

Technical Specifications

FOR

Coquina Beach Drainage Improvements

PROJECT # 6005719

July 2018

PROJECT OWNER:

County of Manatee, Florida
c/o Manatee County Purchasing Division
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COQUINA BEACH TECHNICAL SPECIFICATIONS

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SITE WORK

SECTION 001 PERVIOUS CONCRETE

Part 1 General

1.01 Description

- A. Scope - This Section includes furnishing and installing pervious concrete paving for vehicular traffic. The Contractor shall be required to submit a proposed concrete mixture complying with the provisions of this section. All testing required within this Section shall be performed by the COUNTY.

1.02 Quality Assurance

A. Certification

At least one (1) member of the pervious concrete construction crew shall be certified as a "Craftsmen" per the National Ready Mix Concrete Association (NRMCA). Proof of certification shall be provided to the City prior to Contract Award. This certified individual shall be present at the site during all pervious concrete installation activities.

B. Qualifications

The Contractor shall provide a list of at least two (2) reference projeCTS or Approved Equal. This list shall include the project's name, location and Owner's contact information. Test results (void content, unit weight, infiltration, etc.) for reference projeCTS or Approved Equal shall also be provided.

Each reference project shall consist of a minimum of 2,500 square feet of pervious concrete. Reference projeCTS or Approved Equal shall have been completed within the past five (5) years.

1.03 Submittals

The Contractor shall be required to submit a proposed mix design identifying the aggregate type, source and gradation. Cement, fly ash, admixtures (including applicable certifications) shall also be provided. The proposed mix design shall clearly state the concrete mixture proportions.

The Contractor will also be responsible for providing a jointing plan identifying the location of all proposed control, construction and isolation joints.

1.04 Test Panels

Test panels, measuring 12'x 12' (min.), shall be provided by the Contractor prior to construction for inspection and approval. Test panels shall be constructed of a depth matching the plan-defined thickness. A single-ring infiltrometer shall be installed (in accordance with the plans) within this test panel. The Contractor shall perform all specification-required finishing to the panel.

The test panel shall meet all performance specifications (i.e. density, void content, infiltration rate, etc.) required within this section.

Non-compliant test panels shall be removed and disposed of at the Contractor's expense. Additional test panels shall be constructed until the performance specifications are met.

1.5 Performance Requirements

Pervious concrete shall meet the following requirements:

- Void content between 15% and 25% per ASTM C42.
- In-place density within 5 pounds per cubic foot of the design unit weight.
- Water-to-cement ration of 0.35 to 0.45
- Infiltration rate of 1.5 inches / hour.
- Compressive strength of 300 psi.

Part 2 Products or Approved Equal

2.01 Materials

A. Cement

1. Cement shall be Portland Cement (Type I or II) per ASTM C150 or Portland Cement (Type IP or IS) per ASTM C595.
2. The Contractor may substitute up to 20% of the required cement with Class F fly ash per ASTM C618.
3. The Contractor may substitute up to 50% of the required cement with Ground iron blast furnace slag per ASTM C989.

B. Aggregates

Course and fine aggregate shall comply with ASTM C33.

Course aggregate gradation shall be Size No. 89 as defined within FDOT Specification Section 901. Alternate gradations may be used if approved by the CITY.

If used, fine aggregate shall not exceed 3 cubic feet per yard.

C. Water

Water shall be per ASTM C1602.

D. Admixtures

Utilize admixtures in accordance with the manufacturer's recommendations.

Part 3 Execution

3.01 Subgrade Preparation

- A. The Contractor shall prepare the subgrade in accordance with plan details and other applicable specification sections. All excess material shall be removed from the site and disposed of at the Contractor's expense.
- B. Permeability testing shall be performed for each ½ acre of prepared (i.e. compacted) subgrade. Permeability testing shall be performed in accordance with ASTM D3385. Testing shall be submitted to the CITY prior to base installation.

3.02 Forms

- A. Forms shall be constructed of reinforced plastic or roll formed steel. Wooden forms will only be permitted for intermediate transition segments (radii, fill-in, etc.). Forms shall be of a suitable strength to support mechanical equipment.
- B. Forms shall be the width and depth of the pavement. Removable spacers (3/8") shall be placed above the forms to support finishing equipment.
- C. Forms shall maintain proper alignment and grade. Base of forms shall be directly in contact with the subgrade.
- D. A release compound shall be placed on the forms prior to pouring pervious concrete. Forms shall not be removed within 24 hours of a pour.
- E. The Contractor may use previously placed concrete in lieu of a form so long as the newly placed concrete has achieved a sufficient split tensile strength.

3.03 Mixing & Hauling

- A. Aggregate used in pervious concrete mix shall be kept wet prior to mixing activities. Manufacture and deliver pervious concrete in accordance with ASTM C94.
- B. Mixtures can be produced in central or truck mixtures. Concrete delivered shall be mixed in the central mixer for 90 seconds. Concrete mixed in truck mixers shall be mixed at the speed designated as mixing speed by the manufacturer for 75 – 100 revolutions.
- C. Whether mixed offsite or onsite, each load shall be used within one (1) hour of introduction of mix water. This duration can be extended to 90-minutes if a hydration stabilizer is used.
- D. Each truckload shall be inspected for consistency of concrete mixture. Water addition is permitted at the point of discharge to obtain the required mix consistency provided a measurable quantity is used before more than 0.5 cubic yard of concrete is discharged, and the design water to cement ratio is not exceeded. A minimum of 30 revolutions at the manufacturer's designated mixing speed shall be required following the addition of any water to the mix. Discharge shall be a continuous operation and completed as quickly as possible. Concrete shall be deposited as close to its final position as practical. Pulling or shoveling pervious concrete to final placement will not be permitted.

3.04 Placement & Finishing

- A. Concrete shall be used while fresh. Re-tempering shall be minimized.
- B. Concrete shall be applied in successive batches to the full width of a parking stall, drive isle or traffic lane. If approved, adjacent traffic lanes or drive isles may be monolithically poured without a construction joint. A longitudinal weakened-plane joint shall be installed at each traffic lane or drive isle.
- C. Successive concrete batches shall not be placed within 30 minutes of one another.
- D. Slip form or vibratory form riding equipment shall be used to place the pervious concrete. Internal vibration will not be permitted. Mechanical vibratory screed shall be used to strike off the pervious concrete 3/8" above the final height.

- E. Embed infiltrometers per plan requirements (one per each ½ acre of pervious concrete).
- F. Do not disturb concrete when in its plastic state. Low spots shall be filled and compacted. Finish concrete in a manner to consolidate the concrete without segregation (i.e. through use of hand tools).
- G. Form spacers shall be removed after strike-off and compaction shall commence. Compaction shall be performed through the use of a steel roller with a minimum diameter of 10" (or other approved method). The steel roller shall span the width of the pour and exert a vertical pressure of at least 10 PSI. Caution shall be used during compaction to ensure that sufficient compaction is achieved without the application of excessive force that could minimize porosity of the finished surface.
- H. Compaction along the edges of the pervious slab shall be done using hand tampers. No further finishing shall be performed once compaction efforts are completed.
- I. Pavement slopes shall not deviate greater than 3/8" over 10-feet.

3.05 Joints

Joints shall be longitudinal and traverse construction joints and longitudinal and traverse weakened-plane joints. The faces of all joints shall be constructed in a manner that is normal to the finished surface.

Traverse joints shall be constructed normal to the centerline of the road or drive isle and extend the full width of the pavement. Traverse joints shall be in line with each other across the full width of the road or drive isle. Where curbing is present, control joints in the curbing and pervious concrete shall align.

Longitudinal joints shall be parallel to the centerline of the road or drive isle.

A. Construction Joints

Construction joints shall be made when pervious concrete is poured against hardened concrete at planned locations and at locations when concrete pouring operations are interrupted for longer than 30 minutes.

Traverse construction joints shall not be placed within 10' of another traverse joint. When joint spacing is less than 10' due to concrete pouring operations ceasing, excess material shall be removed and pouring shall commence at the nearest joint.

- B. Control (contraction) joints shall be installed at regular intervals not to exceed 15' or the width of the traffic lane or drive isle. Control joint depth shall be ¼ of the overall pervious concrete depth but no greater than 1-1/2". These joints shall be installed in the plastic state using a steel "salt roller" with a beveled fin welded circumferentially along the roller (i.e. "pizza cutter").
- C. Control (contraction) joints may be installed in hardened concrete using a wet saw. Saw cuts shall be at the above-specified depth and made as soon as the pavement has hardened. The curing cover shall be removed the surface kept misted to prevent moisture loss. Curing cover shall be replaced with a minimum of 1' overlap on each side of the joint.
- D. Isolation joints shall be installed when pervious concrete abuts fixed vertical surfaces such as a light pole foundation, building foundation, etc. Isolation material shall extend the full depth of the pervious concrete and be placed prior to pouring.

The contractor will be required to submit a jointing plan prior to construction.

3.06 Curing

- A. Within 20 minutes after final placement, curing procedures shall commence. The pervious concrete surface shall be covered with a 6-mil thick polyethylene sheet or other approved material. The cover shall overlap all exposed edges by 1-foot and be secured to prevent movement and/or uplift.
- B. Joints within the covering sheet shall be overlapped to a suitable degree. Overlapped edges shall be protected from soil intrusion.
- C. The surface shall be kept moist after screeding using misting or fogging devices only. Direct water spray is not permitted.
- D. Vehicular traffic shall be kept off of the pervious concrete surface for seven (7) days. Truck traffic shall be kept off of the pervious concrete surface for fourteen (14) days.

3.07 Field Quality Control

- A. Concrete tests shall be performed for each 150 cubic yards of pervious concrete poured or each work day, whichever is less. Concrete tests shall determine the density (unit weight) of the concrete in accordance with ASTM C138.
- B. At locations determined by the City, test cores (4" diameter) shall be obtained at a rate of one core per 1,000 square yard of pervious concrete surface. Cores shall be drilled in accordance with ASTM C42.

The cores shall be tested for compressive strength in accordance with ASTM C39. Cores shall also be tested for density and void content per ASTM C42.

- C. Infiltration rates shall be tested using the embedded infiltrometers.

End of Section

SECTION 002

EMBEDDED RING INFILTRATION KIT (ERIK)

PART 1 GENERAL

Part 1 General

1.01 Description

A. Scope - This Section includes furnishing and installing embedded ring infiltration kit (ERIK) for measuring the percolation in and through pervious concrete. All inspection required within this Section shall be performed by the COUNTY.

1.02 Submittals

The Contractor shall be required to submit shop drawings of the ERIK or approved equal for review and approval. The contractor can contact Erik Stuart, P.E. at 941-400-8040 or by e-mail at erikstuartpe@gmail.com for additional information above what is included in the construction plans.

Part 2 Products or Approved Equal

2.01 Materials

There are essentially three main components of the ERIK device: the (permanent) embedded ring and two (graduated) measurement reservoirs for monitoring a range of flow rates through the pervious pavement system. The element that is considered novel is the permanently embedded ring portion of the ERIK device. This novel feature of actually embedding the ring into the system at time of construction is the key to preventing water from flowing laterally through a more permeable layer which gives a false indication of the true vertical infiltration of the entire system.

A. Embedded Ring

The material utilized in constructing the embedded ring is a 6 inch ID (schedule 80) PVC pipe and coupling system, in which the bottom (6 inch ID PVC schedule 80) pipe end extends downward through each of the layers of the pervious pavement system under consideration. The embedded ring can be extended into the parent earth soils underneath the pervious pavement system for monitoring the system's infiltration performance at a particular location/site given its own soil characteristics. An advantage of the device is that testing can be conducted throughout the service life of the system for monitoring system performance over time. This can be used to track the performance of the system as it clogs with sediment and is later vacuumed to remove the clogging debris.

B. Measurement Reservoirs

The measurement reservoirs supply water to the embedded ring by easy manipulation of the valves to control the flow rate. This makes the test process easy to conduct and minimal training is needed for future field personnel. By providing pre-determined graduated markings for easy recording and conversion of infiltration rates into inches per hour, the testing device is self-sufficient and user friendly. There are no moving parts or electronics that may malfunction during a test or need continuous maintenance or calibration.

Part 3 Execution

3.01 Placement & Finishing

A. Installation of Embedded Ring

The top of the embedded ring coupling is set flush to the top of the surface of the pavement to enable installers to construct the pavement layers with concurrent construction methods (i.e. screeding, compacting, rolling, troweling, covering, etc.). In large surface areas of pavement, the embedded ring may function as a top of grade marker (or grade stake) set at an elevation consistent with the final elevation of the pavement surface. Once the embedded ring is installed, it is subjected to natural conditions that impact the pavement's infiltrating performance such as wind-blown sediments or automobile tires tracking sediments. These conditions are similar to the natural loading of the remainder of the pavement surface and reflect the eventual accumulation of sediments in the surface pores of the pavement. The sediments then can get washed in deeper into the pore structure of the pavement system by precipitation and even compacted into the void spaces by automobile tire loads.

B. Installation Insert Collar

During installation of the embedded ring in the pavement, a ring shaped gap or dap-out is left between the inner wall of the coupling and the pavement to allow for the insertion and removal of the testing collar into the top of the coupling when a test is conducted. To create this gap, a small (1.5 inches in length) installation collar is temporarily inserted (not glued) as a placeholder into the top of the embedded coupling until flush with pavement surface. Once the pavement is installed and properly cured, this temporary construction insert ring is removed. The small ring can then be discarded or used for future ERIK installations. Since the test collar can only be practically inserted about one inch into the top of the coupling for a test, there is an empty space beneath the test collar. To eliminate this unwanted empty space which may create an artificial flow channel for the water, an additional small ring (labeled "Permanent Insert Collar" in Figure 4) is permanently fixed used PVC glue to the coupling system at the time of installation. Figure 4 shows the details of the entire assembly.

C. Testing Insert Collar

The function of the temporary testing collar is to support the column of water at a certain head level above the pavement surface during an actual test. This insert collar is temporarily sealed with clear silicone prior to testing to prevent leakage between the outside wall of the collar and the inside wall of the embedded coupling. The testing collar is able to be removed once testing is complete avoiding any tripping hazard during normal operation.

D. Embedment Pipe

The bottom portion of the coupling is a permanently-glued, 6-inch ID, schedule 80 PVC pipe that extends downward through the sub-base layers and penetrates 4 inches into the parent earth soils. For example, if the pavement layer is 6 inches in thickness and the sub-base layer is 10 inches, then the total length of the permanent embedded ring would be $6 + 10 + 4 = 16$ inches.

E. Graduated Measurement/Monitoring Reservoirs

The Type-A monitoring reservoir is a 2 inch ID [clear] schedule 40 PVC pipe which stands vertically in close proximity to the embedded pipe during the test. The clear measuring tube is graduated by scoring lines on the outside of the clear pipe at 4.5 inch intervals. At this 4.5 inch interval, the volume of water inside is equal to a 0.5 inch interval or volume of water entering the pavement through the 6 inch ID embedded ring and hence equals the volume of water infiltrating through the pervious pavement system. This graduation provides a quick

and easy measurement of the infiltration rate of water and is expressed in units of inches per hour (in/hr), which may be compared directly to the rainfall intensities.

F. Flow Control Valve

The Type-A measurement reservoir has a $\frac{3}{4}$ inch valve attached near the bottom for manual control of the flow of water into the testing collar. The valve must be manipulated during each test to keep the water level inside the test collar at a constant head level indicated by the marking on the inside of the collar.

End of Section

PART 1 GENERAL**Part 1 General****1.01 Description**

- A. Scope - This Section includes furnishing and installing Bold & Gold Media for water quality enhancement. All inspection required within this Section shall be performed by the COUNTY.

1.02 Submittals

The Contractor shall be required to submit shop drawings of the Bold & Gold Media or approved equal for review and approval. The contractor can contact Chris Bogdan at 407-298-5121 or e-mail at chris.bogdan@ecs-water.com for additional information above what is included in the construction plans.

Part 2 Products or Approved Equal**2.01 Materials**

The contractor shall be responsible for the satisfactory delivery, stockpiling, installation and maintenance of the Bold & Gold® CTS or Approved Equal media during construction based on information provided in the Contract Documents and as provided by the supplier. The Bold & Gold® CTS or approved equal media shall be purchased from an approved source.

A. Composition

The Bold & Gold® CTS or approved equal media shall be manufactured with mineral materials and no organic materials. The final product will have more than 2% but less than 6% passing the 200 sieve. The mix will be composed of 85 % poorly graded sand and 15% sorption materials by volume. The sorption materials are composed of recycled tire crumb with no metal contents and mined clay that has no less than 99% clay content. Percentages shall be determined by in-place volume. The mix will have an average dry weight of non-compacted media greater than 62 pounds per cubic foot and be non-flammable up to 482°F. Water passing through the media must not exhibit acute or chronic toxicity and not change the pH of the filtered water by more than 1.0 unit. The material will have a water holding capacity (amount of water that the media can hold for crop use) of at least 10% as measured by porosity, and total porosity of 32%. The permeability as measured in the laboratory must be greater than 5.0 inch per hour at maximum compaction. The Bold & Gold® CTS or approved equal media has a dissolved phosphorus (DP) removal capacity that exceeds 0.2 mg DP/gram of media as measured in the laboratory during normal operating conditions. Environmental Conservation Solutions, LLC. will provide certification of authenticity on the above composition and performance.

B. Storage and Handling

At the contractor's option, the Bold & Gold® CTS or approved equal media may be delivered pre-mixed and ready to install or the material components delivered separately and mixed on site by a ECS representative. Pre-mixed material and/or the clay portion of the component material shall be stored in a covered and well-drained area. Material shall not be stockpiled longer than 30 days before installation to prevent separation of the material due to rainfall.

Part 3 Execution

3.02 Placement & Finishing

A. Delivery of the Material

Bold & Gold® CTS or approved equal media may be delivered to the jobsite premixed OR the component materials may be delivered for onsite mixing by the manufacturer.

B. Premixed Delivery

Bold & Gold® CTS or approved equal media shall be mixed by an Environmental Conservation Solutions, LLC. and delivered to the jobsite ready for installation. The delivered material is certified to meet the patent requirements.

C. Onsite Mixing Delivery

The mixing shall be done either in a pugmill or other mechanical mixing system that has the capability of uniformly mixing the component material to the requirements of Section 2.01 of this specification. An Environmental Conservation Solutions, LLC. representative shall mix the material on site. Care shall be taken to avoid contaminating the component material with the existing ground in the stockpile area. The mixed material may be stockpiled and covered for up to 30 days before installation.

D. Installation

Surface on which the Bold & Gold® CTS or approved equal media is placed shall be reasonably smooth and within ± 1 of the elevations shown in the plans. The surface of the Bold & Gold® CTS or approved equal media is to be placed or shall be compacted to meet the requirements as specified by the design engineer. The Bold & Gold® CTS or approved equal media shall not be installed until all areas that drain to it have the final stabilization in place. If the installed Bold & Gold® CTS or approved equal media becomes contaminated with sediment it shall be removed and replaced at the contractor's expense. After placement of the top soil over the Bold & Gold® CTS or approved equal media, driving and parking on the installed Bold & Gold® CTS or approved equal media is allowed. If rutting to the Bold & Gold® CTS or approved equal media occurs due to vehicles or equipment during installation the contractor shall repair it to the grades and elevations in the plans.

The Bold & Gold® CTS or approved equal media may be placed in one lift and compacted to the density specified in the plan by the design engineer. The compacted thickness will be no less than the thickness shown in the plans. Clean water with no contaminants may be added to the material to meet the compaction requirements. If the compacted Bold & Gold® CTS or approved equal media has an in-place density greater than 105% of the required density, the material will be reworked to meet density requirements.

If required by the design engineer, sod or seed shall be placed over the Bold & Gold® CTS or approved equal media within two days of placement. The sod used as cover for the Bold & Gold® CTS or approved equal media shall have been grown in a predominantly sandy site with less than 5% of the soil attached to the sod passing the 200 sieve.

End of Section