SECTION 32 32 25

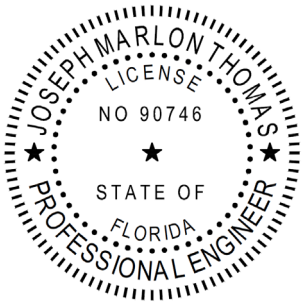
VOID FILLING - STILLING BASIN

APPROVAL STATUS					
PREPARED BY:	GA	DATE	27 JULY 2021	CHECKED BY:	DATE
APPROVED BY:	DB	DATE	27 JULY 2021		

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
0	Bidding					
1	Bidding	GRA	JMT			15 Sept 2021

Engineer's Seal



Digital Signature

J. Marlon Thomas

Digitally signed by J. Marlon Thomas
Date: 2021.09.15 16:20:35 -05'00'

J. MARLON THOMAS P.E., STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 90746.

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY J. MARLON THOMAS ON 15 SEPT 2021

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND THE DIGITAL SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

SECTION 32 32 25

VOID FILLING - STILLING BASIN

PART 1 GENERAL

1.1 GENERAL

A. Summary of Work: The work specified below includes tasks associated with filling voids below the stilling basin slabs and under the adjacent downstream training wall foundations with a slurry of sand and polymer with the intent of providing continuous bearing support while allowing the void network to continue to serve as an underdrain while reducing further erosion/loss of material below the slabs.

B. This is an interim specification, and subject to finalization after evaluation of the demonstration area of the downstream apron. Work shall not proceed until finalization of the specifications and authorization to proceed by Lake Manatee County.

C. Specialty Geotechnical Subcontractor: Nicholson Construction Company, Inc. has been identified as a specialty geotechnical contractor with previous project experience in void filling around sensitive structures using a high permeability sand with polymer as specified below. Contact: Ryan Hall ryan.hall@nicholsonconstruction.com.

D. Responsibilities:

i. The Void Filling Subcontractor shall be responsible for tasks as outlined below, except for items specifically noted as responsibilities of either the Contractor or Engineer.

ii. The Contractor shall be responsible for:

1. Excavating soil from the borrow area, stockpiling soil near the work area, and providing BMPs for the borrow pit excavations and stockpile. See project documents for borrow pit and potential stockpile locations.
2. Providing equipment access to the stilling basin either by the construction of an earthen ramp or using a crane to lift equipment into and out of the stilling basin. The scope of such work shall be coordinated between the Contractor and the Void Filling Subcontractor.
3. Installing passive pressure relief wells with backflow preventers as shown in the project documents and at locations specified by the Engineer.

iii. The Engineer (Wood) shall be responsible for observing the void filling operations and providing locations for pressure relief wells to the Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

A. Slurry: A slurry of sandy soil (sand), polymer, and water shall be used to fill voids beneath the slabs. The slurry shall consist of the following:

i. Water: Water shall be from an on-site fire hydrant as designated by Lake Manatee County. Contractor shall secure permit from Manatee County for this water.

ii. Polymer: Polymer shall be provided by the Void Filling Subcontractor. Polymer shall be a liquid fluid polymer that is certified to NSF/ANSI Standard 60, Drinking Water Treatment Chemicals. The Void Filling Subcontractor shall provide a material specification sheet to Lake Manatee County for approval at least 30 days prior to use in the slurry.

iii. Sand:

1. The Contractor shall excavate sand from a designated borrow area as identified in the project documents and use appropriate BMPs for the excavation. Sand shall be a predominantly sandy soil meeting the following requirements unless otherwise approved by the Engineer:
   a. Free of debris and organic matter;
   b. Have a maximum particle size of ¼ inch;
   c. Less than 6% fine-grained material (less than 6% passing the #200 sieve).
2. The Contractor shall stockpile the sand near the work area (refer to project documents for location) and use appropriate BMPs for the stockpile. Upon completion of the work the Contractor shall return unused sand to the borrow area.

PART 2 PRODUCTS

2.1 CORING AND SLURRY INJECTION EQUIPMENT

A. The Void Filling Subcontractor shall supply all the equipment required to perform the work.

B. Gauges: The Void Filling Subcontractor shall provide gauges and other instrumentation to measure the following:

i. Slurry pumping pressure at ground surface above the point of injection
ii. Slurry flow rate
iii. Volume of slurry pumped

C. Instrumentation: The Void Filling Subcontractor shall provide automated instrumentation to provide real-time measurements of slab heave during void filling operations. The

instrumentation shall be capable of providing audible/visual alarms if excessive heave is detected.

PART 3 EXECUTON

3.1 EXECUTION

A. Excavation and Stockpiling of Sand: The Contractor shall excavate and stockpile sand as noted above.

B. Pre-Work Condition Survey: A Pre-Work Condition Survey shall be performed to document the surface condition of the slab and to check presence and thickness of voids in the work area:

i. The Contractor shall provide a survey of the slab surface elevations in the work area.
ii. The Engineer or their designated on-site representative shall provide high-resolution digital photographs to document the surface condition of the slab in the work area prior to injection.
iii. The Void Filling Subcontractor shall core the slab at up to 10 locations designated by the Engineer. Core holes shall be at least 2 inches in diameter. The Engineer shall check for the presence and thickness of voids below the slab at the core hole locations.

C. Void Filling: In the stilling basin as shown on project documents, the Void Filling Subcontractor shall perform void filling below the slabs. This void filling shall be completed prior to installing the pressure relief wells with backflow preventors in the end sill of the stilling basin. This work shall consist of the following:

i. Slurry shall be pumped through injection points (core holes) under pressure. Vent points (core holes) surrounding the injection points shall be used to check for slurry advancement/return.
ii. Sand Polymer Slurry shall be pumped into the voids at a minimum equivalent dry unit weight established in the demonstration area for the Downstream Apron that is sufficient to optimally fill the voids and provide bearing for the overlying concrete apron. A topping-off at each injection point may be necessary and shall be performed at no additional cost to the County.
iii. The Void Filling Subcontractor shall survey core hole locations (injection and vent points) and assign an identifying number.
iv. For each injection point, the Void Filling Subcontractor shall track thickness of the slab, injection pressures at the slab surface, volume of slurry pumped, vent point spacing from the injection point, and any measured heave of the slab during pumping. If a topping-off is necessary after the primary injection, the Contractor shall note it for each injection location.
v. Throughout void filling operations, the Void Filling Subcontractor shall maintain an automated motorized total station (AMTS) or equivalent means of providing real-time measurements of the slab surface elevation. The instrumentation shall be set

up to provide a visual or audible alarm if measured top of slab elevations change by more than 0.1 inches beyond what is expected due to daily temperature variation.

vi. If slab heave is greater than 0.1 inches during pumping, the injection pressure, vent point spacing, and/or slurry mix shall be adjusted as necessary to provide filling of voids with minimal slab heave. If the slab heaves by more than ½ inch from the original position (not including daily temperature variations) the Contractor shall stop pumping operations and shall at no additional expense provide alternatives to achieve optimal void filling without additional movement of the slab.

vii. Upon completion of the void filling, the Void Filling Subcontractor shall inject a sufficient amount of bleach to cut the polymer and restore the permeability of the sand.

viii. Upon completion of void filling, core holes shall be left open for observation during construction to determine which of them will be fitted with passive pressure relief wells. This decision will be made by the Engineer once the contractor has completely encapsulated the downstream portion of the spillway with a jet grout/soil mixed seepage cutoff wall. After the locations for the pressure relief wells have been selected, the remaining core holes shall be filled with non-shrinking neat grout.

ix. The Void Filling Subcontractor shall measure the moisture content and unit weight of the sand/polymer slurry and collect representative samples of the slurry mix at the injection points at least one time per day using a process to be developed in the demonstration area following the general principles from ASTM D7263-21 but modified to accommodate a slurry. These samples shall be tested by the Contractor's QC firm for laboratory density and moisture content. The acceptance criteria for the equivalent dry unit weight of the sand/polymer slurry shall be established by the Engineer from the demonstration area for the Downstream Apron.

x. Additional samples of the slurry mix at the injection point shall be collected every 20 cubic yards of slurry injected. These samples shall be tested by the Contractor's QC firm for laboratory grainsize analysis (ASTM D6913) and organic content (ASTM D2974) and the results provided to the Engineer.

D. Post-Work Condition Survey: Upon completion of void filling, a Post-Work Condition Survey shall be performed to document changes of the surface condition of the slab as a result of void filling:

i. The Contractor shall provide a repeat survey of the slab surface elevation in the work area.

ii. The Engineer or their designated on-site representative shall repeat the photographs taken for the Pre-Work Condition Survey.

iii. The Void Filling Subcontractor shall core the slab at up to 10 locations designated by the Engineer. Core holes shall be at least 2 inches in diameter. The Engineer shall check for the presence and thickness of voids below the slab at the core hole locations. If voids are discovered then the Void Filling Subcontractor shall core

additional holes at the direction of the Engineer to aid in evaluating the extent of voids and in subsequently filling them at no additional cost to the County.

E. Evaluation and Acceptance of Stilling Basin Floor Slab Void Filling:

i. The Void Filling Subcontractor shall submit an installation data report to the Engineer which shall include for each injection point, the range of injection pressures, vent point spacing, slurry volume pumped, slurry mix ratio, equivalent dry density of the pumped slurry, and any measured slab heave during injection.

ii. The Engineer shall review data submitted by the Void Filling Subcontractor, the Pre- and Post-Work Condition Surveys, laboratory testing data, and provide an installation assessment report to Lake Manatee County.

F. Core Hole Grouting: See Item 3.C.vii above.

G. Pressure Relief Wells with Backflow Preventers: Upon completion of void filling, the Engineer shall evaluate the quantity and location of the pressure relief wells required in the stilling basin slab and shall provide the locations to the Contractor at least 4 weeks prior to the end of the construction period. The Contractor shall construct/install up to 12 pressure relief wells with backflow preventers in the stilling basin as shown in the project documents. These are in addition to the pressure relief wells that will be installed through the end sill of the stilling basin in accordance with the project documents.

-- End of Section --