1. THESE SPECIFICATIONS SHOW MINIMUM REQUIREMENTS FOR PRECAST CONCRETE SEAWALLS WHICH ARE TO BE CONSTRUCTED IN THE CITY OF CAPE CORAL. INDIVIDUAL SEAWALL DESIGN IS THE RESPONSIBILITY OF THE PERMITEE AND MUST BE PERFORMED BY A FLORIDA REGISTERED PROFESSIONAL ENGINEER WHO SHALL BE THE ENGINEER OF RECORD FOR THE PROJECT. THESE SPECIFICATIONS ARE MINIMUM REQUIREMENTS ONLY AND ARE NOT INTENDED TO BE A FINAL SEAWALL DESIGN RELATING TO A SPECIFIC SITE.

2. THE ENGINEER OF RECORD (EOR) SHALL BE RESPONSIBLE FOR CERTIFYING THE FOLLOWING AS PART OF THE FINAL SEAWALL DESIGN:
   a. EOR OR THEIR REPRESENTATIVE VISITED THE PROJECT SITE, AND INCORPORATED ALL SITE-SPECIFIC CONDITIONS, METHOD OF CONSTRUCTION, AND LOADS INTO FINAL DESIGN.
   b. FINAL SEAWALL DESIGN MUST BE SIGNED AND SEALED BY A FLORIDA REGISTERED PROFESSIONAL ENGINEER WITH STRUCTURAL EXPERIENCE.
   c. IN ADDITION TO FINAL SEAWALL DESIGN, THE EOR SHALL CERTIFY THAT THE FOLLOWING SEAWALL ELEMENTS WERE CONSTRUCTED IN ACCORDANCE WITH THEIR PLANS AND SPECIFICATIONS:
      c.1. ALIGNMENT OF SEAWALL
      c.2. PENETRATION OF SEAWALL INTO SEABED
      c.3. SEAWALL CAP REINFORCING AND PLACEMENT
      c.4. DEADMAN ANCHORS, REINFORCING, AND TIE-BACK PLACEMENT

3. MINIMUM SEAWALL DESIGN CRITERIA:
   a. THE FOLLOWING DESIGN CRITERIA IS APPLICABLE FOR A NEW PRECAST CONCRETE SEAWALL. THESE SPECIFICATIONS MAY NOT BE USED TO PLACE A NEW PRECAST CONCRETE SEAWALL IN FRONT OF AN EXISTING SEAWALL.
   b. DESIGN LOAD COMBINATIONS:
      b.1. LOW TIDE CANAL WATER (WATERWARD OF WALL) AT 4.5’ BELOW SEAWALL CAP, PLUS WATER LEVEL LANDWARD OF WALL AT 2’ BELOW SEAWALL CAP, PLUS EARTH PRESSURE, PLUS 200 psf SURCHARGE LOAD.
      b.2. CANAL WATER (WATERWARD OF WALL) AT MUDLINE (6’ MAXIMUM BELOW SEAWALL CAP), PLUS WATER LEVEL LANDWARD OF WALL AT 2’ BELOW SEAWALL CAP, PLUS EARTH PRESSURE, AND NO SURCHARGE LOAD.
   c. SOIL ASSUMED AS LOOSE FINE SAND.
   d. SEABED (WATERWARD OF WALL) SLOPING DOWN AND AWAY FROM WALL AT 1:5 (V:H) SLOPE MAXIMUM.
   e. FINISHED GRADE (LANDWARD OF WALL) SLOPING UP AND AWAY FROM SEAWALL CAP AT 1:4 (V:H) SLOPE MAXIMUM.
   f. PRECAST CONCRETE SEAWALL PANEL:
      f.1. DEPTH = 5”
      f.2. PANEL WIDTH = 5’
      f.3. CONCRETE COMPRESSIVE STRENGTH = 5,000 psi
f.4. REBAR = LOW-CARBON CHROMIUM STEEL REBAR ASTM A1035 CS, GRADE 100 (DO NOT WELD OR FIELD BEND), —OR— GLASS FIBER REINFORCED POLYMER (GFRP) REBAR ASTM D578 (NO FIELD FABRICATION, BENDING, COUPLING, THERMAL CUTTING, OR SHEAR CUTTING PERMITTED EXCEPT FIELD CUTTING PER ACI 440.5)

f.5. COLOR = GRAY

f.6. INSTALLED VERTICAL ALIGNMENT TOLERANCE = ¼” PER FOOT

f.7. MAXIMUM PROJECTION ABOVE MUDLINE = 6’ (TOP OF CAP)

f.8. MINIMUM EMBEDMENT BELOW MUDLINE = 50% PENETRATION OF PANEL

f.9. IF LIMESTONE ROCK IS ENCOUNTERED PRIOR TO FULL EMBEDMENT DEPTH, EMBED PRECAST CONCRETE SEAWALL PANEL 2’ MINIMUM INTO LIMESTONE ROCK AFTER EXCAVATING LIMESTONE ROCK TO FORM A KEYWAY FOR NEW PRECAST CONCRETE SEAWALL PANEL. IF LIMESTONE ROCK IS LESS THAN 2’ THICK, PANEL MUST BE ADVANCED DOWN TO FULL 50% PENETRATION.

f.10. ALTERNATE PINNING IN ROCK MAY BE ALLOWED AS FOLLOWS. LIMESTONE ROCK MUST BE EXCAVATED TO FORM A 1’ KEYWAY AND BE LEVEL ACROSS BOTTOM OF EACH 5’ PRECAST PANEL TO WITHIN ± 3”. DRILL 2¼” Ø HOLES x 3’–0” MIN DEEP VERTICALLY INTO ROCK TIGHT AGAINST BASE OF PANEL, SET 1’–0” IN FROM EACH SIDE OF PANEL. PLACE #18 CARBON STEEL ASTM A615, GRADE 60, REBAR x 5’–0” MIN INTO HOLES AND HAMMER TIGHT FULLY DOWN INTO PRE-DRILLED HOLES (2 REBAR PINS PER 5’ PANEL). REBAR PINS SHALL NOT EXTEND ABOVE MEAN LOW LOW WATER LEVEL.

f.11. SEAWALL CAP ELEVATION TO MATCH EXISTING SEAWALL CAP. IN CASES WHERE ELEVATIONS OR EXISTING CAP DIFFERS, NEW CAP SLOPE SHOULD NOT EXCEED 20%.

f.12. WORK TO BE PERFORMED IN ACCORDANCE WITH ARMY CORPS OF ENGINEERS (ACOE) PERMITTING GUIDELINES.

4. CONSTRUCTION IS TO CONFORM TO CURRENT FLORIDA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION. FDOT SPECS APPLY WHERE REFERENCE IS MADE TO A SPECIFIC SECTION.

5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION OF ALL CONSTRUCTION STAKES UNTIL THE SEAWALL IS INSTALLED AND APPROVED.

6. CONCRETE IS TO HAVE THE FOLLOWING MINIMUM COMPRESSIVE STRENGTHS AT 28 DAYS AND COMPLY WITH FDOT SPECIFICATION PORTLAND CEMENT CONCRETE:

a. SEAWALL PANEL = 5,000 psi (TYPE II CEMENT, CLASS III CONCRETE)

b. SEAWALL CAP = 5,000 psi (TYPE II CEMENT, CLASS III CONCRETE)

c. DEADMAN = 5,000 psi (TYPE II CEMENT, CLASS III CONCRETE)

7. REINFORCING STEEL SHALL BE AS FOLLOWS AND SHALL BE PLACED IN ACCORDANCE WITH FDOT SPECIFICATION REINFORCING STEEL.

a. SEAWALL PANEL: LOW-CARBON CHROMIUM STEEL REBAR ASTM A1035 CS, GRADE 100 (DO NOT WELD OR FIELD BEND), —OR— GLASS FIBER REINFORCED POLYMER (GFRP) REBAR ASTM D578 (NO FIELD FABRICATION, BENDING, COUPLING, THERMAL CUTTING, OR SHEAR CUTTING PERMITTED EXCEPT FIELD CUTTING PER ACI 440.5).
b. SEAWALL PANEL LIFTING RINGS: LOW-CARBON CHROMIUM STEEL REBAR ASTM A1035 CS, GRADE 100 (DO NOT WELD OR FIELD BEND).

c. SEAWALL CAP AND DEADMAN: LOW-CARBON CHROMIUM STEEL REBAR ASTM A1035 CS, GRADE 100 (DO NOT WELD OR FIELD BEND).

d. TIE-RODS: LOW-CARBON CHROMIUM STEEL REBAR ASTM A1035 CS, GRADE 100 (DO NOT WELD OR FIELD BEND), OR STAINLESS STEEL REBAR ASTM A995, GRADE 60, OR STAINLESS STEEL THREADED ROD ASTM A193, GRADE B8M CLASS 2.

e. TIE REINFORCING USING PLASTIC, POLYMER, OR NYLON COATED PLIABLE STEEL WIRE THAT READILY BENDS AND TWISTS WITHOUT BREAKING.

8. ALL EXPOSED SURFACES SHALL HAVE A CLASS 3 FINISH IN ACCORDANCE WITH FDOT SPECIFICATION FINISHING CONCRETE. ALL UNEXPOSED-surfaces are to be FREE OF HONEYCOMBING AND MAJOR IMPERFECTIONS.

9. BACK FILL BELOW TIE-RODS SHALL BE HAND-COMPACTED TO PROVIDE FULL SUPPORT OF THE TIE-RODS TO PREVENT BENDING OR FRACtURING DURING COMPACTION. BACK FILL IS TO BE COMPACTED TO A STABLE DENSITY SUCH THAT NO APPRECIABLE SETTLEMENT OCCURS AFTER COMPLETION OF WALLS.

10. THE DEAD MAN ANCHORS ARE TO BE CONSTRUCTED BY PLACING CONCRETE INTO THE SPECIFIED SIZE HOLE EXCAVATED IN UNDISTURBED GROUND. ALTERNATIVELY, ENGINEERED SOIL ANCHOR SYSTEMS MAY BE CONSIDERED IF SITE-SPECIFIC ENGINEERED AND SUBMITTED FOR APPROVAL.

11. THE CANAL FACE OF THE SEAWALL SLABS IS TO BE PLACED ON THE PROPERTY LINE (+/- 6") UNLESS INSTRUCTED OTHERWISE BY PERMIT.

12. ROCK 3” NOMINAL DIAMETER AND LESS MAY BE LEFT IN BACKFILL. ALL OTHER ROCK IS TO BE REMOVED.

13. THE CONTRACTOR WILL BE RESPONSIBLE TO COMPLETE THE CONSTRUCTION OF THE SEAWALL.

14. THE CONTRACTOR WILL BE RESPONSIBLE TO PEG THE TOP ROW OF THE SOD AT TOP OF SLOPE WITH STANDARD SURVEY STAKES AT LEAST 12” LONG SPACED 24” APART.

15. CONTRACTOR TO SEED ALL DISTURBED AREAS UNLESS A BUILDING PERMIT IS POSTED ON SITE.

16. ALL JOB SITES SHALL HAVE SEAWALL PERMITS POSTED ON AN APPROVED PERMIT BOARD WITH RAIN SHIELD PRIOR TO BEGINNING ANY CONSTRUCTION.

17. THE CONTRACTOR SHALL BE RESPONSIBLE TO INSTALL APPROVED TURBIDITY SCREENS IN PLACE DURING ANY AND ALL CLEARING, EXCAVATING, JETTING, AND BACK FILLING OPERATIONS WHICH TOTALLY ENCLOSURES THE CONSTRUCTION SITE. SCREENS ARE TO REMAIN INPLACE 24 HOURS MINIMUM AFTER CONSTRUCTION CEASES OR UNTIL TURBIDITY LEVEL IS 20 OR LESS NTU ABOVE THE PRE-CONSTRUCTION TURBIDITY LEVEL. SCREENS MUST EXTEND FROM THE WATER SURFACES TO THE BOTTOM AND BE ADEQUATELY WEIGHTED TO KEEP THEM IN PLACE DURING ALL OPERATIONS. THERE SHALL BE ADEQUATE FLOATATION AT THE SURFACE TO PREVENT OVERFLOW. THIS FLOATATION MUST BE BRIGHTLY COLORED TO MAXIMIZE VISIBILITY.

18. ANY LOOSE DIRT OR STOCK PILES SHALL BE SURROUNDED BY SILT SCREENS AND MAINTAINED IN GOOD WORKING ORDER (AT THE EDGE OF THE TOE OF THE SLOPE) TO PREVENT RUNOFF INTO CANAL.

19. CULVERT PIPE WHERE APPLICABLE SHALL NOT PROJECT MORE THAN 4” FROM THE WATER—FACE OF THE SEAWALL.

20. REFER TO THE FDOT SPECIFICATION ON EROSION CONTROL FOR PROTECTION OF SLOPES.
EXTEND SOD OR SUITABLE GROUND COVER TO TOP OF SLOPE PLUS 32" WHERE EROSION CONTROL MEASURE IS NEEDED (MIN 2.25 H + 2'-0")

MAX SLOPE

4' LONG DEADMAN

(3) #5 HORIZONTAL BARS EQUAL SPACED

(3) #5 VERTICAL BARS EQUAL SPACED

SEE SHEET H-1G FOR THICKNESS

2.25 H MIN (SEE NOTES 1 & 2)

NOTES:

1. ALTERNATE TIE–ROD (STAINLESS STEEL) AND SOIL ANCHOR SYSTEMS MAY BE CONSIDERED IF ENGINEERED FOR A HORIZONTAL COMPONENT WORKING LOAD OF 1030 PLF MIN (SPACED AT 10'-0" O.C. MAX) AND EMBEDDED 2.25 H MIN BEHIND SEAWALL.

2. ANY ANCHORS EMBEDDED < 2.25 H BEHIND SEAWALL MUST BE SITE–SPECIFIC ENGINEERED AND SUBMITTED FOR APPROVAL.

PRECAST CONCRETE SEAWALL ELEVATION
EXTEND SOD OR SUITABLE GROUND COVER TO TOP OF SLOPE PLUS 32" WHERE EROSION CONTROL MEASURE IS NEEDED (MIN 2.25 H + 2'-0"

1'-8"

H = 6'-0" MAX

10"

4 MAX SLOPE

4' LONG DEADMAN (SEE SHEET H-1D)

(2) #5 TIE ROD WITH 10" STANDARD HOOK & EMBEDDED 1'-0" INTO CONCRETE AT EACH END 10'-0" O.C. MAX ENCASED IN PVC OR HDPE SLEEVE (NOT SHOWN) (EMBED SLEEVE 2" INTO CONC)

LIMESTONE ROCK (SEE NOTE 3)

2.25 H MIN (SEE NOTES 1 & 2)

NOTES:
1. ALTERNATE TIE-ROD (STAINLESS STEEL) AND SOIL ANCHOR SYSTEMS MAY BE CONSIDERED IF ENGINEERED FOR A HORIZONTAL COMPONENT WORKING LOAD OF 1030 PLF MIN (SPACED AT 10'-0" O.C. MAX) AND EMBEDDED 2.25 H MIN BEHIND SEAWALL.

2. ANY ANCHORS EMBEDDED < 2.25 H BEHIND SEAWALL MUST BE SITE-SPECIFIC ENGINEERED AND SUBMITTED FOR APPROVAL.

3. REFERENCE PRECAST SEAWALL GENERAL NOTES 3.f.9 & 3.f.10.

PRECAST CONCRETE SEAWALL EMBEDDED IN ROCK DETAIL
EXPANSION JOINT
(55'-0" O.C.) SEE DETAIL SHEET H-1H

TIE ROD
SEE SECTION (TYP)

1 1/4" Ø PVC WEEP HOLE THRU WALL AT ±5' O.C. HORIZ.
4" ABOVE BARNACLE LINE
PROVIDE 1 FT³ CLEAN GRAVEL (¾") WITH FILTER FABRIC
ATTACHED W/ BITUMASTIC

PRECAST CONCRETE SEAWALL PLAN
SEAWALL PANEL DETAIL

1' - 8" CAP

#3 TIES @ 8" O.C. (CONT.)

1" CHAMFER (TYP)

(2) #5 AT EACH FACE LAP 2' - 6" MIN.

#4 BAR – LIFTING RING

PRECAST SEAWALL PANEL

(5" THICK PANEL) 7 1/2"

(6" THICK PANEL) 7"

CAP DETAIL

6" TYP

4" TYP

#4 LIFTING RINGS

SECTION

1 1/4" DIA. WEEP HOLE W/ 9" SQ.
CARThAGE 6% PATCH ATTACHED
W/BITUMASTIC MAT’. (SLABS W/GROUTED JOINTS ONLY)

8' PANELS: #3 AT 18" O.C. (6-REQ’D.)
9' PANELS: #3 AT 18" O.C. (7-REQ’D.)
10' PANELS: #3 AT 18" O.C. (8-REQ’D.)
12' PANELS: #3 AT 18" O.C. (9-REQ’D.)

8' PANELS: #3 AT 4 1/2" O.C. (12 REQ’D.)
9' PANELS: #3 AT 4 1/2" O.C. (12 REQ’D.)
10' PANELS: #4 AT 6" O.C. (10 REQ’D.)
12' PANELS: #5 AT 6" O.C. (10 REQ’D.)

SEAWALL PANEL DETAIL

8' MINIMUM LENGTH

VARIIES (4" ABOVE BARNACLE LINE)
EXPANSION JOINT DETAIL

FILL GROOVES W/ HIGH STRENGTH GROUT OR 5000 PSI CONCRETE W/ #16 GRAVEL IN PLASTIC SOCK

9" STRIP OF CARTHAGE 6% (OR EQUAL) 65% OF SLAB LENGTH, ATTACHED WITH BITUMASTIC MATERIAL

ALTERNATE PANEL JOINT DETAIL

9" STRIP OF CARTHAGE 6% (OR EQUAL) 65% OF SLAB LENGTH, ATTACHED WITH BITUMASTIC MATERIAL

PANEL JOINT DETAIL

1 7/16" @ 5" PANELS
1 15/16" @ 6" PANELS

2 1/8"
2"
1" 1/2"
1/2"
1/4" 1/4"
2 1/4"

1 3/8" @ 5" PANELS
1 7/8" @ 6" PANELS

1 7/16" @ 5" PANELS
1 15/16" @ 6" PANELS

1 3/8" @ 5" PANELS
1 7/8" @ 6" PANELS

1 7/16" @ 5" PANELS
1 15/16" @ 6" PANELS

EXPANSION JOINT DETAIL

#5 BAR
1" EXPANSION MATERIAL
SLAB JOINT
PROPERTY LINE

(2) #5 DOWELS 36" LONG W/ ONE END WRAPPED IN FELT AND COATED W/ BITUMASTIC MATERIAL (OR ONE END ENCASED IN 3/4" DIA. PVC (OR HDPE SLEEVE)
NOTES:

1. THE PLANTING OF EMERGENT AQUATIC PLANTS FOR LANDSCAPING IS OPTIONAL. (ONLY APPROVED VEGETATION WILL BE PERMITTED.)

2. VARIATIONS TO THIS STANDARD MUST BE APPROVED BY THE CITY PUBLIC WORKS DEPARTMENT.

3. CAP ELEVATION TO MATCH EXISTING SEAWALL CAPS OR MATCH EXISTING DOWNSTREAM WEIR WINGWALL CAP ELEVATION.

4. TOLERANCE FOR WATER DEPTH AT SEAWALL AND AT 5'-0" FROM PROPERTY LINE SHALL BE +/- 6".

5. IN CASES WHERE ELEVATIONS OF EXISTING SEAWALL CAP DIFFERS WITH THE NEW SEAWALL CAP, ELEVATION OF THE NEW CAP SLOPE SHOULD NOT EXCEED 10%.

PRECAST SEAWALL FRESHWATER CANAL
AT EXISTING SEAWALLS, A RETAINING WALL MUST BE INSTALLED AND / OR EXTENDED AND SECURELY ATTACHED FOR EROSION CONTROL.

NOTES:

1. VARIATIONS TO THE ESTABLISHED SEAWALL STANDARDS FOR FRESH WATER SYSTEMS MAY BE CONSIDERED BY THE CITY OF CAPE CORAL PUBLIC WORKS DEPARTMENT.

2. THE FOLLOWING MINIMUM DESIGN CRITERIA MUST BE INCORPORATED INTO THE PROPOSED DESIGN.

   A. MAXIMUM ALLOWABLE SLOPE TO WATERLINE IS 1:4 (V:H).
   
   B. SLOPE TO BE STABILIZED WITH APPROVED MATERIALS / METHODS FOR EROSION CONTROL.
   
   C. MAXIMUM WATER DEPTH AT PROPERTY LINE IS TO BE 6 INCHES.
   
   D. TERRACING MAY BE USED TO ESTABLISH PROPER SLOPES.
   
   E. ALL PLANS MUST BE SEALED BY A PROFESSIONAL ENGINEER, REGISTERED IN FLORIDA WITH STRUCTURAL EXPERIENCE.

DRAFT - August 9, 2019
VERTICAL BULKHEAD ALTERNATE 2

- 5' wide strip of sod the width of the lots
- Typical seawall with typical grassed slope on adjacent property
- Existing return slab
- 6" to 12" dia. washed stone to be hand-placed to insure tight, stable fit
- Platted to be toe of proposed bulkhead
- Mean water elevation established at downstream weir
- Max depth c.o 7'
- Erosion control cloth Terrax HD to be anchored at top and toe of slope
- 2' wide littoral shelf running the width of the lots
- 7' horizontal distance
- 3.5' vertical distance
- 2' wide littoral shelf running the width of the lots
NOTES:
1. AS A STANDARD, RIP-RAP IS NOT ALLOWED.
2. WHERE RIP-RAP IS ALLOWED BY CURRENT ACOE AND FDEP PERMIT CRITERIA, RIP-RAP MAY ONLY BE INSTALLED IN ACCORDANCE WITH THE PERMIT CRITERIA.
4. RIP-RAP MAY BE PLACED UNDER DOCKS.
5. NO RIP-RAP SHALL BE PLACED WITHOUT A PERMIT.
6. ALL RIP-RAP SHALL BE CAREFULLY PLACED.
7. RIP-RAP SHALL BE CLEAN STONE OR ROCK, 6" TO 3'-0" IN SIZE, FREE OF FOREIGN MATERIAL (SUCH AS: SAND, WOOD OR STEEL). CLEAN CONCRETE RUBBLE WILL BE ALLOWED.
8. TOLERANCE FOR RIP-RAP ELEVATION SHALL BE 0" TO -6" NGVD.
9. RIP-RAP SHALL BE IRREGULAR SIZES WITH NOMINAL DIMENSIONS FROM 6" MIN. TO 36" MAX. OR AS REQUIRED BY THE APPROPRIATE REGULATORY AGENCY.
10. CAP ELEVATIONS THAT ARE GREATER THAN 4.0' NGVD, RIP-RAP ELEVATION SHALL BE 4.0' BELOW PROPOSED CAP ELEVATION TO A MAXIMUM OF 1.0' NGVD, OR AS REQUIRED BY THE APPROPRIATE REGULATORY AGENCY.
11. NO RIP-RAP SHALL BE ALLOWED TO OBSTRUCT THE CENTRAL NAVIGABLE SECTION OF THE CANAL.
NOTES:
1. WALER AND TIE RODS MUST BE ENGINEERED TO ACCOMMODATE SITE CONDITIONS.

2. CONTRACTOR TO OBTAIN APPROVAL FROM PUBLIC WORKS DEPT. BEFORE CONSTRUCTING.

3. ALLOWABLE WALER MATERIALS: STAINLESS STEEL, ALUMINUM, STRUCTURAL PLASTIC.

4. HORIZONTAL COMPONENT WORKING LOAD OF WALER = 1030 PLF (MIN.).

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