Padre Isles

Property Owners

Association

Bulkhead Manual

Corpus Christi, TX

Fall 2020

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INTRODUCTION

This manual is intended as an easy-to-understand guide for owners and prospective owners of waterfront property located on North Padre Island in the city of Corpus Christi. All the waterfront properties in the PIPOA (canal-front) are protected by bulkheads which were installed by the original developer.

The manual contains an overview of frequently used bulkhead terminology, illustrations of common problems with bulkheads, and information regarding the repair and replacement of bulkheads. In addition, there are tips on how to prolong the useful life of a bulkhead, and thus postpone the expense of major repairs or replacement. The costs involved in repairing or replacing bulkheads can be substantial.

The waterways of Padre Island are perhaps the most visible and important aspect of island life. Thank you for taking the time to learn about our bulkheads and the critical role that they serve on our island.

FORM, FUNCTION, AND IMPORTANCE OF BULKHEADS

A bulkhead is a structure which separates a body of water from the adjacent land. While the appropriate term for most of the structures on Padre Island is "bulkhead" (a straight wall) residents and visitors commonly use the term "seawall" instead. Bulkheads perform several functions which are important to Padre Isles Property Owners:

- they serve to protect property from loss of land mass into the water due to erosion, current, and wave action
- they help maintain the proper water depth in adjacent waterways
- they delineate between private property (the owner's land) and the water
- they define the width of a waterway for purposes of dock and accessory construction
- they contribute to the stability and value of waterfront property

An essential point to remember is that our bulkheads are intended to keep "land in" rather than the "water out". Accessing the bulkheads to inspect by land is necessary, since it is not always possible to inspect by the waterside. A bulkhead is not one unit; rather it is designed and constructed from several distinct components such as panels, caps, tieback rods, and deadmen.

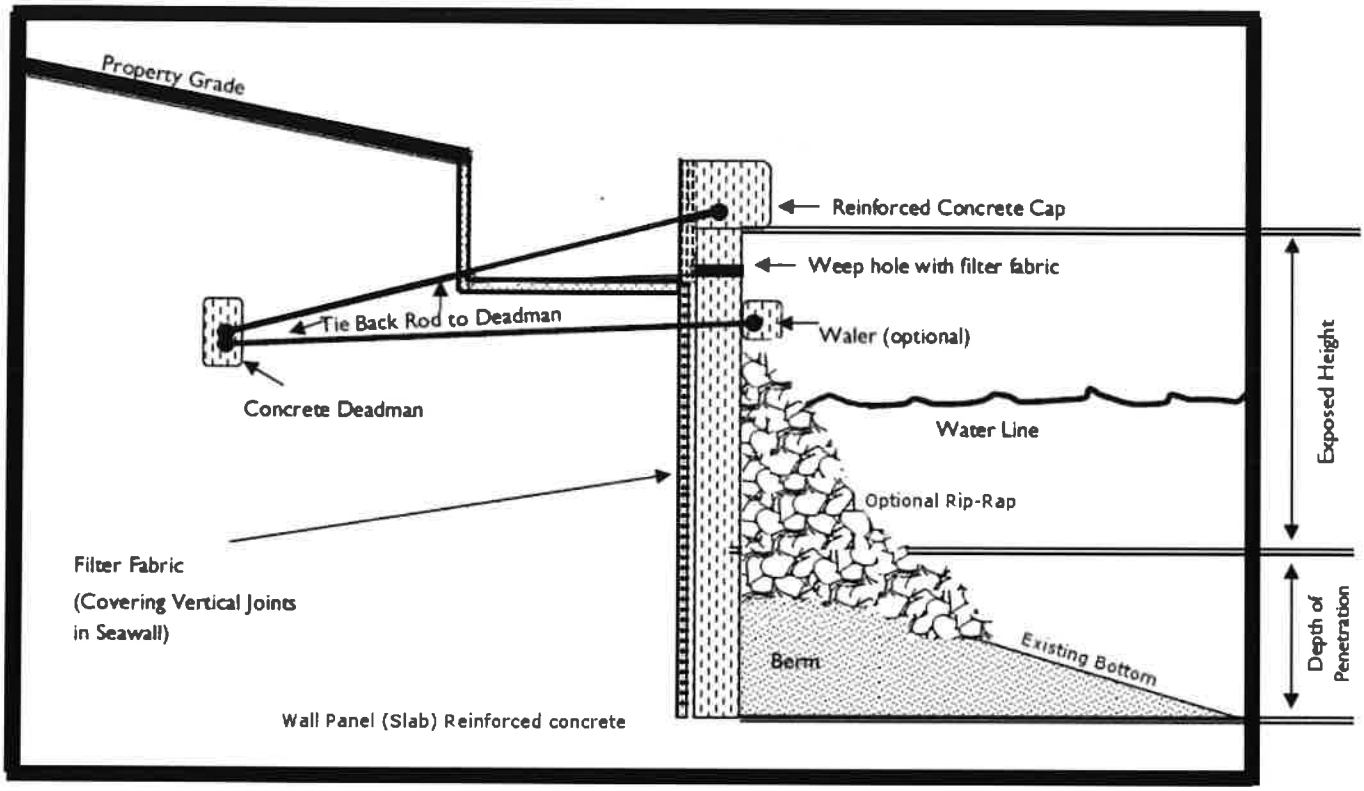
Generally, a bulkhead consists of a series of interlocked panels (concrete, composite, PVC, metal) that are not watertight. A cap (usually concrete) ties individual panels together. The panels extend vertically from below the water floor (berm) to above the land elevation. Traditional construction methods include tie-back rods that anchor the vertical structure to concrete blocks called deadmen which are embedded in the landside soil.

The tiebacks and deadmen are vital to maintain the wall in an upright position and prevent it from falling into the water.

Bulkheads are designed with weep holes to allow water collecting behind the panels to drain and relieve (hydrostatic) pressure on the structure.

To help visualize the bulkhead structure, an illustration, is included on the next page.

TYPICAL BULKHEAD AND COMPONENTS



COMMON BULKHEAD PROBLEMS

Bulkhead construction methods have improved significantly over time because of technological advances, experience, and regulatory action. Older bulkheads can suffer from several common problems:

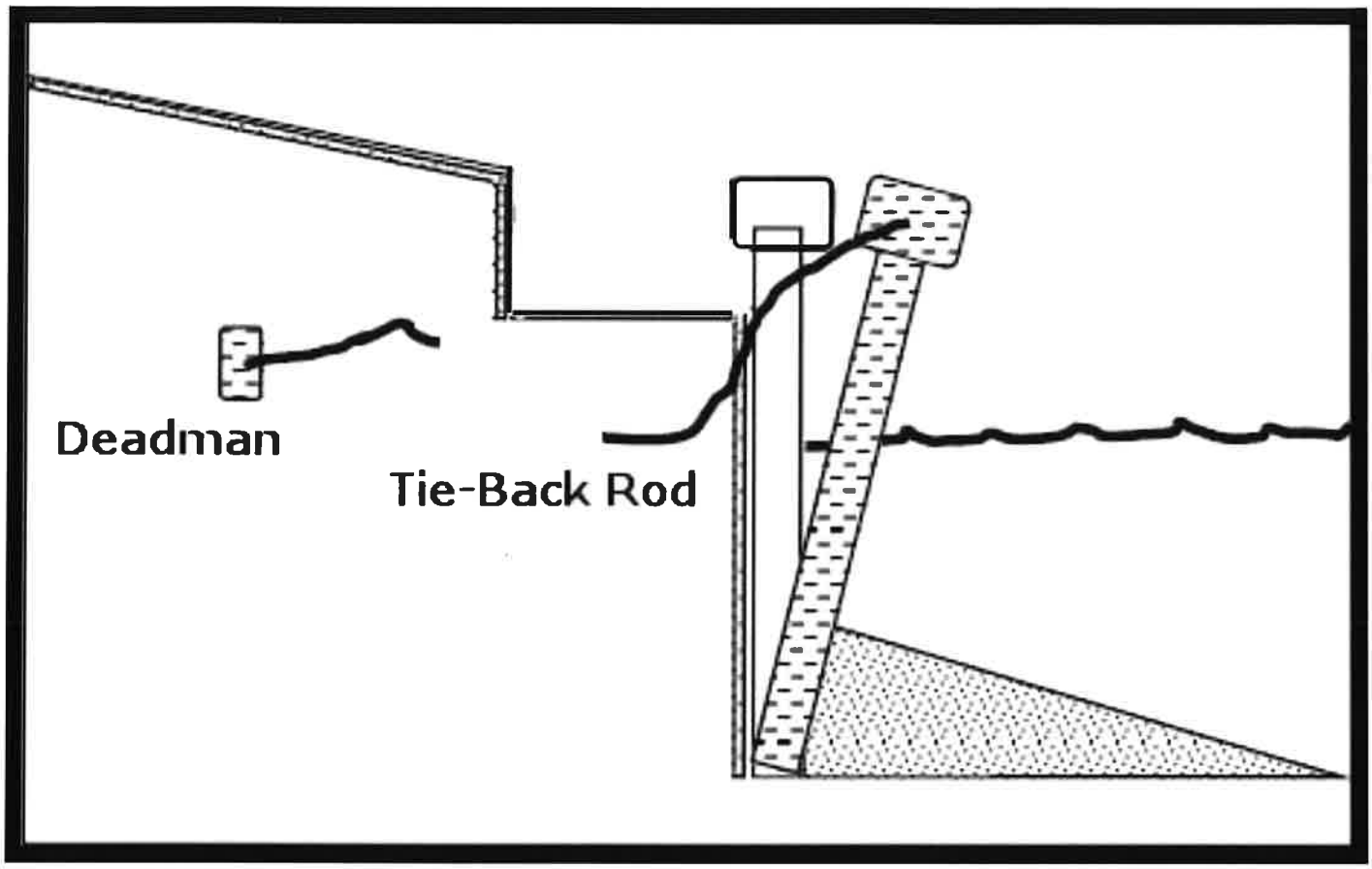
SINKHOLES:

Symptoms: Sinkholes upland of the wall, visible back-fill mounds in the water near bulkhead joints (most visible at low tide).

Cause: Age, settling, structural failure, insufficient berm at the slab toe of the wall. Slab separation allowing backfill to migrate through openings into the water that frequently occur after heavy rains.

Remedies: Installation of a French Drain may be appropriate if not already present. Maintain water passage through weep holes, by cleaning or adding supplemental drainage, add filter fabric to vertical slab joints, and if berm is lacking at the slab bottoms, may require replenishment.

TIEBACK FAILURE

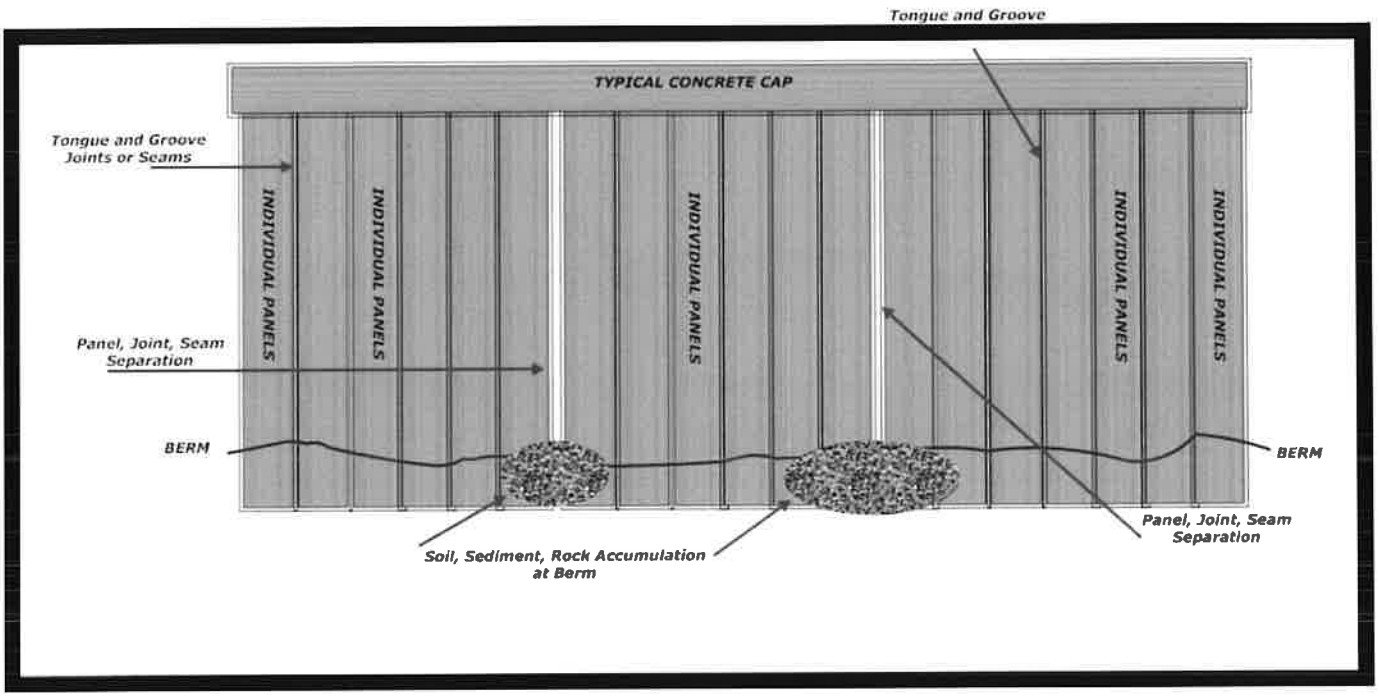


Symptoms: A deteriorating cap, wavy or sagging panels, cracks / spalling and backfill settlement.

Cause: This is the result of saltwater corrosion and oxidation in the cap reinforcing or tie-back rods. It could also stem from movement of the structure. The results are upper rotation, cracking or crumbling of the concrete cap and its ability to keep the slabs aligned, and/or the slabs moving out of vertical (plumb).

Remedies: If tie-back rods are heavily corroded, excavation may be necessary for their replacement and integration into a newly poured cap. On many older bulkheads, owners faced with tieback rod failure have installed a new set of tie-back rods and a waler -- a concrete structure that runs the length of the bulkhead about 2' below the top on the water side of the panels. Supplemental helical tiebacks are also a common remedy.

SLAB JOINT (SEAM) SEPARATION

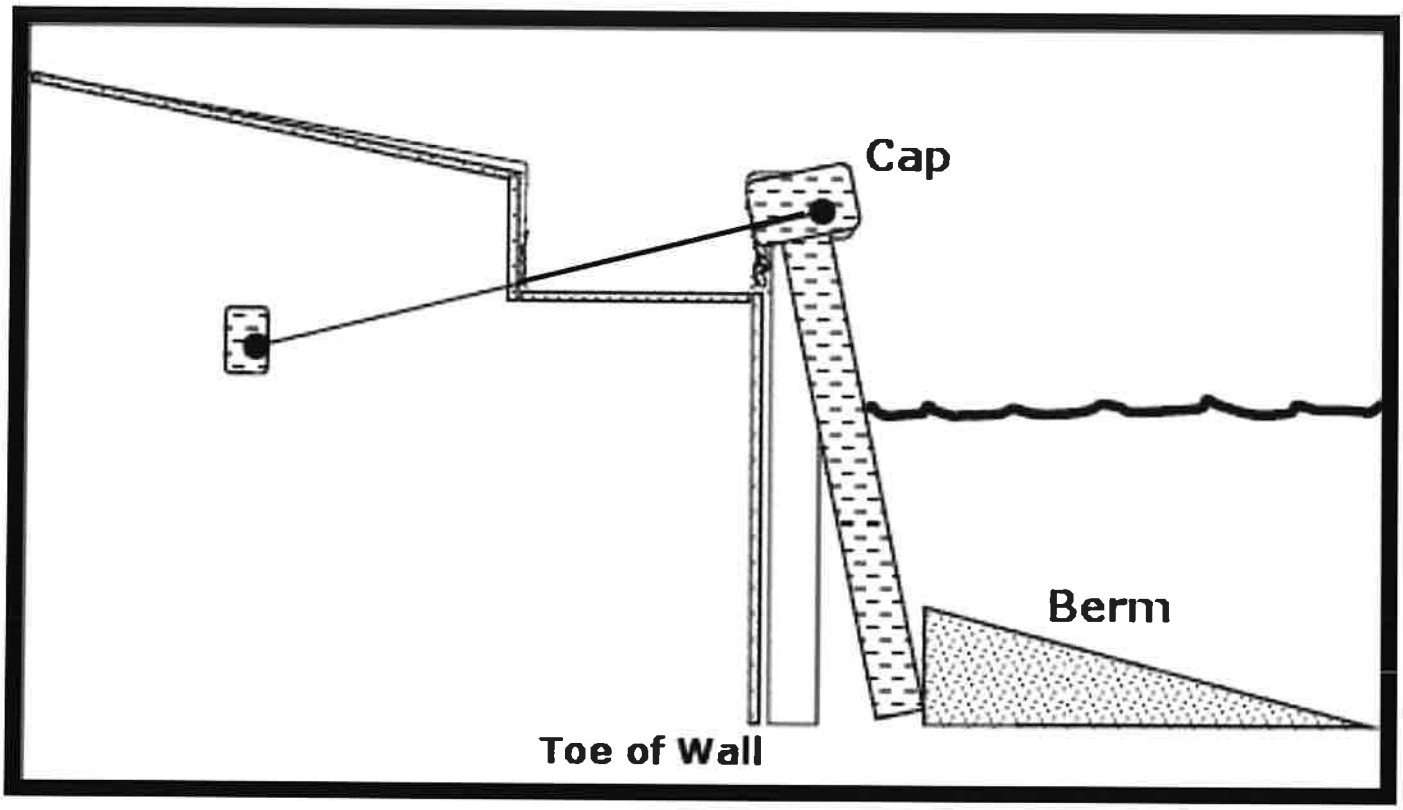


Symptoms: Sinkholes, separation in seams, accumulation of rock, and sediment at base of the affected joint.

Cause: Age, uneven exertion of hydrostatic pressure particularly during low tide, tieback failures.

Remedies: Seal seams and cracks, install filter fabric, install supplemental tiebacks (traditional or helical) for additional support in crack areas. Ensure proper drainage and relief of hydrostatic pressure. To the extent possible, route storm water away from the bulkhead.

TOE & BERM FAILURE

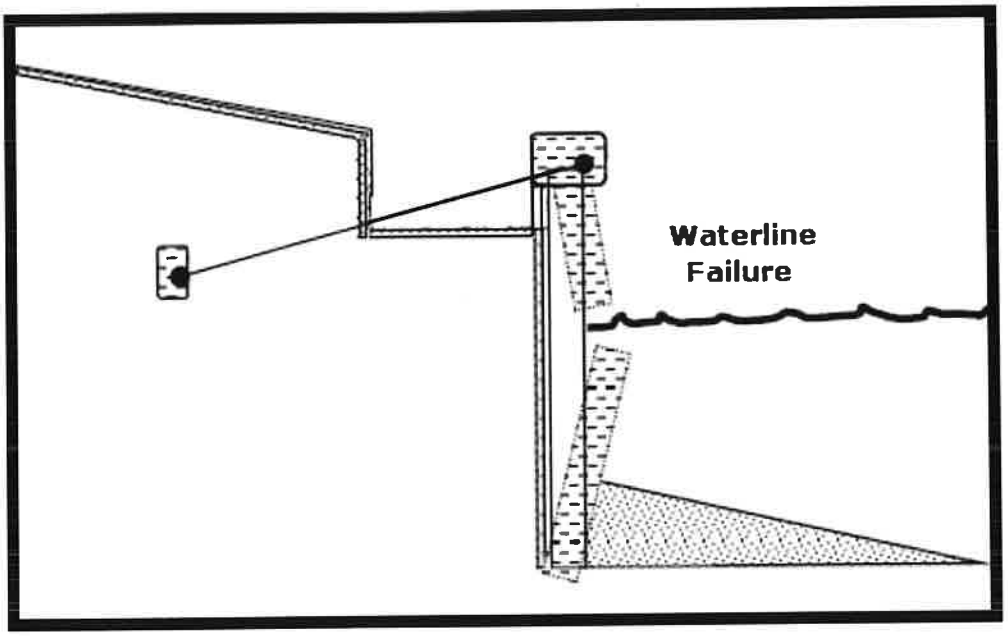


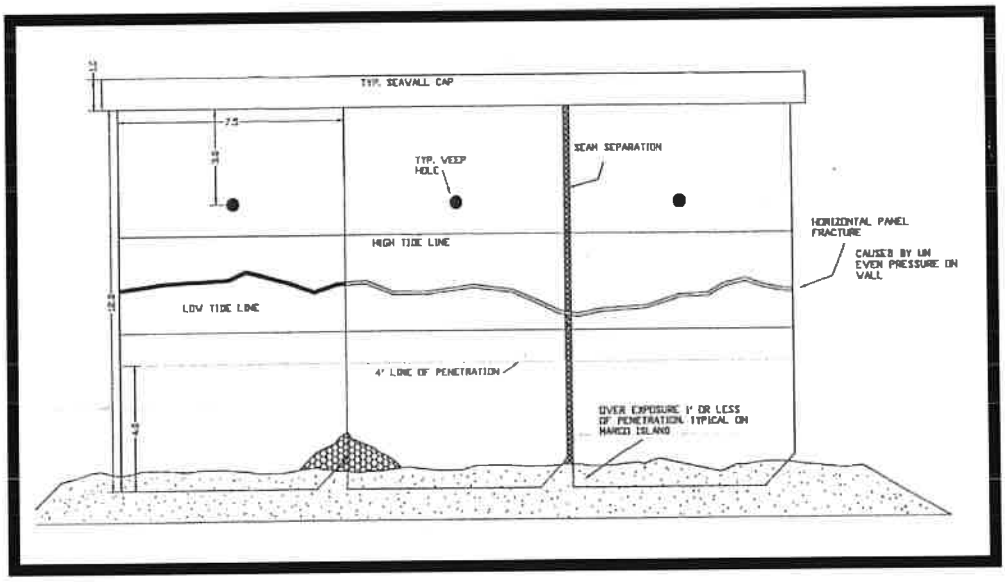
Symptoms: Cap rotation, movement or cracking, a gap opening between bulkhead and dock (if present), and support pilings (if present) tight against the bulkhead indicating pressure on the structure from the failure.

Cause: Loss of supporting berm at the bottom of the slabs in the water. The panels tilt out, and sometimes crack or cause the cap to twist or break. Loss of berm is usually associated with wave action, either natural or from speeding boats. Insufficient panel penetration and / or improper placement in the berm may be the cause of such failures as well.

Remedies: Placement of additional berm, rip rap or bags of dry concrete mix to stabilize the bottom of the structure if the toe-out is not too severe. In severe cases, the panels may be pulled and replaced, or reinserted if not irreparably damaged. If pilings are present along the bulkhead perimeter, dry concrete bags wedged between the piling, and the wall may help.

WATERLINE FAILURE





Symptoms: The principal symptom is cracking with rust marks on the panels facing the water.

Cause: Aging, corrosion of concrete and reinforcing rod and uneven hydrostatic pressure. Slabs or panels develop horizontal cracks usually along the water line, and the panels eventually break along these lines.

Remedies: Replace affected panels if possible. Potential for helical tieback usage.

CAP FAILURE

Symptoms: The principal symptoms are rust, spalling, exposed rebar, and fractures.

Cause: Aging, corrosion of concrete and reinforcing rod and uneven hydrostatic pressure. Slabs or panels develop horizontal cracks usually along the water line, and the panels eventually break along these lines.

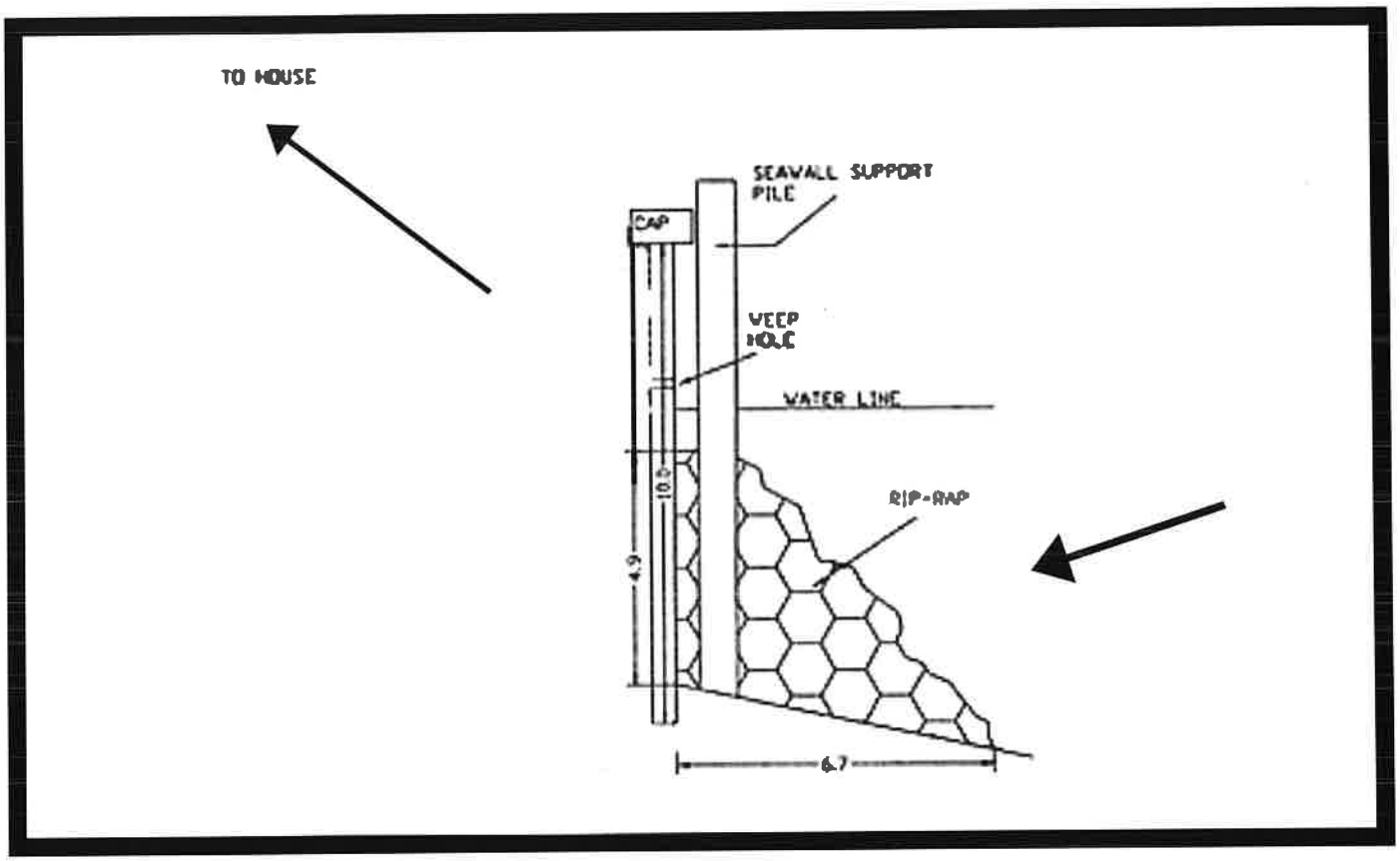
Remedies: Partial or full cap replacement.

ADDITIONAL PHOTOGRAPHIC EXAMPLES

{PICTURE #1} - Supplemental tieback example – in this case, a helical tieback installed at corner point with vertical flange. The actual tieback is a solid rod with helices driven 14-21 feet into the ground at a specified angle.

{PICTURE #2} - Rip Rap (stone piled against the seawall) is particularly useful in areas of high tidal velocity to keep berm from washing away. Unfortunately, rip rap can hamper boat docking and dock installation.

Rip Rap



Profile illustration of rip rap. Note degree of necessary protrusion into canal which may make installing a future dock difficult.

Note horizontal crack at mid-point of concrete panel – the weakest point of the seawall, particularly at low tide. Crack is likely caused by either excess hydrostatic pressure or possibly a tieback failure. Drain (bottom of picture) was likely installed in response.

BULKHEAD REPLACEMENT

The best way to maximize bulkhead life is to start with a properly engineered and installed bulkhead. Subsequent problems will be reduced if the original design and construction is properly done.

Undeveloped (vacant) lots provide reasonable access for contractor's equipment and materials. However, developed lots present access problems, often requiring work to be done from a barge. The presence of a house, dock, davits, trees, other landscaping, sprinkler systems, exterior plumbing and electric conduits will add to the cost of replacement, as these items will either limit access or require removal and replacement.

MAXIMIZING THE LIFE OF YOUR BULKHEAD

There are several things that a property owner may do to prolong the useful life of a bulkhead, and thereby postpone the expense of major repairs or replacement. Please consider the following recommendations:

1. Install pilings or supplemental tieback rods around the perimeter of the bulkhead. These will add support and help to maintain alignment of the slabs or panels.
2. If you boat, maintain "Idle Speed" in the bays, waterways, and canals of Padre Island. This protects berms securing the lower end or toe of the slabs or panels. Encourage your friends and neighbors with boats to do the same.
3. Encourage your neighbors to properly maintain their bulkheads. A sagging bulkhead adjacent to yours may cause you some damage.
4. Avoid the placement of large trees adjacent to bulkheads and avoid the use of heavy equipment traveling along bulkhead perimeter so as to reduce pressure on the bulkhead.
5. Adjust sprinkler heads in the vicinity of bulkheads to minimize water application behind the wall. Try to redirect drainage from yard and roof so that it does not flow directly into pond behind the bulkhead structure.

WATERSIDE RESPONSIBILITIES

There are certain responsibilities that come with the waterside living that will help to ensure the value, integrity, and long-term enjoyment of your property and those of your neighbors.

As an owner of property adjacent to water, you are also a steward of the condition of the waterbody and everything that may live there. The health and well-being of our surrounding waters, and the marine life therein, is greatly impacted by your actions.

Please try to adhere to the following recommendations:

- Be sure that lawn clippings, tree/ shrub trimmings and other vegetative waste do not make it into the waterways.
- Do not allow any fertilizers (liquid or broadcast granules) into the water - insist that your landscaper adheres to this rule as well as compliance is mandated.
- Leave a buffer zone ("no fertilizer, no pesticide") of at least 10' along the shoreline.
- Do not leave fertilizer granules on impervious (paved surfaces). Be sure any fertilizer spills, large or small, are swept onto the grass.
- Make sure that storm water from roofs, driveways, or other drains do not discharge directly into waterways.
- Never store gas, diesel, oil, or chemical solvents on or near your dock or bulkhead.
- Keep decks and bilges of your boat free of fuels and chemicals in case rainwater causes your automatic bile pump to discharge.
- Try to use only biodegradable cleaners and soaps (not household cleaners) when maintaining your boat or personal watercraft.
- Discuss best waterside practices with your neighbors and cooperate with them to ensure that bulkheads, boat docks, boats, and personal watercraft are maintained and pose no environmental threat.
- Notify the PIPOA if you notice any unusual discharges, colorations, debris, or hazards to navigation in any of the waterways.

Thank you for your cooperation!

GLOSSARY OF TERMS

Berm- Ground or soil which supports toe of the wall at the bottom. May also include rip rap.

Cap- Concrete (usually reinforced) box structure which ties bulkhead together at top.

Deadman- Poured concrete block approximately 15' back in the yard which anchors panel and cap structure by means of steel tie-back rod.

Erosion- Soil from behind the wall escaping into the water. This may occur through defective bulkhead joints or cracked panels.

French Drain- Usually a 2' by 2' trench dug out behind the bulkhead lined with filter fabric.

Helical – Having the shape of form of a helix; spiral

Hydrostatic Pressure- Invisible but constant force created from water on the landside of the bulkhead.

Panel (or Slab) - A reinforced concrete rectangle, 6" thick and 5' to 8' wide and 10' to 16' long. These are placed vertically to form the wall. Alternatively, plastic (PVC) sheet piling, composite sheet piling, or metal sheet piling is used for this purpose.

Piling- Concrete or wood poles placed at regular intervals outside of the panel perimeter in the water to reduce movement of the bulkhead.

Rip-Rap- Large size stone placed at the toe of the wall to stabilize its position and prevent or reduce erosion.

Tie-Back or Rod -Steel bars connecting the bulkhead cap and the anchor.

Waler- A supporting structure installed about 2' below the bulkhead top placed on the outside of the panels which normally anchors a separate tie-back rod system to help support the bulkhead.

Weep Holes- Drilled holes in bulkhead above the water line to facilitate drainage and reduce water pressure.