

# Protecting Utilities



FEMA



HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION FEMA 499/August 2005 Technical Fact Sheet No. 29

**Purpose:** To identify the special considerations that must be made when installing utility equipment in a coastal home.

**Key Issues:** Hazards, requirements, and recommendations

Special considerations must be made when installing utility systems in coastal homes. **Proper placement and connection** of utilities and mechanical equipment can **significantly reduce the costs of damage caused by coastal storms** and will **enable homeowners to reoccupy their homes** soon after electricity, sewer, and water are restored to a neighborhood.

## Coastal Hazards That Damage Utility Equipment

- Standing or moving floodwaters
- Impact from floating debris in floodwaters
- Erosion and scour from floodwaters
- High winds
- Windborne missiles

## Common Utility Damage in Coastal Areas

Floodwaters cause corrosion and contamination, short-circuiting of electronic and electrical equipment, and other physical damage.

**Electrical** – Floodwaters can corrode and short-circuit electrical system components, possibly leading to electrical shock. In velocity flow areas, electrical panels can be torn from their attachments by the force of breaking waves or the impact of floating debris.

**Water/Sewage** – Water wells can be exposed by erosion and scour caused by floodwaters with velocity flow. A sewage backup can occur even without the structure flooding.

**Fuel** – Floodwaters can float and rupture tanks, corrode and short-circuit electronic components, and sever pipe connections. In extreme cases, damage to fuel systems can lead to fires.

## Basic Protection Methods

The primary protection methods are **elevation** or **component protection**.

### Elevation

Elevation refers to the location of a component and/or utility system above the Design Flood Elevation (DFE).

### Component Protection

Component protection refers to the implementation of design techniques that protect a component or group of components from flood damage when they are located below the DFE.



**Electrical lines and box dislocated by hurricane forces.**

**Elevation of utilities and mechanical equipment is the preferred method of protection.**

## NFIP Utility Protection Requirements

The NFIP regulations [Section 60.3(a)(3)] state that:

**All new construction and substantial improvements shall 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.**

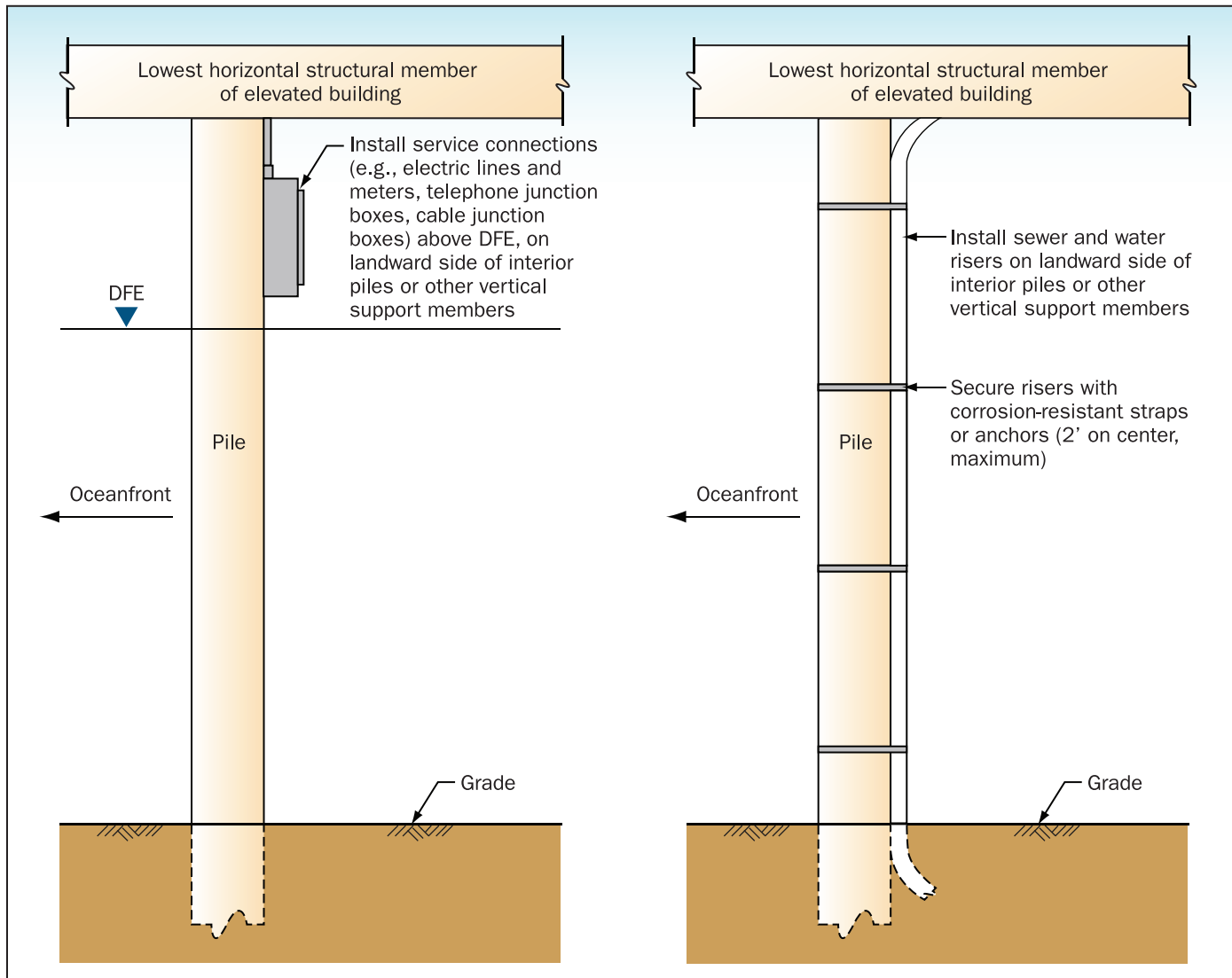
## Utility Protection Recommendations

### Electrical

- Limit switches, wiring, and receptacles below the DFE to those items required for life safety. Substitute motion detectors above the DFE for below-DFE switches whenever possible. Use only ground-fault-protected electrical outlets below the DFE.
- Install service connections (e.g., electrical lines, panels, and meters; telephone junction boxes; cable junction boxes) above the DFE, on the landward side of interior piles or other vertical support members.
- Use drip loops to minimize water entry at penetrations.
- Never attach electrical components to breakaway walls.

### Water/Sewage

- Attach plumbing risers on the landward side of interior piles or other vertical support members.



**Recommended installation techniques for electrical and plumbing lines and other utility components.**

- When possible, install plumbing runs inside joists for protection.
- Never attach plumbing runs to breakaway walls.

## HVAC

- Install HVAC components (e.g., condensers, air handlers, ductwork, electrical components) above the DFE.
- Mount outdoor units on the leeward side of the building.
- Secure the unit so that it cannot move, vibrate, or be blown off its support.
- Protect the unit from damage by windborne debris.



**Elevated air conditioning compressors.**

## Fuel

- Fuel tanks should be installed so as to prevent their loss or damage. This will require one of the following techniques: (1) elevation above the DFE and anchoring to prevent blowoff, (2) burial and anchoring to prevent exposure and flotation during erosion and flooding, (3) anchoring at ground level to prevent flotation during flooding and loss during scour and erosion. The first method (elevation) is preferred.
- Any anchoring, strapping, or other attachments must be designed and installed to resist the effects of corrosion and decay.

## Additional Resources

American Society of Civil Engineers. *Flood Resistant Design and Construction* (SEI/ASCE 24-98). (<http://www.asce.org>)

FEMA. NFIP Technical Bulletin 5-93, *Free-Of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*. (<http://www.fema.gov/fima/techbul.shtm>)

FEMA. *Protecting Building Utilities From Flood Damage*. FEMA 348. November 1999. (<http://www.fema.gov/hazards/floods/lib06b.shtm>)