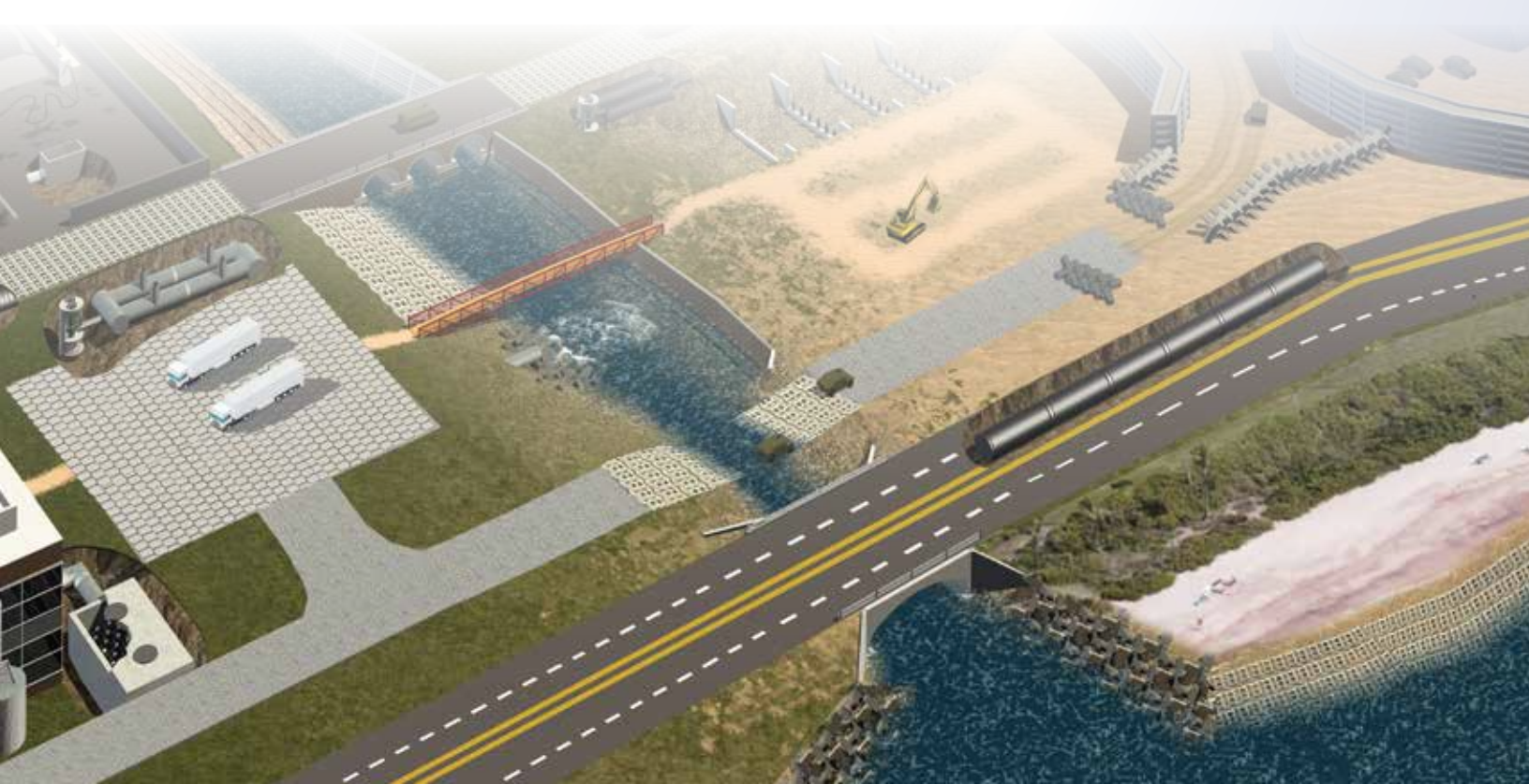


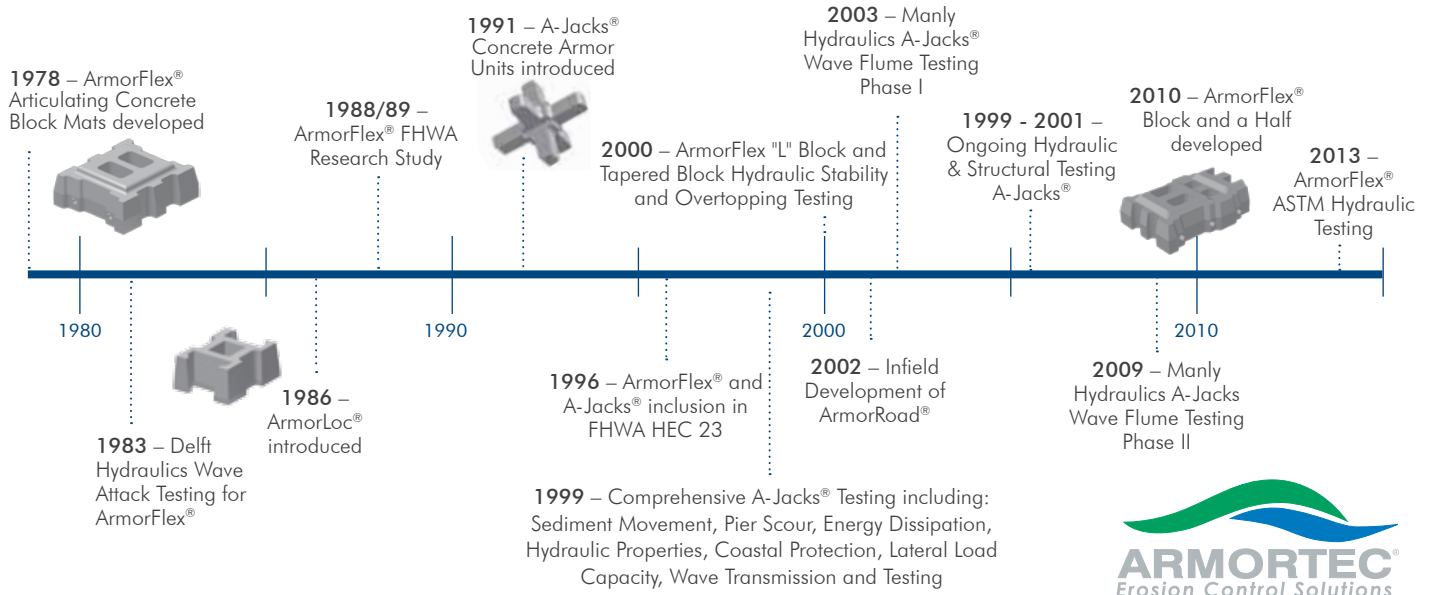
# ARMORTEC® HARD ARMOR SOLUTIONS



# ARMORTEC HARD ARMOR SOLUTIONS.

## A LEGACY OF SUCCESS

Doing the seemingly impossible is an everyday job. With erosion control systems for any need in any application, Contech Engineered Solutions delivers a range of effective, efficient solutions. Our engineered systems provide performance-tested solutions for a wide variety of applications including channel lining, shoreline protection, dam crests and spillways, energy dissipation, pipeline and cable protection, bridge and abutment protection, boat ramps, low water crossings, outfall protection, wave attack protection and more.



## BUILDING CONFIDENCE EVERY STEP OF THE WAY



# PROCESS – DESIGN, PREFABRICATION, INSTALL.

PRODUCTION



TRANSPORTATION



SITE PREPARATION



INSTALLATION



COMPLETION



# ARMORFLEX® ARTICULATING CONCRETE BLOCKS

## OPEN CELL BLOCK DESIGN ALLOWS FOR REVEGETATION



BEFORE



AFTER

## CLOSED CELL BLOCK DESIGN ALLOWS FOR HEAVY LOADING



VEHICULAR



DEBRIS LOADING

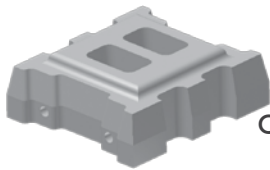
## BOTH BLOCKS READILY ADAPT TO COMPLEX SITE GEOMETRIES



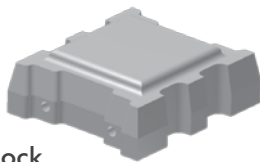
MATTED SOLUTIONS

## BLOCK OPTIONS

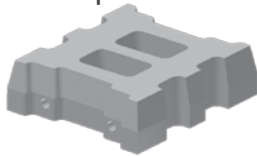
Open-Cell Block



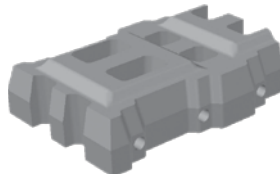
Closed-Cell Block



Tapered Open-Cell Block



Block and a Half®



### ARMORFLEX UNIT SPECIFICATION

Block Class	Nominal Thickness (in)	Length (in)	Width (in)	Gross Area (sf)	Minimum Weight (lbs)	Open Area %	$\tau_c$ 0° slope* (psf)
OPEN	30-S	4.75	13.0	11.6	0.98	33	5.2
	50-S	6.00	13.0	11.6	0.98	42	6.1
	40	4.75	17.4	15.5	1.77	59	11.2
	50	6.00	17.4	15.5	1.77	76	13.6
	70	8.50	17.4	15.5	1.77	107	17.7
	40-L	4.75	17.4	23.6	2.58	97	14.6
	50-L	6.00	17.4	23.6	2.58	116	22.1
70-L	8.50	17.4	23.6	2.58	164	29.5	
CLOSED	45-S	4.75	13.0	11.6	0.98	39	6.2
	55-S	6.00	13.0	11.6	0.98	50	7.3
	45	4.75	17.4	15.5	1.77	71	13.5
	55	6.00	17.4	15.5	1.77	91	16.3
	85	8.50	17.4	15.5	1.77	126	21.1
	45-L	4.75	17.4	23.6	2.58	109	21.9
	55-L	6.00	17.4	23.6	2.58	138	26.3
85-L	8.50	17.4	23.6	2.58	195	35.1	
HIGH VELOCITY APPLICATIONS							
TAPERED	40-T	4.75	17.4	15.5	1.77	58	25.0
	50-T	6.00	17.4	15.5	1.77	75	30.5
	70-T	8.50	17.4	15.5	1.77	109	38.5

\* In accordance with ASTM D 7276 – Standard Guide for Analysis and Interpretation of Test Data for ACB Revetment Systems in Open Channel Flow.

# ARMORFLEX® ARTICULATING CONCRETE BLOCKS

## APPLICATIONS

- Channel Lining
- Shoreline Protection
- Scour Protection
- Slope Protection
- Outfall Protection
- Pipeline & Cable Protection
- Weirs
- Spillways
- Dam Overtopping
- Emergency Overflows
- Grade Transitions
- Intracoastal Waterways
- Bays
- Lakes
- Reservoirs
- Low Water Crossings
- Boat Ramps
- Down Chutes



Dam Overtopping

SCOUR PROTECTION



SHORELINE PROTECTION



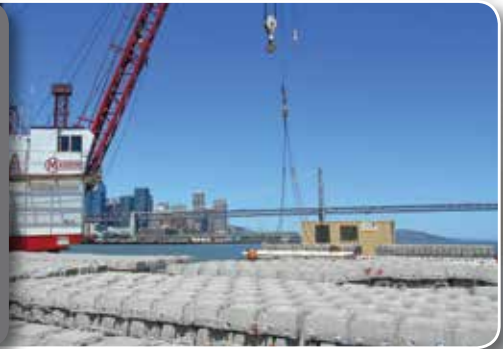
VEGETATED SLOPE



CHANNEL LINING



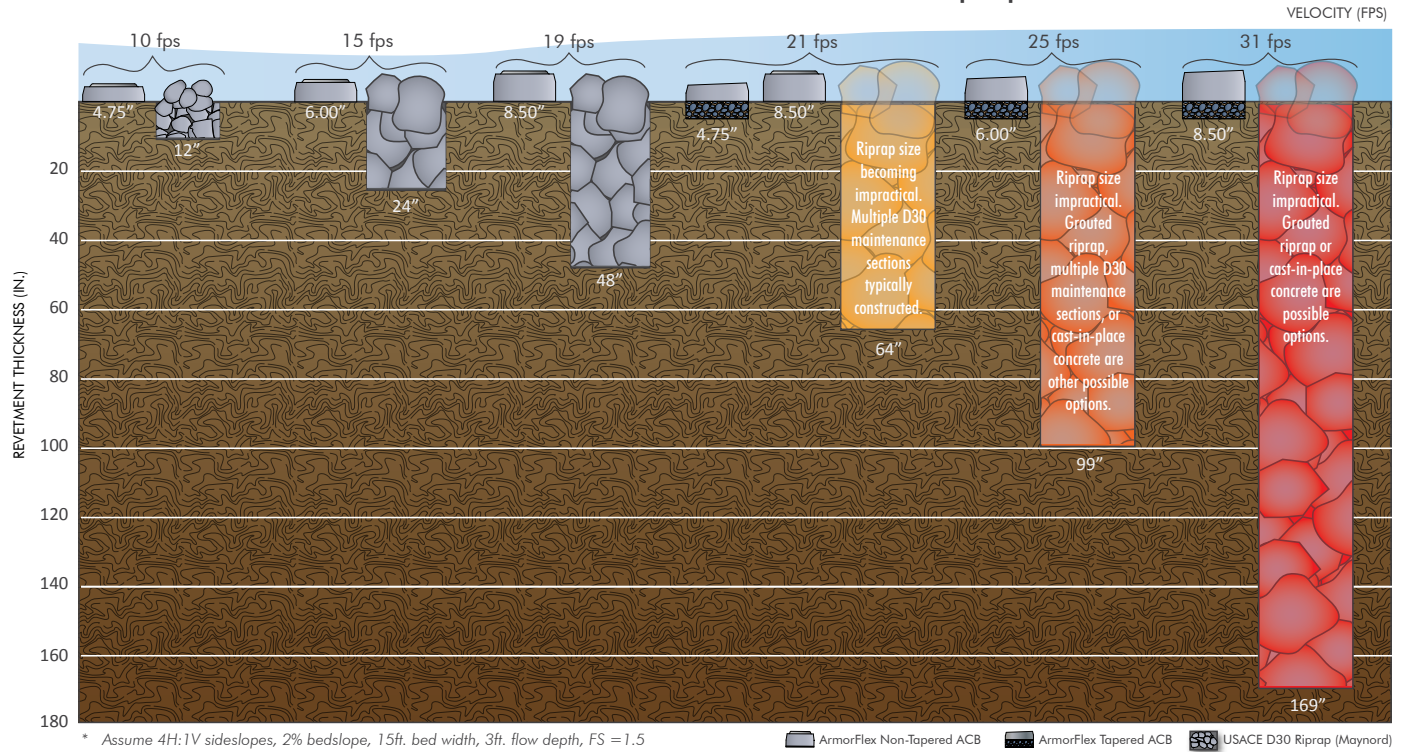
SUBMERGED ARMORING



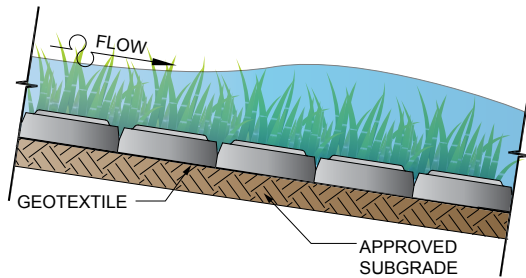
MATTED SOLUTIONS

## SIZING

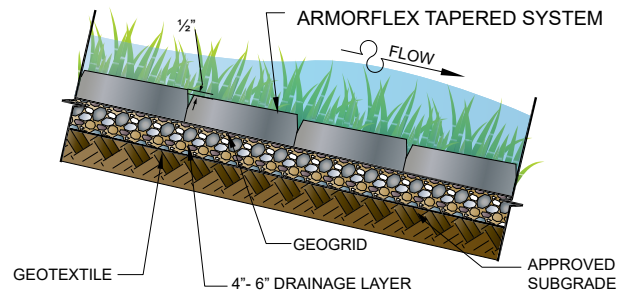
### ArmorFlex® ACB vs Traditional Riprap\*



## TYPICAL CROSS SECTIONS (not to scale)



Standard Cross Section



Tapered Series - Cross Section

## REFERENCES AND STANDARDS

- National Concrete Masonry Association (2010), "Design Manual for Articulating Concrete Block (ACB) Revetment Systems", NCMA Publication TR 220A
- ASTM D 7276 – Standard Guide for Analysis and Interpretation of Test Data for ACB Revetment Systems in Open Channel Flow
- ASTM D 7277 – Standard Test Method for Performance Testing of ACB Revetment Systems for Hydraulic Stability in Open Channel Flow
- ASTM D 6684 – Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems
- ASTM D 6884 – Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems
- FHWA Hydraulic Engineering Circular NO. 23: Bridge Scour and Stream Instability Countermeasures: Experience, Selection and Design Guidance – Third Edition, Volume II, Design Guideline 8.
- USDOT Federal Highway Administration Hydraulic Engineering Circular NO. 15, Third Edition (2005) "Design of Roadside Channels with Flexible Linings" National Highway Institute.
- Julien, Pierre Y. (2010) "Erosion and Sedimentation", 2nd Edition, Cambridge University Press

# ARMORFLEX® INSTALLATION

## THE ARMORTEC® HARD ARMOR ADVANTAGE

EASE OF INSTALLATION



### PROCESS

**Step 1:**  
ArmorFlex arrives on-site as a system of factory-assembled mats. ArmorFlex is placed on a site specific geotextile which has been placed on a prepared subgrade using conventional construction equipment.

**Step 3:**  
ArmorFlex Mats are placed according to the site plans with appropriately sized equipment. Above normal waterline mats may be topsoiled and seeded to give a vegetated effect.

**Step 2:**  
Mats are supplied on flat bed trailers. Mats can be handled with a spreader bar which can be rented from Contech.

**Step 4:**  
Proper toe trench requires a minimum of two rows of block buried below predicated soil depth. Tapered series block or mats subject to wave attack are required to have a bedding layer of crushed stone or gravel.

\* See ArmorFlex Installation Guide for additional information.

# ARMORROAD® CONCRETE UNITS

## APPLICATIONS

- Industrial Yards
- Durable Driving Surface
- Temporary Road
- Lay Down Yard
- Heaving and Expanding Subgrades



### ARMORROAD UNIT SPECIFICATION

Block	L	W	H	Minimum Weight (lbs / sf)	SF per Truck load
Mat	18.00	15.60	6.00	60	750



MATTED SOLUTIONS

# A-JACKS® CONCRETE ARMORING UNITS (CAU)

## APPLICATIONS

- Bridge/Pier Scour
- Energy Dissipation
- Streambank/Toe Stabilization
- Shoreline
- Drop Structure
- Weirs
- Coastal Breakwater (Jetty)
- Habitat Creation



A-Jacks® provided bridge pier foundation scour protection to withstand Hurricane Sandy.



ENERGY DISSIPATION



STREAMBANK



PIER SCOUR



HAND-PLACED SOLUTIONS

## INSTALLATION

- Hand-placed and Bundled Unit Methods
- Field Technicians Available for Pre-con and Installation
- Construction Versatility

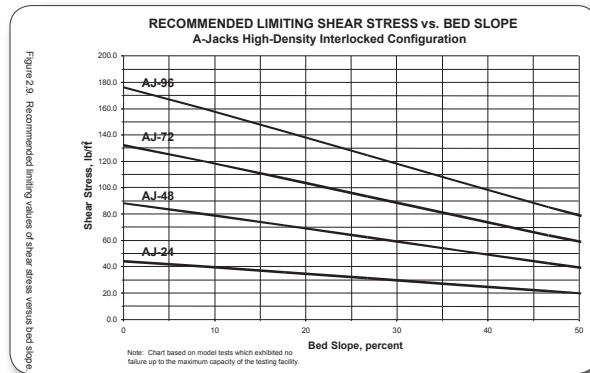
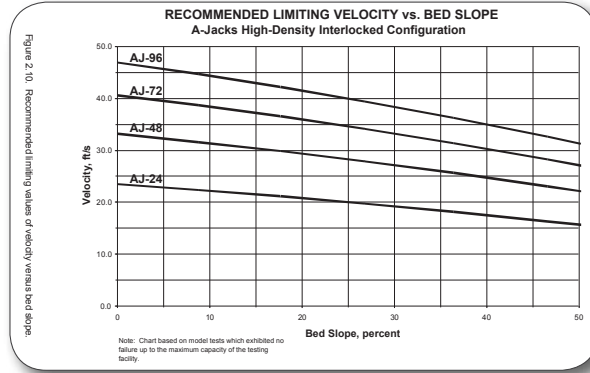




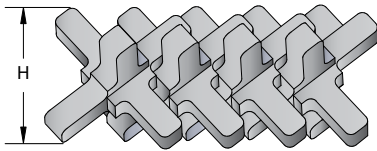
# A-JACKS® DESIGN CONSIDERATIONS

## DESIGN

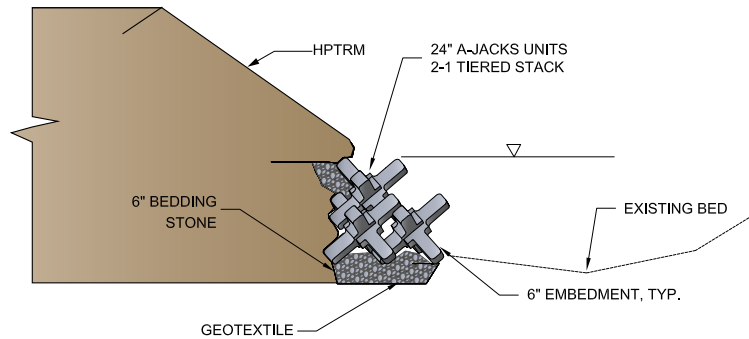
- A-Jacks® are recommended in FHWA HEC 23 with further guidance in Design Guideline 19.



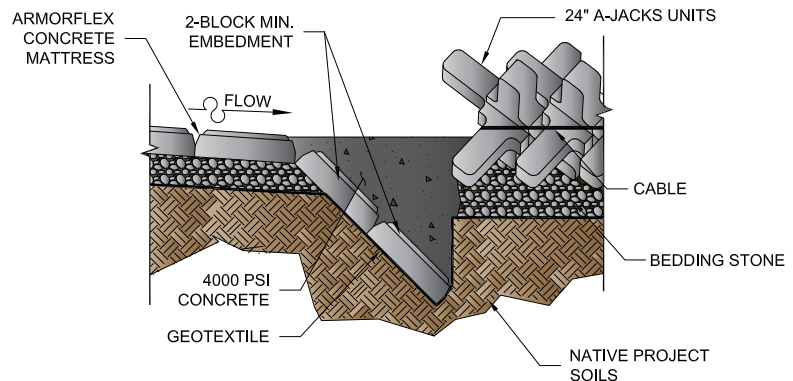
## STANDARD DETAILS



A-Jacks Placement Profile



A-Jacks Toe Stabilization Detail



A-Jacks Energy Dissipation Detail

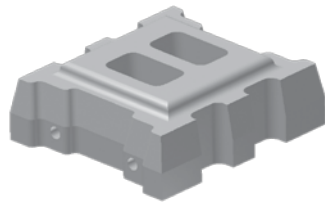
### A-JACKS UNIT SPECIFICATION

A-Jacks	Coverage (SF)	Weight (lbs)	Standing Height (H) (ft)
AJ-24	1.0	78	1.5
AJ-48	4.0	629	3.0
AJ-72	9.0	2,120	4.5
AJ-96	16.0	5,022	6.0
AJ-120	25.0	9,699	7.5

# ADDITIONAL HAND-PLACED ACB SOLUTIONS

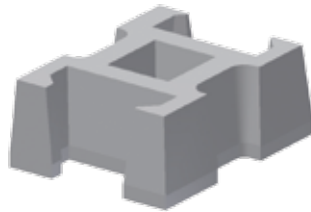
## ARMORFLEX®

- Dam Overtopping
- Auxiliary Spillways
- Emergency Overflow
- Grade Transitions
- Retention Basins
- Shoreline Protection
- Drainage Ditch Lining
- Outfall Protection
- Bridge Abutment Protection



## ARMORLOC®

- Auxiliary Spillways
- Emergency Overflow
- Grade Transitions
- Retention Basins
- Shoreline Protection
- Drainage Ditch Lining
- Outfall Protection
- Bridge Abutment Protection
- Walking Paths
- Auxiliary Parking
- Slope Paving



## ARMORWEDGE®

- Dam Overtopping
- High Velocity Channels
- Primary and Secondary Spillways
- Down Chutes















# PROJECT PARTNER. CONTECH.


## OPTIONS & SUPPORT SPECIFIC TO YOUR PROJECT NEEDS

### CONSIDERATIONS FOR ENGINEER OF RECORD

- Site Design
- Soil Borings
- Hydraulic Analysis
- Scour Analysis
- Scour Countermeasures
- Permitting
- Inspections

### SOLUTION DEVELOPMENT & DESIGN SUPPORT

- Limit Assessment 
- Hydraulic Analysis 
- HEC RAS Review 
- Factor of Safety Analysis 
- Block Selection 
- Engineer's Estimate 
- Proposal Drawings 
- Contract Drawings 
- Specifications 
- Approval Assistance 
- Staging and Layout 
- Fabrication Drawings 

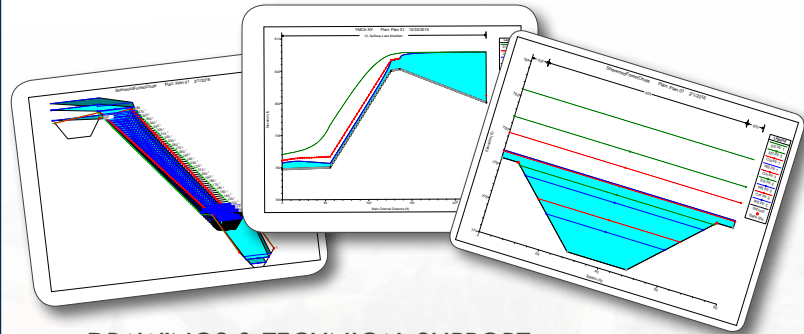
	Contech Support Available
<input checked="" type="checkbox"/>	Engineer of Record May Provide

### INSTALLATION SUPPORT

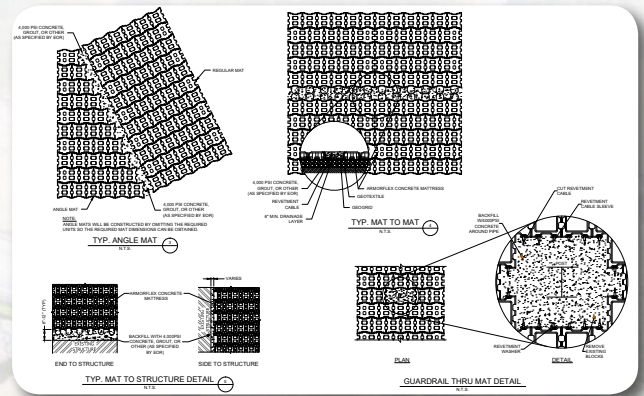
- Preconstruction Meeting 
- Logistics Coordination 
- Onsite Installation Assistance 



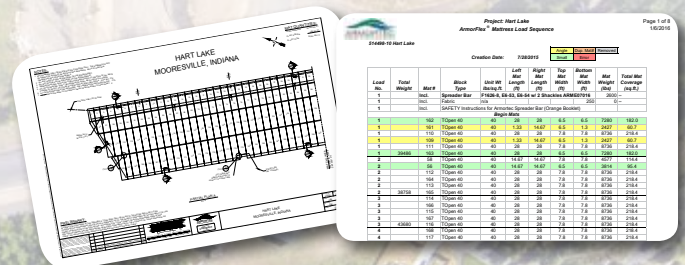
### HEC RAS REVIEW

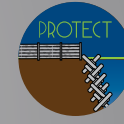
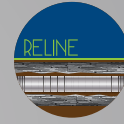
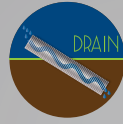


### DRAWINGS & TECHNICAL SUPPORT



### STAGING & LAYOUT





**STORMWATER SOLUTIONS**

Helping to satisfy stormwater management requirements on land development projects

- Stormwater Treatment
- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretenation

**PIPE SOLUTIONS**

Meeting project needs for durability, hydraulics, corrosion resistance, and stiffness

- Corrugated Metal Pipe (CMP)
- Steel Reinforced Polyethylene (SRPE)
- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)

**STRUCTURES SOLUTIONS**

Providing innovative options and support for crossings, culverts, and bridges

- Plate, Precast & Truss bridges
- Hard Armor
- Retaining Walls
- Tunnel Liner Plate

**ADDITIONAL SPECIALTY PRODUCTS**



**TURF REINFORCEMENT MATS**



**BIN WALL**



**LIGHT GAGE METRIC SHEETING**

For more information, call one of Contech's Regional Offices located in the following cities:

<b>Corporate Office - Ohio (Cincinnati)</b>	<b>513-645-7000</b>
California (Roseville)	800-548-4667
Colorado (Denver)	720-587-2700
Florida (Orlando)	321-348-3520
Maine (Scarborough)	207-885-9830
Maryland (Baltimore)	410-740-8490
Oregon (Portland)	503-258-3180
Texas (Dallas)	972-590-2000

[www.ContechES.com](http://www.ContechES.com)  
800-338-1122



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