City of Marco Island

Seawall Owner's Manual

Prepared By:

City of Marco Island

Waterways Advisory Committee

April 2014

INTRODUCTION

This manual is intended for owners and prospective owners of waterfront property within the city limits of Marco Island. Almost all of these lots are protected by seawalls which were installed by the developer, a builder or by a former owner. Most of the seawalls on Marco Island were designed for a 30 year life, and as such, many have reached or exceeded this useful life. This manual includes a description of a seawall, discusses purposes of seawalls, problems with seawalls and how to recognize them, as well as remedies available to owners. In addition, there are tips as to how to prolong the useful life of a seawall, and thus postpone the cost of major repairs or replacement. Seawall maintenance is a concern for waterfront property owners, and this manual hopefully will help owners to understand and cope with seawalls and their problems. When purchasing a vacant lot for future development, owners should evaluate the seawall immediately, and re-build as necessary.

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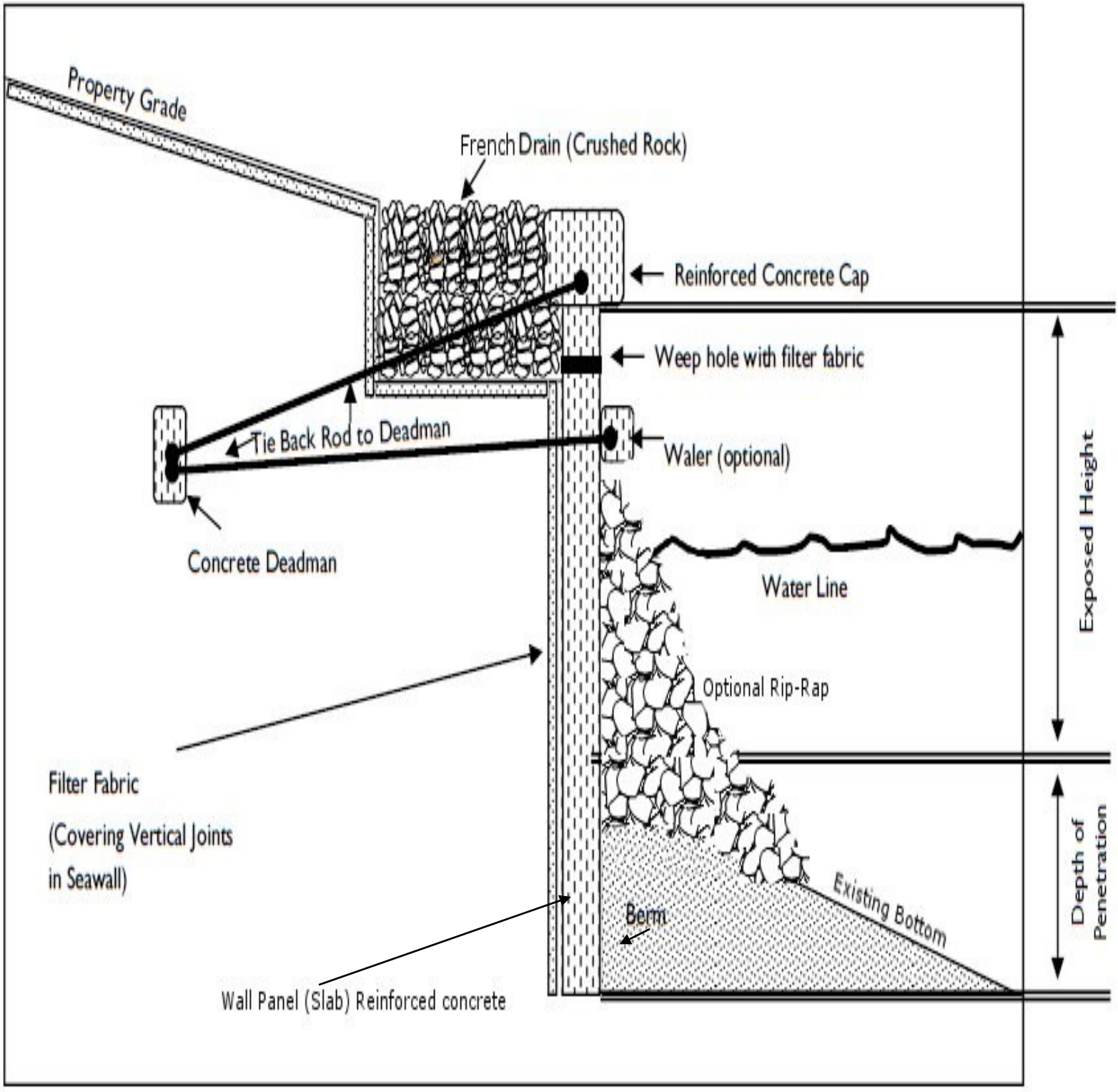
WHAT IS A SEAWALL?

A seawall is a structure which separates a body of water (on a Marco Island bay, waterway or canal) from adjacent land. Seawalls are composed of distinct portions: a series of interlocked concrete panels that are not designed to be watertight, composite or PVC sheet piling, or metal sheet piling which extend vertically from the land elevation to below the water floor, a concrete cap which ties the panels together and tie-back rods which anchor the vertical structure in an upright position and prevent it from falling into the water. The seawall is designed with weep holes to allow water collecting behind the panels to drain and relieve pressure on the structure. The ends of the tie-back rods are secured in concrete blocks called deadman.

Many, but not all seawalls on Marco Island, have wood or concrete pilings spaced around the waterside perimeter to prevent sagging or leaning into the water, and are required to have special drain systems called French Drains designed to facilitate drainage from behind the slabs. These features help prolong the life of seawalls.

To help visualize the seawall structure, a sketch, modeled on the Collier County and City of Marco Island seawall ordinances, is included on page 3.

TYPICAL SEAWALL CROSS SECTION



WHY ARE SEAWALLS IMPORTANT?

Seawalls perform two functions, both of which are important to property owners and to the City of Marco Island. The first function is physical; it serves to protect private property from loss of land mass into the water due to erosion or improper drainage. A seawall will also help maintain the proper water depth in an adjacent water-way. The second function is legal; a seawall delineates the boundary between private property (the owner's land) and public property (the water which covers sovereign lands of a governmental entity). It may also define the width of a waterway or a permitted dock structure. Seawalls also serve navigational purposes and protect property from wave action. A properly maintained seawall will contribute to the stability of neighboring properties, and, very importantly, adds to the value of the property.

A well-maintained seawall enhances your property value.

GLOSSARY OF SEAWALL TERMS

Berm:

Ground or soil which supports toe of the wall at the bottom. May also include rip-rap (see definition of rip-rap).

Cap:

Concrete (usually reinforced) box structure which ties seawall together at top.

Deadman:

Poured concrete block approximately 10-12' 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 seawall joints, or cracked panels.

French Drain:

Usually a 2' by 2' trench dug out behind the seawall lined with filter fabric and filled with crushed stone. The purpose is to facilitate water flow behind wall and relieve pressure.

Hydrostatic Pressure:

Invisible but constant force created from water on the landside of the seawall, alleviated though French drains, seams in the panel and weep holes.

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 seawall.

Rip-Rap:

Large size stone placed at the toe of the wall to stabilize it's position and prevent or reduce erosion.

Tie-Back or Rod:

Steel bars connecting the seawall cap and the anchor.

Waler "Waler":

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

Weep Holes:

Drilled holes in seawall above the water line to facilitate drainage and reduce water pressure.

SLAB JOINT SEPARATION & SINKHOLES

Cause: Age, settling, structural failure or perhaps insufficient berm at the slab toe of the wall. Slabs move apart vertically and horizontally, allowing backfill to migrate through the openings into the water, and salt water to enter behind the wall. Uneven hydrostatic pressure is exerted on the slabs, particularly at low tide. This may be critical during heavy rain and low tide conditions.

Symptoms: Sinkholes behind the wall, visible seawall back-fill in the water on the canal side seawall joints (most visible at low tide). Rust on the cap or slabs would also indicate corrosion from salt water.

Remedies: Maintain water passage through weep holes by cleaning or installing weep hole filters which permit water passage but retain fill. Seal the vertical slab joints with filter fabric material. If the berm is lacking at the slab bottoms, it may need replenishment. Alternatively, rip-rap material may be placed at the toe of the panels. Replenish or add rock to the French Drains if fill loss is excessive. In instances of repeated sink holes, installation of a French Drain may be appropriate if not already installed. All of the remedies are relatively simple, and may be done on undeveloped or developed lots.

← The backfill leaking through the wall creates a sinkhole on the land side of the seawall.

→ The canal side of the same seawall shows a wide separation between slabs. More backfill is washed away from the fill side daily as the tide flows in & out through the separation.

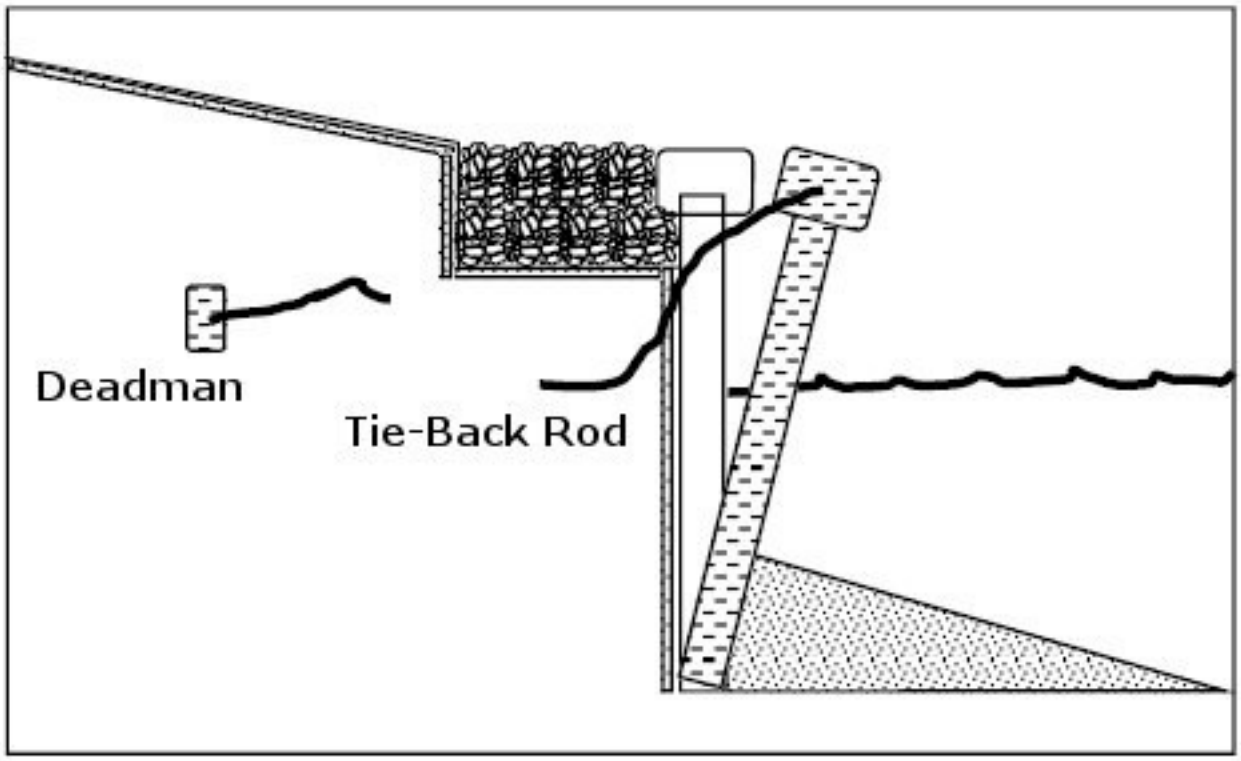
TIE-BACK ROD FAILURE

Cause: This is the result of salt water corrosion 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 tilting out of vertical.

Symptoms: A deteriorating cap, wavy or sagging panels and back fill settlement. Often these indications occur together.

Remedies: Replacement of the cap with a new poured concrete cap. Panels or slabs may have to be realigned. If tie-back rods are corroded through, excavation may be necessary for replacement. On many older seawalls, owners faced with tie- back rod failure have installed a new set of tie-back rods and a waler, a concrete header that runs the length of the seawall about 2' below the top and out-side of the panels. This effectively replaces a failed tie-back rod system and cap, but probably requires a new deadman.

TIE-BACK ROD FAILURE



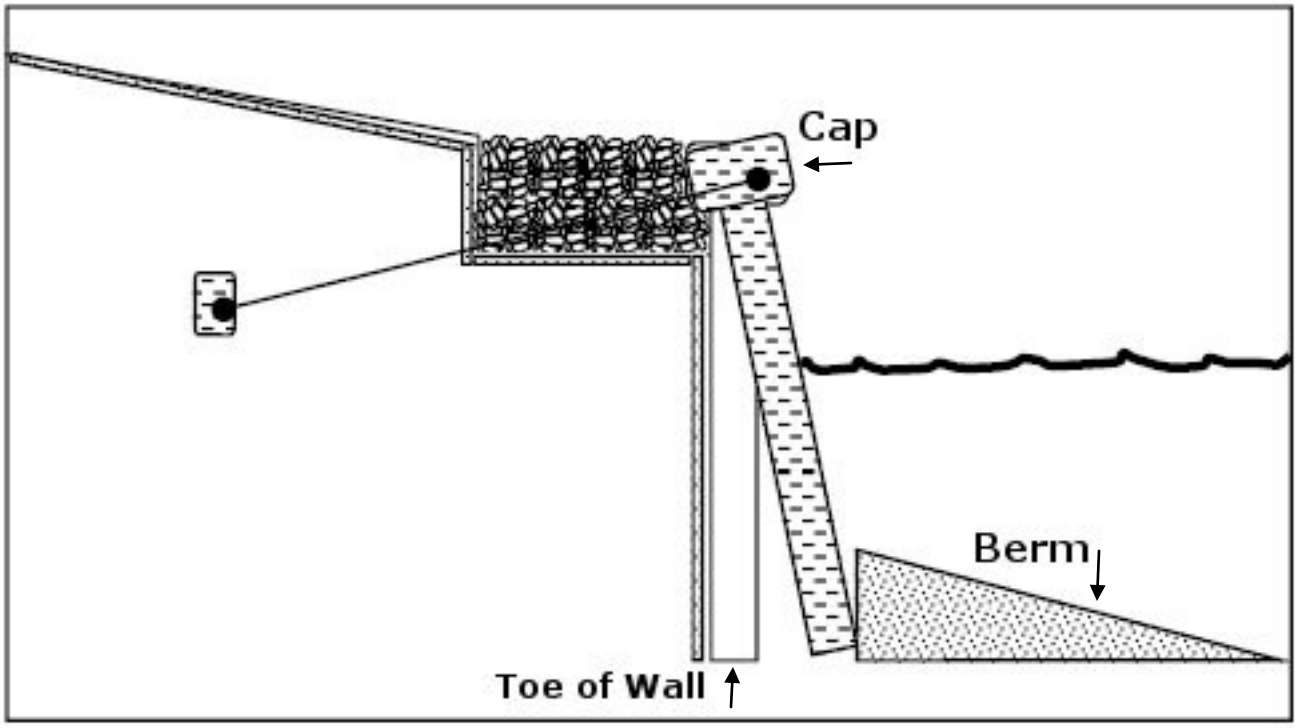
TOE & BERM FAILURE

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. Improper berm placement may be the cause of such failures.

Symptoms: Cap rotation, movement or cracking, a gap opening between seawall and dock (if present), and support pilings (if present) tight against the seawall indicating pressure on the structure from the failure. A good way to determine berm loss is to measure the height of the wall from the cap to the berm. Most panels or slabs are 10 feet in length, so that less than 2 or 3 feet of berm holding them in place may be the reason for existing toe-out or future toe-out.

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 bad cases, the panels may be pulled and replaced, or reinserted if not badly damaged. If pilings are present along the seawall perimeter, of dry concrete bags inserted between them and the wall may help. Repairs to the cap will depend on the amount of damage.

BERM FAILURE



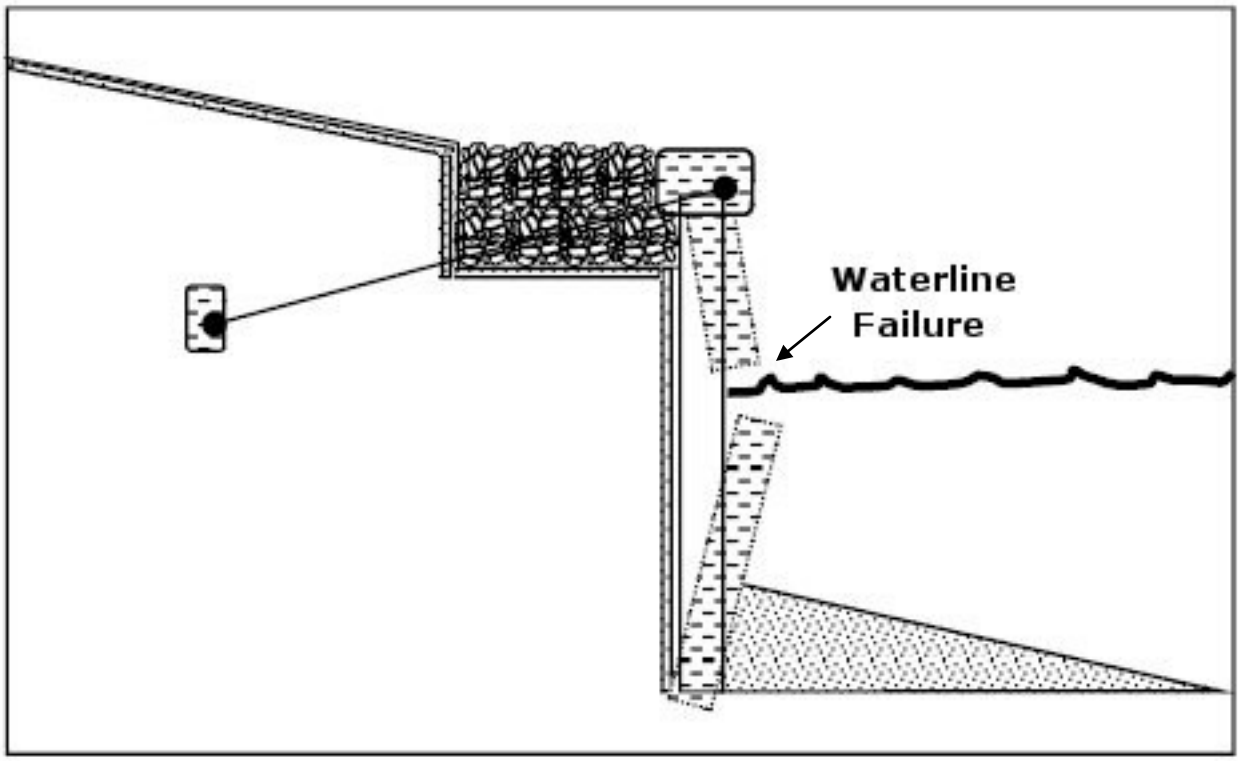
WATERLINE FAILURE

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.

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

Remedies: The remedy for an advanced failure will usually mean new panels, cap, tie-back rods and deadman; in other words a complete new seawall. Seawalls with minor cracks could probably be repaired in the manner of cap and tie-back rod failure, i.e. stabilization of the berm and cap repairs. Attention will need to be given to reducing or eliminating uneven hydrostatic pressure from water behind the wall. Also helical anchors may be used to secure the wall.

WATERLINE FAILURE

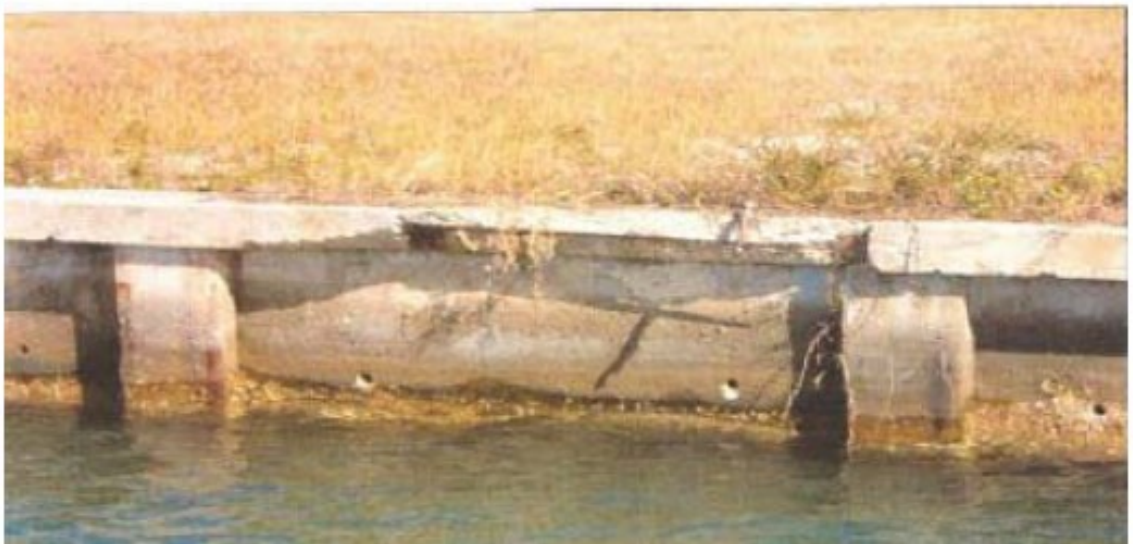


SEAWALL PROBLEMS

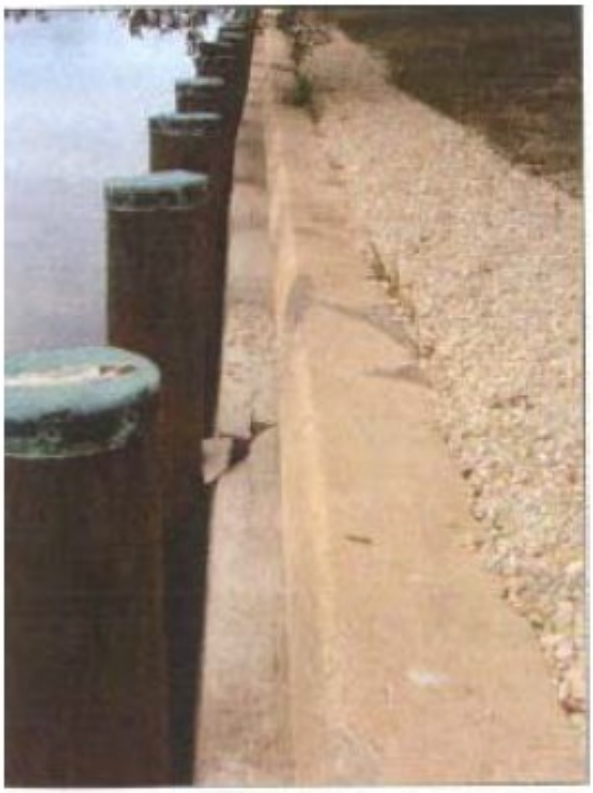
Note the horizontal crack just above the water line and the wide gap between slabs at the right. Concrete pilings have been driven in to attempt to stabilize the wall.

The tie-back rods to the reinforced concrete waler have rusted through and the unsupported waler is useless and falling into the water.

SEAWALL PROBLEMS



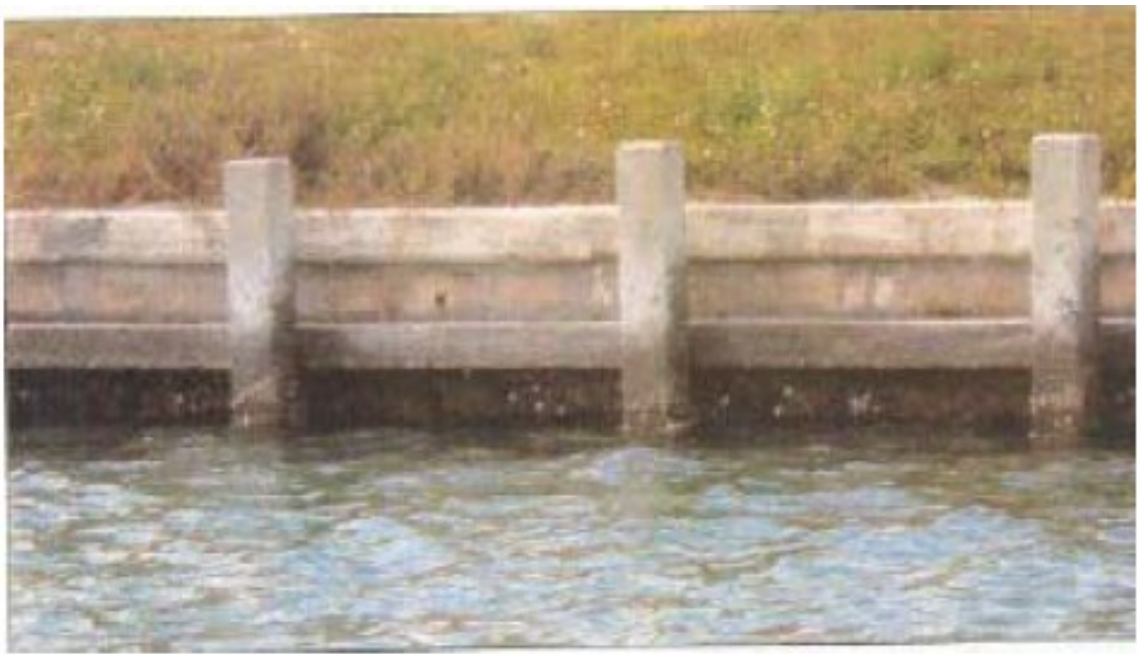
The concrete cap on this seawall has failed. As the cap comes apart tie-back rods will have no anchor point. Also, without a solid cap there will be nothing to hold the vertical walls in alignment.



Note the tipped cap on this seawall. The berm has failed and the toe has moved out toward the canal tipping the whole structure. The pilings are the only thing retaining the toe of the wall. The concrete waler is also starting to fail

SEAWALL IMPROVEMENTS

A waler is installed about 2 ft. below the seawall cap. The waler is a reinforced concrete beam which is connected to tie-back rods anchored to deadman. A waler is usually added as reinforcement when it is suspected the original tie-back rods to the cap have rusted through.



This seawall has a waler plus pilings driven into the canal bottom for extra support. The pilings help stabilize the wall to keep the toe of the wall from moving out.

SEAWALL IMPROVEMENTS

Wood pilings are also used for stabilization. This seawall also has galvanized steel channels just above water level which are anchored to the deadman in the same manner as a waler.

Rip-Rap (stone piled against the seawall) is particularly useful in areas of high tidal velocity to keep berm from washing away. The negative of Rip-Rap is that it extends out from the wall and can hamper boat docking unless there is a dock extending out over the Rip-Rap.

MAXIMIZING THE LIFE OF A SEAWALL

There are a few things that a property owner may do to prolong the useful life of a seawall, and thereby postpone the expense of major repairs or replacement. The best way to maximize seawall life is to start with a properly engineered and installed seawall. Subsequent problems will be reduced if the original design and construction is properly done, and an inspection proved that the installation was correct. Approved construction specifications are attached to the City Seawall Ordinance. The following suggestions embody a number of remedies utilized by Marco Island property owners in the past to prolong their seawall's useful life.

1. Install a French Drain. This will help even out the pressure differential between the two sides of the seawall, the land side and the water side. This pressure differential is one of the major causes of seawall damage.

2. Maintain the French Drain and the seawall weep holes so that effective drainage occurs. Weep holes tend to become clogged with sand or soil, thus reducing water flow. French Drains need "replenishing" with rock or gravel to work properly and prevent erosion.

3. Install pilings or supplemental tie-back rods around the perimeter of the seawall. These will contain sagging and maintain alignment of the slabs or panels.

4. If you boat, maintain "Idle Speed" in the bays, waterways and canals of Marco 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.

5. Encourage your neighbors to properly maintain their seawalls. A sagging seawall adjacent to yours may cause you some damage.

6. Avoid the placement of large trees adjacent to seawalls, and avoid the use of heavy equipment traveling along seawall perimeter so as to reduce pressure on the seawall.

7. Adjust sprinkler heads in the vicinity of seawalls to minimize water application behind the wall. Try to redirect drainage from yard and roof so that it does not flow directly into French Drains or pond behind the seawall structure.

8. Avoid continual use of davits installed adjacent to a seawall for hoisting heavy boats as this will also create additional pressure behind seawalls.

TIPS FOR SEAWALL OWNERS

1. Seawall repairs or replacement may be very expensive, for more information, contact a licensed Marine Contractor. As most seawalls on Marco Island are at least 80 feet in length, this could become a major cost for property owners. 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 piping or other pipes or electric conduits will add to the repairs, as these items will either limit access or require removal and replacement.

2. Prospective water-front property owners should have a thorough inspection of the seawall by a competent Professional Engineer, registered in the State of Florida before purchase.
This may help reduce future repairs by bringing attention to needed work before purchase is completed.

3. Always be aware of signs of rust or corrosion, particularly on the cap. This is a major telltale sign of potential future problems.

4. Often an underwater inspection by a diver will uncover hidden problems.

5. ALL repairs, and particularly major repairs, require a permit from the City. A plan submitted by a qualified professional engineer registered in The State of Florida is necessary in some cases. Completed work is inspected for compliance with City ordinance and code. A collapsed seawall, by existing City ordinance, requires action to correct with in 60 days. Fines are applicable for non-compliance. The City ordinance is available from City Hall.

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