

Vegetative Growth with ArmorFlex® Articulated Concrete Revetment

The purpose of this letter is to clarify our position regarding vegetative growth within the ArmorFlex® Concrete Revetment system. Three main types of vegetation will be addressed.

The type first being non-woody vegetation such as foxtail, spiked bentgrass, ragweed, western rye, rock cress and other native grass species. It is Contech's opinion these native grass species with relatively shallow root systems and flexible, conforming stems will not pose long term threats to the integrity of the ArmorFlex® Articulated Concrete Blocks (ACBs). The establishment of native grasses in conjunction with the ACB system can achieve a more natural aesthetic to the site and is often promoted after placement of the ACB system.

The second type can be classified as small perennials and shrubs with shallow root systems and flexible, conforming branch structure. Species such as coyote brush, California sagebrush, asters and western columbine would be examples of this native type of vegetation. It is Contech's opinion these native species, will not pose long term threats to the integrity of the ArmorFlex® Articulated Concrete Blocks (ACBs).

The third type is woody vegetation such as arroyo willow, dogwood, western sycamore, cottonwood and other trees and shrubs, either native or non-native. This type of vegetation is not promoted by Contech in the riparian zone where ACB systems have been installed. Primarily, the increase of stem diameter as well as the root ball beneath the revetment system could dislodge or crack ACB units. If the units become dislodged, bulged or cracked the effect could produce block to block protection heights exceeding industry standard design tolerances. This could jeopardize and possibly diminish the factor of safety for stability to the point of failure. As it increases in size, this type of vegetation could itself be subject to overturning and become dislodged during a design event. The resulting hole in the revetment system could obviously affect the long-term performance of the ACB system.

For design engineers, in order to minimize the establishment of unwanted vegetation, Contech offers the following suggestions:

1. Specify closed cell ACBs instead of the open cell versions. The open area associated with open cell models is 20% but only 10% for the closed cell models.
2. Installation of impermeable liner beneath the system in place of the standard geotextile. To protect against hydrostatic pressure from developing under the liner a suitable drainage layer should be installed between the subgrade and the liner.

If woody vegetation has become established, either intentionally or unintentionally, the issue becomes that of maintenance. Inspection, regular cutting or removal of this type of vegetation would be recommended to prohibit the potential issues from occurring. If ACB units have been affected by the growth of woody vegetation as shown by evidence of bulging, cracking or dislodged units please find the attached description of recommended repairs (see Attachment 1).

ATTACHMENT 1

RECOMMENDED REPAIRS

- Damaged ACB Unit: Cracked or split unit(s) by woody vegetative growth through the block.

Method 1

- Remove existing damaged unit and woody vegetation, re-grade and replace geotextile per project specification, then replace with new unit(s).

Method 2

- Remove existing damaged unit and woody vegetation, re-grade and replace geotextile per project specification, grout solid with 4,000 psi grout or concrete. Ensure filled void is adequately consolidated (vibration of material possible) as well as finishing the in-filled area to the top of the surrounding ACB units.

- Bulged ACB Unit: Unit dislodged upward by root ball or other form of woody vegetation.

Method 1

- Remove existing damaged unit(s) and woody vegetation, re-grade and replace geotextile per project specification, and then re-install previously dislodged unit(s).

Method 2

- Remove existing damaged units (s) and woody vegetation, re-grade and replace geotextile per project specification, grout solid with 4,000 psi. grout or concrete. Ensure filled void is adequately consolidated (vibration of material possible) as well as finishing the in-filled area to the top of the surrounding ACB units.