Ferguson Waterworks
12500 Jefferson Ave.
Newport News, VA 23602

# IRON CLAY SAND (ICS) MEDIA SPECIFICATION

## 1.1. Description

ICS is a Biosorption Activated Media (BAM) for water treatment in conjunction with other structural or non-structural measures. It is primarily used within stormwater BMPs and for wastewater treatment. The media is a patented product developed at the Stormwater Management Academy at the University of Central Florida and is per Patents #10,696,567 June 30, 2020, and #10,787,373 September 29, 2020.

## 1.2. Responsibility

The contractor shall be responsible for the satisfactory delivery, stockpiling, installation, and maintenance of the ICS during construction based on information provided in the Contract Documents and as provided by the supplier. The ICS shall be bought from an approved source.

Contact the local Ferguson Waterworks branch for pricing information. **A Certificate of Authenticity to the Engineer of Record at the completion of the project can be provided. The Certificate of Authenticity includes the quantity of media delivered to the project site and certifies ICS delivered meets the patent requirements of the University of Central Florida.**

## 1.3. Material

**Composition:** The ICS is manufactured with mineral materials and no organic materials. The final product has more than 2% but less than 6% passing the US #200 (75 micron opening size) sieve. The mix is composed of 91% poorly graded clean sand (washed), 4% clay (at least 99% Kaolin clay content) and 5% iron fillings. Percentages are based on in-place volume. The permeability of this mix as measured in the laboratory for a media mix at 100 pounds/cubic feet is 18.4 inches per hour (0.13 centimeter/second).

**Storage and Handling:** The ICS is delivered as a pre-mix and ready to install or the material components delivered and mixed onsite by an authorized representative of Ferguson Waterworks. The mixed material shall be stored in a covered and well-drained area. Components or mixed media shall not be stockpiled longer than 30 days before installation and must be covered always, to prevent separation of the material due to adverse weather and environmental conditions such as, but not limited to rainfall and wind.

## 1.4. Construction

**Delivery of the Material:** ICS may be delivered to the jobsite premixed or the component materials delivered for onsite mixing by an authorized representative of Ferguson Waterworks. Delivery of premixed media is usually by bulk but can be delivered in super sacks.

**Installation:** Surface on which the ICS is placed shall be reasonably levelled within ±1-inch of the elevations shown in the plans. Unless a slope grade is specified in the plans, a level surface is recommended for the subgrade soil to ensure uniform infiltration of filtered stormwater spread over the entire surface area.

The ICS may be placed in one lift and compacted to the density specified in the plan by the design engineer. For traffic load-bearing BMP applications, the ICS shall be installed, in number and depth of lifts, as specified by the design engineer to achieve target installation density. Unless specified by the design engineer; a) the suggested installation dry density of the ICS shall not be greater than 100 pounds per cubic feet for all non-traffic bearing BMP applications; or b) no less than 110 pounds per cubic feet for all traffic bearing BMP applications. The final in-place thickness of the ICS shall not be less than the thickness shown in the plans for the specific project.

**Subgrade:** The surface of the subgrade soil underneath the ICS shall be compacted and/or scarified to meet the requirements as specified by the design engineer. All necessary construction practices shall be taken to minimize the compaction of the subgrade soil, above the specified subgrade density, to avoid the reduction of the infiltration rate at the soil-filter media interface. The contractor shall take all necessary measures needed to control the deposition of sediments on the surface of the subgrade soil prior to the placement of the ICS.

**Adjacent Areas:** The ICS shall not be installed until all areas that drain to it have temporal/permanent erosion and sedimentation stabilization in place. No runoff shall be directed to the specified location of the ICS until all drainage area leading to the location are stabilized. If the installed ICS becomes contaminated with sediment, prior to the placement of the cover material, it shall be removed and replaced at the contractor's expense.

**Compaction:** of the ICS shall be achieved by using industry-standard compaction techniques. Water free of contaminants (sediments and nutrients) may be sprinkled on to the ICS to achieve the compaction requirements. If the compacted ICS has an in-place density greater than specified by the design engineer, the material will be reworked to meet density requirements.

**Surface Slope:** Unless specified by the design engineer, the surface of the ICS shall have a slope of between zero and 0.5 percent in preparation for the placement of the top cover material. The top cover material shall serve as a spreader of runoff over the filter media and prefilter of gross pollutants from contaminating the ICS. In case of clogging, the top cover material shall be removed and replaced with clean top cover material, at the same depth, to rejuvenate flow into the filter media. The top cover shall be free-draining material that is free of organics, sediments and all other pollutants that negates

the purpose for the installation of the ICS. Top cover materials shall be, but not limited to clean sand, gravel, geotextile, grass seed, and others that may be specified by the design engineer and does not hinder the performance of the ICS.

**Cover Crop:** If required by the design engineer, seed or sod shall be placed over the ICS within five days of placement. Seed is preferred. If sod is used as cover over ICS the sod shall have been grown in a predominantly sandy site with less than 5% of the soil attached to the sod passing the #200 (75 micron opening size) sieve and have no added fertilizer.

After placement of the cover crop, driving and parking on the installed ICS maybe allowed, if the surface is intended for traffic loading. If rutting to the ICS occurs due to vehicles or equipment during installation, the contractor shall repair it to the grades and elevations in the plans.

## 1.5. Maintenance

Maintenance requirements for the ICS shall be dependent on the proper functioning and maintenance of all components of the applicable BMP in which the filter media is used. To prevent the clogging of the voids of the ICS, there shall be installed an intermediary aggregate media that is free-draining and free of organics (clean sand, acceptable aggregates, etc.) as cover material directly above the top of the filter media surface. In addition, the cover material shall serve to control the erosion of the components of the ICS.

In case of the clogging resulting from the reduction of permeability through the cover material and the filter media, the sediment-laden cover material shall be removed. The filter should be "disced" at a depth of at least 2 inches to help maintain the treatment rate, until the treatment flow rate is restored. Once the treatment rate is restored, install new cover material meeting the original specifications. Reduction in permeability shall be described as the increase of the drawdown time that exceeds the design duration for the specific BMP application.

ICS is typically designed to last the life span of the applicable BMP. However, maintenance shall be performed if the ICS has shown a reduction in the performance efficiencies on the reduction of Total Phosphorus (TP) below the design value before and/or at the end of the design service life. The maintenance procedure shall involve the removal of the cover material and ICS and replaced with new material and filter media meeting the original specifications. The spent filter media and cover material shall be disposed of at an approved landfill.

## 1.6. Applications

ICS is recommended for stormwater filters. The filter depth depends on the application, however typical are depths of 12-, 24-, 36- inches or greater depths. Examples of such applications include rain gardens, exfiltration trenches; after a wet pond as a filter, under pervious pavements, within a dry retention pond, swale and vegetated filter strips, to mention a few applications. It can be also used to remove particulates and algal blooms.

It is also used in regional ponds or filters; and in a wastewater disposal drain fields, excess reclaimed water ponds, infiltration basins and other wastewater filter applications.

If used for storage volume or attenuation, storage capacity is limited to the available porosity of 0.25, or the sustainable storage capacity.

Typical names of Stormwater BMPs where it can be used:

- Side-bank and shelf filters after wet detention ponds and retention ponds with deep seasonal high groundwater table elevations
- Bottom of retention pond; to include roadside ditches; swales; trench underdrains; permeable pavements; vegetated filter strips (VFS)
- Underneath rain gardens and subsurface storage systems
- Low Impact Development (LID) devices such as – tree wells, rain gardens, bioretention, bioswales, and other user-defined slow-flow BMPs

## 1.7. Design Considerations

The primary control for sizing the ICS is to capture the water quality volume to achieve a specific removal effectiveness and to pass it through the filter media with a specified hydraulic residence time to achieve the target level pollutant mass removal within a specific recovery time. There are two primary calculations needed, namely surface area and for a given thickness of media an expected service life.

**Surface Area:** Surface area is the area through which the water flows. The minimum surface area is dependent on the treatment rate and the volume of runoff to be treated. The volume of runoff to be treated is a function of the rainfall excess at the water quality treatment depth. A factor of safety is applied to the area or to the treatment rate to recognize clogging over a period of time. The treatment rate recommended that includes the factor of safety is 5 inches per hour.

Most applications required a minimum depth to achieve the removal. Thus, the volume and mass of media is calculated based on the surface area and the depth of the media. If used in a filter that requires complete drainage before the next loading event, a larger surface may be needed than calculated using the treatment rate and volume of runoff.

**Expected Service Life:** Expected service life is dependent on the removal rate of a mass of pollutant, usually orthophosphate, per unit weight of filter media, as well as the mass of pollutant that must be removed in a period of time, usually one year. Thus, the expected service life in years is the removed mass of the pollutant achieved by the media divided by the removal rate per year.