CONCRETE ARMOR UNIT SYSTEM BRIDGE SCOUR SPECIFICATIONS – A-JACKS®

\*\* NOTE TO SPECIFIER \*\* This is a generic ARCAT specification, provided in the style and format of all ARCAT manufacturer's specifications. The Notes to Specifier are intended to provide guidance in editing the text. Delete and add text as required for your individual project.

1. GENERAL
   1. SCOPE OF WORK

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. The work to be performed under this Item shall consist of the placement of a Concrete Armor Unit (CAU) system to provide scour protection for bridge piers and abutments as shown on the Plans and as accepted by the Engineer. The CAU system shall be installed to the lines, grades, design, and dimensions shown on the Contract Plan and as specified herein.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 31 22 00 – Grading
    2. Section 31 35 19.16 – Geotextile Slope Protection
  1. SUBMITTALS

The Contractor shall submit to the Engineer of Record, at a minimum, the following information prior to ordering any materials or commencement of any work related to installation of the CAU system:

* + 1. Product Testing:
       1. Certification by accredited laboratory of successful completion of scale laboratory testing on CAUs as outlined in the *Federal Highway Administration, Hydraulic Engineering Circular No. 23 (HEC-23), Design Guideline 19, Section 19.6*.
       2. Certification by accredited laboratory of successful completion of laboratory testing on CAUs to determine:
          1. Manning’s n
          2. Critical Shear Stress
          3. Dynamic Impact Factor > 1.75
          4. Drag Coefficient
          5. Permissible Velocity
    2. Design Criteria
       1. The CAU system shall provide sufficient hydraulic stability to prevent erosion of the bed under the design conditions specified below. Appropriate size of CAUs shall be selected based on methodologies presented in HEC-23 or NCHRP Report 587.
          1. The following project specific hydraulic requirements are to be utilized:

|  |  |
| --- | --- |
| Property | Value |
| Channel Bed Slope (ft/ft) |  |
| Channel Width (ft) |  |
| Design Velocity, Vdes |  |
| Flow Depth, ft |  |

* + 1. Filter Layer
       1. Graded granular filter layer or geotextile as shown on plans.
    2. Installation Guide
       1. Manufacturer’s current version of the manufacturer’s installation guide.
    3. Quality Assurance and Material Testing
       1. Certification of compliance with Section 1.4.
       2. Certification of compliance with Section 2.2
  1. QUALITY ASSURANCE
     1. Manufacturer Qualifications:
        1. Suppliers must own and operate their own manufacturing facility.
        2. Suppliers shall directly employ a minimum of five (5) registered Professional Engineers.
        3. A list of five (5) comparable projects, in terms of size and applications, in the United States, where the satisfactory performance of the specific CAU system can be verified after a minimum of five (5) years of service life.
        4. The names and contact information (phone numbers and e-mail addresses, at a minimum) for the suppliers’ representatives, for technical, production or logistics questions, at least one of whom must reside in the state where the project is located.
     2. Installer Qualifications: Minimum 2-year experience installing similar products.
  2. PRE-INSTALLATION MEETINGS
     1. Supplier’s representative shall be available for pre-installation meeting prior to starting work of this section.
  3. DELIVERY, STORAGE, AND HANDLING
     1. Materials delivered to the site shall be inspected for damage, unloaded and stored with the minimum of handling. Material shall be kept free of dirt and debris.
     2. Storage shall be in accordance with manufacturer’s requirements.
     3. Handling: Materials shall be handled in such a manner as to ensure delivery to the site in sound, undamaged condition.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturers:

A-Jacks® as manufactured and sold by:

ARMORTEC, a Contech Company

9025 Centre Pointe Dr., Suite 400

West Chester, OH 45069

P: 800-645-7000

F: 513-645-7993

www.conteches.com/Products/Erosion-Control/Hard-Armor/A-Jacks

* + 1. Substitutions: Not permitted.
  1. MATERIALS
     1. Concrete Armor Units
        1. Cementitious Materials - Materials shall conform to the following applicable ASTM specifications:
           1. Portland Cements - Specification C 150, for Portland Cement.
           2. Blended Cements - Specification C 595, for Blended Hydraulic Cements.
           3. Hydrated Lime Types - Specification C 207, for Hydrated Lime Types.
           4. Pozzolans - Specification C 618, for Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete.
           5. Aggregates – Specification C 33, for Concrete Aggregates, except that grading requirements shall not necessarily apply.
        2. Casting: Casting shall be in accordance with ASTM D6684.
        3. Physical Requirements: At the time of delivery to the work site, the CAU units shall conform to the physical requirements prescribed in the Table 2 below:

## TABLE 2: PHYSICAL REQUIREMENTS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Compressive Strength Net Area  Min. psi (mPa) | | Water Absorption  Max. lb/ft3 (kg/m3) | | Density in Air, Min.  lb/ft3 (kg/m3) | |
| Avg. of 3 units | Individual Unit | Avg. of 3 units | Individual Unit | Avg. of 3 units | Individual Unit |
| 4,000 (27.6) | 3,500 (24.1) | 9.1 (160) | 11.7 (192) | 130 (2080) | 125 (2000) |

Units shall be sampled and tested in accordance with ASTM C 140, Standard Test Methods of Sampling and Testing Concrete Masonry Units.

* + - 1. Visual Inspection
         1. All units shall be sound and free of defects which would interfere with the proper placement of the unit, or which would impair the performance of the system. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.
         2. Cracks exceeding 0.25 inches (.635 cm) in width and/or 1.0 inch (2.54 cm) in depth shall be deemed grounds for rejection. Chipping resulting in a weight loss exceeding 10% of the average weight of a concrete unit shall be deemed grounds for rejection.
         3. Units rejected prior to delivery from the point of manufacture shall be replaced at the manufacturer's expense. Units rejected at the job site shall be repaired with structural grout or replaced upon request at the expense of the contractor.
      2. Sampling and Testing
         1. The purchaser (or their authorized representative) shall be afforded access to the relevant manufacturing facility or facilities, if desired, in order to inspect and/or sample the CAU units from lots ready for delivery prior to release for delivery to the job site. Such inspections are at the sole expense of the requesting entity.
         2. Purchaser may request additional testing other than that provided by the manufacturer as needed. Such requested testing will extend any stated lead times for manufacturing and delivery, if the results of such testing are a prerequisite to approval (i.e., approval for release to manufacturing). Costs associated with such testing shall be borne by the purchaser.
    1. Cables and Fittings
       1. Galvanized steel or Polyester Cable for bundled assembly.
          1. Cable type will be minimum 3/16” or 1/4” galvanized steel or polyester, as approved by the Engineer per details described in HEC-23.
          2. Fitting type will be minimum 3/16” aluminum, as approved by the Engineer per details described in HEC-23.
    2. Filter Fabric (if applicable)
       1. Geotextile shall be selected per Figure 16.3 in Design Guideline 16 of HEC-23.
       2. Woven monofilament and non-woven geotextile are acceptable; woven slit-film geotextiles are not acceptable.
       3. During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, UV radiation, and temperatures greater than 140°F. To the extent possible, the fabric shall be maintained wrapped in its protective covering. Geotextile exposure to sunlight or UV radiation shall be minimized to the greatest extent possible until the installation process begins.
    3. Graded Granular Layer (if applicable)
       1. Granular filter layer should be selected per USACE EM 1110-2-2300 – Appendix B.

1. EXECUTION
   1. SITE PREPARATION
      1. The layer directly underneath the CAU system shall be prepared as directed by the EOR and be free from debris.
   2. PLACEMENT OF THE CAUs
      1. The CAUs shall be placed individually or in bundles at the discretion of the Contractor.
      2. Individually placed CAUs shall be set with uniform spacing. Standard spacing between unit centers in both the x and y direction is 50% of the total arm length. Subsequent cabling of outer units is common, depending on the system embedment for the project.
      3. Bundled CAUs are made up of a predetermined matrix, spaced at 40% of the total arm length center to center in the x and y directions. Cable will be placed around the pre-determined matrix, (around the mid-section) hand tightened and connected using standard cable hardware. These cables shall not be used for lifting the bundles. Bundles are to be placed with a recommended spacing of 4” between bundles in a staggered configuration or as agreed upon prior to commencement of work.

END OF SECTION