

CITY OF MARCO ISLAND  
ORDINANCE NO. 10- 02

1  
2  
3  
4 AN ORDINANCE AMENDING CHAPTER 6, ARTICLE III, DIVISION 2, OF THE  
5 CODE OF ORDINANCES, OF THE CITY OF MARCO ISLAND, FLORIDA  
6 ENTITLED "SEAWALLS AND REVETMENTS" BY AMENDING SECTION 6-82,  
7 DEFINITIONS, ADDING GENERAL INDICATORS OF A FAILED SEAWALL TO  
8 THE DEFINITION OF A FAILED SEAWALL OR REVETMENT; AMENDING  
9 SECTION 6-83, REQUIRING SUBMITTAL OF A BUILDING PERMIT  
10 APPLICATION FOR REPAIR OR REPLACEMENT OF A SEAWALL WITHIN 60  
11 DAYS OF NOTIFICATION OF A FAILED SEAWALL; AMENDING SECTION 6-  
12 85 PROVIDING FOR PLACEMENT OF A SEAWALL WATERWARD OF AN  
13 EXISTING SEAWALL; PROVIDING FOR INCLUSION IN THE CODE OF  
14 ORDINANCES; PROVIDING FOR REPEAL OF CONFLICTS AND  
15 SEVERABILITY; AND PROVIDING FOR AN EFFECTIVE DATE.

16  
17 **WHEREAS**, The City of Marco Island has adopted an ordinance for the construction,  
18 maintenance and repair of seawalls and revetments; and

19 **WHEREAS**, properly maintained seawalls and revetments serve to protect waterfront upland  
20 property and improvements located thereon against wave action and serve to stabilize the  
21 position of the shoreline; and

22 **WHEREAS**, a failed seawall or revetment with accompanying loss of soil, unless promptly  
23 replaced or repaired, may cause continuing loss of soil on adjoining properties which can  
24 seriously and adversely affect the stability of seawalls and revetments on those adjoining  
25 properties as well as the value of adjoining properties; and

26 **WHEREAS**, individual property owners are currently responsible for maintenance, repair, and  
27 replacement of seawalls and revetments along their property; and

28 **WHEREAS**, there exists a threat to public health, safety, and welfare because of the failure of  
29 some individual property owners to maintain, repair, or replace their failed seawalls or  
30 revetments; and

31 **WHEREAS**, general indicators of a failed seawall have been identified by the Waterways  
32 Advisory Committee following consultation with representatives of the marine construction and  
33 contracting industry; and

34  
35 **WHEREAS**, a clearer and more definitive definition of a failed seawall is necessary to ensure  
36 uniform enforcement of the requirements for repair, maintenance and replacement of failing  
37 seawalls;

38  
39 **WHEREAS**, construction of a new seawall waterward of an existing seawall can provide an  
40 alternative solution to removal and replacement of a failed seawall;

41

Note:

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42 WHEREAS, after considering the recommendation of the Planning Board, Waterways Advisory  
43 Committee and City Staff, and following a public hearing on the subject, the City Council has  
44 determined that it is in the best interest of the City of Marco Island to adopt this Ordinance; and

45 NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF  
46 MARCO ISLAND, FLORIDA:

47  
48 SECTION 1. **Recitals.** The foregoing “WHEREAS” clauses are hereby ratified and  
49 confirmed as being true, correct and reflective of the legislative intent underlying this Ordinance  
50 and are hereby made a specific part of this Ordinance.

51  
52 SECTION 2. **Amendment and Adoption.** The following sections of the City of Marco  
53 Island Code of Ordinances are amended as follows:

54  
55 **DIVISION 2. SEAWALLS AND REVETMENTS**

56  
57 **Sec. 6-82. Definitions:** As used in this division, the following words shall have the following  
58 meanings:

59  
60 *Anchor.* The buried portion of the tieback that is typically a reinforced concrete block, which  
61 engages the soil to resist the pull on the tie-rod.

62  
63 *Batter.* The angle from plumb (vertical) deliberately constructed for a bearing pile.

64  
65 *Concrete cap.* The structural element on top of the seawall panels.

66  
67 *City.* The City of Marco Island, Collier County, Florida.

68  
69 *Exposed height.* The distance measured from the top of the toe-berm to the top of the seawall  
70 cap.

71  
72 *Failed seawall or revetment.* A seawall or revetment that has failed structurally or that has  
73 moved from its original position and no longer stabilizes the position of the shoreline, or that is  
74 allowing significant amounts of soil from the landward property to migrate through the wall or  
75 revetment into the adjacent body of water. **General indicators of a failed seawall shall**  
76 **include: 1) severe bowing or outward movement of a seawall; and/or 2) broken panels or**  
77 **separation of panels; and/or 3) severe wall rotation; and/or 4) severe wall settlement.**

78  
79 *Filter fabric.* A geosynthetic fabric manufactured specifically as a filter to inhibit soil movement  
80 through the fabric while allowing water to move through it. The fabric shall comply with Florida  
81 Department of Transportation specification for woven fabric specifically used for shore  
82 protection and filter applications.

83  
84 *French drain.* Stone wrapped with filter fabric to direct water to seawall weep holes to reduce  
85 hydrostatic pressure on the seawall.

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86 *Minor repairs.* Those repairs that do not include work on existing reinforcing steel or tiebacks,  
87 epoxy injection of concrete cracks, or replacement of seawall components. Examples of minor  
88 repairs include exterior coatings and repair of concrete spalling that does not have exposed  
89 reinforcing steel.  
90  
91 *N.G.V.D.* National Geodetic Vertical Datum of 1929.  
92  
93 *Pre-construction depth.* The depth profile of the waterway in front of and to either side of the  
94 seawall requiring repairs prior to initiation of construction. Impact from soil migration into the  
95 waterway from the seawall property does not affect pre-construction depth.  
96  
97 *Return wall.* The portion of a seawall that is parallel to and abutting the adjacent property line.  
98 ~~Usually, This wall is short and is approximately one foot below grade.~~ The wall provides  
99 anchorage and stability to the seawall and provides soil containment.  
100  
101 *Revetment.* A sloping structure that serves to separate real property and/or improvements  
102 thereon from any natural or manmade body of water.  
103  
104 *Riprap.* Stone placed on filter fabric to aid in stabilizing soil.  
105  
106 *Seawall.* Any solid vertical structure, which serves to separate landward real property and/or any  
107 improvements thereon from any natural or manmade body of water.  
108  
109 *Sheet pile.* Preformed structural element providing vertical stability and separation of soil from  
110 an adjacent waterway.  
111  
112 *Tie-back system.* The structural system installed to laterally support the seawall. This system  
113 typically consists of a steel rod with one end embedded into the cap and a buried concrete anchor  
114 attached to the other end of the rod. However, it could be another assembly performing the same  
115 function such as a screw anchor.  
116  
117 *T-pile seawall.* Seawall consisting of specially formed support piles that support sheet piles  
118 horizontally with a concrete cap and tie-back at each pile.  
119  
120 *Technical specification.* Construction regulations for seawalls and revetments adopted by  
121 resolution by the city council.  
122  
123 *Tie-rod.* The rod connecting the cap to the anchor; part of the tie-back system.  
124  
125 *Toe-berm.* Soil on waterward side of seawall, typically underwater.  
126  
127 *Turbidity barrier.* A floating geotextile barrier that confines turbid water to the immediate  
128 construction area in accordance with state law.  
129

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130 *Wale.* A horizontal structural element laterally supporting sheet piles. A concrete cap typically  
131 performs this function, but a wale can be positioned vertically anywhere along the height of the  
132 sheet piles.

133

134 *Weep hole.* A hole through a sheet pile to allow water from behind the sheet pile to drain through  
135 the wall without allowing loss of soil.

136

137 **Sec. 6-83. Failed seawall or revetment declared to be unlawful and a public nuisance:** It is  
138 hereby declared unlawful and a public nuisance for any property owner in the city to allow, or  
139 fail to repair or reconstruct, any failed seawall or revetment on the owner's property. Within 60  
140 days of notification of a failed seawall by the City of Marco Island, the property owner or  
141 his representative shall submit a building permit application to the Building Services  
142 Division for repair or replacement of the seawall as necessary to comply with the  
143 requirements and technical specifications of this ordinance. Property owners who disagree  
144 with the determination of the Seawall Inspector that a seawall or revetment has failed may  
145 provide, within 60 days, an independent inspection report completed by a licensed Florida  
146 Engineer describing the condition of the seawall. The report shall include a description of  
147 any remedial repairs that may be necessary to restore the condition of the seawall in  
148 compliance with required standards. The report and any accompanying documentation  
149 shall be dated, signed and sealed by the Engineer and submitted to the Building Official for  
150 review.

151

152 **Sec. 6-85. Technical specification for seawalls and revetments:** The city shall adopt by  
153 resolution the technical specification that establishes minimum performance based standards for  
154 seawall and revetment construction and repair. Site-specific designs and specifications are  
155 required and shall be appropriate for conditions at each location and construction materials  
156 employed. All seawalls and revetments constructed, reconstructed, repaired, or altered in the city  
157 after the effective date of this division shall meet or exceed this technical specification as  
158 follows:

159

160 (a) Minor repairs to the seawall or revetment that do not require physical alteration to the  
161 existing structural support system are exempt from the technical specification.

162

163 (b) Major repairs to the seawall or revetment that requires replacement of any portion of the  
164 structural support system, shall comply with all applicable provisions of the technical  
165 specification for that portion of the seawall or revetment. Repairs shall restore the original  
166 integrity of the seawall or revetment.

167

168 (c) Reconstruction of any seawall or revetment requiring complete reinstallation of the sheet  
169 pile portion of the structural support system, or any new seawall or revetment section installed  
170 adjacent to or independent from any existing seawall or revetment shall comply with all  
171 applicable provisions of the technical specification for that portion of the seawall or revetment.

172

173 (d) Seawalls shall be placed so that the waterward face of the wall is coincidental with the  
174 platted property or bulkhead line, if one exists, or at the intersection of the mean high water line

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175 with the existing shoreline. ~~New seawalls shall not be placed waterward of existing seawalls.~~  
176 Upon specific request to the city, an administrative variance to the above may be approved by  
177 the city for seawalls that were originally constructed with an intentional offset from the property  
178 line provided the offset shall not be increased.

179  
180 **(e) The placing of a new seawall water ward (in front of) of an existing seawall is permitted**  
181 **in artificially created waterway such as a man-made canal/basin or in a natural or man-**  
182 **altered waterbody in accordance with 40E-4.051 (4) (a), (b), and (c) of Florida**  
183 **Administrative Code (FAC), pursuant to the following conditions:**

- 184
- 185 1. **A Florida registered Professional Engineer certifies the new seawall design.**
- 186 2. **The new seawall does not extend more than 12 inches from the water ward face of**  
187 **the original existing vertical seawall location.**
- 188 3. **The cap shall not extend more than 18 inches water ward from the water ward face**  
189 **of the previous seawall.**
- 190 4. **The new seawall is in contact with the existing seawall.**
- 191 5. **The new seawall is placed vertically plumb.**
- 192 6. **The existing seawall was not constructed with an initial water ward offset from the**  
193 **property line.**
- 194 7. **Placing a seawall in front of an existing seawall shall only be permitted once.**
- 195 8. **Existing seawall sections that interfere with new seawall location shall be removed.**
- 196 9. **The new seawall shall include an adequate “closure” at each property line.**
- 197

198 **(f) The placing of a new seawall water ward (in front of) of an existing seawall where the**  
199 **seawall is located on sovereign submerged land (Barfield Bay) may qualify for a consent by**  
200 **rule (18-21.005 (1)(b), FAC or a letter of consent (18-21.005 (1)(c), FAC if it meets the**  
201 **regulatory exemption criteria listed in these Rules.**

202  
203 **(g) The top of cap elevation for all replacement and new seawalls and top elevation for all other**  
204 **revetments shall be equal to or greater than 4.5 feet N.G.V.D. but not exceeding 5.5 feet**  
205 **N.G.V.D. If the top of a seawall cap is constructed at an elevation differing from the adjacent**  
206 **property owner top of cap elevation by greater than one foot, then a return wall is required to**  
207 **sufficiently provide for the break in grade at the property line. The return wall shall include**  
208 **one five-foot wide, sixteen foot long panel installed one foot below grade.**

209  
210 **(h) The community development director or his designee may approve after-the-fact height**  
211 **encroachments of up to three inches for seawall caps for which a certificate of completion or a**  
212 **final development order has not been granted. After-the-fact encroachments are subject to the**  
213 **following criteria:**

- 214
- 215 (1) A survey must be prepared and certified by a Florida licensed registered engineer  
216 or surveyor identifying the exact location and size of the encroachment;
- 217
- 218 (2) A statement of how and when the encroachment was created;
- 219

- 220 (3) A statement of current ownership and ownership at the time the encroachment  
221 was created;  
222
- 223 (4) A letter of no objection from each adjacent property owner;  
224
- 225 (5) Any other factors which may show the encroachment was not intentionally  
226 created; and  
227
- 228 (6) Payment of any applicable fees imposed by the city council.  
229
- 230 (i) A property owner desiring shoreline protection may request permission from the city to  
231 construct a seawall or revetment. In general, revetments would be constructed adjoining natural  
232 bodies of water (if allowed by the State of Florida), and seawalls adjoining manmade channels.  
233
- 234 (j) A building permit is required for all seawall and revetment work. The building and planning  
235 divisions shall review the plans and specifications to determine compliance with the minimum  
236 requirements set forth herein.  
237
- 238 (1) For minor repairs only, the application for permit shall include a drawing prepared  
239 by a licensed contractor with the legal description of the property signed by the owner or  
240 contractor as owner's representative.  
241
- 242 (2) For all other seawall and revetment repair, alteration, reconstruction, or replacement,  
243 the application for permit shall include two copies of scaled plans and specifications signed and  
244 sealed by a professional engineer registered in the State of Florida including the legal description  
245 of the property.  
246
- 247 (3) Seawall construction shall be subject to inspections by the building and planning  
248 division for the purpose of determining conformance of seawall construction with the permitted  
249 plans and this division. A schedule of quality control and inspections is given in the technical  
250 specification.  
251
- 252 (4) Note there are State of Florida environmental regulations (F.A.C. ch. 40E-4)  
253 governing seawall and revetment work including exemptions to the state permit process. It  
254 remains the responsibility of the property owner where seawall and revetment work is to be  
255 performed to comply with all state and federal regulations governing the work. Additionally, the  
256 property owner shall comply with state and federal regulations concerning vegetation affected by  
257 the work, including the restoration of mangroves.  
258
- 259 (k) Existing seawall construction does not coordinate with location of perpendicular platted  
260 property lines throughout the city. Accordingly, a burden exists on the property owners to  
261 cooperate during seawall repair or replacement. If the permitted seawall or revetment repair or  
262 replacement would require entry onto neighboring properties to properly locate and construct the  
263 seawall expansion, joint tie-in or return wall, the owner seeking the repair or replacement should  
264 seek permission from the neighboring property owner. If said neighbor owner consents to entry,

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265 a temporary construction easement or license should be obtained of approximately six feet by 17  
266 feet adjacent to the seawall and common boundary to accommodate the construction. The  
267 property owner undertaking the repairs shall be responsible for restoring the neighboring  
268 property to pre-work condition prior to receipt of a certificate of completion. These repairs shall  
269 be completed prior to final inspection. Depending on job site conditions, or if the adjoining  
270 property owner does not consent to entry, the seawall to be replaced or repaired shall  
271 include a return wall.  
272

273 (I) Seawalls shall include adequate provision for pipe penetrations through the seawall as  
274 required by the city. The seawall design details for such penetrations shall be provided as part of  
275 the engineered design seawall plans for building permit.  
276

277 **SECTION 3. Inclusion in the Code of Ordinances.** It is the intention of the City Council and  
278 it is hereby ordained that the amendments to the Code of Ordinances adopted by this Ordinance  
279 shall be included and become a part of the Code of Ordinances of the City of Marco Island. The  
280 sections of this Ordinance, as adopted, may be renumbered or relettered and that the word  
281 "ordinance" may be changed to "section," "article," or other appropriate word.  
282

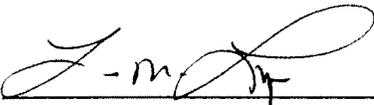
283 **SECTION 4. Conflicts and Severability.** If any word, phrase, clause, subsection, or section of  
284 this Ordinance is for any reason held unconstitutional or invalid for any reason or cause, the  
285 remaining portion of this Ordinance shall remain in full force and effect and shall be valid as if  
286 the invalid portion was not included in the Ordinance. All sections or parts of sections of all  
287 existing ordinances in conflict with this Ordinance shall be and the same are hereby repealed to  
288 the extent of such conflict.  
289

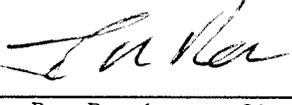
290 **SECTION 5. Effective Date.** This Ordinance shall take effect immediately upon adoption.  
291

292 **ADOPTED BY THE CITY COUNCIL OF THE CITY OF MARCO ISLAND** this 15<sup>th</sup>  
293 day of March 2010.  
294

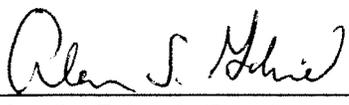
295 Attest:

CITY OF MARCO ISLAND, FLORIDA

296  
297  
298 By:   
299 Laura M. Litzan, City Clerk  
300 (SEAL)  
301

By:   
Frank R. Recker, Chairman

302  
303 Reviewed for legal sufficiency:

304  
305 By:   
306 Alan L. Gabriel, City Attorney  
307  
308  
309

## EXHIBIT A

### CITY OF MARCO ISLAND SEAWALL & REVETMENT REGULATIONS TECHNICAL SPECIFICATIONS

#### SECTION 1: DESCRIPTION

The work described herein consists of the design and construction of waterfront upland property and building protection structures such as seawalls and revetments, which serve to protect against wave action and to stabilize the position of the shoreline.

These design and construction standards provide minimum requirements for all seawalls and revetments constructed, reconstructed, repaired, or altered.

#### SECTION 2: DESIGN CONSIDERATIONS

##### A. General

1. A professional engineer registered in the State of Florida shall prepare all plans and specifications for seawalls and revetments. The professional engineer shall be qualified by training and experience to provide seawall and revetment design.

##### B. Criteria

1. Figure 1. (attached) provides soil and site parameters for structural design. As a minimum, the seawall shall be adequate to sustain the loads shown on Figure 1.
2. Design of seawalls shall be in accordance with generally accepted engineering design methodologies such as those published by the Portland Cement Association, American Concrete Institute, U S Steel Sheet Pile Manual, Aluminum Association, Composite wall manufacturers, and "Pile Buck" sheet pile wall design. New technologies exhibiting acceptable engineering standards are also acceptable for design. Maximum initial panel deflection shall be the exposed face (inches) divided by 12.
3. Seawalls may be designed as cantilever walls without the use of a tieback system. An expansion joint is required where a cantilever wall abuts a tied-back wall. Initial deflection at the top of the cantilever seawall shall not exceed 1".
4. T-pile seawalls shall not be used to replace existing seawalls.
5. Structural repairs to seawalls shall comply with the applicable specifications contained herein.

#### SECTION 3: GENERAL REQUIREMENTS

1. Location: See Ordinance, SECTION SIX, Paragraph D.
2. Top of Seawall Construction Elevation: See Ordinance, SECTION SIX, Paragraph F.
3. Fill (soil) – The only fill authorized herein shall be for fill behind the seawalls or revetments and shall not exceed any further waterward than the face of the new seawall construction or the face of the existing seawall for repairs or the highest elevation of revetment construction. Fill behind the seawall extending a minimum of 5' from the wall shall be from upland sources and consist of clean granular material (less than 10% passing no. 200 sieve) free from pollutants. The filling of wetlands is not allowed. The toe-berm may be restored after the construction by moving displaced soil under water back into its original position. Fill in the form of small toe-berm riprap protection in front of the seawall is allowed as shown on Figure 2.
4. Clean-up after construction/repairs.

5. Upon completion of construction/repairs, restore waterway to pre-construction depths, including the removal of displaced soils from the lot due to sheet pile jetting, and other construction activities, removal of soil that leaked through the seawall joints prior to construction, and removal of construction debris from the waterway. Extent of clean up shall be all areas impacted, including directly in front of the property and extending as necessary onto the waterway in front of adjacent properties. Restore the toe-berm to its preconstruction depth unless permit specifies otherwise.

#### **SECTION 4: RESTRICTIVE SPECIFICATIONS**

##### **A. General**

1. The Standard Specifications of the Florida Department of Transportation for Road and Bridge Construction, Latest Edition, shall govern all construction. The American Concrete Institute Standard 318. "Building Code Requirements for Reinforced Concrete," Latest Edition shall govern concrete and reinforcing steel. Concrete Class designated herein refers to Section 346 of the Florida Department of Transportation Specification.
2. References to tieback rods and anchors in the following sections do not restrict seawall design to tied-back seawall design. Where required, the tieback rods shall be straight between the wall cap and the anchors.
3. Seawall construction shall conform to the following tolerances of construction and placement:

##### **Fabrication Tolerances:**

Sheet pile width: + or - 1/4" per 10' length. Sheet pile length: + or - 2" Concrete sheet pile thickness: +or - 1/4"

##### **Erection/Placement Tolerances:**

Concrete sheet pile reinforcing clear distance to concrete surface: +1/2", -1/2" Concrete sheet pile reinforcing bar spacing: + or - 1" Seawall cap top and formed surfaces: + or - 1/2" Horizontal alignment of front face of sheet pile: + or - 1" In plane plumbness: 2" per 10' sheet pile length. Transverse plumbness: 2" per 10' sheet pile length Key Joint separation: Maximum 1/2" except maximum 3/4" allowed for up to 10% of key joints.

##### **Exposed height: 6"**

1. Sheet piling shall penetrate into firm soil a minimum of 40% of the total length of the sheet pile but not less than 4 feet. This penetration may be adjusted if the bottom of the sheet pile can be embedded a minimum of 12 inches into solid bedrock.
2. The toe-berm of all sheet pile seawalls shall be protected by a rip-rap revetment placed on filter fabric as follows:
  - a. At locations where soils will not adequately resist toe-out failure by additional penetration depth alone.
  - b. At locations where lateral tidal flows create excessive scour and erosion of the toe-berm.
  - c. At any other location where the design Engineer deems it necessary for the preservation of the integrity of the seawall.

3. Acceptable materials for seawall construction are:
  - a. Precast reinforced concrete sheet pile units
  - b. Prestressed concrete sheet pile units
  - c. Aluminum sheet piles
  - d. Vinyl (PVC) sheet piles
  - e. Fiber reinforced/carbon enhanced resin composite sheet piles
  - f. Steel sheet piles with protective marine coating (Commercial only-special permit only)
  - g. Color of seawalls shall be solid tones of gray.
    - o Timber is unacceptable for seawalls.
    - o Steel is unacceptable for residential seawalls.
    - o All seawall caps shall be of reinforced concrete to provide uniformity to the City's seawalls. Provide cap expansion joints at panel tongue and groove joint nearest to a property line.
    - o Tieback rods shall be Grade 60 reinforcing or hot dipped galvanized as a minimum. Series 300 Stainless steel is also acceptable for use for reinforcing and tieback rods. Do not use MMFX reinforcing as tieback rods. Additionally, hot dipped galvanized rods shall be wrapped with polyethylene. Concrete for concrete anchors shall have a 28-day minimum compressive strength of 5,000 psi.
    - o Provide a positive means to reduce the build-up of hydrostatic pressure behind the seawall by the use of weep holes protected by filter fabric and "French drains" consisting of gravel clean stone wrapped with filter fabric.

Figures 1, 2, and 3 provide other minimum requirements for seawalls.

**Figure 2A provides general requirements for new seawalls placed in front of existing seawalls. End treatment at property lines indicate intent of "closure" where the wall abuts an older existing wall. Other arrangements recommended by the Owner's design engineer may be accepted based upon the decision by the City Building Department.**

#### B. Concrete Sheet Pile Seawalls

1. All seawalls and caps shall consist of one of the following combinations of materials:
  - a. Florida Department of Transportation Class IV concrete (Section 346-extremely aggressive environment) with either or both prestressing strand (ASTM A416 Grade 270) and grade 60 reinforcing steel. For caps only, dense concrete mix with a compressive strength of 5,000 psi, low water/cement ratio (0.4) and smaller aggregate suitable for pumps may be substituted for the FDOT concrete.
  - b. 5,000 psi minimum 28-day compressive strength concrete with maximum water-cement ratio of .45 and ~~MMFX~~ or stainless reinforcing steel.
  - c. Florida Department of Transportation Class IV concrete (Section 346-extremely aggressive environment) with ~~MMFX~~ or stainless reinforcing steel. The substitution for cap concrete in a) above is applicable here.
2. Each panel shall have tongue and groove side joints, and be a minimum of 6" in thickness with the reinforcing centered. If 8" thickness or greater is required, a double mat of reinforcing is allowed, but with a minimum cover of 2".
3. Provide minimum 2' wide woven filter fabric strip behind each tongue and groove joint from bottom of cap down to 1' below the top of the toe-berm.
4. Do not grout or plaster over keyway joints between the sheet piles.

5. Minimum seawall standards are shown in Figures 2 and 3, attached.

#### C. Aluminum Sheet Pile Seawalls

1. No aluminum shall be used in contact with non-draining cohesive soils.
2. Use only structural grade aluminum sheeting that has been demonstrated to be suitable for marine use.
3. Provide protection for the portion of the aluminum sheeting to be embedded into the concrete cap such as coal tar epoxy or mechacrylate lacquer.
4. Provide minimum .125" thick material.

#### D. Vinyl (PVC) Seawall panels and Fiber reinforced/carbon enhanced resin composite sheet piles

1. Seawall panels shall be manufactured with UV resistant material.

#### E. Revetments

1. The work under this Section includes heavy armoring consisting of large riprap placed on a stable sloping sub-grade to protect upland property.
2. The revetment shall be placed on an uneven, possibly stepped compacted slope with a gradient not exceeding one-foot vertical drop for every two feet of horizontal distance (top of revetment stone). The unevenness is intended to restrain the revetment stone from sliding on the fabric.
3. All revetments shall be placed on a woven plastic filter fabric in accordance with FDOT Specifications, Section 514. Filter fabric shall be approved by FDOT for shoreline stabilization use. The fabric shall be folded over and anchored by larger stone at the toe of the revetment slope. A layer of 1" to 4" stone shall be placed directly on the fabric as a cushion for the rip-rap stone.
4. As a minimum, the riprap stone shall comply with FDOT Specifications, Section 530, Rubble (Bank and Shore).
5. Other approved armoring systems may be approved by the City on a specific basis. However, the use of sand-cement bags is not approved for revetments.
6. See Figure 4 for revetment standards.
7. The above does not apply to toe-berm protection.

### **SECTION 5: PERFORMANCE REQUIREMENTS**

This specification provides minimum requirements for seawalls and revetments, which are constructed within the City. Individual design is the responsibility of the landowner, based upon specific site conditions, type of shore stabilization structure desired, method of construction, and all other factors affecting the stability of the structure. This specification is not to be considered a final design relating to a specific site or any other affecting conditions.

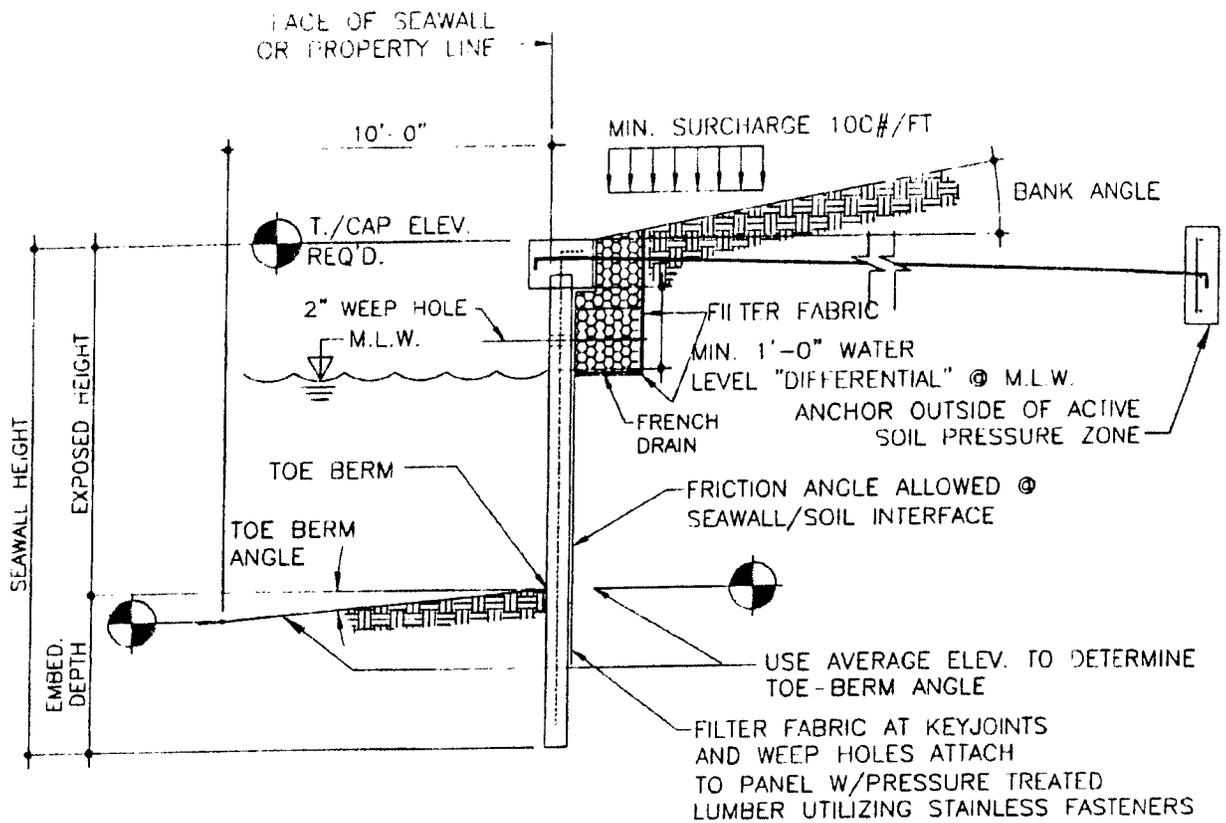
### **SECTION 6: SEAWALL INSPECTION AND QUALITY CONTROL SCHEDULE**

Building and Planning Division personnel shall conduct site visits for observation of seawall construction to determine compliance with permitted construction plans and specifications. These inspections shall occur at the following construction "milestones" (where applicable):

- 1) Prior to construction, recording of exposed height above toe-berm at a minimum of three locations: center and each end at property lines.
- 2) Forming of concrete sheet piles and placement of reinforcing prior to concrete placement.

- 3) Seawall placement, with filter fabric, including proper length, and weep holes prior to backfilling.
- 4) Anchor reinforcement/tieback placement, and concrete cap forming and reinforcement, including expansion joints.
- 5) Toe-berm riprap, French drains, final grades, final exposed height, and post-construction cleanup.

**The contractor** shall test all concrete used in seawall sheet pile and cap construction for 28 day compressive cylinder strength as per ASTM C-39, using a minimum of 2 cylinders for testing. Cast an additional cylinder to hold for later testing. Cast a 3 cylinder set for each day's pour. Separate tests shall be performed for concrete sheet piles and seawall cap. Use a qualified independent engineering testing laboratory Provide written test results to the City upon completion. Alternatively, 7-day tests are acceptable in lieu of 28-day tests of concrete cylinders. The average 7 day compressive strength for each 2 cylinder test shall be a minimum of 70% of the specified 28 day compressive strength.



## SHEET PILE WALL SECTION

SOIL PARAMETERS:

DRY DENSITY.....          PCF.  
 SATURATED DENSITY.....          PCF.  
 BUOYANT DENSITY.....          PCF.  
 ANGLE OF INTERNAL FRICTION =          DEGREES (ANGLE OF REPOSE).  
 SOIL SEAWALL FRICTION ANGLE =          DEGREES.

SITE PARAMETERS:

EXPOSED HEIGHT.....          FEET.  
 ANCHOR LOCATION.....          FEET.  
 BANK ANGLE.....          DEGREES.  
 TOE BERM ANGLE.....          DEGREES.  
 SURCHARGE.....          PSF.  
 LAG.....          FT.



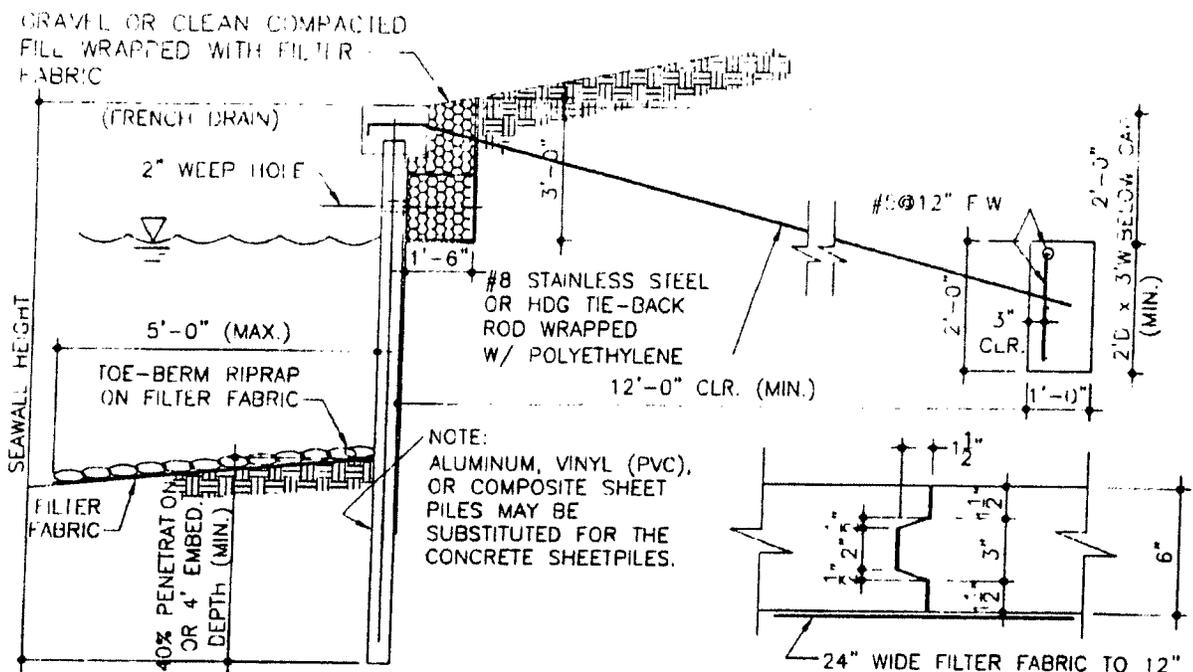
CERTIFICATE OF AUTHORIZATION NO. 12322  
 12550 Professional Park Drive, Suite  
 ECRT Myers, FL 33913  
 PHONE: (239) 539-1414  
 FAX: (239) 478-4289

DATE: 05/19/09  
 PROJ. NO.: 09-0045  
 DRAWN BY: JLE  
 CHECKED BY: JLE  
 REV. NO.: 01  
 SCALE: AS SHOWN

**CITY OF MARCO ISLAND  
 PUBLIC WORKS**  
 50 BALD EAGLE DRIVE  
 MARCO ISLAND, FLORIDA 34145

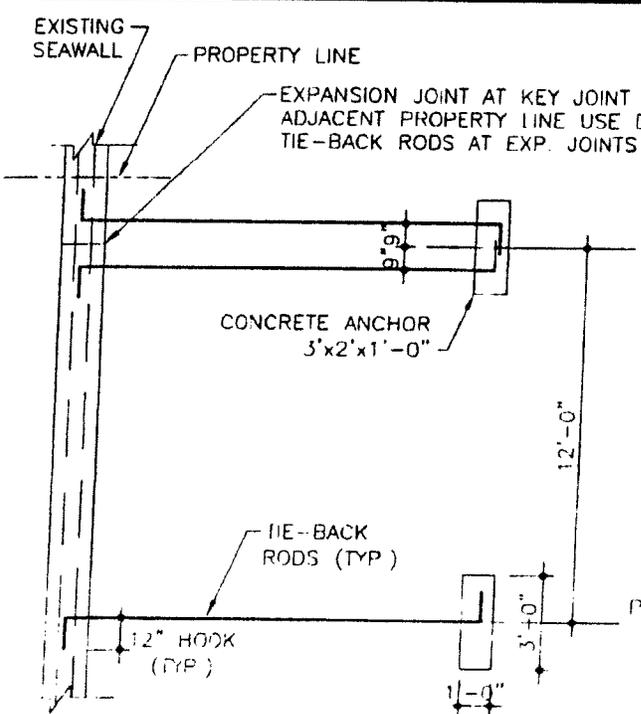
**FIGURE 1**  
**CITY OF MARCO ISLAND**  
**SEAWALL DESIGN CRITERIA**

SHEET  
 7  
 OF 11

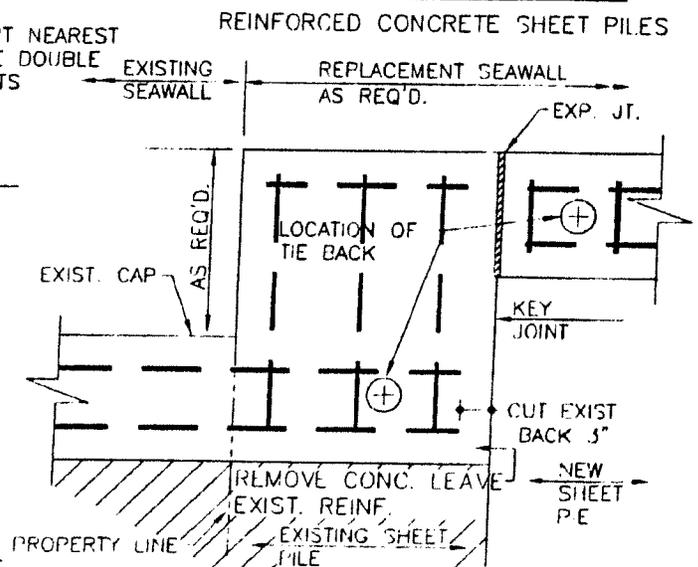


**SECTION TYPICAL SEAWALL**

**KEY JOINT**



**PLAN TYPICAL SEAWALL**



**EXPANSION JOINT DETAIL**

ALL  
 YOU NO  
 CAMP BY  
 CUB BY  
 MAR 10  
 A.E.

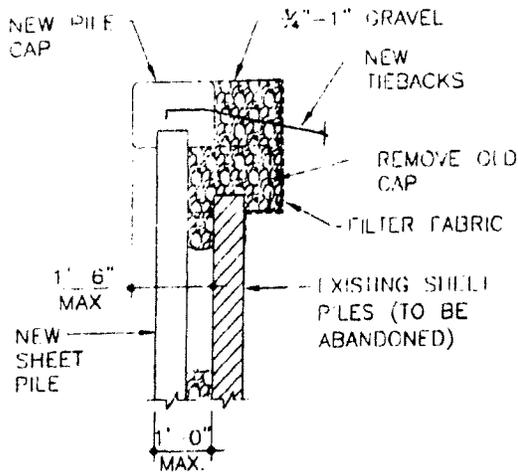
CITY OF MARCO ISLAND  
 PUBLIC WORKS  
 50 BALD EAGLE DRIVE  
 MARCO ISLAND, FLORIDA 34145



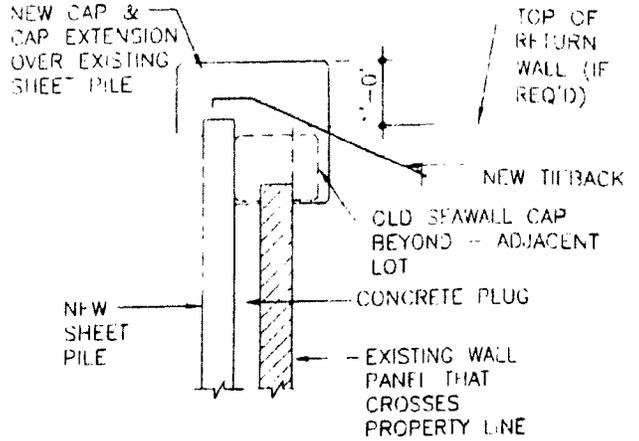
ENGINEER OF AUTHORIZATION NO. 27322  
 12340 Professional Park Drive, Suite 7  
 CRT Myers, FL 33513  
 PHONE (229) 339-1434  
 FAX (229) 339-4289

FIGURE 2  
 CITY OF MARCO ISLAND  
 SEAWALL STANDARDS

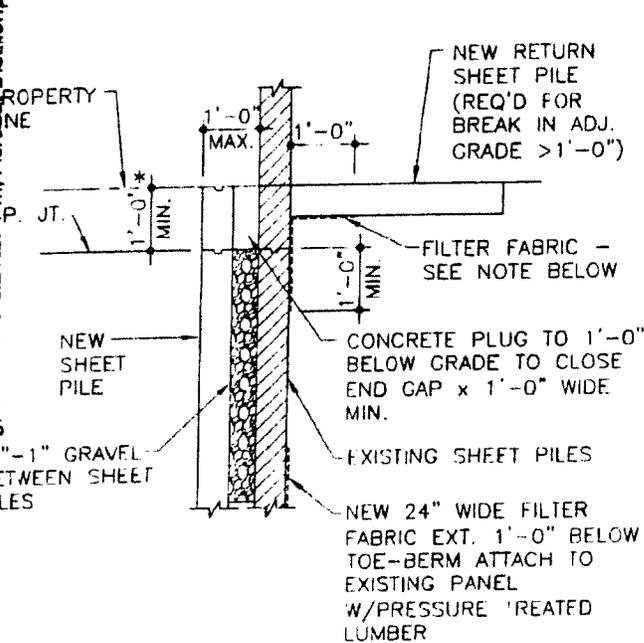
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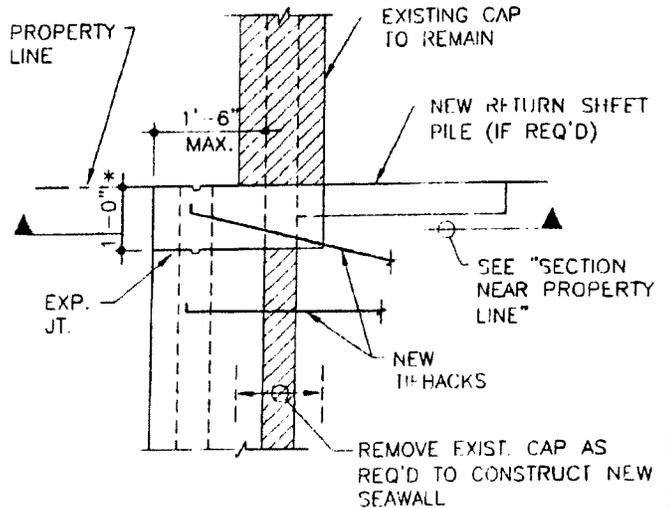
**TYPICAL SECTION**



**SECTION NEAR PROPERTY LINE**



**PARTIAL PLAN SECTION**



\* NOTE: IF < 1'-0" PLACE EXP. JT. @ NEXT JOINT PANEL

**TOP VIEW**

**DETAILS-NEW SEAWALL PLACED IN FRONT OF OLD**

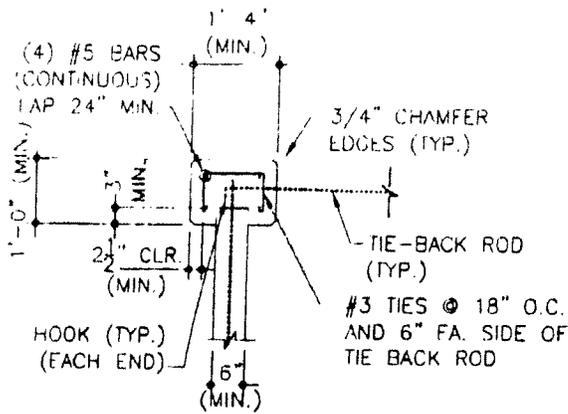
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 CHECKED BY: TAD  
 SCALE: NTS

CITY OF MARCO ISLAND  
 PUBLIC WORKS  
 50 BALD EAGLE DRIVE  
 MARCO ISLAND, FLORIDA 34145

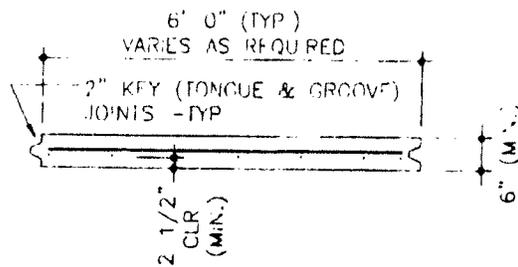


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 1000, Fort Myers, FL 33913  
 PHONE (239) 939-1414  
 FAX (239) 279-4789

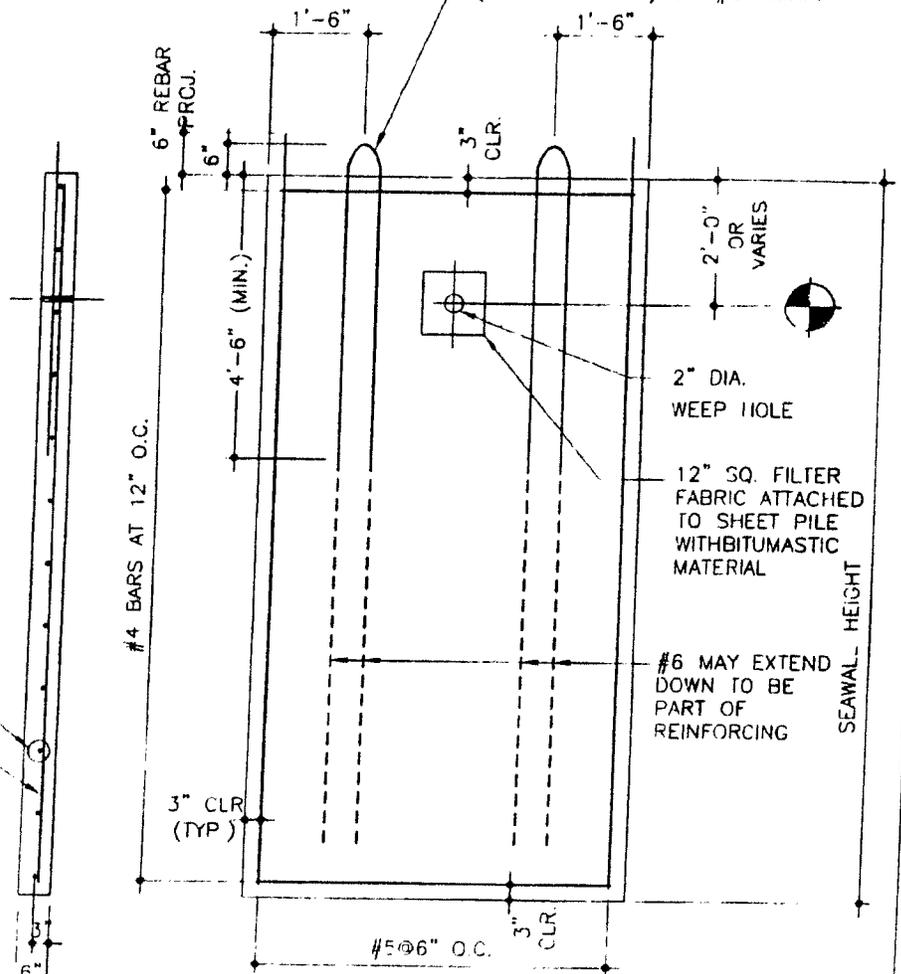
**FIGURE 2A**  
**CITY OF MARCO ISLAND**  
**SEAWALL STANDARDS**



**CAP DETAIL**



(2) 1/2" # 270KSI PICK-UP STRANDS (CAST INTO CAP) OR #6 REINF.



#4 AT 12" (H)  
#5 AT 6" (V)  
OR #6 @ 10"

SEE TECHNICAL SPECIFICATIONS FOR THE REQUIRED CONCRETE TYPE AND REINFORCEMENT TYPE.

**6" CONCRETE SEAWALL PANEL**



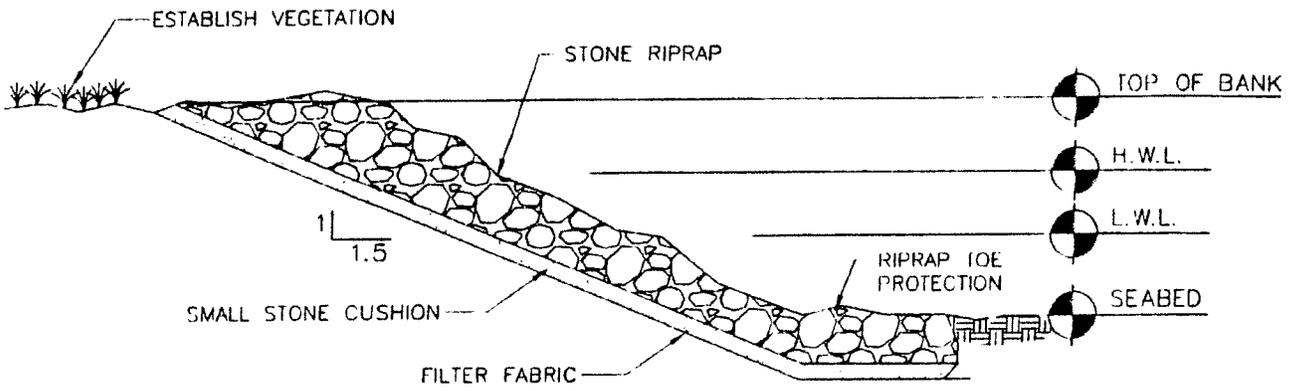
CERTIFICATE OF AUTHORIZATION NO. 21122  
12550 Professional Park Drive, Suite 2  
FORT Myers, FL 33913  
PHONE (813) 939-1414  
FAX (813) 278-4799

DATE: AUGUST 2009  
DRAWN BY: [signature]  
CHECKED BY: [signature]  
SCALE: AS SHOWN  
SHEET NO: 10

CITY OF MARCO ISLAND  
PUBLIC WORKS  
50 BALD EAGLE DRIVE  
MARCO ISLAND, FLORIDA 33145

FIGURE 3  
CITY OF MARCO ISLAND  
SEAWALL STANDARDS

SHEET  
10  
OF 11



TYPICAL STONE REVETMENT

A.E. 1/25/05  
 D.R. 1/25/05  
 C.A. 1/25/05  
 J.M. 1/25/05  
 A.F. 1/25/05

CITY OF MARCO ISLAND  
 PUBLIC WORKS  
 50 BALD EAGLE DRIVE  
 MARCO ISLAND, FLORIDA 34115



CERTIFICATE OF AUTHORIZATION NO. 27322  
 17550 Professional Park Drive, Suite 7  
 Fort Myers, FL 32913  
 PHONE: (239) 919-1414  
 FAX: (239) 278-4289

FIGURE 4  
 CITY OF MARCO ISLAND  
 REVETMENT STANDARD

SHEET  
 1  
 OF 1