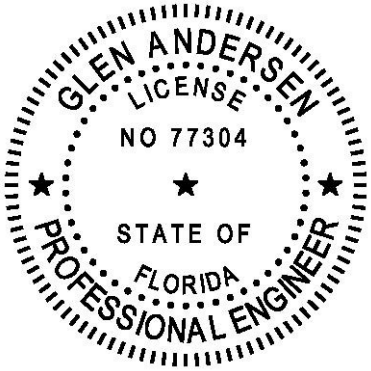
SECTION 32 32 25

VOID FILLING - STILLING BASIN

APPROVAL STATUS							
PREPARED BY:	GA	DATE	27July2021	CHECKED BY:	DD	DATE	27July2021
APPROVED BY:	DB	DATE	27July2021				

REVISION STATUS						
REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
0	Bidding					

Engineer's Seal



Digital Signature

DN: c=GB, l=Aberdeen, o=JOHN WOOD GROUP PLC, cn=Glen Andersen, email=glen.andersen@woodplc.com
Date: 2021.07.29 15:42:30 -04'00'

GLEN ANDERSEN P.E., STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 77304.

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY GLEN ANDERSEN ON 29 JULY 2021, USING AN SHA AUTHENTICATION CODE.

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 for void filling in the downstream apron in accordance with the application specification. 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 is responsible for tasks as outlined below, except for items specifically noted as responsibilities of either the Contractor or Engineer.

ii. The Contractor is responsible for:

1. Excavating soil (SP or SP-SM) from the borrow area, stockpiling soil near the work area, and providing BMPs for erosion and runoff for the borrow pit excavations and stockpile. See Plans 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 is coordinated between the Contractor and the Void Filling Subcontractor.
3. Installing passive pressure relief wells with backflow preventers as shown in the plans and specifications and at locations specified by the Engineer.

iii. The Engineer (Wood) is responsible for observing the void filling operations and providing locations for weep holes to the Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

A. Slurry: A slurry of sandy soil (SP pr SP-SM as specified herein), 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 secures permit from Manatee County for this water.

ii. Polymer: Polymer is 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 provides a material specification sheet to Lake Manatee County for approval at least 30 days prior to use in the slurry.

iii. Sand:

1. Excavate sand from a designated borrow area as identified in the Plans 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 and classifying as SP or SP-SM in accordance with the Unified Soil Classification System).
2. Stockpile the sand near the work area (refer to Plans for location) and use appropriate BMPs for the stockpile. Upon completion of the work the return unused sand to the borrow area.
3. Take samples from the stockpile at a frequency corresponding to every 20 cubic yards of sand injected and shall have the following laboratory testing performed. The results of laboratory testing shall be provided to the Engineer.
   a. Grain size distribution (ASTM D6913)
   b. Organic content (ASTM D2974)

2.2 CORING AND SLURRY INJECTION EQUIPMENT

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

B. Gauges: The Void Filling Subcontractor provides 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 provides 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: Excavate and stockpile sand as noted above.

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

i. 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 cores 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: Void filling below the stilling basin slabs is performed as shown on Plans. 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 target minimum equivalent dry unit weight of 115 lbs/ft^3 based on a 3-point moving average with not less than 110 lbs/ft^3 for any one sample.
ii. The Void Filling Subcontractor surveys the core hole locations (injection and vent points) and assign an identifying number.
iii. For each injection point, the Void Filling Subcontractor tracks the 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.
iv. Throughout void filling operations, the Void Filling Subcontractor maintains 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.
v. 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.
vi. Upon completion of the injection area, the Void Filling Subcontractor makes a visual assessment of each injection and observation core hole and injects additional sand/polymer slurry to fill any remaining voids (top-off).
vii. Upon completion of the void filling, the Void Filling Subcontractor injects a sufficient amount of bleach to cut the polymer and restore the permeability of the sand.

viii. Upon completion of void filling, injection and observation 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 measures the moisture content and unit weight of the sand/polymer slurry and collects representative samples of the slurry mix at the injection point at least three times per day or every 20 cubic yards of slurry injected, whichever is more stringent. These are placed in 3" diameter concrete molds and capped to prevent moisture loss and submitted by the Contractor's QC firm for laboratory moisture content, unit weight, and grainsize analyses in accordance with ASTM D6913 and ASTM D7263-21. The results are provided to the Engineer for review.

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 due to void filling:

i. 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 cores 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 fills these at no additional cost to the County.

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

i. The Void Filling Subcontractor submits 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.

A. Pressure Relief Wells with Backflow Preventers: Upon completion of void filling and after the entire spillway is encased in a seepage cutoff barrier, the Engineer evaluates 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 6 weeks prior to the end of the construction period. Construct/install up to 12 weep holes with backflow preventers in

the stilling basin as shown in the Plans. 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 Plans.

-- End of Section --