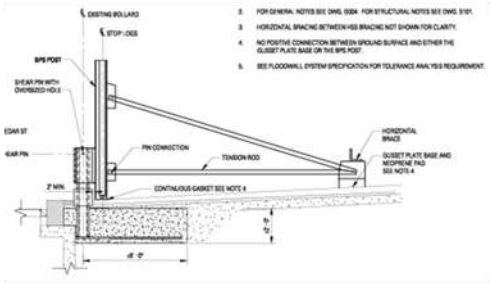
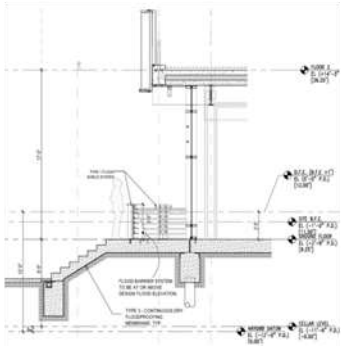
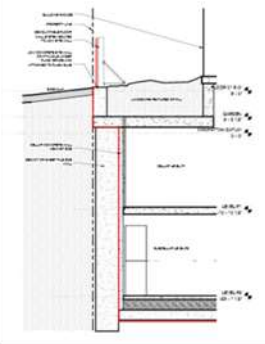
FEMA Policy Call









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- requires dry floodproofing systems to meet ASCE 24 for all engineering loads and for flood action plans

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Insurance Rates for Dry Floodprooing

To encourage designs with reduced reliance on shields

Examples:

- Perimeter wall concept:
  - Reduced rates: all walls (no openings)
  - Increased rates: some openings
  - Significantly increased rates: lots of openings (% of wall to opening)
- Performance standard concept:
  - Payout of claim only when the actual flood level exceeds DFE
  - No payout for failure of dry floodproofing where actual level of flood is below DFE

An "Opening" Argument: The Controversy Over Floodshields & the Protection of Glass Storefronts & Curtain Walls

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