

AQUABLOK® APPLICATION GUIDELINES: BASIN LINING (Construction/Dry State)

Mobilization and On-Site Material Handling/Stockpile Maintenance Specification

Installation preparation activities to be performed by Contractor include: mobilizing appropriate construction/installation equipment to the project area; providing site security and safety requirements, as appropriate; providing access for material deliveries; preparation of the material stockpile location; and, protecting stockpiled material from direct contact/exposure to water.

Transport of materials to the project site is customarily via tarped flatbed truck or covered van. The standard packaging unit is a 2,400-lb to 3,000-lb (1 to 1.25 cubic yard) bulk bag or “super sack.” Off-loading can be facilitated using appropriate equipment by lifting individual bulk bags from beneath (using pallets) or from above (using the four built-in lifting loops).

The number of material deliveries per day and the supply of lining material at the site stockpile area is generally based on the material placement rate. Dependent upon the anticipated weather conditions, the quantity of material stored on-site should not significantly exceed what is needed to accommodate the planned rate of installation, unless the Contractor provides appropriate controls in the stockpile area.

Adequate stockpile maintenance is critical to material integrity and ultimate performance. Material can be stacked two pallets high, either under-roof or beneath waterproof tarps. In the event that the lining material requires outside storage prior to installation, the stockpile location should be elevated to promote prompt drainage and runoff away from the material. Tarps or temporary covers should be routinely maintained to ensure secure and complete coverage. Ponding water should be removed promptly to reduce the potential for infiltration. Material shall be stored in manufacturer’s original packaging (i.e. bulk “super sacks”) on pallets prior to installation. These practices help protect material both from precipitation and from run-off.

With proper stockpile maintenance, AquaBlok is resilient to most environmental conditions – even in both excessively arid and humid environments. However, the Contractor is responsible for any damage/material losses associated with long-term storage and excessive handling. In typical stockpiling scenarios, a 5% material overage is normally adequate to account for any associated material loss.

General Material Placement (Installation) Specification

SITE PREPARATION

- A. Contractor shall be responsible for draining the basin of any water that obstructs the ability to place AquaBlok in a uniform and consistent manner. NOTE: At the site engineer’s discretion – and if substrate conditions and application equipment are deemed appropriate for even material placement through standing water – Contractor may leave areas of standing water to minimize substrate disturbance during installation.
- B. Excessively soft organic material (e.g. leaf litter, silt, etc.) greater than 6-inches thick shall be carefully removed such that AquaBlok can be placed on a firm and stable substrate.
- C. Where feasible, stone, debris, and inconsistencies in excess of 3-inches in diameter (including ruts associated with equipment) shall be removed from surfaces to be lined. Larger objects intended for habitat/structure (e.g., boulders, downed trees, etc.) can either be sealed around or temporarily removed prior to material placement. If removed, care should be taken to reset objects so as not to compromise the consistency of the liner material.
- D. All woody vegetation and any dense herbaceous vegetation shall be removed/stripped prior to material placement.

MATERIAL PLACEMENT

- A. Placement (Installation) of AquaBlok can be performed using a wide range of standard, commercially available construction equipment. Depending on site requirements and/or other activities to be performed, suitable equipment includes: excavators; front-end loaders; skid steer loaders; clam shells (drag lines); stone slingers; TeleBelts®; or other machinery designed to handle and evenly disperse dry bulk aggregate materials.
1. If Contractor chooses to work with heavy equipment from inside the basin, care should be taken to apply material working from one end of the basin to the other such that ruts, disturbances, etc. can be carefully leveled prior to material placement. Contractor should not drive over AquaBlok once it is placed, however, it can be hand raked to achieve more uniform coverage.
 2. A manageable grid dimension or application width should be determined in advance of material placement based on site access and type of placement equipment used.
 3. Target application areas should be measured and delineated (using survey stakes, paint, etc.) to ensure consistent coverage at the targeted application rate.
 4. When utilizing conveyor systems (e.g., stone slingers), a pre-determined quantity of material can be placed in a pre-determined area in multiple passes to help ensure complete and uniform coverage.
 5. Provided material is placed onto relatively firm substrate, workers can walk over dry AquaBlok both to even and visually inspect the consistency of coverage. In a dry state, steel rakes and/or floats may be used to assist in achieving the most consistent finished layer.
- B. The application rate or target material layer thickness – typically cited in dry pounds per square foot (lbs/SF) – is determined based on existing soil conditions, anticipated head pressure (based on designed water depths), and permeability objectives. For competent substrate soils having a permeability of 10^{-5} cm/sec or less, the following application rates may apply:
1. A 1-inch nominal dry layer of AquaBlok (or 7-lbs/SF) is recommended as a minimum material thickness for designed water depths of 10-feet or less.
 2. A 1.5-inch dry layer of AquaBlok is equivalent to a 10-lbs per square foot application rate (therefore, 2-inches = 14-lbs/SF; 2.5-inches = 17.5-lbs/SF).
- NOTE: For a soil subgrade having a permeability of 10^{-4} cm/sec or greater, a dry material thickness up to 3-inches (21-lbs/SF) may be deemed necessary. Sealing applications for water containment only do not customarily exceed a 3-inch dry layer of AquaBlok unless extenuating circumstances dictate a more robust sealant layer.
- C. Material stability must be considered when applying AquaBlok on slopes.
1. Material is typically stable when directly applied on slopes less than 3:1; periodic buttressing is typically recommended on extended 3:1 slopes (in excess of 25-feet) to prevent material slumping.
 2. More robust buttressing or placement into a geotextile cellular confinement system is typically required when applying material onto slopes 2:1 or greater.
 3. Independent of slope, material associated with any observed slumping areas of subgrade should be removed and replaced with competent material until the area is stabilized.
 4. When deemed beneficial, the point of lowest elevation can be prepared with a layer of aggregate to provide a 'toe' or lower support point for the AquaBlok layer.
 5. When deemed beneficial (and feasible), dry material can be carefully compacted into slope substrate using a roller to encourage the cohesive properties of the sealant and to improve slope stability.
- D. AquaBlok should not be mixed with native soils unless at the direction of soil/geotechnical engineer and should not be mechanically compacted once hydrated.

- E. Cover media can be added either as a habitat layer, armor (protective layer), or both. Potential media includes (but is not limited to): sand; soil; gravel; rip rap; and cable-concrete (depending on site conditions and objectives).
1. To maximize sealing capability, a protective layer should be added above AquaBlok in environments where regular energy (e.g. wind action, wave action, water current, repeated water level drawdown, etc.) is anticipated. The size of the media and the thickness of the protective layer should be consistent with the erosional force anticipated. Armoring in depths greater than one to three feet is typically not necessary unless current, excessive wave action, and/or ice scour are anticipated.
 2. AquaBlok should be wetted and ideally given a minimum of one hour to hydrate before any cover media is added. Timing is based on site conditions. The objective is to provide adequate hydration time for the individual particles to coalesce together to minimize intermixing of the cover media with the sealant material.
 3. Care should be taken when adding the cover media so as not to compromise the consistency of the liner material.
 4. If AquaBlok material placed on any given day is specified to be covered by a cover media, then prior to the end of each daily shift an unarmored 'edge' of AquaBlok (between 3 and 5 feet in width) should be maintained to accommodate placement on subsequent days.
- F. Care should be taken to protect newly applied AquaBlok from direct erosional forces as the basin is being initially filled. Any damage to the basin lining from incoming water flow should be reinforced with additional material to ensure a uniform liner.
- G. The above specifications are general guidance only and can be modified by a geotechnical engineer familiar with site conditions, project objectives, experience with AquaBlok, or who has conducted specific analyses/bench-scale studies, etc.

Quality Control (QC) and Technical Support

Quality Control (QC) during installation into a dry basin typically consists of a field technician confirming grid dimensions and documenting material quantities (weights) applied into the corresponding grid. Dry material thicknesses can also be measured using a graduated probe on a prescribed grid and at regular intervals, as determined by the site engineer. If material placement is outside the pre-determined tolerance level, then material should be added or removed at the site engineer's discretion. If material levels are altered, then a subsequent survey should be performed to confirm thickness. All material placements shall be observed by the site engineer, who will receive and maintain all placement documents and records.

AquaBlok, Ltd. and/or its distributor representatives can provide field oversight to assist with application and other on-site activities. Questions relating to material placement can be directed to AquaBlok, Ltd. or to its distribution representatives.

Questions or Comments?